

# 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  $\text{\TeX}$  for its typesetting.

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

This package provides the uniform interface for all ACM publications. It is intended to replace all the different classes and packages and provide an up-to-date  $\text{\LaTeX}$  package.

This package uses only free  $\text{\TeX}$  packages and fonts included in  $\text{\TeX}$ Live, Mik $\text{\TeX}$  and other popular  $\text{\TeX}$  distributions. It is intended to be published in these distributions itself, which minimizes users' efforts in the installation and support of this package.

I am grateful to Michael D. Adams, Leif Andersen, Dirk Beyer, Benjamin Byholm, Michael Ekstrand, Matthew Fluet, Paolo G. Giarrusso, Ben Greenman, Jamie Davis, LianTze Lim, Ben Liblit, Kai Mindermann, Frank Mittelbach, Ross Moore, John Owens, Joel Nider, Tobias Pape, Mathias Rav, Matteo Riondato, Craig Rodkin, Bernard Rous, David Shamma, Stephen Spencer, John Wickerson and many others for their invaluable help.

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

## 2 User's guide

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

### 2.1 Installation

Most probably, you already have this package installed in your favorite  $\text{\TeX}$  distribution; if not, you may want to upgrade. You may need to upgrade it anyway since this package uses a number of relatively recent packages, especially the ones related to fonts.

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

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:

---

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

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  $\text{\LaTeX}$  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>
- *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>
- *flushend*, <http://www.ctan.org/pkg/flushend>
- *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 3) 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 2.10.

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

## 2.3 Top matter

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

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

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

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 2.10)
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)
timestamp	false	Whether to put a time stamp in the footer of each page
authordraft	false	Whether author's-draft mode is enabled
acmthm	true	Whether to define theorem-like environments, see Section 2.6

`\acmJournal{TOMS}`

The currently recognized journals are listed in Table 3. Note that conference proceedings published in *book* form do not set this macro.

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

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

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

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

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

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

Examples:

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

`\acmBooktitle` By default we assume that 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)}
```



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

Abbreviation	Publication
CIE	ACM Computers in Entertainment
CSUR	ACM Computing Surveys
IMWUT	PACM on Interactive, Mobile, Wearable and Ubiquitous Technologies
JACM	Journal of the ACM
JDIQ	ACM Journal of Data and Information Quality
JEA	ACM Journal of Experimental Algorithmics
JERIC	ACM Journal of Educational Resources in Computing
JETC	ACM Journal on Emerging Technologies in Computing Systems
JOCCH	ACM Journal on Computing and Cultural Heritage
PACMHCI	PACM on Human-Computer Interaction
PACMPL	PACM on Programming Languages
POMACS	PACM on Measurement and Analysis of Computing Systems
TAAS	ACM Transactions on Autonomous and Adaptive Systems
TACCESS	ACM Transactions on Accessible Computing
TACO	ACM Transactions on Architecture and Code Optimization
TALG	ACM Transactions on Algorithms
TALLIP	ACM Transactions on Asian and Low-Resource Language Information Processing
TAP	ACM Transactions on Applied Perception
TCPS	ACM Transactions on Cyber-Physical Systems
TEAC	ACM Transactions on Economics and Computation
TECS	ACM Transactions on Embedded Computing Systems
THRI	ACM Transactions on Human-Robot Interaction
TIIS	ACM Transactions on Interactive Intelligent Systems
TISSEC	ACM Transactions on Information and System Security
TIST	ACM Transactions on Intelligent Systems and Technology
TKDD	ACM Transactions on Knowledge Discovery from Data
TMIS	ACM Transactions on Management Information Systems
TOCE	ACM Transactions on Computing Education
TOCHI	ACM Transactions on Computer-Human Interaction
TOCL	ACM Transactions on Computational Logic
TOCS	ACM Transactions on Computer Systems
TOCT	ACM Transactions on Computation Theory
TODAES	ACM Transactions on Design Automation of Electronic Systems
TODS	ACM Transactions on Database Systems
TOG	ACM Transactions on Graphics
TOIS	ACM Transactions on Information Systems
TOIT	ACM Transactions on Internet Technology
TOMACS	ACM Transactions on Modeling and Computer Simulation
TOMM	ACM Transactions on Multimedia Computing, Communications and Applications
TOMPECS	ACM Transactions on Modeling and Performance Evaluation of Computing Systems
TOMS	ACM Transactions on Mathematical Software
TOPC	ACM Transactions on Parallel Computing
TOPLAS	ACM Transactions on Programming Languages and Systems
TOPS	ACM Transactions on Privacy and Security
TOS	ACM Transactions on Storage
TOSEM	ACM Transactions on Software Engineering and Methodology
TOSN	ACM Transactions on Sensor Networks
TRETS	ACM Transactions on Reconfigurable Technology and Systems
TSAS	ACM Transactions on Spatial Algorithms and Systems
TSC	ACM Transactions on Social Computing
TSLP	ACM Transactions on Speech and Language Processing
TWEB	ACM Transactions on the Web

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

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

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

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

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

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

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

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

`\author` The basic commands are `\author`, `\orcid` (for the researchers registered with ORCID, <http://www.orcid.org/>), `\affiliation` and `\email`. In the simplest case, you enter them in this order:

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

Do *not* use the  $\TeX$  `\and` macro! Each author deserves his or her own `\author` command.

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.

<code>\position</code> <code>\institution</code> <code>\department</code> <code>\streetaddress</code> <code>\city</code> <code>\state</code> <code>\postcode</code> <code>\country</code>	<p>The <code>\affiliation</code> and <code>\additionalaffiliation</code> commands are further structured to interact with the metadata extraction tools. Inside these commands you should use the <code>\position</code>, <code>\institution</code>, <code>\department</code>, <code>\city</code>, <code>\streetaddress</code>, <code>\state</code>, <code>\postcode</code> and <code>\country</code> 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 <i>are</i> necessary since they are used by the XML metadata extraction programs. Do <i>not</i> put commas or <code>\\</code> between the elements of <code>\affiliation</code>. They will be provided automatically.</p>
--	--

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  
Sonentallee 17  
123456 Helm, Germany

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

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

`\thanks` Like `amsart` (and unlike standard  $\text{\LaTeX}$ ), we allow `\thanks` only *outside* of the commands `\title` and `\author`. This command is obsolete and should *not* be used in most cases. Do not list your acknowledgments or grant sponsors here. Put this information in the `acks` environment (see Section 2.9).

`\authorsaddresses` 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 `\authorsaddresses{<contact addresses>}`, for example,

```
\authorsaddresses{%
  Authors' addresses: G.~Zhou, Computer Science Department, College of
  William and Mary, 104 Jameson Rd, Williamsburg, PA 23185, US;
  V.~B\eranger, Inria Paris-Rocquencourt, Rocquencourt, France;
  A.~Patel, Rajiv Gandhi University, Rono-Hills, Doimukh, Arunachal
  Pradesh, India; H.~Chan, Tsinghua University, 30 Shuangqing Rd,
  Haidian Qu, Beijing Shi, China; T.~Yan, Eaton Innovation Center,
  Prague, Czech Republic; T.~He, C.~Huang, J.~A.~Stankovic University
  of Virginia, School of Engineering Charlottesville, VA 22903, USA;
  T. F. Abdelzaher, (Current address) NASA Ames Research Center,
  Moffett Field, California 94035.}
```

You can *suppress* printing authors' addresses by setting them to an empty string:

`\authorsaddresses{}`.

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

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

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

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

```
\author{A. U. Thor}
\authornote{Both authors contributed equally to the paper}
```

```
...
\author{A. N. Other}
\authornotemark[1]
```

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

The macros `\acmVolume`, `\acmNumber`, `\acmArticle`, `\acmYear` and `\acmMonth` are 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.

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.

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

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

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` or `rightsretained`, 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.

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 <code>\acmISBN{}</code> , suppresses printing the ISBN.
<code>\acmDOI</code>	<p>The macro <code>\acmDOI{&lt;DOI&gt;}</code> sets the DOI of the article, for example,</p> <pre>\acmDOI{10.1145/9999997.9999999}</pre> <p>It is normally set by the typesetter. Setting it to the empty string, as <code>\acmDOI{}</code>, suppresses the DOI.</p>
<code>\acmBadgeR</code> <code>\acmBadgeL</code>	<p>Some conference articles get special distinctions, for example, the artifact evaluation for PPOPP 2016 (see <a href="http://ctuning.org/ae/ppopp2016.html">http://ctuning.org/ae/ppopp2016.html</a>). These articles display special badges supplied by the conference organizers. This class provides commands to add these badges: <code>\acmBadgeR[&lt;url&gt;]{&lt;graphics&gt;}</code> and <code>\acmBadgeL[&lt;url&gt;]{&lt;graphics&gt;}</code>. The first command puts the badge to the right of the title, and the second one—to the left. The exception is the <code>sigchi-a</code> mode for SIGCHI extended abstracts, which puts the badges on the left margin. The arguments have the following meaning: <code>[&lt;url&gt;]</code>, if provided, sets the link to the badge authority in the screen version, while <code>{&lt;graphics&gt;}</code> sets the graphics file with the badge image. The file must be a cropped square, which is scaled to a standard size in the output. For example, if the badge image is <code>ae-logo.pdf</code>, the command is</p> <pre>\acmBadgeR[http://ctuning.org/ae/ppopp2016.html]{ae-logo}</pre>
<code>\startPage</code>	<p>The macro <code>\startPage{&lt;page&gt;}</code> sets the first page of the article in a journal or book. It is used by the typesetter.</p>
<code>\terms</code> <code>\keywords</code>	<p>The command <code>\keywords{&lt;keyword, keyword,...&gt;}</code> sets keywords for the article. They must be separated by commas, for example,</p> <pre>\keywords{wireless sensor networks, media access control, multi-channel, radio interference, time synchronization}</pre>
<code>CCSXML</code> <code>\ccsdesc</code>	<p>ACM publications are classified according to the ACM Computing Classification Scheme (CCS). CCS codes are used both in the typeset version of the publications <i>and</i> in the metadata in various databases. Therefore you need to provide both <math>\TeX</math> commands and XML metadata with the paper.</p> <p>The tool at <a href="http://dl.acm.org/ccs.cfm">http://dl.acm.org/ccs.cfm</a> can be used to generate CCS codes. After you select the topics, click on “Generate CCS codes” to get results like the following:</p> <pre>\begin{CCSXML} &lt;ccs2012&gt; &lt;concept&gt;   &lt;concept_id&gt;10010520.10010553.10010562&lt;/concept_id&gt;   &lt;concept_desc&gt;Computer systems organization~Embedded systems&lt;/concept_desc&gt;   &lt;concept_significance&gt;500&lt;/concept_significance&gt; &lt;/concept&gt; &lt;concept&gt;   &lt;concept_id&gt;10010520.10010575.10010755&lt;/concept_id&gt;   &lt;concept_desc&gt;Computer systems organization~Redundancy&lt;/concept_desc&gt;   &lt;concept_significance&gt;300&lt;/concept_significance&gt; &lt;/concept&gt; &lt;/ccs2012&gt; \end{CCSXML}</pre>



```

</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 4.

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

`\copyrightyear` Each copyright statement must have the year of copyright. By default it is the same as `\acmYear`, but you can override this 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  $\text{\TeX}$  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  $\text{\LaTeX}$ .

`teaserfigure` A special kind of figure is used for many two-column conference proceedings.

Table 4: 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 the 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 the ACM.
<code>licensedcagov</code>	All the authors are employees of the Canadian government, and the publication rights are licensed to the ACM.
<code>licensedcagovmixed</code>	Some authors are employees of the Canadian government, and the publication rights are licensed to the 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 the ACM.

Table 5: 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

This figure is placed just after the authors but before the main text. The environment `teaserfigure` is used for these figures. This environment must be used *before* `\maketitle`, for example,

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

`\settopmatter` Some information in the top matter is printed for certain journals or proceedings and suppressed for others. You can override these defaults using the command `\settopmatter{<settings>}`. The settings and their meanings are listed in Table 5. For example,

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

The parameter `authorsperrow` requires some explanation. In conference proceedings authors' information is typeset in boxes, several boxes per row (see `sample-sigconf.pdf`, `sample-sigplan.pdf`, etc.). The number of 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  $\text{\LaTeX}$  interface for figures and tables. There are some important items to be aware of, however.

1. The captions for figures must be entered *after* the figure bodies and for 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 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.

## 2.7 Online-only and offline-only material

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

```
\section{Supplementary materials}

\begin{printonly}
  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.

## 2.8 Note about anonymous mode

`anonsuppress` When the option `anonymous` is selected,  $\TeX$  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.

## 2.9 Acknowledgments

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

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

Example:

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

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

## 2.10 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 Bib<sub>T</sub><sub>E</sub>X 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}
```

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.

There are several customized Bib<sub>T</sub><sub>E</sub>X entry types and fields in the ACM style file ACM-Reference-Format.bst that you may want to be aware of.

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

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

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 the special entry types `online` and `game` for Web pages and games, for example,

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

For these 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",
}

```

## 2.11 Colors

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

## 2.12 Other notable packages and typographic remarks

Several other packages are recommended for specialized tasks.

The package subcaption [8] is recommended for complex figures with several subplots or subfigures that require separate subcaptioning. The packages nomencl [9] and glossaries [10] can be used for the automatic creation of the lists of symbols and concepts used.

By default `acmart` prevents all widows and orphans (i.e., lonely lines at the beginning 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.

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

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

For example, one may want to use 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.

## 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 [2017/09/16 v1.48 Typesetting articles for the Association for
7 Computing Machinery]
```

And the driver code:

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

### 3.2 Preload hook

We preload acmart-preload-hook:

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

### 3.3 Options

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

```
30 \RequirePackage{xkeyval}
```

We use xstring to check whether user input is integer

```
31 \RequirePackage{xstring}
```

format The possible formats

```

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

```

\if@ACM@screen Whether we use screen mode

```

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

```

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

```

57 \define@boolkey+{acmart.cls}[\ACM@]{acmthm}[true]{%
58 \if@ACM@acmthm
59 \PackageInfo{\@classname}{Requiring acmthm}%
60 \else
61 \PackageInfo{\@classname}{Suppressing acmthm}%
62 \fi}{\PackageError{\@classname}{The option acmthm can be either true or
63 false}}
64 \ExecuteOptionsX{acmthm=true}

```

\if@ACM@review Whether we use review mode

```

65 \define@boolkey+{acmart.cls}[\ACM@]{review}[true]{%
66 \if@ACM@review
67 \PackageInfo{\@classname}{Using review mode}%
68 \AtBeginDocument{\ACM@printfoliostrue}%
69 \else
70 \PackageInfo{\@classname}{Not using review mode}%
71 \fi}{\PackageError{\@classname}{The option review can be either true or
72 false}}
73 \ExecuteOptionsX{review=false}

```

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

```

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

```

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

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

```

82 \define@boolkey+{acmart.cls}[@ACM@]{natbib}[true]{%
83   \if@ACM@natbib
84     \PackageInfo{\@classname}{Explicitly selecting natbib mode}%
85   \else
86     \PackageInfo{\@classname}{Explicitly deselecting natbib mode}%
87   \fi}{\PackageError{\@classname}{The option natbib can be either true or
88     false}}
89 \ExecuteOptionsX{natbib=true}

```

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

```

90 \define@boolkey+{acmart.cls}[@ACM@]{anonymous}[true]{%
91   \if@ACM@anonymous
92     \PackageInfo{\@classname}{Using anonymous mode}%
93   \else
94     \PackageInfo{\@classname}{Not using anonymous mode}%
95   \fi}{\PackageError{\@classname}{The option anonymous can be either true or
96     false}}
97 \ExecuteOptionsX{anonymous=false}

```

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

```

98 \define@boolkey+{acmart.cls}[@ACM@]{timestamp}[true]{%
99   \if@ACM@timestamp
100     \PackageInfo{\@classname}{Using timestamp mode}%
101   \else
102     \PackageInfo{\@classname}{Not using timestamp mode}%
103   \fi}{\PackageError{\@classname}{The option timestamp can be either true or
104     false}}
105 \ExecuteOptionsX{timestamp=false}

```

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

```

106 \define@boolkey+{acmart.cls}[@ACM@]{authordraft}[true]{%
107   \if@ACM@authordraft
108     \PackageInfo{\@classname}{Using authordraft mode}%
109     \@ACM@timestamptrue
110     \@ACM@reviewtrue
111   \else

```

```

112 \PackageInfo{\@classname}{Not using authordraft mode}%
113 \fi}{\PackageError{\@classname}{The option authordraft can be either true or
114     false}}
115 \ExecuteOptionsX{authordraft=false}

```

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

```

116 \def\ACM@fontsize{
117 \DeclareOptionX{9pt}{\edef\ACM@fontsize{\CurrentOption}}
118 \DeclareOptionX{10pt}{\edef\ACM@fontsize{\CurrentOption}}
119 \DeclareOptionX{11pt}{\edef\ACM@fontsize{\CurrentOption}}
120 \DeclareOptionX{12pt}{\edef\ACM@fontsize{\CurrentOption}}

121 \DeclareOptionX{draft}{\PassOptionsToClass{\CurrentOption}{amsart}}
122 \DeclareOptionX{*}{\PassOptionsToClass{\CurrentOption}{amsart}}
123 \ProcessOptionsX
124 \ClassInfo{\@classname}{Using format \ACM@format, number \ACM@format@nr}

```

### 3.4 Setting switches

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

```

125 \newif\if@ACM@manuscript

```

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

```

126 \newif\if@ACM@journal

```

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

```

127 \newif\if@ACM@sigchiamode

```

Setting up switches

```

128 \ifnum\ACM@format@nr=5\relax % siggraph
129 \ClassWarning{\@classname}{The format siggraph is now obsolete.
130     I am switching to sigconf.}
131 \setkeys{acmart.cls}{format=sigconf}
132 \fi
133 \ifnum\ACM@format@nr=0\relax
134 \@ACM@manuscripttrue
135 \else
136 \@ACM@manuscriptfalse
137 \fi
138 \@ACM@sigchiamodefalse
139 \ifcase\ACM@format@nr
140 \relax % manuscript
141 \@ACM@journaltrue
142 \or % acmsmall
143 \@ACM@journaltrue
144 \or % acmlarge
145 \@ACM@journaltrue

```

```

146 \or % acmtog
147   \ACM@journaltrue
148 \or % sigconf
149   \ACM@journalfalse
150 \or % siggraph
151   \ACM@journalfalse
152 \or % sigplan
153   \ACM@journalfalse
154 \or % sigchi
155   \ACM@journalfalse
156 \or % sigchi-a
157   \ACM@journalfalse
158   \ACM@sigchiamodetrue
159 \fi

```

### 3.5 Loading the base class and package

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

```

160 \ifx\ACM@fontsize\empty
161   \ifcase\ACM@format@nr
162     \relax % manuscript
163     \def\ACM@fontsize{9pt}%
164   \or % acmsmall
165     \def\ACM@fontsize{10pt}%
166   \or % acmlarge
167     \def\ACM@fontsize{10pt}%
168   \or % acmtog
169     \def\ACM@fontsize{9pt}%
170   \or % sigconf
171     \def\ACM@fontsize{9pt}%
172   \or % siggraph
173     \def\ACM@fontsize{9pt}%
174   \or % sigplan
175     \def\ACM@fontsize{10pt}%
176   \or % sigchi
177     \def\ACM@fontsize{10pt}%
178   \or % sigchi-a
179     \def\ACM@fontsize{10pt}%
180   \fi
181 \fi
182 \ClassInfo{\@classname}{Using fontsize \ACM@fontsize}
183 \LoadClass[\ACM@fontsize, reqno]{amsart}
184 \RequirePackage{microtype}

```

We use flushend for two-column formats.

```

185 \ifcase\ACM@format@nr
186   \relax % manuscript
187   \or % acmsmall
188   \or % acmlarge
189   \or % acmtog

```



```

190 \RequirePackage{flushend}
191 \or % sigconf
192 \RequirePackage{flushend}
193 \or % siggraph
194 \RequirePackage{flushend}
195 \or % sigplan
196 \RequirePackage{flushend}
197 \or % sigchi
198 \RequirePackage{flushend}
199 \or % sigchi-a
200 \fi

    We need etoolbox for delayed code
201 \RequirePackage{etoolbox}

    We need totpages to calculate the number of pages and refcount to use that num-
ber
202 \RequirePackage{refcount}
203 \RequirePackage{totpages}

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

    We use setspace for double spacing
205 \if@ACM@manuscript
206 \RequirePackage{setspace}
207 \onehalfspacing
208 \fi

    We need textcase for better upcasing
209 \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.

