



Fragment Experiment 1: Reconstructing Original Dimensions

This experiment proposes to assess the viability and accuracy of a method for determining the original dimensions of the text block of a medieval manuscript, when the text is known. For this purpose, we have selected five manuscripts from e-codices, copied between the seventh and fifteenth centuries, and used the images to create simulated fragments. We have also compiled the sources corresponding to those five fragments.¹

In this experiment, fragmentologists of different levels of experience are asked to study the simulated fragments, and, with the help of the published sources (excerpts provided for each fragment), estimate the width and height of the text column(s), and the total size of the text block.

We will then compare the results to the actual dimensions of the manuscript, and thereby assess the accuracy of the method.

Instructions

The main version of the test involves printing out a page on which the simulated fragments are printed to scale. Those familiar with photogrammetry can measure directly off the images ([front](#) and [back](#)).

Preparing the Test

1. Download the [Test Card](#) PDF and print it out using Adobe Acrobat. On the print screen, be sure to select “Actual Size” for the size of the document. If possible, use duplex (front/back) printing, so that the fragments line up on both sides (flip on long edge). While the card is formatted for A4 (well, the bottom of the ruler doesn’t always print), it should also print out correctly on US 8 1/2 x 11 sheets.
2. Verify that the PDF is printed to scale. With a ruler, measure the ruler on the page, and record any discrepancy.
3. Download the PDF of [sources](#), containing the editions of the texts on the fragments. The texts are in the order of the fragments (*Life of St. Columba*, *Historia Scholastica*, *Ps.-Eusebius*, *Gregory the Great*, and *Legenda Aurea*).
4. For added realism, you may cut out the individual fragments and throw them into a shoebox.

The Test

On the test sheet, there are five fragments, numbered 1-5, and each fragment has two sides. These fragments are simulated using images published on e-codices. For each fragment, and in accordance with the instructions below, estimate:

¹ A note on sources and usage rights: the collections have placed three of the five images in the public domain, the other two are under Creative Commons Attribution-Non-Commercial licenses. With regards to the sources, Brepols claims copyright on the *Moralia in Job* text; the other editions have lapsed into the public domain. We claim fair use for all excerpts of text and images published here; the identity of the donor manuscripts will be published when the experiment is finished.

1. The height of each line (in mm).
2. The number of lines per page in the original
3. The number of columns in the original manuscript
4. The width of each column.
5. The height of the text block.
6. The width of the text block

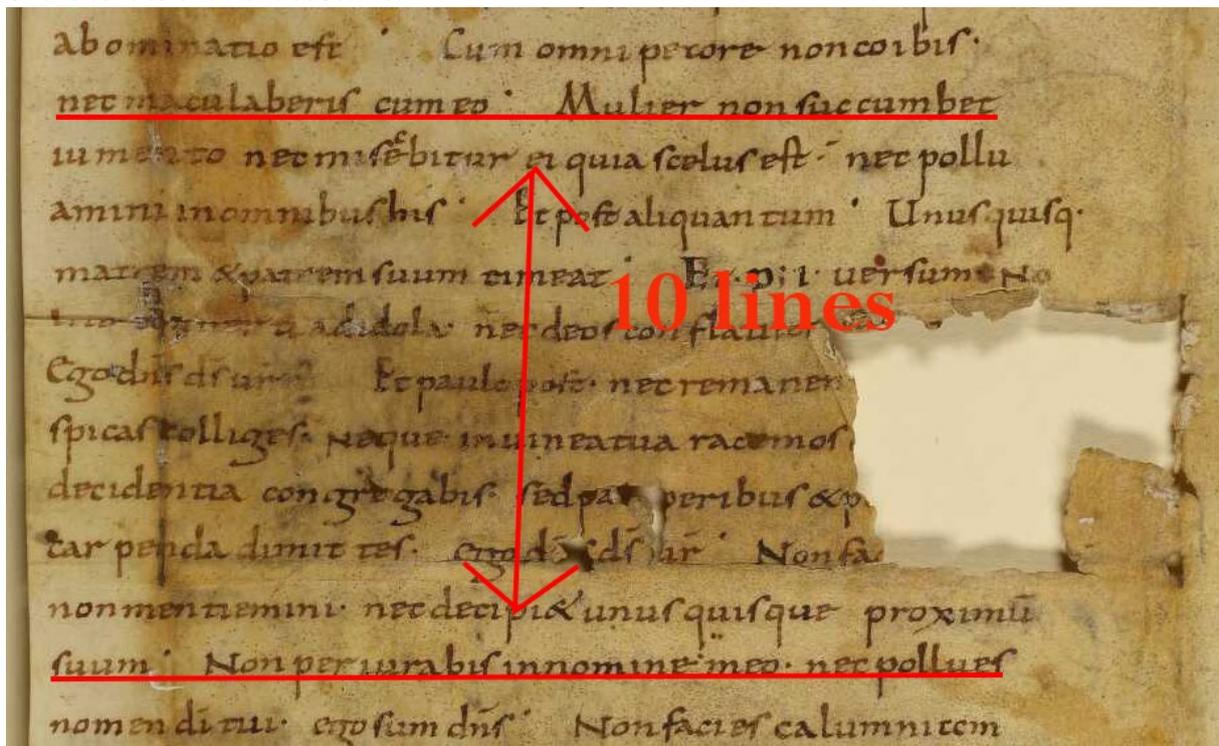
Email the results, along with an optional brief statement of your relation to codicology and fragments (e.g., “undergraduate history major”, “Professor of Fragmentology”), to fragmentarium@unifr.ch. We will record the answers (but will not retain personally-identifiable information), and send you the answer sheet.

