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Textual Criticism in the Gaps

The Likelihood of $\mathfrak{P}^{46}$'s Readings in Galatians 3:1 and 4:17, Hebrews 11:4, and Philippians 1:1

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Abstract

This article concerns the likelihoods of competing textual reconstructions in the Chester Beatty Papyrus $\mathfrak{P}^{46}$ based on the available space in its lacunose lines. To quantify these relative probabilities, the author uses statistical models of line lengths in $\mathfrak{P}^{46}$ and a recently described technique for calculating the likelihood of a reconstructed lacunose text. He first demonstrates the power and versatility of this approach with examples in Gal 4:17 and 3:1. He then revisits two more contested textual reconstructions proposed for $\mathfrak{P}^{46}$: the absence of τῷ θεῷ in Heb 11:4, suggested by G.D. Kilpatrick in 1941, and the absence of σὺν ἐπισκόποις καὶ διακόνοις in Phil 1:1, suggested by T.C. Skeat in 1995. He shows that Kilpatrick's proposed shorter reading in $\mathfrak{P}^{46}$ is six times more likely than the longer reading in Heb 11:4, while the evidence is not decisive between the readings in Phil 1:1.

Keywords

Gal 3:1 – Gal 4:17 – Phil 1:1 – Heb 11:4 – $\mathfrak{P}^{46}$ – textual criticism – computer-assisted methods

1 Introduction*

The Chester Beatty Papyrus of the Pauline Epistles (Chester Beatty Library CBL BP II, hereafter denoted by its Gregory-Aland identifier $\mathfrak{P}^{46}$) is, like most ancient papyri, paradoxically both honored by time and ravaged by it. Dating from sometime between the second and fourth centuries,[1] it is one of our earliest extant witnesses to this portion of the New Testament. But the papyrus has not been preserved complete due primarily to fraying at the bottom of its pages. As a result, at least one line is lacunose (or nearly so) on each page, and the text in the bottom lines must be reconstructed on the basis of the surrounding extant text and the available line lengths.

The textual value of $\mathfrak{P}^{46}$ and the specific nature of its lacunae has made it a popular testing ground for text-critical analyses based on codicological calculations. Textual critics have naturally had an interest in the readings of this ancient witness,[2] but as Edgar Ebojo remarks in his dissertation on $\mathfrak{P}^{46}$, "This interest on the text of $\mathfrak{P}^{46}$ is further made evident by the fact that some scholars even commented on the reconstructed portions."[3] Two such scholars are G.D. Kilpatrick and T.C. Skeat, whose notes on $\mathfrak{P}^{46}$ discuss alternative reconstructions of its text in Heb 11:4 and Phil 1:1, respectively.[4] Specifically, using total letter counts, Kilpatrick argues that the two missing lines of Heb 11:4 on

* This work was supported by an Australian Government Research Training Program (RTP) Scholarship. I wish to thank my PhD supervisor Stephen C. Carlson, whose feedback made the initial and revised drafts of this article more concise and effective, and the anonymous referee, whose suggestions made the arguments of this article more rigorous.

1 Narrowing down the date range of the papyrus has proven contentious. While the broad agreement of Kenyon and Sanders on a date within the third century has long been the scholarly consensus, a reassessment of comparable documentary evidence has led to the suggestion of extending the date range into the fourth century; see S.R. Pickering, "The Dating of the Chester Beatty-Michigan Codex of the Pauline Epistles ($\mathfrak{P}^{46}$)," in *Ancient History in a Modern University, Volume 2: Early Christianity, Late Antiquity and Beyond*, ed. T.W. Hillard et al. (Grand Rapids, MI: Eerdmans, 1998) 216–227. A brief survey of the state of the question is available in B. Nongbri, *God's Library: The Archaeology of the Earliest Christian Manuscripts* (New Haven, CT: Yale University Press, 2018) 141–144, and a longer survey can be found in E.B. Ebojo, "A Scribe and His Manuscript: An Investigation into the Scribal Habits of Papyrus 46 (P. Chester Beatty II — P. Mich. Inv. 6238)" (University of Birmingham, PhD thesis, 2014), http://etheses.bham.ac.uk/id/eprint/4838, 138–146.

2 For a treatment of $\mathfrak{P}^{46}$ that sifts out its unique errors and identifies its more significant readings, see G. Zuntz, *The Text of the Epistles: A Disquisition Upon the Corpus Paulinum* (London: The British Academy, 1953; repr. Eugene, OR: Wipf & Stock, 2007).

3 Ebojo, "Scribe and His Manuscript," 52 n. 197.

4 G.D. Kilpatrick, "The Chester Beatty Papyrus $\mathfrak{P}^{46}$ and Hebrews xi. 4," *JTS* 1/42.1 (1941) 68–69; T.C. Skeat, "Did Paul Write to 'Bishops and Deacons' at Philippi? A Note on Philippians 1:1," *NovT* 37.1 (1995) 12–15.

fol. 33^{r} more likely lacked the phrase τῷ $\overline{\theta\omega}$, in agreement with $\mathfrak{P}^{13}$ and Clement of Alexandria. Skeat argues that the lacunose portion of fol. 86^{r} consists of five lines, making it likely that the text of Phil 1:1–4 either lacks σὺν ἐπισκόποις καὶ διακόνοις in 1:1 or τῇ μνείᾳ ὑμῶν πάντοτε ἐν πάσῃ in 1:3–4; as for which of these two phrases was lacking in $\mathfrak{P}^{46}$, his verdict is that the answer is unclear. While similar work has been done with the reconstruction of partially lacunose lines on one end of the spectrum and the presence or absence of entire epistles on the other end,[5] the cases discussed by Kilpatrick and Skeat are of a scale and complexity appropriate for the methods that will be applied in this study.

The need for a more rigorous approach is evident from the continuing disagreements on how to reconstruct the lacunose texts in these very passages. In Heb 11:4, for instance, Ebojo's transcription of $\mathfrak{P}^{46}$ includes τω $\overline{\theta\omega}$ in the reconstructed lines *contra* Kilpatrick,[6] but the more recent transcription of $\mathfrak{P}^{46}$ by Jacob W. Peterson agrees with Kilpatrick in omitting the words, although it still does not follow the line breaks in Kilpatrick's reconstruction.[7] For Phil 1:1, Ebojo argues more extensively against Skeat that the lacunose portion of the page better accommodates six and not five lines, which renders both omissions suggested by Skeat unnecessary;[8] both Ebojo's and Peterson's transcriptions have the common longer text in Phil 1:1.[9] If we are to have any hope of advancing the state of our knowledge, we need to adopt a more rigorous approach for discerning between competing reconstructions of lacunose texts.

To fill this gap, this study adopts a statistical method that can assign numerical likelihoods to such constructions. The idea is simple: if we can establish a reliable model of average line lengths in letters based on trends in the papyrus, then we can use a common algorithmic strategy called dynamic programming in conjunction with this model to calculate the total probability of all possible partitions of the reconstructed text across a given number of lines efficiently.[10] To demonstrate the robustness of this approach, I will first apply

5 These questions are addressed in T.J. Finney, "A Proposed Reconstruction of Hebrews 7.28a in $\mathfrak{P}^{46}$," *NTS* 40.3 (1994) 472–473, and J. Duff, "$\mathfrak{P}^{46}$ and the Pastorals: A Misleading Consensus?" *NTS* 44.4 (1998) 578–590, respectively.

