

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

Boris Veytsman<sup>†</sup>

2017/03/04, v1.31

## Abstract

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

## Contents

<b>1</b>	<b>Introduction</b>	<b>3</b>
<b>2</b>	<b>User's guide</b>	<b>3</b>
2.1	Installation . . . . .	3
2.2	Invocation and options . . . . .	5
2.3	Topmatter commands . . . . .	7
2.4	Algorithms . . . . .	16
2.5	Figures and tables . . . . .	16
2.6	Theorems . . . . .	18
2.7	Online-only and offline-only material . . . . .	18
2.8	Note about anonymous mode . . . . .	18
2.9	Acknowledgments . . . . .	19
2.10	Bibliography . . . . .	20
2.11	Colors . . . . .	22
2.12	Other notable packages and typographic remarks . . . . .	22
<b>3</b>	<b>Implementation</b>	<b>23</b>
3.1	Identification . . . . .	23
3.2	Options . . . . .	23
3.3	Setting switches . . . . .	25
3.4	Loading base class and package . . . . .	26
3.5	Paper size and paragraphing . . . . .	33

---

\*©2016–2017, Association for Computing Machinery

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

3.6	Fonts	36
3.7	Floats	37
3.8	Lists	38
3.9	Top matter data	39
3.10	Concepts system	50
3.11	Copyright system	51
3.12	Typesetting top matter	55
3.13	Headers and Footers	68
3.14	Sectioning	72
3.15	TOC Lists	74
3.16	Theorems	74
3.17	Acknowledgments	77
3.18	Conditional typesetting	77
3.19	Additional bibliography commands	77
3.20	End of Class	78

# 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<sup>1</sup>. It was one of the early adopters of T<sub>E</sub>X 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 L<sup>A</sup>T<sub>E</sub>X package.

The package uses only free T<sub>E</sub>X packages and fonts included in T<sub>E</sub>XLive, MikT<sub>E</sub>X and other popular T<sub>E</sub>X distributions. It is intended to be published in these distributions itself, which minimizes users' efforts in the installation and support of the package.

I am grateful to Matthew Fluet, John Owens, Craig Rodkin, Bernard Rous, David Shamma, Stephen Spencer and many others for their invaluable help.

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

## 2 User's guide

### 2.1 Installation

Most probably, you already have this package installed in your favorite T<sub>E</sub>X 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.

If you decide to install the package yourself, follow the standard rules:

1. Run `latex onacmart.ins`. This will produce the file `acmart.cls`.
2. Put the file `acmart.cls` and the bibliography files `*.bst` to the places where L<sup>A</sup>T<sub>E</sub>X can find them (see [1] or the documentation for your T<sub>E</sub>X system).
3. Update the database of file names. Again, see [1] or the documentation for your T<sub>E</sub>X 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.

---

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

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

- *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>
- *environ*, <http://www.ctan.org/pkg/environ>
- *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>
- *latex-tools*, <http://www.ctan.org/pkg/latex-tools>
- *libertine*, <http://www.ctan.org/pkg/libertine>
- *manyfoot*, <http://www.ctan.org/pkg/manyfoot>
- *microtype*, <http://www.ctan.org/pkg/microtype>
- *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>
- *setspace*, <http://www.ctan.org/pkg/setspace>
- *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>

## 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}
```

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.

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}
```

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, TAAS, TACCESS, TACO, TALG, TALLIP (formerly TALIP), TCPS, TEAC, TECS, 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, TRET, TSAS, TSC, TSLP, TWEB.
acmlarge	Large single column format, used for IMWUT, JOCCH, PACMPL, TAP
acmtog	Large double column format, used for TOG
sigconf	Proceedings format for most of ACM conferences (with the exceptions listed below) and all ICPS volumes
siggraph	Proceedings format for SIGGRAPH and SIGGRAPH Asia conferences, published in ACM Transactions on Graphics journal issues
sigplan	Proceedings format for SIGPLAN conferences
sigchi	Proceedings format for SIGCHI conferences
sigchi-a	Format for SIGCHI extended abstract

The option `review` is useful when combined with the `manuscript` format option: it provides a version suitable for reviewers and copyeditors.

The option `screen` 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.

Table 2: Boolean options

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

## 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 *or* the name of the book as set by the editor.

**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}
```

Normally this command is entered either by the editor or by the typesetter.

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

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

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

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

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
PACMPL	PACM on Programming Languages
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
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



`\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` 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:

`\orcid`

`\affiliation`

`\email`

```

\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 typeset 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 Thørvöld Group.

`\position` The `\affiliation` and `\additionalaffiliation` commands are further structured to interact with the metadata extraction tools. Inside the this command you should use `\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}}

```

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`. Example:

```
\thanks{This work is supported by the Widget Corporation Grant
\#312-001.\\
Author's address: D. Pineo, Kingsbury Hall, 33 Academic Way, Durham,
N.H. 03824; email: dspineo@comcast.net; Colin Ware, Jere A. Chase
Ocean Engineering Lab, 24 Colovos Road, Durham, NH 03824; email:
cware@ccom.unh.edu;
Sean Fogarty, (Current address) NASA Ames Research Center, Moffett
Field, California 94035.}
```

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

`\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).

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

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

`\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
```

`\acmPrice` The macro `\acmPrice{<price>}` sets the price for the article (by default 15.00), for  
example,

```
\acmPrice{25.00}
```

<code>\acmISBN</code>	<p>Book-like volumes have ISBN numbers attached to them. The macro <code>\acmISBN{&lt;ISBN&gt;}</code> sets it. Normally it is set by the typesetter, for example,</p> <pre>\acmISBN{978-1-4503-3916-2}</pre>
<code>\acmDOI</code>	<p>The macro <code>\acmDOI{&lt;DOI&gt;}</code> sets the DOI number of the article, for example,</p> <pre>\acmDOI{10.1145/9999997.9999999}</pre> <p>It is normally set by the typesetter.</p>
<code>\acmBadgeR</code> <code>\acmBadgeL</code>	<p>Some conference articles get special distinction, for example, the artifact evaluation for PPOPP 2016 (see <a href="http://ctuning.org/ae/ppopp2016.html">http://ctuning.org/ae/ppopp2016.html</a>). These articles display special badges supplied by the conference organizers. The class provides commands to add these badges: <code>\acmBadgeR[&lt;url&gt;]{&lt;graphics&gt;}</code> and <code>\acmBadgeL[&lt;url&gt;]{&lt;graphics&gt;}</code>. 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: <code>[&lt;url&gt;]</code>, if provided, sets the link to the badge authority in the screen version, while <code>{&lt;graphics&gt;}</code> 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 <code>ae-logo.pdf</code>, the command is</p> <pre>\acmBadgeR[http://ctuning.org/ae/ppopp2016.html]{ae-logo}</pre>
<code>\startPage</code>	<p>The macro <code>\startPage{&lt;page&gt;}</code> sets the first page of the article in the journal or book. It is used by the typesetter.</p>
<code>\terms</code> <code>\keywords</code>	<p>The macros <code>\terms{&lt;term, term,...&gt;}</code> and <code>\keywords{&lt;keyword, keyword,...&gt;}</code> set the main terms and the additional keywords for the article. Term and keywords must be separated by commas, for example,</p> <pre>\terms{wireless, interference} \keywords{wireless sensor networks, media access control, multi-channel, radio interference, time synchronization}</pre>
<code>CCSXML</code> <code>\ccsdesc</code>	<p>ACM publications are classified according to the ACM Computing Classification Scheme (CCS). CCS codes are used both in the typeset version of the publications <i>and</i> in the metadata in the various databases. Therefore you need to provide both <math>\TeX</math> commands and XML metadata with the paper.</p> <p>The tool at <a href="http://dl.acm.org/ccs.cfm">http://dl.acm.org/ccs.cfm</a> can be used to generate CCS codes. After you select the topics, click on “Generate CCS codes” to get the result like the following:</p> <pre>\begin{CCSXML} &lt;ccs2012&gt; &lt;concept&gt; &lt;concept_id&gt;10010520.10010553.10010562&lt;/concept_id&gt; &lt;concept_desc&gt;Computer systems organization~Embedded systems&lt;/concept_desc&gt;</pre>

```

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

\ccsdesc[500]{Computer systems organization~Embedded systems}
\ccsdesc[300]{Computer systems organization~Redundancy}
\ccsdesc{Computer systems organization~Robotics}
\ccsdesc[100]{Networks~Network reliability}

```

You 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

Table 4: Parameters for `\setcopyright` command

Parameter	Meaning
<code>none</code>	The copyright and permission information is not typeset (this is the option for some ACM conferences).
<code>acmcopyright</code>	The authors transfer the copyright to ACM (the “traditional” choice).
<code>acmlicensed</code>	The authors retain the copyright but license the publication rights to ACM.
<code>rightsretained</code>	The authors retain the copyright and publication rights to themselves or somebody else.
<code>usgov</code>	All the authors are employees of the US Government.
<code>usgovmixed</code>	Some authors are employees of the US Government.
<code>cagov</code>	All the authors are employees of the Canadian Government.
<code>cagovmixed</code>	Some authors are employees of the Canadian Government.

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}

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

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

```

Table 5: Settings for `\settopmatter` command

| Parameter                | Values     | Meaning                                  |
|--------------------------|------------|------------------------------------------|
| <code>printccs</code>    | true/false | Whether to print CCS categories          |
| <code>printacmref</code> | true/false | Whether to print ACM bibliographic entry |
| <code>printfolios</code> | true/false | Whether to print page numbers (folios)   |

`\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 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  $\text{\LaTeX}$  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  
marginable

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

**marginable:** 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, corollary, and

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

## 2.7 Online-only and offline-only material

`printonly` Some supplementary material in ACM publication is put online, but not in the printed  
`screenonly` version. The text inside the environment `screenonly` will be typeset only when the option `screen` (see Section 2.2) is set to true. Conversely, the text inside the environment `printonly` is typeset only when this option is set to false. For example

```
\section{Supplementary materials}

\begin{printonly}
  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,  $\text{\TeX}$  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` All the financial support *must* be listed using the commands `\grantsponsor` and  
`\grantnum` `\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}{http://dx.doi.org/10.13039/501100001809} under Grant
  No.: ~\grantnum{GS501100001809}{61273304}
  and ~\grantnum[http://www.nnsf.cn/youngscientsts]{GS501100001809}{Young
  Scientists' Support Program}.
\end{acks}
```

## 2.10 Bibliography

ACM uses the *natbib* package for formatting references and the style `ACM-Reference-Format.bst` for Bib<sub>TeX</sub> 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 Bib<sub>TeX</sub> styles other than `ACM-Reference-Format.bst`, and may delay the processing of the manuscript.

`\citestyle` If you use *natbib*, you can select one of two predefined citation styles: 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 Bib<sub>TeX</sub> 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 bibliography corresponding to two different possibilities. 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 = "99.9999/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 = CACM,
  volume = "39",
  number = "11",
  month = nov,
  year = "1996",
}
```

## 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]: ACMBBlue, ACMYellow, ACMOrange, ACMRed, ACMLightBlue, ACMGreen, ACMPurple, ACMDarkBlue. You can use them in the color assignments.

## 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.

## 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.

```
1 <class>\NeedsTeXFormat{LaTeX2e}
2 <*gobble>
3 \ProvidesFile{acmart.dtx}
4 </gobble>
5 <class>\ProvidesClass{acmart}
6 [2017/03/04 v1.31 Typesetting articles for Association of
7 Computing Machinery]
```

And the driver code:

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

### 3.2 Options

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

```
26 \RequirePackage{xkeyval}
```

format The possible formats

```
27 \define@choicekey*+{acmart.cls}{format}[\ACM@format\ACM@format@nr]{%
28   manuscript, acmsmall, acmlarge, acmtog, sigconf, siggraph,
29   sigplan, sigchi, sigchi-a}[manuscript]{}{%
30   \ClassError{\@classname}{The option format must be manuscript,
31     acmsmall, acmlarge, acmtog, sigconf, siggraph,
32     sigplan, sigchi or sigchi-a}}
33 \def\@DeclareACMFormat#1{\DeclareOptionX{#1}{\setkeys{acmart.cls}{format=#1}}}
34 \@DeclareACMFormat{manuscript}
```

```

35 \DeclareACMFormat{acmsmall}
36 \DeclareACMFormat{acmlarge}
37 \DeclareACMFormat{acmtog}
38 \DeclareACMFormat{sigconf}
39 \DeclareACMFormat{siggraph}
40 \DeclareACMFormat{sigplan}
41 \DeclareACMFormat{sigchi}
42 \DeclareACMFormat{sigchi-a}
43 \ExecuteOptionsX{format}

\if@ACM@screen Whether we use screen mode
44 \define@boolkey+{acmart.cls}[@ACM@]{screen}[true]{%
45   \if@ACM@screen
46     \PackageInfo{\@classname}{Using screen mode}%
47   \else
48     \PackageInfo{\@classname}{Not using screen mode}%
49   \fi}{\PackageError{\@classname}{Option screen can be either true or
50     false}}
51 \ExecuteOptionsX{screen=false}

\if@ACM@review Whether we use review mode
52 \define@boolkey+{acmart.cls}[@ACM@]{review}[true]{%
53   \if@ACM@review
54     \PackageInfo{\@classname}{Using review mode}%
55   \else
56     \PackageInfo{\@classname}{Not using review mode}%
57   \fi}{\PackageError{\@classname}{Option review can be either true or
58     false}}
59 \ExecuteOptionsX{review=false}

\if@ACM@authorversion Whether we use author's version
60 \define@boolkey+{acmart.cls}[@ACM@]{authorversion}[true]{%
61   \if@ACM@authorversion
62     \PackageInfo{\@classname}{Using authorversion mode}%
63   \else
64     \PackageInfo{\@classname}{Not using authorversion mode}%
65   \fi}{\PackageError{\@classname}{Option authorversion can be either true or
66     false}}
67 \ExecuteOptionsX{authorversion=false}

\if@ACM@natbib@override Whether to override the format decision about natbib
68 \newif\if@ACM@natbib@override
69 \@ACM@natbib@overridefalse

\if@ACM@natbib Whether we use natbib mode
70 \define@boolkey+{acmart.cls}[@ACM@]{natbib}[true]{%
71   \@ACM@natbib@override=true
72   \if@ACM@natbib
73     \PackageInfo{\@classname}{Explicitly selecting natbib mode}%

```



```

74 \else
75 \PackageInfo{\@classname}{Explicitly deselecting natbib mode}%
76 \fi}{\PackageError{\@classname}{Option natbib can be either true or
77 false}}

\if@ACM@anonymous Whether we use anonymous mode
78 \define@boolkey+{acmart.cls}[@ACM@]{anonymous}[true]{%
79 \if@ACM@anonymous
80 \PackageInfo{\@classname}{Using anonymous mode}%
81 \else
82 \PackageInfo{\@classname}{Not using anonymous mode}%
83 \fi}{\PackageError{\@classname}{Option anonymous can be either true or
84 false}}
85 \ExecuteOptionsX{anonymous=false}

\ACM@fontsize The font size to pass to the base class
86 \def\ACM@fontsize{
87 \DeclareOptionX{9pt}{\edef\ACM@fontsize{\CurrentOption}}
88 \DeclareOptionX{10pt}{\edef\ACM@fontsize{\CurrentOption}}
89 \DeclareOptionX{11pt}{\edef\ACM@fontsize{\CurrentOption}}
90 \DeclareOptionX{12pt}{\edef\ACM@fontsize{\CurrentOption}}

91 \DeclareOptionX{draft}{\PassOptionsToClass{\CurrentOption}{amsart}}
92 \DeclareOptionX{*}{\PassOptionsToClass{\CurrentOption}{amsart}}
93 \ProcessOptionsX
94 \ClassInfo{\@classname}{Using format \ACM@format, number \ACM@format@nr}

```

### 3.3 Setting switches

```

\if@ACM@manuscript Whether we use manuscript mode
95 \newif\if@ACM@manuscript

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

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

Setting up switches
98 \ifnum\ACM@format@nr=0\relax
99 \@ACM@manuscripttrue
100 \else
101 \@ACM@manuscriptfalse
102 \fi
103 \@ACM@sigchiamodefalse
104 \ifcase\ACM@format@nr
105 \relax % manuscript
106 \@ACM@journaltrue

```

```

107 \or % acmsmall
108   \@ACM@journaltrue
109 \or % acmlarge
110   \@ACM@journaltrue
111 \or % acmtog
112   \@ACM@journaltrue
113 \or % sigconf
114   \@ACM@journalfalse
115 \or % siggraph
116   \@ACM@journalfalse
117 \or % sigplan
118   \@ACM@journalfalse
119 \or % sigchi
120   \@ACM@journalfalse
121 \or % sigchi-a
122   \@ACM@journalfalse
123   \@ACM@sigchiamodetrue
124 \fi

```

A format sets up `\if@ACM@natbib` only if `\@ACM@natbib@override` is false (i.e. user did *not* override format's selection):

```

125 \if@ACM@natbib@override\else
126   \@ACM@natbibtrue
127 \fi

```

### 3.4 Loading base class and package

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

```

128 \ifx\ACM@fontsize\@empty
129   \ifcase\ACM@format@nr
130     \relax % manuscript
131     \def\ACM@fontsize{9pt}%
132   \or % acmsmall
133     \def\ACM@fontsize{10pt}%
134   \or % acmlarge
135     \def\ACM@fontsize{10pt}%
136   \or % acmtog
137     \def\ACM@fontsize{9pt}%
138   \or % sigconf
139     \def\ACM@fontsize{9pt}%
140   \or % siggraph
141     \def\ACM@fontsize{9pt}%
142   \or % sigplan
143     \def\ACM@fontsize{9pt}%
144   \or % sigchi
145     \def\ACM@fontsize{10pt}%
146   \or % sigchi-a
147     \def\ACM@fontsize{10pt}%
148   \fi
149 \fi

```

```

150 \ClassInfo{\@classname}{Using fontsize \ACM@fontsize}
151 \LoadClass[\ACM@fontsize, reqno]{amsart}
152 \RequirePackage{microtype}

```

We need totpages package to calculate the number of pages

```

153 \RequirePackage{totpages}

```

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

```

154 \RequirePackage{environ}

```

We use setspace for doublespacing

```

155 \if@ACM@manuscript
156 \RequirePackage{setspace}
157 \onehalfspacing
158 \fi

```

Citations. We patch \setcitestyle to allow, e.g., \setcitestyle{sort} and \setcitestyle{nosort}. We patch \citestyle to warn about undefined citation styles.

```

159 \if@ACM@natbib
160 \RequirePackage{natbib}
161 \renewcommand{\bibsection}{%
162   \section*{\refname}%
163   \phantomsection\addcontentsline{toc}{section}{\refname}%
164 }
165 \renewcommand{\bibfont}{\bibliofont}
166 \renewcommand\setcitestyle[1]{
167   \@for\@tempa:=#1\do
168   {\def\@tempb{round}\ifx\@tempa\@tempb
169     \renewcommand\NAT@open{(\}\renewcommand\NAT@close{)}\fi
170     \def\@tempb{square}\ifx\@tempa\@tempb
171       \renewcommand\NAT@open{[\}\renewcommand\NAT@close{]}\fi
172     \def\@tempb{angle}\ifx\@tempa\@tempb
173       \renewcommand\NAT@open{$<$}\renewcommand\NAT@close{$>$}\fi
174     \def\@tempb{curly}\ifx\@tempa\@tempb
175       \renewcommand\NAT@open{\{}\renewcommand\NAT@close{\}}\fi
176     \def\@tempb{semicolon}\ifx\@tempa\@tempb
177       \renewcommand\NAT@sep{;}\fi
178     \def\@tempb{colon}\ifx\@tempa\@tempb
179       \renewcommand\NAT@sep{:}\fi
180     \def\@tempb{comma}\ifx\@tempa\@tempb
181       \renewcommand\NAT@sep{,}\fi
182     \def\@tempb{authoryear}\ifx\@tempa\@tempb
183       \NAT@numbersfalse\fi
184     \def\@tempb{numbers}\ifx\@tempa\@tempb
185       \NAT@numberstrue\NAT@superfalse\fi
186     \def\@tempb{super}\ifx\@tempa\@tempb
187       \NAT@numberstrue\NAT@supertrue\fi
188     \def\@tempb{nobibstyle}\ifx\@tempa\@tempb
189       \let\bibstyle=\gobble\fi

```

```

190 \def\@tempb{bibstyle}\ifx\@tempa\@tempb
191 \let\bibstyle=\@citestyle\fi
192 \def\@tempb{sort}\ifx\@tempa\@tempb
193 \def\NAT@sort{\@ne}\fi
194 \def\@tempb{nosort}\ifx\@tempa\@tempb
195 \def\NAT@sort{\@z}\fi
196 \def\@tempb{compress}\ifx\@tempa\@tempb
197 \def\NAT@cmprs{\@ne}\fi
198 \def\@tempb{nocompress}\ifx\@tempa\@tempb
199 \def\NAT@cmprs{\@z}\fi
200 \def\@tempb{sort&compress}\ifx\@tempa\@tempb
201 \def\NAT@sort{\@ne}\def\NAT@cmprs{\@ne}\fi
202 \def\@tempb{mcite}\ifx\@tempa\@tempb
203 \let\NAT@merge\@ne\fi
204 \def\@tempb{merge}\ifx\@tempa\@tempb
205 \ifnum\NAT@merge<\tw@\{\let\NAT@merge\tw@\}\fi
206 \def\@tempb{elide}\ifx\@tempa\@tempb
207 \ifnum\NAT@merge<\thr@\{\let\NAT@merge\thr@\}\fi
208 \def\@tempb{longnamesfirst}\ifx\@tempa\@tempb
209 \NAT@longnamestrue\fi
210 \def\@tempb{nonamebreak}\ifx\@tempa\@tempb
211 \def\NAT@nmfmt#1{\mbox{\NAT@up#1}}\fi
212 \expandafter\NAT@find@eq\@tempa=\relax\@nil
213 \if\@tempc\relax\else
214 \expandafter\NAT@rem@eq\@tempc
215 \def\@tempb{open}\ifx\@tempa\@tempb
216 \xdef\NAT@open{\@tempc}\fi
217 \def\@tempb{close}\ifx\@tempa\@tempb
218 \xdef\NAT@close{\@tempc}\fi
219 \def\@tempb{aysep}\ifx\@tempa\@tempb
220 \xdef\NAT@aysep{\@tempc}\fi
221 \def\@tempb{yysep}\ifx\@tempa\@tempb
222 \xdef\NAT@yrsep{\@tempc}\fi
223 \def\@tempb{notesep}\ifx\@tempa\@tempb
224 \xdef\NAT@cmt{\@tempc}\fi
225 \def\@tempb{citesep}\ifx\@tempa\@tempb
226 \xdef\NAT@sep{\@tempc}\fi
227 \fi
228 }%
229 \NAT@@setcites
230 }
231 \renewcommand\citestyle[1]{%
232 \ifcsname bibstyle@#1\endcsname%
233 \csname bibstyle@#1\endcsname\let\bibstyle\@gobble%
234 \else%
235 \latexerror{Undefined ‘#1’ citestyle}%
236 \fi
237 }%
238 \fi

```

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

```
239 \newcommand{\bibstyle@acmauthoryear}{%
240   \setcitestyle{%
241     authoryear,%
242     open={()},close={},citesep={;},%
243     aysep={},yysep={},,%
244     notesep={, }}}
```

`\bibstyle@acmnumeric` The default numeric format:

```
245 \newcommand{\bibstyle@acmnumeric}{%
246   \setcitestyle{%
247     numbers,sort&compress,%
248     open={},close={},citesep={},,%
249     notesep={, }}}
```

The default is numeric:

```
250 \if@ACM@natbib
251 \citestyle{acmnumeric}
252 \fi
```

`\@startsection` Before we call `hyperref`, we redefine `\startsection` commands to their  $\text{\LaTeX}$  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:

```
253 \def\@startsection#1#2#3#4#5#6{%
254   \if@noskipsec \leavevmode \fi
255   \par
256   \@tempskipa #4\relax
257   \@afterindenttrue
258   \ifdim \@tempskipa <\z@
259     \@tempskipa -\@tempskipa \@afterindentfalse
260   \fi
261   \if@nobreak
262     \everypar{}%
263   \else
264     \addpenalty\@secpenalty\addvspace\@tempskipa
265   \fi
266   \@ifstar
267     {\@ssect{#3}{#4}{#5}{#6}}%
268     {\@dblarg{\@sect{#1}{#2}{#3}{#4}{#5}{#6}}}
269 \def\@sect#1#2#3#4#5#6[#7]#8{%
270   \edef\@toclevel{\ifnum#2=\@m 0\else\number#2\fi}%
271   \ifnum #2>\c@secnumdepth
272     \let\@svsec\@empty
273   \else
274     \refstepcounter{#1}%
275     \protected@edef\@svsec{\@secntformat{#1}\relax}%
276   \fi
277   \@tempskipa #5\relax
278   \ifdim \@tempskipa>\z@
```

```

279 \begingroup
280   #6{%
281     \@hangfrom{\hskip #3\relax\@svsec}%
282     \interlinepenalty \@M #8\@@par}%
283 \endgroup
284 \csname #1mark\endcsname{#7}%
285 \ifnum #2>\c@secnumdepth \else
286   \@tochangmeasure{\csname the#1\endcsname}%
287 \fi
288 \addcontentsline{toc}{#1}{%
289   \ifnum #2>\c@secnumdepth \else
290     \protect\numberline{\csname the#1\endcsname}%
291   \fi
292   #7}%
293 \else
294   \def\@svsechd{%
295     #6{\hskip #3\relax
296       \@svsec #8}%
297     \csname #1mark\endcsname{#7}%
298     \ifnum #2>\c@secnumdepth \else
299       \@tochangmeasure{\csname the#1\endcsname\space}%
300     \fi
301     \addcontentsline{toc}{#1}{%
302       \ifnum #2>\c@secnumdepth \else
303         \protect\numberline{\csname the#1\endcsname}%
304       \fi
305       #7}}%
306 \fi
307 \@xsect{#5}}
308 \def\@xsect#1{%
309   \@tempskipa #1\relax
310   \ifdim \@tempskipa>\z@
311     \par \nobreak
312     \vskip \@tempskipa
313     \afterheading
314   \else
315     \@nobreakfalse
316     \global\@noskipsectrue
317     \everypar{%
318       \if@noskipsec
319         \global\@noskipsecfalse
320         {\setbox\z@\lastbox}%
321         \clubpenalty\@M
322         \begingroup \@svsechd \endgroup
323         \unskip
324         \@tempskipa #1\relax
325         \hskip -\@tempskipa
326       \else
327         \clubpenalty \@clubpenalty
328         \everypar{}%

