

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

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## Abstract

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

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# 1 Introduction

The Association for Computing Machinery<sup>1</sup> is the world’s largest educational and scientific computing society, which delivers resources that advance computing as a science and a profession. It was one of the early adopters of T<sub>E</sub>X for its typesetting.

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

This package provides the uniform interface for all ACM publications. It is intended to replace all the different classes and packages and provide an up-to-date L<sup>A</sup>T<sub>E</sub>X package.

This 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 this package.

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

## 2 User’s guide

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

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

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

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

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

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

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

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

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

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

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

## 2.2 Invocation and options

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The option `natbib` is used when the corresponding BibTeX style is based on `natbib`. In most cases you do not need to set it. See Section 2.11.

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

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

Table 1: The possible values for the format option

Value	Meaning
<code>manuscript</code>	A manuscript. This is the default.
<code>acmsmall</code>	Small single-column format. Used for CIE, CSUR, DTRAP, HEALTH, JACM, JDIQ, JEA, JERIC, JETC, PACMCGIT, PACMHCI, PACMPL, TAAS, TACCESS, TACO, TALG, TALLIP (formerly TALIP), TCPS, TDS, TEAC, TECS, TELO, THRI, TIIS, TIOT, TISSEC, TIST, TKDD, TMIS, TOCE, TOCHI, TOCL, TOCS, TOCT, TODAES, TODS, TOIS, TOIT, TOMACS, TOMM (formerly TOMCCAP), TOMPECS, TOMS, TOPC, TOPLAS, TOPS, TOS, TOSEM, TOSN, TQC, TRET, TSAS, TSC, TSLP and TWEB, including special issues.
<code>acmlarge</code>	Large single-column format. Used for IMWUT, JOCCH, POMACS and TAP, including special issues.
<code>acmtog</code>	Large double-column format. Used for TOG, including annual conference Technical Papers.
<code>sigconf</code>	Proceedings format for most ACM conferences (with the exceptions listed below) and all ICPS volumes.
<code>sigplan</code>	Proceedings format for SIGPLAN conferences.
<code>sigchi</code>	Proceedings format for SIGCHI conferences.
<code>sigchi-a</code>	Format for SIGCHI extended abstracts.

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

The option `balance` determines whether the last page in the two column mode has balanced columns. By default it is true; however, it may lead to problems for some documents. Set it to false if you encounter compilation errors. Note that for one page documents `\balance` command might cause problems.

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

## 2.3 Top matter

A number of commands set up *top matter* or (in computer science jargon) *metadata* for an article. They establish the publication name, article title, authors, DOI and other data. Some of these commands, like `\title` and `\author`, should be put by the authors. Others, like `\acmVolume` and `\acmDOI`—by the editors. Below we describe these commands and mention who should issue them. These macros should be used *before* the `\maketitle` command. Note that in previous versions of ACM classes some of these commands should be used before `\maketitle`, and some after it. Now they all must be

Table 2: Boolean options

Option	Default	Meaning
review	false	A review version: lines are numbered and hyperlinks are colored
screen	see text	A screen version: hyperlinks are colored
natbib	true	Whether to use the natbib package (see Section 2.11)
anonymous	false	Whether to make author(s) anonymous
authorversion	false	Whether to generate a special version for the authors' personal use or posting (see Section 2.3)
nonacm	false	Use the class typesetting options for a non-ACM document, which will not include the conference/journal header and footers or permission statements
timestamp	false	Whether to put a time stamp in the footer of each page
authordraft	false	Whether author's-draft mode is enabled
acmthm	true	Whether to define theorem-like environments, see Section 2.7
balance	true	Whether to balance the last page in two column mode
urlbreakonhyphens	true	Whether to break urls on hyphens



used before `\maketitle`.

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

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

```
\acmJournal{TOMS}
```

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

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

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

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

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

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

Examples:

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

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

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

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

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

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

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

```
\title[\langle ShortTitle \rangle]{\langle FullTitle \rangle}
```

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

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

`\subtitle`      Besides title, ACM classes allow a subtitle, set with the `\subtitle{\langle subtitle \rangle}` macro.

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

`\author`      The basic commands are `\author`, `\orcid` (for the researchers registered with OR-

`\orcid`      CID, <http://www.orcid.org/>), `\affiliation` and `\email`. In the simplest case, you

`\affiliation`      enter them in this order:

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

Do *not* use the  $\LaTeX$  `\and` macro or commas, or `\\` between the authors! Each author deserves his or her own `\author` command. An attempt to list several authors or their e-mails in one command leads to a warning or an error. This is not a bug, but the expected behavior.

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

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

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

Similarly you can repeat the `\email` command.

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

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

```

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

```

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

```

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

```

However, this format is not generally recommended.

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

```

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

```

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

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

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

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

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

```
\institution{University of San Serriffe}
\country{San Serriffe}}
```

and

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

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

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

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

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

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

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

will be typeset as

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

	Note that you should <i>not</i> use this option for journals.
	It is expected that these commands are inserted by the author of the manuscript.
<code>\thanks</code>	Like <code>amsart</code> (and unlike standard $\text{\LaTeX}$ ), we allow <code>\thanks</code> only <i>outside</i> of the commands <code>\title</code> and <code>\author</code> . This command is obsolete and should <i>not</i> be used in most cases. Do not list your acknowledgments or grant sponsors here. Put this information in the <code>acks</code> environment (see Section 2.10).
<code>\authorsaddresses</code>	In some formats, addresses are printed as a footnote on the first page. By default $\text{\LaTeX}$ typesets them itself using the information you give it. However, you can override its choice using the command <code>\authorsaddresses{&lt;contact addresses&gt;}</code> , for example, <pre> \authorsaddresses{%   Authors' addresses: G.~Zhou, Computer Science Department, College of   William and Mary, 104 Jameson Rd, Williamsburg, PA 23185, US;   V.~B\eranger, Inria Paris-Rocquencourt, Rocquencourt, France;   A.~Patel, Rajiv Gandhi University, Rono-Hills, Doimukh, Arunachal   Pradesh, India; H.~Chan, Tsinghua University, 30 Shuangqing Rd,   Haidian Qu, Beijing Shi, China; T.~Yan, Eaton Innovation Center,   Prague, Czech Republic; T.~He, C.~Huang, J.~A.~Stankovic University   of Virginia, School of Engineering Charlottesville, VA 22903, USA;   T. F. Abdelzaher, (Current address) NASA Ames Research Center,   Moffett Field, California 94035.} </pre>
	You can <i>suppress</i> printing authors' addresses by setting them to an empty string: <code>\authorsaddresses{}</code> .
<code>\titlenote</code>	While the command <code>\thanks</code> generates a note without a footnote mark, sometimes the authors might need notes more tightly connected to the title, subtitle or author. The commands <code>\titlenote</code> , <code>\subtitlenote</code> and <code>\authornote</code> that follow the corresponding commands ( <code>\title</code> , <code>\subtitle</code> and <code>\author</code> ) generate such notes. For example, <pre> \title{This is a title} \titlenote{This is a titlenote} \author{A. U. Thor} \authornote{This is an authornote} </pre>
<code>\subtitlenote</code>	
<code>\authornote</code>	
	Please never use a <code>\footnote</code> inside an <code>\author</code> or <code>\title</code> command since this confuses the metadata extraction software. (Actually these commands now produce errors.)
<code>\authornotemark</code>	Sometimes one may need to have the same footnote connected to several authors. The command <code>\authornotemark[&lt;number&gt;]</code> adds just the footnote mark, for example, <pre> \author{A. U. Thor} \authornote{Both authors contributed equally to the paper} ... \author{A. N. Other} \authornotemark[1] </pre>
	The correct numbering of these marks is the responsibility of the user.
<code>\acmVolume</code>	The macros <code>\acmVolume</code> , <code>\acmNumber</code> , <code>\acmArticle</code> , <code>\acmYear</code> and <code>\acmMonth</code> are
<code>\acmNumber</code>	
<code>\acmArticle</code>	
<code>\acmYear</code>	
<code>\acmMonth</code>	

inserted by the editor and set the journal volume, issue, article number, year and month correspondingly. The arguments of all these commands, including \acmMonth, is numerical. For example,

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

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

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

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

Setting this number to zero suppresses the blob.

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

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

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

```
\acmPrice{25.00}
```

Note that you do not need to put the dollar sign here, just the amount. By default the price is \$15.00, unless the copyright is set to usgov, rightsretained, iw3c2w3, or iw3c2w3g, when it is suppressed. Note that to override the defaults you need to set the price *after* the \setcopyright command. Also, the command \acmPrice{} suppresses the printing of the price.

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

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

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

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

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

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

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

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

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

`\terms`            The command `\keywords{<keyword, keyword,...>}` sets keywords for the article.  
`\keywords`        They must be separated by commas, for example,

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

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

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

```
\begin{CCSXML}
<ccs2012>
<concept>
<concept_id>10010520.10010553.10010562</concept_id>
<concept_desc>Computer systems organization~Embedded systems</concept_desc>
<concept_significance>500</concept_significance>
</concept>
<concept>
<concept_id>10010520.10010575.10010755</concept_id>
<concept_desc>Computer systems organization~Redundancy</concept_desc>
<concept_significance>300</concept_significance>
</concept>
<concept>
<concept_id>10010520.10010553.10010554</concept_id>
<concept_desc>Computer systems organization~Robotics</concept_desc>
<concept_significance>100</concept_significance>
```



```

</concept>
<concept>
  <concept_id>10003033.10003083.10003095</concept_id>
  <concept_desc>Networks~Network reliability</concept_desc>
  <concept_significance>100</concept_significance>
</concept>
</ccs2012>
\end{CCSXML}

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

```

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

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

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

`\copyrightyear` Each copyright statement must have the year of copyright. By default it is the same as `\acmYear`, but you can override this using the macro `\copyrightyear`, e.g.,

```

\acmYear{2016}
\copyrightyear{2015}

```

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

`abstract` The environment `abstract` must *precede* the `\maketitle` command. Again, this is different from the standard  $\LaTeX$ . Putting `abstract` after `\maketitle` will trigger an error.

`teaserfigure` 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,

Table 3: Parameters for the `\setcopyright` command

Parameter	Meaning
<code>none</code>	The copyright and permission information is not typeset. (This is the option for some ACM conferences.)
<code>acmcopyright</code>	The authors transfer the copyright to the ACM (the “traditional” choice).
<code>acmlicensed</code>	The authors retain the copyright but license the publication rights to ACM.
<code>rightsretained</code>	The authors retain the copyright and publication rights to themselves or somebody else.
<code>usgov</code>	All the authors are employees of the US government.
<code>usgovmixed</code>	Some authors are employees of the US government.
<code>cagov</code>	All the authors are employees of the Canadian government.
<code>cagovmixed</code>	Some authors are employees of the Canadian government.
<code>licensedusgovmixed</code>	Some authors are employees of the US government, and the publication rights are licensed to ACM.
<code>licensedcagov</code>	All the authors are employees of the Canadian government, and the publication rights are licensed to ACM.
<code>licensedcagovmixed</code>	Some authors are employees of the Canadian government, and the publication rights are licensed to ACM.
<code>othergov</code>	Authors are employees of a government other than the US or Canada.
<code>licensedothergov</code>	Authors are employees of a government other than the US or Canada, and the publication rights are licensed to ACM.
<code>iw3c2w3</code>	Special statement for conferences organized by IW3C2.
<code>iw3c2w3g</code>	Special statement for conferences organized by IW3C2, when some authors are approved Google employees.

Table 4: Settings for the `\settopmatter` command

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

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

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

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

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

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

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

`\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}
```

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

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

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

## 2.4 Algorithms

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

## 2.5 Figures and tables

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

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

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

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

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

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

3. Accordingly, when scaling images, one should use the following sizes:
  - (a) For teaserfigure, figure in one-column mode or figure\* in two-column mode, use \textwidth. In one-column mode, you can also use \columnwidth, which coincides with \textwidth in this case.
  - (b) For figure in two-column mode, use \columnwidth.
  - (c) For marginfigure, use \marginparwidth.
  - (d) For figure\* in SIGCHI extended abstracts, use \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 the TeX FAQ [1]. The simplest one is to use a `\minipage` environment:

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

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

sidebar  
marginfigure  
margintable

SIGCHI extended abstracts use margin space extensively. This package provides three environments for this with optional captions:

**sidebar:** textual information in the margin

**marginfigure:** a figure in the margin

**margintable:** a table in the margin

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. A good way to do so is to put the contents into a `\minipage` of the width `\columnwidth`.

## 2.6 Descriptions of images

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

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

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

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

## 2.7 Theorems

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

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

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

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

## 2.8 Online-only and offline-only material

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

```
\section{Supplementary materials}

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

\begin{screenonly}
```

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

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

## 2.9 Note about anonymous mode

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

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

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

## 2.10 Acknowledgments

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

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

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

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

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

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

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

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

Example:

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

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

## 2.11 Bibliography

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

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

```
\citestyle{acmauthoryear}
```

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

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

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

One of the more common versions is

```
\setcitestyle{nosort}
```

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

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



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

and then encode the author as

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

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

## 2.12 Colors

While printed ACM publications are usually black and white, screen mode allows the use of colors. The ACM classes pre-define several colors according to [7]: ACMBLue, ACMYellow, ACMOrange, ACMRed, ACMLightBlue, ACMGreen, ACMPurple and ACMDarkBlue. You can use them in color assignments.

The ACM provides the following recommendation on color use.

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

1. The most common type of inherited Color Vision Deficiency (CVD) is red-green (in which similar-brightness colors that differ only in their amounts of red or green are often confused), and it affects up to 8% of males and 0.5% of females of Northern European descent.
2. The most common type of acquired Color Vision Deficiency (CVD) is blue-yellow (including mild cases for many older adults).

3. Most printing is in black and white.
4. Situational impairments (e.g., bright sunlight shining on a mobile screen) tend to reduce the entire color gamut, reducing color discriminability.

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

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

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

## 2.13 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 or end of the page) and hyphenation at the end of the page. This is done by the rather strict settings

```
\widowpenalty=10000
\clubpenalty=10000
\brokenpenalty=10000
```

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

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

Note that the uppercasing in section titles is done using the `textcase` package [11], so the command `\NoCaseChange` inside the title may help to prevent extraneous uppercasing.

## 2.14 Disabled or forbidden commands

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

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

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

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

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

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

For example, one may want to use the `titletoc` package with `acmart`. This package should be loaded before `hyperref`. However, since `acmart` loads `hyperref` itself, the line `\usepackage{titletoc}` in the preamble will lead to grief (see <http://tex.stackexchange.com/questions/357265/using-titletoc-with-acm-acmart-style>).

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

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

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

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

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

you will pass `dvipsnames` to `xcolor`.

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

## 2.16 Currently supported publications

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

Abbreviation	Publication
CIE	ACM Computers in Entertainment
CSUR	ACM Computing Surveys
DTRAP	Digital Threats: Research and Practice
HEALTH	ACM Transactions on Computing for Healthcare
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

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

Abbreviation	Publication
JOCCH	ACM Journal on Computing and Cultural Heritage
PACMCGIT	Proceedings of the ACM on Computer Graphics and Interactive Techniques
PACMHCI	PACM on Human-Computer Interaction
PACMPL	PACM on Programming Languages
POMACS	PACM on Measurement and Analysis of Computing Systems
TAAS	ACM Transactions on Autonomous and Adaptive Systems
TACCESS	ACM Transactions on Accessible Computing
TACO	ACM Transactions on Architecture and Code Optimization
TALG	ACM Transactions on Algorithms
TALLIP	ACM Transactions on Asian and Low-Resource Language Information Processing
TAP	ACM Transactions on Applied Perception
TCPS	ACM Transactions on Cyber-Physical Systems
TDS	ACM Transactions on Data Science
TEAC	ACM Transactions on Economics and Computation
TECS	ACM Transactions on Embedded Computing Systems
TELO	ACM Transactions on Evolutionary Learning
THRI	ACM Transactions on Human-Robot Interaction
TIIS	ACM Transactions on Interactive Intelligent Systems
TIOT	ACM Transactions on Internet of Things
TISSEC	ACM Transactions on Information and System Security
TIST	ACM Transactions on Intelligent Systems and Technology
TKDD	ACM Transactions on Knowledge Discovery from Data
TMIS	ACM Transactions on Management Information Systems
TOCE	ACM Transactions on Computing Education
TOCHI	ACM Transactions on Computer-Human Interaction
TOCL	ACM Transactions on Computational Logic
TOCS	ACM Transactions on Computer Systems
TOCT	ACM Transactions on Computation Theory
TODAES	ACM Transactions on Design Automation of Electronic Systems
TODS	ACM Transactions on Database Systems
TOG	ACM Transactions on Graphics
TOIS	ACM Transactions on Information Systems
TOIT	ACM Transactions on Internet Technology
TOMACS	ACM Transactions on Modeling and Computer Simulation
TOMM	ACM Transactions on Multimedia Computing, Communications and Applications
TOMPECS	ACM Transactions on Modeling and Performance Evaluation of Computing Systems
TOMS	ACM Transactions on Mathematical Software
TOPC	ACM Transactions on Parallel Computing

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

Abbreviation	Publication
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
TQC	ACM Transactions on Quantum Computing
TRETS	ACM Transactions on Reconfigurable Technology and Systems
TSAS	ACM Transactions on Spatial Algorithms and Systems
TSC	ACM Transactions on Social Computing
TSLP	ACM Transactions on Speech and Language Processing
TWEB	ACM Transactions on the Web

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

## 3 Implementation

### 3.1 Identification

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

```
1 <class>\NeedsTeXFormat{LaTeX2e}
2 <*gobble>
3 \ProvidesFile{acmart.dtx}
4 </gobble>
5 <class>\ProvidesClass{acmart}
6 [2019/08/24 v1.64 Typesetting articles for the Association for Computing Machinery]
```

And the driver code:

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

### 3.2 Preload hook

We preload acmart-preload-hook:

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

### 3.3 Options

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

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

We use xstring to check whether user input is valid

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



format The possible formats

```

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

```

\if@ACM@screen Whether we use screen mode

```

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

```

\if@ACM@urlbreakonhyphens

```

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

```

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

```

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

```

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

```

72 \define@boolkey+{acmart.cls}[@ACM@]{review}[true]{%
73   \if@ACM@review
74     \PackageInfo{\@classname}{Using review mode}%
75     \AtBeginDocument{\@ACM@printfoliostrue}%
76   \else
77     \PackageInfo{\@classname}{Not using review mode}%
78   \fi}{\PackageError{\@classname}{The option review can be either true or
79     false}}
80 \ExecuteOptionsX{review=false}

```

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

```

81 \define@boolkey+{acmart.cls}[@ACM@]{authorversion}[true]{%
82   \if@ACM@authorversion
83     \PackageInfo{\@classname}{Using authorversion mode}%
84   \else
85     \PackageInfo{\@classname}{Not using authorversion mode}%
86   \fi}{\PackageError{\@classname}{The option authorversion can be either true or
87     false}}
88 \ExecuteOptionsX{authorversion=false}

```

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

```

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

```

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

```

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

```

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

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

```

105 \define@boolkey+{acmart.cls}[@ACM@]{natbib}[true]{%
106   \if@ACM@natbib
107     \PackageInfo{\@classname}{Explicitly selecting natbib mode}%
108   \else
109     \PackageInfo{\@classname}{Explicitly deselecting natbib mode}%

```

```

110 \fi}{\PackageError{\@classname}{The option natbib can be either true or
111     false}}
112 \ExecuteOptionsX{natbib=true}

\if@ACM@anonymous Whether we use anonymous mode
113 \define@boolkey+{acmart.cls}{@ACM@}{anonymous}[true]{%
114     \if@ACM@anonymous
115         \PackageInfo{\@classname}{Using anonymous mode}%
116     \else
117         \PackageInfo{\@classname}{Not using anonymous mode}%
118     \fi}{\PackageError{\@classname}{The option anonymous can be either true or
119         false}}
120 \ExecuteOptionsX{anonymous=false}

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

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

\ACM@fontsize The font size to pass to the base class
139 \def\ACM@fontsize{}
140 \DeclareOptionX{9pt}{\edef\ACM@fontsize{\CurrentOption}}
141 \DeclareOptionX{10pt}{\edef\ACM@fontsize{\CurrentOption}}
142 \DeclareOptionX{11pt}{\edef\ACM@fontsize{\CurrentOption}}
143 \DeclareOptionX{12pt}{\edef\ACM@fontsize{\CurrentOption}}

144 \DeclareOptionX{draft}{\PassOptionsToClass{\CurrentOption}{amsart}}
145 \DeclareOptionX{*}{\PassOptionsToClass{\CurrentOption}{amsart}}
146 \ProcessOptionsX
147 \ClassInfo{\@classname}{Using format \ACM@format, number \ACM@format@nr}

```

### 3.4 Setting switches

<code>\if@ACM@manuscript</code>	Whether we use manuscript mode 148 <code>\newif\if@ACM@manuscript</code>
<code>\if@ACM@journal</code>	There are two kinds of publications: journals and books 149 <code>\newif\if@ACM@journal</code>
<code>\if@ACM@journal@bibstrip</code>	Sometimes ACM wants a journal-like publication to have conference information in the bibstrip and vice versa, so we have an additional switch. 150 <code>\newif\if@ACM@journal@bibstrip</code>
<code>\if@ACM@sigchiamode</code>	The formatting of SIGCHI extended abstracts is quite unusual. We have a special switch for them. 151 <code>\newif\if@ACM@sigchiamode</code>

#### Setting up switches