6 Ebojo, "Scribe and His Manuscript," 702.

7 J.W. Peterson, "GA 1739: A Monk, His Manuscript and the Text of Paul's Letters" (University of Edinburgh, PhD thesis, 2020) 485, www.doi.org/10.7488/era/528.

8 Ebojo, "Scribe and His Manuscript," 108 n. 169.

9 Ebojo, "Scribe and His Manuscript," 809; Peterson, "GA 1739," 592.

10 This procedure is detailed in J. McCollum, "Likelihood Calculations for Reconstructed Lacunae and Papyrus 46's Text of Ephesians," *DSH* 38.2 (2023) 647–657. I obtained the results in this study using the software implementation available at www.github.com/jjmccollum/calclac.

it to two lesser-known variants of differing complexity from Galatians. From there, I will assess the probabilities of Kilpatrick and Skeat's proposals.

2 Galatians 4:17

On fol. 84^{r}, $\mathfrak{P}^{46}$ has lost its final four lines containing most of Gal 4:17–19. As Ebojo and Peterson's transcriptions show, it seems unlikely that $\mathfrak{P}^{46}$ had room for the words ζηλοῦτε δὲ τὰ κρείττω χαρίσματα—a longer reading found in the Greek-Latin diglots with Gregory-Aland (GA) numbers 06, 010, and 012—at the end of Gal 4:17. But with a reliable model of $\mathfrak{P}^{46}$'s average line lengths, we can assess precisely how unlikely this scenario is.

It must first be shown that such a model can be established. As Ebojo observes, the numbers of characters and lines per page fluctuate erratically throughout $\mathfrak{P}^{46}$.[11] Because these fluctuations have a more prominent effect in the long run, and because $\mathfrak{P}^{46}$ is a single-quire codex with wider outer leaves, it is safest to establish a model of average line lengths on the basis of a local sample of lines drawn from folios surrounding the one in question, as their average line lengths should be similar. One sample that is small enough to avoid long-term fluctuations in line length but large enough to provide a sufficient population of line lengths is fols. 75^{r}–90^{r} containing all of Galatians and the two epistles on either side of it (which, in the case of $\mathfrak{P}^{46}$, are Ephesians and Philippians). A box-and-whiskers plot illustrating the patterns of line lengths on these folios is depicted in Fig. 1.

Sampling all lines except for lacunose lines and lines with missing endings before lacunose lines (to avoid the risk of incorrectly measuring a line's length), we arrive at a population of 780 lines with a mean length of $\mu \approx 32.3$ letters and a standard deviation of $\sigma \approx 3.0$ letters. If we group the lines according to their lengths, the resulting histogram approximates a normal distribution (i.e., a probability distribution having the classic bell curve shape) with the same mean and standard deviation (see Fig. 2).

The coefficient of determination for this normal distribution is $R^2 = 0.962$. This means that the model based on this distribution accounts for over 96% of the variance in the data, which makes it an excellent fit. On the basis of

11 Ebojo, "Scribe and His Manuscript," 216–19. The nature of these fluctuations and other concerns about the available space in the codex has led one scholar to argue that the scribe of $\mathfrak{P}^{46}$ originally intended to include the Pastoral Epistles; see Duff, "$\mathfrak{P}^{46}$ and the Pastorals." More recent interactions with Duff's proposal can be found in the pages of Ebojo's thesis cited above and in B. Nongbri, "The Construction and Contents of the Beatty-Michigan Pauline Epistles Codex ($\mathfrak{P}^{46}$)," *NovT* 64.3 (2022) 388–407.

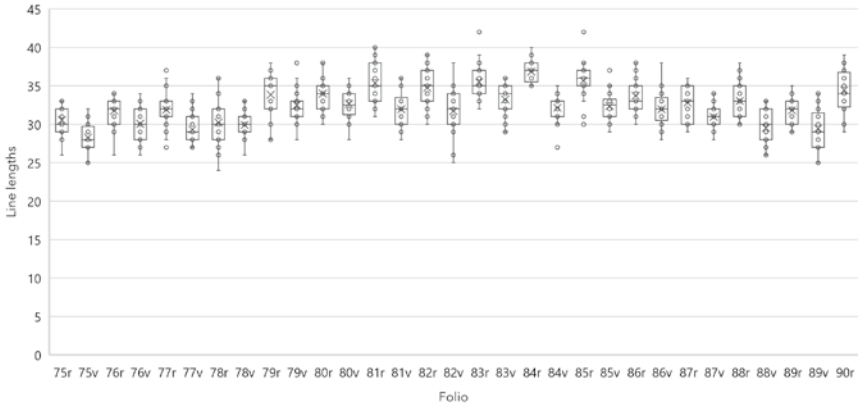

FIGURE 1 Box-and-whiskers plot of lengths (in letters) of sampled lines from the folios of $\mathfrak{P}^{46}$ containing Ephesians, Galatians, and Philippians

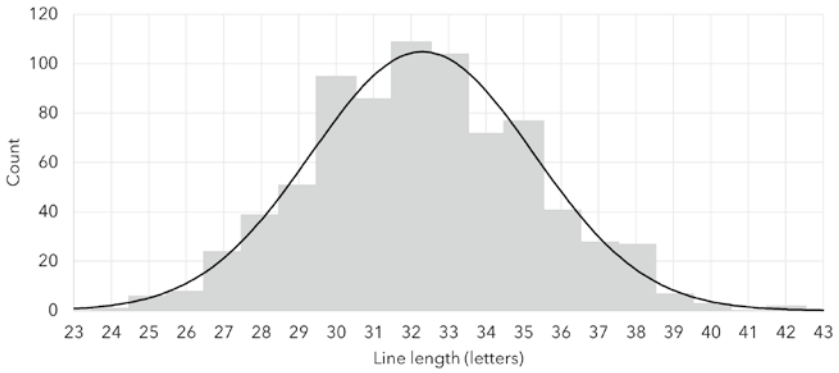

FIGURE 2 Histogram of line lengths in letters for the folios of $\mathfrak{P}^{46}$ containing Ephesians, Galatians, and Philippians, superimposed by a scaled normal distribution bell curve

the large sample population and this high coefficient of determination, the selected set of folios containing Ephesians, Galatians, and Philippians should be a reliable basis for a model of average line lengths in this portion of $\mathfrak{P}^{46}$.

Of course, this set of folios is not the only such basis, and one might reasonably object that a sample based on epistles of varying lengths is arbitrary. As a sanity check on the stability of the proposed approach, we will also take the smaller but more centered sample of fols. 79^{r}–90^{r} (the folios containing Galatians, along with eight folios on each side) as an alternative basis for the model and compare the results of the approach with both models. These folios furnish us with a population of 681 lines, with a mean of $\mu \approx 32.6$ letters

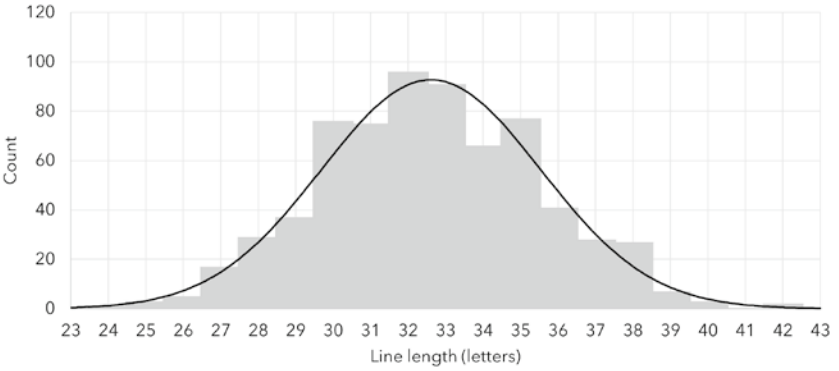

FIGURE 3 Histogram of line lengths in letters for fols. 77r–90r of 𝔓46, superimposed by a scaled normal distribution bell curve

and a standard deviation of $\sigma \approx 2.9$ letters. A normal distribution with these parameters fits the data with a coefficient of determination of $R^2 = 0.959$, so this selection of folios centered on Galatians provides a model that is nearly as accurate as the model based on the larger selection of folios (see Fig. 3).