```

```

329     \fi}%
330 \fi
331 \ignorespaces}
332 \def\@seccntformat#1{\csname the#1\endcsname\quad}
333 \def\@ssect#1#2#3#4#5{%
334   \@tempskipa #3\relax
335   \ifdim \@tempskipa>\z@
336     \begingroup
337       #4{%
338         \@hangfrom{\hskip #1}%
339         \interlinepenalty \@M #5\@par}%
340     \endgroup
341   \else
342     \def\@svsechd{#4{\hskip #1\relax #5}}%
343   \fi
344   \@xsect{#3}}

```

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

```

345 \def\@starttoc#1#2{\begingroup
346   \setTrue{#1}%
347   \par\removelastskip\vskip\z@skip
348   \@startsection{section}\@M\z@{\linespacing\@plus\linespacing}%
349   {.5\linespacing}{\centering\contentsnamefont}{#2}%
350   \@input{\jobname.#1}%
351   \if@files
352     \xp\newwrite\csname tf@#1\endcsname
353     \immediate\xp\openout\csname tf@#1\endcsname \jobname.#1\relax
354   \fi
355   \global\@nobreakfalse \endgroup
356   \addvspace{32\p@\@plus14\p@}%
357 }

```

\l@section Amsart has too large spacing

```

358 \def\l@section{\@tocline{2}{0pt}{1pc}{3pc}{}}

```

\l@subsubsection Amsart has too large spacing

```

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

```

And hyperref

```

360 \let\@footnotemark@nolink\@footnotemark
361 \let\@footnotetext@nolink\@footnotetext
362 \RequirePackage[bookmarksnumbered,unicode]{hyperref}
363 \pdfstringdefDisableCommands{%
364   \def\unskip{}%
365   \def\textbullet{- }%
366   \def\textrightarrow{-> }%
367   \def\footnotemark{}%
368 }
369 \urlstyle{rm}

```

```

370 \ifcase\ACM@format@nr
371 \relax % manuscript
372 \or % acmsmall
373 \or % acmlarge
374 \or % acmtog
375 \or % sigconf
376 \or % siggraph
377 \or % sigplan
378 \urlstyle{sf}
379 \or % sigchi
380 \or % sigchi-a
381 \urlstyle{sf}
382 \fi
383 \if@ACM@screen
384 \hypersetup{colorlinks,
385   linkcolor=ACMRed,
386   citecolor=ACMPurple,
387   urlcolor=ACMDarkBlue,
388   filecolor=ACMDarkBlue}
389 \else
390 \hypersetup{hidelinks}
391 \fi

  Bibliography mangling.
392 \if@ACM@natbib
393 \let\cite\citeN
394 \let\cite\citep
395 \let\citeANP\citeauthor
396 \let\citeNN\citeyearpar
397 \let\citeyearNP\citeyear
398 \let\citeyear\citeyearpar
399 \let\citeNP\citealt
400 \DeclareRobustCommand\citeA
401   {\begingroup\NAT@swafalse
402     \let\NAT@ctype\@ne\NAT@partrue\NAT@fullfalse\NAT@open\NAT@citetp}%
403 \providecommand\newblock{}%
404 \else
405 \providecommand\citename[1]{#1}
406 \fi
407 \def\shortcite#1{\ifNAT@numbers\cite{#1}\else\citeyear{#1}\fi}

```

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

```

408 \def\bibliographystyle#1{%
409   \ifx\@begindocumenthook\undefined\else
410     \expandafter\AtBeginDocument
411   \fi
412   {\if@filesw
413     \immediate\write\@auxout{\string\bibstyle{#1}}%
414   \fi}}

```



## Graphics and color

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

We define ACM colors according to [7]:

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

## 3.5 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>.

```
424 \RequirePackage{geometry}
425 \ifcase\ACM@format@nr
426 \relax % manuscript
427   \geometry{letterpaper,head=13pt,
428     marginparwidth=6pc}%
429 \or % acmsmall
430   \geometry{twoside=true,
431     includeheadfoot, head=13pt, foot=2pc,
432     paperwidth=6.75in, paperheight=10in,
433     top=58pt, bottom=44pt, inner=46pt, outer=46pt,
434     marginparwidth=2pc
435   }%
436 \or % acmlarge
437   \geometry{twoside=true, head=13pt, foot=2pc,
438     paperwidth=8.5in, paperheight=11in,
439     includeheadfoot,
440     top=78pt, bottom=114pt, inner=81pt, outer=81pt,
441     marginparwidth=4pc
442   }%
443 \or % acmtog
444   \geometry{twoside=true, head=13pt, foot=2pc,
445     paperwidth=8.5in, paperheight=11in,
446     includeheadfoot, columnsep=24pt,
447     top=52pt, bottom=75pt, inner=52pt, outer=52pt,
448     marginparwidth=2pc
449   }%
450 \or % sigconf
451   \geometry{twoside=true, head=13pt,
452     paperwidth=8.5in, paperheight=11in,
453     includeheadfoot, columnsep=2pc,
454     top=57pt, bottom=73pt, inner=54pt, outer=54pt,
```

```

455     marginparwidth=2pc
456   }%
457 \or % siggraph
458   \geometry{twoside=true, head=13pt,
459     paperwidth=8.5in, paperheight=11in,
460     includeheadfoot, columnsep=2pc,
461     top=57pt, bottom=73pt, inner=54pt, outer=54pt,
462     marginparwidth=2pc
463   }%
464 \or % sigplan
465   \geometry{twoside=true, head=13pt,
466     paperwidth=8.5in, paperheight=11in,
467     includeheadfoot=false, columnsep=2pc,
468     top=1in, bottom=1in, inner=0.75in, outer=0.75in,
469     marginparwidth=2pc
470   }%
471 \or % sigchi
472   \geometry{twoside=true, head=13pt,
473     paperwidth=8.5in, paperheight=11in,
474     includeheadfoot, columnsep=2pc,
475     top=66pt, bottom=73pt, inner=54pt, outer=54pt,
476     marginparwidth=2pc
477   }%
478 \or % sigchi-a
479   \geometry{twoside=false, head=13pt,
480     paperwidth=11in, paperheight=8.5in,
481     includeheadfoot, marginparsep=72pt,
482     marginparwidth=170pt, columnsep=20pt,
483     top=72pt, bottom=72pt, left=314pt, right=72pt
484   }%
485   \@mparswitchfalse
486   \reversemarginpar
487 \fi

```

\parindent Paragraphing

```

\parskip
488 \setlength\parindent{10\p@}
489 \setlength\parskip{\z@}
490 \ifcase\ACM@format@nr
491 \relax % manuscript
492 \or % acmsmall
493 \or % acmlarge
494 \or % acmtog
495   \setlength\parindent{9\p@}%
496 \or % sigconf
497 \or % siggraph
498 \or % sigplan
499 \or % sigchi
500 \or % sigchi-a
501 \fi

```

Footnotes require some consideration. We have several layers of footnotes: front-matter 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.

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

504 \RequirePackage{manyfoot}
505 \SelectFootnoteRule[2]{copyrightpermission}
506 \DeclareNewFootnote{copyrightpermission}
```

`\footnoterule` Tschichold’s rules:

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

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

```
509 \def\endminipage{%
510   \par
511   \unskip
512   \ifvoid\@mpfootins\else
513     \vskip\skip\@mpfootins
514     \normalcolor
515     \unvbox\@mpfootins
516   \fi
517   \@minipagefalse %% added 24 May 89
518   \color@endgroup
519   \egroup
520   \expandafter\@iiiparbox\@mpargs{\unvbox\@tempboxa}}
```

`\@makefnmark` We do not use indentation for footnotes

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

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

```
522 \if@ACM@sigchiamode
523 \long\def\@footnotetext#1{\marginpar{%
524   \reset@font\small
525   \interlinepenalty\interfootnotelinepenalty
526   \protected@edef\@currentlabel{%
527     \csname p@footnote\endcsname\@thefnmark
528   }%
529   \color@begingroup
530     \@makefnmark{%
531       \rule{z@footnotesep}{\ignorespaces#1}\@finalstrut\strutbox}%
532   \color@endgroup}}%
533 \fi
```

`\empfootnotetext` We want the footnotes in minipages centered:

```
534 \long\def\empfootnotetext#1{%
535   \global\setbox\empfootins\vbox{%
536     \unvbox\empfootins
537     \reset@font\footnotesize
538     \hsize\columnwidth
539     \@parboxrestore
540     \protected@edef\currentlabel
541       {\csname p@mpfootnote\endcsname\@thefnmark}%
542     \color@begingroup\centering
543     \makefnmark{%
544       \rule\z@\footnotesep\ignorespaces#1\@finalstrut\strutbox}%
545     \color@endgroup}}
```

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

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

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

```
547 \def\textbottom{\vskip \z@ \@plus 1pt}
548 \let\texttop\relax
```

### 3.6 Fonts

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

```
549 \newif\if@ACM@newfonts
550 \@ACM@newfontstrue
551 \IfFileExists{libertine.sty}{\ClassWarning{\@classname}{You do not
552   have libertine package installed. Please upgrade your
553   TeX}\@ACM@newfontsfalse}
554 \IfFileExists{zi4.sty}{\ClassWarning{\@classname}{You do not
555   have zi4 package installed. Please upgrade your TeX}\@ACM@newfontsfalse}
556 \IfFileExists{newtxmath.sty}{\ClassWarning{\@classname}{You do not
557   have newtxmath package installed. Please upgrade your
558   TeX}\@ACM@newfontsfalse}
```

We use Libertine throughout.

```
559 \if@ACM@newfonts
560 \RequirePackage[tt=false]{libertine}
561 \RequirePackage[varqu]{zi4}
562 \RequirePackage[libertine]{newtxmath}
563 \RequirePackage[T1]{fontenc}
564 \fi
```

The SIGCHI extended abstracts are sans serif:

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

### 3.7 Floats

We use caption package

```

568 \RequirePackage{caption, float}
569 \captionsetup[table]{position=top}
570 \if@ACM@journal
571   \captionsetup{labelfont={sf, small},
572     textfont={sf, small}, margin=\z@}
573   \captionsetup[figure]{name={Fig.}}
574 \else
575   \captionsetup{labelfont={bf},
576     textfont={bf}, labelsep=colon, margin=\z@}
577   \ifcase\ACM@format@nr
578     \relax % manuscript
579     \or % acmsmall
580     \or % acmlarge
581     \or % acmtog
582     \or % sigconf
583     \or % siggraph
584     \captionsetup{textfont={it}}
585     \or % sigplan
586     \captionsetup{labelfont={bf},
587       textfont={normalfont}, labelsep=period, margin=\z@}
588     \or % sigchi
589     \captionsetup[figure]{labelfont={bf, small},
590       textfont={bf, small}}
591     \or % sigchi-a
592     \captionsetup[figure]{labelfont={bf, small},
593       textfont={bf, small}}
594   \fi
595 \fi

```

sidebar The sidebar environment:

```

596 \newfloat{sidebar}{}{sbar}
597 \floatname{sidebar}{Sidebar}
598 \renewenvironment{sidebar}{\Collect@Body\@sidebar}{}

```

\@sidebar The processing of the saved text

```

599 \long\def\@sidebar#1{\bgroup\captionsetup{type=sidebar}%
600   \marginpar{\small#1}\egroup}

```

marginfigure The marginfigure environment:

```

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

```

\@marginfigure The processing of the saved text

```

602 \long\def\@marginfigure#1{\bgroup\captionsetup{type=figure}%
603   \marginpar{\centering\small#1}\egroup}

```

marginatable The marginatable environment:

```

604 \newenvironment{marginatable}{\Collect@Body\@marginatable}{}

```

`\@margintable` The processing of the saved text

```
605 \long\def\@margintable#1{\bgroup\captionsetup{type=table}%
606 \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

```
607 \newdimen\fulltextwidth
608 \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)

```
609 \if@ACM@sigchiamode
610 \def\@dblfloat{\bgroup\columnwidth=\fulltextwidth
611 \let\endfloatbox\endwidefloatbox
612 \def\@fpsaddddefault{\def\@fps{tp}}%
613 \float}
614 \fi
```

`\enddblfloat` And the end. Just adding a `\bgroup`.

```
615 \if@ACM@sigchiamode
616 \def\enddblfloat{%
617 \endfloat\egroup}
618 \fi
```

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

```
619 \def\@endwidefloatbox{%
620 \par\vskip\z@skip
621 \@minipagefalse
622 \outer@nobreak
623 \egroup
624 \color@endbox
625 \global\setbox\@currbox=\vbox{\moveleft
626 \dimexpr(\fulltextwidth-\textwidth)\box\@currbox}%
627 \wd\@currbox=\textwidth
628 }
```

### 3.8 Lists

```
629 \ifcase\ACM@format@nr
630 \relax % manuscript
631 \or % acmsmall
632 \or % acmlarge
633 \or % acmtog
634 \or % sigconf
635 \or % siggraph
636 \or % sigplan
637 \def\labelenumi{\theenumi.}
```

```

638 \def\labelenumii{\theenumii.}
639 \def\labelenumiii{\theenumiii.}
640 \def\labelenumiv{\theenumiv.}
641 \or % sigchi
642 \or % sigchi-a
643 \fi

\descriptionlabel We do not use default colon as \amsart does:
644 \renewcommand{\descriptionlabel}[1]{\hspace\labelsep \upshape\bfseries #1}

\description AMS uses additional indent of 6pt. Frank recommends dropping it.
645 \renewenvironment{description}{\list{}{%
646   \itemindent-12\p@
647   \labelwidth\z@ \let\makelabel\descriptionlabel}%
648 }{
649   \endlist
650 }
651 \let\enddescription=\endlist % for efficiency

```

### 3.9 Top matter data

We use keyval interface to define journal title and relevant information

```

652 \define@choicekey*+{ACM}{acmJournal}[\@journalCode\@journalCode@nr]{%
653   CIE,%
654   CSUR,%
655   IMWUT,%
656   JACM,%
657   JDIQ,%
658   JEA,%
659   JERIC,%
660   JETC,%
661   JOCCH,%
662   PACMPL,%
663   TAAS,%
664   TACCESS,%
665   TACO,%
666   TALG,%
667   TALLIP,%
668   TAP,%
669   TCPS,%
670   TEAC,%
671   TECS,%
672   TIIS,%
673   TISSEC,%
674   TIST,%
675   TKDD,%
676   TMIS,%
677   TOCE,%
678   TOCHI,%

```

```

679 TOCL,%
680 TOCS,%
681 TOCT,%
682 TODAES,%
683 TODS,%
684 TOG,%
685 TOIS,%
686 TOIT,%
687 TOMACS,%
688 TOMM,%
689 TOMPECS,%
690 TOMS,%
691 TOPC,%
692 TOPS,%
693 TOPLAS,%
694 TOS,%
695 TOSEM,%
696 TOSN,%
697 TRETs,%
698 TSAS,%
699 TSC,%
700 TSLP,%
701 TWEB%
702 }{%
703 \ifcase\@journalCode@nr
704 \relax % CIE
705 \def\@journalName{ACM Computers in Entertainment}%
706 \def\@journalNameShort{ACM Comput. Entertain.}%
707 \def\@permissionCodeOne{1544-3574}%
708 \or % CSUR
709 \def\@journalName{ACM Computing Surveys}%
710 \def\@journalNameShort{ACM Comput. Surv.}%
711 \def\@permissionCodeOne{0360-0300}%
712 \or % IMWUT
713 \def\@journalName{Proceedings of the ACM on Interactive, Mobile,
714 Wearable and Ubiquitous Technologies}%
715 \def\@journalNameShort{Proc. ACM Interact. Mob. Wearable Ubiquitous Technol.}%
716 \def\@permissionCodeOne{2474-9567}%
717 \or % JACM
718 \def\@journalName{Journal of the ACM}%
719 \def\@journalNameShort{J. ACM}%
720 \def\@permissionCodeOne{0004-5411}%
721 \or % JDIQ
722 \def\@journalName{ACM Journal of Data and Information Quality}%
723 \def\@journalNameShort{ACM J. Data Inform. Quality}%
724 \def\@permissionCodeOne{1936-1955}%
725 \or % JEA
726 \def\@journalName{ACM Journal of Experimental Algorithmics}%
727 \def\@journalNameShort{ACM J. Exp. Algor.}%
728 \def\@permissionCodeOne{1084-6654}%

```



```

729 \or % JERIC
730 \def\@journalName{ACM Journal of Educational Resources in Computing}%
731 \def\@journalNameShort{ACM J. Edu. Resources in Comput.}%
732 \def\@permissionCodeOne{1073-0516}%
733 \or % JETC
734 \def\@journalName{ACM Journal on Emerging Technologies in Computing Systems}%
735 \def\@journalNameShort{ACM J. Emerg. Technol. Comput. Syst.}%
736 \def\@permissionCodeOne{1550-4832}%
737 \or % JOCCH
738 \def\@journalName{ACM Journal on Computing and Cultural Heritage}%
739 \def\@journalName{ACM J. Comput. Cult. Herit.}%
740 \or % PACMPL
741 \def\@journalName{Proceedings of the ACM on Programming Languages}%
742 \def\@journalName{Proc. ACM Program. Lang.}%
743 \def\@permissionCodeOne{2475-1421}%
744 \or % TAAS
745 \def\@journalName{ACM Transactions on Autonomous and Adaptive Systems}%
746 \def\@journalNameShort{ACM Trans. Autonom. Adapt. Syst.}%
747 \def\@permissionCodeOne{1556-4665}%
748 \or % TACCESS
749 \def\@journalName{ACM Transactions on Accessible Computing}%
750 \def\@journalNameShort{ACM Trans. Access. Comput.}%
751 \def\@permissionCodeOne{1936-7228}%
752 \or % TACO
753 \def\@journalName{ACM Transactions on Architecture and Code Optimization}%
754 \or % TALG
755 \def\@journalName{ACM Transactions on Algorithms}%
756 \def\@journalNameShort{ACM Trans. Algor.}%
757 \def\@permissionCodeOne{1549-6325}%
758 \or % TALLIP
759 \def\@journalName{ACM Transactions on Asian and Low-Resource Language Information Processing}%
760 \def\@journalNameShort{ACM Trans. Asian Low-Resour. Lang. Inf. Process.}%
761 \def\@permissionCodeOne{2375-4699}%
762 \or % TAP
763 \def\@journalName{ACM Transactions on Applied Perception}%
764 \or % TCPS
765 \def\@journalName{ACM Transactions on Cyber-Physical Systems}%
766 \or % TEAC
767 \def\@journalName{ACM Transactions on Economics and Computation}%
768 \or % TECS
769 \def\@journalName{ACM Transactions on Embedded Computing Systems}%
770 \def\@journalNameShort{ACM Trans. Embedd. Comput. Syst.}%
771 \def\@permissionCodeOne{1539-9087}%
772 \or % TIIS
773 \def\@journalName{ACM Transactions on Interactive Intelligent Systems}%
774 \def\@journalNameShort{ACM Trans. Interact. Intell. Syst.}%
775 \def\@permissionCodeOne{2160-6455}%
776 \or % TISSEC
777 \def\@journalName{ACM Transactions on Information and System Security}%
778 \def\@journalNameShort{ACM Trans. Info. Syst. Sec.}%

```

```

779 \def\@permissionCodeOne{1094-9224}%
780 \or % TIST
781 \def\@journalName{ACM Transactions on Intelligent Systems and Technology}%
782 \def\@journalNameShort{ACM Trans. Intell. Syst. Technol.}%
783 \def\@permissionCodeOne{2157-6904}%
784 \or % TKDD
785 \def\@journalName{ACM Transactions on Knowledge Discovery from Data}%
786 \def\@journalNameShort{ACM Trans. Knowl. Discov. Data.}%
787 \def\@permissionCodeOne{1556-4681}%
788 \or % TMIS
789 \def\@journalName{ACM Transactions on Management Information Systems}%
790 \def\@journalNameShort{ACM Trans. Manag. Inform. Syst.}%
791 \def\@permissionCodeOne{2158-656X}%
792 \or % TOCE
793 \def\@journalName{ACM Transactions on Computing Education}%
794 \def\@journalNameShort{ACM Trans. Comput. Educ.}%
795 \def\@permissionCodeOne{1946-6226}%
796 \or % TOCHI
797 \def\@journalName{ACM Transactions on Computer-Human Interaction}%
798 \def\@journalNameShort{ACM Trans. Comput.-Hum. Interact.}%
799 \def\@permissionCodeOne{1073-0516}%
800 \or % TOCL
801 \def\@journalName{ACM Transactions on Computational Logic}%
802 \def\@journalNameShort{ACM Trans. Comput. Logic}%
803 \def\@permissionCodeOne{1529-3785}%
804 \or % TOCS
805 \def\@journalName{ACM Transactions on Computer Systems}%
806 \def\@journalNameShort{ACM Trans. Comput. Syst.}%
807 \def\@permissionCodeOne{0734-2071}%
808 \or % TOCT
809 \def\@journalName{ACM Transactions on Computation Theory}%
810 \def\@journalNameShort{ACM Trans. Comput. Theory}%
811 \def\@permissionCodeOne{1942-3454}%
812 \or % TODAES
813 \def\@journalName{ACM Transactions on Design Automation of Electronic Systems}%
814 \def\@journalNameShort{ACM Trans. Des. Autom. Electron. Syst.}%
815 \def\@permissionCodeOne{1084-4309}%
816 \or % TODS
817 \def\@journalName{ACM Transactions on Database Systems}%
818 \def\@journalNameShort{ACM Trans. Datab. Syst.}%
819 \def\@permissionCodeOne{0362-5915}%
820 \or % TOG
821 \def\@journalName{ACM Transactions on Graphics}%
822 \def\@journalNameShort{ACM Trans. Graph.}%
823 \def\@permissionCodeOne{0730-0301}%
824 \or % TOIS
825 \def\@journalName{ACM Transactions on Information Systems}%
826 \def\@journalName{ACM Transactions on Information Systems}%
827 \def\@permissionCodeOne{1046-8188}%
828 \or % TOIT

```

```

829 \def\@journalName{ACM Transactions on Internet Technology}%
830 \def\@journalNameShort{ACM Trans. Internet Technol.}%
831 \def\@permissionCodeOne{1533-5399}%
832 \or % TOMACS
833 \def\@journalName{ACM Transactions on Modeling and Computer Simulation}%
834 \def\@journalNameShort{ACM Transactions on Modeling and Computer Simulation}%
835 \def\@journalNameShort{ACM Trans. Model. Comput. Simul.}%
836 \or % TOMM
837 \def\@journalName{ACM Transactions on Multimedia Computing, Communications and Applications}%
838 \def\@journalNameShort{ACM Trans. Multimedia Comput. Commun. Appl.}%
839 \def\@permissionCodeOne{1551-6857}%
840 \def\@permissionCodeTwo{0100}%
841 \or % TOMPECS
842 \def\@journalName{ACM Transactions on Modeling and Performance Evaluation of Computing Systems}%
843 \def\@journalNameShort{ACM Trans. Model. Perform. Eval. Comput. Syst.}%
844 \def\@permissionCodeOne{2376-3639}%
845 \or % TOMS
846 \def\@journalName{ACM Transactions on Mathematical Software}%
847 \def\@journalNameShort{ACM Trans. Math. Softw.}%
848 \def\@permissionCodeOne{0098-3500}%
849 \or % TOPC
850 \def\@journalName{ACM Transactions on Parallel Computing}%
851 \def\@journalNameShort{ACM Trans. Parallel Comput.}%
852 \def\@permissionCodeOne{1539-9087}%
853 \or % TOPS
854 \def\@journalName{ACM Transactions on Privacy and Security}%
855 \def\@journalNameShort{ACM Trans. Priv. Sec.}%
856 \def\@permissionCodeOne{2471-2566}%
857 \or % TOPLAS
858 \def\@journalName{ACM Transactions on Programming Languages and Systems}%
859 \def\@journalNameShort{ACM Trans. Program. Lang. Syst.}%
860 \def\@permissionCodeOne{0164-0925}%
861 \or % TOS
862 \def\@journalName{ACM Transactions on Storage}%
863 \def\@journalNameShort{ACM Trans. Storage}%
864 \def\@permissionCodeOne{1553-3077}%
865 \or % TOSEM
866 \def\@journalName{ACM Transactions on Software Engineering and Methodology}%
867 \def\@journalNameShort{ACM Trans. Softw. Eng. Methodol.}%
868 \def\@permissionCodeOne{1049-331X}%
869 \or % TOSN
870 \def\@journalName{ACM Transactions on Sensor Networks}%
871 \def\@journalNameShort{ACM Trans. Sensor Netw.}%
872 \def\@permissionCodeOne{1550-4859}%
873 \or % TRET
874 \def\@journalName{ACM Transactions on Reconfigurable Technology and Systems}%
875 \def\@journalNameShort{ACM Trans. Reconfig. Technol. Syst.}%
876 \def\@permissionCodeOne{1936-7406}%
877 \or % TSAS
878 \def\@journalName{ACM Transactions on Spatial Algorithms and Systems}%

```

```

879 \def\@journalNameShort{ACM Trans. Spatial Algorithms Syst.}%
880 \def\@permissionCodeOne{2374-0353}%
881 \or % TSC
882 \def\@journalName{ACM Transactions on Social Computing}%
883 \def\@journalNameShort{ACM Trans. Soc. Comput.}%
884 \def\@permissionCodeOne{2469-7818}%
885 \or % TSLP
886 \def\@journalName{ACM Transactions on Speech and Language Processing}%
887 \def\@journalNameShort{ACM Trans. Speech Lang. Process.}%
888 \def\@permissionCodeOne{1550-4875}%
889 \or % TWEB
890 \def\@journalName{ACM Transactions on the Web}%
891 \def\@journalNameShort{ACM Trans. Web}%
892 \def\@permissionCodeOne{1559-1131}%
893 \fi
894 \ClassInfo{\@classname}{Using journal code \@journalCode}%
895 }{%
896 \ClassError{\@classname}{Incorrect journal #1}%
897 }%

\acmJournal And the syntactic sugar around it
898 \def\acmJournal#1{\setkeys{ACM}{acmJournal=#1}}

The defaults:
899 \def\@journalCode@nr{0}
900 \def\@journalName{}%
901 \def\@journalNameShort{\@journalName}%
902 \def\@permissionCodeOne{XXXX-XXXX}%
903 \def\@permissionCodeTwo{}%

