

marginalia — Marginal content anywhere with automatic adjustment for Lua¹TeX¹

¹ This document describes v0.84.6, last revised 2026-10-09.

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Released 2026-10-09

Abstract

This Lua¹TeX package allows the placement of marginal content anywhere, without `\marginpar`'s limits, and automatically adjusts positions to prevent overlaps or content being pushed off the page, and offers key–value settings that allow fine-grained customization.

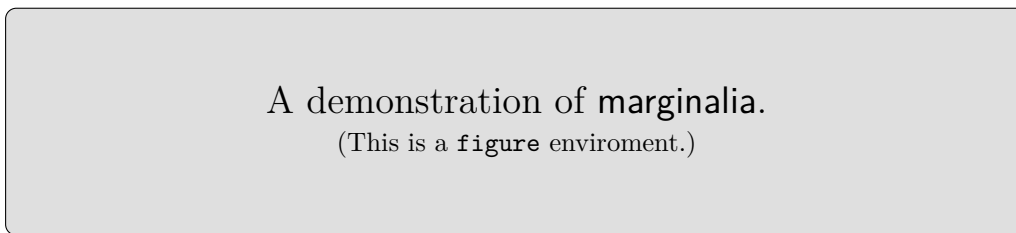
Demonstration

The `marginalia` package permits intelligent placement of marginal content, such as notes. This page demonstrates some of its capabilities.

Key–value options allow global or local settings of the style, width, placement, and spacing of marginal content. In particular, styles and widths can be specified globally depending on the margin in which the content is placed; the correct style or width will be selected for each item. For example, in this demonstration, 15 mm-wide ragged-right sans-serif has been specified globally as the default for items in the right margin and 35 mm-wide justified sans-serif for items in the left margin. Note that the vertical position of items is adjusted automatically to avoid overlaps, but there is an option to specify that items have fixed positions.

By default, this marginal note would have its top line aligned with the last line of the adjacent paragraph, but it has been automatically moved upwards to avoid clashing with the figure caption below, which has been set with an option that fixes its position.

Figure 0
`marginalia` can place content alongside floats, so it can be used to place float captions in the margin. (Here, the text style has been locally switched to Roman.)



(Like this one.)

Notes can be placed on both sides of the paragraph.

This is a top-aligned margin item pointing to the relevant line of text.

Unlike the usual `\marginpar` command, `marginalia` allows marginal content to be placed next to floats, footnotes, or the page head or footer. ‘Marks’ can also be added pointing to the relevant line of text and there are various vertical alignment options.

The automatic adjustment of the vertical positions of items will not result in items being closer than specified distances from the top or bottom of the page (unless there is actually insufficient space to place the items).

This marginal note, the width and style of which have locally been set to 25 mm and ragged left, would by default have its top line aligned with the last line of the adjacent paragraph, but it has been moved upwards to maintain a minimum distance of 10 mm from the bottom of the page.

This is a middle-aligned margin item pointing to the relevant line of text.

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1 Introduction

The $\text{\LaTeX}$ `\marginpar` command is the basic method for placing content in the margin. For purposes such as drawing attention to particular points in the text, it functions well. Its main limitation is that `\marginpar` works via the $\text{\LaTeX}$ float mechanism and so cannot be used to create marginal content next to a figure, table, or other float, or next to a footnote, or to place running heads in the margin, such as are found in the left-hand margin of this document except for the ‘implementation’ section. (Bringhurst called this style ‘running shoulderheads’ [Bri04, p. 65], but the term may be non-standard.)

Trying to set many separate pieces of marginal content using `\marginpar` can lead to other problems. If two `\marginpars` would clash, $\text{\LaTeX}$ shifts the second item downward. But the cumulative effect can lead to `\marginpars` being shifted downward off the bottom of the page. Further, the asynchronous nature of $\text{\TeX}$ ’s page-breaking can cause: (1) a `\marginpar` to be placed in the wrong margin; (2) the topmost `\marginpar` on a page to be unnecessarily shifted downward because of a hypothetical clash that would have occurred with the previous `\marginpar`, had they been on the same page.

Packages like `mparhack`³ (Tom Sgouros & Stefan Ulrich), `marginnote`⁴ (Markus Kohm), `marginfix`⁵ (Stephen Hicks) and `marginfit`⁶ (Maurice Leclaire) were created to avoid these limitations and problems. `mparhack` only ensures that each `\marginpar` appears on the correct side of the page. `marginnote` allows marginal content to be placed anywhere, but does not adjust positions to avoid clashes. `marginfix` adjusts positions, but the unadjusted vertical positioning can be slightly off, and the package still uses floats. `marginfit` gets positions exactly right, but uses the insert mechanism and so marginal content cannot appear next to floats or footnotes.

This $\text{\LuaTeX}$ package, `marginalia`, provides a `\marginalia` command that attempts to avoid these limitations. Marginal content is placed, not via floats or inserts, but by a calculated per-item horizontal shift inside an (invisible) `\rlap` or `\llap` from the position where the `\marginalia` command was issued (which is similar to the technique used by `marginnote`), plus a calculated per-item vertical shift to avoid clashes with other content. The vertical shift is usually downward, but may be upward when necessary to prevent content from being shifted off the bottom of the page (which is similar to the vertical shifts performed by `marginfix` and `marginfit`).

The calculation of the horizontal and vertical shifts uses information written to the `.aux` file during the previous $\text{\LuaTeX}$ run. It thus takes at least two runs for all content to appear in the correct places. The package reports any changes from the previous run and any problems encountered.

Note: `marginalia` was written to typeset running heads in the margin, sidenote references, side-captions for floats, and small marginal figures in the author’s book *Form & Number: A History of Mathematical Beauty* [Cai24].⁷ Thus the basic functionality has been tested extensively, and it has performed correctly.

Licence. `marginalia` is released under the $\text{\LaTeX}$ Project Public Licence v1.3c or later.⁸

Acknowledgements. The author thanks Ulrike Fischer for explaining how to add tagging support, and Julien Labbé and François Pantigny for some valuable suggestions.

Translation. A French translation of the documentation has been made by members of GUTenberg (Le Groupe francophone des Utilisateurs de $\text{\TeX}$).⁹

3 URL: <https://ctan.org/pkg/mparhack>

4 URL: <https://ctan.org/pkg/marginnote>

5 URL: <https://ctan.org/pkg/marginfix>

6 URL: <https://ctan.org/pkg/marginfit>

7 *Form & Number* is freely available on the Internet Archive under a Creative Commons licence.

URL: https://archive.org/details/cain_formand_number_ebook_large

8 URL: <https://www.latex-project.org/lppl.txt>

9 URL: <https://gitlab.gutenberg-asso.fr/gutenberg/traduction-de-marginalia/>

User commands

Feature requests and bug reports The development code and issue tracker are hosted at Codeberg.¹⁰

¹⁰ URL: <https://codeberg.org/ajcain/marginalia>

Other resources. An introduction to `marginalia` has appeared in *TUGboat* [Cai25].

2 Requirements

`marginalia` requires

- (1) Lua $\text{\LaTeX}$,
- (2) a recent $\text{\LaTeX}$ kernel with `expl3` support (any kernel version since 2020-02-02 should suffice).

It does not depend on any other packages.

3 Installation

To install `marginalia` manually, run `luatex marginalia.ins` and copy `marginalia.sty` and `marginalia.lua` to somewhere Lua $\text{\LaTeX}$ can find them.

4 Getting started

`marginalia` works ‘out of the box’. Load the package (there are no package options) and use the main `\marginalia` command to place marginal content. Figure 4.1 shows the source code for a small demonstration and the resulting document. *The source code must be processed twice by Lua $\text{\LaTeX}$ for the marginal content to be placed correctly.* (See Subsection 8.1 for discussion of the need for multiple runs.)

Turn to Section 5 for a detailed description of the available user commands, and Section 6 for the various options (such as `style=<code>`) that can be used to change the placement and formatting of the marginal content.

5 User commands

<code>\marginalia</code>	<code>\marginalia[<options>]{<content>}</code>
--------------------------	--

This is the basic command for placing marginal content. The `<content>` can, roughly speaking, be anything: text, mathematics, included graphics, TikZ. The optional argument `<options>` is a key–value list that specifies how the content is typeset. The keys are described in Section 6.

<code>\marginaliasetup</code>	<code>\marginaliasetup{<options>}</code>
-------------------------------	--

This command is used to set options for subsequent calls to `\marginalia`. The argument `<options>` is the same kind of key–value list as the `<options>` argument for the `\marginalia` command, and the keys are described in Subsection 6.

Note that `\marginaliasetup` can be used in the preamble or in the body of the document. Options set using `\marginaliasetup` have effect only within the current group.

User commands

```
\documentclass[11pt,a4paper]{article}

\usepackage{marginalia}

\begin{document}

Here is some body text.\marginalia{Here is a marginal note.} Some more
body text.\marginalia[style=\footnotesize\itshape\raggedright]{Here is another
    marginal note, set in smaller text and italics, whose position has been been
    adjusted automatically.}

\vspace{20mm}

Some final body text after a space.\marginalia[pos=left, valign=b,
style=\sffamily\raggedleft, width=35mm]{This note is placed on the left side
    of the page, wider, in sans serif, ragged left, and bottom-aligned.}

\end{document}
```

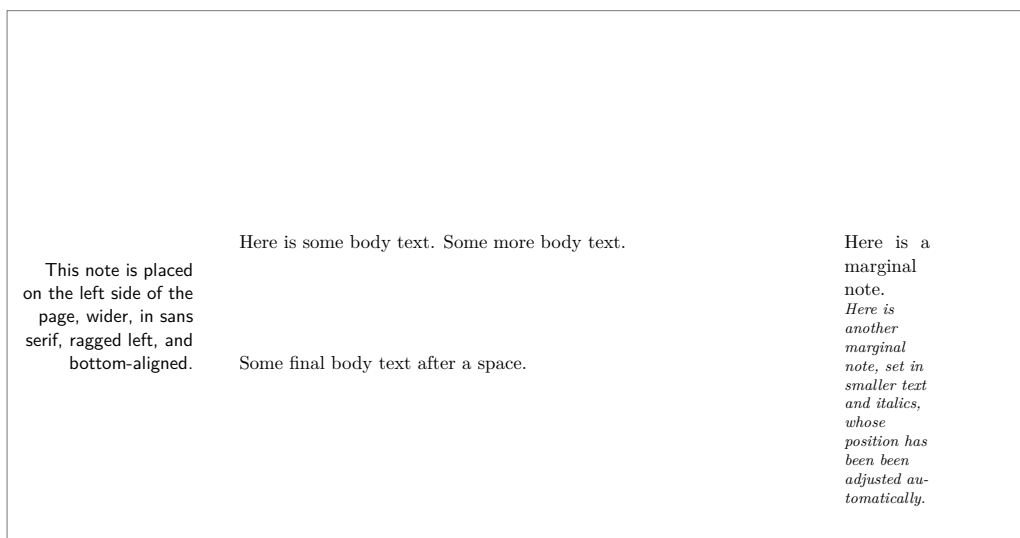


Figure 4.1: A small demonstration of marginalia.

`\marginalianewgeometry` `\marginalianewgeometry`

¹¹ URL: <https://ctan.org/pkg/geometry>

This command signals to `marginalia` that the page layout has been changed, for instance by using the `\newgeometry` command from the `geometry` package,¹¹ or by using the `\twocolumn` command to switch to two-column mode. It should be issued immediately after such a change, and certainly before the first page with the new layout has been shipped out. There is no harm in using it unnecessarily.

5.1 Access to page and column

Within the `<content>` of `\marginalia`, two counters are available which specify the actual page and column in which the call to `\marginalia` appears. These counters can be used to select different actions depending on the page on which the content appears or (in two-column mode) whether it pertains to the left or right column. It is best to use the variants of the `style` and `width` keys if marginal content should have different widths or styles depending on whether they appear on a recto/verso page or pertain to a particular column. These counters are made available for purposes not covered by the `style` and `width` variants. The value of each counter is based on the position of the call to `\marginalia` on the previous Lua $\text{\LaTeX}$ run.

<code>\marginaliapage</code>	A counter register, available within the <code><content></code> of <code>\marginalia</code> , that holds the actual page on which the marginal content appears. The value is based on the previous Lua $\text{\LaTeX}$ run and will default to 1.
------------------------------	---

<code>\marginaliacolumn</code>	A counter register, available within the <code><content></code> of <code>\marginalia</code> , that holds the actual column to which the marginal content pertains. The value is 1 for the left column, 2 for the right column. In one-column mode, the value is always 0. (If the key <code>column</code> is used to manually specify the column to which the content pertains, the value of <code>\marginaliacolumn</code> will change accordingly.) The value is based on the previous Lua $\text{\LaTeX}$ run and will default to 0.
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5.2 expl3 commands

There are also public expl3 versions of these commands for package authors and programmers. Most users will not need to use these commands.

<code>\marginalia:nn</code>	<code>\marginalia:nn{<options>}{<content>}</code>
-----------------------------	---

The expl3 version of `\marginalia`. The difference is that `<options>` is now a required parameter (but can be empty).

<code>\marginalia_setup:n</code>	<code>\marginalia_setup:n{<options>}</code>
----------------------------------	---

The expl3 version of `\marginaliasetup`.

<code>\marginalia_new_geometry:</code>	<code>\marginalia_new_geometry:</code>
--	--

The expl3 version of `\marginalianewgeometry`.

6 Options

The description of keys in this section, which are summarized in [Tables 1](#) and [2](#) (on pages [9](#) and [15](#) respectively), should be read in conjunction with the discussion of how marginal content is placed in [Section 7](#). In particular, the variants of the keys `style`, `width`, and `mark` follow the terminology shown in [Figure 7.1](#).

Note that the initial values of the various keys that take dimensions (namely `width...`, `xsep...`, `ysep...`) are assigned at `\begin{document}`. Thus their defaults are determined by

Options the values of `\marginparwidth`, `\marginparsep`, `\marginparpush` and the page layout at `\begin{document}`, *not* at package load time. Similarly, if the user sets these keys in the preamble, the assignment is evaluated at `\begin{document}`. For example, using `\marginaliasetup{width=.5\oddsidemargin}` in the preamble results in the `width` key being set to half the value of `\oddsidemargin` at `\begin{document}`, *not* to half the value of `\oddsidemargin` at the call to `\marginaliasetup`.

6.1 Document orientation

binding side The side of a recto page on which the document is bound and which is thus the ‘inner’ margin of a recto page. It can take the values `left` (the normal for books written in left-to-right languages, such as European languages) and `right` (the normal for books written in right-to-left languages, such as Arabic or Hebrew). *This option can only be set in the preamble. (Default: left)*

Options which involve the term `outer` and `inner` are affected by the value of `binding side`. If `binding side=left`, then `outer` refers to the right-hand margin of recto pages and to the left-hand margin of verso pages. If `binding side=right`, then `outer` refers to the left-hand margin of recto pages and to the right-hand margin of verso pages.

For example: if `binding side=left`, then setting `width recto outer` has the same effect as setting `width recto right`; if `binding side=right` then setting `width recto outer` has the same effect as setting `width recto left`.

6.2 Type

type The `type` of an item of marginal content can be set to one of the following three values:

- normal:** The vertical position of the item will be changed automatically if necessary to prevent a clash with another item of content.
- fixed:** The vertical position of the item will *never* be changed automatically from the position specified by `yshift`, even if there is a clash with another item. (The type `fixed` was designed for setting float captions in the margin, since a caption should not move away from the float with which it is associated.)
- optfixed:** The vertical position of the item will *never* be changed automatically from the position specified by `yshift`, even if there is a clash with another item. But an `optfixed` item will not appear in the document if it would clash with a `fixed` item. (The type `optfixed` was designed for setting running heads in the margin, which should not appear if they would clash with a figure caption set in the margin.)

(Default: normal)

6.3 Horizontal placement

pos The position in which an item of marginal content should be placed. It can be set to one of the the following seven values:

- auto:** Place the item in the default position as described in [Section 7](#): the outer margin in single-column mode, and on the opposite side from the other column in two-column mode.
- reverse:** Place the item on the opposite side of the text block (in one-column mode) or column (in two-column mode) from `auto`.
- outer:** The outer side of the text block or column.
- inner:** The inner side of the text block or column.
- right:** The right side of the text block or column.

Options

Table 1: Summary of keys affecting the type and position of the marginal content. (For keys affecting the appearance of marginal content, see [Table 2](#).) All keys can be set using `\marginaliasetup` or passed in the optional argument to `\marginalia`.

Key name	Value	Default
<code>type</code>	<code>{normal, fixed, optfixed}</code>	<code>normal</code>
<code>pos</code>	<code>{auto, reverse, left, right, nearest}</code>	<code>auto</code>
<code>column</code>	<code>{auto, one, left, right}</code>	<code>auto</code>
<code>xsep recto right</code>	Dimension	<code>\marginparsep</code>
<code>xsep recto left</code>	Dimension	<code>\marginparsep</code>
<code>xsep verso right</code>	Dimension	<code>\marginparsep</code>
<code>xsep verso left</code>	Dimension	<code>\marginparsep</code>
<code>xsep right between</code>	Dimension	<code>\marginparsep</code>
<code>xsep left between</code>	Dimension	<code>\marginparsep</code>
<code>xsep recto outer</code>	Dimension	<code>\marginparsep</code>
<code>xsep recto inner</code>	Dimension	<code>\marginparsep</code>
<code>xsep verso outer</code>	Dimension	<code>\marginparsep</code>
<code>xsep verso inner</code>	Dimension	<code>\marginparsep</code>
<code>xsep</code>	Dimension	<code>\marginparsep</code>
<code>xsep between</code>	Dimension	<code>\marginparsep</code>
<code>xsep outer</code>	Dimension	<code>\marginparsep</code>
<code>xsep inner</code>	Dimension	<code>\marginparsep</code>
<code>valign</code>	<code>{t, b, c, m}</code>	<code>t</code>
<code>yshift</code>	Dimension	<code>0pt</code>
<code>ysep</code>	Dimension	<code>\marginparpush</code>
<code>ysep above below</code>	Dimension	<code>\marginparpush</code>
<code>ysep above</code>	Dimension	<code>\marginparpush</code>
<code>ysep below</code>	Dimension	<code>\marginparpush</code>
<code>ysep page top</code>	Dimension	[Margin above textblock]
<code>ysep page bottom</code>	Dimension	[Margin below textblock]
<code>ysep page top margin</code>	[None]	—
<code>ysep page bottom margin</code>	[None]	—
<code>ysep page top bottom margin</code>	[None]	—

Options

left: The left side of the text block or column.

nearest: The side of the text block or column nearest to which `\marginalia` was called.

(Default: `auto`)

The values `auto`, `reverse`, `outer`, and `inner` are affected by the key `binding side`. The value `outer` means ‘the opposite side of the page from the binding’ and the value `inner` means ‘the same side of the page as the binding’.

Similarly, in one-column mode, the value `auto` places the item in the margin on the opposite side of the page from the binding. In two-column mode, `auto` places the item in the margin on the opposite side from the other column, regardless of the value of `binding side`. The value `reverse` always places the item on the opposite side of the text block or column from `auto`.

The values `right`, `left`, and `nearest` are *not* affected by `binding side`.

column In two-column mode, `marginalia` tries to determine to which column an item of marginal content pertains using the position of the call to `\marginalia`. If the call is to the left of the mid-point between the columns, the item is assumed to pertain to the left column; otherwise, it is assumed to pertain to the right column. In certain situations, this might lead to undesired placement of the item. In particular, any call to `\marginalia` in a full-width float in two-column mode would be handled as if it were a call from one of the columns and might thus be set in the wrong place. Similarly, an overflow hbox or a piece of `\rlap`-ped text might carry a call to `\marginalia` from the left column text into the area of the page occupied by the right column.