From here, we can use each of these models with an algorithm for calculating the total likelihood of each reconstruction occurring over a given number of lacunose lines. Since fol. 84r and its facing page on fol. 83v both consist of standard text lines and probably had the same number of lines (thirty) originally, we can safely assume that the lacuna containing the variant in question is four lines long. All we have to do is calculate, for each variant reading we are considering, the probability that the reconstructed text fits in four lines under each of our models of normally distributed line lengths.

In this case, the matter is complicated by a number of other well-attested variants that could also affect the length of the reconstructed text to varying degrees. For the variant in question, we have (1) the shorter reading with no addition at the end of Gal 4:17; (2) the longer reading with the conventional spelling ζηλοῦτε δὲ τὰ κρείττω χαρίσματα; and (3) the longer reading with the itacistic spelling ζηλοῦτε δὲ τὰ κρίττω χαρίσματα found in all of the Greek witnesses that attest to it. Shortly after this in 4:18, we have ten variant readings of one phrase: (1) καλὸν δὲ ζηλοῦσθαι, (2) καλὸν γὰρ ζηλοῦσθαι, (3) καλὸν ζηλοῦσθαι, (4) καλὸν δὲ τὸ ζηλοῦσθαι, (5) καλὸν γὰρ τὸ ζηλοῦσθαι, (6) καλὸν τὸ ζηλοῦσθαι, (7) καλὸν δὲ ζηλοῦσθε, (8) καλὸν γὰρ ζηλοῦσθε, (9) καλὸν ζηλοῦσθε, and (10) an omission of the entire phrase. Later in the same verse, where most witnesses read (1) ἐν καλῷ πάντοτε, the diglots GA 010 and 012 read (2) πάντοτε ἐν τῷ ἀγαθῷ. At the start of 4:19, the witnesses are divided between reading (1) τέκνα and (2) τεκνία. Later in the same verse, another division arises between (1) μέχρις

οὗ and (2) ἄχρις οὗ. Finally, at the end of 4:19, 𝔓[46] could have followed (1) the traditional spelling ἐν ὑμῖν or (2) the spelling ἐν ὑμεῖν, which it often attests. In sum, there are 480 hypothetical reconstructions of the text arising from every possible combination of these variant readings.[12] The dynamic programming algorithm that calculates the likelihood of each of these reconstructions can do so for all of them in just a few minutes.

It is helpful to introduce some notation here. We will denote the reconstruction that follows the first reading of each variant $T_{1,1,1,1,1,1}$ = σαι υ-μας θε-λου-σιν ι-να αυ-τους ζη-λου-τε κα-λον δε ζη-λου-σθαι εν κα-λω παν-το-τε και μη μο-νον εν τω πα-ρει-ναι με προς υ-μας τε-κνα μου ους πα-λιν ω-δι-νω με-χρις ου μορ-φω-θη χρς εν υ-μιν, where the σαι at the start of the reconstruction is the end of the word ἐκκλεῖσαι broken at the end of the preceding extant line. The subscripts of the symbol to the left of the equals sign correspond to the indices of the variant readings in each phrase, and potential breakpoints within words are denoted by hyphens. One example of a reconstruction with different variant readings would be $T_{3,6,2,1,2,2}$ = σαι υ-μας θε-λου-σιν ι-να αυ-τους ζη-λου-τε ζη-λου-τε δε τα κριτ-τω χα-ρι-σμα-τα κα-λον το ζη-λου-σθαι παν-το-τε εν τω α-γα-θω και μη μο-νον εν τω πα-ρει-ναι με προς υ-μας τε-κνα μου ους πα-λιν ω-δι-νω α-χρις ου μορ-φω-θη χρς εν υ-μειν. Given a number of lines, denoted by L, and the mean μ and standard deviation σ of the model for line lengths, the total likelihood of all possible segmentations of a text T into L lines (along inter-word breakpoints or spaces between words) is denoted $\Pr(T \mid L, \mu, \sigma)$. Because the probability of a line being a specific length will always be a fraction of its probability of being any length, and because such a probability is multiplied for L separate lines to get the probability of an entire segmentation, this likelihood will always be very small in practice; we are ultimately interested in the *relative likelihoods* of competing reconstructions.

For reasons of space, it is not practical to include a table of likelihoods for all 480 potential reconstructions of the text under consideration, but a summary of the likelihoods calculated under each of our two line-length models should suffice for our purposes. For the model based on the folios containing Ephesians, Galatians, and Philippians, with μ = 32.3 and σ = 3.0, the total likelihood of all reconstructions that exclude ζηλοῦτε δὲ τὰ κρείττω χαρίσματα or ζηλοῦτε δὲ τὰ κρίττω χαρίσματα is 0.2428, while the total likelihood

12 I have drawn these variants from the extensive collation made available by the University of Birmingham's Institute for Textual Scholarship and Electronic Editing at https://itseeweb.cal.bham.ac.uk/epistulae/apparatus/galatians/positive/index.html. I have ignored variants with singular attestation or sparse and manifestly late manuscript support, as well as variants involving substitutions of equal-length words.

of all reconstructions that include one of these forms of the longer reading is 0.0007. In other words, under this model, it is over 346 times more likely that 𝔓46 did not have either form of the longer reading. By comparison, under the model based on the smaller selection of folios centered on Galatians, with $\mu = 32.6$ and $\sigma = 2.9$, the total likelihood of all reconstructions that exclude ζηλοῦτε δὲ τὰ κρείττω χαρίσματα or ζηλοῦτε δὲ τὰ κρίττω χαρίσματα is 0.2893, while the total likelihood of all reconstructions that include one of these forms of the longer reading is 0.0012. In other words, the shorter reading remains over 241 times more likely than either form of the longer reading in 𝔓46. Under either model, the intuition that 𝔓46 would not have room for the longer reading finds ample numerical justification. This example also shows that inferences with high degrees of certainty can be made by this approach even in the presence of "noise" from other possible variants, as long as those variants affect the length of the reconstructed text to a different extent than the variant in question.

3 Galatians 3:1

It is helpful to consider a second example with fewer confounding factors and a less predictable outcome. On fol. 82^{v}, 𝔓46 is lacking three lines containing part of Gal 3:1–2 at the bottom of the page. Here we consider the presence or absence of two variant readings: the first is the inclusion of τῇ ἀληθείᾳ μὴ πείθεσθαι after ἐβάσκανεν, and the second is the inclusion of ἐν ὑμῖν after προεγράφη. Both longer readings have widespread attestation, but the shorter readings have support from early manuscripts. Both Ebojo and Peterson reconstruct the lacunose text with the shorter reading in both places, but they disagree on whether the participle of ἐσταυρωμένος should be abbreviated $\overline{\text{εστς}}$ (Peterson) or $\overline{\text{εστνος}}$ (Ebojo). While our intuition would suggest that the gap probably does not have room for a phrase as long as τῇ ἀληθείᾳ μὴ πείθεσθαι, the phrase ἐν ὑμῖν is short enough that it could reasonably fit.