\acmConference This is the conference command
904 \newcommand\acmConference[4][{}%
905 \gdef\acmConference@shortname{#1}%
906 \gdef\acmConference@name{#2}%
907 \gdef\acmConference@date{#3}%
908 \gdef\acmConference@venue{#4}%
909 \ifx\acmConference@shortname\empty
910 \gdef\acmConference@shortname{#2}%
911 \fi}
912 \acmConference[Conference'17]{ACM Conference}{July 2017}{Washington,
913 DC, USA}

\subtitle The subtitle macro
914 \def\subtitle#1{\def\@subtitle{#1}}
915 \subtitle{}

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

```

918 \renewcommand\author[2][{}%
919   \if@insideauthorgroup\else
920     \global\advance\num@authorgroups by 1\relax
921     \global\@insideauthorgrouptrue
922   \fi
923   \ifx\addresses\@empty
924     \if@ACM@anonymous
925       \gdef\addresses{\@author{Anonymous Author(s)}}%
926       \gdef\authors{Anonymous Author(s)}%
927     \else
928       \gdef\addresses{\@author{#2}}%
929       \gdef\authors{#2}%
930     \fi
931   \else
932     \if@ACM@anonymous\else
933       \g@addto@macro\addresses{\and\@author{#2}}%
934       \g@addto@macro\authors{\and#2}%
935     \fi
936   \fi
937   \if@ACM@anonymous
938     \ifx\shortauthors\@empty
939       \gdef\shortauthors{Anon.}%
940     \fi
941   \else
942     \def\@tempa{#1}%
943     \ifx\@tempa\@empty
944       \ifx\shortauthors\@empty
945         \gdef\shortauthors{#2}%
946       \else
947         \g@addto@macro\shortauthors{\and#2}%
948       \fi
949     \else
950       \ifx\shortauthors\@empty
951         \gdef\shortauthors{#1}%
952       \else
953         \g@addto@macro\shortauthors{\and#1}%
954       \fi
955     \fi
956   \fi}

```

`\affiliation` The macro `\affiliation` mimics `\address` from `amsart`. Note that it has an optional argument we do not currently need, but keep for the possible future use.

```

957 \newcommand{\affiliation}[2][{}%
958   \global\@insideauthorgroupfalse
959   \if@ACM@anonymous\else

```

```

960     \g@addto@macro\addresses{\affiliation{#1}{#2}}%
961     \fi}

\additionalaffiliation Additional affiliations go to footnotes
962 \def\additionalaffiliation#1{\authornote{\@additionalaffiliation{#1}}}

\@additionalaffiliation Process additionalaffiliation inside \authornote
963 \def\@additionalaffiliation#1{\bgroup
964   \def\position##1{\ignorespaces}%
965   \def\institution##1{##1\ignorespaces}%
966   \def\department{\@ifnextchar[{\@department}{\@department[]}}%
967   \def\@department[##1]##2{\unskip, ##2\ignorespaces}%
968   \let\streetaddress\position
969   \let\city\position
970   \let\state\position
971   \let\postcode\position
972   \let\country\position
973   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.
974 \renewcommand{\email}[2][{}]{%
975   \if@ACM@anonymous\else
976     \g@addto@macro\addresses{\email{#1}{#2}}%
977     \fi}

\orcid Right now we do not typeset orcid's gobble

\@titlenotes The titlenotes
978 \def\@titlenotes{}

\titlenote Adding note to the title
979 \def\titlenote#1{%
980   \g@addto@macro\@title{\footnotemark}%
981   \if@ACM@anonymous
982     \g@addto@macro\@titlenotes{%
983       \stepcounter{footnote}\footnotetext{Title note}}%
984   \else
985     \g@addto@macro\@titlenotes{\stepcounter{footnote}\footnotetext{#1}}%
986   \fi}

\@subtitlenotes The subtitlenotes
987 \def\@subtitlenotes{}

\subtitlenote Adding note to the subtitle
988 \def\subtitlenote#1{%
989   \g@addto@macro\@subtitle{\footnotemark}%
990   \if@ACM@anonymous
991     \g@addto@macro\@subtitlenotes{%

```

```

992     \stepcounter{footnote}\footnotetext{Subtitle note}}%
993 \else
994     \g@addto@macro\@subtitlenotes{%
995         \stepcounter{footnote}\footnotetext{#1}}%
996 \fi}

\@authornotes The authornotes
997 \def\@authornotes{}

\authornote Adding note to the author
998 \def\authornote#1{%
999     \if@ACM@anonymous\else
1000     \g@addto@macro\addresses{\@authornotemark}
1001     \g@addto@macro\@authornotes{%
1002         \stepcounter{footnote}\footnotetext{#1}}%
1003 \fi}

\acmVolume The current volume
1004 \def\acmVolume#1{\def\@acmVolume{#1}}
1005 \acmVolume{1}

\acmNumber The current number
1006 \def\acmNumber#1{\def\@acmNumber{#1}}
1007 \acmNumber{1}

\acmArticle The current article
1008 \def\acmArticle#1{\def\@acmArticle{#1}}
1009 \acmArticle{1}

\acmArticleSeq The sequence number
1010 \def\acmArticleSeq#1{\def\@acmArticleSeq{#1}}
1011 \acmArticleSeq{\@acmArticle}

\acmYear The current year
1012 \def\acmYear#1{\def\@acmYear{#1}}
1013 \acmYear{\the\year}

\acmMonth The current month
1014 \def\acmMonth#1{\def\@acmMonth{#1}}
1015 \acmMonth{\the\month}

\@acmPubDate The publication date
1016 \def\@acmPubDate{\ifcase\@acmMonth\or
1017     January\or February\or March\or April\or May\or June\or
1018     July\or August\or September\or October\or November\or
1019     December\fi~\@acmYear}

\acmPrice The price
1020 \def\acmPrice#1{\def\@acmPrice{#1}}
1021 \acmPrice{15.00}

```

|                                |                                                                                                                                                                                                                   |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>\acmISBN</code>          | <p>The book isbn</p> <pre>1022 \def\acmISBN#1{\def\@acmISBN{#1}} 1023 \acmISBN{978-x-xxxx-xxxx-x/YY/MM}</pre>                                                                                                     |
| <code>\acmDOI</code>           | <p>The paper doi</p> <pre>1024 \def\acmDOI#1{\def\@acmDOI{#1}} 1025 \acmDOI{10.1145/nnnnnnn.nnnnnnn}</pre>                                                                                                        |
| <code>\if@ACM@badge</code>     | <p>Whether to print badge. Note that either left or right badge triggers it:</p> <pre>1026 \newif\if@ACM@badge 1027 \@ACM@badgefalse</pre>                                                                        |
| <code>\@ACM@badge@width</code> | <p>The width of the badge</p> <pre>1028 \newlength\@ACM@badge@width 1029 \setlength\@ACM@badge@width{5pc}</pre>                                                                                                   |
| <code>\@ACM@title@width</code> | <p>The width of the badge</p> <pre>1030 \newlength\@ACM@title@width</pre>                                                                                                                                         |
| <code>\@ACM@badge@skip</code>  | <p>The space between the badge and the title</p> <pre>1031 \newlength\@ACM@badge@skip 1032 \setlength\@ACM@badge@skip{1pc}</pre>                                                                                  |
| <code>\acmBadgeR</code>        | <p>Setting the right badge</p> <pre>1033 \newcommand\acmBadgeR[2][\@ACM@badgetrue 1034   \def\@acmBadgeR@url{#1}% 1035   \def\@acmBadgeR@image{#2}} 1036 \def\@acmBadgeR@url{} 1037 \def\@acmBadgeR@image{}</pre> |
| <code>\acmBadgeL</code>        | <p>Setting the left badge</p> <pre>1038 \newcommand\acmBadgeL[2][\@ACM@badgetrue 1039   \def\@acmBadgeL@url{#1}% 1040   \def\@acmBadgeL@image{#2}} 1041 \def\@acmBadgeL@url{} 1042 \def\@acmBadgeL@image{}</pre>  |
| <code>\startPage</code>        | <p>The start page of the paper</p> <pre>1043 \def\startPage#1{\def\@startPage{#1}} 1044 \startPage{}</pre>                                                                                                        |
| <code>\terms</code>            | <p>Terms are mostly obsolete, we use CCS now. Still it makes sense to keep them for compatibility.</p> <pre>1045 \def\terms#1{\def\@terms{#1}} 1046 \terms{}</pre>                                                |
| <code>\keywords</code>         | <p>Keywords are mostly obsolete, we use CCS now. Still it makes sense to keep them for compatibility.</p> <pre>1047 \def\keywords#1{\def\@keywords{#1}} 1048 \keywords{}</pre>                                    |



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

```
1049 \renewenvironment{abstract}{\Collect@Body\@saveabstract}{}
```

\@saveabstract    And saving the abstract

```
1050 \long\def\@saveabstract#1{\long\gdef\@abstract{#1}}
1051 \@saveabstract{}
```

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

```
1052 \long\def\@empty{}
```

\if@ACM@printccs    Whether to print CCS

```
1053 \define@boolkey+{@ACM@topmatter@}[@ACM@]{printccs}[true]{%
1054   \if@ACM@printccs
1055     \ClassInfo{\@classname}{Printing CCS}%
1056   \else
1057     \ClassInfo{\@classname}{Suppressing CCS}%
1058   \fi}{\ClassError{\@classname}{printccs must be true or false}}
```

\if@ACM@printacmref    Whether to print ACM bib

```
1059 \define@boolkey+{@ACM@topmatter@}[@ACM@]{printacmref}[true]{%
1060   \if@ACM@printacmref
1061     \ClassInfo{\@classname}{Printing bibformat}%
1062   \else
1063     \ClassInfo{\@classname}{Suppressing bibformat}%
1064   \fi}{\ClassError{\@classname}{printacmref must be true or false}}
```

\if@ACM@printfolios    Whether to print folios

```
1065 \define@boolkey+{@ACM@topmatter@}[@ACM@]{printfolios}[true]{%
1066   \if@ACM@printfolios
1067     \ClassInfo{\@classname}{Printing folios}%
1068   \else
1069     \ClassInfo{\@classname}{Suppressing folios}%
1070   \fi}{\ClassError{\@classname}{printfolios must be true or false}}
```

\settopmatter    The usual syntactic sugar

```
1071 \def\settopmatter#1{\setkeys{@ACM@topmatter@}{#1}}
```

Now the settings

```
1072 \settopmatter{printccs=true, printacmref=true}
1073 \if@ACM@manuscript
1074   \settopmatter{printfolios=true}
1075 \else
1076   \if@ACM@journal
1077     \settopmatter{printfolios=true}
1078   \else
1079     \settopmatter{printfolios=false}
1080   \fi
1081 \fi
```

\@received The container for the paper history

```
1082 \def\@received{}
```

\received The \received command

```
1083 \newcommand\received[2][\def\@tempa{#1}%
1084 \ifx\@tempa\empty
1085 \ifx\@received\empty
1086 \gdef\@received{Received #2}%
1087 \else
1088 \g@addto@macro{\@received}{; revised #2}%
1089 \fi
1090 \else
1091 \ifx\@received\empty
1092 \gdef\@received{#1 #2}%
1093 \else
1094 \g@addto@macro{\@received}{; #1 #2}%
1095 \fi
1096 \fi}
1097 \AtEndDocument{%
1098 \ifx\@received\empty\else
1099 \par\bigskip\noindent\small\normalfont\@received\par
1100 \fi}
```

### 3.10 Concepts system

We exclude CCSXML stuff generated by the ACM system:

```
1101 \RequirePackage{comment}
1102 \excludecomment{CCSXML}
```

\@concepts This is the storage macro for concepts

```
1103 \let\@concepts\empty
```

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

```
1104 \newcommand\ccsdesc[2][100]{%
1105 \ccsdesc@parse#1~#2~}
```

\ccsdesc@parse The parser of the expression Significance~General~Specific (we need textcomp for \textrightarrow:

```
1106 \RequirePackage{textcomp}
1107 \def\ccsdesc@parse#1~#2~#3~{%
1108 \expandafter\ifx\csname CCS@#2\endcsname\relax
1109 \expandafter\gdef\csname CCS@#2\endcsname{\textbullet\ \textbf{#2}\textrightarrow\ }%
1110 \g@addto@macro{\@concepts}{\csname CCS@#2\endcsname}\fi
1111 \expandafter\g@addto@macro\expandafter{\csname CCS@#2\endcsname}{%
1112 \ifnum#1>499\textbf{#3}; \else
1113 \ifnum#1>299\textit{#3}; \else
1114 #3; \fi\fi}}
```

### 3.11 Copyright system

This is from acmcopyright.sty

`\if@printcopyright` A flag whether to print copyright symbol  
1115 `\newif\if@printcopyright`  
1116 `\@printcopyrighttrue`

`\if@printpermission` Whether to print permission block  
1117 `\newif\if@printpermission`  
1118 `\@printpermissiontrue`

`\if@acmowned` Whether ACM owns the rights to the paper  
1119 `\newif\if@acmowned`  
1120 `\@acmownedtrue`

Keys:

```
1121 \define@choicekey*{ACM@}{acmcopyrightmode}[%  
1122   \acm@copyrightinput\acm@copyrightmode]{none,acmcopyright,acmlicensed,%  
1123   rightsretained,usgov,usgovmixed,cagov,cagovmixed,%  
1124   licensedusgovmixed,licensedcagovmixed,othergov,licensedothergov}{%  
1125   \@printpermissiontrue  
1126   \@printcopyrighttrue  
1127   \@acmownedtrue  
1128   \ifnum\acm@copyrightmode=0\relax % none  
1129     \@printpermissionfalse  
1130     \@printcopyrightfalse  
1131     \@acmownedfalse  
1132   \fi  
1133   \ifnum\acm@copyrightmode=2\relax % acmlicensed  
1134     \@acmownedfalse  
1135   \fi  
1136   \ifnum\acm@copyrightmode=3\relax % rightsretained  
1137     \@acmownedfalse  
1138   \fi  
1139   \ifnum\acm@copyrightmode=4\relax % usgov  
1140     \@printpermissiontrue  
1141     \@printcopyrightfalse  
1142     \@acmownedfalse  
1143   \fi  
1144   \ifnum\acm@copyrightmode=6\relax % cagov  
1145     \@acmownedfalse  
1146   \fi  
1147   \ifnum\acm@copyrightmode=8\relax % licensedusgovmixed  
1148     \@acmownedfalse  
1149   \fi  
1150   \ifnum\acm@copyrightmode=9\relax % licensedcagovmixed  
1151     \@acmownedfalse  
1152   \fi  
1153   \ifnum\acm@copyrightmode=10\relax % othergov
```

```

1154 \acmownedtrue
1155 \fi
1156 \ifnum\acm@copyrightmode=11\relax % licensedothergov
1157 \acmownedfalse
1158 \fi}

```

\setcopyright This is the syntactic sugar around setting keys.

```

1159 \def\setcopyright#1{\setkeys{ACM@}{acmcopyrightmode=#1}}
1160 \setcopyright{acmcopyright}

```

\@copyrightowner Here is the owner of the copyright

```

1161 \def\@copyrightowner{%
1162 \ifcase\acm@copyrightmode\relax % none
1163 \or % acmcopyright
1164 ACM\@.
1165 \or % acmlicensed
1166 Copyright held by the owner/author(s). Publication rights licensed to
1167 ACM\@.
1168 \or % rightsretained
1169 Copyright held by the owner/author(s).
1170 \or % usgov
1171 \or % usgovmixed
1172 ACM\@.
1173 \or % cagov
1174 Crown in Right of Canada.
1175 \or %cagovmixed
1176 ACM\@.
1177 \or %licensedusgovmixed
1178 Copyright held by the owner/author(s). Publication rights licensed to
1179 ACM\@.
1180 \or %licensedcagovmixed
1181 Copyright held by the owner/author(s). Publication rights licensed to
1182 ACM\@.
1183 \or % othergov
1184 ACM\@.
1185 \or % licensedothergov
1186 Copyright held by the owner/author(s). Publication rights licensed to
1187 ACM\@.
1188 \fi}

```

\@formatdoi Print a clickable doi

```

1189 \def\@formatdoi#1{\url{http://dx.doi.org/#1}}

```

\@copyrightpermission The canned permission block.

```

1190 \def\@copyrightpermission{%
1191 \ifcase\acm@copyrightmode\relax % none
1192 \or % acmcopyright
1193 Permission to make digital or hard copies of all or part of this
1194 work for personal or classroom use is granted without fee provided

```

1195 that copies are not made or distributed for profit or commercial  
1196 advantage and that copies bear this notice and the full citation on  
1197 the first page. Copyrights for components of this work owned by  
1198 others than ACM must be honored. Abstracting with credit is  
1199 permitted. To copy otherwise, or republish, to post on servers or to  
1200 redistribute to lists, requires prior specific permission  
1201 and\hspace\*{.5pt}/or a fee. Request permissions from  
1202 permissions@acm.org.

1203 \or % acmlicensed

1204 Permission to make digital or hard copies of all or part of this  
1205 work for personal or classroom use is granted without fee provided  
1206 that copies are not made or distributed for profit or commercial  
1207 advantage and that copies bear this notice and the full citation on  
1208 the first page. Copyrights for components of this work owned by  
1209 others than the author(s) must be honored. Abstracting with credit  
1210 is permitted. To copy otherwise, or republish, to post on servers  
1211 or to redistribute to lists, requires prior specific permission  
1212 and\hspace\*{.5pt}/or a fee. Request permissions from  
1213 permissions@acm.org.

1214 \or % rightsretained

1215 Permission to make digital or hard copies of part or all of this work  
1216 for personal or classroom use is granted without fee provided that  
1217 copies are not made or distributed for profit or commercial advantage  
1218 and that copies bear this notice and the full citation on the first  
1219 page. Copyrights for third-party components of this work must be  
1220 honored. For all other uses, contact the  
1221 owner\hspace\*{.5pt}/author(s).

1222 \or % usgov

1223 This paper is authored by an employee(s) of the United States  
1224 Government and is in the public domain. Non-exclusive copying or  
1225 redistribution is allowed, provided that the article citation is  
1226 given and the authors and agency are clearly identified as its  
1227 source.

1228 \or % usgovmixed

1229 ACM acknowledges that this contribution was authored or co-authored  
1230 by an employee, or contractor of the national government. As such,  
1231 the Government retains a nonexclusive, royalty-free right to  
1232 publish or reproduce this article, or to allow others to do so, for  
1233 Government purposes only. Permission to make digital or hard copies  
1234 for personal or classroom use is granted. Copies must bear this  
1235 notice and the full citation on the first page. Copyrights for  
1236 components of this work owned by others than ACM must be  
1237 honored. To copy otherwise, distribute, republish, or post,  
1238 requires prior specific permission and\hspace\*{.5pt}/or a  
1239 fee. Request permissions from permissions@acm.org.

1240 \or % cagov

1241 This article was authored by employees of the Government of Canada.  
1242 As such, the Canadian government retains all interest in the  
1243 copyright to this work and grants to ACM a nonexclusive,  
1244 royalty-free right to publish or reproduce this article, or to allow

1245 others to do so, provided that clear attribution is given both to  
 1246 the authors and the Canadian government agency employing them.  
 1247 Permission to make digital or hard copies for personal or classroom  
 1248 use is granted. Copies must bear this notice and the full citation  
 1249 on the first page. Copyrights for components of this work owned by  
 1250 others than the Canadian Government must be honored. To copy  
 1251 otherwise, distribute, republish, or post, requires prior specific  
 1252 permission and\hspace\*{.5pt}/or a fee. Request permissions from  
 1253 permissions@acm.org.  
 1254 \or % cagovmixed  
 1255 ACM acknowledges that this contribution was co-authored by an  
 1256 affiliate of the national government of Canada. As such, the Crown  
 1257 in Right of Canada retains an equal interest in the copyright.  
 1258 Reprints must include clear attribution to ACM and the author's  
 1259 government agency affiliation. Permission to make digital or hard  
 1260 copies for personal or classroom use is granted. Copies must bear  
 1261 this notice and the full citation on the first page. Copyrights for  
 1262 components of this work owned by others than ACM must be honored.  
 1263 To copy otherwise, distribute, republish, or post, requires prior  
 1264 specific permission and\hspace\*{.5pt}/or a fee. Request permissions  
 1265 from permissions@acm.org.  
 1266 \or % licensedusgovmixed  
 1267 Publication rights licensed to ACM\@. ACM acknowledges that this  
 1268 contribution was authored or co-authored by an employee, contractor  
 1269 or affiliate of the United States government. As such, the  
 1270 Government retains a nonexclusive, royalty-free right to publish or  
 1271 reproduce this article, or to allow others to do so, for Government  
 1272 purposes only.  
 1273 \or % licensedcagovmixed  
 1274 Publication rights licensed to ACM\@. ACM acknowledges that this  
 1275 contribution was authored or co-authored by an employee, contractor  
 1276 or affiliate of the national government of Canada. As such, the  
 1277 Government retains a nonexclusive, royalty-free right to publish or  
 1278 reproduce this article, or to allow others to do so, for Government  
 1279 purposes only.  
 1280 \or % othergov  
 1281 ACM acknowledges that this contribution was authored or co-authored  
 1282 by an employee, contractor or affiliate of a national government. As  
 1283 such, the Government retains a nonexclusive, royalty-free right to  
 1284 publish or reproduce this article, or to allow others to do so, for  
 1285 Government purposes only.  
 1286 \or % licensedothergov  
 1287 Publication rights licensed to ACM\@. ACM acknowledges that this  
 1288 contribution was authored or co-authored by an employee, contractor  
 1289 or affiliate of a national government. As such, the Government  
 1290 retains a nonexclusive, royalty-free right to publish or reproduce  
 1291 this article, or to allow others to do so, for Government purposes  
 1292 only.  
 1293 \fi}

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

```

1294 \def\copyrightyear#1{\def\@copyrightyear{#1}}
1295 \copyrightyear{\@acmYear}

\@teaserfigures The teaser figures container
1296 \def\@teaserfigures{}

teaserfigure The teaser figure
1297 \newenvironment{teaserfigure}{\Collect@Body\@saveteaser}{}

\@saveteaser Saving the teaser
1298 \long\def\@saveteaser#1{\g@addto@macro\@teaserfigures{\@teaser{#1}}}}

\thanks We redefine amsart \thanks, so the anonymous key works
1299 \renewcommand{\thanks}[1]{%
1300   \ifnotempty{#1}{%
1301     \if@ACM@anonymous
1302       \g@addto@macro\thankses{\thanks{A note}}}%
1303   \else
1304     \g@addto@macro\thankses{\thanks{#1}}}%
1305   \fi}}
```

### 3.12 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]`.

```

1306 \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 copy-
right/permission block. By the way, this was the default behavior of the old ACM classes.
1307 \def\maketitle{%
1308   \if@ACM@anonymous
1309     % Anonymize omission of \author-s
1310     \ifnum\@authorgroups=0\author{}\fi
1311   \fi
1312   \begingroup
1313   \let\@footnotemark\@footnotemark@nolink
1314   \let\@footnotetext\@footnotetext@nolink
1315   \renewcommand\thefootnote{\@fnsymbol\c@footnote}%
1316   \@topnum\z@ % this prevents figures from falling at the top of page
1317               % 1
1318   \hsize=\textwidth
1319   \def\@makefnmark{\hbox{\@textsuperscript{\@thefnmark}}}%
1320   \mktitle\if@ACM@sigchiamode\else\@mkauthors\fi\@mkteasers
1321   \@printtopmatter}
```

```

1322 \if@ACM@sigchiamode\mkauthors\fi
1323 \setcounter{footnote}{0}%
1324 \def\@makefnmark{\hbox{\@textsuperscript{\normalfont\@thefnmark}}}%
1325 \@titlenotes
1326 \@subtitlenotes
1327 \@authornotes
1328 \let\@makefnmark\relax \let\@thefnmark\relax
1329 \let\@makefntext\noindent
1330 \ifx\@empty\thankses\else
1331   \footnotetextcopyrightpermission{%
1332     \def\par{\let\par\@par}\parindent\z@\@setthanks}%
1333   \fi
1334   \footnotetextcopyrightpermission{\parindent\z@\parskip0.1\baselineskip
1335   \if@ACM@authorversion\else
1336     \if@printpermission\@copyrightpermission\par\fi
1337   \fi
1338   \if@ACM@manuscript\else
1339     \if@ACM@journal\else % Print the conference short name
1340       {\itshape \acmConference@shortname, \acmConference@venue}\par
1341     \fi
1342   \fi
1343   \if@printcopyright
1344     \copyright\ \@copyrightyear\ \@copyrightowner\
1345   \else
1346     \@copyrightyear.\
1347   \fi
1348   \if@ACM@manuscript
1349     Manuscript submitted to ACM\
1350   \else
1351     \if@ACM@authorversion
1352       This is the author's version of the work. It is posted here for
1353       your personal use. Not for redistribution. The definitive Version
1354       of Record was published in
1355       \if@ACM@journal
1356         \emph{\@journalName}%
1357       \else
1358         \emph{Proceedings of \acmConference@name, \acmConference@date}%
1359       \fi
1360       \ifx\@acmDOI\@empty
1361         .
1362       \else
1363         , \@formatdoi{\@acmDOI}.
1364       \fi\
1365     \else
1366       \if@ACM@journal
1367         \@permissionCodeOne/\@acmYear/\@acmMonth-ART\@acmArticle\
1368         \$\@acmPrice\
1369         DOI: \nolinkurl{\@acmDOI}%
1370       \else % Conference
1371         \@acmISBN

```



```

1372         \ifx\@acmPrice\@empty.\else\dots\$\@acmPrice\fi\\
1373         DOI: \nolinkurl{\@acmDOI}%
1374     \fi
1375 \fi
1376 \fi}%
1377 \endgroup
1378 \setcounter{footnote}{0}%
1379 \@mkabstract
1380 \if@ACM@printccs
1381     \ifx\@concepts\@empty\else\bgroup
1382         {\@specialsection{CCS Concepts}%
1383         \@concepts\par}\egroup
1384     \fi
1385 \fi
1386 \if\@terms\@empty\else\bgroup
1387     {\@specialsection{General Terms}%
1388     \@terms\par}\egroup
1389 \fi
1390 \ifx\@keywords\@empty\else\bgroup
1391     {\if@ACM@journal
1392         \@specialsection{Additional Key Words and Phrases}%
1393     \else
1394         \@specialsection{Keywords}%
1395     \fi
1396     \@keywords}\par\egroup
1397 \fi
1398 \andify\authors
1399 \andify\shortauthors
1400 \global\let\authors=\authors
1401 \global\let\shortauthors=\shortauthors
1402 \if@ACM@printacmref
1403     \@mkbibcitation
1404 \fi
1405 \hypersetup{pdfauthor={\authors},
1406     pdftitle={\@title}, pdfkeywords={\@concepts}}%
1407 \@printendtopmatter
1408 \@afterindentfalse
1409 \@afterheading
1410 }

```

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

```

1411 \def\@specialsection#1{%
1412     \ifcase\ACM@format@nr
1413     \relax % manuscript
1414     \par\medskip\small\noindent#1: %
1415     \or % acmsmall
1416     \par\medskip\small\noindent#1: %
1417     \or % acmlarge
1418     \par\medskip\small\noindent#1: %
1419     \or % acmtog

```

```

1420 \par\medskip\small\noindent#1: %
1421 \or % sigconf
1422 \section*{#1}%
1423 \or % siggraph
1424 \section*{#1}%
1425 \or % sigplan
1426 \paragraph*{#1}%
1427 \or % sigchi
1428 \section*{#1}%
1429 \or % sigchi-a
1430 \section*{#1}%
1431 \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.