The key `column` can be used to specify which column `marginalia` should place the item in. It can be set to one of four values:

auto: Automatically determine which column an item of marginal content is placed in.

one: Treat the item as being called from one-column mode.

left: Treat the item as pertaining to the left column.

right: Treat the item as pertaining to the right column.

The value of `column` has no effect in one-column mode. (Default: `auto`)

xsep recto right These keys specify the horizontal separation between an item of marginal content and the text block next to which it is placed. Which separation is used will depend on where the item is typeset. The terminology is as in [Figure 7.1](#).

xsep recto left

xsep verso right

xsep verso left

xsep right between

xsep left between

xsep recto right: used for an item in the right margin of a recto page.

xsep recto left: used for an item in the left margin of a recto page.

xsep verso right: used for an item in the right margin of a verso page.

xsep verso left: used for an item in the left margin of a verso page.

xsep right between: used for an item set from the right column between the columns.

xsep left between: used for an item set from the left column between the columns.

xsep recto outer These alternative keys similarly specify the horizontal separation between an item

xsep recto inner of marginal content and the text block. The `inner` keys apply to the margin where the

xsep verso outer binding is (as specified by `binding side`) and the `outer` keys apply to the opposite

xsep verso inner margin. Setting each of these keys has the same effect as setting the corresponding

`right/left` key listed above. (See the documentation of `binding side` for further details of how `outer/inner` correspond to `right/left`.)

xsep recto outer: used for an item in the outer margin of a recto page.

xsep recto inner: used for an item in the inner margin of a recto page.

xsep verso outer: used for an item in the outer margin of a verso page.

Options

	xsep verso inner: used for an item in the inner margin of a verso page.
	These keys are shortcuts for setting more than one of the above keys simultaneously.
	xsep: a shorthand for setting all of the xsep... simultaneously.
xsep	xsep between: a shorthand for setting the keys xsep right between and xsep left between simultaneously to the same value.
xsep between	
xsep outer	xsep outer: a shorthand for setting the keys xsep recto outer and xsep verso outer simultaneously to the same value.
xsep inner	xsep inner: a shorthand for setting the keys xsep recto inner and xsep verso inner simultaneously to the same value.

(The shorthands **xsep outer** and **xsep inner** exist because page geometry is usually symmetrical between recto and verso pages as regards outer and inner margins. The shorthand **xsep between** exists because the space between columns, if used at all for marginal content, will often be shared equally.) Each of these keys must be set to a valid dimension. (*Default:* value of `\marginparsep` at `\begin{document}`)

6.4 Vertical placement

valign This key specifies the vertical alignment of the marginal content item, before any **yshift** or automatic adjustment is applied. It can be set to one of the following three values:

- t:** The baseline of the marginal content item is the baseline of the topmost box in its contents. Thus, if no **yshift** is specified and there is no automatic adjustment, the baseline of the topmost box of the marginal content will be vertically aligned with the line where the call to `\marginalia` is located.
- b:** The baseline of the marginal content item is the baseline of the bottommost box in its contents. Thus, if no **yshift** is specified and there is no automatic adjustment, the baseline of the bottommost box of the marginal content will be vertically aligned with the line where the call to `\marginalia` is located.
- c:** The baseline of the marginal content item will be placed centrally between top and bottom of the contents as a whole.
- m:** The baseline of the marginal content item will be midway between the baselines of the topmost and bottommost boxes in its contents. Thus, if the marginal content comprises an *odd* number of *equally-spaced* lines, the baseline of the middle line will be vertically aligned with the line where the call to `\marginalia` is located.

These values are illustrated in [Figure 6.1](#) If **type=normal**, then the alignments described above for **t**, **b**, **m** may not hold because of automatic adjustment. (*Default:* **t**)

The option **valign=c** may be useful if the marginal content contains a picture, which would sit on a single oversized line. Conversely, the option **valign=m** may be useful if one is wants textual alignment with the body text.

yshift The key **yshift** is used to shift the default position of the marginal content item up (positive) or down (negative) from its normal position, which is to have its baseline aligned with the baseline of the callout position. It must be set to a valid dimension. Note that if **type=normal**, then the vertical position may be adjusted from that specified by **yshift**. If this is not desired, specify a different **type**. (*Default:* 0pt).

ysep	These keys specify the minimum vertical separation above and below an item of marginal content (see Figure 6.2).
ysep above	
ysep below	ysep above: the minimum vertical separation between an item and the one above. (<i>Default:</i> value of <code>\marginparpush</code> at <code>\begin{document}</code>)
ysep page top	
ysep page bottom	ysep below: the minimum vertical separation between an item and the one below. (<i>Default:</i> value of <code>\marginparpush</code> at <code>\begin{document}</code>)

Options

```

\documentclass[11pt,a4paper]{article}

\usepackage{marginalia}
\marginaliasetup{
  ysep page top=0mm,
  style recto outer=\raggedright\footnotesize,
  style recto inner=\raggedleft\footnotesize,
  width=30mm,
}

\begin{document}

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod%
\marginalia[valign=t]{\large\ttfamily valign=t}\\The baseline of this marginal note
  is the baseline of the its top line.}%
\marginalia[valign=b,pos=reverse]{\large\ttfamily valign=b}\\The  baseline of this
  marginal note is the baseline of its bottom line.}

\vspace{30mm}

Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris
nisi%
\marginalia[valign=c,pos=reverse]{\large\ttfamily valign=c}\\The baseline of this
  marginal note is midway between the top and bottom of its content.}%
\marginalia[valign=m]{\large\ttfamily valign=m}\\The baseline of this marginal note
  is midway between the baseline of its top line and the baseline of its bottom line.}

\end{document}

```

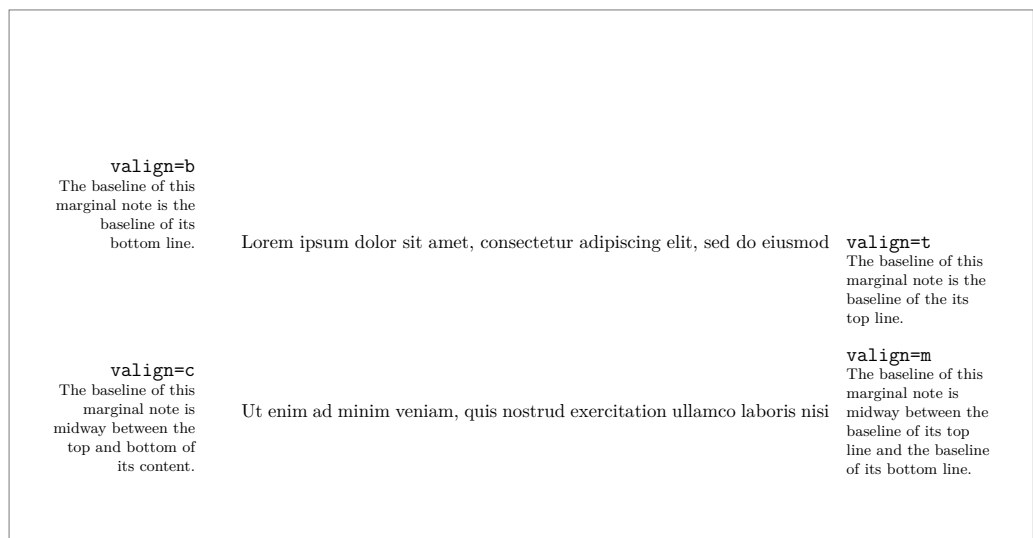


Figure 6.1: A demonstration of the various values of `valign`.

Options

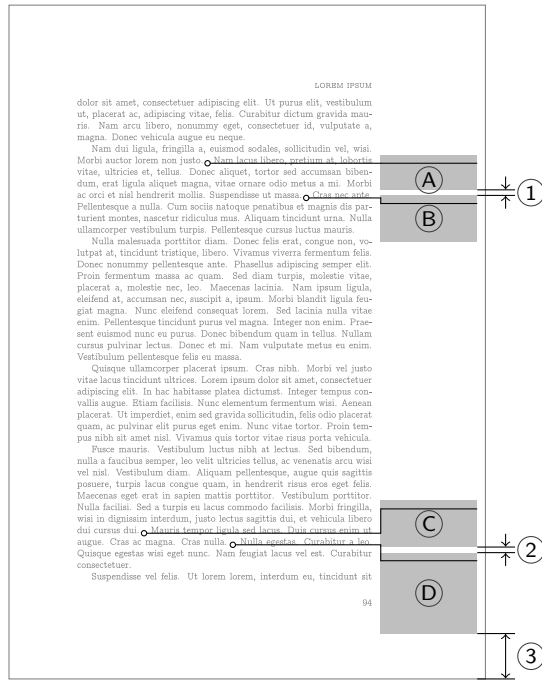


Figure 6.2: (Illustration of `ysep`) The length ① is at least the value of `ysep below` specified (locally or globally) for marginal content item ① and at least the value of `ysep above` specified for item ②. In this example diagram, ② has been automatically moved down from its natural position to maintain the required distance. Similarly, the length ② is at least the value of `ysep below` specified for ③ and at least the value of `ysep above` specified for ④, and the length ③ is at least the value of `ysep page bottom` specified for ④. In this example, to maintain the required distances, ③ and ④ have been automatically moved (respectively) up and down from their natural positions.

`ysep page top`: the minimum vertical separation between an item and top of the page. (*Default:* margin above main textblock at `\begin{document}`)

`ysep page bottom`: the minimum vertical separation between an item and bottom of the page. (*Default:* margin below main textblock at `\begin{document}`)

`ysep above below`: is a shorthand for setting both `ysep above` and `ysep below` simultaneously to the same value.

`ysep`: is a shorthand for setting all of these keys simultaneously to the same value.

Each of these keys must be set to a valid dimension. (*Default:* value of `\marginparpush` at `\begin{document}`)

`ysep page top margin` and `ysep page bottom margin` These keys automatically set vertical separation between an item of marginal content and the top and bottom of the page to match the main textblock.

`ysep page top bottom margin` **`ysep page top margin`:** Automatically set `ysep page top` to match the margins above the main textblock; to be precise, `ysep page top` is set to the value of `1in + \voffset + \topmargin + \headheight + \headsep`.

`ysep page bottom margin`: Automatically set `ysep page bottom` to match the margins above the main textblock; to be precise, `ysep page bottom` is set to the value of `\paperheight - (1in + \voffset + \topmargin + \headheight +`

Options

`\headsep`) – `\textheight`.

ysep page top bottom margin: Automatically set `ysep page top` and `ysep page bottom` to match the margins above and below the main textblock; has the same effect as specifying `ysep page top margin` and `ysep page bottom margin` separately.

None of these keys takes a value. Note that if the sizes of the top and bottom margins are changed, the values of `ysep page top` and `ysep page bottom` do not change automatically, even if these options have been used. The options can of course be used immediately after the new margins have been set.

6.5 Appearance

An item of marginal content that appears in the inner margin might be narrower than one that appears in the outer margin, and an item appearing in the outer margin of a recto page might be set ragged right, while an item appearing in the outer margin of a verso page might be set ragged left. And since it is not known where an item will appear until the page is assembled, the keys in this subsection, dealing with the width and style of an item, have variants that apply depending on where the item appears on the page.

<code>width recto right</code>	These keys specify the width of the an item of marginal content (or, more precisely, the <code>\hsize</code> of the box into which the item is typeset). Which width is chosen will depend on the where the item is typeset. The terminology is as in Figure 7.1 .
<code>width recto left</code>	width recto right: used for an item in the right margin of a recto page.
<code>width verso right</code>	width recto left: used for an item in the left margin of a recto page.
<code>width verso left</code>	width verso right: used for an item in the right margin of a verso page.
<code>width right between</code>	width verso left: used for an item in the left margin of a verso page.
<code>width left between</code>	width right between: used for an item set from the right column and placed between the columns.
	width left between: used for an item set from the right column and placed between the columns.
<code>width recto outer</code>	These alternative keys similarly specify the width of an item of marginal content.
<code>width recto inner</code>	The <code>inner</code> keys apply to the margin where the binding is (as specified by <code>binding side</code>)
<code>width verso outer</code>	and the <code>outer</code> keys apply to the opposite margin. Setting each of these keys has
<code>width verso inner</code>	the same effect as setting the corresponding <code>right/left</code> key listed above. (See the documentation of <code>binding side</code> for further details of how <code>outer/inner</code> correspond to <code>right/left</code> .)
	width recto outer: used for an item in the outer margin of a recto page.
	width recto inner: used for an item in the inner margin of a recto page.
	width verso outer: used for an item in the outer margin of a verso page.
	width verso inner: used for an item in the inner margin of a verso page.
<code>width</code>	These keys are shortcuts for setting more than one of the above keys simultaneously.
<code>width between</code>	width: a shorthand for setting all of these keys simultaneously.
<code>width outer</code>	width between: a shorthand for setting the keys <code>width right between</code> and <code>width left between</code> simultaneously to the same value.
<code>width inner</code>	width outer: a shorthand for setting the keys <code>width recto outer</code> and <code>width verso outer</code> simultaneously to the same value.
	width inner: a shorthand for setting the keys <code>width recto inner</code> and <code>width verso inner</code> simultaneously to the same value.

(The shorthands `width outer` and `width inner` exist because page geometry is usually symmetrical between recto and verso pages as regards outer and inner margins.

Options

Table 2: Summary of keys affecting the appearance of the marginal content. (For keys affecting the type or position of marginal content, see [Table 1](#).) All keys can be set using `\marginaliasetup` or passed in the optional argument to `\marginalia`.

Key name	Value	Default
<code>width recto right</code>	Dimension	<code>\marginparwidth</code>
<code>width recto left</code>	Dimension	<code>\marginparwidth</code>
<code>width verso right</code>	Dimension	<code>\marginparwidth</code>
<code>width verso left</code>	Dimension	<code>\marginparwidth</code>
<code>width right between</code>	Dimension	<code>\marginparwidth</code>
<code>width left between</code>	Dimension	<code>\marginparwidth</code>
<code>width recto outer</code>	Dimension	<code>\marginparwidth</code>
<code>width recto inner</code>	Dimension	<code>\marginparwidth</code>
<code>width verso outer</code>	Dimension	<code>\marginparwidth</code>
<code>width verso inner</code>	Dimension	<code>\marginparwidth</code>
<code>width</code>	Dimension	<code>\marginparwidth</code>
<code>width between</code>	Dimension	<code>\marginparwidth</code>
<code>width outer</code>	Dimension	<code>\marginparwidth</code>
<code>width inner</code>	Dimension	<code>\marginparwidth</code>
<code>style recto right</code>	L ^A T _E X code	[Empty]
<code>style recto left</code>	L ^A T _E X code	[Empty]
<code>style verso right</code>	L ^A T _E X code	[Empty]
<code>style verso left</code>	L ^A T _E X code	[Empty]
<code>style right between</code>	L ^A T _E X code	[Empty]
<code>style left between</code>	L ^A T _E X code	[Empty]
<code>style recto outer</code>	L ^A T _E X code	[Empty]
<code>style recto inner</code>	L ^A T _E X code	[Empty]
<code>style verso outer</code>	L ^A T _E X code	[Empty]
<code>style verso inner</code>	L ^A T _E X code	[Empty]
<code>style</code>	L ^A T _E X code	[Empty]
<code>mark recto right</code>	L ^A T _E X code	[Empty]
<code>mark recto left</code>	L ^A T _E X code	[Empty]
<code>mark verso right</code>	L ^A T _E X code	[Empty]
<code>mark verso left</code>	L ^A T _E X code	[Empty]
<code>mark right between</code>	L ^A T _E X code	[Empty]
<code>mark left between</code>	L ^A T _E X code	[Empty]
<code>mark recto outer</code>	L ^A T _E X code	[Empty]
<code>mark recto inner</code>	L ^A T _E X code	[Empty]
<code>mark verso outer</code>	L ^A T _E X code	[Empty]
<code>mark verso inner</code>	L ^A T _E X code	[Empty]
<code>mark</code>	L ^A T _E X code	[Empty]

Options

The shorthand `width between` exists because the space between columns, if used at all for marginal content, will often be shared equally.) Each of these keys must be set to a valid dimension. (*Default:* value of `\marginparwidth` at `\begin{document}`)

`style recto outer` These keys specify the style with which an item of marginal content is typeset.
`style recto inner` Which style is chosen will depend on where the item is typeset. The terminology is as in
`style verso outer` Figure 7.1.
`style verso inner` **style recto right:** used for an item in the outer margin of a recto page.
`style right between` **style recto left:** used for an item in the inner margin of a recto page.
`style left between` **style verso right:** used for an item in the outer margin of a verso page.
style verso left: used for an item in the inner margin of a verso page.
style right between: used for an item set from the right column between the columns.
style left between: used for an item set from the right column between the columns.

`style recto outer` These alternative keys similarly specify the style with which an item of marginal
`style recto inner` content is typeset. The `inner` keys apply to the margin where the binding is (as specified
`style verso outer` by `binding side`) and the `outer` keys apply to the opposite margin. Setting each
`style verso inner` of these keys has the same effect as setting the corresponding `right/left` key listed above. (See the documentation of `binding side` for further details of how `outer/inner` correspond to `right/left`.)

style recto outer: used for an item in the outer margin of a recto page.
style recto inner: used for an item in the inner margin of a recto page.
style verso outer: used for an item in the outer margin of a verso page.
style verso inner: used for an item in the inner margin of a verso page.

`style` There is one relevant shorthand:
style: is a shorthand for setting all of these keys simultaneously.
Each of these keys should be set to L^AT_EX code that specifies the style. (*Default:* [Empty])

`mark recto right` These keys specify code to typeset something alongside the line where the call to
`mark recto left` `\marginalia` appears, on the same side on which the marginal content is placed. Roughly
`mark verso right` speaking, they can be set to any L^AT_EX code, from a single symbol to a TikZ picture.
`mark verso left` Which code is chosen will depend on where the marginal item is typeset. If the marginal
`mark right between` item is placed on the right of the text, the `mark` code will be executed in an `\rlap` flush
`mark left between` with the right end of the line; if the marginal item is placed on the left of the text, the
`mark` code will be executed in an `\llap` flush with the left end of the line. These could
be used to place arrowheads or more complicated indicators associating a marginal item
with the text; see Figure 6.3

The terminology for the various `mark` options is as in Figure 7.1.

mark recto right: used for an item in the outer margin of a recto page.
mark recto left: used for an item in the inner margin of a recto page.
mark verso right: used for an item in the outer margin of a verso page.
mark verso left: used for an item in the inner margin of a verso page.
mark right between: used for an item set from the right column between the columns.
mark left between: used for an item set from the right column between the columns.

`mark recto outer` These alternative keys similarly specify code to typeset something alongside the line
`mark recto inner` where the call to `\marginalia` appears. The `inner` keys apply to the margin where the
`mark verso outer` binding is (as specified by `binding side`) and the `outer` keys apply to the opposite
`mark verso inner` margin. Setting each of these keys has the same effect as setting the corresponding

Placement `right/left` key listed above. (See the documentation of `binding side` for further details of how `outer/inner` correspond to `right/left`.)

`mark recto outer:` used for an item in the outer margin of a recto page.
`mark recto inner:` used for an item in the inner margin of a recto page.
`mark verso outer:` used for an item in the outer margin of a verso page.
`mark verso inner:` used for an item in the inner margin of a verso page.

`mark` There is one relevant shorthand:
`mark:` is a shorthand for setting all of these keys simultaneously.
Each of these keys should be set to L^AT_EX code. (*Default:* [Empty])

6.6 Warning message configuration

The options described in this subsection have no effect on the placement of marginal content, but simply affect the number of problems or changes that are listed at `\end{document}`. Note that each of them can be set to 0 to suppress the list entirely (although warnings will still be emitted).

`max problem count` These options specify the maximum number of placement problems, the maximum number of changes in marginal content item data, and the maximum number of changes in page data to list. (*Default:* 40, 10, 10, respectively.)

