The Return to the Classics

Pablo Rosell-González

Coordinación de Cómputo,
Facultad de Ciencias, UNAM,
México, D.F., México
email: pablo@ciencias.unam.mx
http://hipatia.fciencias.unam.mx/~prosell/

Abstract

When did width margins in a page become less important than having a small number of pages in a book? We have been inundated by bad printed material since most of the publishers are now more interested in getting as much profit as possible, leaving the art of publishing aside. The premise of book designers should be to create not only attractive printed material but to provide a pleasant reading experience.

There are quite a few examples of designs that are now considered classics because they have proven themselves to be aesthetically incomparable. These designs include:

**Ternary canon**: 2:3 page proportions where the height of the typographic box is equal to the width of the page, the left margin is half the right margin and the top margin is half the bottom margin.

**Gutenberg’s Götttingen Bible**: same as above but in two columns with a width column separation.

**Universal Scaling**: the page is created when the user defines a unit box and the design takes multiples of three times the unit box: the left margin is the unit’s box width, the top margin is the unit’s box height, and the right and bottom margins are twice the unit’s box width and height respectively.

**Diagonal and double diagonal methods**: the page dimensions and the left margin are provided by the user and all the other elements are defined in terms of either a diagonal or using both diagonals.

**iso 216**: the typographic box is sized either A5 or A6 depending on the choice of A4 or A5 paper size, and the left and top margins are half the right and bottom margins respectively.

**2–3–4–6 system**: page dimensions and the margin unit are defined by the user; and the typographic box is adapted to have two, three, four, and six times the margin unit as left, top, right and bottom margins respectively.

In this paper I am going to present **classics**, my brand new class that allows the user to typeset camera-ready books using any of the above designs. This class uses **calc** and **geometry** packages to create the design, and **crop** to generate the crop marks. If **classics** is used with Hàn Thế Thành’s micro-typographic extensions, the user will get state of the art printed material. Let’s recover centuries of publishing tradition!

Introduction

Typography and book design are artistic expressions whose principal goal is to bring the reader the most pleasant reading experience.

Gutenberg, in the XVth century, used more than 280 types including ligatures and expanded (contracted) characters to get almost even interword spaces and protruding some left and rightmost characters (marginal kerning). With these, he obtained perfectly visual “gray” boxes when printing his Bible.
Most of these aspects are already achieved by using \( \text{LATEX} \), and the micro-typographic extensions made by Hân Thê Thành for \( \text{pdfLATEX} \), explained in [7].

This paper is divided in two sections: the first one contains a brief geometric description of some page layouts that have been proved to be aesthetic and functional. Some variations obtained from them are included. The second which explains the usage of \texttt{classics} a class that allows the user to typeset books using those page layouts. Some instances of the usage of \texttt{classics} with protruding characters generated with \( \text{pdfLATEX} \) are included.

\textbf{Classic page layouts}

Traditional published works present carefully studied margin proportions obeying (some of) the following four rules:

1. the diagonal of the typographic box coincides with the diagonal of the page;
2. the typographic’s box height equals the page width;
3. the outer margin is twice the inner margin;
4. the bottom margin is twice the top margin.

\textbf{First approach to the classics}. Let \( ABCD \) be a page with arbitrary proportions. Consider the following construction for the type area (figure 1) which guarantees rules 1, 3 and 4.

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{figure1.png}
\caption{First approach.}
\end{figure}

Construct diagonals \( AC \) and \( BM \), where \( M \) is the midpoint of \( AD \), and \( O \) the point of intersection. Take any point \( P \) between \( A \) and \( O \). From \( P \) draw the parallel to \( AB \) which intersects \( BM \) in \( Q \). From \( Q \) trace the parallel to \( BC \) which intersects \( AC \) in \( R \). To obtain \( S \), draw parallels from \( R \) and \( P \) to \( CD \) and \( AD \) respectively. Then the rectangle \( PQRS \) will have the same proportions as \( ABCD \). Moreover, \( O \) divides in the same ratio both \( PR \) and \( AC \), i.e., \( PR/PO = AC/AO = 1/3 \).

