

The “Golden Canon” of Book-Page Design: A Visual Presentation Using Geometer’s Sketchpad

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Abstract

The “Golden Canon” of book-page design is based upon a set of geometric proportion rules (unrelated to the golden ratio) that plausibly guided some medieval scribes and early-modern printers as they planned their page layouts. Using photographs of these centuries-old manuscripts and printed books, along with the Geometer’s Sketchpad computer program, we can ascertain the degree to which the golden canon might have been used to place the text area on the pages of any given handwritten or printed book. In many cases, the layouts closely match what the proportional rules predict.

Proponents of the Golden Canon

Did medieval scribes and printers of early modern Europe deliberately place the text on the page so as to produce certain specific text-to-page ratios? Several 20th-century scholars of book arts have made this claim. Especially notable proponents of this theory were Jan Tschichold, an eminent German student of book design and typography who spoke of the “Golden Canon of book page construction” and thereby coined the term. Tschichold said that medieval scribes applied the golden canon [1]. The Argentinian book-arts scholar Raúl Rosarivo said that 15th-century printers, including Gutenberg, did the same [2].

The term *canon* simply means a rule by which the text — either handwritten or printed — was placed on the page. Moreover, we should not confuse the golden canon with the golden ratio, which does not necessarily have anything to do with book-page design.

How Is Text Placed on the Page Using the Golden Canon?

In a 2010 article published in the *Journal of Mathematics and the Arts* [3], this process is explained in detail. For the presentation at the Bridges conference, however, a different tack will be taken by using Geometer’s Sketchpad to animate the process. This will lead to a more interesting, illustrative, and understandable demonstration than a more traditional text-on-a-page explanation can. Using Geometer’s Sketchpad will make a strong impression upon the viewer, as one sees rays being drawn and text area being constructed on the computer screen.

The reader needs to be able to visualize the method by which scribes or printers determined the placement of the text on the page so as to conform with the specifications of the golden canon. Fig. 1 shows the line segments that scribes or printers possibly drew on the two-page layout of an open handwritten or printed book. If scribes or printers had not actually drawn these lines, then in their minds’ eye they drew them, because — if the golden canon was being used — the text had to be placed on the page using the lines as guides. Once these line segments were laid down, the text area could be placed.

Fig. 2 shows one possible size for the text area on the verso and the recto. For the verso, the top right and the bottom left of the text area needs to line up with the diagonal of that page (the diagonal that runs from the top right to the bottom left of the verso). The corresponding relationship applies to the recto. As long as this is done, then certain geometrical properties will always apply, irrespective of the size of the text area.

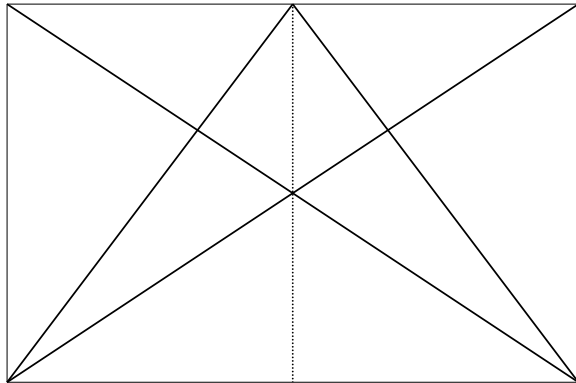


Figure 1: How the line segments would be drawn on the two-page layout of an open book preparatory to placing the text.

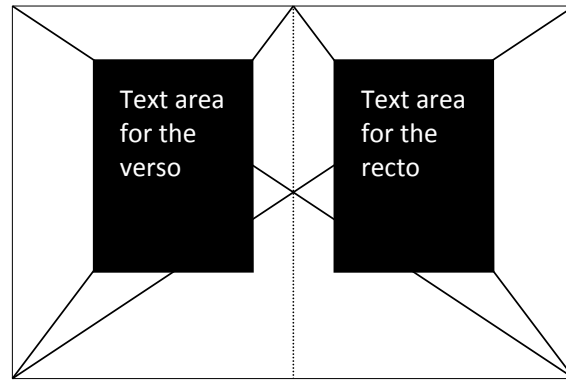


Figure 2: One possible size of the text area on the verso and the recto, assuming that the text area has been placed on the page according to the golden canon.