`max item data change count`

`max page data change count`

7 Placement

The placement of an item of marginal content depends on where the call to `\marginalia` appears in the finished document. Both horizontal and vertical placement can be complicated.

7.1 Horizontal placement

To understand the horizontal placement, first recall some terminology: a recto page is an odd-numbered page in two-sided mode, or any page in one-sided mode; a verso page is an even-numbered page in two-sided mode. The description in the paragraphs that follow is summarized in [Figure 7.1](#).

In a document where the binding is on the left (and thus on the left of recto pages), which is specified with `binding side=left`, the outer margin is on the right on recto pages and on the left on verso pages; the inner margin is on the left on recto pages and on the right on verso pages.

In a document where the binding is on the right (and thus on the right of recto pages), which is specified with `binding side=right`, the outer margin is on the left on recto pages and on the right on verso pages; the inner margin is on the right on recto pages and on the left on verso pages.

In one-column mode, marginal content is placed by default in the outer margin. If `pos=reverse` is applied, it is placed in the inner margin.

In two-column mode, the default placement is next to the column in which the call to `\marginalia` appears, on the side opposite to the other column. Thus, if the call to `\marginalia` was in the left column, the marginal content item is placed by default on the left. If `pos=reverse` is applied, it is placed between the two columns, adjacent to the left column. If the call to `\marginalia` was in the right column, the item is placed

Placement

```

\documentclass[11pt,a4paper]{article}

\usepackage{marginalia}
\marginaliasetup{
  xsep=5mm, style=\raggedright\sffamily,
}

\usepackage{tikz}
\newcommand\drawarrow{%
  \tikz[remember picture,overlay]
    \draw[->,thick] (arrowstart) -- ++(-1.5mm,0) |- (.5mm,.5ex);%
}
\newcommand\savearrowstart{%
  \tikz[remember picture,overlay] \coordinate (arrowstart) at (-.5mm,.5ex);%
}

\begin{document}

Lorem ipsum dolor sit amet,%
\marginalia[mark={~$\triangleleft$}]{A marginal note. (Extra text to push down the
note below.)) consectetur adipiscing elit, sed do eiusmod tempor incididunt ut
labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation
ullamco laboris nisi ut aliquip ex ea commodo consequat.%
\marginalia[mark={\drawarrow}]{\savearrowstart Another marginal note.}
Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu
fugiat nulla pariatur.

\end{document}

```

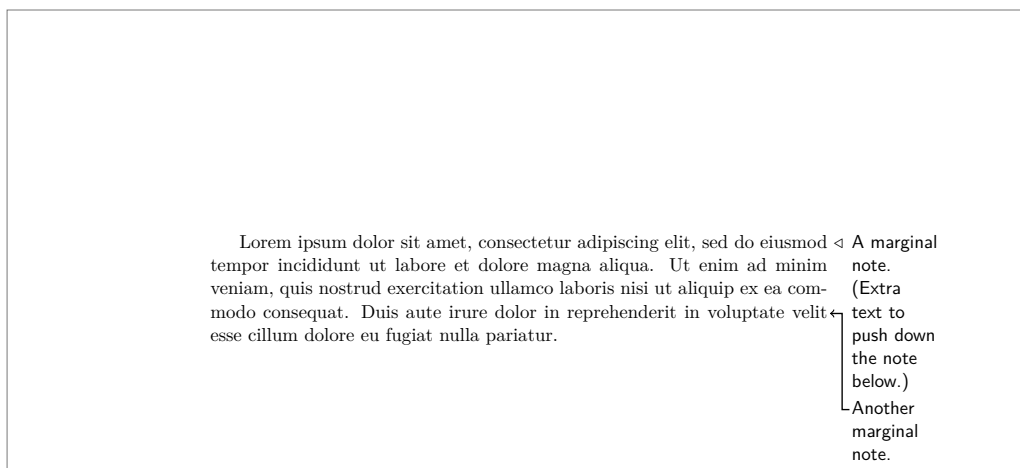


Figure 6.3: A demonstration of the `mark` option, in particular showing how it can be used to draw a TikZ arrow from a (moved) note to the relevant line. Notes: (1) The code in the marginal content is processed *before* the mark, so the `mark` TikZ code refers to a coordinate defined in the marginal content, not the other way around. (2) The code must be compiled *three* times to give this output, because the `arrowstart` coordinate is not placed correctly until after `marginalia` has placed the second marginal note on the second run. Thus one more run is necessary for TikZ to draw the arrow correctly.

Placement

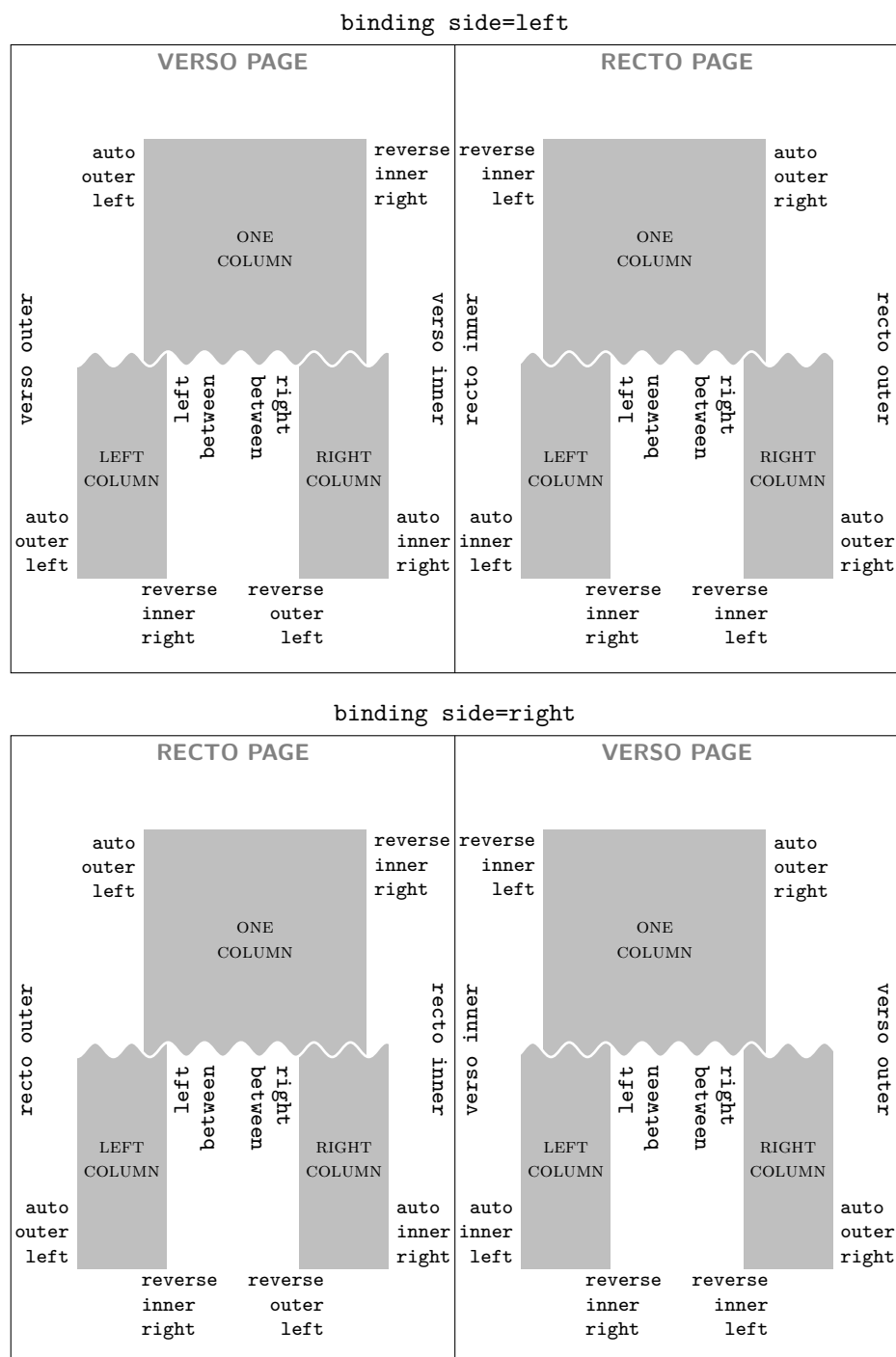


Figure 7.1: Summary of the positioning of marginal content using `pos`, and terminology used in `width` and `style` keys, on recto and verso pages, in both one-column and two-column mode. Above: when binding `side=left`. Below: when binding `side=right`.

Placement

by default on the right. If `pos=reverse` is applied, it is placed between the two columns, adjacent to the right column.

`pos=outer` specifies that the item is to be placed on the outer side of the text block or column containing the call to `\marginalia`. In two-column mode, if the column is adjacent to the inner margin, its outer side lies between the columns.

`pos=right` similarly specifies that the item is to be placed on the inner side of the text block or column containing the call to `\marginalia`. In two-column mode, if the column is adjacent to the outer margin, its inner side lies between the columns.

`pos=left` specifies that the item is to be placed on the left of the text block or column containing the call to `\marginalia`.

`pos=right` similarly specifies that the item is to be placed on the right of the text block or column containing the call to `\marginalia`.

`marginalia` determines in which column the call to `\marginalia` was made using its horizontal position. As discussed in the description of the key `column`, there are situations where this can go wrong and which necessitate a manual specification of a particular column.

7.2 Vertical placement

`marginalia` tries by default to place each item of marginal content with its baseline shifted by the value of `yshift` (by default, 0pt) from the baseline where `\marginalia` was called. The actual vertical placement is calculated by the procedure described below, carried out for the items appearing in a particular horizontal location. (As shown in [Figure 7.1](#), in one-column mode the possible locations are in outer and inner margins; in two-column mode the possible locations are the outer and inner margins and on the left and right sides of the space between the columns.) A *clash* exists when two items are closer than specified by `ysep below` for the upper item or `ysep above` for the lower item, whichever is greater.

For the items in each horizontal location, the procedure is as follows:

1. Place the items appearing in a given horizontal location on the page into a list.
2. Set the vertical shift of each item to the one specified by `yshift`.
3. For each `type=optfixed` item, if it clashes with any `type=fixed` item, delete it from the list of items that appear on the page.
4. Sort the list by the position of the call to `\marginalia`, top-to-bottom, left-to-right, breaking ties by the order of calls. (Because of floats, footnotes, etc., the sorted order of the list is not necessarily the same as the order of appearance of `\marginalia` commands in the source code.)
5. Pass through the list of items in sorted order. For each `type=normal` item, if necessary shift it in a negative (downward) direction so that it (1) does not reach closer to the top of the page than specified by `ysep page top`, and (2) does not clash with the previous (above) item. (After this stage, it is possible for an assigned vertical shift to push a `type=normal` item off the bottom of the page.)
6. Pass through the list of items in the reverse of the sorted order. For each `type=normal` item, if necessary shift it in a positive (upward) direction so that it (1) does not reach closer to the bottom of the page than specified by `ysep page bottom`, and (2) does not clash with the next (below) item.

Usage notes

During this process, it may be found that it is impossible to prevent clashes or items reaching beyond the limits (e.g. fixed items clash with each other; a fixed item conflicts with `ysep page top` or `ysep page bottom`, or there are simply too many items of marginal content to fit (in which case, the top of some of them will be above the limit specified by `ysep page top` or will clash with fixed items)). In these cases, warnings are issued at the end of the Lua^AT_EX run.

8 Usage notes

8.1 Multiple runs

`marginalia` requires a minimum of two Lua^AT_EX runs, and often more, to place items of marginal content correctly. On the first pass, information about items, including their vertical size, is written to the `.aux` file, and this information is used to position them correctly on the next run. However, because `width` and `style` have variants dependent on the margin in which the item is placed, an item may only be typeset at the correct size on this second run. Thus the vertical size of the item may have changed and so the information written to the `.aux` file on the previous run may be out of date. In this case a third run may be needed for correct placement.

More runs may be needed if the position of the call to `\marginalia` changes between runs. (For example, if `\marginalia` is used to set numbered sidenotes with per-page numbering, the number may change between runs and the small difference in widths can change line breaks and page/column breaks.) Provided that the main text stabilizes, the placement of items using `\marginalia` should be correct two runs later.

8.2 Reports of problems in placement

At the end of the Lua^AT_EX run, `marginalia` reports any problems encountered in the vertical placement of items (as described at the end of [Subsection 7.2](#)). These problems are based on calculations made on the basis of information from the previous run written to the `.aux` file on the previous run, and may not arise if item positions or sizes (i.e. height or depth) have changed. `marginalia` also reports any changes in positions or sizes compared to the previous run.

In these reports, a page number refers to a visible page number if it is prefixed with ‘p’; it otherwise refers to the absolute page number of the output.

8.3 Right-to-left text

`marginalia` should place items of marginal content correctly regardless of whether `\marginalia` is called from left-to-right text or right-to-left text. The text direction of the main text will be inherited by the marginal content. The `style` key is the natural place to alter this, if one wishes to have a different text direction in the marginal content.

If the document as a whole is set in right-to-left text, then its binding is normally on the right. Using `binding side=right` changes the meanings of keys involving `inner` and `outer` to reflect this binding position and also changes the meanings of `pos=auto`, `reverse`, `outer`, `inner` appropriately.

Note: `marginalia` has not been tested extensively with right-to-left text and documents. Feedback (positive or negative) is welcome.

9 Incompatibilities

Using `marginalia` alongside `\marginpar` or packages like `mparhak`, `marginnote`, `marginfix`, or `marginfit` should not produce any errors, but `marginalia` will ignore marginal content not created using `\marginalia`; for example, an item of marginal content created using `\marginpar` might overlap with one created using `\marginpar`.

10 Limitations

As noted in the introduction, `marginalia` was originally written to typeset a particular kind of book. It thus has several limitations. Three of these are:

Lua $\LaTeX$ only Most of the code for deciding the placement of items of marginal content is written in Lua. In principle, it could be replaced with a pure $\LaTeX$ solution.

No support for ‘moving past’ fixed items The adjustment of vertical positions will never cause a `type=normal` item to be shifted past a `type=fixed` one, even when there is space on the other side. It may be desirable to have this available as an option.

No support for nested content items Nesting might be desirable for typesetting editions of manuscripts which sometimes contain marginal glosses, and then glosses upon those glosses.

The lack of any built-in facility for producing (for example) numbered sidenotes is a conscious design choice. This is properly the concern of a command that merely uses `\marginalia` to place the notes correctly.

References

- [Bri04] R. Bringhurst. *The Elements of Typographic Style*. Hartley & Marks, version 3.0, 2004.
- [Cai24] A. J. Cain. *Form & Number: A History of Mathematical Beauty*. Lisbon, 2024. URL: https://archive.org/details/cain_formandnumber_ebook_large.
- [Cai25] A. J. Cain ‘`marginalia` at work: Running heads, float captions, citations, and small figures in the margins’. *TUGboat*. The Communications of the $\TeX$ Users Group. 46, no.1 (2025), pp.49–53. DOI: [10.47397/tb/46-1/tb142cain-marginalia](https://doi.org/10.47397/tb/46-1/tb142cain-marginalia)

11 Implementation (L^AT_EX package)

```
1 <*package>
2 <@@=marginalia>
```

11.1 Initial set-up

Package identification/version information.

```
3 \NeedsTeXFormat{LaTeX2e}[2020-02-02]
4 \ProvidesExplPackage{marginalia}{2026-10-09}{0.84.6}
5 {Non-floating marginal content for LuaLaTeX}
```

Check that LuaT_EX is in use.

```
6 \sys_if_engine luatex:F
7 {
8   \msg_new:nnn{marginalia}{lualatex_required}
9   {LuaLaTeX-required.~Package-loading-will-abort.}
10  \msg_critical:nn{marginalia}{lualatex_required}
11 }
```

11.2 Tagging set-up

If L^AT_EX has tagging support, set up sockets if necessary and define `\__marginalia_tagging_socket:n` to be `\UseTaggingSocket`.

```
12 \@ifundefined{UseTaggingSocket}
13 {
14   \cs_new:Npn \__marginalia_tagging_socket:n #1 {}
15 }
16 {
17   \str_if_exist:cF { l__socket_tagsupport/marginpar/begin_plug_str }
18   {
19     \socket_new:nn {tagsupport/marginpar/begin}{0}
20     \socket_new:nn {tagsupport/marginpar/end}{0}
21   }
22   \str_if_exist:cF { l__socket_tagsupport/para/restore_plug_str }
23   {
24     \socket_new:nn {tagsupport/para/restore}{0}
25   }
26   \cs_new:Npn \__marginalia_tagging_socket:n #1
27   {
28     \UseTaggingSocket{#1}
29   }
30 }
```

11.3 Lua backend and interface

Load the Lua backend.

```
31 \lua_now:n{ require('marginalia') }
```

The following 10 macros interface between L^AT_EX and Lua code. Each control sequence `\__marginalia_lua_XYZ` simply calls the corresponding Lua function `marginalia.XYZ`.

`\_marginalia_lua_store_default_page_data:` The first 8 macros do not require expansion of parameters: they either have none, or process data not containing control sequences (read from the .aux file); hence `\lua_now:n` is used.

```

32 \cs_new:Npn\_marginalia_lua_store_default_page_data:
33 {
34   \lua_now:n{ marginalia.store_default_page_data() }
35 }
36 \cs_new:Npn\_marginalia_lua_store_page_data:n #1
37 {
38   \lua_now:n{ marginalia.store_page_data('#1') }
39 }
40 \cs_new:Npn\_marginalia_lua_check_page_data:n #1
41 {
42   \lua_now:n{ marginalia.check_page_data('#1') }
43 }
44 \cs_new:Npn\_marginalia_lua_write_page_change_report:
45 {
46   \lua_now:n{ marginalia.write_page_change_report() }
47 }
48 \cs_new:Npn\_marginalia_lua_store_item_data:n #1
49 {
50   \lua_now:n{ marginalia.store_item_data('#1') }
51 }
52 \cs_new:Npn\_marginalia_lua_check_item_data:n #1
53 {
54   \lua_now:n{ marginalia.check_item_data('#1') }
55 }
56 \cs_new:Npn\_marginalia_lua_compute_items:
57 {
58   \lua_now:n{ marginalia.compute_items() }
59 }
60 \cs_new:Npn\_marginalia_lua_write_problem_report:
61 {
62   \lua_now:n{ marginalia.write_problem_report() }
63 }
64 \cs_new:Npn\_marginalia_lua_write_item_change_report:
65 {
66   \lua_now:n{ marginalia.write_item_change_report() }
67 }

```

(End of definition for `\_marginalia_lua_store_default_page_data:` and others.)

`\_marginalia_lua_load_item_data:n` This macro will receive a control sequence parameter and so requires expansion; hence `\lua_now:e` is used.

```

68 \cs_new:Npn\_marginalia_lua_load_item_data:n #1
69 {
70   \lua_now:e{ marginalia.load_item_data('#1') }
71 }

```

(End of definition for `\_marginalia_lua_load_item_data:n`.)

`\_marginalia_lua_call_boolean:nN` Call the Lua function (in the `marginalia` module) named by the first parameter to the value of the `expl3boolean` given in the second parameter. Since the boolean must be converted to a string, `\lua_now:e` is used.

```

72 \cs_new:Npn \__marginalia_lua_call_boolean:nN #1#2
73 {
74   \lua_now:ef marginalia.#1(\bool_to_str:N #2) }
75 }

```

(End of definition for __marginalia_lua_call_boolean:nN.)

11.4 Auxiliary macros for setting options

11.4.1 General

`\__marginalia_setup_preamble:n` Macro used to set the configuration in the preamble. This only has effect at the outer group level: inside a group, options should be confined to that group, so adding the options that use the `begindocument` hook should have no effect. And since the `\marginalia` command cannot be used in the preamble, setting other options inside a group in the preamble is pointless.

```

76 \cs_new:Npn \__marginalia_setup_preamble:n #1
77 {
78   \int_if_zero:nT{ \currentgrouplevel }
79   {
80     \keys_set:nn{marginalia}{ #1 }
81   }
82 }

```

(End of definition for __marginalia_setup_preamble:n.)