Of course we are interested in leaving enough margins to our page, say no less than 50\%. But if we also want to follow rule 2 we must restrict the proportions of our page to no less than 1 : \( \sqrt{2} \). Table 1 shows some page ratios with the percentage of area their typographic box occupies if its height equals the paper’s width (i.e. following rule 2).
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<table>
<thead>
<tr>
<th>Page ratios</th>
<th>Documents</th>
<th>% of area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 : 2</td>
<td>—</td>
<td>25%</td>
</tr>
<tr>
<td>2 : 3</td>
<td>Gutenberg’s Bible</td>
<td>39.5%</td>
</tr>
<tr>
<td>2 : 3</td>
<td>Ternary Canon</td>
<td>44.4%</td>
</tr>
<tr>
<td>1 : $\sqrt{2}$</td>
<td>ISO216</td>
<td>50%</td>
</tr>
<tr>
<td>3 : 4</td>
<td>archA</td>
<td>56%</td>
</tr>
<tr>
<td>1 : 1</td>
<td>—</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 1: Page ratios and typographic box area.

2–3–4–6 approach. Take a unit $u$ as half the inner margin of any page, if we take $2u$, $3u$, $4u$, and $6u$ dimensions for the inner, top, outer, and bottom margins respectively we will get a fairly good typographic box —this depends, of course, on the width to height ratio of the page and on the value of $u$ respect to the width of the page—. In most cases —except for a 2 : 3 page—, the typographic box will not present the same width to height ratio as the page, because if $w$ and $h$ represent the width and height of the page, then the typographic box will be $w - 6u$ width and $h - 9u$ height. Suppose the page and type area have the same proportions, then

$$\frac{w}{h} = \frac{w - 6u}{h - 9u} = \frac{2}{3}.$$ 

This is, nevertheless, a good method for obtaining interesting asymmetrical results.

Ternary Canon. Many medieval and Renaissance manuscripts and printed books present a 2 : 3 width to height page ratio whose typographic box not only follows the four rules mentioned above but also present the 2–3–4–6 progression in the margins.

Following Van der Graaf’s method, Jan Tschichold [8] published an elegant geometrical way to obtain such a layout. Take a two-page diagram (see figure 2), draw diagonals $AC$ and $BD$ which intersect in $M$, the midpoint of $EF$; draw diagonals $EC$ and $ED$ which intersect $AC$ and $BD$ in $G$ and $G'$ respectively. Draw $GG'$ and perpendiculars through $G$ and $G'$ to $AB$ which intersect it in $H$ and $H'$. The point of intersection $P (P')$ of $EG$ ($EG'$) and $H'G$ ($HG'$) is the upper left (right) corner of the typographic box. Complete the construction as in figure 1.

![Figure 2: Tschichold’s geometric construction for the Ternary Canon.](image)

The circle in figure 2 simply shows that the height of the typographic box equals the width of the page. That the margins are in 2–3–4–6 progression, follows from the fact that the top left corner of the box divides in $\frac{1}{9}$ both the height and the width of the page. If we fix a unit $u$ which is half the inner margin
then the page will have width $18u$ and height $27u$, so the inner margin is $2u$ width, the top margin is $3u$ height. Because the height of the type area is equal to the width of the page, $18u$, the bottom margin is $27u - (3u + 18u) = 6u$. Moreover, as the typographic box is in the same ratio as the page then its width is $12u$, thus the outer margin is $18u - (2u + 12u) = 4u$.

On the other hand, a much different approach is given by Raúl Rosarivo [6], who discovered that creating a $9 \times 9$ grid on a $2 : 3$ ratio page (figure 3, left), and positioning the typographic box leaving one column and one row of the grid as inner and top margins, and two columns and rows as outer and bottom margins, gives exactly the same position and proportions for the typographic box to fulfill the rules and the $2–3–4–6$ progression.