```

1432 \def\@printtopmatter{%
1433 \ifx\@startPage\empty
1434 \gdef\@startPage{1}%
1435 \else
1436 \setcounter{page}{\@startPage}%
1437 \fi
1438 \thispagestyle{firstpagestyle}%
1439 \noindent
1440 \ifcase\ACM@format@nr
1441 \relax % manuscript
1442 \box\mktitle@bx\par
1443 \noindent\hrulefill\par
1444 \or % acmsmall
1445 \box\mktitle@bx\par
1446 \noindent\hrulefill\par
1447 \or % acmlarge
1448 \box\mktitle@bx\par
1449 \noindent\hrulefill\par
1450 \or % acmtog
1451 \twocolumn[\box\mktitle@bx]%
1452 \or % sigconf
1453 \twocolumn[\box\mktitle@bx]%
1454 \or % siggraph
1455 \twocolumn[\box\mktitle@bx]%
1456 \or % sigplan
1457 \twocolumn[\box\mktitle@bx]%
1458 \or % sigchi
1459 \twocolumn[\box\mktitle@bx]%
1460 \or % sigchi-a
1461 \par\box\mktitle@bx\par\bigskip
1462 \if@ACM@badge
1463 \marginpar{\noindent
1464 \ifx\@acmBadgeL@image\empty\else
1465 \href{\@acmBadgeL@url}{%

```

```

1466         \includegraphics[width=\@ACM@badge@width]{\@acmBadgeL@image}}%
1467         \hskip\@ACM@badge@skip
1468     \fi
1469     \ifx\@acmBadgeR@image\@empty\else
1470         \href{\@acmBadgeR@url}{%
1471             \includegraphics[width=\@ACM@badge@width]{\@acmBadgeR@image}}%
1472         \fi}%
1473 \fi
1474 \fi
1475 }

\@mktitle The title of the article
1476 \def\@mktitle{%
1477     \ifcase\ACM@format@nr
1478     \relax % manuscript
1479     \@mktitle@i
1480 \or % acmsmall
1481     \@mktitle@i
1482 \or % acmlarge
1483     \@mktitle@i
1484 \or % acmtog
1485     \@mktitle@i
1486 \or % sigconf
1487     \@mktitle@iii
1488 \or % siggraph
1489     \@mktitle@iii
1490 \or % sigplan
1491     \@mktitle@iii
1492 \or % sigchi
1493     \@mktitle@iii
1494 \or % sigchi-a
1495     \@mktitle@iv
1496 \fi
1497 }

\@titlefont The font to typeset title
1498 \def\@titlefont{%
1499     \ifcase\ACM@format@nr
1500     \relax % manuscript
1501     \LARGE\bfseries\sffamily
1502 \or % acmsmall
1503     \LARGE\bfseries\sffamily
1504 \or % acmlarge
1505     \LARGE\bfseries\sffamily
1506 \or % acmtog
1507     \Huge\sffamily
1508 \or % sigconf
1509     \Huge\sffamily\bfseries
1510 \or % siggraph
1511     \Huge\sffamily\bfseries

```

```

1512 \or % sigplan
1513 \Huge\bfseries
1514 \or % sigchi
1515 \Huge\sffamily\bfseries
1516 \or % sigchi-a
1517 \Huge\bfseries
1518 \fi}

\@subtitlefont The font to typeset title
1519 \def\@subtitlefont{%
1520 \ifcase\ACM@format@nr
1521 \relax % manuscript
1522 \mdseries
1523 \or % acmsmall
1524 \mdseries
1525 \or % acmlarge
1526 \mdseries
1527 \or % acmtog
1528 \LARGE
1529 \or % sigconf
1530 \LARGE\mdseries
1531 \or % siggraph
1532 \LARGE\mdseries
1533 \or % sigplan
1534 \LARGE\mdseries
1535 \or % sigchi
1536 \LARGE\mdseries
1537 \or % sigchi-a
1538 \mdseries
1539 \fi}

\@mktitle@i The version of \mktitle for most journals
1540 \def\@mktitle@i{\hsize=\textwidth
1541 \ACM@title@width=\hsize
1542 \ifx\@acmBadgeL@image\@empty\else
1543 \advance\ACM@title@width by -\ACM@badge@width
1544 \advance\ACM@title@width by -\ACM@badge@skip
1545 \fi
1546 \ifx\@acmBadgeR@image\@empty\else
1547 \advance\ACM@title@width by -\ACM@badge@width
1548 \advance\ACM@title@width by -\ACM@badge@skip
1549 \fi
1550 \setbox\mktitle@bx=\vbox{\noindent\@titlefont
1551 \ifx\@acmBadgeL@image\@empty\else
1552 \raisebox{-.5\baselineskip}{\vcenter{\href{\@acmBadgeL@url}}}%
1553 \includegraphics[width=\ACM@badge@width]{\@acmBadgeL@image}}}%
1554 \hskip\ACM@badge@skip
1555 \fi
1556 \parbox[t]{\ACM@title@width}{\raggedright
1557 \@titlefont\noindent

```

```

1558     \@title
1559     \ifx\@subtitle\@empty\else
1560         \par\noindent{\@subtitlefont\@subtitle}
1561     \fi}%
1562     \ifx\@acmBadgeR@image\@empty\else
1563         \hskip\@ACM@badge@skip
1564         \raisebox{-.5\baselineskip}[\z@][\z@]{\href{\@acmBadgeR@url}{%
1565             \includegraphics[width=\@ACM@badge@width]{\@acmBadgeR@image}}}%
1566     \fi
1567     \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.
1568 \def\@mktitle@iii{\hsize=\textwidth
1569     \setbox\mktitle@bx=\vbox{\@titlefont\centering
1570         \@ACM@title@width=\hsize
1571         \if@ACM@badge
1572             \advance\@ACM@title@width by -2\@ACM@badge@width
1573             \advance\@ACM@title@width by -2\@ACM@badge@skip
1574             \parbox[b]{\@ACM@badge@width}{\strut
1575                 \ifx\@acmBadgeL@image\@empty\else
1576                     \raisebox{-.5\baselineskip}[\z@][\z@]{\href{\@acmBadgeL@url}{%
1577                         \includegraphics[width=\@ACM@badge@width]{\@acmBadgeL@image}}}%
1578                 \fi}%
1579             \hskip\@ACM@badge@skip
1580         \fi
1581         \parbox[t]{\@ACM@title@width}{\centering\@titlefont
1582             \@title
1583             \ifx\@subtitle\@empty\else
1584                 \par\noindent{\@subtitlefont\@subtitle}
1585             \fi
1586         }%
1587         \if@ACM@badge
1588             \hskip\@ACM@badge@skip
1589             \parbox[b]{\@ACM@badge@width}{\strut
1590                 \ifx\@acmBadgeR@image\@empty\else
1591                     \raisebox{-.5\baselineskip}[\z@][\z@]{\href{\@acmBadgeR@url}{%
1592                         \includegraphics[width=\@ACM@badge@width]{\@acmBadgeR@image}}}%
1593                 \fi}%
1594         \fi
1595         \par\bigskip}}%

\@mktitle@iv The version of \@mktitle for sigchi-a
1596 \def\@mktitle@iv{\hsize=\textwidth
1597     \setbox\mktitle@bx=\vbox{\raggedright\leftskip5pc\@titlefont
1598         \noindent\leavevmode\leaders\hrule height 2pt\hfill\kern0pt\par
1599         \noindent\@title
1600         \ifx\@subtitle\@empty\else

```

```

1601     \par\noindent\@subtitlefont\@subtitle
1602     \fi
1603     \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.

```

1604 \newbox\@ACM@commabox
1605 \def\@ACM@addtoaddress#1{%
1606     \ifvmode\else
1607         \setbox\@ACM@commabox=\hbox{, }%
1608         \unskip\cleaders\copy\@ACM@commabox\hskip\wd\@ACM@commabox
1609     \fi
1610     #1}

```

\institution Theoretically we can define the macros for \affiliation inside the \@mkauthors-style commands. However, this would lead to a strange error if an author uses them outside \affiliation. Of course we can make them produce an error message, but...  
\department \affiliation.  
\streetaddress We follow the strange American tradition of no comma before zip code.

```

\city 1611 \if@ACM@journal
\state 1612     \let\position\@gobble
\postcode 1613     \def\institution#1{#1\ignorespaces}%
\country 1614     \newcommand\department[2][0]{}%
1615     \let\streetaddress\@gobble
1616     \let\city\@gobble
1617     \let\state\@gobble
1618     \let\postcode\@gobble
1619     \let\country\@gobble
1620 \else
1621     \def\position#1{#1\par}%
1622     \def\institution#1{#1\par}%
1623     \newcommand\department[2][0]{#2\par}%
1624     \def\streetaddress#1{#1\par}%
1625     \let\city\@ACM@addtoaddress
1626     \let\state\@ACM@addtoaddress
1627     \def\postcode#1{\unskip\space#1}%
1628     \let\country\@ACM@addtoaddress
1629 \fi

```

\@mkauthors Typesetting authors

```

1630 \def\@mkauthors{\begingroup
1631     \hsize=\textwidth
1632     \ifcase\ACM@format@nr
1633     \relax % manuscript

```

```

1634 \mkauthors@i
1635 \or % acmsmall
1636 \mkauthors@i
1637 \or % acmlarge
1638 \mkauthors@i
1639 \or % acmtog
1640 \mkauthors@i
1641 \or % sigconf
1642 \mkauthors@iii
1643 \or % siggraph
1644 \mkauthors@iii
1645 \or % sigplan
1646 \mkauthors@iii
1647 \or % sigchi
1648 \mkauthors@iii
1649 \or % sigchi-a
1650 \mkauthors@iv
1651 \fi
1652 \endgroup
1653 }

```

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

```

1654 \def\@authorfont{\Large\sffamily}

```

\@affiliationfont Font for affiliations

```

1655 \def\@affiliationfont{\normalsize\normalfont}

```

#### Adjusting fonts for different formats

```

1656 \ifcase\ACM@format@nr
1657 \relax % manuscript
1658 \or % acmsmall
1659 \def\@authorfont{\large\sffamily}
1660 \def\@affiliationfont{\small\normalfont}
1661 \or % acmlarge
1662 \or % acmtog
1663 \def\@authorfont{\LARGE\sffamily}
1664 \def\@affiliationfont{\large}
1665 \or % sigconf
1666 \def\@authorfont{\LARGE}
1667 \def\@affiliationfont{\large}
1668 \or % siggraph
1669 \def\@authorfont{\normalsize\normalfont}
1670 \def\@affiliationfont{\normalsize\normalfont}
1671 \or % sigplan
1672 \def\@authorfont{\Large\normalfont}
1673 \def\@affiliationfont{\normalsize\normalfont}
1674 \or % sigchi
1675 \def\@authorfont{\bfseries}
1676 \def\@affiliationfont{\mdseries}

```

```

1677 \or % sigchi-a
1678 \def\@authorfont{\bfseries}
1679 \def\@affiliationfont{\mdseries}
1680 \fi

```

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

```

1681 \def\@typeset@author@line{%
1682   \andify\@currentauthors\par\noindent
1683   \@currentauthors\def\@currentauthors{}%
1684   \ifx\@currentaffiliations\@empty\else
1685     \andify\@currentaffiliations
1686     \unskip, {\@currentaffiliations}\par
1687   \fi
1688   \def\@currentaffiliations{}}

```

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

```

1689 \def\@mkauthors@i{%
1690   \def\@currentauthors{}%
1691   \def\@currentaffiliations{}%
1692   \global\let\and\@typeset@author@line
1693   \def\@author##1{%
1694     \ifx\@currentauthors\@empty
1695       \gdef\@currentauthors{\@authorfont\MakeUppercase{##1}}%
1696     \else
1697       \g@addto@macro{\@currentauthors}{\and\MakeUppercase{##1}}%
1698     \fi
1699     \gdef\and{}}%
1700   \def\email##1##2{%
1701     \def\@tempa{##2}\ifx\@tempa\@empty\else
1702       \ifx\@currentaffiliations\@empty
1703         \gdef\@currentaffiliations{\@affiliationfont##2}%
1704       \else
1705         \g@addto@macro{\@currentaffiliations}{\and##2}%
1706       \fi
1707     \fi
1708     \global\let\and\@typeset@author@line}%
1709   \global\setbox\mktitle@bx=\vbox{\noindent\box\mktitle@bx\par\medskip
1710     \noindent\addresses\@typeset@author@line
1711     \par\medskip}%
1712   \par\medskip}%
1713 }

```

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

\author@bx The box to put individual author to

```

1714 \newbox\author@bx

```



`\author@bx@wd` The width of the author box  
1715 `\newdimen\author@bx@wd`

`\author@bx@sep` The separation between the author boxes  
1716 `\newskip\author@bx@sep`  
1717 `\author@bx@sep=1pc\relax`

`\@typeset@author@bx` Typesetting the box with authors. Note that in SIGCHI-A the box is not centered.  
1718 `\def\@typeset@author@bx{\bgroup\hsize=\author@bx@wd\def\and{\par}%`  
1719 `\global\setbox\author@bx=\vtop{\if@ACM@sigchiamode\else\centering\fi`  
1720 `\@authorfont\@currentauthors\par\@affiliationfont`  
1721 `\@currentaffiliation}\egroup`  
1722 `\box\author@bx\hspace{\author@bx@sep}%`  
1723 `\gdef\@currentauthors{}}%`  
1724 `\gdef\@currentaffiliation{}}%`

`\@mkauthors@iii` The sigconf version. Here we use centered design with each author in a separate box.  
1725 `\def\@mkauthors@iii{%`  
First, we need to determine the design of the author strip. The boxes are separated by `\author@bx@sep` plus two `\author@bx@sep` margins. This means that each box must be of width  $(\text{textwidth} - \text{author@bx@sep})/N - \text{author@bx@sep}$ , where  $N$  is the number of boxes per row.  
1726 `\author@bx@wd=\textwidth\relax`  
1727 `\advance\author@bx@wd by -\author@bx@sep\relax`  
1728 `\ifcase\@num@authorgroups`  
1729 `\relax % 0?`  
1730 `\or % 1=one author per row`  
1731 `\or % 2=two authors per row`  
1732 `\divide\author@bx@wd by \@num@authorgroups\relax`  
1733 `\or % 3=three authors per row`  
1734 `\divide\author@bx@wd by \@num@authorgroups\relax`  
1735 `\or % 4=two authors per row (!)`  
1736 `\divide\author@bx@wd by 2\relax`  
1737 `\else % three authors per row`  
1738 `\divide\author@bx@wd by 3\relax`  
1739 `\fi`  
1740 `\advance\author@bx@wd by -\author@bx@sep\relax`  
Now, parsing of `\addresses`:  
1741 `\gdef\@currentauthors{}}%`  
1742 `\gdef\@currentaffiliation{}}%`  
1743 `\def\@author##1{\ifx\@currentauthors\@empty`  
1744 `\gdef\@currentauthors{\par##1}%`  
1745 `\else`  
1746 `\g@addto@macro\@currentauthors{\par##1}%`  
1747 `\fi`  
1748 `\gdef\and{}}%`  
1749 `\def\@email##1##2{\ifx\@currentaffiliation\@empty`  
1750 `\gdef\@currentaffiliation{\nolinkurl{##2}}%`

```

1751 \else
1752   \g@addto@macro\@currentaffiliation{\par\nolinkurl{##2}}%
1753 \fi}%
1754 \def\affiliation##1##2{\ifx\@currentaffiliation\@empty
1755   \gdef\@currentaffiliation{##2}%
1756 \else
1757   \g@addto@macro\@currentaffiliation{\par##2}%
1758 \fi
1759 \global\let\and\@typeset@author@bx
1760 }%

```

Actual typesetting is done by \and macro:

```

1761 \hsize=\textwidth
1762 \global\setbox\mktitle@bx=\vbox{\noindent
1763   \box\mktitle@bx\par\medskip\leavevmode
1764   \lineskip=1pc\relax\centering\hspace*{-1em}%
1765   \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.

```

1766 \def\@mkauthors@iv{%

```

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

```

1767   \author@bx@wd=\columnwidth\relax
1768   \advance\author@bx@wd by -\author@bx@sep\relax
1769   \ifcase\num@authorgroups
1770   \relax % 0?
1771   \or % 1=one author per row
1772   \else % 2=two authors per row
1773     \divide\author@bx@wd by 2\relax
1774   \fi
1775   \advance\author@bx@wd by -\author@bx@sep\relax

```

Now, parsing of \addresses:

```

1776   \gdef\@currentauthors{}%
1777   \gdef\@currentaffiliation{}%
1778   \def\@author##1{\ifx\@currentauthors\@empty
1779     \gdef\@currentauthors{\par##1}%
1780   \else
1781     \g@addto@macro\@currentauthors{\par##1}%
1782   \fi
1783   \gdef\and{}}%
1784   \def\email##1##2{\ifx\@currentaffiliation\@empty
1785     \gdef\@currentaffiliation{\nolinkurl{##2}}%
1786   \else
1787     \g@addto@macro\@currentaffiliation{\par\nolinkurl{##2}}%
1788   \fi}%

```

```

1789 \def\affiliation##1##2{\ifx\@currentaffiliation\@empty
1790   \gdef\@currentaffiliation{##2}%
1791   \else
1792     \g@addto@macro\@currentaffiliation{\par##2}%
1793   \fi
1794   \global\let\and\@typeset@author@bx}%
1795 %
Actual typesetting is done by \and macro
1796   \bgroup\hsize=\columnwidth
1797   \par\raggedright\leftskip=\z@
1798   \lineskip=1pc\noindent
1799   \addresses\let\and\@typeset@author@bx\and\par\bigskip\egroup}

\@authornotemark Adding footnote mark to authors
1800 \def\@authornotemark{\g@addto@macro\@currentauthors{\footnotemark}}

\@mkteasers Typesetting teasers
1801 \def\@mkteasers{%
1802   \ifx\@teaserfigures\@empty\else
1803     \def\@teaser##1{\par\bigskip\bgroup
1804       \captionsetup{type=figure}##1\egroup\par}
1805     \global\setbox\mktitle@bx=\vbox{\noindent\box\mktitle@bx\par
1806       \noindent\@teaserfigures\par\medskip}%
1807     \fi}

\@setaddresses This is an amsart macro, which we do not need.
1808 \def\@setaddresses{}

\@mkabstract Typesetting abstract
1809 \def\@mkabstract{\bgroup
1810   \ifx\@abstract\@empty\else
1811     {\phantomsection\addcontentsline{toc}{section}{Abstract}%
1812       \if@ACM@journal
1813         \small\noindent
1814       \else
1815         \section*{Abstract}%
1816       \fi
1817       \ignorespaces\@abstract\par}%
1818   \fi\egroup}

\@mkbibcitation Print bibcitation format
1819 \def\@mkbibcitation{\bgroup
1820   \def\footnotemark{}%
1821   \def\{\unskip}\ignorespaces}%
1822   \def\footnote{\ClassError{\@classname}{Please do not use footnotes
1823     inside \string\title{} or \string\author{} command! Use
1824     \string\titlenote{} or \string\authornote{} instead!}}%
1825   \par\medskip\small\noindent{\bfseries ACM Reference format:}\par\nobreak

```

```

1826 \noindent\authors. \@acmYear. \@title.
1827 \if@ACM@journal
1828   \textit{\@journalNameShort}
1829   \@acmVolume, \@acmNumber, Article~\@acmArticle\ (\@acmPubDate),
1830   \ref{TotPages}~pages.
1831 \else
1832   In \textit{Proceedings of \@acmConference@name, \@acmConference@venue,
1833   \@acmConference@date
1834   \ifx\@acmConference@name\@acmConference@shortname\else
1835     \ (\@acmConference@shortname)\fi
1836   ,} \ref{TotPages}~pages.
1837 \fi\par
1838 \noindent DOI: \nolinkurl{\@acmDOI}
1839 \par\egroup}

```

\@printendtopmatter End the top matter

```

1840 \def\@printendtopmatter{\par\medskip
1841   \ifcase\ACM@format@nr
1842   \relax % manuscript
1843   \noindent\hrulefill\par\medskip
1844   \or % acmsmall
1845   \noindent\hrulefill\par\medskip
1846   \or % acmlarge
1847   \noindent\hrulefill\par\medskip
1848   \or % acmtog
1849   \par\bigskip
1850   \or % sigconf
1851   \par\bigskip
1852   \or % siggraph
1853   \par\bigskip
1854   \or % sigplan
1855   \par\bigskip
1856   \or % sigchi
1857   \par\bigskip
1858   \or % sigchi-a
1859   \fi
1860 }

```

\@setthanks We redefine \@setthanks using \long

```

1861 \def\@setthanks{\long\def\thanks##1{\par##1\@addpunct.}\thankses}

```

### 3.13 Headers and Footers

We use fancyhdr for our headers and footers:

```

1862 \RequirePackage{fancyhdr}

```

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

```

1863 \if@ACM@review
1864   \newsavebox{\ACM@linecount@bx}

```

```

1865 \savebox{\ACM@linecount@bx}[4em][t]{\parbox[t]{4em}{%
1866 \newlength\ACM@linecount@bxht\setlength{\ACM@linecount@bxht}{-\baselineskip}
1867 \@tempcnta\@ne\relax
1868 \loop{\color{ACMRed}\scriptsize\the\@tempcnta}\
1869 \advance\@tempcnta by \@ne
1870 \addtolength{\ACM@linecount@bxht}{\baselineskip}
1871 \ifdim\ACM@linecount@bxht<\textheight\repeat}}
1872 \fi

\ACM@linecount How to display the box
1873 \def\ACM@linecount{%
1874 \if@ACM@review
1875 \begin{picture}(0,0)%
1876 \put(-26,-22){\usebox{\ACM@linecount@bx}}%
1877 \end{picture}%
1878 \fi}

\@shortauthors Even if the author redefined \shortauthors, we do not print them in the anonymous
mode in the headers:
1879 \def\@shortauthors{\if@ACM@anonymous Anon.\else\shortauthors\fi}

\@headfootfont The font to typeset header and footer text.
1880 \def\@headfootfont{%
1881 \ifcase\ACM@format@nr
1882 \relax % manuscript
1883 \sffamily
1884 \or % acmsmall
1885 \sffamily
1886 \or % acmlarge
1887 \sffamily
1888 \or % acmtog
1889 \sffamily
1890 \or % sigconf
1891 \sffamily
1892 \or % siggraph
1893 \sffamily
1894 \or % sigplan
1895 \sffamily
1896 \or % sigchi
1897 \sffamily
1898 \or % sigchi-a
1899 \sffamily
1900 \fi}

standardpagestyle The pagestyle for all pages but the first one
1901 \fancypagestyle{standardpagestyle}{%
1902 \fancyhf{}%
1903 \renewcommand{\headrulewidth}{\z@}%
1904 \renewcommand{\footrulewidth}{\z@}%

```

```

1905 \ifcase\ACM@format@nr
1906 \relax % manuscript
1907 \fancyhead[LE]{\ACM@linecount\if@ACM@printfolios\thepage\fi}%
1908 \fancyhead[RO]{\if@ACM@printfolios\thepage\fi}%
1909 \fancyhead[RE]{\@shortauthors}%
1910 \fancyhead[LO]{\ACM@linecount\shorttitle}%
1911 \fancyfoot[RO,LE]{\footnotesize Manuscript submitted to ACM}%
1912 \or % acmsmall
1913 \fancyhead[LE]{\ACM@linecount\@headfootfont\@acmArticle\if@ACM@printfolios:\thepage\fi}%
1914 \fancyhead[RO]{\@headfootfont\@acmArticle\if@ACM@printfolios:\thepage\fi}%
1915 \fancyhead[RE]{\@headfootfont\@shortauthors}%
1916 \fancyhead[LO]{\ACM@linecount\@headfootfont\shorttitle}%
1917 \fancyfoot[RO,LE]{\footnotesize \@journalName, Vol. \@acmVolume, No.
1918 \@acmNumber, Article \@acmArticle. Publication date: \@acmPubDate.}%
1919 \or % acmlarge
1920 \fancyhead[LE]{\ACM@linecount\@headfootfont
1921 \@acmArticle\if@ACM@printfolios:\thepage\fi\quad\textbullet\quad\@shortauthors}%
1922 \fancyhead[LO]{\ACM@linecount}%
1923 \fancyhead[RO]{\@headfootfont
1924 \shorttitle\quad\textbullet\quad\@acmArticle\if@ACM@printfolios:\thepage\fi}%
1925 \fancyfoot[RO,LE]{\footnotesize \@journalName, Vol. \@acmVolume, No.
1926 \@acmNumber, Article \@acmArticle. Publication date: \@acmPubDate.}%
1927 \or % acmtog
1928 \fancyhead[LE]{\ACM@linecount\@headfootfont
1929 \@acmArticle\if@ACM@printfolios:\thepage\fi\quad\textbullet\quad\@shortauthors}%
1930 \fancyhead[LO]{\ACM@linecount}%
1931 \fancyhead[RO]{\@headfootfont
1932 \shorttitle\quad\textbullet\quad\@acmArticle\if@ACM@printfolios:\thepage\fi}%
1933 \fancyfoot[RO,LE]{\footnotesize \@journalName, Vol. \@acmVolume, No.
1934 \@acmNumber, Article \@acmArticle. Publication date: \@acmPubDate.}%
1935 \else % Proceedings
1936 \fancyfoot[C]{\if@ACM@printfolios\footnotesize\thepage\fi}%
1937 \fancyhead[LO]{\ACM@linecount\@headfootfont\shorttitle}%
1938 \fancyhead[RE]{\@headfootfont\@shortauthors}%
1939 \fancyhead[LE]{\ACM@linecount\@headfootfont\acmConference@shortname,
1940 \acmConference@date, \acmConference@venue}%
1941 \fancyhead[RO]{\@headfootfont\acmConference@shortname,
1942 \acmConference@date, \acmConference@venue}%
1943 \fi
1944 \if@ACM@sigchiamode
1945 \fancyheadoffset[L]{\dimexpr(\marginparsep+\marginparwidth)}%
1946 \fi
1947 }
1948 \pagestyle{standardpagestyle}

```

```

\@folio@wd Folio blob width, height, offsets and max number
\@folio@ht 1949 \newdimen\@folio@wd
\@folio@voffset 1950 \@folio@wd=\z@
\@folio@max 1951 \newdimen\@folio@ht
1952 \@folio@ht=\z@

```

```

1953 \newdimen\@folio@voffset
1954 \@folio@voffset=\z@
1955 \def\@folio@max{1}
1956 \ifcase\ACM@format@nr
1957 \relax % manuscript
1958 \or % acmsmall
1959   \@folio@wd=45.75pt\relax
1960   \@folio@ht=1.25in\relax
1961   \@folio@voffset=.2in\relax
1962   \def\@folio@max{8}
1963 \or % acmlarge
1964   \@folio@wd=43.25pt\relax
1965   \@folio@ht=79pt\relax
1966   \@folio@voffset=.55in\relax
1967   \def\@folio@max{10}
1968 \fi

```

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

```

1969 \def\@folioblob{\@tempcnta=\@acmArticleSeq\relax
First, we calculate \@acmArticleSeq modulo \@folio@max
1970 \loop
1971   \ifnum\@tempcnta>\@folio@max\relax
1972     \advance\@tempcnta by - \@folio@max
1973   \repeat
1974   \advance\@tempcnta by -1\relax
1975   \@tempdima=\@folio@ht\relax
1976   \multiply\@tempdima by \the\@tempcnta\relax
1977   \advance\@tempdima by -\@folio@voffset\relax
1978   \begin{picture}(0,0)
1979     \makebox[\z@]{\raisebox{-\@tempdima}{%
1980       \rlap{%
1981         \raisebox{-0.45\@folio@ht}{\z@}\z@}%
1982         \rule{\@folio@wd}{\@folio@ht}}}%
1983     \parbox{\@folio@wd}{%
1984       \centering
1985       \textcolor{white}{\LARGE\bfseries\sffamily\@acmArticle}}}%
1986   \end{picture}}
1987

```

`firstpagestyle` The pagestyle for the first page only.