We can reuse the two line-length models for Galatians from the previous example to evaluate the likelihood of textual reconstructions involving these variants. Here, as well, we must take into account multiple variants that could affect line lengths in the gap. In the case of the first variant between (1) excluding τῇ ἀληθείᾳ μὴ πείθεσθαι and (2) including it, there are no other variations in wording or orthography to consider. Shortly after this, however, we must consider an orthographic variant between (1) κατ᾽ without the final *alpha* and (2) the *plene* spelling κατά. Regarding the inclusion or exclusion of ἐν ὑμῖν, we must consider three possibilities: (1) the exclusion of the phrase altogether,

(2) the inclusion of the phrase with the conventional spelling ἐν ὑμῖν, and (3) the inclusion of the phrase with the spelling ἐν ὑμεῖν. Finally, we must consider whether 𝔓46 abbreviates ἐσταυρωμένος as (1) $\overline{\text{εστνος}}$, per Ebojo, or (2) $\overline{\text{εστς}}$, per Peterson. Since there are only twenty-four potential reconstructions for all combinations of these variant readings, their individual likelihoods can be displayed in a table. The likelihoods calculated with the model based on the folios containing Ephesians, Galatians, and Philippians are shown in Table 1, and those calculated with the model based on folios centered at Galatians are shown in Table 2. Because some reconstructions have extremely low likelihoods, it is often more informative to write the logarithms of these likelihoods, or their "log-likelihoods," instead. A logarithmic scale represents a number in terms of its order of magnitude rather than its value, which allows us to describe quantities more succinctly in terms of their orders of magnitude.[13] Comparison of relative likelihoods is also easy in the log-likelihood domain: if two reconstructions' log-likelihoods have a difference of *d*, then the first reconstruction is *d* orders of magnitude more likely than the second reconstruction.

We will begin with the total likelihoods for reconstructions involving the variant readings in question under the model based on folios of Ephesians, Galatians, and Philippians, with $\mu = 32.3$ and $\sigma = 3.0$. Under this model, the total likelihood of all reconstructions that exclude τῇ ἀληθείᾳ μὴ πείθεσθαι and exclude any form of ἐν ὑμῖν (i.e., those whose first subscripted index and third subscripted index are both 1) is 0.0214; the total likelihood of all reconstructions that include τῇ ἀληθείᾳ μὴ πείθεσθαι and exclude any form of ἐν ὑμῖν (i.e., those whose first subscripted index is 2 and whose third subscripted index is 1) is 0.0007; the total likelihood of all reconstructions that exclude τῇ ἀληθείᾳ μὴ πείθεσθαι and include ἐν ὑμῖν or ἐν ὑμεῖν (i.e., those whose first subscripted index is 1 and whose third subscripted index is 2 or 3) is 0.0713; and the total likelihood of all reconstructions that include τῇ ἀληθείᾳ μὴ πείθεσθαι and include ἐν ὑμῖν or ἐν ὑμεῖν (i.e., those whose first subscripted index is 2 and whose third subscripted index is 2 or 3) is so negligible that it cannot be represented in four decimal digits. While the high likelihood that τῇ ἀληθείᾳ μὴ πείθεσθαι was not originally present in 𝔓46 confirms our earlier suspicions, it is somewhat surprising that the inclusion of ἐν ὑμῖν (or ἐν ὑμεῖν) is more likely than its exclusion. Since it is only a little over three times more likely, it

13 Mathematically, the logarithm of a number x to the base b, denoted $\log_b(x)$, is the number such that b raised to the power of $\log_b(x)$ equals x. For our purposes, we will use the logarithm to the base 10, so that each order of magnitude corresponds to a place before or after the decimal point.

TABLE 1 Table of likelihoods and log-likelihoods for reconstructions of the lacunose text of Gal 3:1–2, calculated using the line length model with $\mu = 32.3$ and $\sigma = 3.0$. The subscripts in the reconstruction notation are indices for the variant readings (which are provided in the discussion), and the log-likelihoods are calculated to base ten.

Reconstruction	Likelihood	Log-likelihood
$T_{1,1,1,1}$	0.0045	−2.3465
$T_{1,1,1,2}$	0.0049	−2.3070
$T_{1,1,2,1}$	0.0071	−2.1498
$T_{1,1,2,2}$	0.0121	−1.9175
$T_{1,1,3,1}$	0.0052	−2.2829
$T_{1,1,3,2}$	0.0098	−2.0098
$T_{1,2,1,1}$	0.0056	−2.2526
$T_{1,2,1,2}$	0.0063	−2.1977
$T_{1,2,2,1}$	0.0076	−2.1201
$T_{1,2,2,2}$	0.0134	−1.8723
$T_{1,2,3,1}$	0.0054	−2.2659
$T_{1,2,3,2}$	0.0107	−1.9708
$T_{2,1,1,1}$	0.0001	−4.1401
$T_{2,1,1,2}$	0.0004	−3.4083
$T_{2,1,2,1}$	< 0.0001	−6.0633
$T_{2,1,2,2}$	< 0.0001	−5.0383
$T_{2,1,3,1}$	< 0.0001	−6.4381
$T_{2,1,3,2}$	< 0.0001	−5.3672
$T_{2,2,1,1}$	< 0.0001	−4.4222
$T_{2,2,1,2}$	0.0002	−3.6535
$T_{2,2,2,1}$	< 0.0001	−6.4591
$T_{2,2,2,2}$	< 0.0001	−5.3726
$T_{2,2,3,1}$	< 0.0001	−6.8516
$T_{2,2,3,2}$	< 0.0001	−5.7220

is probably not substantial enough to encourage editors to print ἐν ὑμῖν with $\mathfrak{P}^{46vid}$ in a critical apparatus. But this difference in likelihood should certainly call into question any assumption that $\mathfrak{P}^{46}$ lacked these words.

The outcome changes little under the model based on a selection of folios centered at Galatians, with $\mu = 32.6$ and $\sigma = 2.9$. Under this model, the likelihood of excluding both longer readings is 0.0183, the likelihood of including

TABLE 2 Table of likelihoods and log-likelihoods for reconstructions of the lacunose text of Gal 3:1–2, calculated using the line length model with $\mu = 32.6$ and $\sigma = 2.9$. The subscripts in the reconstruction notation are indices for the variant readings (which are provided in the discussion), and the log-likelihoods are calculated to base ten.