![Figure 3](image_url)

**Figure 3**: Rosarivo’s $9 \times 9$ grid. At the left, the ternary canon typographic box in gray. At the right, Gutenberg’s Bible two column boxes.

In the ternary canon model, the typographic box will cover only $\frac{4}{9}$ (44%) of the area of the paper.

Gutenberg designed his Göttingen Bible of 42 lines using the ternary canon model but the text is written in two columns whose separation space is exactly $\frac{2}{3}$ the width of the grid’s cells as shown in figure 3 (right), each column has $3\frac{2}{3}$ cell width covering just (39.5%) of the area of the paper.

**Universal Scaling.** Rosarivo extended this idea performing $n \times n$ grids, where $n$ is a multiple of 3. Once divided, the column and the row correspond to inner and top margins, and two columns and rows to outer and bottom margins. The margin dimensions are inversely proportional to the number of divisions made.

Note, however, that if $n$ is not a multiple of 3 we are still following rules 1, 3 and 4. A quite critical example is taking a square page and dividing it in a $10 \times 10$ grid. The resulting type area is a $7 \times 7$ box, filling 49% of the page (see figure 10). Nice, isn’t it?

**ISO216.** The A range begins with the A0 sheet whose ratio is $1 : \sqrt{2}$ and has area $1 \text{m}^2$. If we cut the A0 sheet along the middle of the long side we obtain a sheet whose ratio is $\sqrt{2}/2 : 1 = 1/\sqrt{2}$.

This new sheet, A1, is proportional to the original one and has half A0’s area, $\frac{1}{2}\text{m}^2$. This process can be continued to obtain proportional sheets with half the area of the predecessor.

Another range that belongs to ISO216 family starts with the B0 sheet, whose ratio is again $1 : \sqrt{2}$ and has area $\sqrt{2}\text{m}^2$, i.e., whose width is 1m. It happens that the B range are the geometric means of the A range. For example B5 height is equal to the square root of the product of A4’s and A5’s height.

Table 2 shows the dimensions of the A range up to 6 divisions, and B5, between A4 and A5 in italics. Figure 4 shows a sketch of the A range.

What is really important of this system is that it allows us two things. On one hand, the possibility to get a complete sheet made out of, say 8 physical pages without having to make unnecessary cuts. On the other hand, the possibility to reduce the size of the page to the immediate successor retaining proportions, using either `pstops`, `psnup` or some other PS tool; or by means of photographic media.

Let $A_n$ be the page, then if $A(n + 1)$ is the typographic box which, as mentioned above, has 50% the area of the page (not far much as the 44.4% of the ternary canon). If we follow the four rules (as shown in
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<table>
<thead>
<tr>
<th>Name</th>
<th>dimensions (mm)</th>
<th>area (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A0</td>
<td>841 × 1189</td>
<td>1</td>
</tr>
<tr>
<td>A1</td>
<td>594 × 841</td>
<td>1/2</td>
</tr>
<tr>
<td>A2</td>
<td>420 × 594</td>
<td>1/4</td>
</tr>
<tr>
<td>A3</td>
<td>297 × 420</td>
<td>1/8</td>
</tr>
<tr>
<td>A4</td>
<td>210 × 297</td>
<td>1/16</td>
</tr>
<tr>
<td>B5</td>
<td>176 × 250</td>
<td>√2/32</td>
</tr>
<tr>
<td>A5</td>
<td>148 × 210</td>
<td>1/32</td>
</tr>
<tr>
<td>A6</td>
<td>105 × 148</td>
<td>1/64</td>
</tr>
</tbody>
</table>

Table 2: ISO216 A range and B5 page dimensions.

![Figure 4: Subdivisions of an A0 sheet.](image)

The margin progression will be 2–2\(\sqrt{2}\)–4–4\(\sqrt{2}\) which is approximately 2–2.828–4–5.657 which is not very far to the ternary canon’s progression.