Measuring the Fragments: Test Methodology

Original Condition

The act of fragmentation for reuse often involves trimming, cutting, or even mutilating the manuscript, and, as a result, certain measurements become of greater importance for the rapid identification and grouping of fragments.

In particular, **line height** should be measured carefully. If possible, measure the height of ten lines, and divide the result by 10. If this is not possible, measure as many complete lines as possible. The measured line height should be reported to the nearest 1/10 mm. On a ruled page, measure from ruled line to ruled line; if the page is not ruled, measure from the baseline of the text to the next baseline.



1 F-od7u, Leipzig UB, Fragm. lat. 169a

Avoid using the first line on the page for measurement, since in some hands (especially documentary hands) it can have an exaggerated height.

To estimate the dimensions of the **text blocks** and **columns** when only a fraction remains, find an edition or other source of the same text (if it exists). The method described below uses ratios between the text on the fragment and the missing part of the column or page.

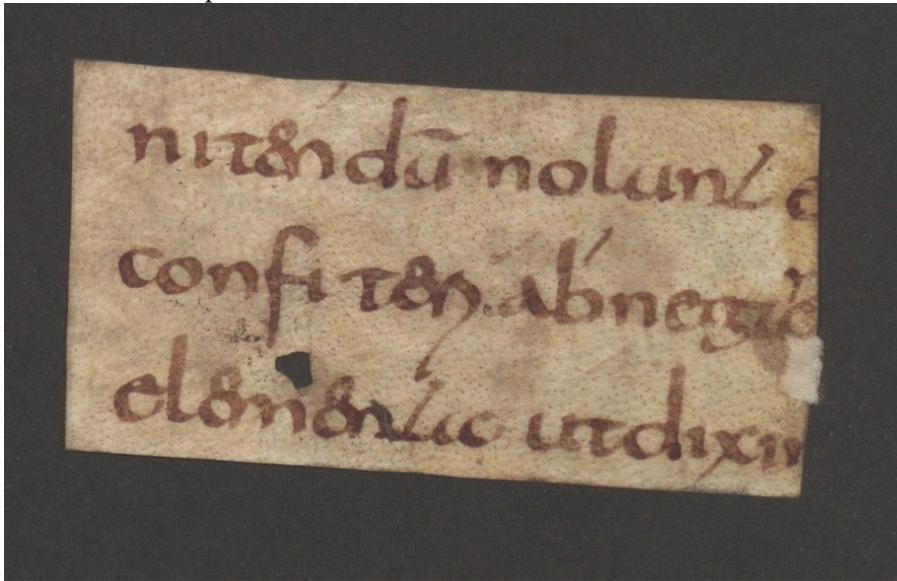
It involves procuring an edition or other source of the text, and using that to calculate how much text is missing, and establish the ratio between surviving part and original whole. This ratio can be expressed in words or, if the abbreviation is not severe, the total number of letters (and, for manuscripts that have them, spaces between words).