```

1988 \fancypagestyle{firstpagestyle}{%
1989   \fancyhf{}%
1990   \renewcommand{\headrulewidth}{\z@}%
1991   \renewcommand{\footrulewidth}{\z@}%
1992   \ifcase\ACM@format@nr
1993   \relax % manuscript
1994   \fancyhead[L]{\ACM@linecount}%
1995   \fancyfoot[RO,LE]{\if@ACM@printfolios\small\thepage\fi}%
1996   \fancyfoot[RE,LO]{\footnotesize Manuscript submitted to ACM}%

```

```

1997 \or % acmsmall
1998 \fancyfoot[R0,LE]{\footnotesize \@journalName, Vol. \@acmVolume, No.
1999 \@acmNumber, Article \@acmArticle. Publication date:
2000 \@acmPubDate.}%
2001 \fancyhead[LE]{\ACM@linecount\@folioblob}%
2002 \fancyhead[LO]{\ACM@linecount}%
2003 \fancyhead[R0]{\@folioblob}%
2004 \fancyheadoffset[R0,LE]{0.6\@folio@wd}%
2005 \or % acmlarge
2006 \fancyfoot[R0,LE]{\footnotesize \@journalName, Vol. \@acmVolume, No.
2007 \@acmNumber, Article \@acmArticle. Publication date:
2008 \@acmPubDate.}%
2009 \fancyhead[R0]{\@folioblob}%
2010 \fancyhead[LE]{\ACM@linecount\@folioblob}%
2011 \fancyhead[LO]{\ACM@linecount}%
2012 \fancyheadoffset[R0,LE]{1.4\@folio@wd}%
2013 \or % acmtog
2014 \fancyfoot[R0,LE]{\footnotesize \@journalName, Vol. \@acmVolume, No.
2015 \@acmNumber, Article \@acmArticle. Publication date:
2016 \@acmPubDate.}%
2017 \fancyhead[L]{\ACM@linecount}%
2018 \else % Conference proceedings
2019 \fancyhead[L]{\ACM@linecount}%
2020 \fancyfoot[C]{\if@ACM@printfolios\footnotesize\thepage\fi}%
2021 \fi
2022 }

```

### 3.14 Sectioning

Sectioning is different for different levels

```

2023 \renewcommand\section{\@startsection{section}{1}{\z@}%
2024 {- .75\baselineskip \@plus -2\p@ \@minus -.2\p@}%
2025 {.25\baselineskip}%
2026 {\@secfont}}
2027 \renewcommand\subsection{\@startsection{subsection}{2}{\z@}%
2028 {- .75\baselineskip \@plus -2\p@ \@minus -.2\p@}%
2029 {.25\baselineskip}%
2030 {\@subsecfont}}
2031 \renewcommand\subsubsection{\@startsection{subsubsection}{3}{10pt}%
2032 {- .5\baselineskip \@plus -2\p@ \@minus -.2\p@}%
2033 {-3.5\p@}%
2034 {\@subsubsecfont\@adddotafter}}
2035 \renewcommand\paragraph{\@startsection{paragraph}{4}{\parindent}%
2036 {- .5\baselineskip \@plus -2\p@ \@minus -.2\p@}%
2037 {-3.5\p@}%
2038 {\@parfont\@adddotafter}}
2039 \renewcommand\part{\@startsection{part}{9}{\z@}%
2040 {-10\p@ \@plus -4\p@ \@minus -2\p@}%
2041 {4\p@}%

```



```

2042  {\@parfont}}

\section@raggedright Special version of \raggedright compatible with \MakeUppercase
2043 \def\section@raggedright{\@rightskip\@flushglue
2044   \rightskip\@rightskip
2045   \leftskip\z@skip
2046   \parindent\z@}

\@secfont Fonts for sections etc. are different for different formats.
\@subsecfont
\@subsubsecfont
\@parfont
2047 \def\@secfont{\sffamily\bfseries\section@raggedright\MakeUppercase}
2048 \def\@subsecfont{\sffamily\bfseries\section@raggedright}
2049 \def\@subsubsecfont{\sffamily\itshape}
2050 \def\@parfont{\itshape}
2051 \setcounter{secnumdepth}{3}
2052 \ifcase\ACM@format@nr
2053 \relax % manuscript
2054 \or % acmsmall
2055 \or % acmlarge
2056 \def\@secfont{\sffamily\large\section@raggedright\MakeUppercase}
2057 \def\@subsecfont{\sffamily\large\section@raggedright}
2058 \or % acmtog
2059 \def\@secfont{\sffamily\large\section@raggedright\MakeUppercase}
2060 \def\@subsecfont{\sffamily\large\section@raggedright}
2061 \or % sigconf
2062 \def\@secfont{\bfseries\Large\section@raggedright\MakeUppercase}
2063 \def\@subsecfont{\bfseries\Large\section@raggedright}
2064 \or % siggraph
2065 \def\@secfont{\bfseries\sffamily\Large\section@raggedright\MakeUppercase}
2066 \def\@subsecfont{\bfseries\sffamily\Large\section@raggedright}
2067 \or % sigplan
2068 \def\@secfont{\bfseries\Large\section@raggedright}
2069 \def\@subsecfont{\bfseries\section@raggedright}
2070 \renewcommand\subsubsection{\@startsection{subsubsection}{3}{\z@}%
2071   {-1.75\baselineskip \@plus -2\p@ \@minus -.2\p@}%
2072   {.25\baselineskip}%
2073   {\@subsubsecfont}}
2074 \def\@subsubsecfont{\bfseries\section@raggedright}
2075 \renewcommand\paragraph{\@startsection{paragraph}{4}{\z@}%
2076   {-1.5\baselineskip \@plus -2\p@ \@minus -.2\p@}%
2077   {-3.5\p@}%
2078   {\@parfont\@addspaceafter}}
2079 \def\@parfont{\bfseries\itshape}
2080 \renewcommand\subparagraph{\@startsection{subparagraph}{5}{\z@}%
2081   {-1.5\baselineskip \@plus -2\p@ \@minus -.2\p@}%
2082   {-3.5\p@}%
2083   {\@subparfont\@addspaceafter}}
2084 \def\@subparfont{\itshape}
2085 \or % sigchi
2086 \setcounter{secnumdepth}{1}
2087 \def\@secfont{\bfseries\sffamily\section@raggedright\MakeUppercase}

```

```

2088 \def\@subsecfont{\bfseries\sffamily\section@raggedright}
2089 \or % sigchi-a
2090 \setcounter{secnumdepth}{0}
2091 \def\@secfont{\bfseries\sffamily\section@raggedright\MakeUppercase}
2092 \def\@subsecfont{\bfseries\sffamily\section@raggedright}
2093 \fi

```

`\@adddotafter` Add punctuation after the command

```
2094 \def\@adddotafter#1{#1\@addpunct{.}}
```

`\@addspaceafter` Add space after the command

```
2095 \def\@addspaceafter#1{#1\@addpunct{\enspace}}
```

### 3.15 TOC Lists

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

```
2096 \providecommand*\@dotsep{4.5}
```

### 3.16 Theorems

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

```
2097 \def\@acmplainbodyfont{\itshape}
```

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

```
2098 \def\@acmplainindent{\parindent}
```

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

```
2099 \def\@acmplainheadfont{\scshape}
```

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

```
2100 \def\@acmplainnotefont{\@empty}
```

Customization of `acmplain` theorem style:

```

2101 \ifcase\ACM@format@nr
2102 \relax % manuscript
2103 \or % acmsmall
2104 \or % acmlarge
2105 \or % acmtog
2106 \or % sigconf
2107 \or % siggraph
2108 \or % sigplan
2109 \def\@acmplainbodyfont{\itshape}
2110 \def\@acmplainindent{\z@}
2111 \def\@acmplainheadfont{\bfseries}
2112 \def\@acmplainnotefont{\normalfont}

```

```

2113 \or % sigchi
2114 \or % sigchi-a
2115 \fi

```

**acmplain** The acmplain theorem style

```

2116 \newtheoremstyle{acmplain}%
2117   {.5\baselineskip\@plus.2\baselineskip
2118     \@minus.2\baselineskip}% space above
2119   {.5\baselineskip\@plus.2\baselineskip
2120     \@minus.2\baselineskip}% space below
2121   {\@acmplainbodyfont}% body font
2122   {\@acmplainindent}% indent amount
2123   {\@acmplainheadfont}% head font
2124   {.}% punctuation after head
2125   {.5em}% spacing after head
2126   {\thmname{#1}\thmnumber{#2}\thmnote{ {\@acmplainnotefont{#3}}}}% head spec

```

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

```

2127 \def\@acmdefinitionbodyfont{\normalfont}

```

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

```

2128 \def\@acmdefinitionindent{\parindent}

```

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

```

2129 \def\@acmdefinitionheadfont{\itshape}

```

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

```

2130 \def\@acmdefinitionnotefont{\@empty}

```

Customization of acmdefinition theorem style:

```

2131 \ifcase\ACM@format@nr
2132 \relax % manuscript
2133 \or % acmsmall
2134 \or % acmlarge
2135 \or % acmtog
2136 \or % sigconf
2137 \or % siggraph
2138 \or % sigplan
2139   \def\@acmdefinitionbodyfont{\normalfont}
2140   \def\@acmdefinitionindent{\z@}
2141   \def\@acmdefinitionheadfont{\bfseries}
2142   \def\@acmdefinitionnotefont{\normalfont}
2143 \or % sigchi
2144 \or % sigchi-a
2145 \fi

```

**acmdefinition** The acmdefinition theorem style

```

2146 \newtheoremstyle{acmdefinition}%
2147   {.5\baselineskip\@plus.2\baselineskip

```

```

2148 \@minus.2\baselineskip}% space above
2149 {.5\baselineskip\@plus.2\baselineskip
2150 \@minus.2\baselineskip}% space below
2151 {\@acmdefinitionbodyfont}% body font
2152 {\@acmdefinitionindent}% indent amount
2153 {\@acmdefinitionheadfont}% head font
2154 {.}% punctuation after head
2155 {.5em}% spacing after head
2156 {\thmname{#1}\thmnumber{ #2}\thmnote{ {\@acmdefinitionnotefont{#3}}}}% head spec

```

The definitions for theorems:

```

2157 \theoremstyle{acmplain}
2158 \newtheorem{theorem}{Theorem}[section]
2159 \newtheorem{conjecture}[theorem]{Conjecture}
2160 \newtheorem{proposition}[theorem]{Proposition}
2161 \newtheorem{lemma}[theorem]{Lemma}
2162 \newtheorem{corollary}[theorem]{Corollary}
2163 \theoremstyle{acmdefinition}
2164 \newtheorem{example}[theorem]{Example}
2165 \newtheorem{definition}[theorem]{Definition}
2166 \theoremstyle{acmplain}

```

\@proofnamefont The font to typeset the proof name.

```

2167 \def\@proofnamefont{\scshape}

```

\@proofindent Whether or not to indent proofs.

```

2168 \def\@proofindent{\indent}

```

Customization of proof environment.

```

2169 \ifcase\ACM@format@nr
2170 \relax % manuscript
2171 \or % acmsmall
2172 \or % acmlarge
2173 \or % acmtog
2174 \or % sigconf
2175 \or % siggraph
2176 \or % sigplan
2177 \def\@proofnamefont{\itshape}
2178 \def\@proofindent{\noindent}
2179 \or % sigchi
2180 \or % sigchi-a
2181 \fi

```

proof We want some customization of proof environment.

```

2182 \renewenvironment{proof}[1][\proofname]{\par
2183 \pushQED{\qed}%
2184 \normalfont \topsep6\p@\@plus6\p@\relax
2185 \trivlist
2186 \item[\@proofindent\hskip\labelsep

```

```

2187         {\@proofnamefont #1\@addpunct{.}}]\ignorespaces
2188     }{%
2189     \popQED\endtrivlist\enddefalse
2190 }

```

### 3.17 Acknowledgments

`\acks` This is a comment-like structure

```

2191 \specialcomment{acks}{%
2192     \begingroup
2193     \section*{Acknowledgments}
2194     \phantomsection\addcontentsline{toc}{section}{Acknowledgments}
2195 }{%
2196     \endgroup
2197 }

```

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

```

2198 \def\grantsponsor#1#2#3{#2}

```

`\grantnum`

```

2199 \newcommand\grantnum[3][\]{#3%
2200     \def\@tempa{#1}\ifx\@tempa\@empty\else\space(\url{#1})\fi}

```

### 3.18 Conditional typesetting

We use the `comment` package for conditional typesetting:

```

2201 \if@ACM@screen
2202     \includecomment{screenonly}
2203     \excludecomment{printonly}
2204 \else
2205     \excludecomment{screenonly}
2206     \includecomment{printonly}
2207 \fi
2208 \if@ACM@anonymous
2209     \excludecomment{anonsuppress}
2210     \excludecomment{acks}
2211 \else
2212     \includecomment{anonsuppress}
2213 \fi

```

### 3.19 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/>).

```

2214 \newcommand\showeprint[2][arxiv]{%
2215     \def\@tempa{#1}%
2216     \ifx\@tempa\@empty\def\@tempa{arxiv}\fi

```

```
2217 \def\@tempb{arxiv}%  
2218 \ifx\@tempa\@tempb  
2219     arXiv:\href{http://arxiv.org/abs/#2}{#2}\else arXiv:#2%  
2220 \fi}
```

### **3.20 End of Class**