```

210 \if@ACM@natbib
211 \RequirePackage{natbib}
212 \renewcommand{\bibsection}{%
213 \section*{\refname}%
214 \phantomsection\addcontentsline{toc}{section}{\refname}%
215 }
216 \renewcommand{\bibfont}{\bibliofont}
217 \renewcommand\setcitestyle[1]{
218 \@for\@tempa:=#1\do
219 {\def\@tempb{round}\ifx\@tempa\@tempb
220 \renewcommand\NAT@open{(\}\renewcommand\NAT@close{)}\fi
221 \def\@tempb{square}\ifx\@tempa\@tempb
222 \renewcommand\NAT@open{[\]\renewcommand\NAT@close{]}\fi
223 \def\@tempb{angle}\ifx\@tempa\@tempb

```

```

224 \renewcommand\NAT@open{$<$}\renewcommand\NAT@close{$>$}\fi
225 \def\@tempb{curly}\ifx\@tempa\@tempb
226 \renewcommand\NAT@open{\}\renewcommand\NAT@close{\}\fi
227 \def\@tempb{semicolon}\ifx\@tempa\@tempb
228 \renewcommand\NAT@sep{;}\fi
229 \def\@tempb{colon}\ifx\@tempa\@tempb
230 \renewcommand\NAT@sep{;}\fi
231 \def\@tempb{comma}\ifx\@tempa\@tempb
232 \renewcommand\NAT@sep{,}\fi
233 \def\@tempb{authoryear}\ifx\@tempa\@tempb
234 \NAT@numbersfalse\fi
235 \def\@tempb{numbers}\ifx\@tempa\@tempb
236 \NAT@numberstrue\NAT@superfalse\fi
237 \def\@tempb{super}\ifx\@tempa\@tempb
238 \NAT@numberstrue\NAT@supertrue\fi
239 \def\@tempb{nobibstyle}\ifx\@tempa\@tempb
240 \let\bibstyle=\@gobble\fi
241 \def\@tempb{bibstyle}\ifx\@tempa\@tempb
242 \let\bibstyle=\@citestyle\fi
243 \def\@tempb{sort}\ifx\@tempa\@tempb
244 \def\NAT@sort{\@ne}\fi
245 \def\@tempb{nosort}\ifx\@tempa\@tempb
246 \def\NAT@sort{\@z}\fi
247 \def\@tempb{compress}\ifx\@tempa\@tempb
248 \def\NAT@cmprs{\@ne}\fi
249 \def\@tempb{nocompress}\ifx\@tempa\@tempb
250 \def\NAT@cmprs{\@z}\fi
251 \def\@tempb{sort&compress}\ifx\@tempa\@tempb
252 \def\NAT@sort{\@ne}\def\NAT@cmprs{\@ne}\fi
253 \def\@tempb{mcite}\ifx\@tempa\@tempb
254 \let\NAT@merge\@ne\fi
255 \def\@tempb{merge}\ifx\@tempa\@tempb
256 \@ifnum{\NAT@merge<\tw@}{\let\NAT@merge\tw@}{}\fi
257 \def\@tempb{elide}\ifx\@tempa\@tempb
258 \@ifnum{\NAT@merge<\thr@@}{\let\NAT@merge\thr@@}{}\fi
259 \def\@tempb{longnamesfirst}\ifx\@tempa\@tempb
260 \NAT@longnamestrue\fi
261 \def\@tempb{nonamebreak}\ifx\@tempa\@tempb
262 \def\NAT@nmfmt#1{\mbox{\NAT@up#1}}\fi
263 \expandafter\NAT@find@eq\@tempa=\relax\@nil
264 \if\@tempc\relax\else
265 \expandafter\NAT@rem@eq\@tempc
266 \def\@tempb{open}\ifx\@tempa\@tempb
267 \xdef\NAT@open{\@tempc}\fi
268 \def\@tempb{close}\ifx\@tempa\@tempb
269 \xdef\NAT@close{\@tempc}\fi
270 \def\@tempb{aysep}\ifx\@tempa\@tempb
271 \xdef\NAT@aysep{\@tempc}\fi
272 \def\@tempb{yysep}\ifx\@tempa\@tempb
273 \xdef\NAT@yrsep{\@tempc}\fi

```

```

274 \def\@tempb{notesep}\ifx\@tempa\@tempb
275 \xdef\NAT@cmt{\@tempc}\fi
276 \def\@tempb{citesep}\ifx\@tempa\@tempb
277 \xdef\NAT@sep{\@tempc}\fi
278 \fi
279 }%
280 \NAT@@setcites
281 }
282 \renewcommand\citestyle[1]{%
283 \ifcsname bibstyle@#1\endcsname%
284 \csname bibstyle@#1\endcsname\let\bibstyle\@gobble%
285 \else%
286 \@latex@error{Undefined ‘#1’ citestyle}%
287 \fi
288 }%
289 \fi

```

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

```

290 \newcommand{\bibstyle@acmauthoryear}{%
291 \setcitestyle{%
292 authoryear,%
293 open={},close={},citesep={;},%
294 aysep={},yysep={},%
295 notesep={, }}

```

`\bibstyle@acmnumeric` The default numeric format:

```

296 \newcommand{\bibstyle@acmnumeric}{%
297 \setcitestyle{%
298 numbers,sort&compress,%
299 open={},close={},citesep={},%
300 notesep={, }}

```

The default is numeric:

```

301 \if@ACM@natbib
302 \citestyle{acmnumeric}
303 \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:

```

304 \def\@startsection#1#2#3#4#5#6{%
305 \if@noskipsec \leavevmode \fi
306 \par
307 \@tempskipa #4\relax
308 \@afterindenttrue
309 \ifdim \@tempskipa <\z@
310 \@tempskipa -\@tempskipa \@afterindentfalse
311 \fi
312 \if@nobreak

```

```

313 \everypar{%
314 \else
315 \addpenalty\@secpenalty\addvspace\@tempskipa
316 \fi
317 \@ifstar
318 {\@ssect{#3}{#4}{#5}{#6}}%
319 {\@dblarg{\@sect{#1}{#2}{#3}{#4}{#5}{#6}}}%
320 \def\@sect#1#2#3#4#5#6[#7]#8{%
321 \edef\@toclevel{\ifnum#2=\@m 0\else\number#2\fi}%
322 \ifnum #2>\c@secnumdepth
323 \let\@svsec\@empty
324 \else
325 \refstepcounter{#1}%
326 \protected@edef\@svsec{\@secntformat{#1}\relax}%
327 \fi
328 \@tempskipa #5\relax
329 \ifdim \@tempskipa>\z@
330 \begingroup
331 #6{%
332 \@hangfrom{\hskip #3\relax\@svsec}%
333 \interlinepenalty \@M #8\@par}%
334 \endgroup
335 \csname #1mark\endcsname{#7}%
336 \ifnum #2>\c@secnumdepth \else
337 \@tochangmeasure{\csname the#1\endcsname}%
338 \fi
339 \addcontentsline{toc}{#1}{%
340 \ifnum #2>\c@secnumdepth \else
341 \protect\numberline{\csname the#1\endcsname}%
342 \fi
343 #7}%
344 \else
345 \def\@svsechd{%
346 #6{\hskip #3\relax
347 \@svsec #8}%
348 \csname #1mark\endcsname{#7}%
349 \ifnum #2>\c@secnumdepth \else
350 \@tochangmeasure{\csname the#1\endcsname\space}%
351 \fi
352 \addcontentsline{toc}{#1}{%
353 \ifnum #2>\c@secnumdepth \else
354 \protect\numberline{\csname the#1\endcsname}%
355 \fi
356 #7}%
357 \fi
358 \@xsect{#5}}
359 \def\@xsect#1{%
360 \@tempskipa #1\relax
361 \ifdim \@tempskipa>\z@
362 \par \nobreak

```

```

363 \vskip \@tempskipa
364 \@afterheading
365 \else
366 \@nbreakfalse
367 \global\@noskipsectrue
368 \everypar{%
369 \if@noskipsec
370 \global\@noskipsecfalse
371 {\setbox\z@\lastbox}%
372 \clubpenalty\@M
373 \begingroup \@svsechd \endgroup
374 \unskip
375 \@tempskipa #1\relax
376 \hskip -\@tempskipa
377 \else
378 \clubpenalty \@clubpenalty
379 \everypar{%
380 \fi}%
381 \fi
382 \ignorespaces}
383 \def\@secntformat#1{\csname the#1\endcsname\quad}
384 \def\@essect#1#2#3#4#5{%
385 \@tempskipa #3\relax
386 \ifdim \@tempskipa>\z@
387 \begingroup
388 #4{%
389 \@hangfrom{\hskip #1}%
390 \interlinepenalty \@M #5\@par}%
391 \endgroup
392 \else
393 \def\@svsechd{#4{\hskip #1\relax #5}}%
394 \fi
395 \@xsect{#3}}

```

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

```

396 \def\@starttoc#1#2{\begingroup\makeatletter
397 \setTrue{#1}%
398 \par\removelastskip\vskip\z@skip
399 \@startsection{section}\@M\z@{\linespacing\@plus\linespacing}%
400 {.5\linespacing}{\centering\contentsnamefont}{#2}%
401 \@input{\jobname.#1}%
402 \if@filesw
403 \exp\newwrite\csname tf@#1\endcsname
404 \immediate\exp\openout\csname tf@#1\endcsname \jobname.#1\relax
405 \fi
406 \global\@nbreakfalse \endgroup
407 \addvspace{32\p@\@plus14\p@}%
408 }

```

```

\l@section Section spacing is more generous than for amsart
409 \def\l@section{\@tocline{1}{0pt}{1pc}{2pc}{}}

\l@section The spacing in amsart is too large
410 \def\l@section{\@tocline{2}{0pt}{1pc}{3pc}{}}

\l@subsubsection The spacing in amsart is too large
411 \def\l@subsubsection{\@tocline{2}{0pt}{1pc}{5pc}{}}

    And hyperref
412 \let\@footnotemark@nolink\@footnotemark
413 \let\@footnotetext@nolink\@footnotetext
414 \RequirePackage[bookmarksnumbered,unicode]{hyperref}
415 \pdfstringdefDisableCommands{%
416   \def\unskip{ }%
417   \def\textbullet{- }%
418   \def\textrightarrow{-> }%
419   \def\footnotemark{ }%
420 }
421 \urlstyle{rm}
422 \ifcase\ACM@format@nr
423 \relax % manuscript
424 \or % acmsmall
425 \or % acmlarge
426 \or % acmtog
427 \or % sigconf
428 \or % siggraph
429 \or % sigplan
430 \urlstyle{sf}
431 \or % sigchi
432 \or % sigchi-a
433 \urlstyle{sf}
434 \fi
435 \AtEndPreamble{%
436   \if@ACM@screen
437     \hypersetup{colorlinks,
438       linkcolor=ACMRed,
439       citecolor=ACMPurple,
440       urlcolor=ACMDarkBlue,
441       filecolor=ACMDarkBlue}
442   \else
443     \hypersetup{hidelinks}
444   \fi}

    Bibliography mangling.
445 \if@ACM@natbib
446   \let\citeN\cite
447   \let\cite\citep
448   \let\citeANP\citeauthor
449   \let\citeNN\citeyearpar

```

```

450 \let\citeyearNP\citeyear
451 \let\citeyear\citeyearpar
452 \let\citeNP\citealt
453 \DeclareRobustCommand\citeA
454   {\begingroup\NAT@swafalse
455     \let\NAT@ctype\@ne\NAT@partrue\NAT@fullfalse\NAT@open\NAT@citetp}%
456 \providecommand\newblock{}%
457 \else
458 \AtBeginDocument{%
459   \let\shortcite\cite%
460   \providecommand\citename[1]{#1}}
461 \fi
462 \newcommand\shortcite[2][]{%
463   \ifNAT@numbers\cite[#1]{#2}\else\citeyear[#1]{#2}\fi}

```

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

```

464 \def\bibliographystyle#1{%
465   \ifx\@begindocumenthook\@undefined\else
466     \expandafter\AtBeginDocument
467   \fi
468   {\if@filesw
469     \immediate\write\@auxout{\string\bibstyle{#1}}%
470   \fi}}

```

### Graphics and color

```

471 \RequirePackage{graphicx, xcolor}

```

We define ACM colors according to [7]:

```

472 \definecolor[named]{ACMBlue}{cmyk}{1,0.1,0,0.1}
473 \definecolor[named]{ACMYellow}{cmyk}{0,0.16,1,0}
474 \definecolor[named]{ACMOrange}{cmyk}{0,0.42,1,0.01}
475 \definecolor[named]{ACMRed}{cmyk}{0,0.90,0.86,0}
476 \definecolor[named]{ACMLightBlue}{cmyk}{0.49,0.01,0,0}
477 \definecolor[named]{ACMGreen}{cmyk}{0.20,0,1,0.19}
478 \definecolor[named]{ACMPurple}{cmyk}{0.55,1,0,0.15}
479 \definecolor[named]{ACMDarkBlue}{cmyk}{1,0.58,0,0.21}

```

### Author-draft mode

```

480 \if@ACM@authordraft
481   \RequirePackage{draftwatermark}
482   \SetWatermarkFontSize{0.5in}
483   \SetWatermarkColor[gray]{.9}
484   \SetWatermarkText{\parbox{12em}{\centering
485     Unpublished working draft.\.
486     Not for distribution.}}
487 \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>.

```
488 \RequirePackage{geometry}
489 \ifcase\ACM@format@nr
490 \relax % manuscript
491   \geometry{letterpaper,head=13pt,
492     marginparwidth=6pc,heightrounded}%
493 \or % acmsmall
494   \geometry{twoside=true,
495     includeheadfoot, head=13pt, foot=2pc,
496     paperwidth=6.75in, paperheight=10in,
497     top=58pt, bottom=44pt, inner=46pt, outer=46pt,
498     marginparwidth=2pc,heightrounded
499   }%
500 \or % acmlarge
501   \geometry{twoside=true, head=13pt, foot=2pc,
502     paperwidth=8.5in, paperheight=11in,
503     includeheadfoot,
504     top=78pt, bottom=114pt, inner=81pt, outer=81pt,
505     marginparwidth=4pc,heightrounded
506   }%
507 \or % acmtog
508   \geometry{twoside=true, head=13pt, foot=2pc,
509     paperwidth=8.5in, paperheight=11in,
510     includeheadfoot, columnsep=24pt,
511     top=52pt, bottom=75pt, inner=52pt, outer=52pt,
512     marginparwidth=2pc,heightrounded
513   }%
514 \or % sigconf
515   \geometry{twoside=true, head=13pt,
516     paperwidth=8.5in, paperheight=11in,
517     includeheadfoot, columnsep=2pc,
518     top=57pt, bottom=73pt, inner=54pt, outer=54pt,
519     marginparwidth=2pc,heightrounded
520   }%
521 \or % siggraph
522   \geometry{twoside=true, head=13pt,
523     paperwidth=8.5in, paperheight=11in,
524     includeheadfoot, columnsep=2pc,
525     top=57pt, bottom=73pt, inner=54pt, outer=54pt,
526     marginparwidth=2pc,heightrounded
527   }%
528 \or % sigplan
529   \geometry{twoside=true, head=13pt,
530     paperwidth=8.5in, paperheight=11in,
531     includeheadfoot=false, columnsep=2pc,
532     top=1in, bottom=1in, inner=0.75in, outer=0.75in,
```



```

533     marginparwidth=2pc,heightrounded
534   }%
535 \or % sigchi
536   \geometry{twoside=true, head=13pt,
537     paperwidth=8.5in, paperheight=11in,
538     includeheadfoot, columnsep=2pc,
539     top=66pt, bottom=73pt, inner=54pt, outer=54pt,
540     marginparwidth=2pc,heightrounded
541   }%
542 \or % sigchi-a
543   \geometry{twoside=false, head=13pt,
544     paperwidth=11in, paperheight=8.5in,
545     includeheadfoot, marginparsep=72pt,
546     marginparwidth=170pt, columnsep=20pt,
547     top=72pt, bottom=72pt, left=314pt, right=72pt
548   }%
549   \@mparswitchfalse
550   \reversemarginpar
551 \fi

\parindent Paragraphing
\parskip
552 \setlength\parindent{10\p@}
553 \setlength\parskip{\z@}
554 \ifcase\ACM@format@nr
555 \relax % manuscript
556 \or % acmsmall
557 \or % acmlarge
558 \or % acmtog
559   \setlength\parindent{9\p@}%
560 \or % sigconf
561 \or % siggraph
562 \or % sigplan
563 \or % sigchi
564 \or % sigchi-a
565 \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 com-
mand. We set \normalparindent to the value of \parindent as selected by acmart for
consistent paragraph indents.

566 \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.