```

152 \ifnum\ACM@format@nr=5\relax % siggraph
153   \ClassWarning{\@classname}{The format siggraph is now obsolete.
154     I am switching to sigconf.}
155   \setkeys{acmart.cls}{format=sigconf}
156 \fi
157 \ifnum\ACM@format@nr=0\relax
158   \@ACM@manuscripttrue
159 \else
160   \@ACM@manuscriptfalse
161 \fi
162 \@ACM@sigchiamodefalse
163 \ifcase\ACM@format@nr
164 \relax % manuscript
165   \@ACM@journaltrue
166 \or % acmsmall
167   \@ACM@journaltrue
168 \or % acmlarge
169   \@ACM@journaltrue
170 \or % acmtog
171   \@ACM@journaltrue
172 \or % sigconf
173   \@ACM@journalfalse
174 \or % siggraph
175   \@ACM@journalfalse
176 \or % sigplan
177   \@ACM@journalfalse
178 \or % sigchi
179   \@ACM@journalfalse
180 \or % sigchi-a
181   \@ACM@journalfalse
182   \@ACM@sigchiamodetrue
183 \fi

```

```

184 \if@ACM@journal
185 \@ACM@journal@bibstriptrue
186 \else
187 \@ACM@journal@bibstripfalse
188 \fi

```

### 3.5 Loading the base class and package

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

```

189 \ifx\ACM@fontsize\@empty
190 \ifcase\ACM@format@nr
191 \relax % manuscript
192 \def\ACM@fontsize{9pt}%
193 \or % acmsmall
194 \def\ACM@fontsize{10pt}%
195 \or % acmlarge
196 \def\ACM@fontsize{10pt}%
197 \or % acmtog
198 \def\ACM@fontsize{9pt}%
199 \or % sigconf
200 \def\ACM@fontsize{9pt}%
201 \or % siggraph
202 \def\ACM@fontsize{9pt}%
203 \or % sigplan
204 \def\ACM@fontsize{10pt}%
205 \or % sigchi
206 \def\ACM@fontsize{10pt}%
207 \or % sigchi-a
208 \def\ACM@fontsize{10pt}%
209 \fi
210 \fi
211 \ClassInfo{\@classname}{Using fontsize \ACM@fontsize}
212 \LoadClass[\ACM@fontsize, reqno]{amsart}
213 \RequirePackage{microtype}

```

We need etoolbox for delayed code

```
214 \RequirePackage{etoolbox}
```

Booktabs is now the default

```
215 \RequirePackage{booktabs}
```

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

```
216 \RequirePackage{refcount}
217 \RequirePackage{totpages}
```

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

```
218 \RequirePackage{environ}
```

We use setspace for double spacing

```
219 \if@ACM@manuscript
220 \RequirePackage{setspace}
221 \onehalfspacing
222 \fi
```

We need textcase for better upcasing

```
223 \RequirePackage{textcase}
```

### 3.6 Citations

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

```
224 \if@ACM@natbib
225   \RequirePackage{natbib}
226   \renewcommand{\bibsection}{%
227     \section*{\refname}%
228     \phantomsection\addcontentsline{toc}{section}{\refname}%
229   }
230   \renewcommand{\bibfont}{\bibliofont}
231   \renewcommand{\setcitestyle}[1]{
232     \@for\@tempa:=#1\do
233     {\def\@tempb{round}\ifx\@tempa\@tempb
234       \renewcommand\NAT@open{(\}\renewcommand\NAT@close{)}\fi
235     \def\@tempb{square}\ifx\@tempa\@tempb
236       \renewcommand\NAT@open{[\}\renewcommand\NAT@close{]}\fi
237     \def\@tempb{angle}\ifx\@tempa\@tempb
238       \renewcommand\NAT@open{$<\}\renewcommand\NAT@close{$>}\fi
239     \def\@tempb{curly}\ifx\@tempa\@tempb
240       \renewcommand\NAT@open{\{\}\renewcommand\NAT@close{\}}\fi
241     \def\@tempb{semicolon}\ifx\@tempa\@tempb
242       \renewcommand\NAT@sep{;}\fi
243     \def\@tempb{colon}\ifx\@tempa\@tempb
244       \renewcommand\NAT@sep{;}\fi
245     \def\@tempb{comma}\ifx\@tempa\@tempb
246       \renewcommand\NAT@sep{,}\fi
247     \def\@tempb{authoryear}\ifx\@tempa\@tempb
248       \NAT@numbersfalse\fi
249     \def\@tempb{numbers}\ifx\@tempa\@tempb
250       \NAT@numberstrue\NAT@superfalse\fi
251     \def\@tempb{super}\ifx\@tempa\@tempb
252       \NAT@numberstrue\NAT@supertrue\fi
253     \def\@tempb{nobibstyle}\ifx\@tempa\@tempb
254       \let\bibstyle=\@gobble\fi
255     \def\@tempb{bibstyle}\ifx\@tempa\@tempb
256       \let\bibstyle=\@citestyle\fi
257     \def\@tempb{sort}\ifx\@tempa\@tempb
258       \def\NAT@sort{\@ne}\fi
259     \def\@tempb{nosort}\ifx\@tempa\@tempb
```

```

260 \def\NAT@sort{\z@}\fi
261 \def\@tempb{compress}\ifx\@tempa\@tempb
262 \def\NAT@cmprs{\@ne}\fi
263 \def\@tempb{nocompress}\ifx\@tempa\@tempb
264 \def\NAT@cmprs{\z@}\fi
265 \def\@tempb{sort&compress}\ifx\@tempa\@tempb
266 \def\NAT@sort{\@ne}\def\NAT@cmprs{\@ne}\fi
267 \def\@tempb{mcite}\ifx\@tempa\@tempb
268 \let\NAT@merge\@ne\fi
269 \def\@tempb{merge}\ifx\@tempa\@tempb
270 \ifnum{\NAT@merge<\tw@}{\let\NAT@merge\tw@}\fi
271 \def\@tempb{elide}\ifx\@tempa\@tempb
272 \ifnum{\NAT@merge<\thr@}{\let\NAT@merge\thr@}\fi
273 \def\@tempb{longnamesfirst}\ifx\@tempa\@tempb
274 \NAT@longnamestrue\fi
275 \def\@tempb{nonamebreak}\ifx\@tempa\@tempb
276 \def\NAT@nmfmt#1{\mbox{\NAT@up#1}}\fi
277 \expandafter\NAT@find@eq\@tempa=\relax\@nil
278 \if\@tempc\relax\else
279 \expandafter\NAT@rem@eq\@tempc
280 \def\@tempb{open}\ifx\@tempa\@tempb
281 \xdef\NAT@open{\@tempc}\fi
282 \def\@tempb{close}\ifx\@tempa\@tempb
283 \xdef\NAT@close{\@tempc}\fi
284 \def\@tempb{aysep}\ifx\@tempa\@tempb
285 \xdef\NAT@aysep{\@tempc}\fi
286 \def\@tempb{yysep}\ifx\@tempa\@tempb
287 \xdef\NAT@yrsep{\@tempc}\fi
288 \def\@tempb{notesep}\ifx\@tempa\@tempb
289 \xdef\NAT@cmt{\@tempc}\fi
290 \def\@tempb{citesep}\ifx\@tempa\@tempb
291 \xdef\NAT@sep{\@tempc}\fi
292 \fi
293 }%
294 \NAT@@setcites
295 }
296 \renewcommand\citestyle[1]{%
297 \ifcsname bibstyle@#1\endcsname%
298 \csname bibstyle@#1\endcsname\let\bibstyle\@gobble%
299 \else%
300 \@latex@error{Undefined ‘#1’ citestyle}%
301 \fi
302 }%
303 \fi

```

\bibstyle@acmauthoryear The default author-year format:

```

304 \newcommand{\bibstyle@acmauthoryear}{%
305 \setcitestyle{%
306 authoryear,%
307 open={},close={},citesep={;},%

```

```

308     aysep={},yysep={,},%
309     notesep={, }}

```

`\bibstyle@acmnumeric` The default numeric format:

```

310 \newcommand{\bibstyle@acmnumeric}{%
311   \setcitestyle{%
312     numbers,sort&compress,%
313     open={},close={},citesep={,},%
314     notesep={, }}

```

The default is numeric:

```

315 \if@ACM@natbib
316 \citestyle{acmnumeric}
317 \fi

```

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

```

318 \def\@startsection#1#2#3#4#5#6{%
319   \if@noskipsec \leavevmode \fi
320   \par
321   \@tempskipa #4\relax
322   \@afterindenttrue
323   \ifdim \@tempskipa <\z@
324     \@tempskipa -\@tempskipa \@afterindentfalse
325   \fi
326   \if@nobreak
327     \everypar{}%
328   \else
329     \addpenalty\@secpenalty\addvspace\@tempskipa
330   \fi
331   \ifstar
332     {\@ssect{#3}{#4}{#5}{#6}}%
333     {\@dblarg{\@sect{#1}{#2}{#3}{#4}{#5}{#6}}}
334 \def\@sect#1#2#3#4#5#6[#7]#8{%
335   \edef\@toclevel{\ifnum#2=\@m 0\else\number#2\fi}%
336   \ifnum #2>\c@secnumdepth
337     \let\@svsec\@empty
338   \else
339     \refstepcounter{#1}%
340     \protected@edef\@svsec{\@secntformat{#1}\relax}%
341   \fi
342   \@tempskipa #5\relax
343   \ifdim \@tempskipa>\z@
344     \begingroup
345       #6{%
346         \@hangfrom{\hskip #3\relax\@svsec}%
347         \interlinepenalty \@M #8\@par}%
348     \endgroup

```



```

349 \csname #1mark\endcsname{#7}%
350 \ifnum #2>\c@secnumdepth \else
351   \@tochangmeasure{\csname the#1\endcsname}%
352 \fi
353 \addcontentsline{toc}{#1}{%
354   \ifnum #2>\c@secnumdepth \else
355     \protect\numberline{\csname the#1\endcsname}%
356   \fi
357   #7}%
358 \else
359   \def\@svsechd{%
360     #6{\hskip #3\relax
361       \@svsec #8}%
362     \csname #1mark\endcsname{#7}%
363     \ifnum #2>\c@secnumdepth \else
364       \@tochangmeasure{\csname the#1\endcsname\space}%
365     \fi
366     \addcontentsline{toc}{#1}{%
367       \ifnum #2>\c@secnumdepth \else
368         \protect\numberline{\csname the#1\endcsname}%
369       \fi
370       #7}}%
371 \fi
372 \@xsect{#5}}
373 \def\@xsect#1{%
374   \@tempskipa #1\relax
375   \ifdim \@tempskipa>\z@
376     \par \nobreak
377     \vskip \@tempskipa
378     \@afterheading
379   \else
380     \@nobreakfalse
381     \global\@noskipsectrue
382     \everypar{%
383       \if@noskipsec
384         \global\@noskipsecfalse
385         {\setbox\z@\lastbox}%
386         \clubpenalty\@M
387         \begingroup \@svsechd \endgroup
388         \unskip
389         \@tempskipa #1\relax
390         \hskip -\@tempskipa
391       \else
392         \clubpenalty \@clubpenalty
393       \everypar{}}%
394     \fi}%
395 \fi
396 \ignorespaces}
397 \def\@secntformat#1{\csname the#1\endcsname\quad}
398 \def\@ssect#1#2#3#4#5{%

```

```

399 \@tempskipa #3\relax
400 \ifdim \@tempskipa>\z@
401   \begingroup
402     #4{%
403       \@hangfrom{\hskip #1}%
404       \interlinepenalty \@M #5\@@par}%
405   \endgroup
406 \else
407   \def\@svsechd{#4{\hskip #1\relax #5}}%
408 \fi
409 \xsect{#3}}

```

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

```

410 \def\@starttoc#1#2{\begingroup\makeatletter
411   \setTrue{#1}%
412   \par\removelastskip\vskip\z@skip
413   \@startsection{section}\@M\z@{\linespacing\@plus\linespacing}%
414   {.5\linespacing}{\centering\contentsnamefont}{#2}%
415   \@input{\jobname.#1}%
416   \if@filesw
417     \xp\newwrite\csname tf@#1\endcsname
418     \immediate\xp\openout\csname tf@#1\endcsname \jobname.#1\relax
419   \fi
420   \global\@nobreakfalse \endgroup
421   \addvspace{32\p@\@plus14\p@}%
422 }

```

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

```

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

```

\l@subsection The spacing in amsart is too large

```

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

```

\l@subsubsection The spacing in amsart is too large

```

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

```

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

\@makefnmark We do not use indentation for footnotes

```

426 \def\@makefnmark{\noindent\@makefnmark}

```

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

```

427 \if@ACM@sigchiamode
428 \long\def\@footnotetext#1{\marginpar{%
429   \reset@font\small
430   \interlinepenalty\interfootnotelinepenalty
431   \protected@edef\@currentlabel{%
432     \csname p@footnote\endcsname\@thefnmark

```

```

433 }%
434 \color@begingroup
435 \makefnfont{%
436 \rule\z@\footnotesep\ignorespaces#1\@finalstrut\strutbox}%
437 \color@endgroup}}%
438 \fi

```

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

```

439 \long\def\@mpfootnotetext#1{%
440 \global\setbox\@mpfootins\vbox{%
441 \unvbox\@mpfootins
442 \reset@font\footnotesize
443 \hsize\columnwidth
444 \@parboxrestore
445 \protected@edef\@currentlabel
446 {\csname p@mpfootnote\endcsname\@thefnmark}%
447 \color@begingroup\centering
448 \makefnfont{%
449 \rule\z@\footnotesep\ignorespaces#1\@finalstrut\strutbox}%
450 \color@endgroup}}

```

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

```

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

```

And now, `hyperref`

```

452 \let\@footnotemark@nolink\@footnotemark
453 \let\@footnotetext@nolink\@footnotetext
454 \RequirePackage[bookmarksnumbered,unicode]{hyperref}
455 \pdfstringdefDisableCommands{%
456 \def\addtocounter#1#2{}%
457 \def\unskip{}%
458 \def\textbullet{- }%
459 \def\textrightarrow{-> }%
460 \def\footnotemark{}%
461 }
462 \urlstyle{rm}
463 \ifcase\ACM@format@nr
464 \relax % manuscript
465 \or % acmsmall
466 \or % acmlarge
467 \or % acmtog
468 \or % sigconf
469 \or % siggraph
470 \or % sigplan
471 \urlstyle{sf}
472 \or % sigchi
473 \or % sigchi-a
474 \urlstyle{sf}
475 \fi

```

```

476 \AtEndPreamble{%
477   \if@ACM@urlbreakonhyphens
478     \def\do@url@hyp{\do\~}%
479   \fi
480   \if@ACM@screen
481     \hypersetup{colorlinks,
482       linkcolor=ACMPurple,
483       citecolor=ACMPurple,
484       urlcolor=ACMDarkBlue,
485       filecolor=ACMDarkBlue}
486   \else
487     \hypersetup{hidelinks}
488   \fi
489   \hypersetup{pdflang={en},
490     pdfdisplaydoctitle}}

```

Bibliography mangling.

```

491 \if@ACM@natbib
492   \let\citeN\cite
493   \let\cite\citep
494   \let\citeANP\citeauthor
495   \let\citeNN\citeyearpar
496   \let\citeyearNP\citeyear
497   \let\citeNP\citealt
498   \DeclareRobustCommand\citeA
499     {\begingroup\NAT@swafalse
500       \let\NAT@ctype\@ne\NAT@partrue\NAT@fullfalse\NAT@open\NAT@citetp}%
501   \providecommand\newblock{}%
502 \else
503   \AtBeginDocument{%
504     \let\shortcite\cite%
505     \providecommand\citename[1]{#1}}
506 \fi
507 \newcommand\shortcite[2][]{%
508   \ifNAT@numbers\cite[#1]{#2}\else\citeyearpar[#1]{#2}\fi}

```

`\bibliographystyle` The `amsart` package redefines `\bibliographystyle` since it prefers the AMS bibliography style. We turn it back to the  $\LaTeX$  definition:

```

509 \def\bibliographystyle#1{%
510   \ifx\@begindocumenthook\@undefined\else
511     \expandafter\AtBeginDocument
512   \fi
513   {\if@filesw
514     \immediate\write\@auxout{\string\bibstyle{#1}}%
515   \fi}}

```

Graphics and color.

```

516 \RequirePackage{graphicx}
517 \RequirePackage[prologue]{xcolor}

```

We define ACM colors according to [7]:

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

Author-draft mode

```
526 \if@ACM@authordraft
527   \RequirePackage{draftwatermark}
528   \SetWatermarkFontSize{0.5in}
529   \SetWatermarkColor[gray]{.9}
530   \SetWatermarkText{\parbox{12em}{\centering
531     Unpublished working draft.\}
532     Not for distribution.}}
533 \fi
```

### 3.7 Paper size and paragraphing

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

```
534 \RequirePackage{geometry}
535 \ifcase\ACM@format@nr
536 \relax % manuscript
537   \geometry{letterpaper,head=13pt,
538     marginparwidth=6pc,heightrounded}%
539 \or % acmsmall
540   \geometry{twoside=true,
541     includeheadfoot, head=13pt, foot=2pc,
542     paperwidth=6.75in, paperheight=10in,
543     top=58pt, bottom=44pt, inner=46pt, outer=46pt,
544     marginparwidth=2pc,heightrounded
545   }%
546 \or % acmlarge
547   \geometry{twoside=true, head=13pt, foot=2pc,
548     paperwidth=8.5in, paperheight=11in,
549     includeheadfoot,
550     top=78pt, bottom=114pt, inner=81pt, outer=81pt,
551     marginparwidth=4pc,heightrounded
552   }%
553 \or % acmtog
554   \geometry{twoside=true, head=13pt, foot=2pc,
555     paperwidth=8.5in, paperheight=11in,
556     includeheadfoot, columnsep=24pt,
557     top=52pt, bottom=75pt, inner=52pt, outer=52pt,
```

```

558     marginparwidth=2pc,heightrounded
559   }%
560 \or % sigconf
561   \geometry{twoside=true, head=13pt,
562     paperwidth=8.5in, paperheight=11in,
563     includeheadfoot, columnsep=2pc,
564     top=57pt, bottom=73pt, inner=54pt, outer=54pt,
565     marginparwidth=2pc,heightrounded
566   }%
567 \or % siggraph
568   \geometry{twoside=true, head=13pt,
569     paperwidth=8.5in, paperheight=11in,
570     includeheadfoot, columnsep=2pc,
571     top=57pt, bottom=73pt, inner=54pt, outer=54pt,
572     marginparwidth=2pc,heightrounded
573   }%
574 \or % sigplan
575   \geometry{twoside=true, head=13pt,
576     paperwidth=8.5in, paperheight=11in,
577     includeheadfoot=false, columnsep=2pc,
578     top=1in, bottom=1in, inner=0.75in, outer=0.75in,
579     marginparwidth=2pc,heightrounded
580   }%
581 \or % sigchi
582   \geometry{twoside=true, head=13pt,
583     paperwidth=8.5in, paperheight=11in,
584     includeheadfoot, columnsep=2pc,
585     top=66pt, bottom=73pt, inner=54pt, outer=54pt,
586     marginparwidth=2pc,heightrounded
587   }%
588 \or % sigchi-a
589   \geometry{twoside=false, head=13pt,
590     paperwidth=11in, paperheight=8.5in,
591     includeheadfoot, marginparsep=72pt,
592     marginparwidth=170pt, columnsep=20pt,
593     top=72pt, bottom=72pt, left=314pt, right=72pt
594   }%
595   \@mparswitchfalse
596   \reversemarginpar
597 \fi

\parindent Paragraphing
\parskip 598 \setlength\parindent{10\p@}
599 \setlength\parskip{\z@}
600 \ifcase\ACM@format@nr
601 \relax % manuscript
602 \or % acmsmall
603 \or % acmlarge
604 \or % acmtog
605   \setlength\parindent{9\p@}%

```

```

606 \or % sigconf
607 \or % siggraph
608 \or % sigplan
609 \or % sigchi
610 \or % sigchi-a
611 \fi

```

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

```

612 \setlength\normalparindent{\parindent}

```

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

We use `manyfoot` for layered footnotes instead.

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

```

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

615 \RequirePackage{manyfoot}
616 \SelectFootnoteRule[2]{copyrightpermission}
617 \DeclareNewFootnote{authorsaddresses}
618 \SelectFootnoteRule[2]{copyrightpermission}
619 \DeclareNewFootnote{copyrightpermission}

```

`\footnoterule` Tschichold’s rules:

```

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

```

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

```

622 \def\endminipage{%
623   \par
624   \unskip
625   \ifvoid\@mpfootins\else
626     \vskip\skip\@mpfootins
627     \normalcolor
628     \unvbox\@mpfootins
629   \fi
630   \@minipagefalse
631   \color@endgroup
632   \egroup
633   \expandafter\@iiparbox\@mpargs{\unvbox\@tempboxa}}

```

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

```
634 \def\@textbottom{\vskip \z@ \@plus 1pt}
635 \let\@texttop\relax
```

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

```
636 \ifcase\ACM@format@nr
637 \relax % manuscript
638 \or % acmsmall
639 \or % acmlarge
640 \or % acmtog
641 \flushbottom
642 \or % sigconf
643 \flushbottom
644 \or % siggraph
645 \flushbottom
646 \or % sigplan
647 \flushbottom
648 \or % sigchi
649 \flushbottom
650 \or % sigchi-a
651 \fi
```

### 3.8 Fonts

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

The code below is by Ross Moore.