Determining the width of a partial column.

For each line, determine the number of characters visible (from the fragment) and (from the edition) the total number of characters on the line. If the width of each visible line is the same, multiple the width of visible lines by the total number of characters and divide by the number of visible characters. The result will be an average width. With larger lines, words may be used.

$$\text{original line width} = \text{visible line width} * \left(\frac{\text{total characters}}{\text{visible characters}} \right)$$

Let take an example, F-nxmr, Wien, Österreichische Nationalbibliothek, Fragm. 210a.



The passage is from Gregory the Great, *Homiliae in evangelia*, l. 1, hom. 10, par. 2. Read against the edition (CPL 1711, p. 67, ll. 30):

<paē>

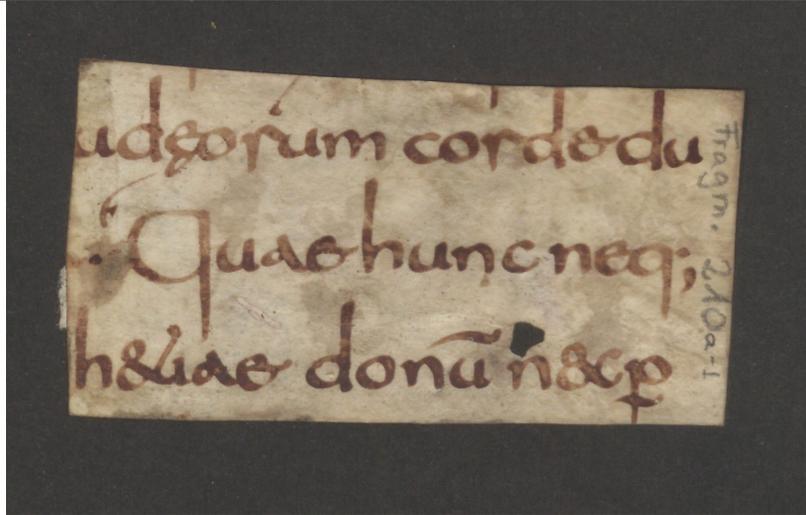
nitendum nolunt e<um que>

confiteri abnegan<t quem>

elementa, ut dixi<mus>

We can determine the content of two complete lines: nitendum...que, and confiteri...quem. The first line has 17 characters and spaces visible and, with the six missing, a total of 23; the second has 16 characters and spaces visible and 6 missing, for a total of 22.

The dorse of the fragment tells a similar story:



(CPL 1711, p. 66, l. 20)

<I>udaeorum corde du

<ritia> Quae hunc neque

<per prop>hetiae donum nec per

The second line has 16 characters and spaces (including a double-width majuscule and two in abbreviation) visible and 5 missing for 21; the third line has 20 visible (including three in abbreviation) and 8 missing (of which four might be abbreviated), for 28. The use of abbreviation here makes us suspect that the *que* and *quem* might also be abbreviated on the other side.

Adding these numbers together, we get 17+16+16+20=69 and 23+22+21+28=94. The visible lines are 60mm wide on both sides.

According to the formula above: *original line width* = 60 mm * ($\frac{94}{69}$), which gives us 82 mm.

Given the use of abbreviations, we can estimate the original width at 75-85 mm.

Determining the height of the text block

If a fragment has *parts of two columns*, the height of the column can be estimated by comparing the number of words (or characters) in the visible text of one column to the total number of words in a column. If a fragment has *only one column visible* and there is text on both sides, text block height can be measured using the same method.

1. **Select a sample.** On the fragment, choose the column where the content of the greatest number of lines can be determined. Count the number of words on those lines.