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

569 \RequirePackage{manyfoot}
570 \SelectFootnoteRule[2]{copyrightpermission}
571 \DeclareNewFootnote{authorsaddresses}
572 \SelectFootnoteRule[2]{copyrightpermission}
573 \DeclareNewFootnote{copyrightpermission}
```

`\footnoterule` Tschichold's rules:

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

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

```
576 \def\endminipage{%
577   \par
578   \unskip
579   \ifvoid\@mpfootins\else
580     \vskip\skip\@mpfootins
581     \normalcolor
582     \unvbox\@mpfootins
583   \fi
584   \@minipagefalse
585   \color@endgroup
586   \egroup
587   \expandafter\@iiiparbox\@mpargs{\unvbox\@tempboxa}}
```

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

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

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

```
589 \if@ACM@sigchiamode
590 \long\def\@footnotetext#1{\marginpar{%
591   \reset@font\small
592   \interlinepenalty\interfootnotelinepenalty
593   \protected@edef\@currentlabel{%
594     \csname p@footnote\endcsname\@thefnmark
595   }%
596   \color@begingroup
597     \@makefnmark{%
598       \rule{z}{\footnotesep\ignorespaces#1\@finalstrut\strutbox}%
599     \color@endgroup}}%
600 \fi
```

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

```
601 \long\def\@mpfootnotetext#1{%
602   \global\setbox\@mpfootins\vbox{%
```

```

603 \unvbox\@mpfootins
604 \reset@font\footnotesize
605 \hsize\columnwidth
606 \@parboxrestore
607 \protected@edef\@currentlabel
608     {\csname p@mpfootnote\endcsname\@thefnmark}%
609 \color@begingroup\centering
610     \makefnmark{\rule\z@\footnotesep\ignorespaces#1\@finalstrut\strutbox}%
611     \color@endgroup}}
\makefnmark AMS classes use a buggy definition of \makefnmark. We revert to the standard one.
613 \def\makefnmark{\hbox{\@textsuperscript{\normalfont\@thefnmark}}}

\textbottom Add some stretch according to David Carlisle's advice at http://tex.stackexchange.com/a/62318/5522
614 \def\textbottom{\vskip \z@ \@plus 1pt}
615 \let\texttop\relax

```

### 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.

```

616 \RequirePackage{iftex}
617 \ifPDFTeX
618 \input{glyphtounicode}
619 \pdfglyphtounicode{f_f}{FB00}
620 \pdfglyphtounicode{f_f_i}{FB03}
621 \pdfglyphtounicode{f_f_l}{FB04}
622 \pdfglyphtounicode{f_i}{FB01}
623 \pdfglyphtounicode{t_t}{00740074}
624 \pdfglyphtounicode{f_t}{00660074}
625 \pdfglyphtounicode{T_h}{00540068}
626 \pdfgentounicode=1
627 \fi
628 \RequirePackage{cmap}

\if@ACM@newfonts Whether we load the new fonts
629 \newif\if@ACM@newfonts
630 \@ACM@newfontstrue
631 \IfFileExists{libertine.sty}{\ClassWarning{\@classname}{You do not
632     have the libertine package installed. Please upgrade your
633     TeX}\@ACM@newfontsfalse}
634 \IfFileExists{zi4.sty}{\ClassWarning{\@classname}{You do not
635     have the zi4 package installed. Please upgrade your
636     TeX}\@ACM@newfontsfalse}
637 \IfFileExists{newtxmath.sty}{\ClassWarning{\@classname}{You do not
638     have the newtxmath package installed. Please upgrade your

```

```
639 TeX}\@ACM@newfontsfalse}
```

We use Libertine throughout.

```
640 \if@ACM@newfonts
641 \RequirePackage[tt=false, type1=true]{libertine}
642 \RequirePackage[varqu]{zi4}
643 \RequirePackage[libertine]{newtxmath}
644 \RequirePackage[T1]{fontenc}
645 \fi
```

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

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

The SIGCHI extended abstracts are sans serif:

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

### 3.9 Floats

We use the caption package

```
652 \RequirePackage{caption, float}
653 \captionsetup[table]{position=top}
654 \if@ACM@journal
655   \captionsetup{labelfont={sf, small},
656     textfont={sf, small}, margin=\z@}
657   \captionsetup[figure]{name={Fig.}}
658 \else
659   \captionsetup{labelfont={bf},
660     textfont={bf}, labelsep=colon, margin=\z@}
661   \ifcase\ACM@format@nr
662     \relax % manuscript
663     \or % acmsmall
664     \or % acmlarge
665     \or % acmtog
666     \or % sigconf
667     \or % siggraph
668     \captionsetup{textfont={it}}
669     \or % sigplan
670     \captionsetup{labelfont={bf},
671       textfont={normalfont}, labelsep=period, margin=\z@}
672     \or % sigchi
673     \captionsetup[figure]{labelfont={bf, small},
674       textfont={bf, small}}
675     \or % sigchi-a
676     \captionsetup[figure]{labelfont={bf, small},
```

```

677         textfont={bf, small}}
678     \fi
679 \fi

sidebar The sidebar environment:
680 \newfloat{sidebar}{}{sbar}
681 \floatname{sidebar}{Sidebar}
682 \renewenvironment{sidebar}{\Collect@Body\@sidebar}{}

\@sidebar The processing of the saved text
683 \long\def\@sidebar#1{\bgroup\captionsetup{type=sidebar}%
684   \marginpar{\small#1}\egroup}

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

\@marginfigure The processing of the saved text
686 \long\def\@marginfigure#1{\bgroup\captionsetup{type=figure}%
687   \marginpar{\centering\small#1}\egroup}

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

\@margintable The processing of the saved text
689 \long\def\@margintable#1{\bgroup\captionsetup{type=table}%
690   \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
691 \newdimen\fulltextwidth
692 \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)
693 \if@ACM@sigchiamode
694 \def\@dblfloat{\bgroup\columnwidth=\fulltextwidth
695   \let\@endfloatbox\@endwidefloatbox
696   \def\@fpsadddefault{\def\@fps{tp}}%
697   \@float}
698 \fi

\end@dblfloat And the end. Just adding a \bgroup.
699 \if@ACM@sigchiamode
700 \def\end@dblfloat{%
701   \end@float\egroup}
702 \fi

```

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

```
703 \def\@endwidefloatbox{%
704   \par\vskip\z@skip
705   \@minipagefalse
706   \outer@nobreak
707   \egroup
708   \color@endbox
709   \global\setbox\@currbox=\vbox{\moveleft
710     \dimexpr(\fulltextwidth-\textwidth)\box\@currbox}%
711   \wd\@currbox=\textwidth
712 }
```

### 3.10 Lists

```
713 \ifcase\ACM@format@nr
714 \relax % manuscript
715 \or % acmsmall
716 \or % acmlarge
717 \or % acmtog
718 \or % sigconf
719 \or % siggraph
720 \or % sigplan
721 \def\labelenumi{\theenumi.}
722 \def\labelenumii{\theenumii.}
723 \def\labelenumiii{\theenumiii.}
724 \def\labelenumiv{\theenumiv.}
725 \or % sigchi
726 \or % sigchi-a
727 \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`.

```
728 \newdimen\ACM@labelwidth
729 \AtBeginDocument{%
730   \setlength\labelsep{4pt}
731   \setlength{\ACM@labelwidth}{6.5pt}
732
733   %% First-level list: when beginning after the first line of an
734   %% indented paragraph or ending before an indented paragraph, labels
735   %% should not hang to the left of the preceding/following text.
736   \setlength\leftmargini{\z@}
737   \addtolength\leftmargini{\parindent}
738   \addtolength\leftmargini{2\labelsep}
739   \addtolength\leftmargini{\ACM@labelwidth}
740 }
```

```

741 %% Second-level and higher lists.
742 \setlength\leftmarginii{\z@}
743 \addtolength\leftmarginii{0.5\labelsep}
744 \addtolength\leftmarginii{\@ACM@labelwidth}
745 \setlength\leftmarginiii{\leftmarginii}
746 \setlength\leftmarginiv{\leftmarginiii}
747 \setlength\leftmarginv{\leftmarginiv}
748 \setlength\leftmarginvi{\leftmarginv}
749 \@listi}
750 \newskip\listisep
751 \listisep\smallskipamount
752 \def\@listI{\leftmargin\leftmargini
753 \labelwidth\leftmargini \advance\labelwidth-\labelsep
754 \listparindent\z@
755 \topsep\listisep}
756 \let\@listi\@listI
757 \def\@listii{\leftmargin\leftmarginii
758 \labelwidth\leftmarginii \advance\labelwidth-\labelsep
759 \topsep\z@skip}
760 \def\@listiii{\leftmargin\leftmarginiii
761 \labelwidth\leftmarginiii \advance\labelwidth-\labelsep}
762 \def\@listiv{\leftmargin\leftmarginiv
763 \labelwidth\leftmarginiv \advance\labelwidth-\labelsep}
764 \def\@listv{\leftmargin\leftmarginv
765 \labelwidth\leftmarginv \advance\labelwidth-\labelsep}
766 \def\@listvi{\leftmargin\leftmarginvi
767 \labelwidth\leftmarginvi \advance\labelwidth-\labelsep}

\descriptionlabel We do not use a colon by default like amsart does:
768 \renewcommand{\descriptionlabel}[1]{\upshape\bfseries #1}

\description Make the description environment indentation consistent with that of the itemize
and enumerate environments.
769 \renewenvironment{description}{\list{}{%
770 \labelwidth\@ACM@labelwidth
771 \let\makelabel\descriptionlabel}%
772 }{
773 \endlist
774 }
775 \let\enddescription=\endlist % for efficiency

```

### 3.11 Top-matter data

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

```

776 \define@choicekey*{ACM}{acmJournal}[\@journalCode\@journalCode@nr]{%
777 CIE,%
778 CSUR,%
779 IMWUT,%
780 JACM,%

```

781 JDIQ,%  
782 JEA,%  
783 JERIC,%  
784 JETC,%  
785 JOCCH,%  
786 PACMHCI,%  
787 PACMPL,%  
788 POMACS,%  
789 TAAS,%  
790 TACCESS,%  
791 TACO,%  
792 TALG,%  
793 TALLIP,%  
794 TAP,%  
795 TCPS,%  
796 TEAC,%  
797 TECS,%  
798 THRI,%  
799 TIIS,%  
800 TISSEC,%  
801 TIST,%  
802 TKDD,%  
803 TMIS,%  
804 TOCE,%  
805 TOCHI,%  
806 TOCL,%  
807 TOCS,%  
808 TOCT,%  
809 TODAES,%  
810 TODS,%  
811 TOG,%  
812 TOIS,%  
813 TOIT,%  
814 TOMACS,%  
815 TOMM,%  
816 TOMPECS,%  
817 TOMS,%  
818 TOPC,%  
819 TOPS,%  
820 TOPLAS,%  
821 TOS,%  
822 TOSEM,%  
823 TOSN,%  
824 TRETs,%  
825 TSAS,%  
826 TSC,%  
827 TSLP,%  
828 TWEB%  
829 }{%  
830 \ifcase\@journalCode@nr



```

831 \relax % CIE
832 \def\@journalName{ACM Computers in Entertainment}%
833 \def\@journalNameShort{ACM Comput. Entertain.}%
834 \def\@permissionCodeOne{1544-3574}%
835 \or % CSUR
836 \def\@journalName{ACM Computing Surveys}%
837 \def\@journalNameShort{ACM Comput. Surv.}%
838 \def\@permissionCodeOne{0360-0300}%
839 \or % IMWUT
840 \def\@journalName{Proceedings of the ACM on Interactive, Mobile,
841     Wearable and Ubiquitous Technologies}%
842 \def\@journalNameShort{Proc. ACM Interact. Mob. Wearable Ubiquitous Technol.}%
843 \def\@permissionCodeOne{2474-9567}%
844 \@ACM@screentruer
845 \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
846 \or % JACM
847 \def\@journalName{Journal of the ACM}%
848 \def\@journalNameShort{J. ACM}%
849 \def\@permissionCodeOne{0004-5411}%
850 \or % JDIQ
851 \def\@journalName{ACM Journal of Data and Information Quality}%
852 \def\@journalNameShort{ACM J. Data Inform. Quality}%
853 \def\@permissionCodeOne{1936-1955}%
854 \or % JEA
855 \def\@journalName{ACM Journal of Experimental Algorithmics}%
856 \def\@journalNameShort{ACM J. Exp. Algor.}%
857 \def\@permissionCodeOne{1084-6654}%
858 \or % JERIC
859 \def\@journalName{ACM Journal of Educational Resources in Computing}%
860 \def\@journalNameShort{ACM J. Edu. Resources in Comput.}%
861 \def\@permissionCodeOne{1073-0516}%
862 \or % JETC
863 \def\@journalName{ACM Journal on Emerging Technologies in Computing Systems}%
864 \def\@journalNameShort{ACM J. Emerg. Technol. Comput. Syst.}%
865 \def\@permissionCodeOne{1550-4832}%
866 \or % JOCCH
867 \def\@journalName{ACM Journal on Computing and Cultural Heritage}%
868 \def\@journalNameShort{ACM J. Comput. Cult. Herit.}%
869 \or % PACMHCI
870 \def\@journalName{Proceedings of the ACM on Human-Computer Interaction}%
871 \def\@journalNameShort{Proc. ACM Hum.-Comput. Interact.}%
872 \def\@permissionCodeOne{2573-0142}%
873 \@ACM@screentruer
874 \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
875 \or % PACMPL
876 \def\@journalName{Proceedings of the ACM on Programming Languages}%
877 \def\@journalNameShort{Proc. ACM Program. Lang.}%
878 \def\@permissionCodeOne{2475-1421}%
879 \@ACM@screentruer
880 \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%

```

```

881 \or % POMACS
882 \def\@journalName{Proceedings of the ACM on Measurement and Analysis of Computing Systems}%
883 \def\@journalNameShort{Proc. ACM Meas. Anal. Comput. Syst.}%
884 \def\@permissionCodeOne{2476-1249}%
885 \@ACM@screentruer
886 \PackageInfo{\@classname}{Using screen mode due to \@journalCode}%
887 \or % TAAS
888 \def\@journalName{ACM Transactions on Autonomous and Adaptive Systems}%
889 \def\@journalNameShort{ACM Trans. Autonom. Adapt. Syst.}%
890 \def\@permissionCodeOne{1556-4665}%
891 \or % TACCESS
892 \def\@journalName{ACM Transactions on Accessible Computing}%
893 \def\@journalNameShort{ACM Trans. Access. Comput.}%
894 \def\@permissionCodeOne{1936-7228}%
895 \or % TACO
896 \def\@journalName{ACM Transactions on Architecture and Code Optimization}%
897 \def\@journalNameShort{ACM Trans. Arch. Code Optim.}%
898 \or % TALG
899 \def\@journalName{ACM Transactions on Algorithms}%
900 \def\@journalNameShort{ACM Trans. Algor.}%
901 \def\@permissionCodeOne{1549-6325}%
902 \or % TALLIP
903 \def\@journalName{ACM Transactions on Asian and Low-Resource Language Information Processing}%
904 \def\@journalNameShort{ACM Trans. Asian Low-Resour. Lang. Inf. Process.}%
905 \def\@permissionCodeOne{2375-4699}%
906 \or % TAP
907 \def\@journalName{ACM Transactions on Applied Perception}%
908 \or % TCPS
909 \def\@journalName{ACM Transactions on Cyber-Physical Systems}%
910 \or % TEAC
911 \def\@journalName{ACM Transactions on Economics and Computation}%
912 \or % TECS
913 \def\@journalName{ACM Transactions on Embedded Computing Systems}%
914 \def\@journalNameShort{ACM Trans. Embedd. Comput. Syst.}%
915 \def\@permissionCodeOne{1539-9087}%
916 \or % THRI
917 \def\@journalName{ACM Transactions on Human-Robot Interaction}%
918 \def\@journalNameShort{ACM Trans. Hum.-Robot Interact.}%
919 \def\@permissionCodeOne{2573-9522}%
920 \or % TIIS
921 \def\@journalName{ACM Transactions on Interactive Intelligent Systems}%
922 \def\@journalNameShort{ACM Trans. Interact. Intell. Syst.}%
923 \def\@permissionCodeOne{2160-6455}%
924 \or % TISSEC
925 \def\@journalName{ACM Transactions on Information and System Security}%
926 \def\@journalNameShort{ACM Trans. Info. Syst. Sec.}%
927 \def\@permissionCodeOne{1094-9224}%
928 \or % TIST
929 \def\@journalName{ACM Transactions on Intelligent Systems and Technology}%
930 \def\@journalNameShort{ACM Trans. Intell. Syst. Technol.}%

```

```

931 \def\@permissionCodeOne{2157-6904}%
932 \or % TKDD
933 \def\@journalName{ACM Transactions on Knowledge Discovery from Data}%
934 \def\@journalNameShort{ACM Trans. Knowl. Discov. Data.}%
935 \def\@permissionCodeOne{1556-4681}%
936 \or % TMIS
937 \def\@journalName{ACM Transactions on Management Information Systems}%
938 \def\@journalNameShort{ACM Trans. Manag. Inform. Syst.}%
939 \def\@permissionCodeOne{2158-656X}%
940 \or % TOCE
941 \def\@journalName{ACM Transactions on Computing Education}%
942 \def\@journalNameShort{ACM Trans. Comput. Educ.}%
943 \def\@permissionCodeOne{1946-6226}%
944 \or % TOCHI
945 \def\@journalName{ACM Transactions on Computer-Human Interaction}%
946 \def\@journalNameShort{ACM Trans. Comput.-Hum. Interact.}%
947 \def\@permissionCodeOne{1073-0516}%
948 \or % TOCL
949 \def\@journalName{ACM Transactions on Computational Logic}%
950 \def\@journalNameShort{ACM Trans. Comput. Logic}%
951 \def\@permissionCodeOne{1529-3785}%
952 \or % TOCS
953 \def\@journalName{ACM Transactions on Computer Systems}%
954 \def\@journalNameShort{ACM Trans. Comput. Syst.}%
955 \def\@permissionCodeOne{0734-2071}%
956 \or % TOCT
957 \def\@journalName{ACM Transactions on Computation Theory}%
958 \def\@journalNameShort{ACM Trans. Comput. Theory}%
959 \def\@permissionCodeOne{1942-3454}%
960 \or % TODAES
961 \def\@journalName{ACM Transactions on Design Automation of Electronic Systems}%
962 \def\@journalNameShort{ACM Trans. Des. Autom. Electron. Syst.}%
963 \def\@permissionCodeOne{1084-4309}%
964 \or % TODS
965 \def\@journalName{ACM Transactions on Database Systems}%
966 \def\@journalNameShort{ACM Trans. Datab. Syst.}%
967 \def\@permissionCodeOne{0362-5915}%
968 \or % TOG
969 \def\@journalName{ACM Transactions on Graphics}%
970 \def\@journalNameShort{ACM Trans. Graph.}%
971 \def\@permissionCodeOne{0730-0301}%
972 \or % TOIS
973 \def\@journalName{ACM Transactions on Information Systems}%
974 \def\@permissionCodeOne{1046-8188}%
975 \or % TOIT
976 \def\@journalName{ACM Transactions on Internet Technology}%
977 \def\@journalNameShort{ACM Trans. Internet Technol.}%
978 \def\@permissionCodeOne{1533-5399}%
979 \or % TOMACS
980 \def\@journalName{ACM Transactions on Modeling and Computer Simulation}%