```
652 \RequirePackage{iftex}
653 \ifPDFTeX
654 \input{glyphtounicode}
655 \pdfglyphtounicode{f_f}{FB00}
656 \pdfglyphtounicode{f_f_i}{FB03}
657 \pdfglyphtounicode{f_f_l}{FB04}
658 \pdfglyphtounicode{f_i}{FB01}
659 \pdfglyphtounicode{t_t}{0074 0074}
660 \pdfglyphtounicode{f_t}{0066 0074}
661 \pdfglyphtounicode{T_h}{0054 0068}
662 \pdfgentounicode=1
663 \fi
664 \RequirePackage{cmap}
```

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

```
665 \newif\if@ACM@newfonts
666 \@ACM@newfontstrue
667 \IfFileExists{libertine.sty}{\ClassWarning{\@classname}{You do not
668 have the libertine package installed. Please upgrade your
```



```

669 TeX}\@ACM@newfontsfalse}
670 \IfFileExists{zi4.sty}{\ClassWarning{\@classname}{You do not
671   have the zi4 package installed. Please upgrade your
672   TeX}\@ACM@newfontsfalse}
673 \IfFileExists{newtxmath.sty}{\ClassWarning{\@classname}{You do not
674   have the newtxmath package installed. Please upgrade your
675   TeX}\@ACM@newfontsfalse}

```

We use Libertine throughout.

```

676 \if@ACM@newfonts
677   \RequirePackage[T1]{fontenc}
678 \ifxetex
679   \RequirePackage[tt=false]{libertine}
680   \setmonofont{inconsolata}
681 \else
682   \RequirePackage[tt=false, type1=true]{libertine}
683 \fi
684 \RequirePackage[varqu]{zi4}
685 \RequirePackage[libertine]{newtxmath}
686 \fi

```

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

```

687 \let\liningnums\@undefined
688 \AtEndPreamble{%
689   \DeclareTextFontCommand{\liningnums}{\libertineLF}}

```

The SIGCHI extended abstracts are sans serif:

```

690 \if@ACM@sigchiamode
691   \renewcommand{\familydefault}{\sfdefault}
692 \fi

```

### 3.9 Image descriptions

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

```

693 \newif\if@Description@present
694 \@Description@presenttrue

```

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

```

695 \newif\if@undescrbed@images
696 \@undescrbed@imagesfalse

```

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

```

697 \newcommand\Description[2][\global\@Description@presenttrue\ignorespaces}

```

The global warning

```

698 \AtEndDocument{\if@undescrbed@images
699   \ClassWarningNoLine{\@classname}{Some images may lack descriptions}\fi}

```

### Hooks for figures and tables

```
700 \AtBeginEnvironment{figure}{\@Description@presentfalse
701   \let\@vspace\@vspace@orig
702   \let\@vspacer\@vspacer@orig}
703 \AtBeginEnvironment{figure*}{\@Description@presentfalse
704   \let\@vspace\@vspace@orig
705   \let\@vspacer\@vspacer@orig}
706 \AtEndEnvironment{figure}{\if@Description@present\else
707   \global\@undescrbed@imagestrue
708   \ClassWarning{\@classname}{A possible image without description}\fi}
709 \AtEndEnvironment{figure*}{\if@Description@present\else
710   \global\@undescrbed@imagestrue
711   \ClassWarning{\@classname}{A possible image without description}\fi}
712 \AtBeginEnvironment{table}{\let\@vspace\@vspace@orig
713   \let\@vspacer\@vspacer@orig}
714 \AtBeginEnvironment{table*}{\let\@vspace\@vspace@orig
715   \let\@vspacer\@vspacer@orig}
```

### 3.10 Floats

We use the caption package

```
716 \RequirePackage{caption, float}
717 \captionsetup[table]{position=top}
718 \if@ACM@journal
719   \captionsetup{labelfont={sf, small},
720     textfont={sf, small}, margin=\z@}
721   \captionsetup[figure]{name={Fig.}}
722 \else
723   \captionsetup{labelfont={bf},
724     textfont={bf}, labelsep=colon, margin=\z@}
725   \ifcase\ACM@format@nr
726     \relax % manuscript
727     \or % acmsmall
728     \or % acmlarge
729     \or % acmtog
730     \or % sigconf
731     \or % siggraph
732     \captionsetup{textfont={it}}
733     \or % sigplan
734     \captionsetup{labelfont={bf},
735       textfont={normalfont}, labelsep=period, margin=\z@}
736     \or % sigchi
737     \captionsetup[figure]{labelfont={bf, small},
738       textfont={bf, small}}
739     \captionsetup[table]{labelfont={bf, small},
740       textfont={bf, small}}
741     \or % sigchi-a
742     \captionsetup[figure]{labelfont={bf, small},
743       textfont={bf, small}}
```

```

744 \captionsetup[table]{labelfont={bf, small},
745 textfont={bf, small}}
746 \fi
747 \fi

sidebar The sidebar environment:
748 \newfloat{sidebar}{}{sbar}
749 \floatname{sidebar}{Sidebar}
750 \renewenvironment{sidebar}{\Collect@Body\@sidebar}{}

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

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

\@marginfigure The processing of the saved text
755 \long\def\@marginfigure#1{\bgroup
756 \let\@vspace\@vspace@orig
757 \let\@vspacer\@vspacer@orig
758 \captionsetup{type=figure}%
759 \marginpar{\@Description@presentfalse\centering
760 \small#1\if@Description@present\else
761 \global\@undescrbed@imagestrue
762 \ClassWarning{\@classname}{A possible image without description}
763 \fi}%
764 \egroup}

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

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

SIGCHI extended abstracts provide an interesting possibility to push into the margin.
Here we use figure* and table* for this.

\fulltextwidth We define the width of the boxes as
769 \newdimen\fulltextwidth
770 \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)
771 \if@ACM@sigchiamode
772 \def\@dblfloat{\bgroup\let\@vspace\@vspace@orig

```

```

773 \let\@vspacer\@vspacer@orig\columnwidth=\fulltextwidth
774 \let\@endfloatbox\@endwidefloatbox
775 \def\@fpsadddefault{\def\@fps{tp}}%
776 \@float}
777 \fi

```

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

```

778 \if@ACM@sigchiamode
779 \def\end@dblfloat{%
780     \end@float\egroup}
781 \fi

```

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

```

782 \def\@endwidefloatbox{%
783     \par\vskip\z@skip
784     \minipagefalse
785     \outer@nobreak
786     \egroup
787     \color@endbox
788     \global\setbox\@currbox=\vbox{\moveleft
789         \dimexpr(\fulltextwidth-\textwidth)\box\@currbox}%
790     \wd\@currbox=\textwidth
791 }

```

### 3.11 Lists

```

792 \ifcase\ACM@format@nr
793 \relax % manuscript
794 \or % acmsmall
795 \or % acmlarge
796 \or % acmtog
797 \or % sigconf
798 \or % siggraph
799 \or % sigplan
800 \def\labelenumi{\theenumi.}
801 \def\labelenumii{\theenumii.}
802 \def\labelenumiii{\theenumiii.}
803 \def\labelenumiv{\theenumiv.}
804 \or % sigchi
805 \or % sigchi-a
806 \fi

```

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

```

807 \newdimen\ACM@labelwidth

```

```

808 \AtBeginDocument{%
809   \setlength\labelsep{4pt}
810   \setlength{\@ACM@labelwidth}{6.5pt}
811
812   %% First-level list: when beginning after the first line of an
813   %% indented paragraph or ending before an indented paragraph, labels
814   %% should not hang to the left of the preceding/following text.
815   \setlength\leftmargini{\z@}
816   \addtolength\leftmargini{\parindent}
817   \addtolength\leftmargini{2\labelsep}
818   \addtolength\leftmargini{\@ACM@labelwidth}
819
820   %% Second-level and higher lists.
821   \setlength\leftmarginii{\z@}
822   \addtolength\leftmarginii{0.5\labelsep}
823   \addtolength\leftmarginii{\@ACM@labelwidth}
824   \setlength\leftmarginiii{\leftmarginii}
825   \setlength\leftmarginiv{\leftmarginiii}
826   \setlength\leftmarginv{\leftmarginiv}
827   \setlength\leftmarginvi{\leftmarginv}
828   \@listi}
829 \newskip\listisep
830 \listisep\smallskipamount
831 \def\@listI{\leftmargin\leftmargini
832   \labelwidth\leftmargini \advance\labelwidth-\labelsep
833   \listparindent\z@
834   \topsep\listisep}
835 \let\@listi\@listI
836 \def\@listii{\leftmargin\leftmarginii
837   \labelwidth\leftmarginii \advance\labelwidth-\labelsep
838   \topsep\z@skip}
839 \def\@listiii{\leftmargin\leftmarginiii
840   \labelwidth\leftmarginiii \advance\labelwidth-\labelsep}
841 \def\@listiv{\leftmargin\leftmarginiv
842   \labelwidth\leftmarginiv \advance\labelwidth-\labelsep}
843 \def\@listv{\leftmargin\leftmarginv
844   \labelwidth\leftmarginv \advance\labelwidth-\labelsep}
845 \def\@listvi{\leftmargin\leftmarginvi
846   \labelwidth\leftmarginvi \advance\labelwidth-\labelsep}
\descriptionlabel We do not use a colon by default like amsart does:
847 \renewcommand{\descriptionlabel}[1]{\upshape\bfseries #1}

\description Make the description environment indentation consistent with that of the itemize
and enumerate environments.
848 \renewenvironment{description}{\list{}}{%
849   \labelwidth\@ACM@labelwidth
850   \let\makelabel\descriptionlabel}%
851 }{
852   \endlist

```

```

853 }
854 \let\enddescription=\endlist % for efficiency

```

### 3.12 Top-matter data

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

```

855 \newif\if@ACM@maketitle@typeset
856 \@ACM@maketitle@typesetfalse

```

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

```

857 \define@choicekey*+{ACM}{acmJournal}[\@journalCode\@journalCode@nr]{%
858   CIE,%
859   CSUR,%
860   DTRAP,%
861   HEALTH,%
862   IMWUT,%
863   JACM,%
864   JDIQ,%
865   JEA,%
866   JERIC,%
867   JETC,%
868   JOCCH,%
869   PACMCGIT,%
870   PACMHCI,%
871   PACMPL,%
872   POMACS,%
873   TAAS,%
874   TACCESS,%
875   TACO,%
876   TALG,%
877   TALLIP,%
878   TAP,%
879   TCPS,%
880   TDS,%
881   TEAC,%
882   TECS,%
883   TELO,%
884   THRI,%
885   TIIS,%
886   TIOT,%
887   TISSEC,%
888   TIST,%
889   TKDD,%
890   TMIS,%
891   TOCE,%
892   TOCHI,%
893   TOCL,%
894   TOCS,%

```

```

895 TOCT,%
896 TODAES,%
897 TODS,%
898 TOG,%
899 TOIS,%
900 TOIT,%
901 TOMACS,%
902 TOMM,%
903 TOMPECS,%
904 TOMS,%
905 TOPC,%
906 TOPS,%
907 TOPLAS,%
908 TOS,%
909 TOSEM,%
910 TOSN,%
911 TQC,%
912 TRETS,%
913 TSAS,%
914 TSC,%
915 TSLP,%
916 TWEB,%
917 FACMP%
918 }{%
919 \ifcase\@journalCode@nr
920 \relax % CIE
921 \def\@journalName{ACM Computers in Entertainment}%
922 \def\@journalNameShort{ACM Comput. Entertain.}%
923 \def\@permissionCodeOne{1544-3574}%
924 \or % CSUR
925 \def\@journalName{ACM Computing Surveys}%
926 \def\@journalNameShort{ACM Comput. Surv.}%
927 \def\@permissionCodeOne{0360-0300}%
928 \or % DTRAP
929 \def\@journalName{Digital Threats: Research and Practice}%
930 \def\@journalNameShort{Digit. Threat. Res. Pract.}%
931 \def\@permissionCodeOne{2576-5337}%
932 \or % HEALTH
933 \def\@journalName{ACM Transactions on Computing for Healthcare}%
934 \def\@journalNameShort{ACM Trans. Comput. Healthcare}%
935 \def\@permissionCodeOne{2637-8051}%
936 \or % IMWUT
937 \def\@journalName{Proceedings of the ACM on Interactive, Mobile,
938 Wearable and Ubiquitous Technologies}%
939 \def\@journalNameShort{Proc. ACM Interact. Mob. Wearable Ubiquitous Technol.}%
940 \def\@permissionCodeOne{2474-9567}%
941 \@ACM@screentru
942 \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
943 \or % JACM
944 \def\@journalName{Journal of the ACM}%

```

```

945 \def\@journalNameShort{J. ACM}%
946 \def\@permissionCodeOne{0004-5411}%
947 \or % JDIQ
948 \def\@journalName{ACM Journal of Data and Information Quality}%
949 \def\@journalNameShort{ACM J. Data Inform. Quality}%
950 \def\@permissionCodeOne{1936-1955}%
951 \or % JEA
952 \def\@journalName{ACM Journal of Experimental Algorithmics}%
953 \def\@journalNameShort{ACM J. Exp. Algor.}%
954 \def\@permissionCodeOne{1084-6654}%
955 \or % JERIC
956 \def\@journalName{ACM Journal of Educational Resources in Computing}%
957 \def\@journalNameShort{ACM J. Edu. Resources in Comput.}%
958 \def\@permissionCodeOne{1073-0516}%
959 \or % JETC
960 \def\@journalName{ACM Journal on Emerging Technologies in Computing Systems}%
961 \def\@journalNameShort{ACM J. Emerg. Technol. Comput. Syst.}%
962 \def\@permissionCodeOne{1550-4832}%
963 \or % JOCCH
964 \def\@journalName{ACM Journal on Computing and Cultural Heritage}%
965 \def\@journalNameShort{ACM J. Comput. Cult. Herit.}%
966 \or % PACMCGIT
967 \def\@journalName{Proceedings of the ACM on Computer Graphics and Interactive Techniques}%
968 \def\@journalNameShort{Proc. ACM Comput. Graph. Interact. Tech.}%
969 \def\@permissionCodeOne{2577-6193}%
970 \@ACM@screentru
971 \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
972 \or % PACMHCI
973 \def\@journalName{Proceedings of the ACM on Human-Computer Interaction}%
974 \def\@journalNameShort{Proc. ACM Hum.-Comput. Interact.}%
975 \def\@permissionCodeOne{2573-0142}%
976 \@ACM@screentru
977 \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
978 \or % PACMPL
979 \def\@journalName{Proceedings of the ACM on Programming Languages}%
980 \def\@journalNameShort{Proc. ACM Program. Lang.}%
981 \def\@permissionCodeOne{2475-1421}%
982 \@ACM@screentru
983 \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
984 \or % POMACS
985 \def\@journalName{Proceedings of the ACM on Measurement and Analysis of Computing Systems}%
986 \def\@journalNameShort{Proc. ACM Meas. Anal. Comput. Syst.}%
987 \def\@permissionCodeOne{2476-1249}%
988 \@ACM@screentru
989 \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
990 \or % TAAS
991 \def\@journalName{ACM Transactions on Autonomous and Adaptive Systems}%
992 \def\@journalNameShort{ACM Trans. Autonom. Adapt. Syst.}%
993 \def\@permissionCodeOne{1556-4665}%
994 \or % TACCESS

```



```

995 \def\@journalName{ACM Transactions on Accessible Computing}%
996 \def\@journalNameShort{ACM Trans. Access. Comput.}%
997 \def\@permissionCodeOne{1936-7228}%
998 \or % TACO
999 \def\@journalName{ACM Transactions on Architecture and Code Optimization}%
1000 \def\@journalNameShort{ACM Trans. Arch. Code Optim.}%
1001 \or % TALG
1002 \def\@journalName{ACM Transactions on Algorithms}%
1003 \def\@journalNameShort{ACM Trans. Algor.}%
1004 \def\@permissionCodeOne{1549-6325}%
1005 \or % TALLIP
1006 \def\@journalName{ACM Transactions on Asian and Low-Resource Language Information Processing}%
1007 \def\@journalNameShort{ACM Trans. Asian Low-Resour. Lang. Inf. Process.}%
1008 \def\@permissionCodeOne{2375-4699}%
1009 \or % TAP
1010 \def\@journalName{ACM Transactions on Applied Perception}%
1011 \or % TCPS
1012 \def\@journalName{ACM Transactions on Cyber-Physical Systems}%
1013 \or % TDS
1014 \def\@journalName{ACM Transactions on Data Science}%
1015 \def\@journalNameShort{ACM Trans. Data Sci.}%
1016 \def\@permissionCodeOne{2577-3224}%
1017 \or % TEAC
1018 \def\@journalName{ACM Transactions on Economics and Computation}%
1019 \or % TECS
1020 \def\@journalName{ACM Transactions on Embedded Computing Systems}%
1021 \def\@journalNameShort{ACM Trans. Embedd. Comput. Syst.}%
1022 \def\@permissionCodeOne{1539-9087}%
1023 \or % TELO
1024 \def\@journalName{ACM Transactions on Evolutionary Learning}%
1025 \def\@journalNameShort{ACM Trans. Evol. Learn.}%
1026 \def\@permissionCodeOne{2688-3007}%
1027 \or % THRI
1028 \def\@journalName{ACM Transactions on Human-Robot Interaction}%
1029 \def\@journalNameShort{ACM Trans. Hum.-Robot Interact.}%
1030 \def\@permissionCodeOne{2573-9522}%
1031 \or % TIIS
1032 \def\@journalName{ACM Transactions on Interactive Intelligent Systems}%
1033 \def\@journalNameShort{ACM Trans. Interact. Intell. Syst.}%
1034 \def\@permissionCodeOne{2160-6455}%
1035 \or % TIOT
1036 \def\@journalName{ACM Transactions on Internet of Things}%
1037 \def\@journalNameShort{ACM Trans. Internet Things}%
1038 \def\@permissionCodeOne{2577-6207}%
1039 \or % TISSEC
1040 \def\@journalName{ACM Transactions on Information and System Security}%
1041 \def\@journalNameShort{ACM Trans. Info. Syst. Sec.}%
1042 \def\@permissionCodeOne{1094-9224}%
1043 \or % TIST
1044 \def\@journalName{ACM Transactions on Intelligent Systems and Technology}%

```

```

1045 \def\@journalNameShort{ACM Trans. Intell. Syst. Technol.}%
1046 \def\@permissionCodeOne{2157-6904}%
1047 \or % TKDD
1048 \def\@journalName{ACM Transactions on Knowledge Discovery from Data}%
1049 \def\@journalNameShort{ACM Trans. Knowl. Discov. Data.}%
1050 \def\@permissionCodeOne{1556-4681}%
1051 \or % TMIS
1052 \def\@journalName{ACM Transactions on Management Information Systems}%
1053 \def\@journalNameShort{ACM Trans. Manag. Inform. Syst.}%
1054 \def\@permissionCodeOne{2158-656X}%
1055 \or % TOCE
1056 \def\@journalName{ACM Transactions on Computing Education}%
1057 \def\@journalNameShort{ACM Trans. Comput. Educ.}%
1058 \def\@permissionCodeOne{1946-6226}%
1059 \or % TOCHI
1060 \def\@journalName{ACM Transactions on Computer-Human Interaction}%
1061 \def\@journalNameShort{ACM Trans. Comput.-Hum. Interact.}%
1062 \def\@permissionCodeOne{1073-0516}%
1063 \or % TOCL
1064 \def\@journalName{ACM Transactions on Computational Logic}%
1065 \def\@journalNameShort{ACM Trans. Comput. Logic}%
1066 \def\@permissionCodeOne{1529-3785}%
1067 \or % TOCS
1068 \def\@journalName{ACM Transactions on Computer Systems}%
1069 \def\@journalNameShort{ACM Trans. Comput. Syst.}%
1070 \def\@permissionCodeOne{0734-2071}%
1071 \or % TOCT
1072 \def\@journalName{ACM Transactions on Computation Theory}%
1073 \def\@journalNameShort{ACM Trans. Comput. Theory}%
1074 \def\@permissionCodeOne{1942-3454}%
1075 \or % TODAES
1076 \def\@journalName{ACM Transactions on Design Automation of Electronic Systems}%
1077 \def\@journalNameShort{ACM Trans. Des. Autom. Electron. Syst.}%
1078 \def\@permissionCodeOne{1084-4309}%
1079 \or % TODS
1080 \def\@journalName{ACM Transactions on Database Systems}%
1081 \def\@journalNameShort{ACM Trans. Datab. Syst.}%
1082 \def\@permissionCodeOne{0362-5915}%
1083 \or % TOG
1084 \def\@journalName{ACM Transactions on Graphics}%
1085 \def\@journalNameShort{ACM Trans. Graph.}%
1086 \def\@permissionCodeOne{0730-0301}%
1087 \or % TOIS
1088 \def\@journalName{ACM Transactions on Information Systems}%
1089 \def\@permissionCodeOne{1046-8188}%
1090 \or % TOIT
1091 \def\@journalName{ACM Transactions on Internet Technology}%
1092 \def\@journalNameShort{ACM Trans. Internet Technol.}%
1093 \def\@permissionCodeOne{1533-5399}%
1094 \or % TOMACS

```