What are the Geometrical Properties of the Golden Canon?

The following are three important properties that, by using similar triangles, have been proven in [3]:

- Property 1) The text area always has the same proportion as the page.
- Property 2) The text area is always distributed within the page so that the outer margin is twice the width of the inner margin, and so that the bottom margin is twice the width of the top margin.
- Property 3) The ratios of inner margin to top margin, and outer margin to bottom margin, are always the same as the ratio of the width of the page to its height.

Fig. 3 illustrates the recto of an open book. Everything regarding the recto applies to the verso (in mirrored form), and therefore only the recto is labeled so as not to clutter the diagram.

Fig. 3 demonstrates the three properties. First, the text area, shown in dark gray, has the same proportion as the page area, shown in light gray. Second, the outer margin of the page (that is, the margin to the right of the text area) is twice as wide as the inner margin (the margin to the left of the text area but on the recto), and the bottom margin (below the text area) is twice as wide as the top margin (above the text area). Finally, the following proportion holds:

$$\frac{AE}{AF} = \frac{CG}{CH} = \frac{AB}{BC}$$

An example of an early book in this regard was printed in Mainz in 1471, shown in Fig. 4 [4]. In the diagram, we see that the layout according to the golden canon fits the text area on the top and bottom nearly perfectly (the right and left sides of the text areas show a slight amount of extra space).

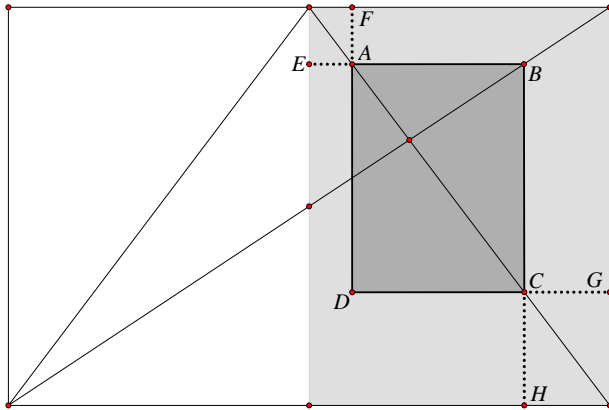


Figure 3: A slide from Geometer’s Sketchpad demonstrating the geometrical properties of the golden canon.

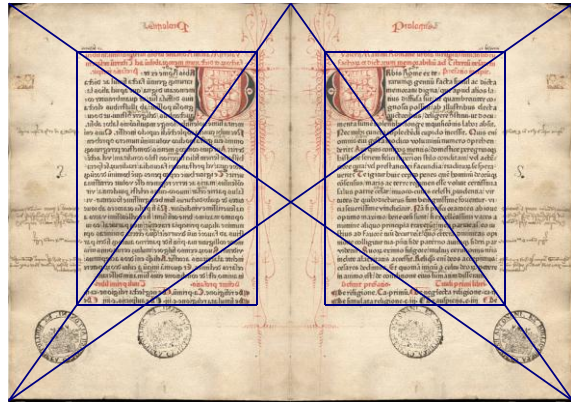


Figure 4: The right side is a photograph of a recto page of Valerius Maximus, *Facta et dicta memorabilia* (Mainz, 1471). Using Photoshop, the page was duplicated, reflected horizontally, and reassembled into a two-page spread, upon which the golden canon layout was superimposed.

The next example (Fig. 5) displays a Gutenberg bible printed in 1454 or 1455 [5]. The top right of the text area on the verso lines up very closely with the diagonal of that page, and similarly the top left of the text area on the recto lines up just as well with the diagonal of that page. The golden canon requires this to occur. Undeniably, however, the outer and bottom margins — between the text area and the superimposed guidelines — have noticeably more space. If the printer had filled up this area with text, then the page layout would have fit the golden canon very nicely.