Reconstruction	Likelihood	Log-likelihood
$T_{1,1,1,1}$	0.0040	−2.3977
$T_{1,1,1,2}$	0.0039	−2.4071
$T_{1,1,2,1}$	0.0078	−2.1062
$T_{1,1,2,2}$	0.0121	−1.9174
$T_{1,1,3,1}$	0.0059	−2.2259
$T_{1,1,3,2}$	0.0101	−1.9960
$T_{1,2,1,1}$	0.0052	−2.2866
$T_{1,2,1,2}$	0.0052	−2.2804
$T_{1,2,2,1}$	0.0087	−2.0620
$T_{1,2,2,2}$	0.0139	−1.8570
$T_{1,2,3,1}$	0.0064	−2.1949
$T_{1,2,3,2}$	0.0114	−1.9420
$T_{2,1,1,1}$	0.0001	−3.9381
$T_{2,1,1,2}$	0.0006	−3.2341
$T_{2,1,2,1}$	< 0.0001	−5.8179
$T_{2,1,2,2}$	< 0.0001	−4.8137
$T_{2,1,3,1}$	< 0.0001	−6.1863
$T_{2,1,3,2}$	< 0.0001	−5.1354
$T_{2,2,1,1}$	0.0001	−4.2114
$T_{2,2,1,2}$	0.0003	−3.4699
$T_{2,2,2,1}$	< 0.0001	−6.2083
$T_{2,2,2,2}$	< 0.0001	−5.1406
$T_{2,2,3,1}$	< 0.0001	−6.5950
$T_{2,2,3,2}$	< 0.0001	−5.4835

the first longer reading and excluding the second is 0.0011, the likelihood of excluding the first longer reading and including the second is 0.0763, and the likelihood of including both longer readings is again negligible. If anything, this model makes the inclusion of ἐν ὑμῖν (or ἐν ὑμεῖν) a more substantial possibility, as its inclusion is now just over four times more likely than its exclusion.

4 Hebrews 11:4

Of the two proposed reconstructions we are going to revisit, Kilpatrick's in Heb 11:4 is simpler to evaluate, so we will cover it first. The gap at the bottom of fol. 32^{r} of $\mathfrak{P}^{46}$ contains the end of Heb 11:3 and the start of 11:4. The folios of $\mathfrak{P}^{46}$ that contain Hebrews (fols. 21^{v}–34^{r}) are local enough to keep fluctuations in average line length under control and extensive enough to furnish a large sample population of lines; a box-and-whiskers plot illustrating the patterns of line lengths on these folios is depicted in Fig. 4.

Using the folios of Hebrews as a basis for a model of average line length, we arrive at a population of 849 lines with a mean length of $\mu \approx 28.0$ letters and a standard deviation of $\sigma \approx 3.0$ letters. The normal distribution with the same mean and standard deviation (depicted in Fig. 5) has a strong coefficient of determination of $R^2 = 0.959$.

Of course, this selection of folios is not centered around the folio containing the variant in question, so it is worthwhile to use an alternative model that better represents the locality of this folio. A sample population drawn from fols. 25^{r}–38^{v} consists of 699 lines with a mean length of $\mu \approx 27.6$ letters per line and a standard deviation of $\sigma \approx 2.9$ letters per line; a box-and-whisker plot showing the distribution of line lengths in these folios is depicted in Fig. 6.

As the box-and-whiskers plot shows, a downward trend in line length is more apparent in this sample. Consequently, the normal distribution with the same mean and standard deviation (depicted in Fig. 7) has a weaker coefficient of determination of $R^2 = 0.884$. This alternative model, then, should provide a stronger test of the robustness of our approach to higher variance in line length data.

We can safely assume that there are two lacunose lines of text at the bottom of fol. 33^{r}. No variant additions long enough to warrant more lines are known in the extant tradition. So all we have to do is calculate how likely competing textual reconstructions are to fit in two lines under the models just described.

As in the previous cases, the gap containing parts of Heb 11:3–4 could contain multiple variant readings besides the one in question. At the end of Heb 11:3, there is a known variant between (1) the singular participle τὸ βλεπόμενον and (2) the plural participle τὰ βλεπόμενα. At the beginning of Heb 11:4, another one-letter difference noted by Kilpatrick is possible: (1) $\mathfrak{P}^{46}$ could have the conventional spelling πίστει, or (2) it could follow the itacistic spelling πίστι "according to its scribe's tendency."[14] We will therefore assess the likelihood of eight variants on the base reconstruction $T_{1,1,1}$ = το βλε-πο-με-νον

14 Kilpatrick, "$\mathfrak{P}^{46}$ and Hebrews xi. 4," 68.

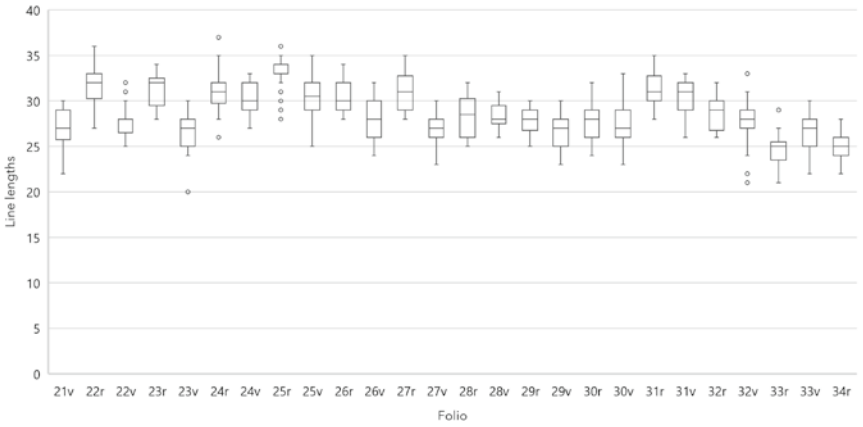

FIGURE 4 Box-and-whiskers plot of lengths (in letters) of sampled lines from all folios of $\mathfrak{P}^{46}$ containing Hebrews

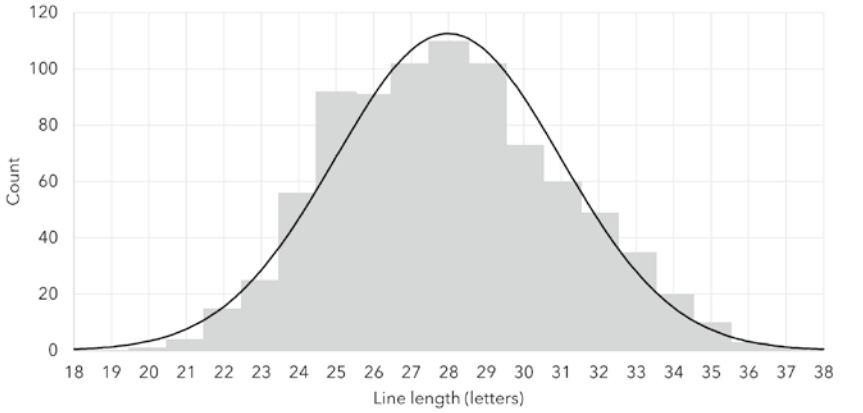

FIGURE 5 Histogram of line lengths in letters for the folios of $\mathfrak{P}^{46}$ containing Hebrews, superimposed by a scaled normal distribution bell curve

γε-γο-νε-ναι πι-στει πλει-ο-να θυ-σι-αν α-βελ πα-ρα κα-ιν προ-ση-νεγ-κεν τω θω.[15] The likelihoods calculated under the model based on all folios are detailed

15 In response to Kenyon's suggestion that παρὰ κάϊν may have been omitted by haplography, Kilpatrick replies, "On the other hand, there is no other textual evidence for the omission of the words παρα καιν. Both $\mathfrak{P}^{13}$ and Clement of Alexandria, however, omit τω $\overline{\theta\omega}$ at the end of the second line … and if, as seems clear, the papyrus did omit something, it is preferable to conjecture that it made an omission already known from other early authorities than that it indulged in one that would be peculiar to itself" (Kilpatrick, "$\mathfrak{P}^{46}$ and Hebrews xi. 4," 68).