```

1095 \def\@journalName{ACM Transactions on Modeling and Computer Simulation}%
1096 \def\@journalNameShort{ACM Trans. Model. Comput. Simul.}%
1097 \or % TOMM
1098 \def\@journalName{ACM Transactions on Multimedia Computing, Communications and Applications}%
1099 \def\@journalNameShort{ACM Trans. Multimedia Comput. Commun. Appl.}%
1100 \def\@permissionCodeOne{1551-6857}%
1101 \def\@permissionCodeTwo{0100}%
1102 \or % TOMPECS
1103 \def\@journalName{ACM Transactions on Modeling and Performance Evaluation of Computing Systems}%
1104 \def\@journalNameShort{ACM Trans. Model. Perform. Eval. Comput. Syst.}%
1105 \def\@permissionCodeOne{2376-3639}%
1106 \or % TOMS
1107 \def\@journalName{ACM Transactions on Mathematical Software}%
1108 \def\@journalNameShort{ACM Trans. Math. Softw.}%
1109 \def\@permissionCodeOne{0098-3500}%
1110 \or % TOPC
1111 \def\@journalName{ACM Transactions on Parallel Computing}%
1112 \def\@journalNameShort{ACM Trans. Parallel Comput.}%
1113 \def\@permissionCodeOne{1539-9087}%
1114 \or % TOPS
1115 \def\@journalName{ACM Transactions on Privacy and Security}%
1116 \def\@journalNameShort{ACM Trans. Priv. Sec.}%
1117 \def\@permissionCodeOne{2471-2566}%
1118 \or % TOPLAS
1119 \def\@journalName{ACM Transactions on Programming Languages and Systems}%
1120 \def\@journalNameShort{ACM Trans. Program. Lang. Syst.}%
1121 \def\@permissionCodeOne{0164-0925}%
1122 \or % TOS
1123 \def\@journalName{ACM Transactions on Storage}%
1124 \def\@journalNameShort{ACM Trans. Storage}%
1125 \def\@permissionCodeOne{1553-3077}%
1126 \or % TOSEM
1127 \def\@journalName{ACM Transactions on Software Engineering and Methodology}%
1128 \def\@journalNameShort{ACM Trans. Softw. Eng. Methodol.}%
1129 \def\@permissionCodeOne{1049-331X}%
1130 \or % TOSN
1131 \def\@journalName{ACM Transactions on Sensor Networks}%
1132 \def\@journalNameShort{ACM Trans. Sensor Netw.}%
1133 \def\@permissionCodeOne{1550-4859}%
1134 \or % TQC
1135 \def\@journalName{ACM Transactions on Quantum Computing}%
1136 \def\@journalNameShort{ACM Trans. Quantum Comput.}%
1137 \def\@permissionCodeOne{2643-6817}%
1138 \or % TRET
1139 \def\@journalName{ACM Transactions on Reconfigurable Technology and Systems}%
1140 \def\@journalNameShort{ACM Trans. Reconfig. Technol. Syst.}%
1141 \def\@permissionCodeOne{1936-7406}%
1142 \or % TSAS
1143 \def\@journalName{ACM Transactions on Spatial Algorithms and Systems}%
1144 \def\@journalNameShort{ACM Trans. Spatial Algorithms Syst.}%

```

```

1145 \def\@permissionCodeOne{2374-0353}%
1146 \or % TSC
1147 \def\@journalName{ACM Transactions on Social Computing}%
1148 \def\@journalNameShort{ACM Trans. Soc. Comput.}%
1149 \def\@permissionCodeOne{2469-7818}%
1150 \or % TSLP
1151 \def\@journalName{ACM Transactions on Speech and Language Processing}%
1152 \def\@journalNameShort{ACM Trans. Speech Lang. Process.}%
1153 \def\@permissionCodeOne{1550-4875}%
1154 \or % TWEB
1155 \def\@journalName{ACM Transactions on the Web}%
1156 \def\@journalNameShort{ACM Trans. Web}%
1157 \def\@permissionCodeOne{1559-1131}%
1158 \else % FACMP, a dummy journal
1159 \def\@journalName{Forthcoming ACM Publication}%
1160 \def\@journalNameShort{ACM Forthcoming}%
1161 \def\@permissionCodeOne{XXXX-XXXX}%
1162 \fi
1163 \ClassInfo{\@classname}{Using journal code \@journalCode}%
1164 }{%
1165 \ClassError{\@classname}{Incorrect journal #1}%
1166 }%

\acmJournal And the syntactic sugar around it
1167 \def\acmJournal#1{\setkeys{ACM}{acmJournal=#1}%
1168 \global\@ACM@journal@bibstriptrue}

The defaults:
1169 \def\@journalCode@nr{0}
1170 \def\@journalName{}%
1171 \def\@journalNameShort{\@journalName}%
1172 \def\@permissionCodeOne{XXXX-XXXX}%
1173 \def\@permissionCodeTwo{}%

\acmConference This is the conference command
1174 \newcommand\acmConference[4][{}]{%
1175 \gdef\acmConference@shortname{#1}%
1176 \gdef\acmConference@name{#2}%
1177 \gdef\acmConference@date{#3}%
1178 \gdef\acmConference@venue{#4}%
1179 \ifx\acmConference@shortname\empty
1180 \gdef\acmConference@shortname{#2}%
1181 \fi
1182 \global\@ACM@journal@bibstripfalse
1183 }
1184 \if@ACM@journal\else
1185 \acmConference[Conference'17]{ACM Conference}{July 2017}{Washington,
1186 DC, USA}%
1187 \fi

```

`\acmBooktitle` The book title of the conference:

`\@acmBooktitle` 1188 `\def\acmBooktitle#1{\gdef\acmBooktitle{#1}}`  
1189 `\acmBooktitle{Proceedings of \acmConference@name`  
1190 `\ifx\acmConference@name\acmConference@shortname\else`  
1191 `\ (\acmConference@shortname)\fi}`

`\@editorsAbbrev` How to abbreviate editors

1192 `\def\@editorsAbbrev{(Ed.)}`

`\@acmEditors` The list of editors

1193 `\def\@acmEditors{}`

`\editor` Add a new editor to the list

1194 `\def\editor#1{\ifx\@acmEditors\empty`  
1195 `\gdef\@acmEditors{#1}%`  
1196 `\else`  
1197 `\gdef\@editorsAbbrev{(Eds.)}%`  
1198 `\g@addto@macro\@acmEditors{\and#1}%`  
1199 `\fi}`

`\subtitle` The subtitle macro

1200 `\def\subtitle#1{\def\@subtitle{#1}}`  
1201 `\subtitle{}`

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

1202 `\newcount\num@authorgroups`  
1203 `\num@authorgroups=0\relax`

`\num@author` The total number of authors

1204 `\newcount\num@author`  
1205 `\num@author=0\relax`

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

1206 `\newif\if@insideauthorgroup`  
1207 `\@insideauthorgroupfalse`

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

1208 `\renewcommand\author[2][{}%`  
1209 `\IfSubStr{#2}{,}{\ClassWarning{\@classname}{Do not put several`  
1210 `authors in the same \string\author\space macro!}}{}`  
1211 `\global\advance\num@author by 1\relax`  
1212 `\if@insideauthorgroup\else`  
1213 `\global\advance\num@authorgroups by 1\relax`  
1214 `\global\@insideauthorgrouptrue`  
1215 `\fi`  
1216 `\ifx\addresses\empty`  
1217 `\if@ACM@anonymous`  
1218 `\gdef\addresses{\@author{Anonymous Author(s)%`

```

1219         \ifx\@acmSubmissionID\@empty\else\Submission Id:
1220         \@acmSubmissionID\fi}}%
1221     \gdef\authors{Anonymous Author(s)}%
1222 \else
1223     \gdef\addresses{\@author{#2}}%
1224     \gdef\authors{#2}%
1225 \fi
1226 \else
1227     \if@ACM@anonymous\else
1228         \g@addto@macro\addresses{\and\@author{#2}}%
1229         \g@addto@macro\authors{\and#2}%
1230     \fi
1231 \fi
1232 \if@ACM@anonymous
1233     \ifx\shortauthors\@empty
1234         \gdef\shortauthors{Anon.
1235             \ifx\@acmSubmissionID\@empty\else Submission Id:
1236             \@acmSubmissionID\fi}%
1237     \fi
1238 \else
1239     \def\@tempa{#1}%
1240     \ifx\@tempa\@empty
1241         \ifx\shortauthors\@empty
1242             \gdef\shortauthors{#2}%
1243         \else
1244             \g@addto@macro\shortauthors{\and#2}%
1245         \fi
1246     \else
1247         \ifx\shortauthors\@empty
1248             \gdef\shortauthors{#1}%
1249         \else
1250             \g@addto@macro\shortauthors{\and#1}%
1251         \fi
1252     \fi
1253 \fi}

```

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

```

1254 \newcommand{\affiliation}[2][{}]{%
1255     \global\@insideauthorgroupfalse
1256     \if@ACM@anonymous\else
1257         \g@addto@macro\addresses{\affiliation{#1}{#2}}%
1258     \fi}

```

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

```

1259 \define@boolkey+{@ACM@affiliation@}[@ACM@affiliation@]{obeypunctuation}%
1260 [true]{\ClassError{\@classname}{The option obeypunctuation can be either true or false}}

```

`\additionalaffiliation` Additional affiliations go to footnotes

```

1261 \def\additionalaffiliation#1{\authornote{\@additionalaffiliation{#1}}}

```

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

```

1262 \def\@additionalaffiliation#1{\bgroup
1263   \def\position##1{\ignorespaces}%
1264   \def\institution##1{##1\ignorespaces}%
1265   \def\department{\@ifnextchar[{\@department}{\@department[]}}%
1266   \def\@department[##1]##2{\unskip, ##2\ignorespaces}%
1267   \let\streetaddress\position
1268   \let\city\position
1269   \let\state\position
1270   \let\postcode\position
1271   \let\country\position
1272   Also with #1\unskip.\egroup}

```

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

```

1273 \renewcommand{\email}[2][{}]{%
1274   \IfSubStr{#2}{,}{\ClassWarning{\@classname}{Do not put several
1275     addresses in the same \string\email\space macro!}}{}%
1276   \if@ACM@anonymous\else
1277     \g@addto@macro\addresses{\email{#1}{#2}}%
1278   \fi}

```

`\orcid` Right now we do not typeset ORCIDs

```

1279 \def\orcid#1{\unskip\ignorespaces}

```

`\authorsaddresses` Setting up authors' addresses

```

1280 \def\authorsaddresses#1{\def\@authorsaddresses{#1}}
1281 \authorsaddresses{\@mkauthorsaddresses}

```

`\@titlenotes` The title notes

```

1282 \def\@titlenotes{}

```

`\titlenote` Adding a note to the title

```

1283 \def\titlenote#1{%
1284   \g@addto@macro\@title{\footnotemark}%
1285   \if@ACM@anonymous
1286     \g@addto@macro\@titlenotes{%
1287       \stepcounter{footnote}\footnotetext{Title note}}%
1288   \else
1289     \g@addto@macro\@titlenotes{\stepcounter{footnote}\footnotetext{#1}}%
1290   \fi}

```

`\@subtitlenotes` The subtitle notes

```

1291 \def\@subtitlenotes{}

```

`\subtitlenote` Adding a note to the subtitle

```

1292 \def\subtitlenote#1{%
1293   \g@addto@macro\@subtitle{\footnotemark}%
1294   \if@ACM@anonymous
1295     \g@addto@macro\@subtitlenotes{%
1296       \stepcounter{footnote}\footnotetext{Subtitle note}}%
1297   \else
1298     \g@addto@macro\@subtitlenotes{%
1299       \stepcounter{footnote}\footnotetext{#1}}%
1300   \fi}

```

`\@authornotes` The author notes

```

1301 \def\@authornotes{}

```

`\authornote` Adding a note to the author

```

1302 \def\authornote#1{%
1303   \if@ACM@anonymous\else
1304     \g@addto@macro\addresses{\@authornotemark}%
1305     \g@addto@macro\@authornotes{%
1306       \stepcounter{footnote}\footnotetext{#1}}%
1307   \fi}

```

`\authornotemark` Adding a footnote mark to the authors

```

1308 \newcommand\authornotemark[1][\relax]{%
1309   \ifx#1\relax\relax\relax
1310     \g@addto@macro\addresses{\@authornotemark}%
1311   \else
1312     \g@addto@macro\addresses{\@authornotemark{#1}}%
1313   \fi}

```

`\acmVolume` The current volume

```

1314 \def\acmVolume#1{\def\@acmVolume{#1}}
1315 \acmVolume{1}

```

`\acmNumber` The current number

```

1316 \def\acmNumber#1{\def\@acmNumber{#1}}
1317 \acmNumber{1}

```

`\acmArticle` The current article

```

1318 \def\acmArticle#1{\def\@acmArticle{#1}}
1319 \acmArticle{}

```

`\acmArticleSeq` The sequence number

```

1320 \def\acmArticleSeq#1{\def\@acmArticleSeq{#1}}
1321 \acmArticleSeq{\@acmArticle}

```

`\acmYear` The current year

```

1322 \def\acmYear#1{\def\@acmYear{#1}}
1323 \acmYear{\the\year}

```



<code>\acmMonth</code>	<p>The current month</p> <pre> 1324 \def\acmMonth#1{\def\@acmMonth{#1}} 1325 \acmMonth{\the\month} </pre>
<code>\@acmPubDate</code>	<p>The publication date</p> <pre> 1326 \def\@acmPubDate{\ifcase\@acmMonth\or 1327   January\or February\or March\or April\or May\or June\or 1328   July\or August\or September\or October\or November\or 1329   December\fi~\@acmYear} </pre>
<code>\acmPrice</code>	<p>The price</p> <pre> 1330 \def\acmPrice#1{\def\@acmPrice{#1}} 1331 \acmPrice{15.00} </pre>
<code>\acmSubmissionID</code>	<p>The submission ID</p> <pre> 1332 \def\acmSubmissionID#1{\def\@acmSubmissionID{#1}} 1333 \acmSubmissionID{} </pre>
<code>\acmISBN</code>	<p>The book ISBN</p> <pre> 1334 \def\acmISBN#1{\def\@acmISBN{#1}} 1335 \acmISBN{978-x-xxxx-xxxx-x/YY/MM} </pre>
<code>\acmDOI</code>	<p>The paper DOI</p> <pre> 1336 \def\acmDOI#1{\def\@acmDOI{#1}} 1337 \acmDOI{10.1145/nnnnnnn.nnnnnnn} </pre>
<code>\if@ACM@badge</code>	<p>Whether to print a badge. Note that either a left or right badge triggers it:</p> <pre> 1338 \newif\if@ACM@badge 1339 \@ACM@badgefalse </pre>
<code>\@ACM@badge@width</code>	<p>The width of the badge</p> <pre> 1340 \newlength\@ACM@badge@width 1341 \setlength\@ACM@badge@width{5pc} </pre>
<code>\@ACM@title@width</code>	<p>The width of the badge</p> <pre> 1342 \newlength\@ACM@title@width </pre>
<code>\@ACM@badge@skip</code>	<p>The space between the badge and the title</p> <pre> 1343 \newlength\@ACM@badge@skip 1344 \setlength\@ACM@badge@skip{1pc} </pre>
<code>\acmBadgeR</code>	<p>Setting the right badge</p> <pre> 1345 \newcommand\acmBadgeR[2][\@ACM@badgetrue 1346   \def\@acmBadgeR@url{#1}% 1347   \def\@acmBadgeR@image{#2}} 1348 \def\@acmBadgeR@url{} 1349 \def\@acmBadgeR@image{} </pre>

`\acmBadgeL` Setting the left badge

```

1350 \newcommand\acmBadgeL[2][\@ACM@badgetrue
1351   \def\@acmBadgeL@url{#1}%
1352   \def\@acmBadgeL@image{#2}}
1353 \def\@acmBadgeL@url{}
1354 \def\@acmBadgeL@image{}

```

`\startPage` The start page of the paper

```

1355 \def\startPage#1{\def\@startPage{#1}}
1356 \startPage{}

```

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

```

1357 \def\terms#1{\ClassWarning{\@classname}{The command \string\terms{} is
1358   obsolete. I am going to ignore it}}

```

`\keywords` Keywords are mostly obsolete. We use CCS now. Still it makes sense to keep them for compatibility.

```

1359 \def\keywords#1{\def\@keywords{#1}}
1360 \keywords{}

```

`abstract` The amsart package puts abstract in a box. Since we do not know whether we will use two-column mode, we prefer to save the text

```

1361 \renewenvironment{abstract}{\Collect@Body\@saveabstract}{}

```

`\@saveabstract` And saving the abstract

```

1362 \long\def\@saveabstract#1{\if@ACM@maketitle@typeset
1363   \ClassError{\@classname}{Abstract must be defined before maketitle
1364     command. Please move it!}\fi
1365   \long\gdef\@abstract{#1}}
1366 \@saveabstract{}

```

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

```

1367 \long\def\@empty{}

```

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

```

1368 \define@boolkey+{@ACM@topmatter@}[@ACM@]{printccs}[true]{%
1369   \if@ACM@printccs
1370     \ClassInfo{\@classname}{Printing CCS}%
1371   \else
1372     \ClassInfo{\@classname}{Suppressing CCS}%
1373   \fi}{\ClassError{\@classname}{The option printccs can be either true or false}}

```

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

```

1374 \define@boolkey+{@ACM@topmatter@}[@ACM@]{printacmref}[true]{%
1375   \if@ACM@printacmref
1376     \ClassInfo{\@classname}{Printing bibformat}%
1377   \else
1378     \ClassInfo{\@classname}{Suppressing bibformat}%
1379   \fi}{\ClassError{\@classname}{The option printacmref can be either true or false}}

```

`\if@ACM@printfolios` Whether to print folios

```

1380 \define@boolkey+{@ACM@topmatter@}[@ACM@]{printfolios}[true]{%
1381   \if@ACM@printfolios
1382     \ClassInfo{\@classname}{Printing folios}%
1383   \else
1384     \ClassInfo{\@classname}{Suppressing folios}%
1385   \fi}{\ClassError{\@classname}{The option printfolios can be either true or false}}

```

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

```

1386 \define@cmdkey{@ACM@topmatter@}[@ACM@]{authorsperrow}[0]{%
1387   \IfInteger{#1}{\ClassInfo{\@classname}{Setting authorsperrow to
1388     #1}}{\ClassWarning{\@classname}{The parameter authorsperrow must be
1389     numerical. Ignoring the input #1}\gdef\@ACM@authorsperrow{0}}

```

`\settopmatter` The usual syntactic sugar

```

1390 \def\settopmatter#1{\setkeys{@ACM@topmatter@}{#1}}

```

Now the settings

```

1391 \settopmatter{printccs=true, printacmref=true}
1392 \if@ACM@manuscript
1393   \settopmatter{printfolios=true}
1394 \else
1395   \if@ACM@journal
1396     \settopmatter{printfolios=true}
1397   \else
1398     \settopmatter{printfolios=false}
1399   \fi
1400 \fi
1401 \settopmatter{authorsperrow=0}

```

`\@received` The container for the paper history

```

1402 \def\@received{}

```

`\received` The `\received` command

```

1403 \newcommand\received[2][\def\@tempa{#1}%
1404   \ifx\@tempa\@empty
1405     \ifx\@received\@empty
1406       \gdef\@received{Received #2}%
1407     \else
1408       \g@addto@macro{\@received}{; revised #2}%
1409     \fi
1410   \else
1411     \ifx\@received\@empty
1412       \gdef\@received{#1 #2}%
1413     \else
1414       \g@addto@macro{\@received}{; #1 #2}%
1415     \fi
1416   \fi}
1417 \AtEndDocument{%

```

```

1418 \ifx\@received\@empty\else
1419 \par\bigskip\noindent\small\normalfont\@received\par
1420 \fi}

```

### 3.13 Concepts system

We exclude CCSXML stuff generated by the ACM system:

```

1421 \RequirePackage{comment}
1422 \excludecomment{CCSXML}

```

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

```

1423 \let\@concepts\@empty
1424 \newcounter{@concepts}

```

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

```

1425 \newcommand\ccsdesc[2][100]{%
1426 \ccsdesc@parse#1~#2~~\ccsdesc@parse@end}

```

\ccsdesc@parse The parser of the expression Significance~General~Specific (we need textcomp for \textrightarrow). Note that Specific can be empty!