`\__marginalia_setup_body:n` Macro used to set the configuration in the document body.

```

83 \cs_new:Npn \__marginalia_setup_body:n #1
84 {
85   \keys_set:nn{marginalia}{ #1 }
86 }

```

(End of definition for __marginalia_setup_body:n.)

`\__marginalia_setup:n` The macro `\__marginalia_setup:n` is defined to be `\__marginalia_setup_preamble:n` initially and is redefined to `\__marginalia_setup_body:n` at `begindocument/end`.

```

87 \cs_set_eq:NN\__marginalia_setup:n\__marginalia_setup_preamble:n
88 \hook_gput_code:nnn{ begindocument/end }{ marginalia/setup }
89 {
90   \cs_set_eq:NN\__marginalia_setup:n\__marginalia_setup_body:n
91 }

```

(End of definition for __marginalia_setup:n.)

11.4.2 outer/inner options

`\__marginalia_outer_inner_set_immediate:NNNn` Use immediately the setting command supplied in the first parameter to set the variables supplied as the second parameter (if `\l__marginalia_binding_left_bool` is true) or the third parameter (if `\l__marginalia_binding_left_bool` is false) to the value supplied as the fourth parameter.

```

92 \cs_set:Npn \__marginalia_outer_inner_set_immediate:NNNn #1#2#3#4
93 {
94   \bool_if:NTF\l__marginalia_binding_left_bool
95   { #1#2{#4} }

```

```

96     { #1#3{#4} }
97   }

```

(End of definition for `\_marginalia_outer_inner_set_immediate:NNNn`.)

`\_marginalia_outer_inner_set_deferred:NNNn`

At the `begindocument` hook, use the setting command supplied in the first parameter to set the variables supplied as the second parameter (if `\l\_marginalia_binding_left_bool` is true) or the third parameter (if `\l\_marginalia_binding_left_bool` is false) to the value supplied as the fourth parameter.

```

98 \cs_set:Npn \_marginalia_outer_inner_set_deferred:NNNn #1#2#3#4
99   {
100     \hook_gput_code:nnn { begindocument } { marginalia/outer-inner-set }
101     {
102       \_marginalia_outer_inner_set_immediate:NNNn #1#2#3{#4}
103     }
104   }

```

(End of definition for `\_marginalia_outer_inner_set_deferred:NNNn`.)

`\_marginalia_outer_inner_set:Nn`

Initially, `\_marginalia_outer_inner_set:Nn` is `\_marginalia_outer_inner_set_deferred:Nn`, but is redefined at `begindocument/end` to be `\_marginalia_outer_inner_set_immediate:Nn`.

```

105 \cs_set_eq:NN
106   \_marginalia_outer_inner_set:NNNn
107   \_marginalia_outer_inner_set_deferred:NNNn
108 \hook_gput_code:nnn { begindocument/end } { marginalia/outer-inner-set-redefinition }
109   {
110     \cs_set_eq:NN
111       \_marginalia_outer_inner_set:NNNn
112       \_marginalia_outer_inner_set_immediate:NNNn
113   }

```

(End of definition for `\_marginalia_outer_inner_set:NNNn`.)

11.4.3 Dimension options

`\_marginalia_dim_set_deferred:Nn`

Set the dimension variable passed as the first parameter to value specified in second parameter at `\begin{document}`.

```

114 \cs_new:Nn \_marginalia_dim_set_deferred:Nn
115   {
116     \hook_gput_code:nnn { begindocument } { marginalia/dim }
117     {
118       \dim_set:Nn #1 { #2 }
119     }
120   }

```

(End of definition for `\_marginalia_dim_set_deferred:Nn`.)

`\_marginalia_dim_set:Nn`

Initially, `\_marginalia_dim_set:Nn` is `\_marginalia_dim_set_deferred:Nn`, but is redefined at `begindocument/end` to be `\dim_set:Nn`.

```

121 \cs_set_eq:NN \_marginalia_dim_set:Nn \_marginalia_dim_set_deferred:Nn
122 \hook_gput_code:nnn { begindocument/end } { marginalia/dim-set-redefinition }
123   {
124     \cs_set_eq:NN \_marginalia_dim_set:Nn \dim_set:Nn
125   }

```

(End of definition for `\_marginalia_dim_set:Nn`.)

11.5 Options

Set up the key–value options and the variables in which the settings will be stored.

11.5.1 Document orientation

`\l__marginalia_binding_left_bool`

```
126 \bool_new:N\l__marginalia_binding_left_bool
127 \keys_define:nn { marginalia }
128 {
129   binding-side .choices:nn = { right,left }{
130     \int_compare:nNnTF{\l_keys_choice_int}={2}
131       { \bool_set_true:N \l__marginalia_binding_left_bool }
132       { \bool_set_false:N\l__marginalia_binding_left_bool }
133   },
134   binding-side .usage:n = preamble,
135   binding-side .initial:n = left,
136 }
```

(End of definition for \l__marginalia_binding_left_bool.)

The value of `\l__marginalia_binding_left_bool` must be passed to the Lua backend at `\begin{document}`, since the resolution of `pos=auto`, `reverse`, `outer`, `inner` takes place there.

```
137 \hook_gput_code:nnn{ begindocument }{ marginalia/options }{
138   \__marginalia_lua_call_boolean:nN
139     {set_binding_left}\l__marginalia_binding_left_bool
140 }
```

11.5.2 Type

`\l__marginalia_type_int`

A key to store the type of the marginal content item. The setting is held in an integer variable: 1 = normal, 2 = fixed, 3 = optfixed.

```
141 \int_new:N\l__marginalia_type_int
142 \keys_define:nn { marginalia }
143 {
144   type .choices:nn = {normal,fixed,optfixed}{
145     \int_set:Nn\l__marginalia_type_int{\l_keys_choice_int}
146   },
147   type .initial:n = normal,
148 }
```

(End of definition for \l__marginalia_type_int.)

11.5.3 Horizontal placement

`\l__marginalia_pos_int`

A key to store the specified position of the marginal content item. The setting is held in an integer variable: 1 = `auto`, (the outer margin in one-column mode; left margin in left column, right margin in right column in two-column mode) 2 = `reverse` (inner margin in one-column mode; between the columns in two-column mode), 3 = `outer`, 4 = `inner`, 5 = `right`, 6 = `left`, 7 = `nearest`.

```
149 \int_new:N\l__marginalia_pos_int
150 \keys_define:nn { marginalia }
151 {
```

```

152 pos .choices:nn = {auto,reverse,outer,inner,right,left,nearest}{
153   \int_set:Nn\l__marginalia_pos_int{\l_keys_choice_int}
154 },
155 pos .initial:n = auto
156 }

```

(End of definition for \l__marginalia_pos_int.)

\l__marginalia_column_int A key to force the marginal content item to be treated in one-column mode or as being set from the left or right column. The setting is held in an integer variable: `-1 = auto` (automatic), `0 = one` (one-column mode), `1 = left` (left column) `2 = right` (right column).

```

157 \int_new:N\l__marginalia_column_int
158 \keys_define:nn { marginalia }
159 {
160   column .choices:nn = {auto,one,left,right}{
161     \int_set:Nn\l__marginalia_column_int{\l_keys_choice_int-2}
162   },
163   column .initial:n = auto,
164 }

```

(End of definition for \l__marginalia_column_int.)

\l__marginalia_xsep_recto_right_dim \l__marginalia_xsep_recto_left_dim \l__marginalia_xsep_verso_left_dim \l__marginalia_xsep_verso_right_dim \l__marginalia_xsep_right_between_dim \l__marginalia_xsep_left_between_dim Dimension keys to hold the separation between the marginal content item and the main text, which can be dependent on where it appears on the page.

```

165 \dim_new:N\l__marginalia_xsep_recto_right_dim
166 \dim_new:N\l__marginalia_xsep_recto_left_dim
167 \dim_new:N\l__marginalia_xsep_verso_left_dim
168 \dim_new:N\l__marginalia_xsep_verso_right_dim
169 \dim_new:N\l__marginalia_xsep_right_between_dim
170 \dim_new:N\l__marginalia_xsep_left_between_dim
171 \keys_define:nn { marginalia }
172 {
173   xsep~recto~right .code:n
174     = \__marginalia_dim_set:Nn\l__marginalia_xsep_recto_right_dim{#1},
175   xsep~recto~left .code:n
176     = \__marginalia_dim_set:Nn\l__marginalia_xsep_recto_left_dim{#1},
177   xsep~verso~right .code:n
178     = \__marginalia_dim_set:Nn\l__marginalia_xsep_verso_right_dim{#1},
179   xsep~verso~left .code:n
180     = \__marginalia_dim_set:Nn\l__marginalia_xsep_verso_left_dim{#1},
181   xsep~right~between .code:n
182     = \__marginalia_dim_set:Nn\l__marginalia_xsep_right_between_dim{#1},
183   xsep~left~between .code:n
184     = \__marginalia_dim_set:Nn\l__marginalia_xsep_left_between_dim{#1},
185   xsep .meta:n = {
186     xsep~recto~right=#1,
187     xsep~recto~left=#1,
188     xsep~verso~right=#1,
189     xsep~verso~left=#1,
190     xsep~right~between=#1,
191     xsep~left~between=#1,
192   },
193   xsep .initial:n = \marginparsep,
194 }

```

Set up outer/inner keys, which will set the appropriate left/right keys.

```

195 \keys_define:nn { marginalia }
196 {
197   xsep~recto~outer .code:n = {
198     \__marginalia_outer_inner_set:NNNn
199     \dim_set:Nn
200     \l__marginalia_xsep_recto_right_dim
201     \l__marginalia_xsep_recto_left_dim
202     {#1}
203   },
204   xsep~recto~inner .code:n = {
205     \__marginalia_outer_inner_set:NNNn
206     \dim_set:Nn
207     \l__marginalia_xsep_recto_left_dim
208     \l__marginalia_xsep_recto_right_dim
209     {#1}
210   },
211   xsep~verso~outer .code:n = {
212     \__marginalia_outer_inner_set:NNNn
213     \dim_set:Nn
214     \l__marginalia_xsep_verso_left_dim
215     \l__marginalia_xsep_verso_right_dim
216     {#1}
217   },
218   xsep~verso~inner .code:n = {
219     \__marginalia_outer_inner_set:NNNn
220     \dim_set:Nn
221     \l__marginalia_xsep_verso_right_dim
222     \l__marginalia_xsep_verso_left_dim
223     {#1}
224   },
225   xsep~outer .meta:n = {
226     xsep~recto~outer=#1,
227     xsep~verso~outer=#1,
228   },
229   xsep~inner .meta:n = {
230     xsep~recto~inner=#1,
231     xsep~verso~inner=#1,
232   },
233 }

```

(End of definition for \l__marginalia_xsep_recto_right_dim and others.)

11.5.4 Vertical placement

`\l__marginalia_valign_int` A key to store the vertical alignment of the marginal content item. The setting is held in a integer variable: 1 = t (aligned at the baseline of the topmost line of the item), 2 = b (aligned at the baseline of the bottommost line of the item).

```

234 \int_new:N\l__marginalia_valign_int
235 \keys_define:nn { marginalia }
236 {
237   valign .choices:nn = {t,b,c,m}{
238     \int_set_eq:NN\l__marginalia_valign_int\l_keys_choice_int
239   },

```

```

240   valign .initial:n = t,
241 }

```

(End of definition for \l__marginalia_valign_int.)

\l__marginalia_default_yshift_dim Dimension key to hold the default vertical shift of the marginal content item from its natural position.

```

242 \keys_define:nn { marginalia }
243 {
244   yshift .dim_set:N = \l__marginalia_default_yshift_dim,
245   yshift .initial:n = 0pt,
246 }

```

(End of definition for \l__marginalia_default_yshift_dim.)

__marginalia_margin_top: These macros are simply the calculations necessary for the space above and below the main textblock. They are simply a convenience to avoid specifying the calculation twice in the definition of the ysep keys.

```

247 \cs_new:Npn \__marginalia_margin_top:
248 {
249   1in + \voffset + \topmargin + \headheight + \headsep
250 }
251 \cs_new:Npn \__marginalia_margin_bottom:
252 {
253   \pageheight - 1in - \voffset - \topmargin - \headheight - \headsep
254   - \textheight
255 }

```

(End of definition for __marginalia_margin_top: and __marginalia_margin_bottom:.)

\l__marginalia_ysep_above_dim Dimension keys to hold the the minimum vertical spacing between a marginal content item and (respectively) the item above, the item below, the page top, and the page bottom.

```

\l__marginalia_ysep_below_dim
\l__marginalia_ysep_page_top_dim
\l__marginalia_ysep_page_bottom_dim
256 \dim_new:N\l__marginalia_ysep_above_dim
257 \dim_new:N\l__marginalia_ysep_below_dim
258 \dim_new:N\l__marginalia_ysep_page_top_dim
259 \dim_new:N\l__marginalia_ysep_page_bottom_dim
260 \keys_define:nn { marginalia }
261 {
262   ysep~above .code:n
263     = \__marginalia_dim_set:Nn\l__marginalia_ysep_above_dim{#1},
264   ysep~below .code:n
265     = \__marginalia_dim_set:Nn\l__marginalia_ysep_below_dim{#1},
266   ysep~page~top .code:n
267     = \__marginalia_dim_set:Nn\l__marginalia_ysep_page_top_dim{#1},
268   ysep~page~bottom .code:n
269     = \__marginalia_dim_set:Nn\l__marginalia_ysep_page_bottom_dim{#1},
270   ysep~page~top~margin .meta:n = {
271     ysep~page~top
272     = \__marginalia_margin_top:
273   },
274   ysep~page~bottom~margin .meta:n = {
275     ysep~page~bottom
276     = \__marginalia_margin_bottom:

```

```

277 },
278 ysep~page~top~bottom~margin .meta:n = {
279   ysep~page~top~margin,
280   ysep~page~bottom~margin,
281 },
282 ysep~above~below .meta:n = {
283   ysep~below=#1,
284   ysep~above=#1,
285 },
286 ysep .meta:n = {
287   ysep~below=#1,
288   ysep~above=#1,
289   ysep~page~top=#1,
290   ysep~page~bottom=#1,
291 },
292 ysep~above~below .initial:n = \marginparpush,
293 ysep~page~top .initial:n = \__marginalia_margin_top:,
294 ysep~page~bottom .initial:n = \__marginalia_margin_bottom:,
295 }

```

(End of definition for \l__marginalia_ysep_above_dim and others.)

11.5.5 Appearance

Dimension keys to hold the width of the marginal content item, which can be dependent on where it appears on the page.

```

\l__marginalia_width_recto_right_dim
\l__marginalia_width_recto_left_dim
\l__marginalia_width_verso_left_dim
\l__marginalia_width_verso_right_dim
\l__marginalia_width_right_between_dim
\l__marginalia_width_left_between_dim
296 \dim_new:N\l__marginalia_width_recto_right_dim
297 \dim_new:N\l__marginalia_width_recto_left_dim
298 \dim_new:N\l__marginalia_width_verso_left_dim
299 \dim_new:N\l__marginalia_width_verso_right_dim
300 \dim_new:N\l__marginalia_width_right_between_dim
301 \dim_new:N\l__marginalia_width_left_between_dim
302 \keys_define:nn { marginalia }
303 {
304   width~recto~right .code:n
305     = \__marginalia_dim_set:Nn\l__marginalia_width_recto_right_dim{#1},
306   width~recto~left .code:n
307     = \__marginalia_dim_set:Nn\l__marginalia_width_recto_left_dim{#1},
308   width~verso~right .code:n
309     = \__marginalia_dim_set:Nn\l__marginalia_width_verso_right_dim{#1},
310   width~verso~left .code:n
311     = \__marginalia_dim_set:Nn\l__marginalia_width_verso_left_dim{#1},
312   width~right~between .code:n
313     = \__marginalia_dim_set:Nn\l__marginalia_width_right_between_dim{#1},
314   width~left~between .code:n
315     = \__marginalia_dim_set:Nn\l__marginalia_width_left_between_dim{#1},
316   width .meta:n = {
317     width~recto~right=#1,
318     width~recto~left=#1,
319     width~verso~right=#1,
320     width~verso~left=#1,
321     width~right~between=#1,
322     width~left~between=#1,
323 }

```

```

324 width~between .meta:n = {
325   width~right~between=#1,
326   width~left~between=#1,
327 },
328 width .initial:n = \marginparwidth,
329 }

```

Set up outer/inner keys, which will set the appropriate left/right keys.

```

330 \keys_define:nn { marginalia }
331 {
332   width~recto~outer .code:n = {
333     \__marginalia_outer_inner_set:NNNn
334     \dim_set:Nn
335     \l__marginalia_width_recto_right_dim
336     \l__marginalia_width_recto_left_dim
337     {#1}
338   },
339   width~recto~inner .code:n = {
340     \__marginalia_outer_inner_set:NNNn
341     \dim_set:Nn
342     \l__marginalia_width_recto_left_dim
343     \l__marginalia_width_recto_right_dim
344     {#1}
345   },
346   width~verso~outer .code:n = {
347     \__marginalia_outer_inner_set:NNNn
348     \dim_set:Nn
349     \l__marginalia_width_verso_left_dim
350     \l__marginalia_width_verso_right_dim
351     {#1}
352   },
353   width~verso~inner .code:n = {
354     \__marginalia_outer_inner_set:NNNn
355     \dim_set:Nn
356     \l__marginalia_width_verso_right_dim
357     \l__marginalia_width_verso_left_dim
358     {#1}
359   },
360   width~outer .meta:n = {
361     width~recto~outer=#1,
362     width~verso~outer=#1,
363   },
364   width~inner .meta:n = {
365     width~recto~inner=#1,
366     width~verso~inner=#1,
367   },
368 }

```

(End of definition for \l__marginalia_width_recto_right_dim and others.)

```

\l__marginalia_style_recto_right_tl
\l__marginalia_style_recto_left_tl
\l__marginalia_style_verso_left_tl
\l__marginalia_style_verso_right_tl
\l__marginalia_style_right_between_tl
\l__marginalia_style_left_between_tl

```

Token list keys to hold the style with which a marginal content item is typeset, which can be dependent on where it appears on the page.

```

369 \keys_define:nn { marginalia }
370 {
371   style~recto~right .tl_set:N = \l__marginalia_style_recto_right_tl,

```

```

372 style~recto~left .tl_set:N = \l__marginalia_style_recto_left_tl,
373 style~verso~right .tl_set:N = \l__marginalia_style_verso_right_tl,
374 style~verso~left .tl_set:N = \l__marginalia_style_verso_left_tl,
375 style~right~between .tl_set:N = \l__marginalia_style_right_between_tl,
376 style~left~between .tl_set:N = \l__marginalia_style_left_between_tl,
377 style .meta:n = {
378   style~recto~right=#1,
379   style~recto~left=#1,
380   style~verso~right=#1,
381   style~verso~left=#1,
382   style~right~between=#1,
383   style~left~between=#1,
384 },
385 style .initial:n = {},
386 }

```

Set up outer/inner keys, which will set the appropriate left/right keys.

```

387 \keys_define:nn { marginalia }
388 {
389   style~recto~outer .code:n = {
390     \__marginalia_outer_inner_set:NNNn
391     \tl_set:Nn
392       \l__marginalia_style_recto_right_tl
393       \l__marginalia_style_recto_left_tl
394       {#1}
395   },
396   style~recto~inner .code:n = {
397     \__marginalia_outer_inner_set:NNNn
398     \tl_set:Nn
399       \l__marginalia_style_recto_left_tl
400       \l__marginalia_style_recto_right_tl
401       {#1}
402   },
403   style~verso~outer .code:n = {
404     \__marginalia_outer_inner_set:NNNn
405     \tl_set:Nn
406       \l__marginalia_style_verso_left_tl
407       \l__marginalia_style_verso_right_tl
408       {#1}
409   },
410   style~verso~inner .code:n = {
411     \__marginalia_outer_inner_set:NNNn
412     \tl_set:Nn
413       \l__marginalia_style_verso_right_tl
414       \l__marginalia_style_verso_left_tl
415       {#1}
416   },
417 }

```

(End of definition for \l__marginalia_style_recto_right_tl and others.)

```

\l__marginalia_mark_recto_right_tl
\l__marginalia_mark_recto_left_tl
\l__marginalia_mark_verso_left_tl
\l__marginalia_mark_verso_right_tl
\l__marginalia_mark_right_between_tl
\l__marginalia_mark_left_between_tl

```

Token list keys to hold code for a mark to be placed adjacent to the line where the call to `\marginalia` is located, on the same side as the marginal content item.

```

418 \keys_define:nn { marginalia }
419 {

```

```

420 mark~recto~right .tl_set:N = \l__marginalia_mark_recto_right_tl,
421 mark~recto~left .tl_set:N = \l__marginalia_mark_recto_left_tl,
422 mark~verso~right .tl_set:N = \l__marginalia_mark_verso_right_tl,
423 mark~verso~left .tl_set:N = \l__marginalia_mark_verso_left_tl,
424 mark~right~between .tl_set:N = \l__marginalia_mark_right_between_tl,
425 mark~left~between .tl_set:N = \l__marginalia_mark_left_between_tl,
426 mark .meta:n = {
427     mark~recto~right=#1,
428     mark~recto~left=#1,
429     mark~verso~right=#1,
430     mark~verso~left=#1,
431     mark~right~between=#1,
432     mark~left~between=#1,
433 },
434 mark .initial:n = {},
435 }

```

Set up outer/inner keys, which will set the appropriate left/right keys.

```

436 \keys_define:nn { marginalia }
437 {
438     mark~recto~outer .code:n = {
439         \__marginalia_outer_inner_set:NNNn
440         \tl_set:Nn
441             \l__marginalia_mark_recto_right_tl
442             \l__marginalia_mark_recto_left_tl
443             {#1}
444     },
445     mark~recto~inner .code:n = {
446         \__marginalia_outer_inner_set:NNNn
447         \tl_set:Nn
448             \l__marginalia_mark_recto_left_tl
449             \l__marginalia_mark_recto_right_tl
450             {#1}
451     },
452     mark~verso~outer .code:n = {
453         \__marginalia_outer_inner_set:NNNn
454         \tl_set:Nn
455             \l__marginalia_mark_verso_left_tl
456             \l__marginalia_mark_verso_right_tl
457             {#1}
458     },
459     mark~verso~inner .code:n = {
460         \__marginalia_outer_inner_set:NNNn
461         \tl_set:Nn
462             \l__marginalia_mark_verso_right_tl
463             \l__marginalia_mark_verso_left_tl
464             {#1}
465     },
466 }

```

(End of definition for \l__marginalia_mark_recto_right_tl and others.)