```

```

981 \def\@journalNameShort{ACM Trans. Model. Comput. Simul.}%
982 \or % TOMM
983 \def\@journalName{ACM Transactions on Multimedia Computing, Communications and Applications}%
984 \def\@journalNameShort{ACM Trans. Multimedia Comput. Commun. Appl.}%
985 \def\@permissionCodeOne{1551-6857}%
986 \def\@permissionCodeTwo{0100}%
987 \or % TOMPECS
988 \def\@journalName{ACM Transactions on Modeling and Performance Evaluation of Computing Systems}%
989 \def\@journalNameShort{ACM Trans. Model. Perform. Eval. Comput. Syst.}%
990 \def\@permissionCodeOne{2376-3639}%
991 \or % TOMS
992 \def\@journalName{ACM Transactions on Mathematical Software}%
993 \def\@journalNameShort{ACM Trans. Math. Softw.}%
994 \def\@permissionCodeOne{0098-3500}%
995 \or % TOPC
996 \def\@journalName{ACM Transactions on Parallel Computing}%
997 \def\@journalNameShort{ACM Trans. Parallel Comput.}%
998 \def\@permissionCodeOne{1539-9087}%
999 \or % TOPS
1000 \def\@journalName{ACM Transactions on Privacy and Security}%
1001 \def\@journalNameShort{ACM Trans. Priv. Sec.}%
1002 \def\@permissionCodeOne{2471-2566}%
1003 \or % TOPLAS
1004 \def\@journalName{ACM Transactions on Programming Languages and Systems}%
1005 \def\@journalNameShort{ACM Trans. Program. Lang. Syst.}%
1006 \def\@permissionCodeOne{0164-0925}%
1007 \or % TOS
1008 \def\@journalName{ACM Transactions on Storage}%
1009 \def\@journalNameShort{ACM Trans. Storage}%
1010 \def\@permissionCodeOne{1553-3077}%
1011 \or % TOSEM
1012 \def\@journalName{ACM Transactions on Software Engineering and Methodology}%
1013 \def\@journalNameShort{ACM Trans. Softw. Eng. Methodol.}%
1014 \def\@permissionCodeOne{1049-331X}%
1015 \or % TOSN
1016 \def\@journalName{ACM Transactions on Sensor Networks}%
1017 \def\@journalNameShort{ACM Trans. Sensor Netw.}%
1018 \def\@permissionCodeOne{1550-4859}%
1019 \or % TRET
1020 \def\@journalName{ACM Transactions on Reconfigurable Technology and Systems}%
1021 \def\@journalNameShort{ACM Trans. Reconfig. Technol. Syst.}%
1022 \def\@permissionCodeOne{1936-7406}%
1023 \or % TSAS
1024 \def\@journalName{ACM Transactions on Spatial Algorithms and Systems}%
1025 \def\@journalNameShort{ACM Trans. Spatial Algorithms Syst.}%
1026 \def\@permissionCodeOne{2374-0353}%
1027 \or % TSC
1028 \def\@journalName{ACM Transactions on Social Computing}%
1029 \def\@journalNameShort{ACM Trans. Soc. Comput.}%
1030 \def\@permissionCodeOne{2469-7818}%

```

```

1031 \or % TSLP
1032 \def\@journalName{ACM Transactions on Speech and Language Processing}%
1033 \def\@journalNameShort{ACM Trans. Speech Lang. Process.}%
1034 \def\@permissionCodeOne{1550-4875}%
1035 \or % TWEB
1036 \def\@journalName{ACM Transactions on the Web}%
1037 \def\@journalNameShort{ACM Trans. Web}%
1038 \def\@permissionCodeOne{1559-1131}%
1039 \fi
1040 \ClassInfo{\@classname}{Using journal code \@journalCode}%
1041 }{%
1042 \ClassError{\@classname}{Incorrect journal #1}%
1043 }%

\acmJournal And the syntactic sugar around it
1044 \def\acmJournal#1{\setkeys{ACM}{acmJournal=#1}}

The defaults:
1045 \def\@journalCode@nr{0}
1046 \def\@journalName{}%
1047 \def\@journalNameShort{\@journalName}%
1048 \def\@permissionCodeOne{XXXX-XXXX}%
1049 \def\@permissionCodeTwo{}%

\acmConference This is the conference command
1050 \newcommand\acmConference[4][{}]{%
1051 \gdef\acmConference@shortname{#1}%
1052 \gdef\acmConference@name{#2}%
1053 \gdef\acmConference@date{#3}%
1054 \gdef\acmConference@venue{#4}%
1055 \ifx\acmConference@shortname\@empty
1056 \gdef\acmConference@shortname{#2}%
1057 \fi}
1058 \acmConference[Conference'17]{ACM Conference}{July 2017}{Washington,
1059 DC, USA}

\acmBooktitle The book title of the conference:
\@acmBooktitle 1060 \def\acmBooktitle#1{\gdef\@acmBooktitle{#1}}
1061 \acmBooktitle{Proceedings of \acmConference@name}
1062 \ifx\acmConference@name\acmConference@shortname\else
1063 \ (\acmConference@shortname)\fi}

\@editorsAbbrev How to abbreviate editors
1064 \def\@editorsAbbrev{(Ed.)}

\@acmEditors The list of editors
1065 \def\@acmEditors{}

```

`\editor` Add a new editor to the list

```

1066 \def\editor#1{\ifx\@acmEditors\@empty
1067   \gdef\@acmEditors{#1}%
1068   \else
1069     \gdef\@editorsAbbrev{(Eds.)}%
1070     \g@addto@macro\@acmEditors{\and#1}%
1071 \fi}

```

`\subtitle` The subtitle macro

```

1072 \def\subtitle#1{\def\@subtitle{#1}}
1073 \subtitle{}

```

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

```

1074 \newcount\num@authorgroups
1075 \num@authorgroups=0\relax

```

`\num@author` The total number of authors

```

1076 \newcount\num@author
1077 \num@author=0\relax

```

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

```

1078 \newif\if@insideauthorgroup
1079 \@insideauthorgroupfalse

```

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

```

1080 \renewcommand\author[2][{}%
1081   \global\advance\num@author by 1\relax
1082   \if@insideauthorgroup\else
1083     \global\advance\num@authorgroups by 1\relax
1084     \global\@insideauthorgrouptrue
1085   \fi
1086   \ifx\addresses\@empty
1087     \if@ACM@anonymous
1088       \gdef\addresses{\@author{Anonymous Author(s)}}%
1089       \gdef\authors{Anonymous Author(s)}%
1090     \else
1091       \gdef\addresses{\@author{#2}}%
1092       \gdef\authors{#2}%
1093     \fi
1094   \else
1095     \if@ACM@anonymous\else
1096       \g@addto@macro\addresses{\and\@author{#2}}%
1097       \g@addto@macro\authors{\and#2}%
1098     \fi
1099   \fi
1100   \if@ACM@anonymous
1101     \ifx\shortauthors\@empty
1102       \gdef\shortauthors{Anon.}%
1103     \fi

```

```

1104 \else
1105   \def\@tempa{#1}%
1106   \ifx\@tempa\@empty
1107     \ifx\shortauthors\@empty
1108       \gdef\shortauthors{#2}%
1109     \else
1110       \g@addto@macro\shortauthors{\and#2}%
1111     \fi
1112   \else
1113     \ifx\shortauthors\@empty
1114       \gdef\shortauthors{#1}%
1115     \else
1116       \g@addto@macro\shortauthors{\and#1}%
1117     \fi
1118   \fi
1119 \fi}

```

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

```

1120 \newcommand{\affiliation}[2][{}]{%
1121   \global\@insideauthorgroupfalse
1122   \if@ACM@anonymous\else
1123     \g@addto@macro\addresses{\affiliation{#1}{#2}}%
1124   \fi}

```

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

```

1125 \define@boolkey+{@ACM@affiliation@}[@ACM@affiliation@]{obeypunctuation}%
1126 [true]{}{\ClassError{\@classname}{The option obeypunctuation can be either true or false}}

```

`\additionalaffiliation` Additional affiliations go to footnotes

```

1127 \def\additionalaffiliation#1{\authornote{\@additionalaffiliation{#1}}}

```

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

```

1128 \def\@additionalaffiliation#1{\bgroup
1129   \def\position##1{\ignorespaces}%
1130   \def\institution##1{##1\ignorespaces}%
1131   \def\department{\@ifnextchar[{\@department}{\@department[]}}%
1132   \def\@department[##1]##2{\unskip, ##2\ignorespaces}%
1133   \let\streetaddress\position
1134   \let\city\position
1135   \let\state\position
1136   \let\postcode\position
1137   \let\country\position
1138   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.

```

1139 \renewcommand{\email}[2][{}]{%

```

```

1140 \if@ACM@anonymous\else
1141 \g@addto@macro\addresses{\email{#1}{#2}}%
1142 \fi}

\orcid Right now we do not typeset ORCIDs
1143 \def\orcid#1{\unskip\ignorespaces}

\authorsaddresses Setting up authors' addresses
1144 \def\authorsaddresses#1{\def\@authorsaddresses{#1}}
1145 \authorsaddresses{\mkauthorsaddresses}

\@titlenotes The title notes
1146 \def\@titlenotes{}

\titlenote Adding a note to the title
1147 \def\titlenote#1{%
1148 \g@addto@macro\@title{\footnotemark}%
1149 \if@ACM@anonymous
1150 \g@addto@macro\@titlenotes{%
1151 \stepcounter{footnote}\footnotetext{Title note}}%
1152 \else
1153 \g@addto@macro\@titlenotes{\stepcounter{footnote}\footnotetext{#1}}%
1154 \fi}

\@subtitlenotes The subtitle notes
1155 \def\@subtitlenotes{}

\subtitlenote Adding a note to the subtitle
1156 \def\subtitlenote#1{%
1157 \g@addto@macro\@subtitle{\footnotemark}%
1158 \if@ACM@anonymous
1159 \g@addto@macro\@subtitlenotes{%
1160 \stepcounter{footnote}\footnotetext{Subtitle note}}%
1161 \else
1162 \g@addto@macro\@subtitlenotes{%
1163 \stepcounter{footnote}\footnotetext{#1}}%
1164 \fi}

\@authornotes The author notes
1165 \def\@authornotes{}

\authornote Adding a note to the author
1166 \def\authornote#1{%
1167 \if@ACM@anonymous\else
1168 \g@addto@macro\addresses{\@authornotemark}%
1169 \g@addto@macro\authornotes{%
1170 \stepcounter{footnote}\footnotetext{#1}}%
1171 \fi}

```



`\authornotemark` Adding a footnote mark to the authors

```

1172 \newcommand\authornotemark[1][\relax]{%
1173   \ifx#1\relax\relax\relax
1174   \g@addto@macro\addresses{\@authornotemark}%
1175   \else
1176   \g@addto@macro\addresses{\@authornotemark{#1}}%
1177   \fi}

```

`\acmVolume` The current volume

```

1178 \def\acmVolume#1{\def\@acmVolume{#1}}
1179 \acmVolume{1}

```

`\acmNumber` The current number

```

1180 \def\acmNumber#1{\def\@acmNumber{#1}}
1181 \acmNumber{1}

```

`\acmArticle` The current article

```

1182 \def\acmArticle#1{\def\@acmArticle{#1}}
1183 \acmArticle{}

```

`\acmArticleSeq` The sequence number

```

1184 \def\acmArticleSeq#1{\def\@acmArticleSeq{#1}}
1185 \acmArticleSeq{\@acmArticle}

```

`\acmYear` The current year

```

1186 \def\acmYear#1{\def\@acmYear{#1}}
1187 \acmYear{\the\year}

```

`\acmMonth` The current month

```

1188 \def\acmMonth#1{\def\@acmMonth{#1}}
1189 \acmMonth{\the\month}

```

`\@acmPubDate` The publication date

```

1190 \def\@acmPubDate{\ifcase\@acmMonth\or
1191   January\or February\or March\or April\or May\or June\or
1192   July\or August\or September\or October\or November\or
1193   December\fi~\@acmYear}

```

`\acmPrice` The price

```

1194 \def\acmPrice#1{\def\@acmPrice{#1}}
1195 \acmPrice{15.00}

```

`\acmSubmissionID` The submission ID

```

1196 \def\acmSubmissionID#1{\def\@acmSubmissionID{#1}}
1197 \acmSubmissionID{}

```

`\acmISBN` The book ISBN

```

1198 \def\acmISBN#1{\def\@acmISBN{#1}}
1199 \acmISBN{978-x-xxxx-xxxx-x/YY/MM}

```

`\acmDOI` The paper DOI

```

1200 \def\acmDOI#1{\def\@acmDOI{#1}}
1201 \acmDOI{10.1145/nnnnnnn.nnnnnnn}

```

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

```

1202 \newif\if@ACM@badge
1203 \@ACM@badgefalse

```

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

```

1204 \newlength\@ACM@badge@width
1205 \setlength\@ACM@badge@width{5pc}

```

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

```

1206 \newlength\@ACM@title@width

```

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

```

1207 \newlength\@ACM@badge@skip
1208 \setlength\@ACM@badge@skip{1pc}

```

`\acmBadgeR` Setting the right badge

```

1209 \newcommand\acmBadgeR[2][\@ACM@badgetrue
1210   \def\@acmBadgeR@url{#1}%
1211   \def\@acmBadgeR@image{#2}}
1212 \def\@acmBadgeR@url{}
1213 \def\@acmBadgeR@image{}

```

`\acmBadgeL` Setting the left badge

```

1214 \newcommand\acmBadgeL[2][\@ACM@badgetrue
1215   \def\@acmBadgeL@url{#1}%
1216   \def\@acmBadgeL@image{#2}}
1217 \def\@acmBadgeL@url{}
1218 \def\@acmBadgeL@image{}

```

`\startPage` The start page of the paper

```

1219 \def\startPage#1{\def\@startPage{#1}}
1220 \startPage{}

```

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

```

1221 \def\terms#1{\ClassWarning{\@classname}{The command \string\terms{} is
1222   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.

```

1223 \def\keywords#1{\def\@keywords{#1}}
1224 \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

```

1225 \renewenvironment{abstract}{\Collect@Body\@saveabstract}{\}

```

`\@saveabstract` And saving the abstract

```

1226 \long\def\@saveabstract#1{\long\gdef\@abstract{#1}}
1227 \@saveabstract{}
```

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

```

1228 \long\def\@empty{}
```

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

```

1229 \define@boolkey+{@ACM@topmatter@}[@ACM@]{printccs}[true]{%
1230   \if@ACM@printccs
1231     \ClassInfo{\@classname}{Printing CCS}%
1232   \else
1233     \ClassInfo{\@classname}{Suppressing CCS}%
1234   \fi}{\ClassError{\@classname}{The option printccs can be either true or false}}
```

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

```

1235 \define@boolkey+{@ACM@topmatter@}[@ACM@]{printacmref}[true]{%
1236   \if@ACM@printacmref
1237     \ClassInfo{\@classname}{Printing bibformat}%
1238   \else
1239     \ClassInfo{\@classname}{Suppressing bibformat}%
1240   \fi}{\ClassError{\@classname}{The option printacmref can be either true or false}}
```

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

```

1241 \define@boolkey+{@ACM@topmatter@}[@ACM@]{printfolios}[true]{%
1242   \if@ACM@printfolios
1243     \ClassInfo{\@classname}{Printing folios}%
1244   \else
1245     \ClassInfo{\@classname}{Suppressing folios}%
1246   \fi}{\ClassError{\@classname}{The option printfolios can be either true or false}}
```

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

```

1247 \define@cmdkey{@ACM@topmatter@}[@ACM@]{authorssperrow}[0]{%
1248   \IfInteger{#1}{\ClassInfo{\@classname}{Setting authorssperrow to
1249     #1}}{\ClassWarning{\@classname}{The parameter authorssperrow must be
1250     numerical. Ignoring the input #1}}\gdef\@ACM@authorssperrow{0}}
```

`\settopmatter` The usual syntactic sugar

```

1251 \def\settopmatter#1{\setkeys{@ACM@topmatter@}{#1}}
```

Now the settings

```

1252 \settopmatter{printccs=true, printacmref=true}
1253 \if@ACM@manuscript
1254   \settopmatter{printfolios=true}
1255 \else
1256   \if@ACM@journal
1257     \settopmatter{printfolios=true}
1258   \else
```

```

1259 \settopmatter{printfolios=false}
1260 \fi
1261 \fi
1262 \settopmatter{authorsperrow=0}

\@received The container for the paper history
1263 \def\@received{}

\received The \received command
1264 \newcommand\received[2][\def\@tempa{#1}%
1265 \ifx\@tempa\@empty
1266 \ifx\@received\@empty
1267 \gdef\@received{Received #2}%
1268 \else
1269 \g@addto@macro{\@received}{; revised #2}%
1270 \fi
1271 \else
1272 \ifx\@received\@empty
1273 \gdef\@received{#1 #2}%
1274 \else
1275 \g@addto@macro{\@received}{; #1 #2}%
1276 \fi
1277 \fi}
1278 \AtEndDocument{%
1279 \ifx\@received\@empty\else
1280 \par\bigskip\noindent\small\normalfont\@received\par
1281 \fi}

```

### 3.12 Concepts system

We exclude CCSXML stuff generated by the ACM system:

```

1282 \RequirePackage{comment}
1283 \excludecomment{CCSXML}

\@concepts This is the storage macro for concepts
1284 \let\@concepts\@empty

\ccsdesc The first argument is the significance, the second is the concept(s)
1285 \newcommand\ccsdesc[2][100]{%
1286 \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!
1287 \RequirePackage{textcomp}
1288 \def\ccsdesc@parse#1~#2~#3~{%
1289 \expandafter\ifx\csname CCS@General@#2\endcsname\relax
1290 \expandafter\gdef\csname CCS@General@#2\endcsname{\textbullet\
1291 \textbf{#2}}%

```

```

1292 \expandafter\gdef\csname CCS@Punctuation@#2\endcsname{; }%
1293 \expandafter\gdef\csname CCS@Specific@#2\endcsname{%
1294 \g@addto@macro{\@concepts}{\csname CCS@General@#2\endcsname
1295 \csname CCS@Punctuation@#2\endcsname
1296 \csname CCS@Specific@#2\endcsname}%
1297 \fi
1298 \ifx#3\relax\relax\else
1299 \expandafter\gdef\csname CCS@Punctuation@#2\endcsname{
1300 \textrightarrow\ }%
1301 \expandafter\g@addto@macro\expandafter{\csname CCS@Specific@#2\endcsname}{%
1302 \ifnum#1>499\textbf{#3}; \else
1303 \ifnum#1>299\textit{#3}; \else
1304 #3; \fi\fi}%
1305 \fi
1306 \ccsdesc@parse@finish}

```

```

\ccdesc@parse@finish Gobble everything to \ccsdesc@parse@end
1307 \def\ccsdesc@parse@finish#1\ccsdesc@parse@end{}

```

### 3.13 Copyright system

This is from acmcopyright.sty

```

\if@printcopyright Whether to print a copyright symbol
1308 \newif\if@printcopyright
1309 \@printcopyrighttrue

\if@printpermission Whether to print the permission block
1310 \newif\if@printpermission
1311 \@printpermissiontrue

\if@acmowned Whether the ACM owns the rights to the paper
1312 \newif\if@acmowned
1313 \@acmownedtrue

```

Keys:

```

1314 \define@choicekey*{ACM@}{acmcopyrightmode}[%
1315 \acm@copyrightinput\acm@copyrightmode]{none,%
1316 acmcopyright,acmlicensed,rightsretained,%
1317 usgov,usgovmixed,cagov,cagovmixed,licensedusgovmixed,%
1318 licensedcagov,licensedcagovmixed,othergov,licensedothergov}{%
1319 \@printpermissiontrue
1320 \@printcopyrighttrue
1321 \@acmownedtrue
1322 \ifnum\acm@copyrightmode=0\relax % none
1323 \@printpermissionfalse
1324 \@printcopyrightfalse
1325 \@acmownedfalse
1326 \fi

```

```

1327 \ifnum\acm@copyrightmode=2\relax % acmlicensed
1328 \@acmownedfalse
1329 \fi
1330 \ifnum\acm@copyrightmode=3\relax % rightsretained
1331 \@acmownedfalse
1332 \acmPrice{}%
1333 \fi
1334 \ifnum\acm@copyrightmode=4\relax % usgov
1335 \@printpermissiontrue
1336 \@printcopyrightfalse
1337 \@acmownedfalse
1338 \acmPrice{}%
1339 \fi
1340 \ifnum\acm@copyrightmode=6\relax % cagov
1341 \@acmownedfalse
1342 \fi
1343 \ifnum\acm@copyrightmode=8\relax % licensedusgovmixed
1344 \@acmownedfalse
1345 \fi
1346 \ifnum\acm@copyrightmode=9\relax % licensedcagov
1347 \@acmownedfalse
1348 \fi
1349 \ifnum\acm@copyrightmode=10\relax % licensedcagovmixed
1350 \@acmownedfalse
1351 \fi
1352 \ifnum\acm@copyrightmode=11\relax % othergov
1353 \@acmownedtrue
1354 \fi
1355 \ifnum\acm@copyrightmode=12\relax % licensedothergov
1356 \@acmownedfalse
1357 \fi}

```

\setcopyright This is the syntactic sugar around setting keys.