```

1427 \RequirePackage{textcomp}
1428 \def\ccsdesc@parse#1~#2~#3~{%
1429 \stepcounter{@concepts}%
1430 \expandafter\ifx\csname CCS@General@#2\endcsname\relax
1431 \expandafter\gdef\csname CCS@General@#2\endcsname{\textbullet\
1432 \textbf{#2}}%
1433 \expandafter\gdef\csname CCS@Punctuation@#2\endcsname{;}%
1434 \expandafter\gdef\csname CCS@Specific@#2\endcsname{}%
1435 \g@addto@macro{\@concepts}{\csname CCS@General@#2\endcsname
1436 \csname CCS@Punctuation@#2\endcsname
1437 \csname CCS@Specific@#2\endcsname}%
1438 \fi
1439 \ifx#3\relax\relax\else
1440 \expandafter\gdef\csname CCS@Punctuation@#2\endcsname{
1441 \textrightarrow\ }%
1442 \expandafter\g@addto@macro\expandafter{\csname CCS@Specific@#2\endcsname}{%
1443 \addtocounter{@concepts}{-1}}%
1444 \ifnum#1>499\textbf{#3}\else
1445 \ifnum#1>299\textit{#3}\else
1446 #3\fi\fi\ifnum\value{@concepts}=0.\else; \fi}%
1447 \fi
1448 \ccsdesc@parse@finish}

```

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

```

1449 \def\ccsdesc@parse@finish#1\ccsdesc@parse@end{}

```

### 3.14 Copyright system

This is from acmcopyright.sty

`\if@printcopyright` Whether to print a copyright symbol  
1450 `\newif\if@printcopyright`  
1451 `\@printcopyrighttrue`

`\if@printpermission` Whether to print the permission block  
1452 `\newif\if@printpermission`  
1453 `\@printpermissiontrue`

`\if@acmowned` Whether the ACM owns the rights to the paper  
1454 `\newif\if@acmowned`  
1455 `\@acmownedtrue`

Keys:

```
1456 \define@choicekey*{ACM@}{acmcopyrightmode}[%
1457   \acm@copyrightinput\acm@copyrightmode]{none,%
1458     acmcopyright,acmlicensed,rightsretained,%
1459     usgov,usgovmixed,cagov,cagovmixed,licensedusgovmixed,%
1460     licensedcagov,licensedcagovmixed,othergov,licensedothergov,%
1461     iw3c2w3,iw3c2w3g}{%
1462   \@printpermissiontrue
1463   \@printcopyrighttrue
1464   \@acmownedtrue
1465   \ifnum\acm@copyrightmode=0\relax % none
1466     \@printpermissionfalse
1467     \@printcopyrightfalse
1468     \@acmownedfalse
1469   \fi
1470   \ifnum\acm@copyrightmode=2\relax % acmlicensed
1471     \@acmownedfalse
1472   \fi
1473   \ifnum\acm@copyrightmode=3\relax % rightsretained
1474     \@acmownedfalse
1475   \AtBeginDocument{\acmPrice{}}%
1476   \fi
1477   \ifnum\acm@copyrightmode=4\relax % usgov
1478     \@printpermissiontrue
1479     \@printcopyrightfalse
1480     \@acmownedfalse
1481   \AtBeginDocument{\acmPrice{}}%
1482   \fi
1483   \ifnum\acm@copyrightmode=6\relax % cagov
1484     \@acmownedfalse
1485   \fi
1486   \ifnum\acm@copyrightmode=8\relax % licensedusgovmixed
1487     \@acmownedfalse
1488   \fi
```

```

1489 \ifnum\acm@copyrightmode=9\relax % licensedcagov
1490 \@acmownedfalse
1491 \fi
1492 \ifnum\acm@copyrightmode=10\relax % licensedcagovmixed
1493 \@acmownedfalse
1494 \fi
1495 \ifnum\acm@copyrightmode=11\relax % othergov
1496 \@acmownedtrue
1497 \fi
1498 \ifnum\acm@copyrightmode=12\relax % licensedothergov
1499 \@acmownedfalse
1500 \fi
1501 \ifnum\acm@copyrightmode=13\relax % iw3c2w3
1502 \@acmownedfalse
1503 \AtBeginDocument{\acmPrice{}}%
1504 \fi
1505 \ifnum\acm@copyrightmode=14\relax % iw3c2w3g
1506 \@acmownedfalse
1507 \AtBeginDocument{\acmPrice{}}%
1508 \fi}

```

\setcopyright This is the syntactic sugar around setting keys.

```

1509 \def\setcopyright#1{\setkeys{ACM@}{acmcopyrightmode=#1}}
1510 \setcopyright{acmcopyright}

```

\@copyrightowner Here is the owner of the copyright

```

1511 \def\@copyrightowner{%
1512 \ifcase\acm@copyrightmode\relax % none
1513 \or % acmcopyright
1514 Association for Computing Machinery.
1515 \or % acmlicensed
1516 Copyright held by the owner/author(s). Publication rights licensed to
1517 ACM\@.
1518 \or % rightsretained
1519 Copyright held by the owner/author(s).
1520 \or % usgov
1521 \or % usgovmixed
1522 Association for Computing Machinery.
1523 \or % cagov
1524 Crown in Right of Canada.
1525 \or %cagovmixed
1526 Association for Computing Machinery.
1527 \or %licensedusgovmixed
1528 Copyright held by the owner/author(s). Publication rights licensed to
1529 ACM\@.
1530 \or % licensedcagov
1531 Crown in Right of Canada. Publication rights licensed to
1532 ACM\@.
1533 \or %licensedcagovmixed
1534 Copyright held by the owner/author(s). Publication rights licensed to

```

```

1535 ACM\@.
1536 \or % othergov
1537 Association for Computing Machinery.
1538 \or % licensedothergov
1539 Copyright held by the owner/author(s). Publication rights licensed to
1540 ACM\@.
1541 \or % ic2w3www
1542 IW3C2 (International World Wide Web Conference Committee), published
1543 under Creative Commons CC-BY~4.0 License.
1544 \or % ic2w3wwwgoogle
1545 IW3C2 (International World Wide Web Conference Committee), published
1546 under Creative Commons CC-BY-NC-ND~4.0 License.
1547 \fi}

```

\@formatdoi Print a clickable DOI

```

1548 \def\@formatdoi#1{\url{https://doi.org/#1}}

```

\@copyrightpermission The canned permission block.

```

1549 \def\@copyrightpermission{%
1550   \ifcase\acm@copyrightmode\relax % none
1551   \or % acmcopyright
1552     Permission to make digital or hard copies of all or part of this
1553     work for personal or classroom use is granted without fee provided
1554     that copies are not made or distributed for profit or commercial
1555     advantage and that copies bear this notice and the full citation on
1556     the first page. Copyrights for components of this work owned by
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1570     or to redistribute to lists, requires prior specific permission
1571     and\hspace*{.5pt}/or a fee. Request permissions from
1572     permissions@acm.org.
1573   \or % rightsretained
1574     Permission to make digital or hard copies of part or all of this work
1575     for personal or classroom use is granted without fee provided that
1576     copies are not made or distributed for profit or commercial advantage
1577     and that copies bear this notice and the full citation on the first
1578     page. Copyrights for third-party components of this work must be
1579     honored. For all other uses, contact the
1580     owner\hspace*{.5pt}/author(s).

```

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 1668 (CC-BY-NC-ND~4.0) license. Authors reserve their rights to  
 1669 disseminate the work on their personal and corporate Web sites with  
 1670 the appropriate attribution.  
 1671 \fi}  
  
 \copyrightyear By default, the copyright year is the same as \acmYear, but one can override this:  
 1672 \def\copyrightyear#1{\def\@copyrightyear{#1}}  
 1673 \copyrightyear{\@acmYear}  
  
 \@teaserfigures The teaser figures container  
 1674 \def\@teaserfigures{}  
  
 teaserfigure The teaser figure

```

1675 \newenvironment{teaserfigure}{\Collect@Body@saveteaser}{}
\@saveteaser Saving the teaser
1676 \long\def\@saveteaser#1{\g@addto@macro\@teaserfigures{\@teaser{#1}}}

\thanks We redefine amsart \thanks so the anonymous key works
1677 \renewcommand{\thanks}[1]{%
1678   \ifnotempty{#1}{%
1679     \if@ACM@anonymous
1680       \g@addto@macro\thankses{\thanks{A note}}%
1681     \else
1682       \g@addto@macro\thankses{\thanks{#1}}%
1683     \fi}}

```

### 3.15 Typesetting top matter

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

```
1684 \newbox\mktitle@bx
```

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

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

```

1685 \def\maketitle{%
1686   \@ACM@maketitle@typesettrue
1687   \if@ACM@anonymous
1688     % Anonymize omission of \author-s
1689     \ifnum\num@authorgroups=0\author{}\fi
1690   \fi
1691   \begingroup
1692   \let\@vspace\@vspace@orig
1693   \let\@vspacer\@vspacer@orig
1694   \let\@footnotemark\@footnotemark@nolink
1695   \let\@footnotetext\@footnotetext@nolink
1696   \renewcommand\thefootnote{\@fnsymbol\c@footnote}%
1697   \hsize=\textwidth
1698   \def\@makefnmark{\hbox{\@textsuperscript{\@thefnmark}}}%
1699   \@mktitle\if@ACM@sigchiamode\else\mkauthors\fi\mkteasers
1700   \@printtopmatter
1701   \if@ACM@sigchiamode\mkauthors\fi
1702   \setcounter{footnote}{0}%
1703   \def\@makefnmark{\hbox{\@textsuperscript{\normalfont\@thefnmark}}}%
1704   \@titlenotes
1705   \@subtitlenotes
1706   \@authornotes

```

```

1707 \let\@makefnmark\relax
1708 \let\@thefnmark\relax
1709 \let\@makefnmark\relax
1710 \ifx\@empty\thankses\else
1711   \footnotetextauthorsaddresses{%
1712     \def\par{\let\par\@par}\parindent\z@\@setthanks}%
1713   \fi
1714 \ifx\@empty\@authorsaddresses\else
1715   \if@ACM@anonymous\else
1716     \if@ACM@journal@bibstrip
1717       \footnotetextauthorsaddresses{%
1718         \def\par{\let\par\@par}\parindent\z@\@setauthorsaddresses}%
1719       \fi
1720     \fi
1721   \fi
1722 \if@ACM@nonacm\else\footnotetextcopyrightpermission{%
1723   \if@ACM@authordraft
1724     \raisebox{-2ex}{\z@}{\z@}{\makebox[0pt][l]{\large\bfseries
1725       Unpublished working draft. Not for distribution.}}%
1726     \color[gray]{0.9}%
1727   \fi
1728   \parindent\z@\parskip0.1\baselineskip
1729   \if@ACM@authorversion\else
1730     \if@printpermission\@copyrightpermission\par\fi
1731   \fi
1732   \if@ACM@manuscript\else
1733     \if@ACM@journal@bibstrip\else % Print the conference information
1734       {\itshape \acmConference@shortname, \acmConference@date, \acmConference@venue}\par
1735     \fi
1736   \fi
1737   \if@printcopyright
1738     \copyright\ \@copyrightyear\ \@copyrightowner\
1739   \else
1740     \@copyrightyear.\
1741   \fi
1742   \if@ACM@manuscript
1743     Manuscript submitted to ACM\
1744   \else
1745     \if@ACM@authorversion
1746       This is the author's version of the work. It is posted here for
1747       your personal use. Not for redistribution. The definitive Version
1748       of Record was published in
1749       \if@ACM@journal@bibstrip
1750         \emph{\@journalName}%
1751       \else
1752         \emph{\@acmBooktitle}%
1753       \fi
1754       \ifx\@acmDOI\@empty
1755         .
1756       \else

```

```

1757         , \@formatdoi{\@acmDOI}.
1758     \fi\\
1759     \else
1760         \if@ACM@nonacm\else
1761             \if@ACM@journal@bibstrip
1762                 \@permissionCodeOne/\@acmYear/\@acmMonth-ART\@acmArticle
1763                 \ifx\@acmPrice\@empty\else\ $\@acmPrice\fi\\
1764                 \@formatdoi{\@acmDOI}%
1765             \else % Conference
1766                 \ifx\@acmISBN\@empty\else ACM~ISBN~\@acmISBN
1767                 \ifx\@acmPrice\@empty.\else\dots\$\@acmPrice\fi\\fi
1768                 \ifx\@acmDOI\@empty\else\@formatdoi{\@acmDOI}\fi%
1769             \fi
1770         \fi
1771     \fi}
1772 \fi}
1773 \fi
1774 \endgroup
1775 \setcounter{footnote}{0}%
1776 \@mkabstract
1777 \if@ACM@printccs
1778 \ifx\@concepts\@empty\else\bgroup
1779     {\@specialsection{CCS Concepts}%
1780     \@concepts\par}\egroup
1781 \fi
1782 \fi
1783 \ifx\@keywords\@empty\else\bgroup
1784     {\if@ACM@journal
1785         \@specialsection{Additional Key Words and Phrases}%
1786     \else
1787         \@specialsection{Keywords}%
1788     \fi
1789     \@keywords}\par\egroup
1790 \fi
1791 \andify\authors
1792 \andify\shortauthors
1793 \global\let\authors=\authors
1794 \global\let\shortauthors=\shortauthors
1795 \if@ACM@printacmref
1796     \@mkbibcitation
1797 \fi
1798 \hypersetup{%
1799     pdfauthor={\authors},
1800     pdftitle={\@title},
1801     pdfsubject={\@concepts},
1802     pdfkeywords={\@keywords},
1803     pdfcreator={LaTeX with acmart
1804         \csname ver@acmart.cls\endcsname\space
1805         and hyperref
1806         \csname ver@hyperref.sty\endcsname}}}%

```

```

1807 \global\@topnum\z@ % this prevents floats from falling
1808 % at the top of page 1
1809 \global\@botnum\z@ % we do not want them to be on the bottom either
1810 \@printendtopmatter
1811 \@afterindentfalse
1812 \@afterheading
1813 }

```

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

```

1814 \def\@specialsection#1{%
1815   \ifcase\ACM@format@nr
1816     \relax % manuscript
1817     \par\medskip\small\noindent#1: %
1818   \or % acmsmall
1819     \par\medskip\small\noindent#1: %
1820   \or % acmlarge
1821     \par\medskip\small\noindent#1: %
1822   \or % acmtog
1823     \par\medskip\small\noindent#1: %
1824   \or % sigconf
1825     \section*{#1}%
1826   \or % siggraph
1827     \section*{#1}%
1828   \or % sigplan
1829     \paragraph*{#1}%
1830   \or % sigchi
1831     \section*{#1}%
1832   \or % sigchi-a
1833     \section*{#1}%
1834   \fi}

```

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

```

1835 \def\@printtopmatter{%
1836   \ifx\@startPage\@empty
1837     \gdef\@startPage{1}%
1838   \else
1839     \setcounter{page}{\@startPage}%
1840   \fi
1841   \thispagestyle{firstpagestyle}%
1842   \noindent
1843   \ifcase\ACM@format@nr
1844     \relax % manuscript
1845     \box\mktitle@bx\par
1846   \or % acmsmall
1847     \box\mktitle@bx\par
1848   \or % acmlarge
1849     \box\mktitle@bx\par

```

```

1850 \or % acmtog
1851   \twocolumn[\box\mktitle@bx]%
1852 \or % sigconf
1853   \twocolumn[\box\mktitle@bx]%
1854 \or % siggraph
1855   \twocolumn[\box\mktitle@bx]%
1856 \or % sigplan
1857   \twocolumn[\box\mktitle@bx]%
1858 \or % sigchi
1859   \twocolumn[\box\mktitle@bx]%
1860 \or % sigchi-a
1861   \par\box\mktitle@bx\par\bigskip
1862 \if@ACM@badge
1863   \marginpar{\noindent
1864     \ifx\@acmBadgeL@image\empty\else
1865       \href{\@acmBadgeL@url}{%
1866         \includegraphics[width=\@ACM@badge@width]{\@acmBadgeL@image}}%
1867       \hskip\@ACM@badge@skip
1868     \fi
1869     \ifx\@acmBadgeR@image\empty\else
1870       \href{\@acmBadgeR@url}{%
1871         \includegraphics[width=\@ACM@badge@width]{\@acmBadgeR@image}}%
1872       \fi}%
1873   \fi
1874 \fi
1875 }

```

\@mktitle The title of the article

```

1876 \def\@mktitle{%
1877   \ifcase\ACM@format@nr
1878   \relax % manuscript
1879   \@mktitle@i
1880 \or % acmsmall
1881   \@mktitle@i
1882 \or % acmlarge
1883   \@mktitle@i
1884 \or % acmtog
1885   \@mktitle@i
1886 \or % sigconf
1887   \@mktitle@iii
1888 \or % siggraph
1889   \@mktitle@iii
1890 \or % sigplan
1891   \@mktitle@iii
1892 \or % sigchi
1893   \@mktitle@iii
1894 \or % sigchi-a
1895   \@mktitle@iv
1896 \fi
1897 }

```

```

\@titlefont The font to typeset the title
1898 \def\@titlefont{%
1899   \ifcase\ACM@format@nr
1900   \relax % manuscript
1901   \LARGE\sffamily\bfseries
1902   \or % acmsmall
1903   \LARGE\sffamily\bfseries
1904   \or % acmlarge
1905   \LARGE\sffamily\bfseries
1906   \or % acmtog
1907   \Huge\sffamily
1908   \or % sigconf
1909   \Huge\sffamily\bfseries
1910   \or % siggraph
1911   \Huge\sffamily\bfseries
1912   \or % sigplan
1913   \Huge\bfseries
1914   \or % sigchi
1915   \Huge\sffamily\bfseries
1916   \or % sigchi-a
1917   \Huge\bfseries
1918   \fi}

\@subtitlefont The font to typeset the subtitle
1919 \def\@subtitlefont{\normalsize
1920   \ifcase\ACM@format@nr
1921   \relax % manuscript
1922   \mdseries
1923   \or % acmsmall
1924   \mdseries
1925   \or % acmlarge
1926   \mdseries
1927   \or % acmtog
1928   \LARGE
1929   \or % sigconf
1930   \LARGE\mdseries
1931   \or % siggraph
1932   \LARGE\mdseries
1933   \or % sigplan
1934   \LARGE\mdseries
1935   \or % sigchi
1936   \LARGE\mdseries
1937   \or % sigchi-a
1938   \mdseries
1939   \fi}

\@mktitle@i The version of \mktitle for most journals
1940 \def\@mktitle@i{\hsize=\textwidth
1941   \@ACM@title@width=\hsize

```

```

1942 \ifx\@acmBadgeL@image\@empty\else
1943   \advance\@ACM@title@width by -\@ACM@badge@width
1944   \advance\@ACM@title@width by -\@ACM@badge@skip
1945 \fi
1946 \ifx\@acmBadgeR@image\@empty\else
1947   \advance\@ACM@title@width by -\@ACM@badge@width
1948   \advance\@ACM@title@width by -\@ACM@badge@skip
1949 \fi
1950 \setbox\mktitle@bx=\vbox{\noindent\@titlefont
1951   \ifx\@acmBadgeL@image\@empty\else
1952     \raisebox{-.5\baselineskip}[\z@][\z@]{\href{\@acmBadgeL@url}{%
1953       \includegraphics[width=\@ACM@badge@width]{\@acmBadgeL@image}}}%
1954     \hskip\@ACM@badge@skip
1955   \fi
1956   \parbox[t]{\@ACM@title@width}{\raggedright
1957     \@titlefont\noindent
1958     \@title
1959   \ifx\@subtitle\@empty\else
1960     \par\noindent{\@subtitlefont\@subtitle}
1961   \fi}%
1962   \ifx\@acmBadgeR@image\@empty\else
1963     \hskip\@ACM@badge@skip
1964     \raisebox{-.5\baselineskip}[\z@][\z@]{\href{\@acmBadgeR@url}{%
1965       \includegraphics[width=\@ACM@badge@width]{\@acmBadgeR@image}}}%
1966   \fi
1967   \par\bigskip}}%

```

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

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

```

1968 \def\@mktitle@iii{\hsize=\textwidth
1969   \setbox\mktitle@bx=\vbox{\@titlefont\centering
1970     \@ACM@title@width=\hsize
1971     \if@ACM@badge
1972       \advance\@ACM@title@width by -2\@ACM@badge@width
1973       \advance\@ACM@title@width by -2\@ACM@badge@skip
1974       \parbox[b]{\@ACM@badge@width}{\strut
1975         \ifx\@acmBadgeL@image\@empty\else
1976           \raisebox{-.5\baselineskip}[\z@][\z@]{\href{\@acmBadgeL@url}{%
1977             \includegraphics[width=\@ACM@badge@width]{\@acmBadgeL@image}}}%
1978         \fi}%
1979       \hskip\@ACM@badge@skip
1980     \fi
1981     \parbox[t]{\@ACM@title@width}{\centering\@titlefont
1982       \@title
1983     \ifx\@subtitle\@empty\else
1984       \par\noindent{\@subtitlefont\@subtitle}
1985     \fi

```



```

1986 }%
1987 \if@ACM@badge
1988 \hskip\@ACM@badge@skip
1989 \parbox[b]{\@ACM@badge@width}{\strut
1990 \ifx\@acmBadgeR@image\@empty\else
1991 \raisebox{-.5\baselineskip}[\z@][\z@]{\href{\@acmBadgeR@url}{%
1992 \includegraphics[width=\@ACM@badge@width]{\@acmBadgeR@image}}}%
1993 \fi}%
1994 \fi
1995 \par\bigskip}}%

```

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

```

1996 \def\@mktitle@iv{\hsize=\textwidth
1997 \setbox\mktitle@bx=\vbox{\raggedright\leftskip5pc\@titlefont
1998 \noindent\leavevmode\leaders\hrule height 2pt\hfill\kern0pt\par
1999 \noindent\@title
2000 \ifx\@subtitle\@empty\else
2001 \par\noindent\@subtitlefont\@subtitle
2002 \fi
2003 \par\bigskip}}%

```

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

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