11.5.6 Warning message configuration

\l__marginalia_max_problem_int	Integer keys to control the number of changes to be output
\l__marginalia_max_page_data_change_int	
\l__marginalia_max_item_data_change_int	

```

467 \keys_define:nn { marginalia }
468 {
469   max~problem~count .int_set:N = \l__marginalia_max_problem_int,
470   max~problem~count .initial:n= 40,
471   max~page~data~change~count .int_set:N = \l__marginalia_max_page_data_change_int,
472   max~page~data~change~count .initial:n = 10,
473   max~item~data~change~count .int_set:N = \l__marginalia_max_item_data_change_int,
474   max~item~data~change~count .initial:n = 10,
475 }

```

(End of definition for \l__marginalia_max_problem_int, \l__marginalia_max_page_data_change_int, and \l__marginalia_max_item_data_change_int.)

11.6 Processing data from the .aux file

`\marginalia@pagedata` This command is used to store version information in the .aux file. It currently does nothing, but may be used in future to avoid errors if changes are made in the format of the data written to the .aux file.

```

476 \cs_new:Npn \marginalia@version #1
477   {}

```

(End of definition for \marginalia@pagedata.)

`\marginalia@pagedata` This command is used to store page data in the .aux file.

```

478 \cs_new:Npn \marginalia@pagedata #1
479   {
480     \__marginalia_process_page_data:n{#1}
481   }

```

Initially `\__marginalia_process_page_data:n` is set to `\__marginalia_lua_store_page_data:n`. Thus, when the .aux file is read, `\marginalia@pagedata` will pass the page data to the Lua backend to be stored.

```

482 \cs_set_eq:NN
483   \__marginalia_process_page_data:n
484   \__marginalia_lua_store_page_data:n

```

(End of definition for \marginalia@pagedata.)

`\marginalia@itemdata` This command is used to store data for each marginal content item in the .aux file.

```

485 \cs_new:Npn \marginalia@itemdata #1
486   {
487     \__marginalia_process_item_data:n{#1}
488   }

```

(End of definition for \marginalia@itemdata.)

Initially `\__marginalia_process_item_data:n` is set to `\__marginalia_lua_store_item_data:n`. Thus, when the .aux file is read, `\marginalia@itemdata` will pass the item data to the Lua backend to be stored.

```

489 \cs_set_eq:NN
490   \__marginalia_process_item_data:n
491   \__marginalia_lua_store_item_data:n

```

At the `begindocument` hook, the `.aux` file has been read and closed. The Lua backend now stores the geometry and computes the vertical shift for each item. Then the handle for the main `.aux` file is stored for use in this package.

```

492 \hook_gput_code:nnn{ begindocument }{ marginalia/prepare }{
493   \__marginalia_lua_store_default_page_data:
494   \__marginalia_lua_compute_items:
495   \cs_set_eq:NN\l__marginalia_aux_iow\@mainaux
496 }

```

The `enddocument/afterlastpage` hook is before the `.aux` file is read back, so this is where `\__marginalia_process_page_data:n` and `\__marginalia_process_item_data:n` are set, respectively, to `\__marginalia_lua_check_page_data:n` and `\__marginalia_lua_check_item_data:n`. Thus, when the `.aux` file is read back, `\marginalia@pagedata` and `\marginalia@itemdata` will pass data to the Lua backend to be checked for changes.

```

497 \hook_gput_code:nnn{enddocument/afterlastpage}{ marginalia/check }{
498   \cs_set_eq:NN
499     \__marginalia_process_page_data:n
500     \__marginalia_lua_check_page_data:n
501   \cs_set_eq:NN
502     \__marginalia_process_item_data:n
503     \__marginalia_lua_check_item_data:n
504 }

```

`\__marginalia_write_reports:` Write reports if the `\marginalia` command has been used at least once, which is determined by checking whether `\g__marginalia_itemno_int` is non-zero.

```

505 \cs_new:Npn\__marginalia_write_reports:
506 {
507   \int_if_zero:nF{ \g__marginalia_itemno_int }
508   {
509     \__marginalia_lua_write_problem_report:
510     \__marginalia_lua_write_item_change_report:
511     \__marginalia_lua_write_page_change_report:
512   }
513 }

```

(End of definition for `\__marginalia_write_reports:`.)

Use the `enddocument/info` hook to write the reports of changes and/or problems.

```

514 \hook_gput_code:nnn{ enddocument/info }{ marginalia/report } {
515   \__marginalia_write_reports:
516 }

```

11.7 Writing version data to the `.aux` file

`\__marginalia_write_version:` This command will be used to write the package version to the `.aux` file.

```

517 \cs_new:Npn\__marginalia_write_version:
518 {
519   \iow_now:Ne\l__marginalia_aux_iow{
520     \token_to_str:N\marginalia@version{
521       \use:c{ver@marginalia.sty}
522     }
523   }
524 }

```

(End of definition for `\__marginalia_write_version:`.)

11.8 Writing page data to the .aux file

To compute the positions of marginal content items, certain page layout data is required. And since all the computation takes place at the beginning of the document, it is necessary to write this information to the .aux file.

`\g_marginalia_pagedatano_int` Global integer variable to index page data items written to the .aux file.

```
525 \int_new:N\g_marginalia_pagedatano_int
```

(End of definition for \g_marginalia_pagedatano_int.)

`\_marginalia_write_page_data:` This command will be used to write the current page data to the .aux file. It is initially defined to do nothing, so that the use of `\marginalianewgeometry` in the preamble does not cause errors (because the .aux file is not available for writing until `begindocument/end`).

```
526 \cs_set_eq:NN\_marginalia_write_page_data:\prg_do_nothing:
527 \cs_new:Npn\_marginalia_write_page_data_real:
528 {
529   \int_gincr:N\g_marginalia_pagedatano_int
530   \legacy_if:nTF{@twocolumn}
531     { \int_set:Nn\l_tmpa_int{2} }
532     { \int_set:Nn\l_tmpa_int{1} }
533   \iow_now:Ne\l_marginalia_aux_iow{
534     \token_to_str:N\marginalia@pagedata{
535       pagedatano=\int_value:w\g_marginalia_pagedatano_int,
536       abspageno=\int_eval:n{\g_shipout_readonly_int+1},
537       hoffset=\int_value:w\hoffset,
538       voffset=\int_value:w\voffset,
539       pageheight=\int_value:w\pageheight,
540       oddsidemargin=\int_value:w\oddsidemargin,
541       evensidemargin=\int_value:w\evensidemargin,
542       textwidth=\int_value:w\textwidth,
543       columncount=\int_value:w\l_tmpa_int,
544       columnwidth=\int_value:w\columnwidth,
545       columnsep=\int_value:w\columnsep,
546       twoside=\bool_to_str:n{\legacy_if_p:n{@twoside}},
547     }
548   }
549 }
```

At the `begindocument/end` hook, the .aux file has been opened for writing, and so the macro `\_marginalia_write_page_data:` is enabled and the initial page data is written out.

```
550 \hook_gput_code:nnn{ begindocument/end }{ marginalia/initial }
551 {
552   \_marginalia_write_version:
553   \cs_set_eq:NN
554     \_marginalia_write_page_data:
555     \_marginalia_write_page_data_real:
556   \_marginalia_write_page_data:
557 }
```

(End of definition for _marginalia_write_page_data:.)

11.9 Marginal content item processing

11.9.1 Variables

Variables set by L^AT_EX.

`\g__marginalia_itemno_int` Global integer variable to index marginal content items.

```
558 \int_new:N\g__marginalia_itemno_int
```

(End of definition for \g__marginalia_itemno_int.)

`\l__marginalia_item_box` Box variable to hold the typeset marginal content item.

```
559 \box_new:N\l__marginalia_item_box
```

(End of definition for \l__marginalia_item_box.)

`\l__marginalia_item_height_dim` Dimension variables to hold the height and depth of the typeset margin content item.

```
\l__marginalia_item_depth_dim 560 \dim_new:N\l__marginalia_item_height_dim
```

```
561 \dim_new:N\l__marginalia_item_depth_dim
```

(End of definition for \l__marginalia_item_height_dim and \l__marginalia_item_depth_dim.)

Variables set by Lua. The following variables will be set by the Lua backend via `tex.count` and `tex.dimen` when `\__marginalia_lua_load_item_data:n` is called.

`\l__marginalia_page_int` Integer variable for the page on which the marginal content item appears. This variable will be made available via `\marginaliapage` within the `\marginalia`.

```
562 \int_new:N\l__marginalia_page_int
```

(End of definition for \l__marginalia_page_int.)

`\l__marginalia_column_computed_int` Integer variable for the column next to which the marginal content item appears. This variable will be made available via `\marginaliacolumn` within the `\marginalia`.

```
563 \int_new:N\l__marginalia_column_computed_int
```

(End of definition for \l__marginalia_column_computed_int.)

`\l__marginalia_xshift_computed_dim` Dimension variables to hold the differences in x and y coordinates between the call to `\marginalia` and the position where the marginal content item should appear.

`\l__marginalia_yshift_computed_dim`

```
564 \dim_new:N\l__marginalia_xshift_computed_dim
```

```
565 \dim_new:N\l__marginalia_yshift_computed_dim
```

(End of definition for \l__marginalia_xshift_computed_dim and \l__marginalia_yshift_computed_dim.)

`\l__marginalia_side_computed_int` Integer variable to indicate the side of the text block or column on which the marginal content item should be placed: 0 = right and 1 = left.

```
566 \int_new:N\l__marginalia_side_computed_int
```

(This variable could be a boolean, but an integer is used because there is no canonical access to booleans from Lua.)

(End of definition for \l__marginalia_side_computed_int.)

`\l__marginalia_marginno_computed_int` Integer variable to indicate in which margin the content will be placed, to enable quick selection of width and style: 0 = recto outer, 1 = recto inner, 2 = verso outer, 3 = verso inner, 4 = right between, 5 = left between.

```
567 \int_new:N\l__marginalia_marginno_computed_int
```

(End of definition for `\l__marginalia_marginno_computed_int`.)

`\l__marginalia_enabled_computed_int` Integer variable to indicate whether the marginal content item is enabled: 0 = disabled, 1 = enabled.

```
568 \int_new:N\l__marginalia_enabled_computed_int
```

(This variable could be a boolean, but an integer is used because there is no canonical access to booleans from Lua.)

(End of definition for `\l__marginalia_enabled_computed_int`.)

11.9.2 Core macro

`\__marginalia_process_item:nn` This macro does most of the work in setting the marginal content item. The first parameter is `<options>`, the second is `<content>`.

```
569 \cs_new:Npn\__marginalia_process_item:nn #1#2
570 {
```

First, increment the index, then enter a group where all the action will happen.

```
571 \int_gincr:N\g__marginalia_itemno_int
572 \group_begin:
```

Process `<options>`. These settings apply locally inside the group.

```
573 \keys_set:nn{marginalia}{ #1 }
```

Get item data from the Lua backend: the integer variables `\l__marginalia_page_int`, `\l__marginalia_column_computed_int`, `\l__marginalia_side_computed_int`, `\l__marginalia_enabled_computed_int`, and the dimension variables `\l__marginalia_xshift_computed_dim`, and `\l__marginalia_yshift_computed_dim` are set by Lua via `tex.count` and `tex.dimen`. If no data is available (if, for instance, no data has been stored from a previous run), default values will be set by Lua. On later runs, the Lua backend will supply the values computed from the data written to the `.aux` file on the previous run.

```
574 \__marginalia_lua_load_item_data:n
575 { \int_value:w\g__marginalia_itemno_int }
```

Choose the correct auxiliary function for typesetting, depending on which mode T_EX is in.

```
576 \mode_if_math:TF
577 {
578   \cs_set_eq:NN
579   \__marginalia_typeset:n
580   \__marginalia_typeset_mmode:n
581 }
582 {
583   \legacy_if:nT{@inlabel}
584   { \leavevmode }
585   \mode_if_horizontal:TF
586   {
587     \cs_set_eq:NN
```

```

588         \l__marginalia_typeset:n
589         \l__marginalia_typeset_hmode:n
590     }
591     {
592         \cs_set_eq:NN
593         \l__marginalia_typeset:n
594         \l__marginalia_typeset_vmode:n
595     }
596 }

```

Choose the correct box in which to typeset the item for the desired vertical alignment, which has been stored in `\l__marginalia_valign_int`.

```

597 \int_case:nn{\l__marginalia_valign_int}{
598 {
599     {1}{ \cs_set_eq:NN\l__marginalia_item_box_set:Nn\ vbox_set_top:Nn }
600     {2}{ \cs_set_eq:NN\l__marginalia_item_box_set:Nn\ vbox_set:Nn }
601     {3}{ \cs_set_eq:NN\l__marginalia_item_box_set:Nn\l__marginalia_vbox_set_center:Nn }
602     {4}{ \cs_set_eq:NN\l__marginalia_item_box_set:Nn\l__marginalia_vbox_set_midway:Nn }
603 }

```

Choose the correct horizontal separation, width, style, and mark for the item.

```

604 \l__marginalia_set_xsep_width_style_mark:

```

Typeset the `<content>` into `\l__marginalia_item_box`. Use `\@parboxrestore` for brevity, even though `\hsize` and `\linewidth` are subsequently set to `\l__marginalia_width_dim`. Make available `\marginaliapage` and `\marginaliacolumn`.

```

605 \l__marginalia_tagging_socket:n {marginpar/begin}
606 \l__marginalia_item_box_set:Nn\l__marginalia_item_box{
607     \@parboxrestore
608     \l__marginalia_tagging_socket:n {para/restore}
609     \normalfont\normalsize
610
611     \tl_use:N\l__marginalia_style_tl
612     \dim_set_eq:NN\hsize\l__marginalia_width_dim
613     \dim_set_eq:NN\linewidth\hsize
614
615     \cs_set_eq:NN\marginaliapage\l__marginalia_page_int
616     \cs_set_eq:NN\marginaliacolumn\l__marginalia_column_computed_int
617
618     \group_begin:
619     \ignorespaces
620     #2
621     \par
622     \group_end:
623 }
624 \l__marginalia_tagging_socket:n{marginpar/end}

```

Measure `\l__marginalia_item_box`.

```

625 \dim_set:Nn\l__marginalia_item_height_dim
626     {\box_ht:N\l__marginalia_item_box}
627 \dim_set:Nn\l__marginalia_item_depth_dim
628     {\box_dp:N\l__marginalia_item_box}

```

Everything is now ready to place the item on the page and write the necessary data to the `.aux` file. Use the chosen auxiliary function for typesetting, and immediately use `\savepos` to store the callout position.

```

629     \__marginalia_typeset:n{
630         \savepos

```

Write the item data to the .aux file. All tokens that will change for future items, and which are currently meaningful, are expanded now; the remainder will be expanded at shipout time, when *they* are meaningful.

```

631     \iow_shipout_e:Ne\l__marginalia_aux_iow{
632         \token_to_str:N\marginalia@itemdata{
633             itemno=\int_value:w\g__marginalia_itemno_int,
634             abspageno=\exp_not:N\int_eval:n{g_shipout_readonly_int},
635             pageno=\exp_not:N\int_value:w\c@page,
636             type=\str_use:N\int_value:w\l__marginalia_type_int,
637             xpos=\exp_not:N\int_value:w\lastxpos,
638             ypos=\exp_not:N\int_value:w\lastypos,
639             height=\int_value:w\l__marginalia_item_height_dim,
640             depth=\int_value:w\l__marginalia_item_depth_dim,
641             pos=\int_value:w\l__marginalia_pos_int,
642             column=\int_value:w\l__marginalia_column_int,
643             yshift=\int_value:w\l__marginalia_default_yshift_dim,
644             ysep~above=\int_value:w\l__marginalia_ysep_above_dim,
645             ysep~below=\int_value:w\l__marginalia_ysep_below_dim,
646             ysep~page~top=\int_value:w\l__marginalia_ysep_page_top_dim,
647             ysep~page~bottom=\int_value:w\l__marginalia_ysep_page_bottom_dim,
648         }
649     }

```

Finally, if the item is enabled, typeset it onto the page: shift the item by

$$|\l__marginalia_xshift_computed_dim| + |\l__marginalia_xsep_dim|$$

to the right or left (depending on `\l__marginalia_side_computed_int` in the appropriate overlap `\hbox`, then use `\__marginalia_place_item_box:` for the vertical placement. To make sure that item placement is correct in right-to-left (TRT) text, placement happens inside a zero-width `\hbox` in which the text direction is set to left-to-right (TLT). This change does not affect the content of the item, since it has already been typeset into `\l__marginalia_item_box`.

```

650     \int_if_zero:nF{\l__marginalia_enabled_computed_int}
651     {
652         \hbox_to_zero:n{
653             \textdir TLT
654             \int_if_zero:nTF{ \l__marginalia_side_computed_int }
655             {
656                 \hbox_overlap_right:n{
657                     \kern\l__marginalia_xshift_computed_dim
658                     \tl_if_empty:NF\l__marginalia_mark_tl
659                     {
660                         \hbox_overlap_right:n{ \tl_use:N\l__marginalia_mark_tl }
661                     }
662                     \kern\l__marginalia_xsep_dim
663                     \__marginalia_place_item_box:
664                 }
665             }
666         }
667         \hbox_overlap_left:n{

```

```

668         \_marginolia_place_item_box:
669         \kern\l__marginolia_xsep_dim
670         \tl_if_empty:NF\l__marginolia_mark_tl
671         {
672             \hbox_overlap_left:n{ \tl_use:N\l__marginolia_mark_tl }
673         }
674         \kern-\l__marginolia_xshift_computed_dim
675     }
676 }
677 }
678 }
679 }

```

Close the group started near the beginning of `\_marginolia_process_item:nn`.

```

680     \group_end:
681 }

```

(End of definition for `\_marginolia_process_item:nn`.)