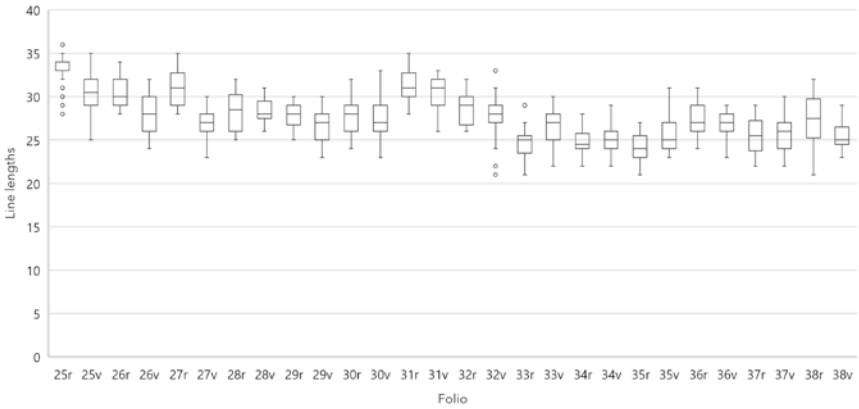

FIGURE 6 Box-and-whiskers plot of lengths (in letters) of sampled lines from fols. 25^{r}–38^{v} of $\mathfrak{P}^{46}$

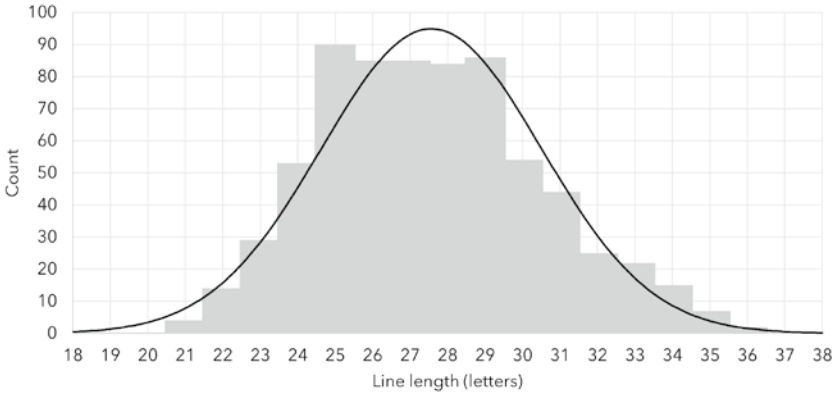

FIGURE 7 Histogram of line lengths in letters for fols. 25^{r}–38^{v} of $\mathfrak{P}^{46}$, superimposed by a scaled normal distribution bell curve

in Table 3, and those calculated under the model of folios centered around fol. 33^{r} are detailed in Table 4.

The likelihoods under both models turn out to favor Kilpatrick's proposal. Under the first model, the total likelihood of all reconstructions that exclude τω $\overline{\theta\omega}$ (i.e., those whose third subscripted index is 1) is 0.0732, while that of all reconstructions that include τω $\overline{\theta\omega}$ (i.e., those whose third subscripted index is 2) is 0.0135. Under the second model, the corresponding total likelihoods are 0.0534 and 0.0075. Between both models, the exclusion of τω $\overline{\theta\omega}$ is consistently between five and seven times more likely than its inclusion. Thus, the

TABLE 3 Table of likelihoods and log-likelihoods for reconstructions of the lacunose text of Heb 11:3–4, calculated using the line length model with $\mu = 28.0$ and $\sigma = 3.0$. The subscripts in the reconstruction notation are indices for the variant readings (which are provided in the discussion), and the log-likelihoods are calculated to base ten.

Reconstruction	Likelihood	Log-likelihood
$T_{1,1,1}$	0.0121	−1.9182
$T_{1,1,2}$	0.0018	−2.7426
$T_{1,2,1}$	0.0180	−1.7437
$T_{1,2,2}$	0.0032	−2.4966
$T_{2,1,1}$	0.0180	−1.7438
$T_{2,1,2}$	0.0032	−2.4966
$T_{2,2,1}$	0.0250	−1.6012
$T_{2,2,2}$	0.0053	−2.2757

TABLE 4 Table of likelihoods and log-likelihoods for reconstructions of the lacunose text of Heb 11:3–4, calculated using the line length model with $\mu = 27.6$ and $\sigma = 2.9$. The subscripts in the reconstruction notation are indices for the variant readings (which are provided in the discussion), and the log-likelihoods are calculated to base ten.

Reconstruction	Likelihood	Log-likelihood
$T_{1,1,1}$	0.0082	−2.0884
$T_{1,1,2}$	0.0009	−3.0397
$T_{1,2,1}$	0.0130	−1.8853
$T_{1,2,2}$	0.0017	−2.7616
$T_{2,1,1}$	0.0130	−1.8854
$T_{2,1,2}$	0.0017	−2.7616
$T_{2,2,1}$	0.0192	−1.7160
$T_{2,2,2}$	0.0031	−2.5096

shorter reading adopted by Kilpatrick and Peterson is substantially more compelling than the longer one preferred by Ebojo.

5 Philippians 1:1

We now turn to Skeat's proposal regarding Phil 1:1. The lacuna in question occurs at the bottom of fol. 86^{r} of 𝔓^{46} and spans Phil 1:1–5. As with the examples in Galatians, we can obtain a large but local sample of lines from the folios containing Philippians and the epistles on either side of it (which in this case are Galatians and Colossians). The distribution of line lengths among these folios is generally stable, as the box-and-whiskers plot in Fig. 8 demonstrates.

The sample population drawn from these folios consists of 643 lines with a mean length of $\mu \approx 33.0$ letters and a standard deviation of $\sigma \approx 3.0$ letters. A normal distribution with this mean and standard deviation fits the data well, with a coefficient of determination $R^2 = 0.945$ (see Fig. 9).

Here, as before, we could also consider a subset of these folios better centered at 86^{r}, such as fols. 81^{r}–91^{r}, but in this case, such a selection happens to yield a sample population with roughly the same mean and standard deviation. We will therefore proceed with just the model based on the larger sample population.

For the gap in question, the assessment of competing reconstructions is complicated by multiple factors. First, it is unclear how many lines of text have been lost at the bottom of the page. Skeat argues that the lacunose text likely spans five lines, while Ebojo has responded by arguing for a six-line lacuna.[16] Peterson's transcription of 𝔓^{46} likewise reconstructs six lines of text. Second, of the two shorter readings suggested by Skeat that could accommodate a lacuna of five lines—the absence of σὺν ἐπισκόποις καὶ διακόνοις in 1:1 and the absence of τῇ μνείᾳ ὑμῶν πάντοτε ἐν πάσῃ in 1:3–4—neither is supported in the rest of the manuscript tradition. While the absence of the former phrase is a conjectural emendation upon which multiple scholars have converged over the years,[17] it can be explained as an omission by haplography just as

16 Ebojo, "Scribe and His Manuscript," 108 n. 169.

17 According to J. Krans et al., eds., "The Amsterdam Database of New Testament Conjectural Emendation," https://ntvmr.uni-muenster.de/nt-conjectures?conjID=cj14719, the following scholars have independently proposed this conjecture: W. Brückner, *Die chronologische Reihenfolge, in welcher die Briefe des Neuen Testaments verfasst sind*, VRNGG 2/12 (Haarlem: Bohn, 1890) 222; D. Völter, "Zwei Briefe an die Philipper," *TT* 26 (1892) 23–24;