```

2004 \newbox\@ACM@commabox
2005 \def\@ACM@addtoaddress#1{%
2006 \ifvmode\else
2007 \if@ACM@affiliation@obeypunctuation\else
2008 \setbox\@ACM@commabox=\hbox{, }%
2009 \unskip\cleaders\copy\@ACM@commabox\hskip\wd\@ACM@commabox
2010 \fi\fi
2011 #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...

```

\streetaddress 2012 \def\streetaddress#1{\unskip\ignorespaces}
\city           2013 \def\postcode#1{\unskip\ignorespaces}
\state         2014 \if@ACM@journal
\postcode      2015 \def\position#1{\unskip\ignorespaces}
\country       2016 \def\institution#1{\unskip~#1\ignorespaces}
2017 \def\city#1{\unskip\ignorespaces}
2018 \def\state#1{\unskip\ignorespaces}
2019 \newcommand\department[2][0]{\unskip\ignorespaces}

```

```

2020 \def\country#1{\if@ACM@affiliation@obexpunctuation\else, \fi#1\ignorespaces}
2021 \else
2022 \def\position#1{\if@ACM@affiliation@obexpunctuation#1\else#1\par\fi}%
2023 \def\institution#1{\if@ACM@affiliation@obexpunctuation#1\else#1\par\fi}%
2024 \newcommand\department[2][0]{\if@ACM@affiliation@obexpunctuation
2025 #2\else#2\par\fi}%
2026 % \def\streetaddress#1{\if@ACM@affiliation@obexpunctuation#1\else#1\par\fi}%
2027 \let\city\@ACM@addtoaddress
2028 \let\state\@ACM@addtoaddress
2029 % \def\postcode#1{\if@ACM@affiliation@obexpunctuation#1\else\unskip\space#1\fi}%
2030 \let\country\@ACM@addtoaddress
2031 \fi

\mkauthors Typesetting the authors
2032 \def\mkauthors{\begingroup
2033 \hsize=\textwidth
2034 \ifcase\ACM@format@nr
2035 \relax % manuscript
2036 \mkauthors@i
2037 \or % acmsmall
2038 \mkauthors@i
2039 \or % acmlarge
2040 \mkauthors@i
2041 \or % acmtog
2042 \mkauthors@i
2043 \or % sigconf
2044 \mkauthors@iii
2045 \or % siggraph
2046 \mkauthors@iii
2047 \or % sigplan
2048 \mkauthors@iii
2049 \or % sigchi
2050 \mkauthors@iii
2051 \or % sigchi-a
2052 \mkauthors@iv
2053 \fi
2054 \endgroup
2055 }

\authorfont Somehow different conferences use different fonts for author names. Why?
2056 \def\authorfont{\Large\sffamily}

\affiliationfont Font for affiliations
2057 \def\affiliationfont{\normalsize\normalfont}

Adjusting fonts for different formats
2058 \ifcase\ACM@format@nr
2059 \relax % manuscript
2060 \or % acmsmall

```

```

2061 \def\@authorfont{\large\sffamily}
2062 \def\@affiliationfont{\small\normalfont}
2063 \or % acmlarge
2064 \or % acmtog
2065 \def\@authorfont{\LARGE\sffamily}
2066 \def\@affiliationfont{\large}
2067 \or % sigconf
2068 \def\@authorfont{\LARGE}
2069 \def\@affiliationfont{\large}
2070 \or % siggraph
2071 \def\@authorfont{\normalsize\normalfont}
2072 \def\@affiliationfont{\normalsize\normalfont}
2073 \or % sigplan
2074 \def\@authorfont{\Large\normalfont}
2075 \def\@affiliationfont{\normalsize\normalfont}
2076 \or % sigchi
2077 \def\@authorfont{\bfseries}
2078 \def\@affiliationfont{\mdseries}
2079 \or % sigchi-a
2080 \def\@authorfont{\bfseries}
2081 \def\@affiliationfont{\mdseries}
2082 \fi

```

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

```

2083 \def\@typeset@author@line{%
2084 \andify\@currentauthors\par\noindent
2085 \@currentauthors\def\@currentauthors{}%
2086 \ifx\@currentaffiliations\@empty\else
2087 \andify\@currentaffiliations
2088 \unskip, {\@currentaffiliations}\par
2089 \fi
2090 \def\@currentaffiliations{}}

```

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

```

2091 \def\@mkauthors@i{%
2092 \def\@currentauthors{}%
2093 \def\@currentaffiliations{}%
2094 \global\let\and\@typeset@author@line
2095 \def\@author##1{%
2096 \ifx\@currentauthors\@empty
2097 \gdef\@currentauthors{\@authorfont\MakeTextUppercase{##1}}%
2098 \else
2099 \g@addto@macro{\@currentauthors}{\and\MakeTextUppercase{##1}}%
2100 \fi
2101 \gdef\and{}}%
2102 \def\email##1##2{%
2103 \def\affiliation##1##2{%

```

```

2104 \def\@tempa{##2}\ifx\@tempa\@empty\else
2105 \ifx\@currentaffiliations\@empty
2106 \gdef\@currentaffiliations{%
2107 \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
2108 \setkeys{@ACM@affiliation@}{##1}%
2109 \@affiliationfont##2}%
2110 \else
2111 \g@addto@macro{\@currentaffiliations}{\and
2112 \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
2113 \setkeys{@ACM@affiliation@}{##1}##2}%
2114 \fi
2115 \fi
2116 \global\let\and\@typeset@author@line}%
2117 \global\setbox\mktitle@bx=\vbox{\noindent\box\mktitle@bx\par\medskip
2118 \noindent\addresses\@typeset@author@line
2119 \par\medskip}%
2120 }

```

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

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

```
2121 \newbox\author@bx
```

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

```
2122 \newdimen\author@bx@wd
```

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

```
2123 \newskip\author@bx@sep
```

```
2124 \author@bx@sep=1pc\relax
```

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

```

2125 \def\@typeset@author@bx{\bgroup\hsize=\author@bx@wd
2126 \def\and{\par}\normalbaselines
2127 \global\setbox\author@bx=\vtop{\if@ACM@sigchiamode\else\centering\fi
2128 \@authorfont\@currentauthors\par\@affiliationfont
2129 \@currentaffiliation}\egroup
2130 \box\author@bx\hspace{\author@bx@sep}%
2131 \gdef\@currentauthors{}}%
2132 \gdef\@currentaffiliation{}}

```

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

```
2133 \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.

```
2134 \author@bx@wd=\textwidth\relax
```

```

2135 \advance\author@bx@wd by -\author@bx@sep\relax
2136 \ifnum\@ACM@author@sprow>0\relax
2137   \divide\author@bx@wd by \@ACM@author@sprow\relax
2138 \else
2139   \ifcase\num@author@groups
2140     \relax % 0?
2141     \or % 1=one author per row
2142     \or % 2=two authors per row
2143     \divide\author@bx@wd by \num@author@groups\relax
2144     \or % 3=three authors per row
2145     \divide\author@bx@wd by \num@author@groups\relax
2146     \or % 4=two authors per row (!)
2147     \divide\author@bx@wd by 2\relax
2148     \else % three authors per row
2149       \divide\author@bx@wd by 3\relax
2150   \fi
2151 \fi
2152 \advance\author@bx@wd by -\author@bx@sep\relax

```

Now, parsing of \addresses:

```

2153 \gdef\@currentauthors{}%
2154 \gdef\@currentaffiliation{}%
2155 \def\author##1{\ifx\@currentauthors\empty
2156   \gdef\@currentauthors{\par##1}%
2157 \else
2158   \g@addto@macro\@currentauthors{\par##1}%
2159 \fi
2160 \gdef\and{}}%
2161 \def\email##1##2{\ifx\@currentaffiliation\empty
2162   \gdef\@currentaffiliation{\bgroup
2163     \mathchardef\UrlBreakPenalty=10000\nolinkurl{##2}\egroup}%
2164 \else
2165   \g@addto@macro\@currentaffiliation{\par\bgroup
2166     \mathchardef\UrlBreakPenalty=10000\nolinkurl{##2}\egroup}%
2167 \fi}%
2168 \def\affiliation##1##2{\ifx\@currentaffiliation\empty
2169   \gdef\@currentaffiliation{%
2170     \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
2171     \setkeys{@ACM@affiliation@}{##1}##2}%
2172 \else
2173   \g@addto@macro\@currentaffiliation{\par
2174     \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
2175     \setkeys{@ACM@affiliation@}{##1}##2}%
2176 \fi
2177 \global\let\and\@typeset@author@bx
2178 }%

```

Actual typesetting is done by the \and macro:

```

2179 \hspace=\textwidth
2180 \global\setbox\mktitle@bx=\vbox{\noindent
2181   \box\mktitle@bx\par\medskip\leavevmode

```

```

2182 \lineskip=1pc\relax\centering\hspace*[-1em]%
2183 \addresses\let\and\@typeset@author@bx\and\par\bigskip}}

```

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

```

2184 \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.

```

2185 \author@bx@wd=\columnwidth\relax
2186 \advance\author@bx@wd by -\author@bx@sep\relax
2187 \ifnum\@ACM@authorsperrow>0\relax
2188 \divide\author@bx@wd by \@ACM@authorsperrow\relax
2189 \else
2190 \ifcase\@num@authorgroups
2191 \relax % 0?
2192 \or % 1=one author per row
2193 \else % 2=two authors per row
2194 \divide\author@bx@wd by 2\relax
2195 \fi
2196 \fi
2197 \advance\author@bx@wd by -\author@bx@sep\relax

```

Now, parsing of \addresses:

```

2198 \gdef\@currentauthors{}%
2199 \gdef\@currentaffiliation{}%
2200 \def\@author##1{\ifx\@currentauthors\@empty
2201 \gdef\@currentauthors{\par##1}%
2202 \else
2203 \g@addto@macro\@currentauthors{\par##1}%
2204 \fi
2205 \gdef\and{}}%
2206 \def\email##1##2{\ifx\@currentaffiliation\@empty
2207 \gdef\@currentaffiliation{\nolinkurl{##2}}%
2208 \else
2209 \g@addto@macro\@currentaffiliation{\par\nolinkurl{##2}}%
2210 \fi}%
2211 \def\affiliation##1##2{\ifx\@currentaffiliation\@empty
2212 \gdef\@currentaffiliation{%
2213 \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
2214 \setkeys{@ACM@affiliation@}{##1}##2}%
2215 \else
2216 \g@addto@macro\@currentaffiliation{\par
2217 \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
2218 \setkeys{@ACM@affiliation@}{##1}##2}%
2219 \fi
2220 \global\let\and\@typeset@author@bx}%
2221 %

```

Actual typesetting is done by the \and macro

```
2222 \bgroup\hsize=\columnwidth
2223 \par\raggedright\leftskip=\z@
2224 \lineskip=1pc\noindent
2225 \addresses\let\and\@typeset@author@bx\and\par\bigskip\egroup}
```

\mkauthorsaddresses Typesetting authors' addresses in the footnote style

```
2226 \def\mkauthorsaddresses{%
2227 \ifnum\num@authors>1\relax
2228 Authors' \else Author's \fi
2229 \ifnum\num@authorgroups>1\relax
2230 addresses: \else address: \fi
2231 \bgroup
2232 \def\streetaddress##1{\unskip\@addpunct, ##1}%
2233 \def\postcode##1{\unskip\@addpunct, ##1}%
2234 \def\position##1{\unskip\ignorespaces}%
2235 \def\institution##1{\unskip\@addpunct, ##1}%
2236 \def\city##1{\unskip\@addpunct, ##1}%
2237 \def\state##1{\unskip\@addpunct, ##1}%
2238 \renewcommand\department[2][0]{\unskip\@addpunct, ##2}%
2239 \def\country##1{\unskip\@addpunct, ##1}%
2240 \def\and{\unskip\@addpunct; }%
2241 \def\@author##1{##1}%
2242 \def\email##1##2{\unskip\@addpunct, \nolinkurl{##2}}%
2243 \addresses
2244 \egroup}
```

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

```
2245 \def\@setaddresses{}
```

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

```
2246 \def\@authornotemark{\g@addto@macro\currentauthors{\footnotemark\relax}}
```

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

```
2247 \def\@@authornotemark#1{\g@addto@macro\currentauthors{\footnotemark[#1]}}
```

\mkteasers Typesetting the teasers

```
2248 \def\mkteasers{%
2249 \ifx\@teaserfigures\empty\else
2250 \def\@teaser##1{\par\bigskip\bgroup
2251 \captionsetup{type=figure}##1\egroup\par}
2252 \global\setbox\mktitle@bx=\vbox{\noindent\box\mktitle@bx\par
2253 \noindent\@Description@presentfalse
2254 \@teaserfigures\par\if@Description@present\else
2255 \global\@undescrbed@imagestrue
2256 \ClassWarning{\@classname}{A possible image without
2257 description}\fi
2258 \medskip}%
2259 \fi}
```

\mkabstract Typesetting the abstract

```
2260 \def\mkabstract{\bgroup
2261   \ifx\@abstract\@empty\else
2262     {\phantomsection\addcontentsline{toc}{section}{Abstract}%
2263      \if@ACM@journal
2264        \everypar{\setbox\z@\lastbox\everypar{}}\small
2265      \else
2266        \section*{\abstractname}%
2267      \fi
2268      \ignorespaces\@abstract\par}%
2269   \fi\egroup}
```

\mkbibcitation Print the bibcitation format

```
2270 \def\mkbibcitation{\bgroup
2271   \let\@vspace\@vspace@orig
2272   \let\@vspacer\@vspacer@orig
2273   \def\@pages@word{\ifnum\getrefnumber{TotPages}=1\relax page\else pages\fi}%
2274   \def\footnotemark{}%
2275   \def\{\@unskip{} \ignorespaces}%
2276   \def\footnote{\ClassError{\@classname}{Please do not use footnotes
2277     inside a \string\title{} or \string\author{} command! Use
2278     \string\titlenote{} or \string\authornote{} instead!}}%
2279   \def\@article@string{\ifx\@acmArticle\@empty{\ } \else,
2280     Article~\@acmArticle\ }%
2281   \par\medskip\small\noindent{\bfseries ACM Reference Format:}\par\nobreak
2282   \noindent\bgroup
2283     \def\{\@unskip{}, \ignorespaces}\authors\egroup. \@acmYear. \@title
2284     \ifx\@subtitle\@empty. \else: \@subtitle. \fi
2285     \if@ACM@nonacm\else
2286       % The 'nonacm' option disables 'printacmref' by default,
2287       % and the present \mkbibcitation definition is never used
2288       % in this case. The conditional remains useful if the user
2289       % explicitly sets \settopmatter{printacmref=true}.
2290       \if@ACM@journal@bibstrip
2291         \textit{\@journalNameShort}
2292         \@acmVolume, \@acmNumber \@article@string (\@acmPubDate),
2293         \ref{TotPages}~\@pages@word.
2294       \else
2295         In \textit{\@acmBooktitle}%
2296         \ifx\@acmEditors\@empty\textit{.}\else
2297           \andify\@acmEditors\textit{, } \@acmEditors~\@editorsAbbrev.%
2298         \fi\
2299         ACM, New York, NY, USA%
2300         \@article@string\unskip, \ref{TotPages}~\@pages@word.
2301       \fi
2302     \fi
2303     \ifx\@acmDOI\@empty\else\@formatdoi{\@acmDOI}\fi
2304   \par\egroup}
```



\@printendtopmatter End the top matter

```
2305 \def\@printendtopmatter{\bgroup
2306   \let\@vspace\@vspace@orig
2307   \let\@vspacer\@vspacer@orig
2308   \par\bigskip
2309   \egroup}
```

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

```
2310 \def\@setthanks{\@long\def\thanks##1{\par##1\@addpunct.}\thankses}
```

\@setauthorsaddresses

```
2311 \def\@setauthorsaddresses{\@authorsaddresses\unskip\@addpunct.}
```

### 3.16 Headers and Footers

We use fancyhdr for our headers and footers:

```
2312 \RequirePackage{fancyhdr}
```

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

```
2313 \let\ACM@ps@plain\ps@plain
2314 \let\ACM@ps@myheadings\ps@myheadings
2315 \let\ACM@ps@headings\ps@headings
2316 \def\ACM@restore@pagestyle{%
2317   \let\ps@plain\ACM@ps@plain
2318   \let\ps@myheadings\ACM@ps@myheadings
2319   \let\ps@headings\ACM@ps@headings}
2320 \AtBeginDocument{\ACM@restore@pagestyle}
```

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

```
2321 \if@ACM@review
2322   \newsavebox{\ACM@linecount@bx}
2323   \newlength\ACM@linecount@bxht
2324   \newcount\ACM@linecount
2325   \ACM@linecount\@ne\relax
2326   \def\ACM@mk@linecount{%
2327     \savebox{\ACM@linecount@bx}[4em][t]{\parbox[t]{4em}{\normalfont
2328       \normalsize
2329       \setlength{\ACM@linecount@bxht}{0pt}%
2330       \loop{\color{red}\scriptsize\the\ACM@linecount}\@
2331       \global\advance\ACM@linecount by \@ne
2332       \addtolength{\ACM@linecount@bxht}{\baselineskip}%
2333       \ifdim\ACM@linecount@bxht<\textheight\repeat
2334       {\color{red}\scriptsize\the\ACM@linecount}\hfill
2335       \global\advance\ACM@linecount by \@ne}}
2336 \fi
```

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

```
2337 \def\ACM@linecountL{%
```

```

2338 \if@ACM@review
2339 \ACM@mk@linecount
2340 \begin{picture}(0,0)%
2341 \put(-26,-22){\usebox{\ACM@linecount@bx}}%
2342 \end{picture}%
2343 \fi}

\ACM@linecountR How to display the box on the right
2344 \def\ACM@linecountR{%
2345 \if@ACM@review
2346 \ACM@mk@linecount
2347 \begin{picture}(0,0)%
2348 \put(20,-22){\usebox{\ACM@linecount@bx}}%
2349 \end{picture}%
2350 \fi}

\ACM@timestamp The timestamp system
2351 \if@ACM@timestamp
2352 % Subtracting 30 from \time gives us the effect of rounding down despite
2353 % \numexpr rounding to nearest
2354 \newcounter{ACM@time@hours}
2355 \setcounter{ACM@time@hours}{\numexpr (\time - 30) / 60 \relax}
2356 \newcounter{ACM@time@minutes}
2357 \setcounter{ACM@time@minutes}{\numexpr \time - \theACM@time@hours * 60 \relax}
2358 \newcommand\ACM@timestamp{%
2359 \footnotesize%
2360 \ifx\@acmSubmissionID\@empty\relax\else
2361 Submission ID: \@acmSubmissionID.{ }%
2362 \fi
2363 \the\year-\two@digits{\the\month}-\two@digits{\the\day}{ }%
2364 \two@digits{\theACM@time@hours}:\two@digits{\theACM@time@minutes}{. }%
2365 Page \thepage\ of \@startPage--\pageref*{TotPages}.%
2366 }
2367 \fi

\@shortauthors Even if the author redefined \shortauthors, we do not print it in the headers when in
anonymous mode:
2368 \def\@shortauthors{%
2369 \if@ACM@anonymous
2370 Anon.
2371 \ifx\@acmSubmissionID\@empty\else Submission Id: \@acmSubmissionID\fi
2372 \else\shortauthors\fi}

\@headfootfont The font to typeset header and footer text.
2373 \def\@headfootfont{\sffamily\footnotesize}

standardpagestyle The page style for all pages but the first one The page style for all pages but the first one
2374 \AtBeginDocument{%
2375 \fancypagestyle{standardpagestyle}{%

```

```

2376 \fancyhf{}%
2377 \renewcommand{\headrulewidth}{\z@}%
2378 \renewcommand{\footrulewidth}{\z@}%
2379 \def\@acmArticlePage{%
2380   \ifx\@acmArticle\empty%
2381     \if@ACM@printfolios\thepage\fi%
2382   \else%
2383     \@acmArticle\if@ACM@printfolios:\thepage\fi%
2384   \fi%
2385 }%
2386 \if@ACM@journal@bibstrip
2387   \ifcase\ACM@format@nr
2388   \relax % manuscript
2389     \fancyhead[LE]{\ACM@linecountL\if@ACM@printfolios\thepage\fi}%
2390     \fancyhead[RO]{\if@ACM@printfolios\thepage\fi}%
2391     \fancyhead[RE]{\@shortauthors}%
2392     \fancyhead[LO]{\ACM@linecountL\shorttitle}%
2393     \if@ACM@nonacm\else%
2394       \fancyfoot[RO,LE]{\footnotesize Manuscript submitted to ACM}
2395     \fi%
2396 \or % acmsmall
2397   \fancyhead[LE]{\ACM@linecountL\@headfootfont\@acmArticlePage}%
2398   \fancyhead[RO]{\@headfootfont\@acmArticlePage}%
2399   \fancyhead[RE]{\@headfootfont\@shortauthors}%
2400   \fancyhead[LO]{\ACM@linecountL\@headfootfont\shorttitle}%
2401   \if@ACM@nonacm\else%
2402     \fancyfoot[RO,LE]{\footnotesize \@journalNameShort, Vol. \@acmVolume, No.
2403       \@acmNumber, Article \@acmArticle. Publication date: \@acmPubDate.}%
2404   \fi
2405 \or % acmlarge
2406   \fancyhead[LE]{\ACM@linecountL\@headfootfont
2407     \@acmArticlePage\quad\textbullet\quad\@shortauthors}%
2408   \fancyhead[LO]{\ACM@linecountL}%
2409   \fancyhead[RO]{\@headfootfont
2410     \shorttitle\quad\textbullet\quad\@acmArticlePage}%
2411   \if@ACM@nonacm\else%
2412     \fancyfoot[RO,LE]{\footnotesize \@journalNameShort, Vol. \@acmVolume, No.
2413       \@acmNumber, Article \@acmArticle. Publication date: \@acmPubDate.}%
2414   \fi
2415 \or % acmtog
2416   \fancyhead[LE]{\ACM@linecountL\@headfootfont
2417     \@acmArticlePage\quad\textbullet\quad\@shortauthors}%
2418   \fancyhead[LO]{\ACM@linecountL}%
2419   \fancyhead[RE]{\ACM@linecountR}%
2420   \fancyhead[RO]{\@headfootfont
2421     \shorttitle\quad\textbullet\quad\@acmArticlePage\ACM@linecountR}%
2422   \if@ACM@nonacm\else%
2423     \fancyfoot[RO,LE]{\footnotesize \@journalNameShort, Vol. \@acmVolume, No.
2424       \@acmNumber, Article \@acmArticle. Publication date: \@acmPubDate.}%
2425   \fi