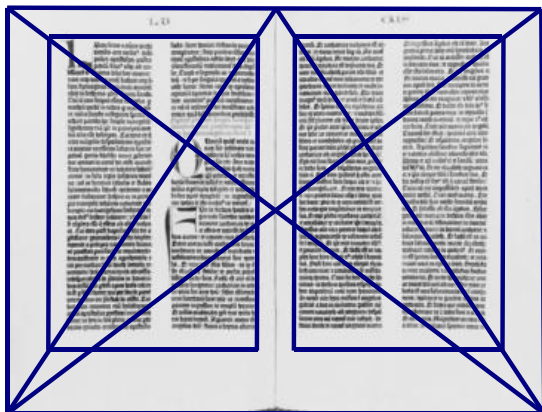


Figure 5: Gutenberg bible (printed in 1454 or 1455) opened to the beginning of the Gospel of Luke.

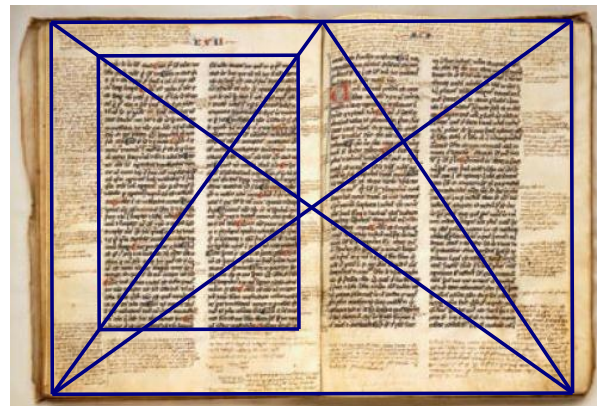


Figure 6: Eastern European manuscript. Verso framed according to the golden canon layout.

As a final example, shown in Fig. 6, consider the image of a Polish manuscript in codex form [6]. The photograph of the open book shows the verso lying quite flat with its inner margin almost completely visible. By contrast, the recto is not flush and therefore yields a distorted image of its text area. The layout of the golden canon has been superimposed upon the two-page spread. On the verso, the text area lines up almost precisely with the layout of the golden canon.

The Significance of the Golden Canon

Late-medieval scribes and early-modern printers appear to have used the golden canon when designing the layout of pages. We can find many examples, a few of which are shown in this paper, where the text layout fits the pattern of the golden canon, and how this could have occurred by chance is difficult to imagine. Admittedly, on the other hand, we can find many examples where the text area bears no resemblance to the golden-canon configuration, so just as certainly scribes and printers did not always use this method when designing page layout.

To the extent that scribes and printers did use the methodology of the golden canon, however, it indicates that they applied mathematics to their profession, probably unwittingly. Even if they did lay out the text area using the golden canon, they did not necessarily understand why it led to the consistent geometrical properties summarized above. Did the scribes and printers of centuries ago analyze text areas using similar triangles? Probably not. Nor did the builders of the great Gothic cathedrals understand the physics behind their architectural masterpieces. Nevertheless, the magnificence of these cathedrals still inspires awe. And the uniformity of page layout, when it occurred, marks a triumph in late medieval and Early Modern European book arts, yielding as it does a reproducible page layout.

Although the topic of this paper is the same as in [3], this paper provides completely new information. Here examples are provided in which the computer program Geometer's Sketchpad was used to draw rays organized according to the methodology of the golden canon. These rays were overlaid on top of photographs of actual printed and handwritten books, and the match was so close as to dispel doubt that scribes and printers sometimes, although not always, used the golden canon.

References

- [1] J. Tschichold, *The Form of the Book: Essays on the Morality of Good Design*, (translated from the German), Hartley & Marks, Vancouver 1991.
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