The **classics** class

The **classics** class is primarily intended to typeset books using any of the designs explained in the previous section, as well as some variations of them. The user should invoke **classics** as any other class,

```latex
\documentclass[options]{classics}
```

The description of **options** will be divided in the generic ones which are inherited from the **book** class, and the specific ones created for **classics** together with the commands (parameters) related to each page layout.

**Generic options.** The following list shows the options inherited from **book** which, do not have to do with the page design whatsoever.

- **10pt|11pt|12pt** For choosing the normal type size. The default is **10pt**.
- **final|draft** Shows (**draft**) black boxes for overfull lines or not (**final**). The **final** option is the default.
- **oneside|twoside** For printing on one or both sides of a page. The default is **twoside**, which produces mirrored layouts of even and odd pages. The **oneside** option makes even pages the same as odd numbered ones.
- **openright|openany** For the chapters to begin only on recto pages (**openright**) or on any pages (**openany**). The default is **openright**.
- **onecolumn|twocolumn** Specifies if the text box will be one or two columns per page. The default is **onecolumn** except if **gutenberg** option is chosen. (See **Specific options**)

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**Figure 5**: A5 as the typographic box of an A4 page (light gray in white), and A6 in A5 (dark in light gray).

titlepage|notitlepage If \texttt{\textbackslash maketitle} is invoked, by default \texttt{classics} (book) will make a separate title page, and a separate abstract page, if any.

openbib To format the bibliography in open style.
leqno Formula numbers will be put to the left for any numbered display math environments.
fleqn Aligns to the left displayed formulae.

As \texttt{classics} is intended specifically to produce page layouts whose dimensions are not, in general, standard, \texttt{book} paper size options (letterpaper, legalpaper, . . .), will not be recognized.

**Specific options.** The \texttt{classics} class offers the following options for page layouts in contrast to page size options of \texttt{book}, being \texttt{ternary} the default.

ternary This layout builds a 2 : 3 width to height page with type area as described in figures 2 and 3. The only parameter users can modify is \texttt{\textbackslash classicswidth} (see Parameters) because all other parameters are absolutely determined.

If \texttt{twocolumn} option is applied then \texttt{ternary} becomes just as \texttt{gutenberg}, but with the flexibility for changing the column separation space using \texttt{\textbackslash classicscolsep}.

Figure 6 shows the \texttt{ternary} design with 42 × 63 picas width to height page.

gutenberg Same as above but the type area is typeset in two columns having the column separation space equal to 2/3 the inner margin.

Figure 7 shows the Gutenberg Bible’s layout. It is the same layout as \texttt{ternary} but in two columns separated by 2/3 the inner margin width.

rosarivo Following Rosarivo’s ideas, the user can define an n × n grid of whatever page proportion he wants. By default n = 9, and the page proportion is 2 : 3.

The command \texttt{\textbackslash cellnum} is used to change the value of n, while the width and height of the paper can be changed using \texttt{\textbackslash classicswidth} and \texttt{\textbackslash classicsheight} respectively.

universal Almost the same as above, but this time the user defines the cell dimensions (\texttt{\textbackslash cellwidth} and \texttt{\textbackslash cellheight}) and n as above.

Note the difference: \texttt{rosarivo} divides the page once fixed to get the n × n grid, while \texttt{universal} constructs the page in terms of the cell and the grid’s dimension. Compare figures 8 and 9.

Figure 10 shows a 40 × 40 picas square page whose type area is 28 × 28 picas.

a4|a5|b5 ISO216 formats. These page layouts are totally determined, except probably for typesetting in two-column fashion. If \texttt{twocolumn} option is selected the default separation space will be equal to the inner margin, but it can be changed using \texttt{\textbackslash classicscolsep} length parameter.
Como aplicación elemental del gas ideal de fermiones consideraremos el pro-
blem de la estructura de las estrellas y las supermasas neuronales. Una
vez que la energía cinética de las partículas de prueba se ha equilibrado con la
energía de radiación, se equilibran con la constante de gravitación, se
limita la presión de radiación, y se equilibran con la constante
global del gas de fermiones. La segunda condición es que la
masa de la estrella sea mayor de 10 veces la masa de la Tierra para que
la estrella pueda formar un agujero negro. La tercera condición es que
la masa de la estrella sea menor que el 5% de la masa del Sol para que
la estrella pueda formar un agujero negro.