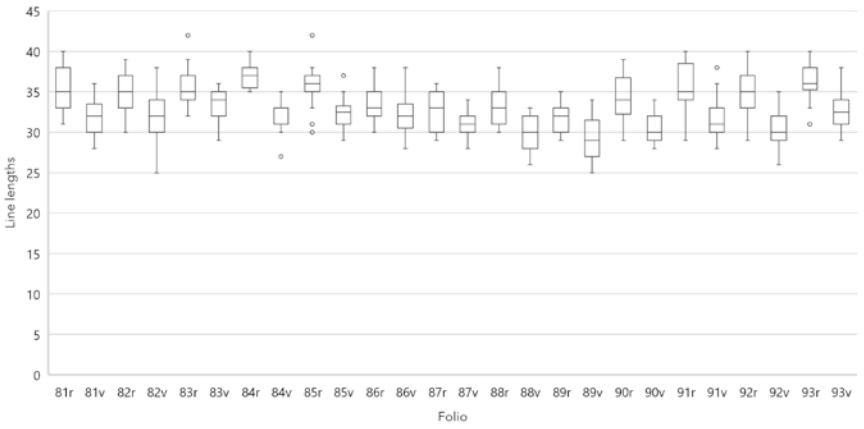

FIGURE 8 Box-and-whiskers plot of lengths (in letters) of sampled lines from the folios of $\mathfrak{P}^{46}$ containing Galatians, Philippians, and Colossians]

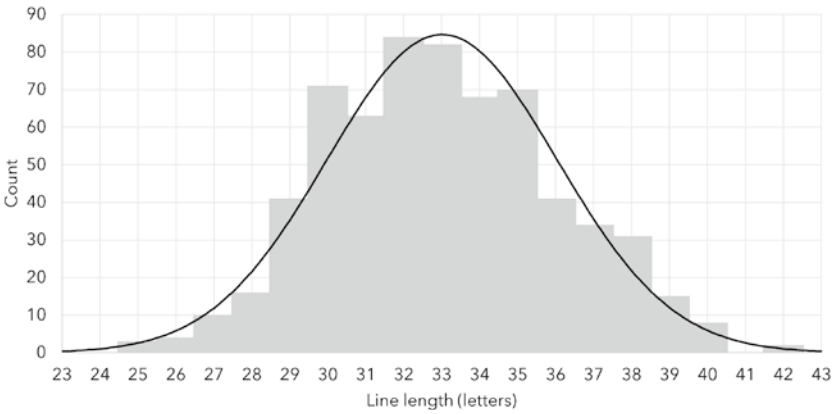

FIGURE 9 Histogram of line lengths in letters for the folios of $\mathfrak{P}^{46}$ containing Galatians, Philippians, and Colossians, superimposed by a scaled normal distribution bell curve

easily as the absence of the latter phrase can.[18] Third, there are several variants in the text of Phil 1:1–5 that can contribute to line length variations in

and W. Schenk, *Die Philipperbriefe des Paulus: Kommentar* (Stuttgart: Kohlhammer, 1984) 78–82.

18 In addition, the problem of Paul mentioning hierarchical church offices that were after his time, which seems to be the impetus for scholars to conjecture a text of Phil 1:1 without "bishops and deacons," may be an interpretive rather than text-critical issue. To this point, Jerome Murphy-O'Connor suggests that the phrase can and should be translated "with the supervisors and ministers," which assumes a less formal hierarchical struc-

the lacuna. The first, of course, is the variant in question: (1) the inclusion of σὺν ἐπισκόποις καὶ διακόνοις or (2) its exclusion. The next is whether the ὑμῖν in 1:2 is spelled (1) ὑμῖν or (2) ὑμεῖν. After this is the question of whether the πατρός in 1:2 is written (1) as the *nomen sacrum* $\overline{\text{πρς}}$ (per Peterson's transcription) or (2) in *plene* form (per Ebojo's transcription). Next, in 1:3, there is an early split in the manuscript tradition between (1) εὐχαριστῶ τῷ $\overline{\text{θω}}$ μου and (2) ἐγώ μεν εὐχαριστῶ τῷ $\overline{\text{κω}}$ ἡμῶν. Finally, there is the other possible omission noted by Skeat in 1:3–4: τῇ μνείᾳ ὑμῶν πάντοτε ἐν πάσῃ is either (1) included or (2) excluded. This leaves us with thirty-two possible variations on the base reconstruction T_1 = τοις ου-σιν εν φι-λιπ-ποις συν ε-πι-σκο-ποις και δι-α-κο-νοις χα-ρις υ-μιν και ει-ρη-νη α-πο θυ πρς η-μων και κυ ιηυ χρυ ευ-χα-ρι-στω τω θω μου ε-πι πα-ση τη μνει-α υ-μων παν-το-τε εν πα-ση δε-η-σει μου υ-περ παν-των υ-μων με-τα χα-ρας την δε-η-σιν ποι-ου-με-νος ε-πι τη. The likelihoods and log-likelihoods of these reconstructions over different numbers of lines are shown in Table 5.

The most important conclusion to draw from this table is that the number of lines in the gap is crucial. If we follow Skeat and assume five lines of text in the lacuna, then we can see that his *non liquet* verdict finds numerical justification: with $L = 5$, the total likelihood of all reconstructions including both σὺν ἐπισκόποις καὶ διακόνοις and τῇ μνείᾳ ὑμῶν πάντοτε ἐν πάσῃ (i.e., those whose first and fifth subscripted indices are both 1) is too negligible to be represented to four digits of precision; that of all reconstructions that exclude σὺν ἐπισκόποις καὶ διακόνοις and include τῇ μνείᾳ ὑμῶν πάντοτε ἐν πάσῃ (i.e., those whose first subscripted index is 2 and whose fifth subscripted index is 1) is 0.0139; that of all reconstructions that include σὺν ἐπισκόποις καὶ διακόνοις and exclude τῇ μνείᾳ ὑμῶν πάντοτε ἐν πάσῃ (i.e., those whose first subscripted index is 1 and whose fifth subscripted index is 2) is 0.0117; and that of all reconstructions that exclude both phrases (i.e., those whose first and fifth subscripted indices are 2) is 0.0006. In short, a five-line gap can reasonably accommodate only one of these two phrases, but since the phrases are just one letter apart in length, a text including just one of them is virtually as likely as a text including just the other one. Meanwhile, if we follow Ebojo and Peterson and assume a six-line lacuna instead, then the inclusion of both phrases becomes easily the most likely scenario: with $L = 6$, the total likelihood of all reconstructions including both phrases dominates at 0.0522, while the total likelihood of all reconstructions without one or both phrases is too negligible to be represented in four decimal digits. These circumstances make clear that the approach adopted

ture (J. Murphy-O'Connor, *Paul the Letter-Writer: His World, His Options, His Skills*, GNS 41 [Collegeville, MN: Liturgical Press, 1995] 52).

TABLE 5 Table of likelihoods and log-likelihoods for reconstructions of the lacunose text of Phil 1:1–5 over different numbers of lines, calculated using the line length model with $\mu = 27.6$ and $\sigma = 2.9$. The subscripts in the reconstruction notation are indices for the variant readings (which are provided in the discussion), and the log-likelihoods are calculated to base ten.