2. **Determine words per line.** Divide the number of words by the number of lines to get the number of words per line.

$$\text{words per line} = \frac{\text{number of words}}{\text{number of lines}}$$

3. **Locate passage in the edition.** Find the corresponding passage in the edition, and note if there are any significant variants. Variation between the text on the fragment and that in the edition may indicate that the edition is unsuitable, or at least give an idea of the margin of error.

4. **Determine words per column.** Using the edition, count the total missing words between the two columns, or between one side of the fragment and the other. Add those words to the total number of words.

5. **Estimate lines per page.** Divide the number of words per column by the number of words per line to get the estimated number of lines per page:

$$\text{lines per column} = \frac{\text{words per column}}{\text{words per line}}$$

6. *Estimate height of text block.* Multiply the estimated lines per column by the line height to get the estimated height of the column (or three) or text block.

$$\text{height of text block} = \text{lines per column} * \text{line height}$$

Note that if, the fragment is from a two-column manuscript, only one of which is visible, and you are measuring from one side to another, the height measured will be either of one column (outer column, rb-va) or of three (inner column, ra-vb).

Taking our example, F-nxmr (Gregory the Great), starting with the fragment's dorse, which textual analysis has shown is the recto of the page (line 20 of the edition) (Bold indicates complete lines):

Dorse (recto):

<I>udaeorum corde du

<ritia> **Quae hunc neque**

<per prop>**hetiae donum nec per**

<miracula agnouit Omnia quippe elementa auctorem suum uenisse testata sunt Vt enim de eis quiddam usu humano loquar Deum hunc caeli esse cognoverunt quia protinus stellam miserunt Mare cognouit quia sub plantis eius se calcabile praebuit Terra cognouit quia eo moriente contremuit Sole cognouit quia lucis suae radios abscondit Saxa et parietes cognouerunt quia tempore mortis eius scissa sunt Infernus agnouit quia hos quos tenebat mortuos reddidit Et tamen hunc quem Deum omnia insensibilia elementa senserunt adhuc infidelium Iudaeorum corda Deum esse minime cognoscunt et duriora saxis scindi ad pae>

nitendum nolunt e<um que>

confiteri abnegan<t quem>

elementa, ut dixi<mus>

1. The text that spans an entire column (or three, or page) is from the line beginning <ritia>to the line ending e<um que>.

2. We can determine the content of four complete lines: 3.5, 5, 3.5, and 3 words, for an average of 3.75 words per line (and, as we saw, an average of 23.5 characters and spaces, which, when word breaks at the end of a line are included, becomes 24.5 characters/line).

3. We used the edition to fill out the passage above. From <ritia> to pae, we count 101.5 words (676 characters with spaces).

4. Dividing by words-per-line:

$$\text{lines per page} = \frac{101.5}{3.75} = 27.07$$

Dividing characters by characters-per line gives a slightly higher result:

$$\text{lines per page} = \frac{676}{24.5} = 27.59$$

Therefore, we can estimate that there were between 26 and 29 lines per page.

5. The line height is between 11.1 and 11.3 mm, therefore, the low estimate for the text-block height is 26 x 11.1 = 289 mm, and the upper estimate is 29 x 11.3 = 328 mm.

The number of lines per column (26-29) and the dimensions (75-85 x 285-330) are appropriate for a single column of text. Since the ratio of text block width to height is between 1:3 and 1:4; either the fragment was part of a narrow single-column codex, or, more likely, it comes from the outer column of a two-column page (rb-va).

Several factors can skew the results. A copy with textual omissions (e.g., homoioteleuta) will be smaller than estimated. Titles, initials, illuminations, and so on can also skew the results. Two manuscript columns do not necessarily have the same width. A scribe can vary the density of the script. For example, a scribe can radically abbreviate or expand the script to align textual divisions with column breaks. Many scribes, especially note-takers, have a decidedly more compact script at the beginning of a session than at the end. Finally, what appear to be two columns on the same page may be the inside of a bifolium. One of the goals of this exercise is to get an idea of the range of responses this methodology produces.

Thank you for your participation.