```

```

2426 \else % Proceedings
2427 \fancyfoot[C]{\if@ACM@printfolios\footnotesize\thepage\fi}%
2428 \fancyhead[LO]{\ACM@linecountL\@headfootfont\shorttitle}%
2429 \fancyhead[RE]{\@headfootfont\@shortauthors\ACM@linecountR}%
2430 \if@ACM@nonacm\else%
2431 \fancyhead[LE]{\ACM@linecountL\@headfootfont\footnotesize
2432 \acmConference@shortname,
2433 \acmConference@date, \acmConference@venue}%
2434 \fancyhead[RO]{\@headfootfont
2435 \acmConference@shortname,
2436 \acmConference@date, \acmConference@venue\ACM@linecountR}%
2437 \fi
2438 \fi
2439 \else % Proceedings
2440 \fancyfoot[C]{\if@ACM@printfolios\footnotesize\thepage\fi}%
2441 \fancyhead[LO]{\ACM@linecountL\@headfootfont\shorttitle}%
2442 \fancyhead[RE]{\@headfootfont\@shortauthors\ACM@linecountR}%
2443 \if@ACM@nonacm\else%
2444 \fancyhead[LE]{\ACM@linecountL\@headfootfont
2445 \acmConference@shortname,
2446 \acmConference@date, \acmConference@venue}%
2447 \fancyhead[RO]{\@headfootfont
2448 \acmConference@shortname,
2449 \acmConference@date, \acmConference@venue\ACM@linecountR}%
2450 \fi
2451 \fi
2452 \if@ACM@sigchiamode
2453 \fancyheadoffset[L]{\dimexpr(\marginparsep+\marginparwidth)}%
2454 \fi
2455 \if@ACM@timestamp
2456 \fancyfoot[LO,RE]{\ACM@timestamp}
2457 \fi
2458 }%
2459 \pagestyle{standardpagestyle}
2460 }

\@folio@wd Folio blob width, height, offsets and max number
\@folio@ht
\@folio@voffset
\@folio@max
2461 \newdimen\@folio@wd
2462 \@folio@wd=\z@
2463 \newdimen\@folio@ht
2464 \@folio@ht=\z@
2465 \newdimen\@folio@voffset
2466 \@folio@voffset=\z@
2467 \def\@folio@max{1}
2468 \ifcase\ACM@format@nr
2469 \relax % manuscript
2470 \or % acmsmall
2471 \@folio@wd=45.75pt\relax
2472 \@folio@ht=1.25in\relax
2473 \@folio@voffset=.2in\relax

```

```

2474 \def\@folio@max{8}
2475 \or % acmlarge
2476 \@folio@wd=43.25pt\relax
2477 \@folio@ht=79pt\relax
2478 \@folio@voffset=.55in\relax
2479 \def\@folio@max{10}
2480 \fi

```

\@folioblob The macro to typeset the folio blob.

```

2481 \def\@folioblob{\@tempcnta=0\@acmArticleSeq\relax
2482 \ifnum\@tempcnta=0\relax\else
First, we calculate \@acmArticleSeq modulo \@folio@max
2483 \loop
2484 \ifnum\@tempcnta>\@folio@max\relax
2485 \advance\@tempcnta by - \@folio@max
2486 \repeat
2487 \advance\@tempcnta by -1\relax
2488 \@tempdima=\@folio@ht\relax
2489 \multiply\@tempdima by \the\@tempcnta\relax
2490 \advance\@tempdima by -\@folio@voffset\relax
2491 \begin{picture}(0,0)
2492 \makebox[\z@]{\raisebox{-\@tempdima}{%
2493 \rlap{%
2494 \raisebox{-0.45\@folio@ht}{\z@}{\z@}{%
2495 \rule{\@folio@wd}{\@folio@ht}}}%
2496 \parbox{\@folio@wd}{%
2497 \centering
2498 \textcolor{white}{\LARGE\sffamily\bfseries\@acmArticle}}}}
2499 \end{picture}\fi}
2500

```

firstpagestyle The page style for the first page only.

```

2501 \AtBeginDocument{%
2502 \fancypagestyle{firstpagestyle}{%
2503 \fancyhf{}%
2504 \renewcommand{\headrulewidth}{\z@}%
2505 \renewcommand{\footrulewidth}{\z@}%
2506 \if@ACM@journal@bibstrip
2507 \ifcase\ACM@format@nr
2508 \relax % manuscript
2509 \fancyhead[L]{\ACM@linecountL}%
2510 \fancyfoot[RO,LE]{\if@ACM@printfolios\small\thepage\fi}%
2511 \if@ACM@nonacm\else%
2512 \fancyfoot[RE,LO]{\footnotesize Manuscript submitted to ACM}%
2513 \fi%
2514 \or % acmsmall
2515 \if@ACM@nonacm\else%
2516 \fancyfoot[RO,LE]{\footnotesize \@journalNameShort, Vol. \@acmVolume, No.
2517 \@acmNumber, Article \@acmArticle. Publication date:

```

```

2518         \@acmPubDate.}%
2519     \fi%
2520     \fancyhead[LE]{\ACM@linecountL\@folioblob}%
2521     \fancyhead[LO]{\ACM@linecountL}%
2522     \fancyhead[RO]{\@folioblob}%
2523     \fancyheadoffset[RO,LE]{0.6\@folio@wd}%
2524 \or % acmlarge
2525     \if@ACM@nonacm\else%
2526     \fancyfoot[RO,LE]{\footnotesize \@journalNameShort, Vol. \@acmVolume, No.
2527         \@acmNumber, Article \@acmArticle. Publication date:
2528         \@acmPubDate.}%
2529     \fi%
2530     \fancyhead[RO]{\@folioblob}%
2531     \fancyhead[LE]{\ACM@linecountL\@folioblob}%
2532     \fancyhead[LO]{\ACM@linecountL}%
2533     \fancyheadoffset[RO,LE]{1.4\@folio@wd}%
2534 \or % acmtog
2535     \if@ACM@nonacm\else%
2536     \fancyfoot[RO,LE]{\footnotesize \@journalNameShort, Vol. \@acmVolume, No.
2537         \@acmNumber, Article \@acmArticle. Publication date:
2538         \@acmPubDate.}%
2539     \fi%
2540     \fancyhead[L]{\ACM@linecountL}%
2541     \fancyhead[R]{\ACM@linecountR}%
2542 \else % Conference proceedings
2543     \fancyhead[L]{\ACM@linecountL}%
2544     \fancyhead[R]{\ACM@linecountR}%
2545     \fancyfoot[C]{\if@ACM@printfolios\footnotesize\thepage\fi}%
2546 \fi
2547 \else
2548     \fancyhead[L]{\ACM@linecountL}%
2549     \fancyhead[R]{\ACM@linecountR}%
2550     \fancyfoot[C]{\if@ACM@printfolios\footnotesize\thepage\fi}%
2551 \fi
2552 \if@ACM@timestamp
2553     \ifnum\ACM@format@nr=0\relax % Manuscript
2554     \fancyfoot[LO,RE]{\ACM@timestamp\quad
2555         \if@ACM@nonacm\else
2556         \footnotesize Manuscript submitted to ACM
2557         \fi}
2558     \else
2559     \fancyfoot[LO,RE]{\ACM@timestamp}
2560     \fi
2561 \fi
2562 }}

```

### 3.17 Sectioning

\ACM@NRadjust Ross Moore's macro.

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

To style the section-number, the line `#1{}` is used at the end of `\ACM@NRadjust`. This imposes style-changing commands for fonts and sizes, but any `\MakeUppercase` acts on just the `{}`. It's a bit hacky, by essentially assuming that only numbers occur here, not letters to be case-changed. (This should be acceptable in a class-file, as it ought to be possible to change the case elsewhere, if that was ever desired.) Also, it can result in `\@adddotafter` being called too soon, so a slight adjustment is made, via `\ACM@adddotafter`, which now tests whether its argument is empty. But the coding has to allow for other packages to have also patched `\@adddotafter`.

```

2563 \def\ACM@NRadjust#1{%
2564   \begingroup
2565   \expandafter\ifx\csname Sectionformat\endcsname\relax
2566   % do nothing when \Sectionformat is unknown
2567   \def\next{\endgroup #1}%
2568   \else
2569   \def\next{\endgroup
2570     \let\realSectionformat\Sectionformat
2571     \def\ACM@sect@format@{#1}%
2572     \let\Sectionformat\ACM@NR@adjustedSectionformat
2573     %% next lines added 2018-06-17 to ensure section number is styled
2574     \let\real@adddotafter\@adddotafter
2575     \let\@adddotafter\ACM@adddotafter
2576     #1}% imposes the styles, but nullifies \MakeUppercase
2577     \let\@adddotafter\real@adddotafter
2578   }%
2579   \fi \next
2580 }
```

`\ACM@NR@adjustedSectionformat`

```

2581 \def\ACM@NR@adjustedSectionformat#1#2{%
2582   \realSectionformat{\ACM@sect@format{#1}}{#2}%
2583   \let\Sectionformat\realSectionformat}
2584 \DeclareRobustCommand{\ACM@sect@format@}{\ACM@sect@format@}
2585 \def\ACM@sect@format@null#1{#1}
2586 \let\ACM@sect@format@\ACM@sect@format@null
2587 \AtBeginDocument{%
2588   \expandafter\ifx\csname LTX@adddotafter\endcsname\relax
2589   \let\LTX@adddotafter\@adddotafter
2590   \fi
```

```

2591 }

\ACM@adddotafter
2592 \def\ACM@adddotafter#1{\ifx\relax#1\relax\else\LTX@adddotafter{#1}\fi}

Sectioning is different for different levels
2593 \renewcommand\section{\@startsection{section}{1}{\z@}%
2594 {- .75\baselineskip \@plus -2\p@ \@minus -.2\p@}%
2595 {.25\baselineskip}%
2596 {\ACM@NRadjust\@secfont}}
2597 \renewcommand\subsection{\@startsection{subsection}{2}{\z@}%
2598 {- .75\baselineskip \@plus -2\p@ \@minus -.2\p@}%
2599 {.25\baselineskip}%
2600 {\ACM@NRadjust\@subsecfont}}
2601 \renewcommand\subsubsection{\@startsection{subsubsection}{3}{\z@}%
2602 {- .5\baselineskip \@plus -2\p@ \@minus -.2\p@}%
2603 {-3.5\p@}%
2604 {\ACM@NRadjust{\@subsubsecfont\@adddotafter}}}}
2605 \renewcommand\paragraph{\@startsection{paragraph}{4}{\parindent}%
2606 {- .5\baselineskip \@plus -2\p@ \@minus -.2\p@}%
2607 {-3.5\p@}%
2608 {\ACM@NRadjust{\@parfont\@adddotafter}}}}
2609 \renewcommand\part{\@startsection{part}{9}{\z@}%
2610 {-10\p@ \@plus -4\p@ \@minus -2\p@}%
2611 {4\p@}%
2612 {\ACM@NRadjust\@parfont}}

\section@raggedright Special version of \raggedright compatible with \MakeUppercase
2613 \def\section@raggedright{\@rightskip\@flushglue
2614 \rightskip\@rightskip
2615 \leftskip\z@skip
2616 \parindent\z@}

\@secfont Fonts for sections etc. are different for different formats.
\@subsecfont
\@subsubsecfont
\@parfont
2617 \def\@secfont{\sffamily\bfseries\section@raggedright\MakeTextUppercase}
2618 \def\@subsecfont{\sffamily\bfseries\section@raggedright}
2619 \def\@subsubsecfont{\sffamily\itshape}
2620 \def\@parfont{\itshape}
2621 \setcounter{secnumdepth}{3}
2622 \ifcase\ACM@format@nr
2623 \relax % manuscript
2624 \or % acmsmall
2625 \or % acmlarge
2626 \def\@secfont{\sffamily\large\section@raggedright\MakeTextUppercase}
2627 \def\@subsecfont{\sffamily\large\section@raggedright}
2628 \or % acmtog
2629 \def\@secfont{\sffamily\large\section@raggedright\MakeTextUppercase}
2630 \def\@subsecfont{\sffamily\large\section@raggedright}
2631 \or % sigconf

```



```

2632 \def\@secfont{\bfseries\Large\section@raggedright\MakeTextUppercase}
2633 \def\@subsecfont{\bfseries\Large\section@raggedright}
2634 \or % siggraph
2635 \def\@secfont{\sffamily\bfseries\Large\section@raggedright\MakeTextUppercase}
2636 \def\@subsecfont{\sffamily\bfseries\Large\section@raggedright}
2637 \or % sigplan
2638 \def\@secfont{\bfseries\Large\section@raggedright}
2639 \def\@subsecfont{\bfseries\section@raggedright}
2640 \renewcommand\subsubsection{\@startsection{subsubsection}{3}{\z@}%
2641   {- .75\baselineskip \@plus -2\p@ \@minus -.2\p@}%
2642   {.25\baselineskip}%
2643   {\@subsubsecfont}}
2644 \def\@subsubsecfont{\bfseries\section@raggedright}
2645 \renewcommand\paragraph{\@startsection{paragraph}{4}{\z@}%
2646   {- .5\baselineskip \@plus -2\p@ \@minus -.2\p@}%
2647   {-3.5\p@}%
2648   {\@parfont\@addspaceafter}}
2649 \def\@parfont{\bfseries\itshape}
2650 \renewcommand\subparagraph{\@startsection{subparagraph}{5}{\z@}%
2651   {- .5\baselineskip \@plus -2\p@ \@minus -.2\p@}%
2652   {-3.5\p@}%
2653   {\@subparfont\@addspaceafter}}
2654 \def\@subparfont{\itshape}
2655 \or % sigchi
2656 \setcounter{secnumdepth}{1}
2657 \def\@secfont{\sffamily\bfseries\section@raggedright\MakeTextUppercase}
2658 \def\@subsecfont{\sffamily\bfseries\section@raggedright}
2659 \or % sigchi-a
2660 \setcounter{secnumdepth}{0}
2661 \def\@secfont{\sffamily\bfseries\section@raggedright\MakeTextUppercase}
2662 \def\@subsecfont{\sffamily\bfseries\section@raggedright}
2663 \fi

```

\@adddotafter Add punctuation after a sectioning command

```
2664 \def\@adddotafter#1{#1\@addpunct{.}}
```

\@addspaceafter Add space after a sectioning command

```
2665 \def\@addspaceafter#1{#1\@addpunct{\enspace}}
```

### 3.18 TOC lists

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

```
2666 \providecommand*\@dotsep{4.5}
```

### 3.19 Theorems

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

2667 `\def\acmplainbodyfont{\itshape}`

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

2668 `\def\acmplainindent{\parindent}`

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

2669 `\def\acmplainheadfont{\scshape}`

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

2670 `\def\acmplainnotefont{\@empty}`

Customization of the acmplain theorem style:

2671 `\ifcase\ACM@format@nr`

2672 `\relax % manuscript`

2673 `\or % acmsmall`

2674 `\or % acmlarge`

2675 `\or % acmtog`

2676 `\or % sigconf`

2677 `\or % siggraph`

2678 `\or % sigplan`

2679 `\def\acmplainbodyfont{\itshape}`

2680 `\def\acmplainindent{\z@}`

2681 `\def\acmplainheadfont{\bfseries}`

2682 `\def\acmplainnotefont{\normalfont}`

2683 `\or % sigchi`

2684 `\or % sigchi-a`

2685 `\fi`

`acmplain` The acmplain theorem style

2686 `\newtheoremstyle{acmplain}%`

2687 `{.5\baselineskip\@plus.2\baselineskip`

2688 `\@minus.2\baselineskip}% space above`

2689 `{.5\baselineskip\@plus.2\baselineskip`

2690 `\@minus.2\baselineskip}% space below`

2691 `{\acmplainbodyfont}% body font`

2692 `{\acmplainindent}% indent amount`

2693 `{\acmplainheadfont}% head font`

2694 `{.}% punctuation after head`

2695 `{.5em}% spacing after head`

2696 `{\thmname{#1}\thmnumber{ #2}\thmnote{ {\acmplainnotefont(#3)}}}% head spec`

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

2697 `\def\acmdefinitionbodyfont{\normalfont}`

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

2698 `\def\acmdefinitionindent{\parindent}`

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

```
2699 \def\@acmdefinitionheadfont{\itshape}
```

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

```
2700 \def\@acmdefinitionnotefont{\@empty}
```

Customization of the acmdefinition theorem style:

```
2701 \ifcase\ACM@format@nr
2702 \relax % manuscript
2703 \or % acmsmall
2704 \or % acmlarge
2705 \or % acmtog
2706 \or % sigconf
2707 \or % siggraph
2708 \or % sigplan
2709 \def\@acmdefinitionbodyfont{\normalfont}
2710 \def\@acmdefinitionindent{\z@}
2711 \def\@acmdefinitionheadfont{\bfseries}
2712 \def\@acmdefinitionnotefont{\normalfont}
2713 \or % sigchi
2714 \or % sigchi-a
2715 \fi
```

`acmdefinition` The acmdefinition theorem style

```
2716 \newtheoremstyle{acmdefinition}%
2717 { .5\baselineskip\@plus.2\baselineskip
2718   \@minus.2\baselineskip}% space above
2719 { .5\baselineskip\@plus.2\baselineskip
2720   \@minus.2\baselineskip}% space below
2721 {\@acmdefinitionbodyfont}% body font
2722 {\@acmdefinitionindent}% indent amount
2723 {\@acmdefinitionheadfont}% head font
2724 { .}% punctuation after head
2725 { .5em}% spacing after head
2726 {\thmname{#1}\thmnumber{ #2}\thmnote{ \@acmdefinitionnotefont{#3}}}% head spec
```

Make acmplain the default theorem style.

```
2727 \theoremstyle{acmplain}
```

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

```
2728 \AtEndPreamble{%
2729   \if@ACM@acmthm
```

```

2730 \theoremstyle{acmplain}
2731 \@ifundefined{theorem}{%
2732 \newtheorem{theorem}{Theorem}[section]
2733 }{}
2734 \@ifundefined{conjecture}{%
2735 \newtheorem{conjecture}[theorem]{Conjecture}
2736 }{}
2737 \@ifundefined{proposition}{%
2738 \newtheorem{proposition}[theorem]{Proposition}
2739 }{}
2740 \@ifundefined{lemma}{%
2741 \newtheorem{lemma}[theorem]{Lemma}
2742 }{}
2743 \@ifundefined{corollary}{%
2744 \newtheorem{corollary}[theorem]{Corollary}
2745 }{}
2746 \theoremstyle{acmdefinition}
2747 \@ifundefined{example}{%
2748 \newtheorem{example}[theorem]{Example}
2749 }{}
2750 \@ifundefined{definition}{%
2751 \newtheorem{definition}[theorem]{Definition}
2752 }{}
2753 \fi
2754 \theoremstyle{acmplain}
2755 }

\@proofnamefont The font to typeset the proof name.
2756 \def\@proofnamefont{\scshape}

\@proofindent Whether or not to indent proofs.
2757 \def\@proofindent{\indent}

Customization of the proof environment.
2758 \ifcase\ACM@format@nr
2759 \relax % manuscript
2760 \or % acmsmall
2761 \or % acmlarge
2762 \or % acmtog
2763 \or % sigconf
2764 \or % siggraph
2765 \or % sigplan
2766 \def\@proofnamefont{\itshape}
2767 \def\@proofindent{\noindent}
2768 \or % sigchi
2769 \or % sigchi-a
2770 \fi

proof We want some customization of the proof environment.