La figura 47 compara los tamaños relativos de una gigante roja, nuestro sol,
una enana blanca, una estrella de neutrones y un agujero negro. Los radios
desde Schwartzschild son de 1 a 20 veces el radio del sol, y el radio
de un agujero negro es el radio de un agujero negro. Los radios
desde Schwartzschild son de 1 a 20 veces el radio del sol, y el radio
de un agujero negro es el radio de un agujero negro.

La masa de la estrella se puede terminar como un agujero negro
si su masa es suficiente. La masa de la estrella se puede terminar como un
agujero negro si su masa es suficiente. La masa de la estrella se puede terminar como un
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la masa de la estrella sea menor que el 5% de la masa del Sol para que
la estrella pueda formar un agujero negro.
Como aplicación elemental del gas ideal de fermiones consideraremos el problema de las estrellas de neutrones y las lamas enanas blancas. Una esquina interior como nuestro sol produce energía principalmente por la fusión de núcleos ligeros, como el hidrógeno, a núcleos más pesados, como el helio. La presión térmica proveniente de la energía cinética de las partículas constituyentes, más la presión de radiación, se equilibra con la compresión gravitacional de las masas en atracción, y la estrella mantiene una cierta estabilidad de tamaño o radio, que es del orden de (más) cm. Al agotarse este mecanismo de producción de energía por fusión, y después de pasar por una etapa de gigante roja, en que la estrella se enfría y se expande enormemente, ocurre la muerte de la estrella que dependiendo de la masa de la estrella puede terminar como:

- Una enana blanca, compuesta principalmente por núcleos de helio-4 (o carbono-12 o hierro-56) inmersos en un mar de electrones liberados; el sistema está a temperaturas entre y y densidades entre y .
- Una estrella de neutrones, compuesta en un 99% por los neutrones remanentes después de la conversión de los protones y electrones en , a neutrones por el proceso de decaimiento beta forzado por la compresión resultante de la gravedad. Si la masa es suficientemente alta, la estrella termina como un agujero negro, en que la contracción gravitacional reduce el tamaño de la estrella a un límite tal que su velocidad de escape es igual a la velocidad de la luz, de modo que ni los fotones pueden escapar. Este radio, llamado radio de Schwartzschild, está definido por , o bien .

La figura 47 compara los tamaños relativos de una gigante roja, nuestro sol, una enana blanca, una estrella de neutrones y un agujero negro. Los radios de Schwartzschild para cuerpos con la masa de la Tierra o del Sol serían, respectivamente, un centímetro o tres kilómetros. Una enana blanca típica con una masa solar tiene un radio de km, un poco mayor que el radio correspondiente de Schwartzschild de km.

\documentclass[gutenberg,utopia,frame]{classics}
...

\begin{figure}[htp]
\centering
\includegraphics[width=\textwidth]{gutenberg.png}
\caption{Page layout for \textit{gutenberg} option.}
\end{figure}

\begin{figure}[htp]
\centering
\includegraphics[width=\textwidth]{rosarivo.png}
\caption{Page layout and relevant parameters for \textit{rosarivo} option.}
\end{figure}

\begin{figure}[htp]
\centering
\includegraphics[width=\textwidth]{universal.png}
\caption{Page layout and relevant parameters for \textit{universal} option.}
\end{figure}
Figure 10: A square page with type area determined using universal option.