11.9.3 Horizontal separation, width, style, mark selection

`\_marginolia_set_xsep_width_style_mark:` Set `\l__marginolia_xsep_dim`, `\l__marginolia_width_dim`, and `\l__marginolia_style_tl`, based on `\l__marginolia_marginno_computed_int`.

```

682 \cs_new:Npn\_marginolia_set_xsep_width_style_mark:
683 {
684     \int_case:nn{\l__marginolia_marginno_computed_int}
685     {
686         {0}
687         {
688             \cs_set_eq:NN\l__marginolia_xsep_dim
689             \l__marginolia_xsep_recto_right_dim
690             \cs_set_eq:NN\l__marginolia_width_dim
691             \l__marginolia_width_recto_right_dim
692             \cs_set_eq:NN\l__marginolia_style_tl
693             \l__marginolia_style_recto_right_tl
694             \cs_set_eq:NN\l__marginolia_mark_tl
695             \l__marginolia_mark_recto_right_tl
696         }
697         {1}
698         {
699             \cs_set_eq:NN\l__marginolia_xsep_dim
700             \l__marginolia_xsep_recto_left_dim
701             \cs_set_eq:NN\l__marginolia_width_dim
702             \l__marginolia_width_recto_left_dim
703             \cs_set_eq:NN\l__marginolia_style_tl
704             \l__marginolia_style_recto_left_tl
705             \cs_set_eq:NN\l__marginolia_mark_tl
706             \l__marginolia_mark_recto_left_tl
707         }
708         {2}
709         {
710             \cs_set_eq:NN\l__marginolia_xsep_dim
711             \l__marginolia_xsep_verso_right_dim
712             \cs_set_eq:NN\l__marginolia_width_dim

```

```

713         \l__marginalia_width_verso_right_dim
714         \cs_set_eq:NN\l__marginalia_style_tl
715         \l__marginalia_style_verso_right_tl
716         \cs_set_eq:NN\l__marginalia_mark_tl
717         \l__marginalia_mark_verso_right_tl
718     }
719 {3}
720 {
721     \cs_set_eq:NN\l__marginalia_xsep_dim
722     \l__marginalia_xsep_verso_left_dim
723     \cs_set_eq:NN\l__marginalia_width_dim
724     \l__marginalia_width_verso_left_dim
725     \cs_set_eq:NN\l__marginalia_style_tl
726     \l__marginalia_style_verso_left_tl
727     \cs_set_eq:NN\l__marginalia_mark_tl
728     \l__marginalia_mark_verso_left_tl
729 }
730 {4}
731 {
732     \cs_set_eq:NN\l__marginalia_xsep_dim
733     \l__marginalia_xsep_right_between_dim
734     \cs_set_eq:NN\l__marginalia_width_dim
735     \l__marginalia_width_right_between_dim
736     \cs_set_eq:NN\l__marginalia_style_tl
737     \l__marginalia_style_right_between_tl
738     \cs_set_eq:NN\l__marginalia_mark_tl
739     \l__marginalia_mark_right_between_tl
740 }
741 {5}
742 {
743     \cs_set_eq:NN\l__marginalia_xsep_dim
744     \l__marginalia_xsep_left_between_dim
745     \cs_set_eq:NN\l__marginalia_width_dim
746     \l__marginalia_width_left_between_dim
747     \cs_set_eq:NN\l__marginalia_style_tl
748     \l__marginalia_style_left_between_tl
749     \cs_set_eq:NN\l__marginalia_mark_tl
750     \l__marginalia_mark_left_between_tl
751 }
752 }
753 }

```

(End of definition for __marginalia_set_xsep_width_style_mark:.)

11.9.4 Auxiliary box macros

__marginalia_vbox_set_center:Nn Typesets the second parameter at natural height and stores the result inside a box register supplied as the first parameter, with the baseline being mid-way between the top and bottom of the box.

```

754 \cs_new:Npn \__marginalia_vbox_set_center:Nn #1#2
755 {
756     \vbox_set_top:Nn #1{#2}
757     \dim_set:Nn \l_tmpa_dim{ \box_ht:N#1 + \box_dp:N#1 }
758     \box_set_ht:Nn #1 { .5\l_tmpa_dim }

```

```

759     \box_set_dp:Nn #1 { .5\l_tmpa_dim }
760 }

```

(End of definition for `\__marginalia_vbox_set_center:Nn`.)

`\__marginalia_vbox_set_midway:Nn` Typesets the second parameter at natural height and stores the result inside a box register supplied as the first parameter, with the baseline being mid-way between the top and bottom baselines of the items in the box.

```

761 \cs_new:Npn \__marginalia_vbox_set_midway:Nn #1#2
762 {

```

The distance between the topmost and bottommost baselines is equal to the difference in depths between the results of typesetting using a `\vtop` and a `\vbox`. So typeset into both (suspending tagging for the latter), calculate the difference, and adjust the height and depth of the first.

```

763     \vbox_set_top:Nn #1{#2}
764     \tag_suspend:n{ marginalia }
765     \vbox_set:Nn \l_tmpa_box {#2}
766     \tag_resume:n{ marginalia }
767     \dim_set:Nn \l_tmpa_dim{ \box_dp:N#1 - \box_dp:N\l_tmpa_box}
768     \box_set_ht:Nn #1 { \box_ht:N#1 + .5\l_tmpa_dim }
769     \box_set_dp:Nn #1 { \box_dp:N#1 - .5\l_tmpa_dim }
770 }

```

(End of definition for `\__marginalia_vbox_set_midway:Nn`.)

11.9.5 Placement macros

`\__marginalia_place_item_box:` Place the item that has been set in `\l__marginalia_item_box`, vertically shifted by `\l__marginalia_yshift_computed_dim` and `\smashed` to avoid altering vertical spacing in the main text.

```

771 \cs_new:Npn \__marginalia_place_item_box:
772 {
773     \smash
774     {
775         \box_move_up:nn{\l__marginalia_yshift_computed_dim}
776         {
777             \box_use:N\l__marginalia_item_box
778         }
779     }
780 }

```

(End of definition for `\__marginalia_place_item_box:`.)

`\__marginalia_typeset_mmode:n` These three macros handle typesetting in math mode, horizontal mode, and vertical mode. Nothing special needs to be done in math mode. In horizontal mode, `\@bsphack...\@esphack` avoids double spacing. In vertical mode, `\if@nobreak` is saved, a new paragraph is started, the item is typeset, the paragraph is ended, a vertical skip of `-\baselineskip` is added, which should ‘hide’ that invisible paragraph, and `\if@nobreak` is restored to the saved value.

```

781 \cs_new:Npn \__marginalia_typeset_mmode:n #1
782 {
783     #1
784 }

```

```

785 \cs_new:Npn\__marginalia_typeset_hmode:n #1
786 {
787   \@bsphack
788   #1
789   \@esphack
790 }
791 \bool_new:N\l__marginalia_nobreak_bool
792 \cs_new:Npn\__marginalia_typeset_vmode:n #1
793 {
794   \bool_set:Nn\l__marginalia_nobreak_bool{ \legacy_if_p:n{@nobreak} }
795   \nobreak\noindent #1\par
796   \skip_vertical:n{-\baselineskip}
797   \legacy_if_gset:nn{ @nobreak }{ \l__marginalia_nobreak_bool }
798 }

```

(End of definition for `\__marginalia_typeset_mmode:n`, `\__marginalia_typeset_hmode:n`, and `\__marginalia_typeset_vmode:n`.)

11.10 User commands

Set up the commands for the user.

`\marginalia` This is the main user command for creating a marginal content item. This macro does nothing but hand off to `\__marginalia_process_item:nn`.

```

799 \NewDocumentCommand{\marginalia}{ 0 } +m {
800   {
801     \__marginalia_process_item:nn{#1}{#2}
802   }

```

(End of definition for `\marginalia`. This function is documented on page 5.)

`\marginaliasetup` The user command to set the configuration. This macro does nothing but hand off to `\__marginalia_setup:n`.

```

803 \NewDocumentCommand{\marginaliasetup}{ 1 }
804 {
805   \__marginalia_setup:n{ #1 }
806 }

```

(End of definition for `\marginaliasetup`. This function is documented on page 5.)

`\marginalianewgeometry` The user command to signal that the page geometry has been changed.

```

807 \NewDocumentCommand{\marginalianewgeometry}{}
808 {
809   \__marginalia_write_page_data:
810 }

```

(End of definition for `\marginalianewgeometry`. This function is documented on page 6.)

11.11 expl3 interface

Set up expl3 commands for the user.

```
\marginalia:nn At present, these commands are just synonyms for internal commands, but in principle
\marginalia_setup:n the latter could change.
\marginalia_new_geometry:
811 \cs_set_eq:NN\marginalia:nn\__marginalia_process_item:nn
812 \cs_set_eq:NN\marginalia_setup:n\__marginalia_setup:n
813 \cs_set_eq:NN\marginalia_new_geometry:\__marginalia_write_page_data:

(End of definition for \marginalia:nn, \marginalia_setup:n, and \marginalia_new_geometry:. These
functions are documented on page 7.)

814 \</package>
```

12 Implementation (Lua backend)

```
815 \*lua>
```

12.1 Initial set-up

Module identification/version information.

```
816 local module_name = 'marginalia'
817 local marginalia_module = {
818   name      = module_name,
819   version   = '0.84.6',
820   date      = '2026-10-09',
821   description = 'marginalia',
822   author    = 'Alan J. Cain',
823   copyright  = 'Alan J. Cain',
824   license    = 'LPPL v1.3c'
825 }
826 luatexbase.provides_module(marginalia_module)
```

12.2 Message functions

`info` Functions for writing info or warning messages. First argument is used as a format string
`warning` for later arguments.

```
827 local function info(s,...)
828   luatexbase.module_info(module_name,s:format(...))
829 end
830 local function warning(s,...)
831   luatexbase.module_warning(module_name,s:format(...))
832 end
833 local function error_(s,...)
834   luatexbase.module_error(module_name,s:format(...))
835 end
```

(End of definition for `info` and `warning`.)

12.3 Module variables

Module tables for `page_data` and `item_data`.

```
836 local PAGE_DATA_MAIN_TABLE = {}  
837 local ITEM_DATA_MAIN_TABLE = {}
```

Module tables for compiling reports.

```
838 local PROBLEM_REPORT_TABLE = {}  
839 local PAGE_CHANGE_REPORT_TABLE = {}  
840 local ITEM_CHANGE_REPORT_TABLE = {}
```

Module variable indicating whether the document binding is on the left.

```
841 local binding_left = true  
842  
843 local function set_binding_left(value)  
844     binding_left = value  
845 end
```

12.4 Constants

Type constants. These match the possible values for the `type` key.

```
846 local TYPE_NORMAL = 1  
847 local TYPE_FIXED = 2  
848 local TYPE_OPTFIXED = 3
```

Position constants. These match the possible values for the `pos` key.

```
849 local POS_AUTO = 1  
850 local POS_REVERSE = 2  
851 local POS_OUTER = 3  
852 local POS_INNER = 4  
853 local POS_RIGHT = 5  
854 local POS_LEFT = 6  
855 local POS_NEAREST = 7
```

12.5 Keys for tables

The strings listed in this subsection are constants used to index the tables. Also listed are the types of values that are indexed by each key. Note that values listed below as **dimensions** are actually integers, giving the dimension in $\text{\TeX}$ scaled points (sp)

12.5.1 Keys for both page and item data tables

Integer: Absolute page number in output file (not on-page number), used in both `page_data` and `item_data` tables

```
856 local KEY_ABSPAGENO = 'abspageno'
```

Boolean: Used to mark `page_data` or `item_data` as checked when the `.aux` file is read back at the end of the document

```
857 local KEY_CHECKED = 'checked'
```

12.5.2 Keys for page data tables, layout etc.

Integer: Used only to distinguish instances of data written to .aux file

```
858 local KEY_PAGEDATANO = 'pagedatano'
```

Dimensions: Value of next two will always be equivalent of 1 in, but it is simpler to keep all geometry data together.

```
859 local KEY_HOFFSETOIGIN = 'hoffsetorigin'
```

```
860 local KEY_VOFFSETOIGIN = 'voffsetorigin'
```

Dimensions: corresponding to obvious L^AT_EX dimensions

```
861 local KEY_HOFFSET = 'hoffset'
```

```
862 local KEY_VOFFSET = 'voffset'
```

```
863 local KEY_PAGEHEIGHT = 'pageheight'
```

```
864 local KEY_ODDSIDEMARGIN = 'oddsidemargin'
```

```
865 local KEY_EVENSIDEMARGIN = 'evensidemargin'
```

```
866 local KEY_TEXTWIDTH = 'textwidth'
```

```
867 local KEY_COLUMNWIDTH = 'columnwidth'
```

```
868 local KEY_COLUMNSEP = 'columnsep'
```

Integer: either 1 or 2, depending on whether L^AT_EX was in one- or two-column mode

```
869 local KEY_COLUMNCOUNT = 'columncount'
```

Boolean: true iff L^AT_EX is in twoside mode

```
870 local KEY_TWOSIDE = 'twoside'
```

12.5.3 Keys for item data tables

Integer: Used to identify data with item

```
871 local KEY_ITEMNO = 'itemno'
```

Integer: On-page number

```
872 local KEY_PAGENO = 'pageno'
```

Dimensions: x and y positions of call to \marginalia

```
873 local KEY_XPOS = 'xpos'
```

```
874 local KEY_YPOS = 'ypos'
```

Dimensions: Height and depth of typeset item

```
875 local KEY_HEIGHT = 'height'
```

```
876 local KEY_DEPTH = 'depth'
```

Integer: Specified type, following TYPE_*

```
877 local KEY_TYPE = 'type'
```

Integer: corresponds to value of pos key and the constants POS_*: 1 = auto, 2 = reverse, 3 = outer, 4 = inner, 5 = right, 6 = left, 7 = nearest.

```
878 local KEY_POS = 'pos'
```

Integer: corresponds to value of column key: -1 = auto, 0 = one, 1 = left, 2 = right

```
879 local KEY_COLUMN = 'column'
```

Dimension: specified vertical shift

```
880 local KEY_YSHIFT = 'yshift'
```

Dimensions: specified vertical separations

```
881 local KEY_YSEP_ABOVE = 'ysep above'
882 local KEY_YSEP_BELOW = 'ysep below'
883 local KEY_YSEP_PAGE_TOP = 'ysep page top'
884 local KEY_YSEP_PAGE_BOTTOM = 'ysep page bottom'
```

The preceding keys refer to values that will be supplied from L^AT_EX. The remaining values will be computed in Lua and passed back to L^AT_EX.

Integer: column in which the call to `\marginalia` was located: 0 = one-column, 1 = left, 2 = right

```
885 local KEY_COLNO_COMPUTED = 'colno computed'
```

Dimension: Horizontal shift between the call to `\marginalia` and the margin in which the item should be located

```
886 local KEY_XSHIFT_COMPUTED = 'xshift computed'
```

Dimension: Computed vertical shift

```
887 local KEY_YSHIFT_COMPUTED = 'yshift computed'
```

Integer: Side of text on which the item will appear: 0 = right, 1 = left

```
888 local KEY_SIDE_COMPUTED = 'side computed'
```

Integer: Number of margin in which the item will appear, 0 = recto right, 1 = recto left, 2 = verso left, 3 = verso right, 4 = right between, 5 = left between

```
889 local KEY_MARGINNO_COMPUTED = 'marginno computed'
```

Boolean: Whether the item will actually appear on the page

```
890 local KEY_ENABLED_COMPUTED = 'enabled computed'
```

12.6 Utility functions

`list_filter`

12 Code adapted from

<https://stackoverflow.com/a/53038524>.

Take a list `t` and remove from it any elements for which the function `f` does not return true. (The index `j` is always the destination index to which a ‘keep’ element is moved.)¹²

```
891 local function list_filter(t, f)
892   local j = 1
893   local n = #t
894
895   for i=1,n do
896     if (f(t[i])) then
897       if (i ~= j) then
898         t[j] = t[i]
899         t[i] = nil
900       end
901       j = j + 1
902     else
903       t[i] = nil
904     end
905   end
906
907 end
```

(End of definition for `list_filter`.)

`list_filter` Return boolean true iff `s` is exactly the string `'true'`.

```
908 local function toboolean(s)
909   return s == "true"
910 end
```

(End of definition for list_filter.)

`get_data_page_number` Take a item or page data and return a human-readable string indicating the page to which the data pertains.

```
911 local function get_data_page_number(data)
912   local pageno = data[KEY_PAGENO]
913   if pageno ~= nil then
914     return 'p' .. pageno .. ' (' .. data[KEY_ABSPAGENO] .. ')'
915   else
916     return data[KEY_ABSPAGENO]
917   end
918 end
```

(End of definition for get_data_page_number.)

12.7 Generic page/item data functions

`parse_data` Parse `keyvalue_string` and return the corresponding data as a table. The `keyvalue_string` is expected to be of precisely the kind written to the `.aux` file as the parameter of `\marginalia@pagedata` or `\marginalia@notedata`.

Ignore any keys in `keyvalue_string` that are not listed in `conversion_table`. Fill in any missing value with values from `defaults_table`.

`conversion_table` is indexed by possible keys, with values equal to functions to convert the corresponding value string to the value that should appear in the returned table.

`defaults_table` is indexed by keys that *will* appear in the returned table, using the corresponding value unless it was given in `keyvalue_string` and the key appeared in `conversion_table`.

```
919 local function parse_data(keyvalue_string,conversion_table,defaults_table)
920
921   local key
922   local value
923   local result = {}
924
925   for s in string.gmatch(keyvalue_string,'([^\,]+)') do
926
927     key,value = string.match(s,'^(.+)=(.+)$')
928     local conv = conversion_table[key]
929     if conv ~= nil then
930       result[key] = conv(value)
931     end
932
933   end
934
935   for key,value in pairs(defaults_table) do
936     if not(result[key] ~= nil) then
937       result[key] = value
938     end
939   end
```

```

939     end
940
941     return result
942
943 end

```

(End of definition for parse_data.)

check_data Check keyvalue_string against stored data. If it is new or has changed, append a report to report_table. Set the KEY_CHECKED of the data item to true.

The keyvalue_string is processed using conversion_table and defaults_table as per the parse_data function. The resulting table is compared to the table in data_table with the same value whose key is data_table_key. The tables are compared using the fields indexed by keys in conversion_table.

```

944 local function check_data(keyvalue_string,conversion_table,defaults_table,
945                           data_table,data_table_key_field,report_table)
946
947     local new_data = parse_data(keyvalue_string,
948                                 conversion_table,defaults_table)
949
950     local data_table_key = new_data[data_table_key_field]
951
952     local stored_data = data_table[data_table_key]
953     if stored_data == nil then
954         table.insert(
955             report_table,
956             get_data_page_number(new_data) .. ' New'
957         )
958     else
959         local change_report = ''
960         for k,_ in pairs(conversion_table) do
961             if stored_data[k] ~= new_data[k] then
962                 change_report = change_report
963                 .. ' ' .. k .. ':' ..
964                 tostring(stored_data[k]) .. '->' .. tostring(new_data[k])
965             end
966         end
967         if change_report ~= '' then
968             table.insert(
969                 report_table,
970                 get_data_page_number(new_data) .. ' ' .. change_report
971             )
972         end
973         stored_data[KEY_CHECKED] = true
974     end
975
976 end

```

(End of definition for check_data.)

check_removed_data Check whether data have been removed from data_table, which corresponds to some entry having the value of KEY_CHECKED being false. In this case, append a report to report_table.

```

977 local function check_removed_data(data_table,report_table)

```

```

978   for _,data in pairs(data_table) do
979       if not data[KEY_CHECKED] then
980           table.insert(
981               report_table,
982               ' Removed'
983           )
984       break
985   end
986 end
987 end

```

(End of definition for check_removed_data.)