```

1358 \def\setcopyright#1{\setkeys{ACM@}{acmcopyrightmode=#1}}
1359 \setcopyright{acmcopyright}

```

\@copyrightowner Here is the owner of the copyright

```

1360 \def\@copyrightowner{%
1361   \ifcase\acm@copyrightmode\relax % none
1362   \or % acmcopyright
1363   Association for Computing Machinery.
1364   \or % acmlicensed
1365   Copyright held by the owner/author(s). Publication rights licensed to
1366   the Association for Computing Machinery.
1367   \or % rightsretained
1368   Copyright held by the owner/author(s).
1369   \or % usgov
1370   \or % usgovmixed
1371   Association for Computing Machinery.
1372   \or % cagov

```

```

1373 Crown in Right of Canada.
1374 \or %cagovmixed
1375 Association for Computing Machinery.
1376 \or %licensedusgovmixed
1377 Copyright held by the owner/author(s). Publication rights licensed to
1378 the Association for Computing Machinery.
1379 \or % licensedcagov
1380 Crown in Right of Canada. Publication rights licensed to
1381 the Association for Computing Machinery.
1382 \or %licensedcagovmixed
1383 Copyright held by the owner/author(s). Publication rights licensed to
1384 the Association for Computing Machinery.
1385 \or % othergov
1386 Association for Computing Machinery.
1387 \or % licensedothergov
1388 Copyright held by the owner/author(s). Publication rights licensed to
1389 the Association for Computing Machinery.
1390 \fi}

```

\@formatdoi Print a clickable DOI

```

1391 \def\@formatdoi#1{\url{https://doi.org/#1}}

```

\@copyrightpermission The canned permission block.

```

1392 \def\@copyrightpermission{%
1393   \ifcase\acm@copyrightmode\relax % none
1394   \or % acmcopyright
1395     Permission to make digital or hard copies of all or part of this
1396     work for personal or classroom use is granted without fee provided
1397     that copies are not made or distributed for profit or commercial
1398     advantage and that copies bear this notice and the full citation on
1399     the first page. Copyrights for components of this work owned by
1400     others than ACM must be honored. Abstracting with credit is
1401     permitted. To copy otherwise, or republish, to post on servers or to
1402     redistribute to lists, requires prior specific permission
1403     and\hspace*{.5pt}/or a fee. Request permissions from
1404     permissions@acm.org.
1405   \or % acmlicensed
1406     Permission to make digital or hard copies of all or part of this
1407     work for personal or classroom use is granted without fee provided
1408     that copies are not made or distributed for profit or commercial
1409     advantage and that copies bear this notice and the full citation on
1410     the first page. Copyrights for components of this work owned by
1411     others than the author(s) must be honored. Abstracting with credit
1412     is permitted. To copy otherwise, or republish, to post on servers
1413     or to redistribute to lists, requires prior specific permission
1414     and\hspace*{.5pt}/or a fee. Request permissions from
1415     permissions@acm.org.
1416   \or % rightsretained
1417     Permission to make digital or hard copies of part or all of this work
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```

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 1429 source.  
 1430 \or % usgovmixed  
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 1447 otherwise, distribute, republish, or post, requires prior specific  
 1448 permission and\hspace\*{.5pt}/or a fee. Request permissions from  
 1449 permissions@acm.org.  
 1450 \or % cagovmixed  
 1451 ACM acknowledges that this contribution was co-authored by an  
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 1456 copies for personal or classroom use is granted. Copies must bear  
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 1458 components of this work owned by others than ACM must be honored.  
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 1462 \or % licensedusgovmixed  
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```

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1475 the authors and the Canadian government agency employing them.
1476 Permission to make digital or hard copies for personal or classroom
1477 use is granted. Copies must bear this notice and the full citation
1478 on the first page. Copyrights for components of this work owned by
1479 others than the Canadian Government must be honored. To copy
1480 otherwise, distribute, republish, or post, requires prior specific
1481 permission and\hspace*{.5pt}/or a fee. Request permissions from
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1489 purposes only.
1490 \or % othergov
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1499 or affiliate of a national government. As such, the Government
1500 retains a nonexclusive, royalty-free right to publish or reproduce
1501 this article, or to allow others to do so, for Government purposes
1502 only.
1503 \fi}

\copyrightyear By default, the copyright year is the same as \acmYear, but one can override this:
1504 \def\copyrightyear#1{\def\@copyrightyear{#1}}
1505 \copyrightyear{\@acmYear}

\@teaserfigures The teaser figures container
1506 \def\@teaserfigures{}

teaserfigure The teaser figure
1507 \newenvironment{teaserfigure}{\Collect@Body\@saveteaser}{}

\@saveteaser Saving the teaser
1508 \long\def\@saveteaser#1{\g@addto@macro\@teaserfigures{\@teaser{#1}}}

```

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

```

1509 \renewcommand{\thanks}[1]{%
1510   \ifnotempty{#1}{%
1511     \if@ACM@anonymous
1512       \g@addto@macro\thankses{\thanks{A note}}%
1513     \else
1514       \g@addto@macro\thankses{\thanks{#1}}%
1515     \fi}}

```

### 3.14 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>].

```

1516 \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.

```

1517 \def\maketitle{%
1518   \if@ACM@anonymous
1519     % Anonymize omission of \author-s
1520     \ifnum\num@authorgroups=0\author{}\fi
1521   \fi
1522   \begingroup
1523   \let\@footnotemark\@footnotemark@nolink
1524   \let\@footnotetext\@footnotetext@nolink
1525   \renewcommand\thefootnote{\@fnsymbol\c@footnote}%
1526   \global\@topnum\z@ % this prevents floats from falling
1527                       % at the top of page 1
1528   \global\@botnum\z@ % we do not want them to be on the bottom either
1529   \hsize=\textwidth
1530   \def\@makefnmark{\hbox{\@textsuperscript{\@thefnmark}}}%
1531   \mktitle\if@ACM@sigchiamode\else\mkauthors\fi\mkteasers
1532   \@printtopmatter
1533   \if@ACM@sigchiamode\mkauthors\fi
1534   \setcounter{footnote}{0}%
1535   \def\@makefnmark{\hbox{\@textsuperscript{\normalfont\@thefnmark}}}%
1536   \@titlenotes
1537   \@subtitlenotes
1538   \@authornotes
1539   \let\@makefnmark\relax
1540   \let\@thefnmark\relax
1541   \let\@makefntext\noindent
1542   \ifx\@empty\thankses\else
1543     \footnotetextauthorsaddresses{%

```

```

1544     \def\par{\let\par\@par}\parindent\z@\@setthanks}%
1545 \fi
1546 \ifx\@empty\@authorsaddresses\else
1547     \if@ACM@anonymous\else
1548         \if@ACM@journal
1549             \footnotetextauthorsaddresses{%
1550                 \def\par{\let\par\@par}\parindent\z@\@setauthorsaddresses}%
1551         \fi
1552     \fi
1553 \fi
1554 \footnotetextcopyrightpermission{%
1555     \if@ACM@authordraft
1556         \raisebox{-2ex}{\z@}{\z@}{\makebox[0pt][l]{\large\bfseries
1557             Unpublished working draft. Not for distribution.}}%
1558         \color[gray]{0.9}%
1559     \fi
1560     \parindent\z@\parskip0.1\baselineskip
1561     \if@ACM@authorversion\else
1562         \if@printpermission\@copyrightpermission\par\fi
1563     \fi
1564     \if@ACM@manuscript\else
1565         \if@ACM@journal\else % Print the conference information
1566             {\itshape \acmConference@shortname, \acmConference@date, \acmConference@venue}\par
1567         \fi
1568     \fi
1569     \if@printcopyright
1570         \copyright\ \@copyrightyear\ \@copyrightowner\
1571     \else
1572         \@copyrightyear.\
1573     \fi
1574     \if@ACM@manuscript
1575         Manuscript submitted to ACM\
1576     \else
1577         \if@ACM@authorversion
1578             This is the author's version of the work. It is posted here for
1579             your personal use. Not for redistribution. The definitive Version
1580             of Record was published in
1581             \if@ACM@journal
1582                 \emph{\@journalName}%
1583             \else
1584                 \emph{\@acmBooktitle}%
1585             \fi
1586             \ifx\@acmDOI\@empty
1587                 .
1588             \else
1589                 , \@formatdoi{\@acmDOI}.
1590             \fi\
1591         \else
1592             \if@ACM@journal
1593                 \@permissionCodeOne/\@acmYear/\@acmMonth-ART\@acmArticle

```

```

1594         \ifx\@acmPrice\@empty\else\ $\@acmPrice\fi\
1595         \@formatdoi{\@acmDOI}%
1596     \else % Conference
1597         \ifx\@acmISBN\@empty\else ACM~ISBN~\@acmISBN
1598         \ifx\@acmPrice\@empty.\else\dots\$\@acmPrice\fi\\\fi
1599         \ifx\@acmDOI\@empty\else\@formatdoi{\@acmDOI}\fi%
1600     \fi
1601 \fi
1602 \fi}
1603 \endgroup
1604 \setcounter{footnote}{0}%
1605 \@mkabstract
1606 \if@ACM@printccs
1607     \ifx\@concepts\@empty\else\bgroup
1608         {\@specialsection{CCS Concepts}%
1609         \@concepts\par}\egroup
1610     \fi
1611 \fi
1612 \ifx\@keywords\@empty\else\bgroup
1613     {\if@ACM@journal
1614         \@specialsection{Additional Key Words and Phrases}%
1615     \else
1616         \@specialsection{Keywords}%
1617     \fi
1618     \@keywords}\par\egroup
1619 \fi
1620 \andify\authors
1621 \andify\shortauthors
1622 \global\let\authors=\authors
1623 \global\let\shortauthors=\shortauthors
1624 \if@ACM@printacmref
1625     \@mkbibcitation
1626 \fi
1627 \hypersetup{pdfauthor={\authors},
1628     pdftitle={\@title},
1629     pdfsubject={\@concepts},
1630     pdfkeywords={\@keywords}}%
1631 \@printendtopmatter
1632 \@afterindentfalse
1633 \@afterheading
1634 }

```

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

```

1635 \def\@specialsection#1{%
1636     \ifcase\ACM@format@nr
1637     \relax % manuscript
1638     \par\medskip\small\noindent#1: %
1639     \or % acmsmall
1640     \par\medskip\small\noindent#1: %
1641     \or % acmlarge

```

```

1642 \par\medskip\small\noindent#1: %
1643 \or % acmtog
1644 \par\medskip\small\noindent#1: %
1645 \or % sigconf
1646 \section*{#1}%
1647 \or % siggraph
1648 \section*{#1}%
1649 \or % sigplan
1650 \paragraph*{#1}%
1651 \or % sigchi
1652 \section*{#1}%
1653 \or % sigchi-a
1654 \section*{#1}%
1655 \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.

```

1656 \def\@printtopmatter{%
1657 \ifx\@startPage\@empty
1658 \gdef\@startPage{1}%
1659 \else
1660 \setcounter{page}{\@startPage}%
1661 \fi
1662 \thispagestyle{firstpagestyle}%
1663 \noindent
1664 \ifcase\ACM@format@nr
1665 \relax % manuscript
1666 \box\mktitle@bx\par
1667 \or % acmsmall
1668 \box\mktitle@bx\par
1669 \or % acmlarge
1670 \box\mktitle@bx\par
1671 \or % acmtog
1672 \twocolumn[\box\mktitle@bx]%
1673 \or % sigconf
1674 \twocolumn[\box\mktitle@bx]%
1675 \or % siggraph
1676 \twocolumn[\box\mktitle@bx]%
1677 \or % sigplan
1678 \twocolumn[\box\mktitle@bx]%
1679 \or % sigchi
1680 \twocolumn[\box\mktitle@bx]%
1681 \or % sigchi-a
1682 \par\box\mktitle@bx\par\bigskip
1683 \ifACM@badge
1684 \marginpar{\noindent
1685 \ifx\@acmBadgeL@image\@empty\else
1686 \href{\@acmBadgeL@url}{%
1687 \includegraphics[width=\@ACM@badge@width]{\@acmBadgeL@image}}%

```

```

1688         \hskip\@ACM@badge@skip
1689         \fi
1690         \ifx\@acmBadgeR@image\@empty\else
1691         \href{\@acmBadgeR@url}{%
1692         \includegraphics[width=\@ACM@badge@width]{\@acmBadgeR@image}}%
1693         \fi}%
1694     \fi
1695 \fi
1696 }

\@mktitle The title of the article
1697 \def\@mktitle{%
1698     \ifcase\ACM@format@nr
1699     \relax % manuscript
1700     \@mktitle@i
1701     \or % acmsmall
1702     \@mktitle@i
1703     \or % acmlarge
1704     \@mktitle@i
1705     \or % acmtog
1706     \@mktitle@i
1707     \or % sigconf
1708     \@mktitle@iii
1709     \or % siggraph
1710     \@mktitle@iii
1711     \or % sigplan
1712     \@mktitle@iii
1713     \or % sigchi
1714     \@mktitle@iii
1715     \or % sigchi-a
1716     \@mktitle@iv
1717     \fi
1718 }

\@titlefont The font to typeset the title
1719 \def\@titlefont{%
1720     \ifcase\ACM@format@nr
1721     \relax % manuscript
1722     \LARGE\sffamily\bfseries
1723     \or % acmsmall
1724     \LARGE\sffamily\bfseries
1725     \or % acmlarge
1726     \LARGE\sffamily\bfseries
1727     \or % acmtog
1728     \Huge\sffamily
1729     \or % sigconf
1730     \Huge\sffamily\bfseries
1731     \or % siggraph
1732     \Huge\sffamily\bfseries
1733     \or % sigplan

```

```

1734 \Huge\bfseries
1735 \or % sigchi
1736 \Huge\sffamily\bfseries
1737 \or % sigchi-a
1738 \Huge\bfseries
1739 \fi}

\@subtitlefont The font to typeset the subtitle
1740 \def\@subtitlefont{\normalsize
1741 \ifcase\ACM@format@nr
1742 \relax % manuscript
1743 \mdseries
1744 \or % acmsmall
1745 \mdseries
1746 \or % acmlarge
1747 \mdseries
1748 \or % acmtog
1749 \LARGE
1750 \or % sigconf
1751 \LARGE\mdseries
1752 \or % siggraph
1753 \LARGE\mdseries
1754 \or % sigplan
1755 \LARGE\mdseries
1756 \or % sigchi
1757 \LARGE\mdseries
1758 \or % sigchi-a
1759 \mdseries
1760 \fi}

\@mktitle@i The version of \mktitle for most journals
1761 \def\@mktitle@i{\hsize=\textwidth
1762 \ACM@title@width=\hsize
1763 \ifx\@acmBadgeL@image\@empty\else
1764 \advance\ACM@title@width by -\ACM@badge@width
1765 \advance\ACM@title@width by -\ACM@badge@skip
1766 \fi
1767 \ifx\@acmBadgeR@image\@empty\else
1768 \advance\ACM@title@width by -\ACM@badge@width
1769 \advance\ACM@title@width by -\ACM@badge@skip
1770 \fi
1771 \setbox\mktitle@bx=\vbox{\noindent\@titlefont
1772 \ifx\@acmBadgeL@image\@empty\else
1773 \raisebox{-.5\baselineskip}[\z@][\z@]{\href{\@acmBadgeL@url}{%
1774 \includegraphics[width=\ACM@badge@width]{\@acmBadgeL@image}}}%
1775 \hskip\ACM@badge@skip
1776 \fi
1777 \parbox[t]{\ACM@title@width}{\raggedright
1778 \@titlefont\noindent
1779 \@title

```

```

1780 \ifx\@subtitle\@empty\else
1781   \par\noindent{\@subtitlefont\@subtitle}
1782 \fi}%
1783 \ifx\@acmBadgeR@image\@empty\else
1784   \hskip\@ACM@badge@skip
1785   \raisebox{-.5\baselineskip}[\z@][\z@]{\href{\@acmBadgeR@url}{%
1786     \includegraphics[width=\@ACM@badge@width]{\@acmBadgeR@image}}}%
1787 \fi
1788 \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.
1789 \def\@mktitle@iii{\hsize=\textwidth
1790   \setbox\mktitle@bx=\vbox{\@titlefont\centering
1791     \@ACM@title@width=\hsize
1792     \if@ACM@badge
1793       \advance\@ACM@title@width by -2\@ACM@badge@width
1794       \advance\@ACM@title@width by -2\@ACM@badge@skip
1795       \parbox[b]{\@ACM@badge@width}{\strut
1796         \ifx\@acmBadgeL@image\@empty\else
1797           \raisebox{-.5\baselineskip}[\z@][\z@]{\href{\@acmBadgeL@url}{%
1798             \includegraphics[width=\@ACM@badge@width]{\@acmBadgeL@image}}}%
1799         \fi}%
1800       \hskip\@ACM@badge@skip
1801     \fi
1802     \parbox[t]{\@ACM@title@width}{\centering\@titlefont
1803       \@title
1804       \ifx\@subtitle\@empty\else
1805         \par\noindent{\@subtitlefont\@subtitle}
1806       \fi
1807     }%
1808     \if@ACM@badge
1809       \hskip\@ACM@badge@skip
1810       \parbox[b]{\@ACM@badge@width}{\strut
1811         \ifx\@acmBadgeR@image\@empty\else
1812           \raisebox{-.5\baselineskip}[\z@][\z@]{\href{\@acmBadgeR@url}{%
1813             \includegraphics[width=\@ACM@badge@width]{\@acmBadgeR@image}}}%
1814         \fi}%
1815       \fi
1816     \par\bigskip}}%