```
2221 \normalsize\normalfont\frenchspacing  
2222 \end{class}
```

## References

- [1] UK T<sub>E</sub>X Users Group. UK list of T<sub>E</sub>X 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.
- [4] Rogério Brito. *The algorithms bundle*, August 2009.
- [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 L<sup>A</sup>T<sub>E</sub>X*, April 2005. <http://www.ctan.org/pkg/booktabs>.
- [7] Association for Computing Machinery. *ACM Visual Identity Standards*, 2007.
- [8] Axel Sommerfeldt. *The subcaption package*, April 2013. <http://www.ctan.org/pkg/subcaption>.
- [9] Boris Veytsman, Bern Schandl, Lee Netherton, and CV 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>.

## Change History

|       |                                                                                                                                                                                     |    |       |                                                                                                                                                                                                    |    |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| v1.00 | General: First released version . . . . .                                                                                                                                           | 23 | v1.05 | General: Added processing doi numbers for acmsiggraph and doi numbers for sigproc.bib . . . . .                                                                                                    | 23 |
| v1.01 | General: Changed hyperref colors in screen mode (closes <a href="https://github.com/borisveytsman/acmart/issues/1">https://github.com/borisveytsman/acmart/issues/1</a> ) . . . . . | 23 |       | Patched \setcitestyle command; closes <a href="https://github.com/borisveytsman/acmart/issues/19">https://github.com/borisveytsman/acmart/issues/19</a> . . . . .                                  | 23 |
|       | Defined ACM colors . . . . .                                                                                                                                                        | 23 | v1.06 | \@ACM@badge@skip: Added macro . . . . .                                                                                                                                                            | 48 |
|       | Explicitly put draft option (closes <a href="https://github.com/borisveytsman/acmart/issues/4">https://github.com/borisveytsman/acmart/issues/4</a> ) . . . . .                     | 25 |       | \@ACM@badge@width: Added macro . . . . .                                                                                                                                                           | 48 |
|       | Set headheight to 1pc for all formats (closes <a href="https://github.com/borisveytsman/acmart/issues/5">https://github.com/borisveytsman/acmart/issues/5</a> ) . . . . .           | 23 |       | \@ACM@title@width: Added macro . . . . .                                                                                                                                                           | 48 |
| v1.02 | General: Added TOPS and TSC (closes <a href="https://github.com/borisveytsman/acmart/issues/12">https://github.com/borisveytsman/acmart/issues/12</a> ) . . . . .                   | 23 |       | \@mktitle@i: Added processing badges . . . . .                                                                                                                                                     | 60 |
|       | Documentation changes (closes <a href="https://github.com/borisveytsman/acmart/issues/13">https://github.com/borisveytsman/acmart/issues/13</a> ) . . . . .                         | 23 |       | Made generic . . . . .                                                                                                                                                                             | 60 |
| v1.03 | \@formatdoi: Added macro . . . . .                                                                                                                                                  | 52 |       | \@mktitle@ii: Now this macro is obsolete . . . . .                                                                                                                                                 | 61 |
|       | \if@ACM@authorversion: Added macro . . . . .                                                                                                                                        | 24 |       | \@mktitle@iii: Added processing badges . . . . .                                                                                                                                                   | 61 |
|       | \maketitle: Added special case of authorversion . . . . .                                                                                                                           | 55 |       | Made more generic . . . . .                                                                                                                                                                        | 61 |
|       | General: Added anon suppress environment . . . . .                                                                                                                                  | 23 |       | \@mktitle@iv: Made more generic . . . . .                                                                                                                                                          | 61 |
|       | Added authorversion option (closes <a href="https://github.com/borisveytsman/acmart/issues/9">https://github.com/borisveytsman/acmart/issues/9</a> ) . . . . .                      | 23 |       | \@printtopmatter: Added processing badges . . . . .                                                                                                                                                | 58 |
| v1.04 | \acmArticleSeq: Name change by Matthew Fluet . . . . .                                                                                                                              | 47 |       | \@subtitlefont: Added macro . . . . .                                                                                                                                                              | 60 |
|       | \acmDOI: Name change by Matthew Fluet . . . . .                                                                                                                                     | 48 |       | \@titlefont: Added macro . . . . .                                                                                                                                                                 | 59 |
|       | \acmISBN: Name change by Matthew Fluet . . . . .                                                                                                                                    | 48 |       | \acmBadgeL: Added macro . . . . .                                                                                                                                                                  | 48 |
|       | General: Updated bibliography for siggraph . . . . .                                                                                                                                | 23 |       | \acmBadgeR: Added macro . . . . .                                                                                                                                                                  | 48 |
|       |                                                                                                                                                                                     |    |       | \if@ACM@badge: Added macro . . . . .                                                                                                                                                               | 48 |
|       |                                                                                                                                                                                     |    | v1.07 | \maketitle: Corrected a bug with abstract footnotes . . . . .                                                                                                                                      | 55 |
|       |                                                                                                                                                                                     |    |       | Corrected a bug with permission and footnotes order . . . . .                                                                                                                                      | 55 |
|       |                                                                                                                                                                                     |    | v1.08 | General: SIGPLAN reformatting by Matthew Fluet . . . . .                                                                                                                                           | 23 |
|       |                                                                                                                                                                                     |    |       | Typos corrected (Tobias Pape) . . . . .                                                                                                                                                            | 23 |
|       |                                                                                                                                                                                     |    | v1.09 | General: Revert SIGPLAN caption rules . . . . .                                                                                                                                                    | 23 |
|       |                                                                                                                                                                                     |    | v1.10 | \maketitle: Corrected a bug with doi in manuscript and author version, <a href="https://github.com/borisveytsman/acmart/issues/36">https://github.com/borisveytsman/acmart/issues/36</a> . . . . . | 55 |



|                                       |       |
|---------------------------------------|-------|
| General: Changes of                   | v1.14 |
| ‘licensedothergov’ wording . . . . .  | 51    |
| standardpagestyle: Reversed folios    |       |
| location . . . . .                    | 69    |
| v1.11                                 |       |
| General: Customization of ACM         |       |
| theorem styles and proof              |       |
| environment by Matthew Fluet . . .    | 23    |
| v1.12                                 |       |
| \@marginfigure: Now centering by      |       |
| default . . . . .                     | 37    |
| \@marginfigure: Now centering by      |       |
| default . . . . .                     | 38    |
| \@parfont: Moved to                   |       |
| \section@raggedright . . . . .        | 73    |
| \copyrightpermissionfootnoterule:     |       |
| Added macro . . . . .                 | 35    |
| \descriptionlabel: Redefined . . . .  | 39    |
| \footnoterule: Made shorter . . . . . | 35    |
| \if@ACM@natbib@override: Added        |       |
| macro . . . . .                       | 24    |
| \if@ACM@newfonts: Added macro . . .   | 36    |
| \maketitle: Moved thanks to           |       |
| copyrightpermission box . . . . .     | 55    |
| \section@raggedright: Introduced      |       |
| macro . . . . .                       | 73    |
| General: Added graceful behavior      |       |
| when libertine fonts are absent . .   | 36    |
| Documentation updates . . . . .       | 23    |
| v1.13                                 |       |
| \@mpfootnotetext: Made minipage       |       |
| footnotes centered . . . . .          | 36    |
| \bibliographystyle: Redefined         |       |
| macro . . . . .                       | 32    |
| \bibstyle@acmauthoryear: Added        |       |
| macro . . . . .                       | 28    |
| \bibstyle@acmnumeric: Added           |       |
| macro . . . . .                       | 29    |
| \if@ACM@printfolios: Added macro      | 49    |
| General: Font adjustments for         |       |
| acmsmall . . . . .                    | 63    |
| Increased font size for ACM Large     | 26    |
| Print bibliographic information by    |       |
| default for the proceedings . . . . . | 49    |
| standardpagestyle: Added headers      |       |
| for sigs . . . . .                    | 69    |
| Expanded headers for sigchi-a . . .   | 69    |
| Suppressed folios if sig . . . . .    | 69    |
| \bibstyle@acmauthoryear: Moved        |       |
| def of \bibstyle@acmauthoryear        |       |
| before use . . . . .                  | 28    |
| \bibstyle@acmnumeric: Moved def of    |       |
| \bibstyle@numeric before use . . .    | 29    |
| General: \citestyle updates           |       |
| (Matthew Fluet) . . . . .             | 23    |
| Patched \citestyle . . . . .          | 27    |
| v1.15                                 |       |
| \@ACM@addtoaddress: Added macro       | 62    |
| \@mkauthors@iii: New authors          |       |
| system . . . . .                      | 65    |
| \@shortauthors: Introduced macro . .  | 69    |
| \@typeset@author@bx: Moved to         |       |
| separate macro . . . . .              | 65    |
| \acks: Added macro . . . . .          | 77    |
| \affiliation: Added code for author   |       |
| groups . . . . .                      | 45    |
| \author: Added code for author        |       |
| groups . . . . .                      | 45    |
| \city: Added macro . . . . .          | 62    |
| \country: Added macro . . . . .       | 62    |
| \department: Added macro . . . . .    | 62    |
| \grantnum: Added macro . . . . .      | 77    |
| \grantsponsor: Added macro . . . . .  | 77    |
| \if@insideauthorgroup: Introduced     |       |
| macro . . . . .                       | 45    |
| \institution: Added macro . . . . .   | 62    |
| \num@authorgroups: Renamed . . . . .  | 44    |
| \orcid: Introduced macro . . . . .    | 46    |
| \position: Added macro . . . . .      | 62    |
| \postcode: Added macro . . . . .      | 62    |
| \state: Added macro . . . . .         | 62    |
| \streetaddress: Added macro . . . .   | 62    |
| standardpagestyle: Better handling    |       |
| of anonymous mode . . . . .           | 69    |
| v1.16                                 |       |
| \@headfootfont: Added macro . . . .   | 69    |
| General: Formatting header/footer     |       |
| (Matthew Fluet) . . . . .             | 23    |
| standardpagestyle: Customize          |       |
| header/footer text font . . . . .     | 69    |
| v1.17                                 |       |
| \@makefnmark: Redefined . . . . .     | 36    |
| \@mkauthors: TOG now uses the same    |       |
| authors block as other journals . .   | 62    |
| \@mkauthors@ii: Deleted . . . . .     | 64    |
| \@mkbibcitation: Added \nobreak       | 67    |
| Changed format for sigs . . . . .     | 67    |

|                                                                                                              |    |       |                                                                                                                                           |    |
|--------------------------------------------------------------------------------------------------------------|----|-------|-------------------------------------------------------------------------------------------------------------------------------------------|----|
| \acmArticle: The default is now numerical . . . . .                                                          | 47 | v1.26 | General: Corrected \shortcite bug . . . . .                                                                                               | 23 |
| \acmMonth: The default must be numerical. Closes #50. . . . .                                                | 47 |       | Documentation typos fixed (thanks to Stephen Spencer) . . . . .                                                                           | 23 |
| \acmNumber: The default is now numerical . . . . .                                                           | 47 | v1.27 | \if@ACM@printccs: Typo corrected . . . . .                                                                                                | 49 |
| \acmVolume: The default is now numerical . . . . .                                                           | 47 | v1.28 | \ccsdesc@parse: Change from \to to \textrightarrow (Matteo Riondato) . . . . .                                                            | 50 |
| \acmYear: The default is now numerical . . . . .                                                             | 47 |       | General: Corrected option natbib behavior . . . . .                                                                                       | 29 |
| \description: Decreased indent . . . . .                                                                     | 39 |       | Got rid of warnings in pdf keywords . . . . .                                                                                             | 31 |
| \grantnum: Added url . . . . .                                                                               | 77 |       |                                                                                                                                           |    |
| \grantsponsor: Renamed . . . . .                                                                             | 77 |       |                                                                                                                                           |    |
| \if@ACM@printacmref: Renamed from \if@ACM@printbib . . . . .                                                 | 49 | v1.29 | \@mkabstract: Removed spurious indentation (John Wickerson) . . . . .                                                                     | 67 |
| General: Slightly decreased margins for sigs . . . . .                                                       | 33 |       | \ccsdesc@parse: Add spacing after bullet and around rightharrow; semicolon separators no longer in bold/italic (John Wickerson) . . . . . | 50 |
| standardpagestyle: Added paper title to sigs . . . . .                                                       | 69 |       | General: Increased head to 13pt . . . . .                                                                                                 | 33 |
| v1.18                                                                                                        |    |       | standardpagestyle: Corrected printfolios (Matthew Fluet) . . . . .                                                                        | 69 |
| \@mkauthors@i: Now we andify affiliations . . . . .                                                          | 64 |       |                                                                                                                                           |    |
| \@typeset@author@line: Added macro . . . . .                                                                 | 64 | v1.30 | \department: Added optional parameter . . . . .                                                                                           | 62 |
| General: Natbib is now the default for all formats . . . . .                                                 | 23 |       | General: Added \frenchspacing . . . . .                                                                                                   | 78 |
| v1.19                                                                                                        |    |       | Bibtex style now recognizes https:// in doi . . . . .                                                                                     | 23 |
| \@mkabstract: Include 'Abstract' in PDF bookmarks (Matthew Fluet) . . . . .                                  | 67 |       | Switched to T1: looks like libertine has problems with \l in OT1 . . . . .                                                                | 36 |
| \acks: Include 'Acknowledgements' in PDF bookmarks (Matthew Fluet) . . . . .                                 | 77 |       | Updated IMWUT and PACMPL . . . . .                                                                                                        | 39 |
| General: Include 'Abstract', 'Acknowledgements', and 'References' in PDF bookmarks (Matthew Fluet) . . . . . | 23 | v1.31 | \@additionalaffiliation: Added macro . . . . .                                                                                            | 46 |
| Include 'References' in PDF bookmarks (Matthew Fluet) . . . . .                                              | 27 |       | \@mkbibcitation: Disabled linebreak . . . . .                                                                                             | 67 |
| v1.20                                                                                                        |    |       | \@startsection: Added \tochangmeasure . . . . .                                                                                           | 29 |
| \@mkabstract: Deleted spurious space . . . . .                                                               | 67 |       | Redefined macro . . . . .                                                                                                                 | 31 |
| General: Bug fixes for bst . . . . .                                                                         | 23 |       | \@textbottom: Redefined . . . . .                                                                                                         | 36 |
| v1.21                                                                                                        |    |       | \acmMonth: The default now is the current month (Matteo Riondato) . . . . .                                                               | 47 |
| \showeprint: Added macro . . . . .                                                                           | 77 |       | \acmYear: The default now is the current year (Matteo Riondato) . . . . .                                                                 | 47 |
| v1.22                                                                                                        |    |       | \additionalaffiliation: Added macro . . . . .                                                                                             | 46 |
| General: More bibliography changes for Aptara . . . . .                                                      | 23 |       | \l@section: Redefined macro . . . . .                                                                                                     | 31 |
| v1.23                                                                                                        |    |       | \l@subsection: Redefined macro . . . . .                                                                                                  | 31 |
| General: Add PACMPL journal option . . . . .                                                                 | 23 |       | General: Documentation changes . . . . .                                                                                                  | 23 |
| v1.24                                                                                                        |    |       |                                                                                                                                           |    |
| General: Add IMWUT journal option . . . . .                                                                  | 39 |       |                                                                                                                                           |    |
| v1.25                                                                                                        |    |       |                                                                                                                                           |    |
| General: Updated PACMPL . . . . .                                                                            | 39 |       |                                                                                                                                           |    |

## 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                              |                                                                        |                                                                                                                             |
|--------------------------------------|------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| \\$ . . . . .                        | 1368, 1372                                                             | \@DeclareACMFormat . . . . . 33, 34, 35, 36, 37, 38, 39, 40, 41, 42                                                         |
| \@ . . . . .                         | 1164, 1167, 1172, 1176, 1179, 1182, 1184, 1187, 1267, 1274, 1287       | \@M . . . . . 282, 321, 339, 348                                                                                            |
| \@par . . . . .                      | 282, 339                                                               | \@abstract 1050, 1810, 1817                                                                                                 |
| \@ACM@addtoaddress . . . . .         | 1604, 1625, 1626, 1628                                                 | \@acmArticle . . . . . 1008, 1011, 1367, 1829, 1913, 1914, 1918, 1921, 1924, 1926, 1929, 1932, 1934, 1985, 1999, 2007, 2015 |
| \@ACM@badge@skip . . . . .           | 1031, 1467, 1544, 1548, 1554, 1563, 1573, 1579, 1588                   | \@acmArticleSeq 1010, 1969                                                                                                  |
| \@ACM@badge@width . . . . .          | 1028, 1466, 1471, 1543, 1547, 1553, 1565, 1572, 1574, 1577, 1589, 1592 | \@acmBadgeL@image . . . . . 1040, 1042, 1464, 1466, 1542, 1551, 1553, 1575, 1577                                            |
| \@ACM@badgefalse . . . . .           | 1027                                                                   | \@acmBadgeL@url . . . . . 1039, 1041, 1465, 1552, 1576                                                                      |
| \@ACM@badgetrue . . . . .            | 1033, 1038                                                             | \@acmBadgeR@image . . . . . 1035, 1037, 1469, 1471, 1546, 1562, 1565, 1590, 1592                                            |
| \@ACM@commabox . . . . .             | 1604, 1607, 1608                                                       | \@acmBadgeR@url . . . . . 1034, 1036, 1470, 1564, 1591                                                                      |
| \@ACM@journalfalse . . . . .         | 114, 116, 118, 120, 122                                                | \@acmDOI . . . . . 1024, 1360, 1363, 1369, 1373, 1838                                                                       |
| \@ACM@journaltrue . . . . .          | 106, 108, 110, 112                                                     | \@acmISBN . . . . . 1022, 1371                                                                                              |
| \@ACM@manuscriptfalse . . . . .      | 101                                                                    | \@acmMonth 1014, 1016, 1367                                                                                                 |
| \@ACM@manuscripttrue . . . . .       | 99                                                                     | \@acmNumber . . . . . 1006, 1829, 1918, 1926, 1934, 1999, 2007, 2015                                                        |
| \@ACM@natbib@overridefalse . . . . . | 69                                                                     | \@acmPrice 1020, 1368, 1372                                                                                                 |
| \@ACM@natbib@overridetrue . . . . .  | 71                                                                     | \@acmPubDate . . . . . 1016, 1829, 1918, 1926, 1934, 2000, 2008, 2016                                                       |
| \@ACM@natbibtrue . . . . .           | 126                                                                    | \@acmVolume . . . . . 1004, 1829, 1917, 1925, 1933, 1998, 2006, 2014                                                        |
| \@ACM@newfontsfalse . . . . .        | 553, 555, 558                                                          | \@acmYear . . . . . 1012, 1019, 1295, 1367, 1826                                                                            |
| \@ACM@newfontstrue . . . . .         | 550                                                                    | \@acmdefinitionbodyfont . . . . . 2127, 2139, 2151                                                                          |
| \@ACM@sigchiamodeffalse . . . . .    | 103                                                                    | \@acmdefinitionheadfont . . . . . 2129, 2141, 2153                                                                          |
| \@ACM@sigchiamodetrue . . . . .      | 123                                                                    | \@acmdefinitionindent . . . . . 2128, 2140, 2152                                                                            |
| \@ACM@title@width . . . . .          | 1030, 1541, 1543, 1544, 1547, 1548, 1556, 1570, 1572, 1573, 1581       | \@acmdefinitionnotefont . . . . . 2130, 2142, 2156                                                                          |
|                                      |                                                                        | \@acmownedfalse . . . . . 1131, 1134, 1137, 1142, 1145, 1148, 1151, 1157                                                    |
|                                      |                                                                        | \@acmownedtrue . . . . . 1120, 1127, 1154                                                                                   |
|                                      |                                                                        | \@acmplainbodyfont . . . . . 2097, 2109, 2121                                                                               |
|                                      |                                                                        | \@acmplainheadfont . . . . . 2099, 2111, 2123                                                                               |
|                                      |                                                                        | \@acmplainindent . . . . . 2098, 2110, 2122                                                                                 |
|                                      |                                                                        | \@acmplainnotefont . . . . . 2100, 2112, 2126                                                                               |
|                                      |                                                                        | \@adddotafter . . . . . 2034, 2038, 2094                                                                                    |
|                                      |                                                                        | \@additionalaffiliation . . . . . 962, 963                                                                                  |
|                                      |                                                                        | \@addpunct . . . . . 1861, 2094, 2095, 2187                                                                                 |
|                                      |                                                                        | \@addspaceafter . . . . . 2078, 2083, 2095                                                                                  |
|                                      |                                                                        | \@affiliationfont . . . . . 1655, 1660, 1664, 1667, 1670, 1673, 1676, 1679, 1704, 1720                                      |
|                                      |                                                                        | \@afterheading . . . . . 313, 1409                                                                                          |
|                                      |                                                                        | \@afterindentfalse . . . . . 259, 1408                                                                                      |
|                                      |                                                                        | \@afterindenttrue . . . . . 257                                                                                             |
|                                      |                                                                        | \@author . . . . . 925, 928, 933, 1693, 1743, 1778                                                                          |
|                                      |                                                                        | \@authorfont . . . . . 1654, 1659, 1663, 1666, 1669, 1672, 1675, 1678, 1695, 1720                                           |
|                                      |                                                                        | \@authornotemark . . . . . 1000, 1800                                                                                       |

|                           |                              |                             |                     |
|---------------------------|------------------------------|-----------------------------|---------------------|
| \@authornotes . . . . .   | 1372, 1381, 1386,            | \@input . . . . .           | 350                 |
| . . . . . 997, 1001, 1327 | 1390, 1433, 1464,            | \@insideauthorgroupfalse    |                     |
| \@auxout . . . . .        | 1469, 1542, 1546,            | . . . . .                   | 958                 |
| \@begindocumenthook 409   | 1551, 1559, 1562,            | \@insideauthorgrouptrue     |                     |
| \@citestyle . . . . .     | 1575, 1583, 1590,            | . . . . .                   | 921                 |
| \@classname . . . . .     | 1600, 1684, 1694,            | \@journalCode . .           | 652, 894            |
| 30, 46, 48, 49, 54,       | 1702, 1703, 1743,            | \@journalCode@nr . . .      |                     |
| 56, 57, 62, 64, 65,       | 1749, 1754, 1778,            | . . . . .                   | 652, 703, 899       |
| 73, 75, 76, 80, 82,       | 1784, 1789, 1802,            | \@journalName . . . . .     |                     |
| 83, 94, 150, 551,         | 2100, 2130, 2200, 2216       | . . .                       | 705, 709, 713,      |
| 554, 556, 894, 896,       | \@endfloatbox . . . . .      | 718, 722, 726, 730,         |                     |
| 1055, 1057, 1058,         | \@endpefalse . . . . .       | 734, 738, 739, 741,         |                     |
| 1061, 1063, 1064,         | \@endwdefloatbox 611, 619    | 742, 745, 749, 753,         |                     |
| 1067, 1069, 1070, 1822    | \@finalstrut . . .           | 755, 759, 763, 765,         |                     |
| \@clubpenalty . . . . .   | 531, 544                     | 767, 769, 773, 777,         |                     |
| 327                       | \@float . . . . .            | 781, 785, 789, 793,         |                     |
| \@concepts . . . . .      | 613                          | 797, 801, 805, 809,         |                     |
| 1110, 1381, 1383, 1406    | \@flushglue . . . . .        | 813, 817, 821, 825,         |                     |
| \@copyrightowner . . .    | 2043                         | 826, 829, 833, 834,         |                     |
| . . . . .                 | \@fnsymbol . . . . .         | 837, 842, 846, 850,         |                     |
| 1161, 1344                | 1315                         | 854, 858, 862, 866,         |                     |
| \@copyrightpermission     | \@folio@ht . . . . .         | 870, 874, 878, 882,         |                     |
| . . . . .                 | 1949, 1975, 1981, 1982       | 886, 890, 900, 901,         |                     |
| 1190, 1336                | \@folio@max 1949, 1971, 1972 | 1356, 1917, 1925,           |                     |
| \@copyrightyear . . . .   | \@folio@voffset 1949, 1977   | 1933, 1998, 2006, 2014      |                     |
| . . .                     | \@folio@wd . . . . .         | \@journalNameShort .        |                     |
| 1294, 1344, 1346          | 1949,                        | . . .                       | 706, 710, 715,      |
| \@currbox . . .           | 1982, 1983, 2004, 2012       | 719, 723, 727, 731,         |                     |
| 625, 626, 627             | \@folioblob . . . . .        | 735, 746, 750, 756,         |                     |
| \@currentaffiliation      | 1969,                        | 760, 770, 774, 778,         |                     |
| . . . . .                 | 2001, 2003, 2009, 2010       | 782, 786, 790, 794,         |                     |
| 1721, 1724, 1742,         | \@footnotemark .             | 798, 802, 806, 810,         |                     |
| 1749, 1750, 1752,         | 360, 1313                    | 814, 818, 822, 830,         |                     |
| 1754, 1755, 1757,         | \@footnotemark@nolink        | 835, 838, 843, 847,         |                     |
| 1777, 1784, 1785,         | . . . . .                    | 851, 855, 859, 863,         |                     |
| 1787, 1789, 1790, 1792    | 360, 1313                    | 867, 871, 875, 879,         |                     |
| \@currentaffiliations     | \@footnotetext . . . .       | 883, 887, 891, 901, 1828    |                     |
| . . . . .                 | . . . . .                    | \@keywords 1047, 1390, 1396 |                     |
| 1684,                     | 361, 1314                    | \@latex@error . . . . .     | 235                 |
| 1685, 1686, 1688,         | \@footnotetext@nolink        | \@lempty . . . . .          | 1052, 1810          |
| 1691, 1703, 1704, 1706    | . . . . .                    | \@m . . . . .               | 270                 |
| \@currentauthors 1682,    | 361, 1314                    | \@makefnmark . . .          | 521,                |
| 1683, 1690, 1694,         | \@for . . . . .              | 546, 1319, 1324, 1328       |                     |
| 1695, 1697, 1720,         | 167                          | \@makefntext . . . . .      |                     |
| 1723, 1741, 1743,         | \@formatdoi . . .            | . . .                       | 521, 530, 543, 1329 |
| 1744, 1746, 1776,         | 1189, 1363                   | \@marginfigure .            | 601, 602            |
| 1778, 1779, 1781, 1800    | \@fps . . . . .              | \@margintable . .           | 604, 605            |
| \@currentlabel .          | 612                          | \@minipagefalse .           | 517, 621            |
| 526, 540                  | \@fpsadddefault . . .        | \@minus . . .               | 2024, 2028,         |
| \@dblarg . . . . .        | 612                          | 2032, 2036, 2040,           |                     |
| 268                       | \@gobble . . . . .           |                             |                     |
| \@dblfloat . . . . .      | 189,                         |                             |                     |
| 609                       | 233, 1612, 1615,             |                             |                     |
| \@department . . .        | 1616, 1617, 1618, 1619       |                             |                     |
| 966, 967                  | \@hangfrom . . . . .         |                             |                     |
| \@dotsep . . . . .        | 281, 338                     |                             |                     |
| 2096                      | \@headfootfont . . . .       |                             |                     |
| \@empty . . . . .         | 1880, 1913, 1914,            |                             |                     |
| 128, 272,                 | 1915, 1916, 1920,            |                             |                     |
| 909, 923, 938, 943,       | 1923, 1928, 1931,            |                             |                     |
| 944, 950, 1084,           | 1937, 1938, 1939, 1941       |                             |                     |
| 1085, 1091, 1098,         | \@ifnextchar . . . . .       |                             |                     |
| 1103, 1330, 1360,         | 966                          |                             |                     |
|                           | \@ifnotempty . . . . .       |                             |                     |
|                           | 1300                         |                             |                     |
|                           | \@ifnum . . . . .            |                             |                     |
|                           | 205, 207                     |                             |                     |
|                           | \@ifstar . . . . .           |                             |                     |
|                           | 266                          |                             |                     |
|                           | \@iiiparbox . . . . .        |                             |                     |
|                           | 520                          |                             |                     |

|                                                                                                                                                                                                                                                                                       |                                                                                                |                                                                                                                                                                                                                                                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2071, 2076, 2081,<br>2118, 2120, 2148, 2150                                                                                                                                                                                                                                           | 2076, 2081, 2117,<br>2119, 2147, 2149, 2184                                                    | \@subtitlefont . . . . .<br>1519, 1560, 1584, 1601                                                                                                                                                                                                       |
| \@mkabstract . . 1379, 1809                                                                                                                                                                                                                                                           | \@printcopyrightfalse . . . . . 1130, 1141                                                     | \@subtitlenotes . . . . .<br>. . . 987, 991, 994, 1326                                                                                                                                                                                                   |
| \@mkauthors 1320, 1322, 1630                                                                                                                                                                                                                                                          | \@printcopyrighttrue . . . . . 1116, 1126                                                      | \@svsec . . 272, 275, 281, 296                                                                                                                                                                                                                           |
| \@mkauthors@i . . 1634,<br>1636, 1638, 1640, 1689                                                                                                                                                                                                                                     | \@printendtopmatter . . . . . 1407, 1840                                                       | \@svsechd . . . 294, 322, 342                                                                                                                                                                                                                            |
| \@mkauthors@ii . . . . 1714                                                                                                                                                                                                                                                           | \@printpermissionfalse . . . . . 1129                                                          | \@teaser . . . . . 1298, 1803                                                                                                                                                                                                                            |