12.8 Processing of page data from .aux file

Conversion and default tables.

```

988 local PAGE_DATA_CONVERSION_TABLE = {
989     [KEY_PAGEDATANO] = tonumber,
990     [KEY_ABSPAGENO] = tonumber,
991     [KEY_HOFFSETORIGIN] = tonumber,
992     [KEY_VOFFSETORIGIN] = tonumber,
993     [KEY_HOFFSET] = tonumber,
994     [KEY_VOFFSET] = tonumber,
995     [KEY_PAGEHEIGHT] = tonumber,
996     [KEY_ODDSIDEMARGIN] = tonumber,
997     [KEY_EVENSIDEMARGIN] = tonumber,
998     [KEY_COLUMNCOUNT] = tonumber,
999     [KEY_COLUMNWIDTH] = tonumber,
1000    [KEY_COLUMNSEP] = tonumber,
1001    [KEY_TEXTWIDTH] = tonumber,
1002    [KEY_TWOSIDE] = toboolean,
1003 }
1004 local PAGE_DATA_DEFAULT_TABLE = {
1005     [KEY_PAGEDATANO] = 0,
1006     [KEY_ABSPAGENO] = 0,
1007     [KEY_HOFFSETORIGIN] = tex.sp('1in'),
1008     [KEY_VOFFSETORIGIN] = tex.sp('1in'),
1009     [KEY_HOFFSET] = tex.dimen['offset'],
1010     [KEY_VOFFSET] = tex.dimen['voffset'],
1011     [KEY_PAGEHEIGHT] = tex.dimen['pageheight'],
1012     [KEY_ODDSIDEMARGIN] = tex.dimen['oddsidemargin'],
1013     [KEY_EVENSIDEMARGIN] = tex.dimen['evensidemargin'],
1014     [KEY_TEXTWIDTH] = tex.dimen['textwidth'],
1015     [KEY_COLUMNWIDTH] = tex.dimen['columnwidth'],
1016     [KEY_COLUMNSEP] = tex.dimen['columnsep'],
1017     [KEY_COLUMNCOUNT] = 1,
1018     [KEY_TWOSIDE] = false,
1019     [KEY_CHECKED] = false,
1020 }

```

store_page_data Store page data supplied by keyvalue_string in PAGE_DATA_MAIN_TABLE.

```

1021 local function store_page_data(keyvalue_string)
1022
1023     local page_data = parse_data(keyvalue_string,

```

```

1024             PAGE_DATA_CONVERSION_TABLE,
1025             PAGE_DATA_DEFAULT_TABLE)
1026
1027     PAGE_DATA_MAIN_TABLE[page_data[KEY_PAGEDATANO]] = page_data
1028
1029 end

```

(End of definition for store_page_data.)

store_default_page_data Store default page data in PAGE_DATA_MAIN_TABLE, so that there is some data to work with when computing item positions, even on a first run, when no page data has been written to the .aux file.

```

1030 local function store_default_page_data()
1031
1032     default_page_data = parse_data('',
1033                                     PAGE_DATA_CONVERSION_TABLE,
1034                                     PAGE_DATA_DEFAULT_TABLE)
1035
1036     default_page_data[KEY_ABSPAGENO] = 1
1037     default_page_data[KEY_CHECKED] = true
1038
1039     PAGE_DATA_MAIN_TABLE[0] = default_page_data
1040
1041 end

```

(End of definition for store_default_page_data.)

check_page_data Check whether page_data supplied by keyvalue_string differs from that in PAGE_DATA_MAIN_TABLE, appending reports to PAGE_CHANGE_REPORT_TABLE if so.

```

1042 local function check_page_data(keyvalue_string)
1043
1044     check_data(keyvalue_string,
1045               PAGE_DATA_CONVERSION_TABLE, PAGE_DATA_DEFAULT_TABLE,
1046               PAGE_DATA_MAIN_TABLE, KEY_PAGEDATANO,
1047               PAGE_CHANGE_REPORT_TABLE)
1048
1049 end

```

(End of definition for check_page_data.)

12.9 Processing of item data from .aux file

Conversion and default tables.

```

1050 local ITEM_DATA_CONVERSIONS = {
1051     [KEY_ITEMNO] = tonumber,
1052     [KEY_ABSPAGENO] = tonumber,
1053     [KEY_PAGENO] = tonumber,
1054     [KEY_XPOS] = tonumber,
1055     [KEY_YPOS] = tonumber,
1056     [KEY_HEIGHT] = tonumber,
1057     [KEY_DEPTH] = tonumber,
1058     [KEY_TYPE] = tonumber,
1059     [KEY_POS] = tonumber,
1060     [KEY_COLUMN] = tonumber,

```

```

1061 [KEY_YSHIFT] = tonumber,
1062 [KEY_YSEP_ABOVE] = tonumber,
1063 [KEY_YSEP_BELOW] = tonumber,
1064 [KEY_YSEP_PAGE_TOP] = tonumber,
1065 [KEY_YSEP_PAGE_BOTTOM] = tonumber,
1066 [KEY_CHECKED] = toboolean,
1067 }
1068 local ITEM_DATA_DEFAULTS = {
1069   [KEY_ITEMNO] = 0,
1070   [KEY_A BSPAGENO] = 1,
1071   [KEY_PAGENO] = 1,
1072   [KEY_XPOS] = 0,
1073   [KEY_YPOS] = 0,
1074   [KEY_HEIGHT] = 0,
1075   [KEY_DEPTH] = 0,
1076   [KEY_TYPE] = 0,
1077   [KEY_POS] = 0,
1078   [KEY_COLUMN] = -1,
1079   [KEY_YSHIFT] = 0,
1080   [KEY_YSEP_ABOVE] = tex.dimen['marginparpush'],
1081   [KEY_YSEP_BELOW] = tex.dimen['marginparpush'],
1082   [KEY_YSEP_PAGE_TOP] = tex.dimen['marginparpush'],
1083   [KEY_YSEP_PAGE_BOTTOM] = tex.dimen['marginparpush'],
1084   [KEY_COLNO_COMPUTED] = 0,
1085   [KEY_XSHIFT_COMPUTED] = 0,
1086   [KEY_YSHIFT_COMPUTED] = 0,
1087   [KEY_SIDE_COMPUTED] = 0,
1088   [KEY_MARGINNO_COMPUTED] = 0,
1089   [KEY_ENABLED_COMPUTED] = true,
1090   [KEY_CHECKED] = false,
1091 }

```

ITEM_DATA_DEFAULTS is also used by load_item_data when no stored item data is found in ITEM_DATA_MAIN_TABLE.

store_item_data Store item_data supplied by keyvalue_string in ITEM_DATA_MAIN_TABLE.

```

1092 local function store_item_data(keyvalue_string)
1093
1094   local item = parse_data(keyvalue_string,
1095                           ITEM_DATA_CONVERSIONS,
1096                           ITEM_DATA_DEFAULTS)
1097
1098   ITEM_DATA_MAIN_TABLE[item[KEY_ITEMNO]] = item
1099
1100 end

```

(End of definition for store_item_data.)

check_item_data Check whether item_data supplied by keyvalue_string differs from that in ITEM_DATA_MAIN_TABLE, appending reports to ITEM_CHANGE_REPORT_TABLE if so.

```

1101 local function check_item_data(keyvalue_string)
1102
1103   check_data(keyvalue_string,
1104              ITEM_DATA_CONVERSIONS, ITEM_DATA_DEFAULTS,
1105              ITEM_DATA_MAIN_TABLE, KEY_ITEMNO,

```

```

1106             ITEM_CHANGE_REPORT_TABLE)
1107
1108 end

```

(End of definition for check_item_data.)

12.10 Writing reports

```

write_report If report_table is non-empty, write the data contained in it as a module warning. Use
              at most max_length items. text is written before the report. If max_length is non-zero,
              after_items_text is written after the items. noun refers to the kind of items.

1109 local function write_report(report_table,max_length,text,after_items_text,noun)
1110
1111     if #report_table == 0 then
1112         return
1113     end
1114
1115     if max_length == 0 then
1116         warning(text)
1117         return
1118     end
1119
1120     local report_text
1121     local report_length
1122
1123     if #report_table <= max_length then
1124         report_length = #report_table
1125         report_text = ' Here are the ' .. noun .. ':\n'
1126     else
1127         report_length = max_length
1128         report_text = ' Here are the first ' .. report_length .. ' ' .. noun .. ':\n'
1129     end
1130
1131     for i=1,report_length do
1132         report_text = report_text .. report_table[i]
1133         if i < report_length then
1134             report_text = report_text .. '\n'
1135         end
1136     end
1137
1138     warning(text .. ' ' .. report_text .. '\n' .. after_items_text)
1139
1140 end

```

(End of definition for write_report.)

`write_problem_report` Write a report about placement problems to T_EX in a format suitable for a package warning.

```

1141 local function write_problem_report()
1142
1143     write_report(
1144         PROBLEM_REPORT_TABLE,
1145         tex.count['l__marginalia_max_problem_int'],
1146         'Problems in placement.',

```

```

1147     'Problems listed at \\end{document}',
1148     'problems'
1149 )
1150
1151
1152 end

```

(End of definition for write_problem_report.)

`write_item_change_report` Write a report about changes in item data to T_EX in a format suitable for a package warning.

```

1153 local function write_item_change_report()
1154
1155     check_removed_data(ITEM_DATA_MAIN_TABLE,ITEM_CHANGE_REPORT_TABLE)
1156     write_report(
1157         ITEM_CHANGE_REPORT_TABLE,
1158         tex.count['l__marginalia_max_item_data_change_int'],
1159         'Changes in item data. Rerun to get correct placement.',
1160         'Changes listed at \\end{document}',
1161         'changes'
1162     )
1163
1164 end

```

(End of definition for write_item_change_report.)

`write_page_change_report` Write a report about changes in page data to T_EX in a format suitable for a package warning.

```

1165 local function write_page_change_report()
1166
1167     check_removed_data(PAGE_DATA_MAIN_TABLE,PAGE_CHANGE_REPORT_TABLE)
1168     write_report(
1169         PAGE_CHANGE_REPORT_TABLE,
1170         tex.count['l__marginalia_max_page_data_change_int'],
1171         'Changes in page data. Rerun to get correct placement.',
1172         'Changes listed at \\end{document}',
1173         'changes'
1174     )
1175
1176 end

```

(End of definition for write_page_change_report.)

12.11 Computing horizontal positions

It is necessary to determine whether an item should be placed on the right or left of the text block, and in which column it lies. The following lookup tables are used.

The value found in `RIGHTSIDE_LOOKUP_TABLE` is either `true` (right) or `false` (left). It is indexed by whether the binding is on the left (`true/false`), whether the item is on a recto page (`true/false`), whether it pertains to single-column text, the left column, or the right column (0/1/2), and the value of `pos` being either `auto` or `reverse`.

`RIGHTSIDE_LOOKUP_TABLE` is only used for `pos=auto`, `reverse`, `outer`, `inner` and the result reflects binding-on-the-left.

```

1177 local RIGHTSIDE_LOOKUP_TABLE = {

```

```

1178 [true] = {
1179     [true] = {
1180         [0] = {
1181             [POS_AUTO]=true,  [POS_REVERSE]=false, [POS_OUTER]=true,  [POS_INNER]=false,
1182         },
1183         [1] = {
1184             [POS_AUTO]=false, [POS_REVERSE]=true,  [POS_OUTER]=true,  [POS_INNER]=false,
1185         },
1186         [2] = {
1187             [POS_AUTO]=true,  [POS_REVERSE]=false, [POS_OUTER]=true,  [POS_INNER]=false,
1188         },
1189     },
1190     [false] = {
1191         [0] = {
1192             [POS_AUTO]=false, [POS_REVERSE]=true,  [POS_OUTER]=false, [POS_INNER]=true,
1193         },
1194         [1] = {
1195             [POS_AUTO]=false, [POS_REVERSE]=true,  [POS_OUTER]=false, [POS_INNER]=true,
1196         },
1197         [2] = {
1198             [POS_AUTO]=true,  [POS_REVERSE]=false, [POS_OUTER]=false, [POS_INNER]=true,
1199         },
1200     },
1201 },
1202 [false] = {
1203     [true] = {
1204         [0] = {
1205             [POS_AUTO]=false, [POS_REVERSE]=true,  [POS_OUTER]=false, [POS_INNER]=true,
1206         },
1207         [1] = {
1208             [POS_AUTO]=false, [POS_REVERSE]=true,  [POS_OUTER]=false, [POS_INNER]=true,
1209         },
1210         [2] = {
1211             [POS_AUTO]=true,  [POS_REVERSE]=false, [POS_OUTER]=false, [POS_INNER]=true,
1212         },
1213     },
1214     [false] = {
1215         [0] = {
1216             [POS_AUTO]=true,  [POS_REVERSE]=false, [POS_OUTER]=true,  [POS_INNER]=false,
1217         },
1218         [1] = {
1219             [POS_AUTO]=false, [POS_REVERSE]=true,  [POS_OUTER]=true,  [POS_INNER]=false,
1220         },
1221         [2] = {
1222             [POS_AUTO]=true,  [POS_REVERSE]=false, [POS_OUTER]=true,  [POS_INNER]=false,
1223         },
1224     },
1225 },
1226 }

```

The value found in MARGINNO_LOOKUP_TABLE ranges from 0 to 5 (see KEY_MARGINNO_COMPUTED for the meaning of these values). It is indexed by whether the item is on a recto page (true/false), whether it pertains to single-column text, the left column, or the right column (0/1/2), and whether it is to be placed on the right of the text block

(true/false).

```

1227 local MARGINNO_LOOKUP_TABLE = {
1228   [true] = {
1229     [0] = {
1230       [false] = 1,
1231       [true] = 0,
1232     },
1233     [1] = {
1234       [false] = 1,
1235       [true] = 5,
1236     },
1237     [2] = {
1238       [false] = 4,
1239       [true] = 0,
1240     },
1241   },
1242   [false] = {
1243     [0] = {
1244       [false] = 3,
1245       [true] = 2,
1246     },
1247     [1] = {
1248       [false] = 3,
1249       [true] = 5,
1250     },
1251     [2] = {
1252       [false] = 4,
1253       [true] = 2,
1254     },
1255   },
1256 }

```

`compute_items_horizontal` For every `item_data` in `item_data_list`, compute the fields relevant to horizontal positioning, namely `KEY_COLNO_COMPUTED`, `KEY_XSHIFT_COMPUTED`, `KEY_SIDE_COMPUTED`, based on the layout information in `page_data`. Every item described in `item_data_list` is assumed to be on the same page.

```

1257 local function compute_items_horizontal(item_data_list,page_data)

```

Immediately return if `item_data_list` is empty, to avoid edge cases.

```

1258   if #item_data_list == 0 then
1259     return
1260   end

```

Information used frequently and which is the same for every item.

```

1261   local pageno = item_data_list[1][KEY_PAGENO]
1262   local twoside = page_data[KEY_TWOSIDE]
1263   local recto = ((pageno % 2) == 1) or (not twoside)
1264   local columncount = page_data[KEY_COLUMNCOUNT]

```

Tables to contain the x -coordinates of left edge, right edge, and middle of the current text, whether a single column (index 0), the left column (index 1), or the right column (index 2).

```

1265   local x_textleft = {}
1266   local x_textright = {}
1267   local x_textmiddle = {}

```

First, compute necessary dimensions for single-column text, since most of these calculations would be used anyway for two-column text. The terms used in calculating `x_textleft[0]` respectively take one to the origin of `\hoffset`, to the origin of `\oddsidemargin` and `\evensidemargin`, and to the left-hand side of the text block.

```

1268   if recto then
1269     x_textleft[0] = (
1270       page_data[KEY_HOFFSETORIGIN]
1271       + page_data[KEY_HOFFSET]
1272       + page_data[KEY_ODDSIDEMARGIN]
1273     )
1274     x_textright[0] = (
1275       x_textleft[0]
1276       + page_data[KEY_TEXTWIDTH]
1277     )
1278   else
1279     x_textleft[0] = (
1280       page_data[KEY_HOFFSETORIGIN]
1281       + page_data[KEY_HOFFSET]
1282       + page_data[KEY_EVENSIDEMARGIN]
1283     )
1284     x_textright[0] = (
1285       x_textleft[0]
1286       + page_data[KEY_TEXTWIDTH]
1287     )
1288   end
1289   x_textmiddle[0] = (x_textleft[0] + x_textright[0])/2
1290
1291
1292   if columncount == 1 then

```

If the page is one-column, the field `KEY_COLNO_COMPUTED` can be set immediately for every `item_data`.

```

1293     for i=1,#item_data_list do
1294       item_data_list[i][KEY_COLNO_COMPUTED] = 0
1295     end
1296   else

```

If the page is two-column, calculate the *x*-coordinates of the left and right edges and the mid-point of each column.

```

1297     x_textleft[1] = x_textleft[0]
1298     x_textright[1] = (
1299       x_textleft[1]
1300       + page_data[KEY_COLUMNWIDTH]
1301     )
1302     x_textmiddle[1] = (x_textleft[1] + x_textright[1])/2
1303
1304     x_textleft[2] = (
1305       x_textright[1]
1306       + page_data[KEY_COLUMNSEP]
1307     )
1308     x_textright[2] = (
1309       x_textleft[2]
1310       + page_data[KEY_COLUMNWIDTH]
1311     )

```

```

1312     x_textmiddle[2] = (x_textleft[2] + x_textright[2])/2
1313

```

Calculate the cut-off (mid-way between the columns) that distinguishes items from left and right columns.

```

1314     local left_column_x_limit = (
1315         x_textright[1]
1316         + .5*page_data[KEY_COLUMNSEP]
1317     )

```

Now set the field KEY_COLNO_COMPUTED for each item.

```

1318     for i=1,#item_data_list do
1319         local item_data = item_data_list[i]
1320
1321         if item_data[KEY_COLUMN] >= 0 then
1322             item_data[KEY_COLNO_COMPUTED] = item_data[KEY_COLUMN]
1323         else
1324             if item_data[KEY_XPOS] <= left_column_x_limit then
1325                 item_data[KEY_COLNO_COMPUTED] = 1
1326             else
1327                 item_data[KEY_COLNO_COMPUTED] = 2
1328             end
1329         end
1330     end
1331
1332 end

```

For every item_data in item_data_list, compute and set the fields KEY_SIDE_COMPUTED, KEY_XSHIFT_COMPUTED, and KEY_MARGINNO_COMPUTED.

```

1333     for i=1,#item_data_list do
1334         local item = item_data_list[i]
1335
1336         local pos = item[KEY_POS]
1337         local colnocomputed = item[KEY_COLNO_COMPUTED]
1338
1339         if pos == POS_LEFT then
1340             rightside = false
1341         elseif pos == POS_RIGHT then
1342             rightside = true
1343         elseif pos == POS_NEAREST then
1344             rightside = (item[KEY_XPOS] >= x_textmiddle[colnocomputed])
1345         else

```

(In this case, pos must be POS_AUTO, POS_REVERSE, POS_OUTER, or POS_INNER.)

```

1346             rightside = RIGHTSIDE_LOOKUP_TABLE[binding_left][recto][colnocomputed][pos]
1347         end
1348
1349         local marginno = MARGINNO_LOOKUP_TABLE[recto][colnocomputed][rightside]
1350
1351         if rightside then
1352             item[KEY_SIDE_COMPUTED] = 0
1353             item[KEY_XSHIFT_COMPUTED] = -item[KEY_XPOS]
1354                                     + x_textright[colnocomputed]
1355         else
1356             item[KEY_SIDE_COMPUTED] = 1

```

```

1357         item[KEY_XSHIFT_COMPUTED] = -item[KEY_XPOS]
1358                                     + x_textleft[colnocomputed]
1359     end
1360     item[KEY_MARGINNO_COMPUTED] = marginno
1361
1362 end
1363
1364 end

```

(End of definition for compute_items_horizontal.)