\@mktitle@iv The version of \mktitle for sigchi-a
1817 \def\@mktitle@iv{\hsize=\textwidth
1818   \setbox\mktitle@bx=\vbox{\raggedright\leftskip5pc\@titlefont
1819     \noindent\leavevmode\leaders\hrule height 2pt\hfill\kern0pt\par
1820     \noindent\@title
1821     \ifx\@subtitle\@empty\else

```



```

1822     \par\noindent\@subtitlefont\@subtitle
1823     \fi
1824     \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 \cleders trick for this.

```

1825 \newbox\@ACM@commabox
1826 \def\@ACM@addtoaddress#1{%
1827     \ifvmode\else
1828         \if@ACM@affiliation@obexpunctuation\else
1829             \setbox\@ACM@commabox=\hbox{, }%
1830             \unskip\cleders\copy\@ACM@commabox\hskip\wd\@ACM@commabox
1831         \fi\fi
1832     #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...

\position

\department

\streetaddress

\city

\state

\postcode

\country

```

1833 \def\streetaddress#1{\unskip\ignorespaces}
1834 \def\postcode#1{\unskip\ignorespaces}
1835 \if@ACM@journal
1836     \def\position#1{\unskip\ignorespaces}
1837     \def\institution#1{\unskip~#1\ignorespaces}
1838     \def\city#1{\unskip\ignorespaces}
1839     \def\state#1{\unskip\ignorespaces}
1840     \newcommand\department[2][0]{\unskip\ignorespaces}
1841     \def\country#1{\if@ACM@affiliation@obexpunctuation\else, \fi#1\ignorespaces}
1842 \else
1843     \def\position#1{\if@ACM@affiliation@obexpunctuation#1\else#1\par\fi}%
1844     \def\institution#1{\if@ACM@affiliation@obexpunctuation#1\else#1\par\fi}%
1845     \newcommand\department[2][0]{\if@ACM@affiliation@obexpunctuation
1846         #2\else#2\par\fi}%
1847 % \def\streetaddress#1{\if@ACM@affiliation@obexpunctuation#1\else#1\par\fi}%
1848 \let\city\@ACM@addtoaddress
1849 \let\state\@ACM@addtoaddress
1850 % \def\postcode#1{\if@ACM@affiliation@obexpunctuation#1\else\unskip\space#1\fi}%
1851 \let\country\@ACM@addtoaddress
1852 \fi

```

\@mkauthors Typesetting the authors

```

1853 \def\@mkauthors{\begingroup
1854     \hsize=\textwidth
1855     \ifcase\ACM@format@nr

```

```

1856 \relax % manuscript
1857 \mkauthors@i
1858 \or % acmsmall
1859 \mkauthors@i
1860 \or % acmlarge
1861 \mkauthors@i
1862 \or % acmtog
1863 \mkauthors@i
1864 \or % sigconf
1865 \mkauthors@iii
1866 \or % siggraph
1867 \mkauthors@iii
1868 \or % sigplan
1869 \mkauthors@iii
1870 \or % sigchi
1871 \mkauthors@iii
1872 \or % sigchi-a
1873 \mkauthors@iv
1874 \fi
1875 \endgroup
1876 }

```

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

```

1877 \def\@authorfont{\Large\sffamily}

```

\@affiliationfont Font for affiliations

```

1878 \def\@affiliationfont{\normalsize\normalfont}

```

#### Adjusting fonts for different formats

```

1879 \ifcase\ACM@format@nr
1880 \relax % manuscript
1881 \or % acmsmall
1882 \def\@authorfont{\large\sffamily}
1883 \def\@affiliationfont{\small\normalfont}
1884 \or % acmlarge
1885 \or % acmtog
1886 \def\@authorfont{\LARGE\sffamily}
1887 \def\@affiliationfont{\large}
1888 \or % sigconf
1889 \def\@authorfont{\LARGE}
1890 \def\@affiliationfont{\large}
1891 \or % siggraph
1892 \def\@authorfont{\normalsize\normalfont}
1893 \def\@affiliationfont{\normalsize\normalfont}
1894 \or % sigplan
1895 \def\@authorfont{\Large\normalfont}
1896 \def\@affiliationfont{\normalsize\normalfont}
1897 \or % sigchi
1898 \def\@authorfont{\bfseries}

```

```

1899 \def\@affiliationfont{\mdseries}
1900 \or % sigchi-a
1901 \def\@authorfont{\bfseries}
1902 \def\@affiliationfont{\mdseries}
1903 \fi

```

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

```

1904 \def\@typeset@author@line{%
1905 \andify\@currentauthors\par\noindent
1906 \@currentauthors\def\@currentauthors{}}%
1907 \ifx\@currentaffiliations\@empty\else
1908 \andify\@currentaffiliations
1909 \unskip, {\@currentaffiliations}\par
1910 \fi
1911 \def\@currentaffiliations{}}

```

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

```

1912 \def\@mkauthors@i{%
1913 \def\@currentauthors{}}%
1914 \def\@currentaffiliations{}}%
1915 \global\let\and\@typeset@author@line
1916 \def\@author##1{%
1917 \ifx\@currentauthors\@empty
1918 \gdef\@currentauthors{\@authorfont\MakeTextUppercase{##1}}%
1919 \else
1920 \g@addto@macro{\@currentauthors}{\and\MakeTextUppercase{##1}}%
1921 \fi
1922 \gdef\and{}}%
1923 \def\email##1##2{%
1924 \def\affiliation##1##2{%
1925 \def\@tempa{##2}\ifx\@tempa\@empty\else
1926 \ifx\@currentaffiliations\@empty
1927 \gdef\@currentaffiliations{%
1928 \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
1929 \setkeys{@ACM@affiliation@}{##1}%
1930 \@affiliationfont##2}%
1931 \else
1932 \g@addto@macro{\@currentaffiliations}{\and
1933 \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
1934 \setkeys{@ACM@affiliation@}{##1}##2}%
1935 \fi
1936 \fi
1937 \global\let\and\@typeset@author@line}%
1938 \global\setbox\mktitle@bx=\vbox{\noindent\box\mktitle@bx\par\medskip
1939 \noindent\addresses\@typeset@author@line
1940 \par\medskip}%
1941 }

```

`\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  
1942 `\newbox\author@bx`

`\author@bx@wd` The width of the author box  
1943 `\newdimen\author@bx@wd`

`\author@bx@sep` The separation between author boxes  
1944 `\newskip\author@bx@sep`  
1945 `\author@bx@sep=1pc\relax`

`\@typeset@author@bx` Typesetting the box with authors. Note that in `sigchi-a` the box is not centered.  
1946 `\def\@typeset@author@bx{\bgroup\hsize=\author@bx@wd\def\and{\par}%`  
1947 `\global\setbox\author@bx=\vtop{\if@ACM@sigchiamode\else\centering\fi`  
1948 `\@authorfont\@currentauthors\par\@affiliationfont`  
1949 `\@currentaffiliation}\egroup`  
1950 `\box\author@bx\hspace{\author@bx@sep}%`  
1951 `\gdef\@currentauthors{}}%`  
1952 `\gdef\@currentaffiliation{}}}`

`\mkauthors@iii` The `sigconf` version. Here we use a centered design with each author in a separate box.  
1953 `\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.  
1954 `\author@bx@wd=\textwidth\relax`  
1955 `\advance\author@bx@wd by -\author@bx@sep\relax`  
1956 `\ifnum\@ACM@authorssperrow>0\relax`  
1957 `\divide\author@bx@wd by \@ACM@authorssperrow\relax`  
1958 `\else`  
1959 `\ifcase\@num@authorgroups`  
1960 `\relax % 0?`  
1961 `\or % 1=one author per row`  
1962 `\or % 2=two authors per row`  
1963 `\divide\author@bx@wd by \@num@authorgroups\relax`  
1964 `\or % 3=three authors per row`  
1965 `\divide\author@bx@wd by \@num@authorgroups\relax`  
1966 `\or % 4=two authors per row (!)`  
1967 `\divide\author@bx@wd by 2\relax`  
1968 `\else % three authors per row`  
1969 `\divide\author@bx@wd by 3\relax`  
1970 `\fi`  
1971 `\fi`  
1972 `\advance\author@bx@wd by -\author@bx@sep\relax`

Now, parsing of \addresses:

```

1973 \gdef\@currentauthors{}%
1974 \gdef\@currentaffiliation{}%
1975 \def\@author##1{\ifx\@currentauthors\empty
1976 \gdef\@currentauthors{\par##1}%
1977 \else
1978 \g@addto@macro\@currentauthors{\par##1}%
1979 \fi
1980 \gdef\and{}}%
1981 \def\email##1##2{\ifx\@currentaffiliation\empty
1982 \gdef\@currentaffiliation{\nolinkurl{##2}}%
1983 \else
1984 \g@addto@macro\@currentaffiliation{\par\nolinkurl{##2}}%
1985 \fi}%
1986 \def\affiliation##1##2{\ifx\@currentaffiliation\empty
1987 \gdef\@currentaffiliation{%
1988 \setkeys{@ACM@affiliation@}{obexpunctuation=false}%
1989 \setkeys{@ACM@affiliation@}{##1}##2}%
1990 \else
1991 \g@addto@macro\@currentaffiliation{\par
1992 \setkeys{@ACM@affiliation@}{obexpunctuation=false}%
1993 \setkeys{@ACM@affiliation@}{##1}##2}%
1994 \fi
1995 \global\let\and\@typeset@author@bx
1996 }%

```

Actual typesetting is done by the \and macro:

```

1997 \hsize=\textwidth
1998 \global\setbox\mktitle@bx=\vbox{\noindent
1999 \box\mktitle@bx\par\medskip\leavevmode
2000 \lineskip=1pc\relax\centering\hspace*{-1em}%
2001 \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.

```

2002 \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.

```

2003 \author@bx@wd=\columnwidth\relax
2004 \advance\author@bx@wd by -\author@bx@sep\relax
2005 \ifnum\@ACM@authorsperrow>0\relax
2006 \divide\author@bx@wd by \@ACM@authorsperrow\relax
2007 \else
2008 \ifcase\@num@authorgroups
2009 \relax % 0?
2010 \or % 1=one author per row
2011 \else % 2=two authors per row

```

```

2012      \divide\author@bx@wd by 2\relax
2013      \fi
2014 \fi
2015 \advance\author@bx@wd by -\author@bx@sep\relax

```

Now, parsing of \addresses:

```

2016 \gdef\@currentauthors{}%
2017 \gdef\@currentaffiliation{}%
2018 \def\@author##1{\ifx\@currentauthors\empty
2019   \gdef\@currentauthors{\par##1}%
2020 \else
2021   \g@addto@macro\@currentauthors{\par##1}%
2022 \fi
2023 \gdef\and{}}%
2024 \def\email##1##2{\ifx\@currentaffiliation\empty
2025   \gdef\@currentaffiliation{\nolinkurl{##2}}%
2026 \else
2027   \g@addto@macro\@currentaffiliation{\par\nolinkurl{##2}}%
2028 \fi}%
2029 \def\affiliation##1##2{\ifx\@currentaffiliation\empty
2030   \gdef\@currentaffiliation{%
2031     \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
2032     \setkeys{@ACM@affiliation@}{##1}##2}%
2033 \else
2034   \g@addto@macro\@currentaffiliation{\par
2035     \setkeys{@ACM@affiliation@}{obeypunctuation=false}%
2036     \setkeys{@ACM@affiliation@}{##1}##2}%
2037 \fi
2038 \global\let\and\@typeset@author@bx}%
2039 %

```

Actual typesetting is done by the \and macro

```

2040 \bgroup\hsize=\columnwidth
2041 \par\raggedright\leftskip=\z@
2042 \lineskip=1pc\noindent
2043 \addresses\let\and\@typeset@author@bx\and\par\bigskip\egroup}

```

\@mkauthorsaddresses Typesetting authors' addresses in the footnote style

```

2044 \def\@mkauthorsaddresses{%
2045   \ifnum\num@authors>1\relax
2046   Authors' \else Author's \fi
2047   \ifnum\num@authorgroups>1\relax
2048   addresses: \else address: \fi
2049   \bgroup
2050   \def\streetaddress##1{\unskip\@addpunct, ##1}%
2051   \def\postcode##1{\unskip\@addpunct, ##1}%
2052   \def\position##1{\unskip\ignorespaces}%
2053   \def\institution##1{\unskip\@addpunct, ##1}%
2054   \def\city##1{\unskip\@addpunct, ##1}%
2055   \def\state##1{\unskip\@addpunct, ##1}%

```

```

2056 \renewcommand\department[2][0]{\unskip\@addpunct, ##2}%
2057 \def\country##1{\unskip\@addpunct, ##1}%
2058 \def\and{\unskip\@addpunct; }%
2059 \def\@author##1{##1}%
2060 \def\email##1##2{\unskip\@addpunct, \nolinkurl{##2}}%
2061 \addresses
2062 \egroup}

\@setaddresses This is an amsart macro that we do not need.
2063 \def\@setaddresses{}

\@authornotemark Adding a footnote mark to authors. This version adds a “normal” footnote mark.
2064 \def\@authornotemark{\g@addto@macro\@currentauthors{\footnotemark\relax}}

\@@authornotemark Adding a footnote mark to authors with a given number
2065 \def\@@authornotemark#1{\g@addto@macro\@currentauthors{\footnotemark[#1]}}

\@mkteasers Typesetting the teasers
2066 \def\@mkteasers{%
2067   \ifx\@teaserfigures\@empty\else
2068     \def\@teaser##1{\par\bigskip\bgroup
2069       \captionsetup{type=figure}##1\egroup\par}
2070     \global\setbox\mktitle@bx=\vbox{\noindent\box\mktitle@bx\par
2071       \noindent\@teaserfigures\par\medskip}%
2072     \fi}

\@mkabstract Typesetting the abstract
2073 \def\@mkabstract{\bgroup
2074   \ifx\@abstract\@empty\else
2075     {\phantomsection\addcontentsline{toc}{section}{Abstract}%
2076     \if@ACM@journal
2077       \everypar{\setbox\z@\lastbox\everypar{}}\small
2078     \else
2079       \section*{Abstract}%
2080     \fi
2081     \ignorespaces\@abstract\par}%
2082   \fi\egroup}

\@mkbibcitation Print the bibcitation format
2083 \def\@mkbibcitation{\bgroup
2084   \def\@pages@word{\ifnum\getrefnumber{TotPages}=1\relax page\else pages\fi}%
2085   \def\footnotemark{}%
2086   \def\{\unskip{} \ignorespaces}%
2087   \def\footnote{\ClassError{\@classname}{Please do not use footnotes
2088     inside a \string\title{} or \string\author{} command! Use
2089     \string\titlenote{} or \string\authornote{} instead!}}%
2090   \def\@article@string{\ifx\@acmArticle\@empty{\ } \else,
2091     Article~\@acmArticle\ }%
2092   \par\medskip\small\noindent{\bfseries ACM Reference Format:}\par\nobreak

```

```

2093 \noindent\authors. \@acmYear. \@title
2094 \ifx\@subtitle\@empty. \else: \@subtitle. \fi
2095 \if@ACM@journal
2096   \textit{\@journalNameShort}
2097   \@acmVolume, \@acmNumber \@article@string (\@acmPubDate),
2098   \ref{TotPages}~\@pages@word.
2099 \else
2100   In \textit{\@acmBooktitle}%
2101   \ifx\@acmEditors\@empty\textit{.}\else
2102     \andify\@acmEditors\textit{, }\@acmEditors~\@editorsAbbrev.%
2103   \fi\
2104   ACM, New York, NY, USA%
2105   \@article@string\unskip, \ref{TotPages}~\@pages@word.
2106 \fi
2107 \@formatdoi{\@acmDOI}
2108 \par\egroup}

```

```

\@printendtopmatter End the top matter
2109 \def\@printendtopmatter{\par\bigskip}

```

```

\@setthanks We redefine \setthanks using \long
2110 \def\@setthanks{\long\def\thanks##1{\par##1\@addpunct.}\thankses}

```

```

\@setauthorsaddresses
2111 \def\@setauthorsaddresses{\@authorsaddresses\unskip\@addpunct.}

```

### 3.15 Headers and Footers

We use fancyhdr for our headers and footers:

```

2112 \RequirePackage{fancyhdr}

```

```

\ACM@linecount@bx This is the box displayed in review mode
2113 \if@ACM@review
2114   \newsavebox{\ACM@linecount@bx}
2115   \newlength\ACM@linecount@bxht
2116   \newcount\ACM@linecount
2117   \ACM@linecount\@ne\relax
2118   \def\ACM@mk@linecount{%
2119     \savebox{\ACM@linecount@bx}[4em][t]{\parbox[t]{4em}{%
2120       \setlength{\ACM@linecount@bxht}{0pt}%
2121       \loop{\color{red}\scriptsize\the\ACM@linecount}\
2122       \global\advance\ACM@linecount by \@ne
2123       \addtolength{\ACM@linecount@bxht}{\baselineskip}%
2124       \ifdim\ACM@linecount@bxht<\textheight\repeat
2125       {\color{red}\scriptsize\the\ACM@linecount}\hfill
2126       \global\advance\ACM@linecount by \@ne}}}%
2127 \fi

```



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

```

2128 \def\ACM@linecountL{%
2129   \if@ACM@review
2130     \ACM@mk@linecount
2131     \begin{picture}(0,0)%
2132       \put(-26,-22){\usebox{\ACM@linecount@bx}}%
2133     \end{picture}%
2134   \fi}

```

`\ACM@linecountR` How to display the box on the right

```

2135 \def\ACM@linecountR{%
2136   \if@ACM@review
2137     \ACM@mk@linecount
2138     \begin{picture}(0,0)%
2139       \put(20,-22){\usebox{\ACM@linecount@bx}}%
2140     \end{picture}%
2141   \fi}

```

`\ACM@timestamp` The timestamp system