| \@mkauthors@iii . 1642,<br>1644, 1646, 1648, 1725                                                                                                                                                                                                                                     | \@printpermissiontrue . . . . . 1118, 1125, 1140                                               | \@teaserfigures . . . . .<br>1296, 1298, 1802, 1806                                                                                                                                                                                                      |
| \@mkauthors@iv 1650, 1766                                                                                                                                                                                                                                                             | \@printtopmatter . . . . . 1321, 1432                                                          | \@tempa . . . . .<br>167, 168, 170, 172,<br>174, 176, 178, 180,<br>182, 184, 186, 188,<br>190, 192, 194, 196,<br>198, 200, 202, 204,<br>206, 208, 210, 212,<br>215, 217, 219, 221,<br>223, 225, 942, 943,<br>1083, 1084, 1702,<br>2200, 2215, 2216, 2218 |
| \@mkbibcitation 1403, 1819                                                                                                                                                                                                                                                            | \@proofindent . . . . . 2168, 2178, 2186                                                       | \@tempb . . . . . 168, 170,<br>172, 174, 176, 178,<br>180, 182, 184, 186,<br>188, 190, 192, 194,<br>196, 198, 200, 202,<br>204, 206, 208, 210,<br>215, 217, 219, 221,<br>223, 225, 2217, 2218                                                            |
| \@mkteasers . . . 1320, 1801                                                                                                                                                                                                                                                          | \@proofnamefont . . . . . 2167, 2177, 2187                                                     | \@tempboxa . . . . . 520                                                                                                                                                                                                                                 |
| \@mktitle . . . . . 1320, 1476                                                                                                                                                                                                                                                        | \@received . 1082, 1085,<br>1086, 1088, 1091,<br>1092, 1094, 1098, 1099                        | \@tempc . 213, 214, 216,<br>218, 220, 222, 224, 226                                                                                                                                                                                                      |
| \@mktitle@i . . . . 1479,<br>1481, 1483, 1485, 1540                                                                                                                                                                                                                                   | \@rightskip . . . 2043, 2044                                                                   | \@tempcnta . . . . . 1867,<br>1868, 1869, 1969,<br>1971, 1972, 1974, 1976                                                                                                                                                                                |
| \@mktitle@ii . . . . . 1568                                                                                                                                                                                                                                                           | \@saveabstract 1049, 1050                                                                      | \@tempdima . . . . .<br>1975, 1976, 1977, 1979                                                                                                                                                                                                           |
| \@mktitle@iii . . 1487,<br>1489, 1491, 1493, 1568                                                                                                                                                                                                                                     | \@saveteaser . . 1297, 1298                                                                    | \@tempskipa . . . . .<br>256, 258, 259, 264,<br>277, 278, 309, 310,<br>312, 324, 325, 334, 335                                                                                                                                                           |
| \@mktitle@iv . . 1495, 1596                                                                                                                                                                                                                                                           | \@secfmtformat . 275, 332                                                                      | \@terms . . 1045, 1386, 1388                                                                                                                                                                                                                             |
| \@mpargs . . . . . 520                                                                                                                                                                                                                                                                | \@secfont . . . . . 2026, 2047                                                                 | \@textbottom . . . . . 547                                                                                                                                                                                                                               |
| \@mparswitchfalse . . 485                                                                                                                                                                                                                                                             | \@secpenalty . . . . . 264                                                                     | \@textsuperscript . . . . .<br>546, 1319, 1324                                                                                                                                                                                                           |
| \@mpfootins . . . . .<br>512, 513, 515, 535, 536                                                                                                                                                                                                                                      | \@sect . . . . . 268, 269                                                                      | \@texttop . . . . . 548                                                                                                                                                                                                                                  |
| \@mpfootnotetext . . . 534                                                                                                                                                                                                                                                            | \@setaddresses . . . . 1808                                                                    | \@thefnmark . 527, 541,<br>546, 1319, 1324, 1328                                                                                                                                                                                                         |
| \@ne . . . . . 193, 197, 201,<br>203, 402, 1867, 1869                                                                                                                                                                                                                                 | \@setthanks . . . 1332, 1861                                                                   | \@title . . . 980, 1406,<br>1558, 1582, 1599, 1826                                                                                                                                                                                                       |
| \@nil . . . . . 212                                                                                                                                                                                                                                                                   | \@shortauthors . . . . . 1879, 1909,<br>1915, 1921, 1929, 1938                                 |                                                                                                                                                                                                                                                          |
| \@nobreakfalse . . 315, 355                                                                                                                                                                                                                                                           | \@sidebar . . . . . 598, 599                                                                   |                                                                                                                                                                                                                                                          |
| \@noskipsecfalse . . . 319                                                                                                                                                                                                                                                            | \@specialsection 1382,<br>1387, 1392, 1394, 1411                                               |                                                                                                                                                                                                                                                          |
| \@noskipsectrue . . . . 316                                                                                                                                                                                                                                                           | \@essect . . . . . 267, 333                                                                    |                                                                                                                                                                                                                                                          |
| \@par . . . . . 1332                                                                                                                                                                                                                                                                  | \@startPage . . . . .<br>1043, 1433, 1434, 1436                                                |                                                                                                                                                                                                                                                          |
| \@parboxrestore . . . . 539                                                                                                                                                                                                                                                           | \@startsection . . . . .<br>. . 253, 345, 2023,<br>2027, 2031, 2035,<br>2039, 2070, 2075, 2080 |                                                                                                                                                                                                                                                          |
| \@parfont . 2038, 2042, 2047                                                                                                                                                                                                                                                          | \@starttoc . . . . . 345                                                                       |                                                                                                                                                                                                                                                          |
| \@permissionCodeOne<br>707, 711, 716, 720,<br>724, 728, 732, 736,<br>743, 747, 751, 757,<br>761, 771, 775, 779,<br>783, 787, 791, 795,<br>799, 803, 807, 811,<br>815, 819, 823, 827,<br>831, 839, 844, 848,<br>852, 856, 860, 864,<br>868, 872, 876, 880,<br>884, 888, 892, 902, 1367 | \@subparfont . . 2083, 2084                                                                    |                                                                                                                                                                                                                                                          |
| \@permissionCodeTwo<br>. . . . . 840, 903                                                                                                                                                                                                                                             | \@subsecfont . . 2030, 2047                                                                    |                                                                                                                                                                                                                                                          |
| \@plus . . 348, 356, 547,<br>2024, 2028, 2032,<br>2036, 2040, 2071,                                                                                                                                                                                                                   | \@subsubsecfont 2034, 2047                                                                     |                                                                                                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                                       | \@subtitle . . . . . 914,<br>989, 1559, 1560,<br>1583, 1584, 1600, 1601                        |                                                                                                                                                                                                                                                          |

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| \@titlefont             | <a href="#">1498</a> , <a href="#">1550</a> ,<br><a href="#">1557</a> , <a href="#">1569</a> , <a href="#">1581</a> , <a href="#">1597</a>                                                                                                                                                                                                                                                                                                             | <a href="#">1905</a> , <a href="#">1956</a> , <a href="#">1992</a> ,<br><a href="#">2052</a> , <a href="#">2101</a> , <a href="#">2131</a> , <a href="#">2169</a>                                                                                                                                                                                                                                                                                | \advance .. <a href="#">920</a> , <a href="#">1543</a> ,<br><a href="#">1544</a> , <a href="#">1547</a> , <a href="#">1548</a> ,<br><a href="#">1572</a> , <a href="#">1573</a> , <a href="#">1727</a> ,<br><a href="#">1740</a> , <a href="#">1768</a> , <a href="#">1775</a> ,<br><a href="#">1869</a> , <a href="#">1972</a> , <a href="#">1974</a> , <a href="#">1977</a>                                                                                                                                                                                                                                                            |
| \@titlenotes ..         | <a href="#">978</a> , <a href="#">982</a> , <a href="#">985</a> , <a href="#">1325</a>                                                                                                                                                                                                                                                                                                                                                                 | ..... <a href="#">1873</a> , <a href="#">1907</a> ,<br><a href="#">1910</a> , <a href="#">1913</a> , <a href="#">1916</a> ,<br><a href="#">1920</a> , <a href="#">1922</a> , <a href="#">1928</a> ,<br><a href="#">1930</a> , <a href="#">1937</a> , <a href="#">1939</a> ,<br><a href="#">1994</a> , <a href="#">2001</a> , <a href="#">2002</a> ,<br><a href="#">2010</a> , <a href="#">2011</a> , <a href="#">2017</a> , <a href="#">2019</a> | \affiliation ..... <a href="#">9</a> ,<br><a href="#">957</a> , <a href="#">1701</a> , <a href="#">1754</a> , <a href="#">1789</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| \@tochangmeasure        | <a href="#">286</a> , <a href="#">299</a>                                                                                                                                                                                                                                                                                                                                                                                                              | \ACM@linecount ..                                                                                                                                                                                                                                                                                                                                                                                                                                | \and .... <a href="#">933</a> , <a href="#">934</a> , <a href="#">947</a> ,<br><a href="#">953</a> , <a href="#">1692</a> , <a href="#">1697</a> ,<br><a href="#">1699</a> , <a href="#">1706</a> , <a href="#">1709</a> ,<br><a href="#">1718</a> , <a href="#">1748</a> , <a href="#">1759</a> ,<br><a href="#">1765</a> , <a href="#">1783</a> , <a href="#">1794</a> , <a href="#">1799</a>                                                                                                                                                                                                                                          |
| \@toclevel .....        | <a href="#">270</a>                                                                                                                                                                                                                                                                                                                                                                                                                                    | ..... <a href="#">1863</a> , <a href="#">1876</a>                                                                                                                                                                                                                                                                                                                                                                                                | \andify .....                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| \@tocline .....         | <a href="#">358</a> , <a href="#">359</a>                                                                                                                                                                                                                                                                                                                                                                                                              | \ACM@linecount@bx ..                                                                                                                                                                                                                                                                                                                                                                                                                             | <a href="#">1398</a> , <a href="#">1399</a> , <a href="#">1682</a> , <a href="#">1685</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| \@topnum .....          | <a href="#">1316</a>                                                                                                                                                                                                                                                                                                                                                                                                                                   | ..... <a href="#">1866</a> , <a href="#">1870</a> , <a href="#">1871</a>                                                                                                                                                                                                                                                                                                                                                                         | anonsuppress (environ-<br>ment) ..... <a href="#">18</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| \@typeset@author@bx     | ..... <a href="#">1718</a> ,<br><a href="#">1759</a> , <a href="#">1765</a> , <a href="#">1794</a> , <a href="#">1799</a>                                                                                                                                                                                                                                                                                                                              | \acmArticle .... <a href="#">12</a> , <a href="#">1008</a>                                                                                                                                                                                                                                                                                                                                                                                       | \AtBeginDocument ... <a href="#">410</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| \@typeset@author@line   | <a href="#">1681</a> , <a href="#">1692</a> , <a href="#">1709</a> , <a href="#">1711</a>                                                                                                                                                                                                                                                                                                                                                              | \acmArticleSeq . <a href="#">12</a> , <a href="#">1010</a>                                                                                                                                                                                                                                                                                                                                                                                       | \AtEndDocument .... <a href="#">1097</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| \@undefined .....       | <a href="#">409</a>                                                                                                                                                                                                                                                                                                                                                                                                                                    | \acmBadgeL ..... <a href="#">13</a> , <a href="#">1038</a>                                                                                                                                                                                                                                                                                                                                                                                       | \author ..... <a href="#">9</a> ,<br><a href="#">918</a> , <a href="#">1309</a> , <a href="#">1310</a> , <a href="#">1823</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| \@width .....           | <a href="#">503</a> , <a href="#">508</a>                                                                                                                                                                                                                                                                                                                                                                                                              | \acmBadgeR ..... <a href="#">13</a> , <a href="#">1033</a>                                                                                                                                                                                                                                                                                                                                                                                       | \author@bx <a href="#">1714</a> , <a href="#">1719</a> , <a href="#">1722</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| \@xp .....              | <a href="#">352</a> , <a href="#">353</a>                                                                                                                                                                                                                                                                                                                                                                                                              | \acmConference ... <a href="#">7</a> , <a href="#">904</a>                                                                                                                                                                                                                                                                                                                                                                                       | \author@bx@sep ....<br>..... <a href="#">1716</a> , <a href="#">1722</a> ,<br><a href="#">1727</a> , <a href="#">1740</a> , <a href="#">1768</a> , <a href="#">1775</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| \@xsect ....            | <a href="#">307</a> , <a href="#">308</a> , <a href="#">344</a>                                                                                                                                                                                                                                                                                                                                                                                        | \acmConference@date<br>..... <a href="#">907</a> ,<br><a href="#">1358</a> , <a href="#">1833</a> , <a href="#">1940</a> , <a href="#">1942</a>                                                                                                                                                                                                                                                                                                  | \author@bx@wd .....<br><a href="#">1715</a> , <a href="#">1718</a> , <a href="#">1726</a> ,<br><a href="#">1727</a> , <a href="#">1732</a> , <a href="#">1734</a> ,<br><a href="#">1736</a> , <a href="#">1738</a> , <a href="#">1740</a> ,<br><a href="#">1767</a> , <a href="#">1768</a> , <a href="#">1773</a> , <a href="#">1775</a>                                                                                                                                                                                                                                                                                                 |
| \@z .....               | <a href="#">199</a>                                                                                                                                                                                                                                                                                                                                                                                                                                    | \acmConference@name<br>..... <a href="#">906</a> , <a href="#">1358</a> , <a href="#">1832</a> , <a href="#">1834</a>                                                                                                                                                                                                                                                                                                                            | \authornote .....<br>... <a href="#">12</a> , <a href="#">962</a> , <a href="#">998</a> , <a href="#">1824</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| \\ .....                | <a href="#">1349</a> , <a href="#">1364</a> ,<br><a href="#">1368</a> , <a href="#">1372</a> , <a href="#">1821</a> , <a href="#">1868</a>                                                                                                                                                                                                                                                                                                             | \acmConference@shortname<br>..... <a href="#">905</a> ,<br><a href="#">909</a> , <a href="#">910</a> , <a href="#">1340</a> ,<br><a href="#">1834</a> , <a href="#">1835</a> , <a href="#">1939</a> , <a href="#">1941</a>                                                                                                                                                                                                                       | \authors <a href="#">926</a> , <a href="#">929</a> , <a href="#">934</a> ,<br><a href="#">1398</a> , <a href="#">1400</a> , <a href="#">1405</a> , <a href="#">1826</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| \{ .....                | <a href="#">175</a>                                                                                                                                                                                                                                                                                                                                                                                                                                    | \acmConference@venue<br>..... <a href="#">908</a> ,<br><a href="#">1340</a> , <a href="#">1832</a> , <a href="#">1940</a> , <a href="#">1942</a>                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| \} .....                | <a href="#">175</a>                                                                                                                                                                                                                                                                                                                                                                                                                                    | \acmdefinition .... <a href="#">2146</a>                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| \_ .....                | <a href="#">1109</a> , <a href="#">1344</a> ,<br><a href="#">1346</a> , <a href="#">1367</a> , <a href="#">1829</a> , <a href="#">1835</a>                                                                                                                                                                                                                                                                                                             | \acmDOI ..... <a href="#">13</a> , <a href="#">1024</a>                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                        | \acmISBN ..... <a href="#">13</a> , <a href="#">1022</a>                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                        | \acmJournal ..... <a href="#">7</a> , <a href="#">898</a>                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>A</b>                |                                                                                                                                                                                                                                                                                                                                                                                                                                                        | \acmMonth ..... <a href="#">12</a> , <a href="#">1014</a>                                                                                                                                                                                                                                                                                                                                                                                        | <b>B</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| \abstract .....         | <a href="#">1049</a>                                                                                                                                                                                                                                                                                                                                                                                                                                   | \acmNumber ..... <a href="#">12</a> , <a href="#">1006</a>                                                                                                                                                                                                                                                                                                                                                                                       | \baselineskip .....<br><a href="#">1334</a> , <a href="#">1552</a> , <a href="#">1564</a> ,<br><a href="#">1576</a> , <a href="#">1591</a> , <a href="#">1866</a> ,<br><a href="#">1870</a> , <a href="#">2024</a> , <a href="#">2025</a> ,<br><a href="#">2028</a> , <a href="#">2029</a> , <a href="#">2032</a> ,<br><a href="#">2036</a> , <a href="#">2071</a> , <a href="#">2072</a> ,<br><a href="#">2076</a> , <a href="#">2081</a> , <a href="#">2117</a> ,<br><a href="#">2118</a> , <a href="#">2119</a> , <a href="#">2120</a> ,<br><a href="#">2147</a> , <a href="#">2148</a> , <a href="#">2149</a> , <a href="#">2150</a> |
| abstract (environment)  | <a href="#">15</a>                                                                                                                                                                                                                                                                                                                                                                                                                                     | \acmplain ..... <a href="#">2116</a>                                                                                                                                                                                                                                                                                                                                                                                                             | \begin .... <a href="#">20</a> , <a href="#">1875</a> , <a href="#">1978</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| \acks .....             | <a href="#">2191</a>                                                                                                                                                                                                                                                                                                                                                                                                                                   | \acmPrice ..... <a href="#">12</a> , <a href="#">1020</a>                                                                                                                                                                                                                                                                                                                                                                                        | \begingroup .....                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| acks (environment) .... | <a href="#">19</a>                                                                                                                                                                                                                                                                                                                                                                                                                                     | \acmVolume ..... <a href="#">12</a> , <a href="#">1004</a>                                                                                                                                                                                                                                                                                                                                                                                       | <a href="#">279</a> , <a href="#">322</a> , <a href="#">336</a> , <a href="#">345</a> ,<br><a href="#">401</a> , <a href="#">1312</a> , <a href="#">1630</a> , <a href="#">2192</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| \acm@copyrightinput     | <a href="#">1122</a>                                                                                                                                                                                                                                                                                                                                                                                                                                   | \acmYear ..... <a href="#">12</a> , <a href="#">1012</a>                                                                                                                                                                                                                                                                                                                                                                                         | \bfseries ..... <a href="#">644</a> ,<br><a href="#">1501</a> , <a href="#">1503</a> , <a href="#">1505</a> ,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| \acm@copyrightmode .    | ..... <a href="#">1122</a> , <a href="#">1128</a> ,<br><a href="#">1133</a> , <a href="#">1136</a> , <a href="#">1139</a> ,<br><a href="#">1144</a> , <a href="#">1147</a> , <a href="#">1150</a> ,<br><a href="#">1153</a> , <a href="#">1156</a> , <a href="#">1162</a> , <a href="#">1191</a>                                                                                                                                                       | \addcontentsline <a href="#">163</a> ,<br><a href="#">288</a> , <a href="#">301</a> , <a href="#">1811</a> , <a href="#">2194</a>                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| \ACM@fontsize .....     | <a href="#">86</a> , <a href="#">128</a> , <a href="#">131</a> , <a href="#">133</a> ,<br><a href="#">135</a> , <a href="#">137</a> , <a href="#">139</a> , <a href="#">141</a> ,<br><a href="#">143</a> , <a href="#">145</a> , <a href="#">147</a> , <a href="#">150</a> , <a href="#">151</a>                                                                                                                                                       | \additionalaffiliation<br>..... <a href="#">10</a> , <a href="#">962</a>                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| \ACM@format .....       | <a href="#">27</a> , <a href="#">94</a>                                                                                                                                                                                                                                                                                                                                                                                                                | \addpenalty ..... <a href="#">264</a>                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| \ACM@format@nr          | <a href="#">27</a> , <a href="#">94</a> ,<br><a href="#">98</a> , <a href="#">104</a> , <a href="#">129</a> , <a href="#">370</a> ,<br><a href="#">425</a> , <a href="#">490</a> , <a href="#">577</a> , <a href="#">629</a> ,<br><a href="#">1412</a> , <a href="#">1440</a> , <a href="#">1477</a> ,<br><a href="#">1499</a> , <a href="#">1520</a> , <a href="#">1632</a> ,<br><a href="#">1656</a> , <a href="#">1841</a> , <a href="#">1881</a> , | \addresses .. <a href="#">923</a> , <a href="#">925</a> ,<br><a href="#">928</a> , <a href="#">933</a> , <a href="#">960</a> , <a href="#">976</a> ,<br><a href="#">1000</a> , <a href="#">1711</a> , <a href="#">1765</a> , <a href="#">1799</a>                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                        | \addtolength ..... <a href="#">1870</a>                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                        | \addvspace ..... <a href="#">264</a> , <a href="#">356</a>                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |



|                     |                                 |                                 |
|---------------------|---------------------------------|---------------------------------|
| 880, 882, 883, 884, | 2092, 2094, 2095,               | 1338, 1339, 1345,               |
| 886, 887, 888, 890, | 2097, 2098, 2099,               | 1350, 1357, 1362,               |
| 891, 892, 898, 899, | 2100, 2109, 2110,               | 1365, 1370, 1372,               |
| 900, 901, 902, 903, | 2111, 2112, 2127,               | 1381, 1386, 1390,               |
| 914, 942, 962, 963, | 2128, 2129, 2130,               | 1393, 1435, 1464,               |
| 964, 965, 966, 967, | 2139, 2140, 2141,               | 1469, 1542, 1546,               |
| 978, 979, 987, 988, | 2142, 2167, 2168,               | 1551, 1559, 1562,               |
| 997, 998, 1004,     | 2177, 2178, 2198,               | 1575, 1583, 1590,               |
| 1006, 1008, 1010,   | 2200, 2215, 2216, 2217          | 1600, 1606, 1620,               |
| 1012, 1014, 1016,   | \define@boolkey . . . .         | 1684, 1696, 1702,               |
| 1020, 1022, 1024,   | . . . . . 44, 52, 60,           | 1705, 1719, 1737,               |
| 1034, 1035, 1036,   | 70, 78, 1053, 1059, 1065        | 1745, 1751, 1756,               |
| 1037, 1039, 1040,   | \define@choicekey . .           | 1772, 1780, 1786,               |
| 1041, 1042, 1043,   | . . . . . 27, 652, 1121         | 1791, 1802, 1810,               |
| 1045, 1047, 1050,   | \definecolor . . . . .          | 1814, 1831, 1834,               |
| 1052, 1071, 1082,   | . . . 416, 417, 418,            | 1879, 1935, 2018,               |
| 1083, 1107, 1159,   | 419, 420, 421, 422, 423         | 2200, 2204, 2211, 2219          |
| 1161, 1189, 1190,   | \department . . 10, 966, 1611   | \email 9, 974, 1700, 1749, 1784 |
| 1294, 1296, 1298,   | \description . . . . . 645      | \emph . . . . . 1356, 1358      |
| 1307, 1319, 1324,   | \descriptionlabel 644, 647      | \EnableCrossrefs . . . . 19     |
| 1332, 1411, 1432,   | \dimexpr . . . 608, 626, 1945   | \end . . . . . 22, 1877, 1986   |
| 1476, 1498, 1519,   | \divide . . . . . 1732,         | \end@dblfloat . . . . . 615     |
| 1540, 1568, 1596,   | 1734, 1736, 1738, 1773          | \end@float . . . . . 617        |
| 1605, 1613, 1621,   | \do . . . . . 167               | \endcsname . . . . . 232,       |
| 1622, 1624, 1627,   | \DocInput . . . . . 21          | 233, 284, 286, 290,             |
| 1630, 1654, 1655,   | \documentclass . . . . . 9      | 297, 299, 303, 332,             |
| 1659, 1660, 1663,   | \dots . . . . . 1372            | 352, 353, 527, 541,             |
| 1664, 1666, 1667,   |                                 | 1108, 1109, 1110, 1111          |
| 1669, 1670, 1672,   | <b>E</b>                        | \enddescription . . . . 651     |
| 1673, 1675, 1676,   | \edef . . . 87, 88, 89, 90, 270 | \endgroup 283, 322, 340,        |
| 1678, 1679, 1681,   | \egroup . . . . . 519,          | 355, 1377, 1652, 2196           |
| 1683, 1688, 1689,   | 600, 603, 606, 617,             | \endlist . . . . . 649, 651     |