12.12 Computing vertical positions

12.12.1 Auxiliary functions

`get_y_item_top` Return the y -coordinate of the top of the item described by `item_data`.

```

1365 local function get_y_item_top(item_data)
1366     return item_data[KEY_YPOS]
1367           + item_data[KEY_YSHIFT_COMPUTED]
1368           + item_data[KEY_HEIGHT]
1369 end

```

(End of definition for get_y_item_top.)

`get_y_item_bottom` Return the y -coordinate of the bottom of the item described by `item_data`.

```

1370 local function get_y_item_bottom(item_data)
1371     return item_data[KEY_YPOS]
1372           - item_data[KEY_DEPTH]
1373           + item_data[KEY_YSHIFT_COMPUTED]
1374 end

```

(End of definition for get_y_item_bottom.)

`get_ysep_list` Calculate the separation to be used between adjacent marginal content items as described in `item_data_list`. The list is assumed to be sorted so that items are in the order they should appear on the page, top to bottom.

The idea is that we have the following arrangement for $i = 1, \dots, \#item_data_list$:

```

:
item_data_list[i]
ysep_list[i]
item_data_list[i+1]
:

```

Also set `ysep_list[0]` and `ysep_list[#item_data_list]` to 0, to avoid checking when these values are accessed (although they are not used).

```

1375 local function get_ysep_list(item_data_list)
1376
1377     local ysep_list = {}
1378
1379     ysep_list[0] = 0
1380     for i=1,#item_data_list-1 do
1381         ysep_list[i] = math.max(
1382             item_data_list[i][KEY_YSEP_BELOW],
1383             item_data_list[i+1][KEY_YSEP_ABOVE]

```

```

1384         )
1385     end
1386     ysep_list[#item_data_list] = 0
1387
1388     return ysep_list
1389
1390 end

```

(End of definition for get_ysep_list.)

12.12.2 Computing optfixed enabled

compute_items_vertical_optfixed_enabled

For every `item_data` in `item_data_list` describing an item of type `TYPE_OPTFIXED`, check for a clash with an item of type `TYPE_FIXED`. If so, set `item_data[KEY_ENABLED_COMPUTED]` to false. Every item described in `item_data_list` is assumed to be on the same page and to have `KEY_YSHIFT` set to the default.

```

1391 local function compute_items_vertical_optfixed_enabled(item_data_list)
1392
1393     local optfixed_item_data_list = {}
1394     local fixed_item_data_list = {}
1395
1396     for _,item_data in pairs(item_data_list) do
1397         if item_data[KEY_TYPE] == TYPE_OPTFIXED then
1398             optfixed_item_data_list[#optfixed_item_data_list+1] = item_data
1399         elseif item_data[KEY_TYPE] == TYPE_FIXED then
1400             fixed_item_data_list[#fixed_item_data_list+1] = item_data
1401         end
1402     end
1403
1404     for _,optfixed_item_data in pairs(optfixed_item_data_list) do
1405         local optfixed_y_item_top = get_y_item_top(optfixed_item_data)
1406         local optfixed_y_item_bottom = get_y_item_bottom(optfixed_item_data)
1407
1408         for _,fixed_item_data in pairs(fixed_item_data_list) do
1409             local fixed_y_item_top = get_y_item_top(fixed_item_data)
1410             local fixed_y_item_bottom = get_y_item_bottom(fixed_item_data)
1411
1412             if (
1413                 (
1414                     (fixed_y_item_bottom - optfixed_y_item_top)
1415                     <
1416                     math.max(
1417                         fixed_item_data[KEY_YSEP_BELOW],
1418                         optfixed_item_data[KEY_YSEP_ABOVE]
1419                     )
1420                 )
1421             and
1422                 (
1423                     (optfixed_y_item_bottom - fixed_y_item_top)
1424                     <
1425                     math.max(
1426                         optfixed_item_data[KEY_YSEP_BELOW],
1427                         fixed_item_data[KEY_YSEP_ABOVE]
1428                     )

```

```

1429         )
1430     ) then
1431         optfixed_item_data[KEY_ENABLED_COMPUTED] = false
1432         break
1433     end
1434 end
1435 end
1436
1437 end

```

(End of definition for `compute_items_vertical_optfixed_enabled`.)

12.12.3 Computing vertical adjustment

`compute_items_vertical_adjustment`

For every `item_data` in `item_data_list`, compute the field relevant to vertical positioning, namely `KEY_YSHIFT_COMPUTED`, based on the layout information in `page_data`. Every item described in `item_data_list` is assumed to be on the same page and to have `KEY_YSHIFT` set to the default, and the list is assumed to be sorted so that items are in the order they should appear on the page, top to bottom.

```

1438 local function compute_items_vertical_adjustment(item_data_list,page_data)

```

Immediately return if `item_data_list` is empty, to avoid edge cases

```

1439     if #item_data_list == 0 then
1440         return
1441     end

```

```

1442
1443     local ysep_list = get_ysep_list(item_data_list)

```

First pass of computation (downward). `y_limit_above` will always be the highest `y`-coordinate at which the top of next item below can appear.

```

1444     local y_limit_above = (
1445         page_data[KEY_VOFFSET]
1446         + page_data[KEY_PAGEHEIGHT]
1447         - item_data_list[1][KEY_YSEP_PAGE_TOP]
1448     )
1449
1450     for i=1,#item_data_list do
1451         local item_data = item_data_list[i]
1452
1453         local y_item_top = get_y_item_top(item_data)
1454
1455         if y_item_top > y_limit_above then
1456             if item_data[KEY_TYPE] == TYPE_NORMAL then
1457                 item_data[KEY_YSHIFT_COMPUTED] = item_data[KEY_YSHIFT_COMPUTED]
1458                                                         + (y_limit_above - y_item_top)
1459             end
1460         end
1461
1462         y_limit_above = get_y_item_bottom(item_data) - ysep_list[i]
1463     end

```

Second pass of computation (upward). `y_limit_below` will always be the lowest `y`-coordinate at which the bottom of next item above can appear.

```

1464     local y_limit_below = (
1465         page_data[KEY_VOFFSET]

```

```

1466     + item_data_list[#item_data_list][KEY_YSEP_PAGE_BOTTOM]
1467 )
1468
1469 for i=#item_data_list,1,-1 do
1470     local item_data = item_data_list[i]
1471
1472     local y_item_bottom = get_y_item_bottom(item_data)
1473
1474     if y_item_bottom < y_limit_below then
1475         if item_data[KEY_TYPE] == TYPE_NORMAL then
1476             item_data[KEY_YSHIFT_COMPUTED] = item_data[KEY_YSHIFT_COMPUTED]
1477                 + (y_limit_below - y_item_bottom)
1478         end
1479     end
1480
1481     y_limit_below = get_y_item_top(item_data) + ysep_list[i-1]
1482 end
1483
1484 end

```

(End of definition for compute_items_vertical_adjustment.)

12.12.4 Checking vertical adjustment

Messages to use when checking results of vertical adjustment.

```

1485 local ITEM_PASSED_YSEP_PAGE_TOP_MESSAGES = {
1486     [TYPE_NORMAL] = 'Moveable item > ysep page top',
1487     [TYPE_FIXED] = 'Topmost fixed item > ysep page top',
1488     [TYPE_OPTFIXED] = 'Topmost optfixed item > ysep page top',
1489 }
1490 local ITEM_CLASH_MESSAGES = {
1491     [TYPE_NORMAL] = {
1492         [TYPE_NORMAL] = 'moveable items'
1493             .. ' (this shouldn\'t happen)',
1494         [TYPE_FIXED] = 'moveable item above fixed item',
1495         [TYPE_OPTFIXED] = 'moveable item above optfixed item',
1496     },
1497     [TYPE_FIXED] = {
1498         [TYPE_NORMAL] = 'moveable item below fixed item',
1499         [TYPE_FIXED] = 'fixed items',
1500         [TYPE_OPTFIXED] = 'fixed item above optfixed item '
1501             .. ' (this shouldn\'t happen)',
1502     },
1503     [TYPE_OPTFIXED] = {
1504         [TYPE_NORMAL] = 'moveable items below optfixed item',
1505         [TYPE_FIXED] = 'fixed item below optfixed item '
1506             .. ' (this shouldn\'t happen)',
1507         [TYPE_OPTFIXED] = 'optfixed items '
1508             .. ' (this shouldn\'t happen)',
1509     },
1510 }
1511 local ITEM_PASSED_YSEP_PAGE_BOTTOM_MESSAGE = {
1512     [TYPE_NORMAL] = 'Moveable item < ysep page bottom',
1513     [TYPE_FIXED] = 'Bottommost fixed item < ysep page bottom',

```

```

1514 [TYPE_OPTFIXED] = 'Bottommost optfixed item < ysep page bottom',
1515 }

```

check_items_vertical For the items described by the item_data in item_data_list, check whether any clash or fail to obey ysep page top or ysep page bottom. If so, write messages to PROBLEM_REPORT_TABLE.

```

1516 local function check_items_vertical(item_data_list,page_data)

```

Immediately return if item_data_list is empty, to avoid edge cases

```

1517 if (#item_data_list) == 0 then
1518     return
1519 end
1520
1521 local ysep_list = get_ysep_list(item_data_list)
1522
1523 local item_data
1524

```

If any item fails to obey ysep page top, the first one in the list does.

```

1525 item_data = item_data_list[1]
1526 if (
1527     get_y_item_top(item_data) > page_data[KEY_VOFFSET]
1528                               + page_data[KEY_PAGEHEIGHT]
1529                               - item_data[KEY_YSEP_PAGE_TOP]
1530 ) then
1531     table.insert(
1532         PROBLEM_REPORT_TABLE,
1533         get_data_page_number(item_data)
1534         .. ' ' .. ITEM_PASSED_YSEP_PAGE_TOP_MESSAGES[item_data[KEY_TYPE]]
1535     )
1536 end
1537
1538 for i=2,#item_data_list do
1539     local item_data = item_data_list[i]
1540     local prev_item_data = item_data_list[i-1]
1541     if (
1542         get_y_item_top(item_data) > get_y_item_bottom(prev_item_data)
1543                                   - ysep_list[i-1]
1544     ) then
1545         table.insert(
1546             PROBLEM_REPORT_TABLE,
1547             get_data_page_number(item_data)
1548             .. ' Clash: ' ..
1549             ITEM_CLASH_MESSAGES[prev_item_data[KEY_TYPE]][item_data[KEY_TYPE]]
1550         )
1551     end
1552 end

```

If any item fails to obey ysep page bottom, the last one in the list does.

```

1553 item_data = item_data_list[#item_data_list]
1554 if (
1555     get_y_item_bottom(item_data) < page_data[KEY_VOFFSET]
1556                                   + item_data[KEY_YSEP_PAGE_BOTTOM]
1557 ) then
1558     table.insert(

```

```

1559     PROBLEM_REPORT_TABLE,
1560     get_data_page_number(item_data)
1561     .. ' ' .. ITEM_PASSED_YSEP_PAGE_BOTTOM_MESSAGE[item_data[KEY_TYPE]]
1562 )
1563 end
1564
1565 end

```

(End of definition for check_items_vertical.)

12.12.5 Core vertical position computation

`compute_items_vertical` For every `item_data` in `item_data_list`, compute the field relevant to vertical positioning, namely `KEY_YSHIFT_COMPUTED`, based on the layout information in `page_data`. This may involve setting the field `KEY_ENABLED_COMPUTED` to false. In such a case, the relevant `item_data` is removed from `item_data_list`.

```

1566 local function compute_items_vertical(item_data_list,page_data)

```

Set `KEY_YSHIFT_COMPUTED` of each `item_data` to the user-supplied value.

```

1567   for i=1,#item_data_list do
1568     local item_data = item_data_list[i]
1569
1570     item_data[KEY_YSHIFT_COMPUTED] = item_data[KEY_YSHIFT]
1571   end

```

Decide which items of `TYPE_OPTFIXED` are to be disabled.

```

1572   compute_items_vertical_optfixed_enabled(item_data_list)

```

Strip any `item_data` with `KEY_ENABLED_COMPUTED` set to false from `item_data_list`.

```

1573   list_filter(item_data_list,function(item_data)
1574     return item_data[KEY_ENABLED_COMPUTED]
1575   end)

```

Sort `item_data_list` according to the stored position from top to bottom and left to right on the page, resolving ties using `KEY_ITEMNO`.

```

1576   table.sort(
1577     item_data_list,
1578     function(left,right)
1579       local y_diff = left[KEY_YPOS] - right[KEY_YPOS]
1580
1581       if y_diff > 0 then
1582         return true
1583       elseif y_diff < 0 then
1584         return false
1585       end
1586
1587       local x_diff = left[KEY_XPOS] - right[KEY_XPOS]
1588
1589       if x_diff < 0 then
1590         return true
1591       elseif x_diff > 0 then
1592         return false
1593       end
1594
1595       return (left[KEY_ITEMNO] < right[KEY_ITEMNO])

```

```

1596     end
1597 )
1598
1599 compute_items_vertical_adjustment(item_data_list,page_data)
1600
1601 check_items_vertical(item_data_list,page_data)
1602
1603 end

```

(End of definition for compute_items_vertical.)

`compute_items` For every item represented in `ITEM_DATA_MAIN_TABLE`, use the `page_data` stored in `PAGE_DATA_MAIN_TABLE` to compute the `item_data` values necessary to place the item correctly on the page, namely those indexed by: `KEY_COLNO_COMPUTED`, `KEY_XSHIFT_COMPUTED`, `KEY_YSHIFT_COMPUTED`, `KEY_SIDE_COMPUTED`, `KEY_ENABLED_COMPUTED`.

```

1604 local function compute_items()

```

Compute the maximum `abspageno`, which will be the last page of the document on which a item appears.

```

1605     local max_abspageno = 0
1606
1607     for k,v in pairs(ITEM_DATA_MAIN_TABLE) do
1608         max_abspageno = math.max(v[KEY_ABSPAGENO],max_abspageno)
1609     end

```

`per_abspage_item_data_list` will be a list indexed by absolute page numbers. Each entry will be a list (possibly empty) of `item_data` describing the items that appear on the corresponding page.

```

1610     local per_abspage_item_data_list = {}

```

Prepare `per_abspage_item_data_list` by making each entry an empty list, then fill it from `ITEM_DATA_MAIN_TABLE`.

```

1611     for i=1,max_abspageno do
1612         per_abspage_item_data_list[i] = {}
1613     end
1614     for _,item_data in pairs(ITEM_DATA_MAIN_TABLE) do
1615         local temp_table = per_abspage_item_data_list[item_data[KEY_ABSPAGENO]]
1616         temp_table[#temp_table+1] = item_data
1617     end

```

`per_abspage_item_data_list` will be a list indexed by absolute page numbers. Each entry will be a `page_data` describing the corresponding page. Usually multiple entries will be the same `page_data`: in the loop, `pagedatano` will be the index of the last entry in `PAGE_DATA_MAIN_TABLE` with `KEY_ABSPAGENO` value less than or equal to `abspageno`. (There may be several such entries in `PAGE_DATA_MAIN_TABLE` because `\marginalianewgeometry` may have been called multiple times on the same page.) Note that `PAGE_DATA_MAIN_TABLE[0]` is available even if there was no data in the `.aux` file, because the defaults were stored by `store_default_page_data`.

```

1618     local per_abspage_page_data_list = {}
1619
1619     local pagedatano = 0
1620     for abspageno = 1,max_abspageno do

```

```

1621     while (
1622         PAGE_DATA_MAIN_TABLE[pagedatano+1] ~= nil
1623         and
1624         PAGE_DATA_MAIN_TABLE[pagedatano+1][KEY_A BSPAGENO] == abspageno
1625     ) do
1626         pagedatano = pagedatano+1
1627     end
1628     per_abspage_page_data_list[abspageno] = PAGE_DATA_MAIN_TABLE[pagedatano]
1629 end

```

Iterate through all pages and perform the necessary computations.

```

1630 for abspageno=1,#per_abspage_item_data_list do
1631     local current_page_data = per_abspage_page_data_list[abspageno]
1632     local current_page_item_data_list = per_abspage_item_data_list[abspageno]

```

First, compute the horizontal positions, which includes sorting items into columns in two-column mode.

```

1633     compute_items_horizontal(current_page_item_data_list,current_page_data)

```

Sort the items into sublists corresponding to the margins in which they are located.

```

1634     local current_page_item_data_sublists = {}
1635
1636     for i=0,5 do
1637         current_page_item_data_sublists[i] = {}
1638     end
1639
1640     for _,item_data in pairs(current_page_item_data_list) do
1641         table.insert(
1642             current_page_item_data_sublists[item_data[KEY_MARGINNO_COMPUTED]],
1643             item_data
1644         )
1645     end

```

Compute vertical positons for each sublist.

```

1646     for i=0,5 do
1647         compute_items_vertical(
1648             current_page_item_data_sublists[i],
1649             current_page_data
1650         )
1651     end
1652 end
1653 end

```

(End of definition for compute_items.)

12.13 Passing item_data back to L^AT_EX

`load_item_data` Set the relevant L^AT_EX counter and dimension variables to the values computed for `itemno`.

```

1654 local function load_item_data(itemno)
1655
1656     item = ITEM_DATA_MAIN_TABLE[tounumber(itemno)]
1657     if item == nil then
1658         item = ITEM_DATA_DEFAULTS
1659     end

```

```

1660
1661 tex.count['l__marginalia_page_int'] = item[KEY_PAGENO]
1662 tex.count['l__marginalia_column_computed_int'] = item[KEY_COLNO_COMPUTED]
1663 tex.dimen['l__marginalia_xshift_computed_dim'] = item[KEY_XSHIFT_COMPUTED]
1664 tex.dimen['l__marginalia_yshift_computed_dim'] = item[KEY_YSHIFT_COMPUTED]
1665 tex.count['l__marginalia_side_computed_int'] = item[KEY_SIDE_COMPUTED]
1666 tex.count['l__marginalia_marginno_computed_int']
1667     = item[KEY_MARGINNO_COMPUTED]
1668 if item[KEY_ENABLED_COMPUTED] then
1669     tex.count['l__marginalia_enabled_computed_int'] = 1
1670 else
1671     tex.count['l__marginalia_enabled_computed_int'] = 0
1672 end
1673
1674 end

```

(End of definition for load_item_data.)

12.14 Export public functions

Finally, make available the functions that will be called from L^AT_EX using `\lua_now:n` and `\lua_now:e`.

```

1675 marginalia = marginalia or {}
1676 marginalia.store_default_page_data = store_default_page_data
1677 marginalia.store_page_data = store_page_data
1678 marginalia.check_page_data = check_page_data
1679
1680 marginalia.store_item_data = store_item_data
1681 marginalia.check_item_data = check_item_data
1682
1683 marginalia.compute_items = compute_items
1684
1685 marginalia.load_item_data = load_item_data
1686
1687 marginalia.write_problem_report = write_problem_report
1688
1689 marginalia.write_page_change_report = write_page_change_report
1690 marginalia.write_item_change_report = write_item_change_report
1691
1692 marginalia.set_binding_left = set_binding_left
1693 </lua>

```

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