```

2142 \if@ACM@timestamp
2143   % Subtracting 30 from \time gives us the effect of rounding down despite
2144   % \numexpr rounding to nearest
2145   \newcounter{ACM@time@hours}
2146   \setcounter{ACM@time@hours}{\numexpr (\time - 30) / 60 \relax}
2147   \newcounter{ACM@time@minutes}
2148   \setcounter{ACM@time@minutes}{\numexpr \time - \theACM@time@hours * 60 \relax}
2149   \newcommand\ACM@timestamp{%
2150     \footnotesize%
2151     \ifx\@acmSubmissionID\@empty\relax\else
2152       Submission ID: \@acmSubmissionID.{ }%
2153     \fi
2154     \the\year-\two@digits{\the\month}-\two@digits{\the\day}{ }%
2155     \two@digits{\theACM@time@hours}:\two@digits{\theACM@time@minutes}{. }%
2156     Page \thepage\ of \@startPage--\pageref*{TotPages}.%
2157   }
2158 \fi

```

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

```

2159 \def\@shortauthors{\if@ACM@anonymous Anon.\else\shortauthors\fi}

```

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

```

2160 \def\@headfootfont{\sffamily}

```

`standardpagestyle` The page style for all pages but the first one

```

2161 \fancypagestyle{standardpagestyle}{%
2162   \fancyhf{}%
2163   \renewcommand{\headrulewidth}{\z@}%
2164   \renewcommand{\footrulewidth}{\z@}%

```

```

2165 \ifcase\ACM@format@nr
2166 \relax % manuscript
2167 \fancyhead[LE]{\ACM@linecountL\if@ACM@printfolios\thepage\fi}%
2168 \fancyhead[RO]{\if@ACM@printfolios\thepage\fi}%
2169 \fancyhead[RE]{\@shortauthors}%
2170 \fancyhead[LO]{\ACM@linecountL\shorttitle}%
2171 \fancyfoot[RO,LE]{\footnotesize Manuscript submitted to ACM}%
2172 \or % acmsmall
2173 \fancyhead[LE]{\ACM@linecountL\@headfootfont\@acmArticle\if@ACM@printfolios:\thepage\fi}%
2174 \fancyhead[RO]{\@headfootfont\@acmArticle\if@ACM@printfolios:\thepage\fi}%
2175 \fancyhead[RE]{\@headfootfont\@shortauthors}%
2176 \fancyhead[LO]{\ACM@linecountL\@headfootfont\shorttitle}%
2177 \fancyfoot[RO,LE]{\footnotesize \@journalName, Vol. \@acmVolume, No.
2178 \@acmNumber, Article \@acmArticle. Publication date: \@acmPubDate.}%
2179 \or % acmlarge
2180 \fancyhead[LE]{\ACM@linecountL\@headfootfont
2181 \@acmArticle\if@ACM@printfolios:\thepage\fi\quad\textbullet\quad\@shortauthors}%
2182 \fancyhead[LO]{\ACM@linecountL}%
2183 \fancyhead[RO]{\@headfootfont
2184 \shorttitle\quad\textbullet\quad\@acmArticle\if@ACM@printfolios:\thepage\fi}%
2185 \fancyfoot[RO,LE]{\footnotesize \@journalName, Vol. \@acmVolume, No.
2186 \@acmNumber, Article \@acmArticle. Publication date: \@acmPubDate.}%
2187 \or % acmtog
2188 \fancyhead[LE]{\ACM@linecountL\@headfootfont
2189 \@acmArticle\if@ACM@printfolios:\thepage\fi\quad\textbullet\quad\@shortauthors}%
2190 \fancyhead[LO]{\ACM@linecountL}%
2191 \fancyhead[RE]{\ACM@linecountR}%
2192 \fancyhead[RO]{\@headfootfont
2193 \shorttitle\quad\textbullet\quad\@acmArticle\if@ACM@printfolios:\thepage\fi\ACM@linecountR}%
2194 \fancyfoot[RO,LE]{\footnotesize \@journalName, Vol. \@acmVolume, No.
2195 \@acmNumber, Article \@acmArticle. Publication date: \@acmPubDate.}%
2196 \else % Proceedings
2197 \fancyfoot[C]{\if@ACM@printfolios\footnotesize\thepage\fi}%
2198 \fancyhead[LO]{\ACM@linecountL\@headfootfont\shorttitle}%
2199 \fancyhead[RE]{\@headfootfont\@shortauthors\ACM@linecountR}%
2200 \fancyhead[LE]{\ACM@linecountL\@headfootfont\acmConference@shortname,
2201 \acmConference@date, \acmConference@venue}%
2202 \fancyhead[RO]{\@headfootfont\acmConference@shortname,
2203 \acmConference@date, \acmConference@venue\ACM@linecountR}%
2204 \fi
2205 \if@ACM@sigchiamode
2206 \fancyheadoffset[L]{\dimexpr\marginparsep+\marginparwidth}%
2207 \fi
2208 \if@ACM@timestamp
2209 \fancyfoot[LO,RE]{\ACM@timestamp}
2210 \fi
2211 }
2212 \pagestyle{standardpagestyle}

```

```

\@folio@wd Folio blob width, height, offsets and max number
\@folio@ht 2213 \newdimen\@folio@wd
\@folio@voffset 2214 \@folio@wd=\z@
\@folio@max 2215 \newdimen\@folio@ht
2216 \@folio@ht=\z@
2217 \newdimen\@folio@voffset
2218 \@folio@voffset=\z@
2219 \def\@folio@max{1}
2220 \ifcase\ACM@format@nr
2221 \relax % manuscript
2222 \or % acmsmall
2223 \@folio@wd=45.75pt\relax
2224 \@folio@ht=1.25in\relax
2225 \@folio@voffset=.2in\relax
2226 \def\@folio@max{8}
2227 \or % acmlarge
2228 \@folio@wd=43.25pt\relax
2229 \@folio@ht=79pt\relax
2230 \@folio@voffset=.55in\relax
2231 \def\@folio@max{10}
2232 \fi

\@folioblob The macro to typeset the folio blob.
2233 \def\@folioblob{\@tempcnta=0\@acmArticleSeq\relax
2234 \ifnum\@tempcnta=0\relax\else
First, we calculate \@acmArticleSeq modulo \@folio@max
2235 \loop
2236 \ifnum\@tempcnta>\@folio@max\relax
2237 \advance\@tempcnta by - \@folio@max
2238 \repeat
2239 \advance\@tempcnta by -1\relax
2240 \@tempdima=\@folio@ht\relax
2241 \multiply\@tempdima by \the\@tempcnta\relax
2242 \advance\@tempdima by -\@folio@voffset\relax
2243 \begin{picture}(0,0)
2244 \makebox[\z@]{\raisebox{-\@tempdima}{%
2245 \rlap{%
2246 \raisebox{-0.45\@folio@ht}{\z@}\z@}{%
2247 \rule{\@folio@wd}{\@folio@ht}}}%
2248 \parbox{\@folio@wd}{%
2249 \centering
2250 \textcolor{white}{\LARGE\sfseries\bfseries\@acmArticle}}}}
2251 \end{picture}\fi}
2252

firstpagestyle The page style for the first page only.
2253 \fancypagestyle{firstpagestyle}{%
2254 \fancyhf{}%
```

```

2255 \renewcommand{\headrulewidth}{\z@}%
2256 \renewcommand{\footrulewidth}{\z@}%
2257 \ifcase\ACM@format@nr
2258 \relax % manuscript
2259 \fancyhead[L]{\ACM@linecountL}%
2260 \fancyfoot[RO,LE]{\if@ACM@printfolios\small\thepage\fi}%
2261 \fancyfoot[RE,LO]{\footnotesize Manuscript submitted to ACM}%
2262 \or % acmsmall
2263 \fancyfoot[RO,LE]{\footnotesize \@journalName, Vol. \@acmVolume, No.
2264 \@acmNumber, Article \@acmArticle. Publication date:
2265 \@acmPubDate.}%
2266 \fancyhead[LE]{\ACM@linecountL\@folioblob}%
2267 \fancyhead[LO]{\ACM@linecountL}%
2268 \fancyhead[RO]{\@folioblob}%
2269 \fancyheadoffset[RO,LE]{0.6\@folio@wd}%
2270 \or % acmlarge
2271 \fancyfoot[RO,LE]{\footnotesize \@journalName, Vol. \@acmVolume, No.
2272 \@acmNumber, Article \@acmArticle. Publication date:
2273 \@acmPubDate.}%
2274 \fancyhead[RO]{\@folioblob}%
2275 \fancyhead[LE]{\ACM@linecountL\@folioblob}%
2276 \fancyhead[LO]{\ACM@linecountL}%
2277 \fancyheadoffset[RO,LE]{1.4\@folio@wd}%
2278 \or % acmtog
2279 \fancyfoot[RO,LE]{\footnotesize \@journalName, Vol. \@acmVolume, No.
2280 \@acmNumber, Article \@acmArticle. Publication date:
2281 \@acmPubDate.}%
2282 \fancyhead[L]{\ACM@linecountL}%
2283 \fancyhead[R]{\ACM@linecountR}%
2284 \else % Conference proceedings
2285 \fancyhead[L]{\ACM@linecountL}%
2286 \fancyhead[R]{\ACM@linecountR}%
2287 \fancyfoot[C]{\if@ACM@printfolios\footnotesize\thepage\fi}%
2288 \fi
2289 \if@ACM@timestamp
2290 \ifnum\ACM@format@nr=0\relax % Manuscript
2291 \fancyfoot[LO,RE]{\ACM@timestamp\quad
2292 \footnotesize Manuscript submitted to ACM}
2293 \else
2294 \fancyfoot[LO,RE]{\ACM@timestamp}
2295 \fi
2296 \fi
2297 }

```

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

```

2298 \let\ACM@ps@plain\ps@plain
2299 \let\ACM@ps@myheadings\ps@myheadings
2300 \let\ACM@ps@headings\ps@headings
2301 \def\ACM@restore@pagestyle{%
2302 \let\ps@plain\ACM@ps@plain

```

```

2303 \let\ps@myheadings\ACM@ps@myheadings
2304 \let\ps@headings\ACM@ps@headings}
2305 \AtBeginDocument{\ACM@restore@pagestyle}

```

### 3.16 Sectioning

Sectioning is different for different levels

```

2306 \renewcommand\section{\@startsection{section}{1}{\z@}%
2307 {- .75\baselineskip \@plus -2\p@ \@minus -.2\p@}%
2308 {.25\baselineskip}%
2309 {\@secfont}}
2310 \renewcommand\subsection{\@startsection{subsection}{2}{\z@}%
2311 {- .75\baselineskip \@plus -2\p@ \@minus -.2\p@}%
2312 {.25\baselineskip}%
2313 {\@subsecfont}}
2314 \renewcommand\subsubsection{\@startsection{subsubsection}{3}{10pt}%
2315 {- .5\baselineskip \@plus -2\p@ \@minus -.2\p@}%
2316 {-3.5\p@}%
2317 {\@subsubsecfont\@adddotafter}}
2318 \renewcommand\paragraph{\@startsection{paragraph}{4}{\parindent}%
2319 {- .5\baselineskip \@plus -2\p@ \@minus -.2\p@}%
2320 {-3.5\p@}%
2321 {\@parfont\@adddotafter}}
2322 \renewcommand\part{\@startsection{part}{9}{\z@}%
2323 {-10\p@ \@plus -4\p@ \@minus -2\p@}%
2324 {4\p@}%
2325 {\@parfont}}

```

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

```

2326 \def\section@raggedright{\@rightskip\@flushglue
2327 \rightskip\@rightskip
2328 \leftskip\z@skip
2329 \parindent\z@}

```

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

```

\@subsecfont 2330 \def\@secfont{\sffamily\bfseries\section@raggedright\MakeTextUppercase}
\@subsubsecfont 2331 \def\@subsecfont{\sffamily\bfseries\section@raggedright}
\@parfont 2332 \def\@subsubsecfont{\sffamily\itshape}
2333 \def\@parfont{\itshape}
2334 \setcounter{secnumdepth}{3}
2335 \ifcase\ACM@format@nr
2336 \relax % manuscript
2337 \or % acmsmall
2338 \or % acmlarge
2339 \def\@secfont{\sffamily\large\section@raggedright\MakeTextUppercase}
2340 \def\@subsecfont{\sffamily\large\section@raggedright}
2341 \or % acmtog
2342 \def\@secfont{\sffamily\large\section@raggedright\MakeTextUppercase}
2343 \def\@subsecfont{\sffamily\large\section@raggedright}

```

```

2344 \or % sigconf
2345 \def\@secfont{\bfseries\Large\section@raggedright\MakeTextUppercase}
2346 \def\@subsecfont{\bfseries\Large\section@raggedright}
2347 \or % siggraph
2348 \def\@secfont{\sffamily\bfseries\Large\section@raggedright\MakeTextUppercase}
2349 \def\@subsecfont{\sffamily\bfseries\Large\section@raggedright}
2350 \or % sigplan
2351 \def\@secfont{\bfseries\Large\section@raggedright}
2352 \def\@subsecfont{\bfseries\section@raggedright}
2353 \renewcommand\subsubsection{\@startsection{subsubsection}{3}{\z@}%
2354   {- .75\baselineskip \@plus -2\p@ \@minus -.2\p@}%
2355   {.25\baselineskip}%
2356   {\@subsubsecfont}}
2357 \def\@subsubsecfont{\bfseries\section@raggedright}
2358 \renewcommand\paragraph{\@startsection{paragraph}{4}{\z@}%
2359   {- .5\baselineskip \@plus -2\p@ \@minus -.2\p@}%
2360   {-3.5\p@}%
2361   {\@parfont\@addspaceafter}}
2362 \def\@parfont{\bfseries\itshape}
2363 \renewcommand\subparagraph{\@startsection{subparagraph}{5}{\z@}%
2364   {- .5\baselineskip \@plus -2\p@ \@minus -.2\p@}%
2365   {-3.5\p@}%
2366   {\@subparfont\@addspaceafter}}
2367 \def\@subparfont{\itshape}
2368 \or % sigchi
2369 \setcounter{secnumdepth}{1}
2370 \def\@secfont{\sffamily\bfseries\section@raggedright\MakeTextUppercase}
2371 \def\@subsecfont{\sffamily\bfseries\section@raggedright}
2372 \or % sigchi-a
2373 \setcounter{secnumdepth}{0}
2374 \def\@secfont{\sffamily\bfseries\section@raggedright\MakeTextUppercase}
2375 \def\@subsecfont{\sffamily\bfseries\section@raggedright}
2376 \fi

```

\@adddotafter Add punctuation after a sectioning command

```
2377 \def\@adddotafter#1{#1\@addpunct{.}}
```

\@addspaceafter Add space after a sectioning command

```
2378 \def\@addspaceafter#1{#1\@addpunct{\enspace}}
```

### 3.17 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.

```
2379 \providecommand*\@dotsep{4.5}
```

### 3.18 Theorems

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

2380 `\def\acmplainbodyfont{\itshape}`

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

2381 `\def\acmplainindent{\parindent}`

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

2382 `\def\acmplainheadfont{\scshape}`

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

2383 `\def\acmplainnotefont{\@empty}`

Customization of the acmplain theorem style:

2384 `\ifcase\ACM@format@nr`

2385 `\relax % manuscript`

2386 `\or % acmsmall`

2387 `\or % acmlarge`

2388 `\or % acmtog`

2389 `\or % sigconf`

2390 `\or % siggraph`

2391 `\or % sigplan`

2392 `\def\acmplainbodyfont{\itshape}`

2393 `\def\acmplainindent{\z@}`

2394 `\def\acmplainheadfont{\bfseries}`

2395 `\def\acmplainnotefont{\normalfont}`

2396 `\or % sigchi`

2397 `\or % sigchi-a`

2398 `\fi`

`acmplain` The acmplain theorem style

2399 `\newtheoremstyle{acmplain}%`

2400 `{.5\baselineskip\@plus.2\baselineskip`

2401 `\@minus.2\baselineskip}% space above`

2402 `{.5\baselineskip\@plus.2\baselineskip`

2403 `\@minus.2\baselineskip}% space below`

2404 `{\acmplainbodyfont}% body font`

2405 `{\acmplainindent}% indent amount`

2406 `{\acmplainheadfont}% head font`

2407 `{.}% punctuation after head`

2408 `{.5em}% spacing after head`

2409 `{\thmname{#1}\thmnumber{ #2}\thmnote{ {\acmplainnotefont(#3)}}}% head spec`

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

2410 `\def\acmdefinitionbodyfont{\normalfont}`

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

2411 `\def\acmdefinitionindent{\parindent}`

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

```
2412 \def\@acmdefinitionheadfont{\itshape}
```

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

```
2413 \def\@acmdefinitionnotefont{\@empty}
```

Customization of the acmdefinition theorem style:

```
2414 \ifcase\ACM@format@nr
```

```
2415 \relax % manuscript
```

```
2416 \or % acmsmall
```

```
2417 \or % acmlarge
```

```
2418 \or % acmtog
```

```
2419 \or % sigconf
```

```
2420 \or % siggraph
```

```
2421 \or % sigplan
```

```
2422 \def\@acmdefinitionbodyfont{\normalfont}
```

```
2423 \def\@acmdefinitionindent{\z@}
```

```
2424 \def\@acmdefinitionheadfont{\bfseries}
```

```
2425 \def\@acmdefinitionnotefont{\normalfont}
```

```
2426 \or % sigchi
```

```
2427 \or % sigchi-a
```

```
2428 \fi
```

`acmdefinition` The acmdefinition theorem style

```
2429 \newtheoremstyle{acmdefinition}%
```

```
2430 { .5\baselineskip\@plus.2\baselineskip
```

```
2431 \@minus.2\baselineskip}% space above
```

```
2432 { .5\baselineskip\@plus.2\baselineskip
```

```
2433 \@minus.2\baselineskip}% space below
```

```
2434 {\@acmdefinitionbodyfont}% body font
```

```
2435 {\@acmdefinitionindent}% indent amount
```

```
2436 {\@acmdefinitionheadfont}% head font
```

```
2437 {.}% punctuation after head
```

```
2438 {.5em}% spacing after head
```

```
2439 {\thmname{#1}\thmnumber{#2}\thmnote{ \@acmdefinitionnotefont{#3}}}% head spec
```

Make acmplain the default theorem style.