| 1690, 1691, 1693,   | 623, 973, 1383,                 | \endminipage . . . . . 509      |
| 1700, 1701, 1702,   | 1388, 1396, 1721,               | \endtrivlist . . . . . 2189     |
| 1718, 1725, 1743,   | 1799, 1804, 1818, 1839          | \enspace . . . . . 2095         |
| 1749, 1754, 1766,   | \else . . . . . 47, 55, 63,     | environments:                   |
| 1778, 1784, 1789,   | 74, 81, 100, 125,               | abstract . . . . . 15           |
| 1800, 1801, 1803,   | 213, 234, 263, 270,             | acks . . . . . 19               |
| 1808, 1809, 1819,   | 273, 285, 289, 293,             | anonsuppress . . . . 18         |
| 1820, 1821, 1822,   | 298, 302, 314, 326,             | CCSXML . . . . . 13             |
| 1840, 1861, 1873,   | 341, 389, 404, 407,             | marginfigure . . . . 17         |
| 1879, 1880, 1955,   | 409, 512, 574, 919,             | marginfigure . . . . 17         |
| 1962, 1967, 1969,   | 927, 931, 932, 941,             | printonly . . . . . 18          |
| 2043, 2047, 2048,   | 946, 949, 952, 959,             | screenonly . . . . . 18         |
| 2049, 2050, 2056,   | 975, 984, 993, 999,             | sidebar . . . . . 17            |
| 2057, 2059, 2060,   | 1056, 1062, 1068,               | teaserfigure . . . . 15         |
| 2062, 2063, 2065,   | 1075, 1078, 1087,               | \everypar . . . 262, 317, 328   |
| 2066, 2068, 2069,   | 1090, 1093, 1098,               | \excludecomment . 1102,         |
| 2074, 2079, 2084,   | 1112, 1113, 1303,               | 2203, 2205, 2209, 2210          |
| 2087, 2088, 2091,   | 1320, 1330, 1335,               |                                 |



|                                            |                                                                      |                                                  |
|--------------------------------------------|----------------------------------------------------------------------|--------------------------------------------------|
| <code>\ExecuteOptionsX</code> . . .        | 1096, 1100, 1110,                                                    | 1331, 1334                                       |
| . . . 43, 51, 59, 67, 85                   | 1114, 1132, 1135,                                                    |                                                  |
| <code>\expandafter</code> . . . . .        | 1138, 1143, 1146,                                                    | <code>\footrulewidth</code> 1904, 1991           |
| . . . 212, 214, 410,                       | 1149, 1152, 1155,                                                    | <code>\format</code> . . . . . <u>27</u>         |
| 520, 1108, 1109, 1111                      | 1158, 1188, 1293,                                                    | <code>\frenchspacing</code> . . . . <u>2221</u>  |
|                                            | 1305, 1310, 1311,                                                    | <code>\fulltextwidth</code> . . . .              |
|                                            | 1320, 1322, 1333,                                                    | . . . . . <u>607</u> , 610, 626                  |
| <b>F</b>                                   | 1336, 1337, 1341,                                                    |                                                  |
| <code>\familydefault</code> . . . . 566    | 1342, 1347, 1359,                                                    | <b>G</b>                                         |
| <code>\fancyfoot</code> . . . . . 1911,    | 1364, 1372, 1374,                                                    | <code>\g@addto@macro</code> . . . .              |
| 1917, 1925, 1933,                          | 1375, 1376, 1384,                                                    | . . . 933, 934, 947,                             |
| 1936, 1995, 1996,                          | 1385, 1389, 1395,                                                    | 953, 960, 976, 980,                              |
| 1998, 2006, 2014, 2020                     | 1397, 1404, 1431,                                                    | 982, 985, 989, 991,                              |
| <code>\fancyhead</code> . 1907, 1908,      | 1437, 1468, 1472,                                                    | 994, 1000, 1001,                                 |
| 1909, 1910, 1913,                          | 1473, 1474, 1496,                                                    | 1088, 1094, 1110,                                |
| 1914, 1915, 1916,                          | 1518, 1539, 1545,                                                    | 1111, 1298, 1302,                                |
| 1920, 1922, 1923,                          | 1549, 1555, 1561,                                                    | 1304, 1697, 1706,                                |
| 1928, 1930, 1931,                          | 1566, 1578, 1580,                                                    | 1746, 1752, 1757,                                |
| 1937, 1938, 1939,                          | 1585, 1593, 1594,                                                    | 1781, 1787, 1792, 1800                           |
| 1941, 1994, 2001,                          | 1602, 1609, 1629,                                                    | <code>\gdef</code> 905, 906, 907, 908,           |
| 2002, 2003, 2009,                          | 1651, 1680, 1687,                                                    | 910, 925, 926, 928,                              |
| 2010, 2011, 2017, 2019                     | 1698, 1707, 1708,                                                    | 929, 939, 945, 951,                              |
| <code>\fancyheadoffset</code> . . .        | 1719, 1739, 1747,                                                    | 1050, 1086, 1092,                                |
| . . . 1945, 2004, 2012                     | 1753, 1758, 1774,                                                    | 1109, 1434, 1695,                                |
| <code>\fancyhf</code> . . . . . 1902, 1989 | 1782, 1788, 1793,                                                    | 1699, 1704, 1723,                                |
| <code>\fancypagestyle</code> 1901, 1988    | 1807, 1816, 1818,                                                    | 1724, 1741, 1742,                                |
| <code>\fi</code> . . . 49, 57, 65, 76, 83, | 1835, 1837, 1859,                                                    | 1744, 1748, 1750,                                |
| 102, 124, 127, 148,                        | 1872, 1878, 1879,                                                    | 1755, 1776, 1777,                                |
| 149, 158, 169, 171,                        | 1900, 1907, 1908,                                                    | 1779, 1783, 1785, 1790                           |
| 173, 175, 177, 179,                        | 1913, 1914, 1921,                                                    | <code>\geometry</code> . . . . .                 |
| 181, 183, 185, 187,                        | 1924, 1929, 1932,                                                    | 427, 430, 437, 444,                              |
| 189, 191, 193, 195,                        | 1936, 1943, 1946,                                                    | 451, 458, 465, 472, 479                          |
| 197, 199, 201, 203,                        | 1968, 1995, 2020,                                                    | <code>\global</code> . . . . .                   |
| 205, 207, 209, 211,                        | 2021, 2093, 2115,                                                    | 316, 319, 355, 535,                              |
| 216, 218, 220, 222,                        | 2145, 2181, 2200,                                                    | 625, 920, 921, 958,                              |
| 224, 226, 227, 236,                        | 2207, 2213, 2216, 2220                                               | 1400, 1401, 1692,                                |
| 238, 252, 254, 260,                        |                                                                      | 1709, 1710, 1719,                                |
| 265, 270, 276, 287,                        | <code>\firstpagestyle</code> . . . . <u>1988</u>                     | 1759, 1762, 1794, 1805                           |
| 291, 300, 304, 306,                        | <code>\floatname</code> . . . . . 597                                | <code>\grantnum</code> . . . . . <u>19, 2199</u> |
| 329, 330, 343, 354,                        | <code>\footnote</code> . . . . . 1822                                | <code>\grantsponsor</code> . . <u>19, 2198</u>   |
| 382, 391, 406, 407,                        | <code>\footnotemark</code> . . 367,                                  |                                                  |
| 411, 414, 487, 501,                        | 980, 989, 1800, 1820                                                 | <b>H</b>                                         |
| 516, 533, 564, 567,                        | <code>\footnoterule</code> . . . . . <u>507</u>                      | <code>\hbox</code> . 546, 1319, 1324, 1607       |
| 594, 595, 614, 618,                        | <code>\footnotesep</code> . . . 531, 544                             | <code>\headrulewidth</code> 1903, 1990           |
| 643, 893, 911, 922,                        | <code>\footnotesize</code> . . 537,                                  | <code>\hfill</code> . . . . . 1598               |
| 930, 935, 936, 940,                        | 1911, 1917, 1925,                                                    | <code>\href</code> . 1465, 1470, 1552,           |
| 948, 954, 955, 956,                        | 1933, 1936, 1996,                                                    | 1564, 1576, 1591, 2219                           |
| 961, 977, 986, 996,                        | 1998, 2006, 2014, 2020                                               | <code>\hrule</code> . . . . . 503, 508, 1598     |
| 1003, 1019, 1058,                          | <code>\footnotetext</code> . . 983,                                  | <code>\hrulefill</code> . 1443, 1446,            |
| 1064, 1070, 1080,                          | 985, 992, 995, 1002                                                  |                                                  |
| 1081, 1089, 1095,                          | <code>\footnotetextcopyrightpermission</code> 1449, 1843, 1845, 1847 |                                                  |

|                                                |                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------------|------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>\hsize</code> . . . . .                  | 538, 1318, 1540, 1541, 1568, 1570, 1596, 1631, 1718, 1761, 1796        | 522, 565, 609, 615, 1320, 1322, 1719, 1944                                                                                                                                                                                                                                                                                                                                                                                        | 1684, 1694, 1702, 1703, 1743, 1749, 1754, 1778, 1784, 1789, 1802, 1810, 1834, 2200, 2216, 2218                                                                                                                                                                                                                                   |
| <code>\hskip</code> . . . . .                  | 281, 295, 325, 338, 342, 1467, 1554, 1563, 1579, 1588, 1608, 2186      | <code>\if@acmowned</code> . . . . . 1119<br><code>\if@filesw</code> . . . . . 351, 412<br><code>\if@insideauthorgroup</code> . . . . . 918, 919<br><code>\if@nobreak</code> . . . . . 261<br><code>\if@noskipsec</code> . . . . . 254, 318<br><code>\if@printcopyright</code> . . . . . 1115, 1343<br><code>\if@printpermission</code> . . . . . 1117, 1336                                                                       | <code>\ignorespaces</code> 331, 531, 544, 964, 965, 967, 1613, 1817, 1821, 2187<br><code>\immediate</code> . . . . . 353, 413<br><code>\includecomment</code> . . . . . 2202, 2206, 2212<br><code>\includegraphics</code> . . . . . 1466, 1471, 1553, 1565, 1577, 1592                                                           |
| <code>\hspace</code> . . . . .                 | 644, 1201, 1212, 1221, 1238, 1252, 1264, 1722, 1764                    | <code>\ifcase</code> . . . . . 104, 129, 370, 425, 490, 577, 629, 703, 1016, 1162, 1191, 1412, 1440, 1477, 1499, 1520, 1632, 1656, 1728, 1769, 1841, 1881, 1905, 1956, 1992, 2052, 2101, 2131, 2169                                                                                                                                                                                                                               | <code>\interfootnotelinepenalty</code> . . . . . 525<br><code>\interlinepenalty</code> . . . . . 282, 339, 525<br><code>\item</code> . . . . . 2186<br><code>\itemindent</code> . . . . . 646<br><code>\itshape</code> . . . . . 1340, 2049, 2050, 2079, 2084, 2097, 2109, 2129, 2177                                            |
| <code>\Huge</code> . . . . .                   | 1507, 1509, 1511, 1513, 1515, 1517                                     | <code>\ifcsname</code> . . . . . 232<br><code>\ifdim</code> 258, 278, 310, 335, 1871<br><code>\IfFileExists</code> 551, 554, 556<br><code>\ifNAT@numbers</code> . . . . . 407<br><code>\ifnum</code> . . . . . 98, 270, 271, 285, 289, 298, 302, 1112, 1113, 1128, 1133, 1136, 1139, 1144, 1147, 1150, 1153, 1156, 1310, 1971                                                                                                     | <code>\institution</code> 10, 965, 1611<br><code>\interfootnotelinepenalty</code> . . . . . 525<br><code>\interlinepenalty</code> . . . . . 282, 339, 525<br><code>\item</code> . . . . . 2186<br><code>\itemindent</code> . . . . . 646<br><code>\itshape</code> . . . . . 1340, 2049, 2050, 2079, 2084, 2097, 2109, 2129, 2177 |
| <code>\hypersetup</code> . . . . .             | 384, 390, 1405                                                         | <code>\ifvmode</code> . . . . . 1606<br><code>\ifvoid</code> . . . . . 512<br><code>\ifx</code> . . . . . 128, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 215, 217, 219, 221, 223, 225, 409, 909, 923, 938, 943, 944, 950, 1084, 1085, 1091, 1098, 1108, 1330, 1360, 1372, 1381, 1390, 1433, 1464, 1469, 1542, 1546, 1551, 1559, 1562, 1575, 1583, 1590, 1600, | <code>\jobname</code> . . . . . 350, 353                                                                                                                                                                                                                                                                                         |
| <b>I</b>                                       |                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\if</code> . . . . .                     | 213, 1386                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\if@ACM@anonymous</code> . . . . .       | 78, 924, 932, 937, 959, 975, 981, 990, 999, 1301, 1308, 1879, 2208     |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\if@ACM@authorversion</code> . . . . .   | 60, 1335, 1351                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\if@ACM@badge</code> . . . . .           | 1026, 1462, 1571, 1587                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\if@ACM@journal</code> . . . . .         | 96, 570, 1076, 1339, 1355, 1366, 1391, 1611, 1812, 1827                |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\if@ACM@manuscript</code> . . . . .      | 95, 155, 1073, 1338, 1348                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\if@ACM@natbib</code> . . . . .          | 70, 159, 250, 392                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\if@ACM@natbib@override</code> . . . . . | 68, 125                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\if@ACM@newfonts</code> . . . . .        | 549, 559                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\if@ACM@printacmref</code> . . . . .     | 1059, 1402                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\if@ACM@printccs</code> . . . . .        | 1053, 1380                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\if@ACM@printfolios</code> . . . . .     | 1065, 1907, 1908, 1913, 1914, 1921, 1924, 1929, 1932, 1936, 1995, 2020 |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\if@ACM@review</code> . . . . .          | 52, 1863, 1874                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\if@ACM@screen</code> . . . . .          | 44, 383, 2201                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\if@ACM@sigchiamode</code> . . . . .     | 97,                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <b>J</b>                                       |                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\jobname</code> . . . . .                | 350, 353                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <b>K</b>                                       |                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\kern</code> . . . . .                   | 502, 503, 507, 508, 1598                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\keywords</code> . . . . .               | 13, 1047                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <b>L</b>                                       |                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\l@section</code> . . . . .              | 358                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\l@subsubsection</code> . . . . .        | 359                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\labelenumi</code> . . . . .             | 637                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\labelenumii</code> . . . . .            | 638                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\labelenumiii</code> . . . . .           | 639                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\labelenumiv</code> . . . . .            | 640                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\labelsep</code> . . . . .               | 644, 2186                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\labelwidth</code> . . . . .             | 647                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\LARGE</code> . . . . .                  | 1501, 1503, 1505, 1528, 1530, 1532, 1534, 1536, 1663, 1666, 1985       |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\Large</code> . . . . .                  | 1654, 1672, 2062, 2063, 2065, 2066, 2068                               |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |
| <code>\large</code> . . . . .                  | 1659, 1664, 1667, 2056, 2057, 2059, 2060                               |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                  |

|                         |                        |                           |                         |                         |                          |
|-------------------------|------------------------|---------------------------|-------------------------|-------------------------|--------------------------|
| \lastbox . . . . .      | 320                    | \medskip . . . . .        |                         | \newdimen . . . . .     | 607,                     |
| \leaders . . . . .      | 1598                   |                           | 1414, 1416, 1418,       |                         | 1715, 1949, 1951, 1953   |
| \leavevmode             | 254, 1598, 1763        |                           | 1420, 1710, 1712,       | \newenvironment . . . . |                          |
| \leftskip .             | 1597, 1797, 2045       |                           | 1763, 1806, 1825,       |                         | . . . . . 601, 604, 1297 |
| \let .                  | 189, 191, 203, 205,    |                           | 1840, 1843, 1845, 1847  | \newfloat . . . . .     | 596                      |
|                         | 207, 233, 272, 360,    | \mktitle@bx . . . .       | 1306,                   | \newif                  | 68, 95, 96, 97, 549,     |
|                         | 361, 393, 394, 395,    |                           | 1442, 1445, 1448,       |                         | 1026, 1115, 1117, 1119   |
|                         | 396, 397, 398, 399,    |                           | 1451, 1453, 1455,       | \newlength . . . . .    |                          |
|                         | 402, 548, 611, 647,    |                           | 1457, 1459, 1461,       |                         | 1028, 1030, 1031, 1866   |
|                         | 651, 968, 969, 970,    |                           | 1550, 1569, 1597,       | \newsavebox . . . . .   | 1864                     |
|                         | 971, 972, 1103,        |                           | 1710, 1762, 1763, 1805  | \newskip . . . . .      | 1716                     |
|                         | 1313, 1314, 1328,      | \month . . . . .          | 1015                    | \newtheorem . . . . .   |                          |
|                         | 1329, 1332, 1400,      | \moveleft . . . . .       | 625                     |                         | 2158, 2159, 2160,        |
|                         | 1401, 1612, 1615,      | \multiply . . . . .       | 1976                    |                         | 2161, 2162, 2164, 2165   |
|                         | 1616, 1617, 1618,      |                           |                         | \newtheoremstyle . . .  |                          |
|                         | 1619, 1625, 1626,      |                           | N                       |                         | . . . . . 2116, 2146     |
|                         | 1628, 1692, 1709,      | \NAT@@setcites . . . .    | 229                     | \newwrite . . . . .     | 352                      |
|                         | 1759, 1765, 1794, 1799 | \NAT@aysep . . . . .      | 220                     | \nobreak . . . . .      | 311, 1825                |
| \lineskip . . . . .     | 1764, 1798             | \NAT@citetp . . . . .     | 402                     | \noindent . . . . .     |                          |
| \linespacing . . .      | 348, 349               | \NAT@close . . . . .      |                         |                         | . 521, 1099, 1329,       |
| \list . . . . .         | 645                    |                           | 169, 171, 173, 175, 218 |                         | 1414, 1416, 1418,        |
| \LoadClass . . . . .    | 151                    | \NAT@cmprs . . . . .      | 197, 199, 201           |                         | 1420, 1439, 1443,        |
| \long . . . . .         | 523,                   | \NAT@cmt . . . . .        | 224                     |                         | 1446, 1449, 1463,        |
|                         | 534, 599, 602, 605,    | \NAT@ctype . . . . .      | 402                     |                         | 1550, 1557, 1560,        |
|                         | 1050, 1052, 1298, 1861 | \NAT@find@eq . . . . .    | 212                     |                         | 1584, 1598, 1599,        |
| \loop . . . . .         | 1868, 1970             | \NAT@fullfalse . . . .    | 402                     |                         | 1601, 1682, 1710,        |
|                         | M                      | \NAT@longnametrue .       | 209                     |                         | 1711, 1762, 1798,        |
| \makebox . . . . .      | 1979                   | \NAT@merge . . . . .      | 203, 205, 207           |                         | 1805, 1806, 1813,        |
| \makelabel . . . . .    | 647                    | \NAT@nmfmt . . . . .      | 211                     |                         | 1825, 1826, 1838,        |
| \maketitle . . . . .    | 16, 1307               | \NAT@numbersfalse . .     | 183                     |                         | 1843, 1845, 1847, 2178   |
| \MakeUppercase . . . .  |                        | \NAT@numberstrue          | 185, 187                | \nolinkurl . . . . .    |                          |
|                         | . . . . . 1695, 1697,  | \NAT@open . . . . .       | 169,                    |                         | 1369, 1373, 1750,        |
|                         | 2047, 2056, 2059,      |                           | 171, 173, 175, 216, 402 |                         | 1752, 1785, 1787, 1838   |
|                         | 2062, 2065, 2087, 2091 | \NAT@partrue . . . . .    | 402                     | \normalcolor . . . . .  | 514                      |
| \marginfigure . . . . . | 601                    | \NAT@rem@eq . . . . .     | 214                     | \normalfont             | 546, 1099,               |
| marginfigure (environ-  |                        | \NAT@sep                  | 177, 179, 181, 226      |                         | 1324, 1655, 1660,        |
| ment) . . . . .         | 17                     | \NAT@sort . . . . .       | 193, 195, 201           |                         | 1669, 1670, 1672,        |
| \marginpar . . . . .    | 523,                   | \NAT@superfalse . . . .   | 185                     |                         | 1673, 2112, 2127,        |
|                         | 600, 603, 606, 1463    | \NAT@supertrue . . . .    | 187                     |                         | 2139, 2142, 2184, 2221   |
| \marginparsep . . .     | 608, 1945              | \NAT@swafalse . . . . .   | 401                     | \normalsize . . . . .   | 1655,                    |
| \marginparwidth .       | 608, 1945              | \NAT@up . . . . .         | 211                     |                         | 1669, 1670, 1673, 2221   |
| \margintable . . . . .  | 604                    | \NAT@yrsep . . . . .      | 222                     | \num@authorgroups . .   |                          |
| margintable (environ-   |                        | \NeedsTeXFormat . . . . . | 1                       |                         | . . . 916, 920, 1310,    |
| ment) . . . . .         | 17                     | \newblock . . . . .       | 403                     |                         | 1728, 1732, 1734, 1769   |
| \mbox . . . . .         | 211                    | \newbox . . . . .         | 1306, 1604, 1714        | \number . . . . .       | 270                      |
| \mdseries . . . . .     |                        | \newcommand . . . . .     | 239, 245,               | \numberline . . . . .   | 290, 303                 |
|                         | 1522, 1524, 1526,      |                           | 904, 957, 1033,         |                         | O                        |
|                         | 1530, 1532, 1534,      |                           | 1038, 1083, 1104,       | \onehalfspacing . . . . | 157                      |
|                         | 1536, 1538, 1676, 1679 | \newcount . . . . .       | 916                     | \openout . . . . .      | 353                      |

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| or . .                       | 107, 109, 111, 113,<br>115, 117, 119, 121,<br>132, 134, 136, 138,<br>140, 142, 144, 146,<br>372, 373, 374, 375,<br>376, 377, 379, 380,<br>429, 436, 443, 450,<br>457, 464, 471, 478,<br>492, 493, 494, 496,<br>497, 498, 499, 500,<br>579, 580, 581, 582,<br>583, 585, 588, 591,<br>631, 632, 633, 634,<br>635, 636, 641, 642,<br>708, 712, 717, 721,<br>725, 729, 733, 737,<br>740, 744, 748, 752,<br>754, 758, 762, 764,<br>766, 768, 772, 776,<br>780, 784, 788, 792,<br>796, 800, 804, 808,<br>812, 816, 820, 824,<br>828, 832, 836, 841,<br>845, 849, 853, 857,<br>861, 865, 869, 873,<br>877, 881, 885, 889,<br>1016, 1017, 1018,<br>1163, 1165, 1168,<br>1170, 1171, 1173,<br>1175, 1177, 1180,<br>1183, 1185, 1192,<br>1203, 1214, 1222,<br>1228, 1240, 1254,<br>1266, 1273, 1280,<br>1286, 1415, 1417,<br>1419, 1421, 1423,<br>1425, 1427, 1429,<br>1444, 1447, 1450,<br>1452, 1454, 1456,<br>1458, 1460, 1480,<br>1482, 1484, 1486,<br>1488, 1490, 1492,<br>1494, 1502, 1504,<br>1506, 1508, 1510,<br>1512, 1514, 1516,<br>1523, 1525, 1527,<br>1529, 1531, 1533,<br>1535, 1537, 1635,<br>1637, 1639, 1641,<br>1643, 1645, 1647, | 1649, 1658, 1661,<br>1662, 1665, 1668,<br>1671, 1674, 1677,<br>1730, 1731, 1733,<br>1735, 1771, 1844,<br>1846, 1848, 1850,<br>1852, 1854, 1856,<br>1858, 1884, 1886,<br>1888, 1890, 1892,<br>1894, 1896, 1898,<br>1912, 1919, 1927,<br>1958, 1963, 1997,<br>2005, 2013, 2054,<br>2055, 2058, 2061,<br>2064, 2067, 2085,<br>2089, 2103, 2104,<br>2105, 2106, 2107,<br>2108, 2113, 2114,<br>2133, 2134, 2135,<br>2136, 2137, 2138,<br>2143, 2144, 2171,<br>2172, 2173, 2174,<br>2175, 2176, 2179, 2180<br><code>\orcid</code> . . . . . 9, 978<br><code>\outer@nobreak</code> . . . . 622 | 1601, 1603, 1621,<br>1622, 1623, 1624,<br>1682, 1686, 1710,<br>1712, 1718, 1720,<br>1744, 1746, 1752,<br>1757, 1763, 1765,<br>1779, 1781, 1787,<br>1792, 1797, 1799,<br>1803, 1804, 1805,<br>1806, 1817, 1825,<br>1837, 1839, 1840,<br>1843, 1845, 1847,<br>1849, 1851, 1853,<br>1855, 1857, 1861, 2182<br><code>\paragraph</code> 1426, 2035, 2075<br><code>\parbox</code> . . . 1556, 1574,<br>1581, 1589, 1865, 1983<br><code>\parindent</code> . . . . .<br>. 488, 1332, 1334,<br>2035, 2046, 2098, 2128<br><code>\parskip</code> . . . . . 488, 1334<br><code>\part</code> . . . . . 2039<br><code>\PassOptionsToClass</code><br>. . . . . 91, 92<br><code>\pdfstringdefDisableCommands</code><br>. . . . . 363<br><code>\phantomsection</code> . . . .<br>. . . . 163, 1811, 2194<br><code>\popQED</code> . . . . . 2189<br><code>\position</code> . 10, 964, 968,<br>969, 970, 971, 972, 1611<br><code>\postcode</code> . . . 10, 971, 1611<br><code>printonly</code> (environment) 18<br><code>\ProcessOptionsX</code> . . . . 93<br><code>\proof</code> . . . . . 2182<br><code>\proofname</code> . . . . . 2182<br><code>\protect</code> . . . . . 290, 303<br><code>\protected@edef</code> . . . .<br>. . . . . 275, 526, 540<br><code>\providecommand</code> . . . .<br>. . . . 403, 405, 2096<br><code>\ProvidesClass</code> . . . . . 5<br><code>\ProvidesFile</code> . . . . . 3<br><code>\pushQED</code> . . . . . 2183<br><code>\put</code> . . . . . 1876 |
| <b>P</b>                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <code>\p@</code> . . . . .   | 356, 488,<br>495, 502, 503, 507,<br>508, 646, 2024,<br>2028, 2032, 2033,<br>2036, 2037, 2040,<br>2041, 2071, 2076,<br>2077, 2081, 2082, 2184<br><code>\PackageError</code> . . . .<br>. . . . 49, 57, 65, 76, 83<br><code>\PackageInfo</code> . . . . .<br>. . . . 46, 48, 54, 56,<br>62, 64, 73, 75, 80, 82<br><code>\PageIndex</code> . . . . . 16<br><code>\pagestyle</code> . . . . . 1948<br><code>\par</code> . 255, 311, 347, 510,<br>620, 1099, 1332,<br>1336, 1340, 1383,<br>1388, 1396, 1414,<br>1416, 1418, 1420,<br>1442, 1443, 1445,<br>1446, 1448, 1449,<br>1461, 1560, 1567,<br>1584, 1595, 1598,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Q</b>                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <code>\qed</code> . . . . .  | 2183                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <code>\quad</code> . . . . . | 332,<br>1921, 1924, 1929, 1932                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

|                               |                                |                                   |
|-------------------------------|--------------------------------|-----------------------------------|
| <b>R</b>                      |                                |                                   |
| \raggedright . . . . .        | 153, 154, 156, 160,            | 2047, 2048, 2049,                 |
| ... 1556, 1597, 1797          | 362, 415, 424, 504,            | 2056, 2057, 2059,                 |
| \raisebox .. 1552, 1564,      | 560, 561, 562, 563,            | 2060, 2065, 2066,                 |
| 1576, 1591, 1979, 1981        | 568, 1101, 1106, 1862          | 2087, 2088, 2091, 2092            |
| \received . . . . . 15, 1083  | \reset@font . . . . . 524, 537 | \shortauthors . . . . .           |
| \RecordChanges . . . . . 18   | \reversemarginpar .. 486       | 16, 938, 939, 944,                |
| \ref . . . . . 1830, 1836     | \rightskip . . . . . 2044      | 945, 947, 950, 951,               |
| \refname . . . . . 162, 163   | \rlap . . . . . 1980           | 953, 1399, 1401, 1879             |
| \refstepcounter . . . . . 274 | \rule . . . . . 531, 544, 1982 | \shortcite . . . . . 407          |
| \relax 98, 105, 130, 212,     | <b>S</b>                       |                                   |
| 213, 256, 275, 277,           | \savebox . . . . . 1865        | \showeprint . . . . . 2214        |
| 281, 295, 309, 324,           | screenonly (environ-           | \sidebar . . . . . 596            |
| 334, 342, 353, 371,           | ment) . . . . . 18             | sidebar (environment) . 17        |
| 426, 491, 548, 578,           | \scriptsize . . . . . 1868     | \skip . . . . . 513               |
| 630, 704, 917, 920,           | \scshape . . . . . 2099, 2167  | \small .. 524, 600, 603,          |
| 1108, 1128, 1133,             | \section . . . . . 162,        | 606, 1099, 1414,                  |
| 1136, 1139, 1144,             | 1422, 1424, 1428,              | 1416, 1418, 1420,                 |
| 1147, 1150, 1153,             | 1430, 1815, 2023, 2193         | 1660, 1813, 1825, 1995            |
| 1156, 1162, 1191,             | \section@raggedright           | \space . . . . . 299, 1627, 2200  |
| 1328, 1413, 1441,             | . . . . . 2043, 2047,          | \specialcomment . . . . . 2191    |
| 1478, 1500, 1521,             | 2048, 2056, 2057,              | \standardpagestyle . 1901         |
| 1633, 1657, 1717,             | 2059, 2060, 2062,              | \startPage . . . . . 13, 1043     |
| 1726, 1727, 1729,             | 2063, 2065, 2066,              | \state . . . . . 10, 970, 1611    |
| 1732, 1734, 1736,             | 2068, 2069, 2074,              | \stepcounter . . . . . 983,       |
| 1738, 1740, 1764,             | 2087, 2088, 2091, 2092         | 985, 992, 995, 1002               |
| 1767, 1768, 1770,             | \SelectFootnoteRule 505        | \streetaddress 10, 968, 1611      |
| 1773, 1775, 1842,             | \setbox . . . . . 320,         | \string . . . . . 413, 1823, 1824 |
| 1867, 1882, 1906,             | 535, 625, 1550,                | \strut . . . . . 1574, 1589       |
| 1957, 1959, 1960,             | 1569, 1597, 1607,              | \strutbox . . . . . 531, 544      |
| 1961, 1964, 1965,             | 1710, 1719, 1762, 1805         | \subparagraph . . . . . 2080      |
| 1966, 1969, 1971,             | \setcitestyle . . . . .        | \subsection . . . . . 2027        |
| 1974, 1975, 1976,             | . . . . . 20, 166, 240, 246    | \subsubsection 2031, 2070         |
| 1977, 1993, 2053,             | \setcopyright .. 14, 1159      | \subtitle . . . . . 9, 914        |
| 2102, 2132, 2170, 2184        | \setcounter 1323, 1378,        | \subtitlenote . . . . . 12, 988   |
| \removelastskip . . . . . 347 | 1436, 2051, 2086, 2090         |                                   |
| \renewcommand .. 161,         | \setkeys 33, 898, 1071, 1159   |                                   |
| 165, 166, 169, 171,           | \setlength .. 488, 489,        |                                   |
| 173, 175, 177, 179,           | 495, 1029, 1032, 1866          | <b>T</b>                          |
| 181, 231, 566, 644,           | \settopmatter 15, 1071,        | \teaserfigure . . . . . 1297      |
| 918, 974, 1299,               | 1072, 1074, 1077, 1079         | teaserfigure (environ-            |
| 1315, 1903, 1904,             | \setTrue . . . . . 346         | ment) . . . . . 15                |
| 1990, 1991, 2023,             | \sfdefault . . . . . 566       | \terms . . . . . 13, 1045         |
| 2027, 2031, 2035,             | \sffamily .. 1501, 1503,       | \textbf . . . . . 1109, 1112      |
| 2039, 2070, 2075, 2080        | 1505, 1507, 1509,              | \textbullet 365, 1109,            |
| \renewenvironment ..          | 1511, 1515, 1654,              | 1921, 1924, 1929, 1932            |
| . 598, 645, 1049, 2182        | 1659, 1663, 1883,              | \textcolor . . . . . 1985         |
| \repeat . . . . . 1871, 1973  | 1885, 1887, 1889,              | \textheight . . . . . 1871        |
| \RequirePackage . . . . .     | 1891, 1893, 1895,              | \textit .. 1113, 1828, 1832       |
| . . . . . 26, 152,            | 1897, 1899, 1985,              | \texttrightarrow . 366, 1109      |

|                             |                                                                           |                          |                                                       |                      |                                                                                                                                                                                                                                                                           |
|-----------------------------|---------------------------------------------------------------------------|--------------------------|-------------------------------------------------------|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>\textwidth</code>     | 608, 626, 627,<br>1318, 1540, 1568,<br>1596, 1631, 1726, 1761             | <code>\topsep</code>     | 2184                                                  |                      | <b>W</b>                                                                                                                                                                                                                                                                  |
| <code>\thanks</code>        | 11, 1299, 1861                                                            | <code>\trivlist</code>   | 2185                                                  | <code>\wd</code>     | 627, 1608                                                                                                                                                                                                                                                                 |
| <code>\thankses</code>      | 1302, 1304, 1330, 1861                                                    | <code>\tw@</code>        | 205                                                   | <code>\write</code>  | 413                                                                                                                                                                                                                                                                       |
| <code>\the</code>           | 1013, 1015, 1868, 1976                                                    | <code>\twocolumn</code>  | 1451,<br>1453, 1455, 1457, 1459                       | <b>X</b>             |                                                                                                                                                                                                                                                                           |
| <code>\theenumi</code>      | 637                                                                       |                          |                                                       | <code>\xdef</code>   | 216,<br>218, 220, 222, 224, 226                                                                                                                                                                                                                                           |
| <code>\theenumii</code>     | 638                                                                       | <b>U</b>                 |                                                       | <b>Y</b>             |                                                                                                                                                                                                                                                                           |
| <code>\theenumiii</code>    | 639                                                                       | <code>\unskip</code>     | 323,<br>364, 511, 967, 973,<br>1608, 1627, 1686, 1821 | <code>\year</code>   | 1013                                                                                                                                                                                                                                                                      |
| <code>\theenumiv</code>     | 640                                                                       | <code>\unvbox</code>     | 515, 520, 536                                         | <b>Z</b>             |                                                                                                                                                                                                                                                                           |
| <code>\thefootnote</code>   | 1315                                                                      | <code>\upshape</code>    | 644                                                   | <code>\z@</code>     | 195,<br>258, 278, 310, 320,<br>335, 348, 489, 531,<br>544, 547, 572, 576,<br>587, 647, 1316,<br>1332, 1334, 1552,<br>1564, 1576, 1591,<br>1797, 1903, 1904,<br>1950, 1952, 1954,<br>1979, 1981, 1990,<br>1991, 2023, 2027,<br>2039, 2046, 2070,<br>2075, 2080, 2110, 2140 |
| <code>\theoremstyle</code>  | 2157, 2163, 2166                                                          | <code>\url</code>        | 1189, 2200                                            | <code>\z@skip</code> | 347, 620, 2045                                                                                                                                                                                                                                                            |
| <code>\thepage</code>       | 1907,<br>1908, 1913, 1914,<br>1921, 1924, 1929,<br>1932, 1936, 1995, 2020 | <code>\urlstyle</code>   | 369, 378, 381                                         |                      |                                                                                                                                                                                                                                                                           |
| <code>\thispagestyle</code> | 1438                                                                      | <code>\usebox</code>     | 1876                                                  |                      |                                                                                                                                                                                                                                                                           |
| <code>\thmname</code>       | 2126, 2156                                                                | <code>\usepackage</code> | 10, 11, 12, 13, 14, 15                                |                      |                                                                                                                                                                                                                                                                           |
| <code>\thmnote</code>       | 2126, 2156                                                                |                          |                                                       |                      |                                                                                                                                                                                                                                                                           |
| <code>\thmnumber</code>     | 2126, 2156                                                                | <b>V</b>                 |                                                       |                      |                                                                                                                                                                                                                                                                           |
| <code>\thr@@</code>         | 207                                                                       | <code>\vbox</code>       | 535,<br>625, 1550, 1569,<br>1597, 1710, 1762, 1805    |                      |                                                                                                                                                                                                                                                                           |
| <code>\title</code>         | 7, 1823                                                                   | <code>\vskip</code>      | 312, 347, 513, 547, 620                               |                      |                                                                                                                                                                                                                                                                           |
| <code>\titlenote</code>     | 12, 979, 1824                                                             | <code>\vtop</code>       | 1719                                                  |                      |                                                                                                                                                                                                                                                                           |