Figure 11: A5 (148 × 210 mm) page with A6 type area obtained using a5 option.
\documentclass[2346,frame]{classics}
\classicswidth40pc
\classicsheight40pc
\classicsinmargin4pc

\begin{figure}
\centering
\includegraphics[width=\textwidth]{example-image-a}
\caption{A 40 \times 40 picas page with 2–3–4–6 margins progression and 4 picas inner margin.}
\end{figure}

$\texttt{\classicswidth(dimen)}$ Sets the width of the paper. For default it is set to 42pc, giving in both, the \texttt{ternary} and \texttt{gutenberg}, 42 lines of text, if the font size is set to 10pt.

$\texttt{\classicsheight(dimen)}$ Sets the height of the paper. If height is in terms of $\texttt{\classicswidth}$, i.e., if page layout \texttt{ternary} or \texttt{gutenberg} is selected, the $\texttt{\classicsheight}$ is ignored.

The following parameters are only useful for \texttt{diagonal} and \texttt{ddiagonal} options:

$\texttt{\classicsinmargin(dimen)}$ Sets the length of the inner margin. Notice that for \texttt{ddiagonal} design the outer margin is determined by means of the inner margin.

$\texttt{\classicsoutmargin(dimen)}$ Sets the length of the outer margin. This parameter is only used by \texttt{diagonal} page layout.

For the \texttt{universal} page layout option

$\texttt{\cellwidth(dimen)}$ Sets the width of the cell (see figure 9).

$\texttt{\cellheight(dimen)}$ Sets the height of the cell.

The next parameter is needed by \texttt{rosarivo} (figure 8) and \texttt{universal}

$\texttt{\cellnum(count)}$. If \texttt{rosarivo} is invoked, then both $\texttt{\classicswidth}$ and $\texttt{\classicsheight}$ will be divided by $\texttt{\cellnum}$ to get the grid.

If \texttt{universal} is invoked then the page dimensions are obtained by multiplying $\texttt{\cellnum}$ to $\texttt{\cellwidth}$ and $\texttt{\cellheight}$.

Finally, for \texttt{twocolumn} or \texttt{gutenberg} options the separation space between columns is set by:

$\texttt{\classicscolsep(dimen)}$. This command is analogous to $\texttt{\columnsep}$ of the base classes in \LaTeXX.

\textbf{The defaults}. If \texttt{classics} is invoked without options,

\documentclass[classics]

The option \texttt{ternary} will be the page layout, 10pt the font size, \texttt{cm} the font family, \texttt{camera} crop-marks, and all \texttt{book} inherited options as described in \texttt{Generic options}

Parameters are initialized in such a way that whatever page layout is selected, it will look like the ternary canon:

$\texttt{\classicswidth=42pc}$

$\texttt{\classicsheight=63pc}$

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\ classicswidth = \frac{2}{3} \ classicsheight
\ classicsinmargin = 56pt
\ classicsoutmargin = 112pt
\ classicsinmargin = \frac{1}{9} \ classicswidth
\ classicsoutmargin = 2 \ classicsinmargin
\ cellwidth = 56pt
\ cellheight = 84pt
\ cellnum = 9
\ cellwidth = \ classicsinmargin
\ cellheight = \frac{3}{2} \ cellwidth
\ cellnum \times \ cellwidth = \ classicswidth
\ cellnum \times \ cellheight = \ classicsheight
\ classicscolsep = 37.33pt
\ classicscolsep = \frac{1}{9}\text{(type area)}
\ classicscolsep = \frac{2}{3} \ classicswidth

No matter what page layout option is chosen, except for the ISO 216 system, if parameters are not modified, the layout will be the ternary canon, or Gutenberg’s Bible if two-column.

Moral of the story

A wider outer margin is quite useful not only to be able to hold the book comfortably, but also to be able to make notes or annotations, and not just for controversial texts.\footnote{Hermann Zapf, \textit{TUGboat}, Volume 22 (2001), No. 1/2. (However, in the XVIIth century, there was not enough margin space for Fermat to write the beautiful proof of his last theorem.)}

References