```
2440 \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.

```
2441 \AtEndPreamble{%
```

```
2442 \if@ACM@acmthm
```



```

2443 \theoremstyle{acmplain}
2444 \@ifundefined{theorem}{%
2445 \newtheorem{theorem}{Theorem}[section]
2446 }{}
2447 \@ifundefined{conjecture}{%
2448 \newtheorem{conjecture}[theorem]{Conjecture}
2449 }{}
2450 \@ifundefined{proposition}{%
2451 \newtheorem{proposition}[theorem]{Proposition}
2452 }{}
2453 \newtheorem{lemma}[theorem]{Lemma}
2454 \@ifundefined{lemma}{}{}
2455 \@ifundefined{corollary}{%
2456 \newtheorem{corollary}[theorem]{Corollary}
2457 }{}
2458 \theoremstyle{acmdefinition}
2459 \@ifundefined{example}{%
2460 \newtheorem{example}[theorem]{Example}
2461 }{}
2462 \@ifundefined{definition}{%
2463 \newtheorem{definition}[theorem]{Definition}
2464 }{}
2465 \fi
2466 \theoremstyle{acmplain}
2467 }

\@proofnamefont The font to typeset the proof name.
2468 \def\@proofnamefont{\scshape}

\@proofindent Whether or not to indent proofs.
2469 \def\@proofindent{\indent}

Customization of the proof environment.
2470 \ifcase\ACM@format@nr
2471 \relax % manuscript
2472 \or % acmsmall
2473 \or % acmlarge
2474 \or % acmtog
2475 \or % sigconf
2476 \or % siggraph
2477 \or % sigplan
2478 \def\@proofnamefont{\itshape}
2479 \def\@proofindent{\noindent}
2480 \or % sigchi
2481 \or % sigchi-a
2482 \fi

proof We want some customization of the proof environment.
2483 \renewenvironment{proof}[1][\proofname]{\par

```

```

2484 \pushQED{\qed}%
2485 \normalfont \topsep6\p@\@plus6\p@\relax
2486 \trivlist
2487 \item[\@proofindent\hskip\labelsep
2488       {\@proofnamefont #1\@addpunct{.}}]\ignorespaces
2489 }{%
2490 \popQED\endtrivlist\@endpfalse
2491 }

```

### 3.19 Acknowledgments

`\acks` This is a comment-like structure

```

2492 \specialcomment{acks}{%
2493 \begin{group}
2494 \section*{Acknowledgments}
2495 \phantomsection\addcontentsline{toc}{section}{Acknowledgments}
2496 }{%
2497 \end{group}
2498 }

```

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

```

2499 \def\grantsponsor#1#2#3{#2}

```

`\grantnum`

```

2500 \newcommand\grantnum[3][{}]{#3%
2501 \def\@tempa{#1}\ifx\@tempa\@empty\else\space(\url{#1})\fi}

```

### 3.20 Conditional typesetting

We use the `comment` package for conditional typesetting:

```

2502 \AtEndPreamble{%
2503 \if@ACM@screen
2504 \includecomment{screenonly}
2505 \excludecomment{printonly}
2506 \else
2507 \excludecomment{screenonly}
2508 \includecomment{printonly}
2509 \fi
2510 \if@ACM@anonymous
2511 \excludecomment{anonsuppress}
2512 \excludecomment{acks}
2513 \else
2514 \includecomment{anonsuppress}
2515 \fi}

```

### 3.21 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/>).

```
2516 \newcommand\showeprint[2][arxiv]{%
2517   \def\@tempa{#1}%
2518   \ifx\@tempa\@empty\def\@tempa{arxiv}\fi
2519   \def\@tempb{arxiv}%
2520   \ifx\@tempa\@tempb
2521     arXiv:\href{http://arxiv.org/abs/#2}{#2}\else arXiv:#2%
2522   \fi}
```

### 3.22 End of Class

```
2523 \normalsize\normalfont\frenchspacing
2524 \end{class}
```

## References

- [1] UK T<sub>E</sub>X Users Group. UK list of T<sub>E</sub>X frequently asked questions. <http://www.tex.ac.uk>, 2016.
- [2] Michael Downes and Barbara Beeton. *The amsart, amsproc, and amsbook document classes*. American Mathematical Society, August 2004. <http://www.ctan.org/pkg/amslatex>.
- [3] Cristophe Fiorio. *algorithm2e.sty—package for algorithms*, October 2015. <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

v1.00	General: First released version . . . . .	28	v1.05	General: Added processing doi numbers for acmsiggraph and doi numbers for sigproc.bib . . . . .	28
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> ) . . . . .	28		Patched \setcitestyle command; closes <a href="https://github.com/borisveytsman/acmart/issues/19">https://github.com/borisveytsman/acmart/issues/19</a> . . . . .	28
	Defined ACM colors . . . . .	28	v1.06	\@ACM@badge@skip: Added macro . . .	58
	Explicitly put draft option (closes <a href="https://github.com/borisveytsman/acmart/issues/4">https://github.com/borisveytsman/acmart/issues/4</a> ) . . . . .	31		\@ACM@badge@width: Added macro . .	58
	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> ) . . . . .	28		\@ACM@title@width: Added macro . .	58
v1.02	General: Added TOPS and TSC (closes <a href="https://github.com/borisveytsman/acmart/issues/12">https://github.com/borisveytsman/acmart/issues/12</a> ) . . . . .	28		\@mktitle@i: Added processing badges . . . . .	71
	Documentation changes (closes <a href="https://github.com/borisveytsman/acmart/issues/13">https://github.com/borisveytsman/acmart/issues/13</a> ) . . . . .	28		Made generic . . . . .	71
v1.03	\@formatdoi: Added macro . . . . .	63		\@mktitle@ii: Now this macro is obsolete . . . . .	72
	\if@ACM@authorversion: Added macro . . . . .	30		\@mktitle@iii: Added processing badges . . . . .	72
	\maketitle: Added special case of authorversion . . . . .	66		Made more generic . . . . .	72
	General: Added anonsuppress environment . . . . .	28		\@mktitle@iv: Made more generic . .	72
	Added authorversion option (closes <a href="https://github.com/borisveytsman/acmart/issues/9">https://github.com/borisveytsman/acmart/issues/9</a> ) . . . . .	28		\@printtopmatter: Added processing badges . . . . .	69
v1.04	\acmArticleSeq: Name change by Matthew Fluet . . . . .	57		\@subtitlefont: Added macro . . . .	71
	\acmDOI: Name change by Matthew Fluet . . . . .	58		\@titlefont: Added macro . . . . .	70
	\acmISBN: Name change by Matthew Fluet . . . . .	57		\acmBadgeL: Added macro . . . . .	58
	General: Updated bibliography for siggraph . . . . .	28		\acmBadgeR: Added macro . . . . .	58
				\if@ACM@badge: Added macro . . . .	58
			v1.07	\maketitle: Corrected a bug with abstract footnotes . . . . .	66
				Corrected a bug with permission and footnotes order . . . . .	66
			v1.08	General: SIGPLAN reformatting by Matthew Fluet . . . . .	28
				Typos corrected (Tobias Pape) . . .	28
			v1.09	General: Revert SIGPLAN caption rules . . . . .	28
			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> . . . . .	66

General: Changes of	v1.14
‘licensedothergov’ wording . . . . .	61
standardpagestyle: Reversed folios	
location . . . . .	81
v1.11	
General: Customization of ACM	
theorem styles and proof	
environment by Matthew Fluet . . .	28
v1.12	
\@marginfigure: Now centering by	
default . . . . .	45
\@marginfigure: Now centering by	
default . . . . .	45
\@parfont: Moved to	
\section@raggedright . . . . .	85
\copyrightpermissionfootnoterule:	
Added macro . . . . .	42
\descriptionlabel: Redefined . . . .	47
\footnoterule: Made shorter . . . . .	42
\if@ACM@natbib@override: Added	
macro . . . . .	30
\if@ACM@newfonts: Added macro . . .	43
\maketitle: Moved thanks to	
copyrightpermission box . . . . .	66
\section@raggedright: Introduced	
macro . . . . .	85
General: Added graceful behavior	
when libertine fonts are absent . . .	43
Documentation updates . . . . .	28
v1.13	
\@mpfootnotetext: Made minipage	
footnotes centered . . . . .	42
\bibliographystyle: Redefined	
macro . . . . .	39
\bibstyle@acmauthoryear: Added	
macro . . . . .	35
\bibstyle@acmnumeric: Added	
macro . . . . .	35
\if@ACM@printfolios: Added macro . .	59
General: Font adjustments for	
acmsmall . . . . .	74
Increased font size for ACM Large	
Print bibliographic information by	
default for the proceedings . . . . .	59
standardpagestyle: Added headers	
for sigs . . . . .	81
Expanded headers for sigchi-a . . . .	81
Suppressed folios if sig . . . . .	81
\bibstyle@acmauthoryear: Moved	
def of \bibstyle@acmauthoryear	
before use . . . . .	35
\bibstyle@acmnumeric: Moved def of	
\bibstyle@numeric before use . . . .	35
General: \citestyle updates	
(Matthew Fluet) . . . . .	28
Patched \citestyle . . . . .	33
v1.15	
\@ACM@addtoaddress: Added macro . . .	73
\@mkauthors@iii: New authors	
system . . . . .	76
\@shortauthors: Introduced macro . . .	81
\@typeset@author@bx: Moved to	
separate macro . . . . .	76
\acks: Added macro . . . . .	90
\affiliation: Added code for author	
groups . . . . .	55
\author: Added code for author	
groups . . . . .	54
\city: Added macro . . . . .	73
\country: Added macro . . . . .	73
\department: Added macro . . . . .	73
\grantnum: Added macro . . . . .	90
\grantsponsor: Added macro . . . . .	90
\if@insideauthorgroup: Introduced	
macro . . . . .	54
\institution: Added macro . . . . .	73
\num@authorgroups: Renamed . . . . .	54
\orcid: Introduced macro . . . . .	56
\position: Added macro . . . . .	73
\postcode: Added macro . . . . .	73
\state: Added macro . . . . .	73
\streetaddress: Added macro . . . . .	73
standardpagestyle: Better handling	
of anonymous mode . . . . .	81
v1.16	
\@headfootfont: Added macro . . . . .	81
General: Formatting header/footer	
(Matthew Fluet) . . . . .	28
standardpagestyle: Customize	
header/footer text font . . . . .	81
v1.17	
\@makefnmark: Redefined . . . . .	43
\@mkauthors: TOG now uses the same	
authors block as other journals . . .	73
\@mkauthors@ii: Deleted . . . . .	76
\@mkbibcitation: Added \nobreak	
Changed format for sigs . . . . .	79

\acmArticle: The default is now numerical . . . . .	57	v1.25	General: Updated PACMPL . . . . .	47
\acmMonth: The default must be numerical. Closes #50. . . . .	57	v1.26	General: Corrected \shortcite bug . . . . .	28
\acmNumber: The default is now numerical . . . . .	57		Documentation typos fixed (thanks to Stephen Spencer) . . . . .	28
\acmVolume: The default is now numerical . . . . .	57	v1.27	\if@ACM@printccs: Typo corrected . . . . .	59
\acmYear: The default is now numerical . . . . .	57	v1.28	\ccsdesc@parse: Change from \to to \textrightarrow (Matteo Riondato) . . . . .	60
\description: Decreased indent . . . . .	47		General: Corrected option natbib behavior . . . . .	35
\granthum: Added url . . . . .	90		Got rid of warnings in pdf keywords . . . . .	38
\grantsponsor: Renamed . . . . .	90			
\if@ACM@printacmref: Renamed from \if@ACM@printbib . . . . .	59	v1.29	\@mkabstract: Removed spurious indentation (John Wickerson) . . . . .	79
General: Slightly decreased margins for sigs . . . . .	40		\ccsdesc@parse: Add spacing after bullet and around rightarrow; semicolon separators no longer in bold/italic (John Wickerson) . . . . .	60
standardpagestyle: Added paper title to sigs . . . . .	81		General: Increased head to 13pt . . . . .	40
v1.18			standardpagestyle: Corrected printfolios (Matthew Fluet) . . . . .	81
\@mkauthors@i: Now we andify affiliations . . . . .	75	v1.30	\department: Added optional parameter . . . . .	73
\@typeset@author@line: Added macro . . . . .	75		General: Added \frenchspacing . . . . .	91
General: Natbib is now the default for all formats . . . . .	28		Bibtex style now recognizes https:// in doi . . . . .	28
v1.19			Switched to T1: looks like libertine has problems with \l in OT1 . . . . .	44
\@mkabstract: Include 'Abstract' in PDF bookmarks (Matthew Fluet) . . . . .	79		Updated IMWUT and PACMPL . . . . .	47
\acks: Include 'Acknowledgements' in PDF bookmarks (Matthew Fluet) . . . . .	90	v1.31	\@additionalaffiliation: Added macro . . . . .	55
General: Include 'Abstract', 'Acknowledgements', and 'References' in PDF bookmarks (Matthew Fluet) . . . . .	28		\@mkbibcitation: Disabled linebreak . . . . .	79
Include 'References' in PDF bookmarks (Matthew Fluet) . . . . .	33		\@startsection: Added \tochangmeasure . . . . .	35
v1.20			Redefined macro . . . . .	37
\@mkabstract: Deleted spurious space . . . . .	79		\@textbottom: Redefined . . . . .	43
General: Bug fixes for bst . . . . .	28		\acmMonth: The default now is the current month (Matteo Riondato) . . . . .	57
v1.21			\acmYear: The default now is the current year (Matteo Riondato) . . . . .	57
\showeprint: Added macro . . . . .	90		\additionalaffiliation: Added macro . . . . .	55
v1.22			\l@section: Redefined macro . . . . .	38
General: More bibliography changes for Aptara . . . . .	28		\l@subsubsection: Redefined macro . . . . .	38
v1.23				
General: Add PACMPL journal option . . . . .	28			
v1.24				
General: Add IMWUT journal option . . . . .	47			

General: Documentation changes . . .	28	BibTeX comma before articleno bug corrected . . . . .	28
v1.32		BibTeX crossref bug corrected . . .	28
\@formatdoi: New doi format . . . . .	63	BibTeX numpages bug corrected . .	28
General: Added POMACS journal option . . . . .	28	Documentation updates . . . . .	28
Format siggraph is now obsolete . .	28	Moved \citenam definition for non-natbib bibliography, so a package may redefine it . . . . .	38
v1.33		Switched to Type 1 fonts for libertine even if OTF-capable engine is used (Kai Mindermann) .	44
\@ACM@addtoaddress: Added obexpunctuation code . . . . .	73	firstpagestyle: Added right linecount for two-column formats	83
\@mkauthors@i: Added obexpunctuation code . . . . .	75	Added timestamp (Michael D. Adams) . . . . .	83
\@mkauthors@iii: Added obexpunctuation code . . . . .	76	standardpagestyle: Added right linecount for two-column formats	81
\@mkauthors@iv: Added obexpunctuation code . . . . .	77	Added timestamp (Michael D. Adams) . . . . .	81
\@subtitlefont: Added \normalsize . . . . .	71	v1.34	
\ACM@linecountL: Renamed macro .	81	\@mkbibcitation: Deleted DOI from doi numbers . . . . .	79
\ACM@linecountR: Added macro . .	81	\ACM@linecount@bx: Rulers now are continuous . . . . .	80
\ACM@timestamp: Added current page number . . . . .	81	\ACM@linecountL: Rulers now are continuous . . . . .	81
Added macro (Michael D. Adams) .	81	\ACM@linecountR: Rulers now are continuous . . . . .	81
Added submission id . . . . .	81	\maketitle: Added date to the bibstrip in conf proceedings . . . .	66
\acmSubmissionID: Added macro . .	57	Deleted 'DOI' from doi numbers .	66
\city: Added obexpunctuation code	73	Rearranged bibstrip . . . . .	66
\country: Added obexpunctuation code . . . . .	73	The \terms command is now obsolete . . . . .	66
\department: Added obexpunctuation code . . . . .	73	\terms: The \terms command now just produces a warning . . . . .	58
\if@ACM@affiliation@obexpunctuation: Added macro . . . . .	55	v1.35	
\if@ACM@authordraft: Added macro	30	\@bibstyle@acmauthoryear: Square brackets for author-year style . . .	35
\if@ACM@natbib@override: Deleted macro . . . . .	30	General: BibTeX bug fixed: et al. . . .	28
\if@ACM@timestamp: Added macro (Michael D. Adams) . . . . .	30	If the copyright is set to usgov or rightsretained, the price is suppressed . . . . .	61
\institution: Added obexpunctuation code . . . . .	73	v1.36	
\maketitle: Fixed the bug with figures on top and bottom of the title page, thanks to David Epstein	66	\@ACM@authorsperrrow: Added macro	59
\position: Added obexpunctuation code . . . . .	73	\@mkauthors@iii: Added authorsperrrow override . . . . .	76
\postcode: Added obexpunctuation code . . . . .	73	\@mkauthors@iv: Added authorsperrrow override . . . . .	77
\state: Added obexpunctuation code	73		
\streetaddress: Added obexpunctuation code . . . . .	73		
General: Added acmart-preload-hook	28		
Added cmap and glyphtounicode .	43		



\if@ACM@authordraft: Corrected typo, thanks to bargteil . . . . .	30	General: Added 'textcase' package . .	33
General: Added PACMHCI journal options . . . . .	47	Added heightrounded to geometry	40
Added the possibility to adjust number of author boxes per row in conference formats . . . . .	28	Added new copyright version: licensedcagov . . . . .	28
v1.37		Added package cleveref . . . . .	28
\description: Reduce list indentation (Matthew Fluet) . . . .	47	Added Ross Moore code for glyphtounicode . . . . .	43
\descriptionlabel: Reduce list indentation (Matthew Fluet) . . . .	47	Bibliography changes . . . . .	28
\normalparindent: Set \normalparindent (Matthew Fluet) . . . . .	41	v1.41	
General: Reduce list indentation (Matthew Fluet) . . . . .	46	General: Added new badges . . . . .	28
Set \normalparindent; Reduce list indentation (Matthew Fluet) . . . .	28	v1.42	
v1.38		General: Deleted ACM badges . . . . .	28
General: Increase default font size for SIGPLAN . . . . .	28, 32	v1.43	
v1.39		\@startsection: Added \makeatletter . . . . .	37
\@authornotemark: Added macro . .	79	\country: Added comma before country for journals . . . . .	73
\authornotemark: Added macro . . .	57	v1.44	
v1.40		\@acmBooktitle: Added macro . . . .	53
\@copyrightowner: Added new copyright version: licensedcagov .	62	\@acmEditors: Added macro . . . . .	53
\@copyrightpermission: Added new copyright version: licensedcagov .	63	\@editorsAbbrev: Added macro . . .	53
\@mkauthors@i: Switched to MakeTextUppercase . . . . .	75	\@folioblob: Suppress the blob if acmArticleSeq is empty . . . . .	83
\@parfont: Switched to MakeTextUppercase . . . . .	85	\@mkbibcitation: If the paper has just one page, use 'page' instead of 'pages' . . . . .	79
\ACM@linecount@bx: Work around a bug in xcolor: looks like cmyk colors in boxes do not work . . . .	80	\ACM@restore@pagestyle: Added macro . . . . .	84
\ccdesc@parse@finish: Added macro . . . . .	61	\acmArticle: The default is now empty . . . . .	57
\city: We now do not print this even in SIG . . . . .	73	\acmArticleSeq: Now acmArticle might be empty . . . . .	57
\country: Fixed bugs with extra spaces . . . . .	73	\acmBooktitle: Added macro . . . . .	53
\l@subsection: Redefined macro . .	37	\editor: Added macro . . . . .	54
\postcode: We now do not print this even in SIG . . . . .	73	\if@ACM@acmthm: Added macro . . . .	29
\state: We now do not print this even in SIG . . . . .	73	\maketitle: Empty DOI or ISBN are not printed (by Michael Ekstrand)	66
\streetaddress: We now do not print this even in SIG . . . . .	73	General: Added package refcount . . .	28
		Deleted package cleveref . . . . .	28
		Put theorem defs in a separate style	28
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