```

```

2771 \renewenvironment{proof}[1][\proofname]{\par
2772   \pushQED{\qed}%
2773   \normalfont \topsep6\p@\@plus6\p@\relax
2774   \trivlist
2775   \item[\@proofindent\hskip\labelsep
2776         {\@proofnamefont #1\@addpunct{.}}]\ignorespaces
2777 }{%
2778   \popQED\endtrivlist\@endpfalse
2779 }

```

### 3.20 Balancing columns

We need balancing only if the user did not disable it, and we use a two column format

```

2780 \AtEndPreamble{%
2781   \if@ACM@balance
2782     \ifcase\ACM@format@nr
2783       \relax % manuscript
2784       \global\@ACM@balancefalse
2785       \or % acmsmall
2786       \global\@ACM@balancefalse
2787       \or % acmlarge
2788       \global\@ACM@balancefalse
2789       \or % acmtog
2790       \RequirePackage{balance}%
2791       \or % sigconf
2792       \RequirePackage{balance}%
2793       \or % siggraph
2794       \RequirePackage{balance}%
2795       \or % sigplan
2796       \RequirePackage{balance}%
2797       \or % sigchi
2798       \RequirePackage{balance}%
2799       \or % sigchi-a
2800       \global\@ACM@balancefalse
2801     \fi
2802   \fi
2803 }
2804 \AtEndDocument{%
2805   \if@ACM@balance
2806     \if@twocolumn
2807       \balance
2808     \fi\fi}

```

### 3.21 Acknowledgments

\acksname

```
2809 \newcommand\acksname{Acknowledgments}
```

\acks This is a comment-like structure

```

2810 \specialcomment{acks}{%
2811   \begingroup
2812   \section*{\acksname}
2813   \phantomsection\addcontentsline{toc}{section}{\acksname}
2814 }{%
2815   \endgroup
2816 }

```

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

```

2817 \def\grantsponsor#1#2#3{#2}

```

`\grantnum`

```

2818 \newcommand\grantnum[3][{}]{#3%
2819   \def\@tempa{#1}\ifx\@tempa\@empty\else\space(\url{#1})\fi}

```

### 3.22 Conditional typesetting

We use the `comment` package for conditional typesetting:

```

2820 \AtEndPreamble{%
2821   \if@ACM@screen
2822     \includecomment{screenonly}
2823     \excludecomment{printonly}
2824   \else
2825     \excludecomment{screenonly}
2826     \includecomment{printonly}
2827   \fi
2828   \if@ACM@anonymous
2829     \excludecomment{anonsuppress}
2830     \excludecomment{acks}
2831   \else
2832     \includecomment{anonsuppress}
2833   \fi}

```

### 3.23 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/>).

```

2834 \newcommand\showeprint[2][arxiv]{%
2835   \def\@tempa{#1}%
2836   \ifx\@tempa\@empty\def\@tempa{arxiv}\fi
2837   \def\@tempb{arxiv}%
2838   \ifx\@tempa\@tempb
2839     arXiv:\href{http://arxiv.org/abs/#2}{#2}\else arXiv:#2%
2840   \fi}

```

### 3.24 End of Class

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

```
2841 \let\@vspace@orig=\@vspace
2842 \let\@vspacer@orig=\@vspacer
2843 \apptocmd{\@vspace}{\ClassWarning{\@classname}{\string\vspace\space should
2844     only be used to provide space above/below surrounding
2845     objects}}{}{}
2846 \apptocmd{\@vspacer}{\ClassWarning{\@classname}{\string\vspace\space should
2847     only be used to provide space above/below surrounding
2848     objects}}{}{}
```

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

```
2849 \let\ACM@origbaselinestretch\baselinestretch
2850 \AtEndDocument{\ifx\baselinestretch\ACM@origbaselinestretch\else
2851     \ClassError{\@classname}{An attempt to redefine
2852         \string\baselinestretch\space detected. Please do not do this for
2853         ACM submissions!}\fi}

2854 \normalsize\normalfont\frenchspacing
2855 </class>
```

## References

- [1] UK T<sub>E</sub>X Users Group. UK list of T<sub>E</sub>X frequently asked questions. <https://texfaq.org>, 2019.
- [2] Michael Downes and Barbara Beeton. *The amsart, amsproc, and amsbook document classes*. American Mathematical Society, August 2004. <http://www.ctan.org/pkg/amslatex>.
- [3] Cristophe Fiorio. *algorithm2e.sty—package for algorithms*, October 2015. <http://www.ctan.org/pkg/algorithm2e>.
- [4] Rogério Brito. *The algorithms bundle*, August 2009. <http://www.ctan.org/pkg/algorithms>.
- [5] Carsten Heinz, Brooks Moses, and Jobst Hoffmann. *The Listings Package*, June 2015. <http://www.ctan.org/pkg/listings>.
- [6] Simon Fear. *Publication quality tables in 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. <http://identitystandards.acm.org>.
- [8] Axel Sommerfeldt. *The subcaption package*, April 2013. <http://www.ctan.org/pkg/subcaption>.
- [9] Boris Veytsman, Bern Schandl, Lee Netherton, and C. V. Radhakrishnan. *A package to create a nomenclature*, September 2005. <http://www.ctan.org/pkg/nomencl>.
- [10] Nicola L. C. Talbot. *User Manual for glossaries.sty v4.25*, June 2016. <http://www.ctan.org/pkg/subcaption>.
- [11] David Carlisle. *The textcase package*, October 2004. <http://www.ctan.org/pkg/textcase>.



## Change History

1.48	General: Added prologue option to xcolor . . . . .	44	Defined ACM colors . . . . .	32
	Bib code cleanup (Zack Weinberg)	32	Explicitly put draft option (closes <a href="https://github.com/borisveytsman/acmart/issues/4">https://github.com/borisveytsman/acmart/issues/4</a> ) . . . . .	35
	Documentation update (siggraph) .	32	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> ) . . . . .	32
1.49	General: New journal: DTRAP . . . . .	32		
1.53	General: New journals: PACMCGIT, TIOT, TDSCI . . . . .	32	v1.02	
	Rearranged docs . . . . .	32	General: Added TOPS and TSC (closes <a href="https://github.com/borisveytsman/acmart/issues/12">https://github.com/borisveytsman/acmart/issues/12</a> ) . . . . .	32
1.54	General: Moved footnote stuff before hyperref call (Ross Moore) . . . . .	32	Documentation changes (closes <a href="https://github.com/borisveytsman/acmart/issues/13">https://github.com/borisveytsman/acmart/issues/13</a> ) . . . . .	32
1.56	General: Documented \Description	32	v1.03	
1.57	General: Booktabs package is now the default . . . . .	32	\@formatdoi: Added macro . . . . .	71
1.58	General: Changes in samples (Enrico Gregorio) . . . . .	32	\if@ACM@authorversion: Added macro . . . . .	34
	New journal: HEALTH. TDS is renamed to TDSCI . . . . .	32	\maketitle: Added special case of authorversion . . . . .	74
1.60	\if@ACM@urlbreakonhyphens: introduced macro . . . . .	33	General: Added anonsuppress environment . . . . .	32
	General: New option: urlbreakonhyphens . . . . .	32	Added authorversion option (closes <a href="https://github.com/borisveytsman/acmart/issues/9">https://github.com/borisveytsman/acmart/issues/9</a> ) . . . . .	32
1.62	General: New journal: TELO . . . . .	32	v1.04	
1.63	General: New journal: FACMP . . . . .	32	\acmArticleSeq: Name change by Matthew Fluet . . . . .	64
	New journal: TQUANT . . . . .	32	\acmDOI: Name change by Matthew Fluet . . . . .	65
1.63a	General: Move: TQUANT to TQC . .	32	\acmISBN: Name change by Matthew Fluet . . . . .	65
1.64	General: Putting abstract after \maketitle now causes an error .	32	General: Updated bibliography for siggraph . . . . .	32
v1.00	General: First released version . . . . .	32	v1.05	
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> ) . . . . .	32	General: Added processing doi numbers for acmsiggraph and doi numbers for sigproc.bib . . . . .	32
			Patched \setcitestyle command; closes <a href="https://github.com/borisveytsman/acmart/issues/19">https://github.com/borisveytsman/acmart/issues/19</a> . . . . .	32

v1.06		\@marginatable: Now centering by default . . . . .	51
	\@ACM@badge@skip: Added macro . .		65
	\@ACM@badge@width: Added macro .		65
	\@ACM@title@width: Added macro .		65
	\@mktitle@i: Added processing badges . . . . .		79
	Made generic . . . . .		79
	\@mktitle@ii: Now this macro is obsolete . . . . .		80
	\@mktitle@iii: Added processing badges . . . . .		80
	Made more generic . . . . .		80
	\@mktitle@iv: Made more generic .		81
	\@printtopmatter: Added processing badges . . . . .		77
	\@subtitlefont: Added macro . . . .		79
	\@titlefont: Added macro . . . . .		79
	\acmBadgel: Added macro . . . . .		66
	\acmBadger: Added macro . . . . .		65
	\if@ACM@badge: Added macro . . . .		65
v1.07		\maketitle: Corrected a bug with abstract footnotes . . . . .	74
	Corrected a bug with permssion and footnotes order . . . . .		74
v1.08		General: SIGPLAN reformatting by Matthew Fluet . . . . .	32
	Typos corrected (Tobias Pape) . . .		32
v1.09		General: Revert SIGPLAN caption rules . . . . .	32
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> . . . . .	74
	General: Changes of ‘licensedothergov’ wording . . . .		69
	standardpagestyle: Reversed folios location . . . . .		90
v1.11		General: Customization of ACM theorem styles and proof environment by Matthew Fluet . .	32
v1.12		\@marginfigure: Now centering by default . . . . .	51
	\@parfont: Moved to \section@raggedright . . . . .		96
	\copyrightpermissionfootnoterule: Added macro . . . . .		47
	\descriptionlabel: Redefined . . . .		53
	\footnoterule: Made shorter . . . .		47
	\if@ACM@natbib@override: Added macro . . . . .		34
	\if@ACM@newfonts: Added macro . .		48
	\maketitle: Moved thankses to copyrightpermission box . . . . .		74
	\section@raggedright: Introduced macro . . . . .		96
	General: Added graceful behavior when libertine fonts are absent . .		48
	Documentation updates . . . . .		32
v1.13		\@mpfootnotetext: Made minipage footnotes centered . . . . .	43
	\bibliographystyle: Redefined macro . . . . .		44
	\bibstyle@acmauthoryear: Added macro . . . . .		39
	\bibstyle@acmnumeric: Added macro . . . . .		40
	\if@ACM@printfolios: Added macro		67
	General: Font adjustments for acmsmall . . . . .		82
	Increased font size for ACM Large		37
	Print bibliographic information by default for the proceedings . . . .		67
	standardpagestyle: Added headers for sigs . . . . .		90
	Expanded headers for sigchi-a . . .		90
	Suppressed folios if sig . . . . .		90
v1.14		\bibstyle@acmauthoryear: Moved def of \bibstyle@acmauthoryear before use . . . . .	39
	\bibstyle@acmnumeric: Moved def of \bibstyle@numeric before use . .		40
	General: \citestyle updates (Matthew Fluet) . . . . .		32
	Patched \citestyle . . . . .		38
v1.15		\@ACM@addtoaddress: Added macro	81
	\@mkauthors@iii: New authors system . . . . .		84

\shortauthors: Introduced macro . . . . .	90	\if@ACM@printacmref: Renamed from \if@ACM@printbib . . . . .	66
\typeset@author@bx: Moved to separate macro . . . . .	84	General: Slightly decreased margins for sigs . . . . .	45
\acks: Added macro . . . . .	101	standardpagestyle: Added paper title to sigs . . . . .	90
\affiliation: Added code for author groups . . . . .	62	v1.18	
\author: Added code for author groups . . . . .	61	\mkauthors@i: Now we andify affiliations . . . . .	83
\city: Added macro . . . . .	81	\typeset@author@line: Added macro . . . . .	83
\country: Added macro . . . . .	81	General: Natbib is now the default for all formats . . . . .	32
\department: Added macro . . . . .	81	v1.19	
\grantnum: Added macro . . . . .	102	\mkabstract: Include 'Abstract' in PDF bookmarks (Matthew Fluet) . . . . .	88
\grantsponsor: Added macro . . . . .	102	\acks: Include 'Acknowledgements' in PDF bookmarks (Matthew Fluet) . . . . .	101
\if@insideauthorgroup: Introduced macro . . . . .	61	General: Include 'Abstract', 'Acknowledgements', and 'References' in PDF bookmarks (Matthew Fluet) . . . . .	32
\institution: Added macro . . . . .	81	Include 'References' in PDF bookmarks (Matthew Fluet) . . . . .	38
\num@authorgroups: Renamed . . . . .	61	v1.20	
\orcid: Introduced macro . . . . .	63	\mkabstract: Deleted spurious space . . . . .	88
\position: Added macro . . . . .	81	General: Bug fixes for bst . . . . .	32
\postcode: Added macro . . . . .	81	v1.21	
\state: Added macro . . . . .	81	\showeprint: Added macro . . . . .	102
\streetaddress: Added macro . . . . .	81	v1.22	
standardpagestyle: Better handling of anonymous mode . . . . .	90	General: More bibliography changes for Aptara . . . . .	32
v1.16		v1.23	
\headfootfont: Added macro . . . . .	90	General: Add PACMPL journal option . . . . .	32
General: Formatting header/footer (Matthew Fluet) . . . . .	32	v1.24	
standardpagestyle: Customize header/footer text font . . . . .	90	General: Add IMWUT journal option . . . . .	54
v1.17		v1.25	
\makefnmark: Redefined . . . . .	43	General: Updated PACMPL . . . . .	54
\mkauthors: TOG now uses the same authors block as other journals . . . . .	82	v1.26	
\mkauthors@ii: Deleted . . . . .	84	General: Corrected \shortcite bug . . . . .	32
\mkbibcitation: Added \nobreak Changed format for sigs . . . . .	88	Documentation typos fixed (thanks to Stephen Spencer) . . . . .	32
\acmArticle: The default is now numerical . . . . .	64	v1.27	
\acmMonth: The default must be numerical. Closes #50. . . . .	65	\if@ACM@printccs: Typo corrected . . . . .	66
\acmNumber: The default is now numerical . . . . .	64	v1.28	
\acmVolume: The default is now numerical . . . . .	64	\ccsdesc@parse: Change from \to to \textrightarrow (Matteo Riondato) . . . . .	68
\acmYear: The default is now numerical . . . . .	64	General: Corrected option natbib behavior . . . . .	40
\description: Decreased indent . . . . .	53		
\grantnum: Added url . . . . .	102		
\grantsponsor: Renamed . . . . .	102		

Got rid of warnings in pdf keywords	43	\@mkauthors@iv: Added	
v1.29		obeypunctuation code	86
\@mkabstract: Removed spurious indentation (John Wickerson)	88	\@subtitlefont: Added	
\ccsdesc@parse: Add spacing after bullet and around rightharpoon;		\normalsize	79
semicolon separators no longer in bold/italic (John Wickerson)	68	\ACM@linecountL: Renamed macro	89
General: Increased head to 13pt	45	\ACM@linecountR: Added macro	90
standardpagestyle: Corrected printfolios (Matthew Fluet)	90	\ACM@timestamp: Added current page number	90
v1.30		Added macro (Michael D. Adams)	90
\department: Added optional parameter	81	Added submission id	90
General: Added \frenchspacing	103	\acmSubmissionID: Added macro	65
Bibtex style now recognizes https:// in doi	32	\city: Added obeypunctuation code	81
Switched to T1: looks like libertine has problems with \l in OT1	49	\country: Added obeypunctuation code	81
Updated IMWUT and PACMPL	54	\department: Added obeypunctuation code	81
v1.31		\if@ACM@affiliation@obeypunctuation: Added macro	62
\@additionalaffiliation: Added macro	63	\if@ACM@authordraft: Added macro	35
\@mkbibcitation: Disabled linebreak	88	\if@ACM@natbib@override: Deleted macro	34
\@startsection: Added \tochangmeasure	40	\if@ACM@timestamp: Added macro (Michael D. Adams)	35
Redefined macro	42	\institution: Added obeypunctuation code	81
\@textbottom: Redefined	48	\maketitle: Fixed the bug with figures on top and bottom of the title page, thanks to David Epstein	74
\acmMonth: The default now is the current month (Matteo Riondato)	65	\position: Added obeypunctuation code	81
\acmYear: The default now is the current year (Matteo Riondato)	64	\postcode: Added obeypunctuation code	81
\additionalaffiliation: Added macro	62	\state: Added obeypunctuation code	81
\l@section: Redefined macro	42	\streetaddress: Added obeypunctuation code	81
\l@subsubsection: Redefined macro	42	General: Added acmart-preload-hook	32
General: Documentation changes	32	Added cmap and glyphtounicode	48
v1.32		BibTeX comma before articleno bug corrected	32
\@formatdoi: New doi format	71	BibTeX crossref bug corrected	32
General: Added POMACS journal option	32	BibTeX numpages bug corrected	32
Format siggraph is now obsolete	32	Documentation updates	32
v1.33		Moved \citename definition for non-natbib bibliography, so a package may redefine it	44
\@ACM@addtoaddress: Added obeypunctuation code	81	Switched to Type 1 fonts for libertine even if OTF-capable engine is used (Kai Mindermann)	49
\@mkauthors@i: Added obeypunctuation code	83	firstpagestyle: Added right linecount for two-column formats	93
\@mkauthors@iii: Added obeypunctuation code	84		

Added timestamp (Michael D. Adams) . . . . .	93	\normalparindent: Set	
standardpagestyle: Added right linecount for two-column formats	90	\normalparindent (Matthew Fluet) . . . . .	47
Added timestamp (Michael D. Adams) . . . . .	90	General: Reduce list indentation (Matthew Fluet) . . . . .	52
v1.34		Set \normalparindent; Reduce list indentation (Matthew Fluet) . . . .	32
\@mkbibcitation: Deleted DOI from doi numbers . . . . .	88	v1.38	
\ACM@linecount@bx: Rulers now are continuous . . . . .	89	General: Increase default font size for SIGPLAN . . . . .	32, 37
\ACM@linecountL: Rulers now are continuous . . . . .	89	v1.39	
\ACM@linecountR: Rulers now are continuous . . . . .	90	\@@authornotemark: Added macro . .	87
\maketitle: Added date to the bibstrip in conf proceedings . . . .	74	\authornotemark: Added macro . . .	64
Deleted 'DOI' from doi numbers . .	74	v1.40	
Rearranged bibstrip . . . . .	74	\@copyrightowner: Added new copyright version: licensedcagov .	70
The \terms command is now obsolete . . . . .	74	\@copyrightpermission: Added new copyright version: licensedcagov .	71
\terms: The \terms command now just produces a warning . . . . .	66	\@mkauthors@i: Switched to MakeTextUppercase . . . . .	83
v1.35		\@parfont: Switched to MakeTextUppercase . . . . .	96
\bibstyle@acmauthoryear: Square brackets for author-year style . . .	39	\ACM@linecount@bx: Work around a bug in xcolor: looks like cmyk colors in boxes do not work . . . .	89
General: BibTeX bug fixed: et al. . . .	32	\ccdesc@parse@finish: Added macro . . . . .	68
If the copyright is set to usgov or rightsretained, the price is suppressed . . . . .	69	\city: We now do not print this even in SIG . . . . .	81
v1.36		\country: Fixed bugs with extra spaces . . . . .	81
\@ACM@authorsperrow: Added macro .	67	\l@section: Redefined macro . . . .	42
\@mkauthors@iii: Added authorsperrow override . . . . .	84	\postcode: We now do not print this even in SIG . . . . .	81
\@mkauthors@iv: Added authorsperrow override . . . . .	86	\state: We now do not print this even in SIG . . . . .	81
\if@ACM@authordraft: Corrected typo, thanks to bargteil . . . . .	35	\streetaddress: We now do not print this even in SIG . . . . .	81
General: Added PACMHCI journal options . . . . .	54	General: Added 'textcase' package . .	38
Added the possibility to adjust number of author boxes per row in conference formats . . . . .	32	Added heightrounded to geometry	45
v1.37		Added new copyright version: licensedcagov . . . . .	32
\description: Reduce list indentation (Matthew Fluet) . . . .	53	Added package cleveref . . . . .	32
\descriptionlabel: Reduce list indentation (Matthew Fluet) . . . .	53	Added Ross Moore code for glyphtounicode . . . . .	48
		Bibliography changes . . . . .	32
		v1.41	
		General: Added new badges . . . . .	32
		v1.42	
		General: Deleted ACM badges . . . . .	32

v1.43		
\@startsection: Added		
\makeatletter	42	
\country: Added comma before		
country for journals	81	
v1.44		
\@acmBooktitle: Added macro	61	
\@acmEditors: Added macro	61	
\@editorsAbbrev: Added macro	61	
\@folioblob: Suppress the blob if		
acmArticleSeq is empty	93	
\@mkbibcitation: If the paper has		
just one page, use 'page' instead of		
'pages'	88	
\ACM@restore@pagestyle: Added		
macro	89	
\acmArticle: The default is now		
empty	64	
\acmArticleSeq: Now acmArticle		
might be empty	64	
\acmBooktitle: Added macro	61	
\editor: Added macro	61	
\if@ACM@acmthm: Added macro	33	
\maketitle: Empty DOI or ISBN are		
not printed (by Michael Ekstrand)	74	
General: Added package refcount	32	
Deleted package cleveref	32	
Put theorem defs in a separate style	32	
v1.45		
\@folioblob: Switched		
\bfseries\sffamily to		
\sffamily\bfseries	93	
\@parfont: Switched		
\bfseries\sffamily to		
\sffamily\bfseries	96	
\@titlefont: Switched		
\bfseries\sffamily to		
\sffamily\bfseries	79	
v1.46		
\@mkauthorsaddresses: Introduced		
macro	87	
\@mkbibcitation: Added subtitle	88	
\@printendtopmatter: Made it		
\par\bigskip uniformly	88	
\@printtopmatter: Deleted rule	77	
\@setauthorsaddresses: Introduced		
macro	89	
\ACM@linecount@bx: Rearranged the		
code to get rid of spurious		
		underfull messages (Benjamin
		Byholm)
		89
		\author: Started counting authors
		61
		\authorsaddresses: Introduced
		macro
		63
		\country: Corrected spacing for
		institution
		81
		\if@ACM@acmthm: Modified
		description
		33
		\liningnums: Workaround for
		compatibility with fontspec
		49
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