Reconstruction	Lines	Likelihood	Log-likelihood
$T_{1,1,1,1,1}$	5	< 0.0001	−5.3295
$T_{1,1,1,1,2}$	5	0.0021	−2.6834
$T_{1,1,1,2,1}$	5	< 0.0001	−7.2004
$T_{1,1,1,2,2}$	5	0.0014	−2.8536
$T_{1,1,2,1,1}$	5	< 0.0001	−6.0739
$T_{1,1,2,1,2}$	5	0.0018	−2.7447
$T_{1,1,2,2,1}$	5	< 0.0001	−8.1242
$T_{1,1,2,2,2}$	5	0.0007	−3.1371
$T_{1,2,1,1,1}$	5	< 0.0001	−5.5658
$T_{1,2,1,1,2}$	5	0.0021	−2.6766
$T_{1,2,1,2,1}$	5	< 0.0001	−7.5001
$T_{1,2,1,2,2}$	5	0.0012	−2.9126
$T_{1,2,2,1,1}$	5	< 0.0001	−6.3371
$T_{1,2,2,1,2}$	5	0.0017	−2.7576
$T_{1,2,2,2,1}$	5	< 0.0001	−8.4463
$T_{1,2,2,2,2}$	5	0.0006	−3.2238
$T_{2,1,1,1,1}$	5	0.0023	−2.6359
$T_{2,1,1,1,2}$	5	< 0.0001	−5.6166
$T_{2,1,1,2,1}$	5	0.0017	−2.7632
$T_{2,1,1,2,2}$	5	0.0001	−4.1478
$T_{2,1,2,1,1}$	5	0.0023	−2.6417
$T_{2,1,2,1,2}$	5	< 0.0001	−4.9502
$T_{2,1,2,2,1}$	5	0.0011	−2.9424
$T_{2,1,2,2,2}$	5	0.0002	−3.6974
$T_{2,2,1,1,1}$	5	0.0022	−2.6663
$T_{2,2,1,1,2}$	5	< 0.0001	−5.4512
$T_{2,2,1,2,1}$	5	0.0014	−2.8461
$T_{2,2,1,2,2}$	5	0.0001	−4.0541
$T_{2,2,2,1,1}$	5	0.0020	−2.6977
$T_{2,2,2,1,2}$	5	< 0.0001	−4.8158
$T_{2,2,2,2,1}$	5	0.0009	−3.0457
$T_{2,2,2,2,2}$	5	0.0002	−3.6276

TABLE 5 Table of likelihoods and log-likelihoods for reconstructions (*cont.*)

Reconstruction	Lines	Likelihood	Log-likelihood
$T_{1,1,1,1,1}$	6	0.0004	−3.4074
$T_{1,1,1,1,2}$	6	< 0.0001	−7.4113
$T_{1,1,1,2,1}$	6	0.0008	−3.1091
$T_{1,1,1,2,2}$	6	< 0.0001	−5.7310
$T_{1,1,2,1,1}$	6	0.0006	−3.2375
$T_{1,1,2,1,2}$	6	< 0.0001	−6.6808
$T_{1,1,2,2,1}$	6	0.0008	−3.1102
$T_{1,1,2,2,2}$	6	< 0.0001	−5.1606
$T_{1,2,1,1,1}$	6	0.0005	−3.3441
$T_{1,2,1,1,2}$	6	< 0.0001	−7.2173
$T_{1,2,1,2,1}$	6	0.0008	−3.0897
$T_{1,2,1,2,2}$	6	< 0.0001	−5.5761
$T_{1,2,2,1,1}$	6	0.0006	−3.1904
$T_{1,2,2,1,2}$	6	< 0.0001	−6.5045
$T_{1,2,2,2,1}$	6	0.0008	−3.1043
$T_{1,2,2,2,2}$	6	< 0.0001	−5.0228
$T_{2,1,1,1,1}$	6	< 0.0001	−7.5561
$T_{2,1,1,1,2}$	6	< 0.0001	−16.2997
$T_{2,1,1,2,1}$	6	< 0.0001	−5.8353
$T_{2,1,1,2,2}$	6	< 0.0001	−13.3096
$T_{2,1,2,1,1}$	6	< 0.0001	−6.7802
$T_{2,1,2,1,2}$	6	< 0.0001	−15.0042
$T_{2,1,2,2,1}$	6	< 0.0001	−5.2477
$T_{2,1,2,2,2}$	6	< 0.0001	−12.1491
$T_{2,2,1,1,1}$	6	< 0.0001	−7.3470
$T_{2,2,1,1,2}$	6	< 0.0001	−15.8508
$T_{2,2,1,2,1}$	6	< 0.0001	−5.6986
$T_{2,2,1,2,2}$	6	< 0.0001	−12.9232
$T_{2,2,2,1,1}$	6	< 0.0001	−6.6014
$T_{2,2,2,1,2}$	6	< 0.0001	−14.5893
$T_{2,2,2,2,1}$	6	< 0.0001	−5.1346
$T_{2,2,2,2,2}$	6	< 0.0001	−11.7997

for this study is not a silver bullet for problems involving lacunose texts; variants producing equal-length texts and the presence of additional uncertainty about the space available for the reconstruction can push some problems out of its reach.

Indeed, it seems that moving beyond Skeat's *non liquet* will only be possible if we can incorporate *a priori* probabilities of which variant readings or line counts are more likely than their alternatives on the basis of external factors. Arguments for both line lengths have been offered on the basis of codicological evidence.[19] It may also be worth considering that both of Skeat's suggested omissions of σὺν ἐπισκόποις καὶ διακόνοις and τῇ μνείᾳ ὑμῶν πάντοτε ἐν πάσῃ are conjectural, while the inclusion of both readings, as in Ebojo and Peterson's transcriptions, is attested by the entire extant manuscript tradition.

6 Conclusion

In this article, I have shown that the use of statistical models of line lengths in $\mathfrak{P}^{46}$ can help close some cases of reconstructed lacunose texts and open other cases. I first demonstrated the power and versatility of this approach in two examples from Galatians. One result of the analysis of Gal 3:1 in particular merits the attention of editors of the New Testament: since $\mathfrak{P}^{46}$ could plausibly have read ἐν ὑμῖν (or ἐν ὑμεῖν) after προεγράφη, a longer reading that was formerly isolated to Greek-Latin diglots, Old Latin witnesses, and witnesses related to the Harklean Syriac version could now also have the support of one

19 On the one hand, Ebojo argues that five lines of lacunose text after the first line of Philippians would result in a bottom margin of 4.2 cm and that "this lower margin would be odd-one-out in this side of the codex, considering that the number of lines per page in this section has also significantly increased from 27–32 lines/page" (Ebojo, "Scribe and His Manuscript," 108 n. 169). On the other hand, Skeat argues that if the scribe intended to make the text block of this page the same height as the text block of the facing page (which he measures at 20.8 cm), then exactly five lines of space after the first line of Philippians would achieve this height (Skeat, "Did Paul Write," 13–14). Skeat's calculations are corroborated by Ebojo's: his observation that the script height plus interlinear space is constant at 0.7 cm is consistent with Ebojo's measurements of script heights between 0.3–0.35 cm and interlinear spacing between 0.4–0.5 cm (Skeat, "Did Paul Write," 13 n. 3; Ebojo, "Scribe and His Manuscript," 213–14); and given a height of 19 × 0.7 = 13.3 cm for the last nineteen lines of Galatians plus Ebojo's measurement of 4.0 cm for the space from the last line of Galatians to the end of the first line of Philippians, including the *paragraphos* and *stichos* lines for Galatians and the *titlos* for Philippians (Ebojo, "Scribe and His Manuscript," 476), we have a total of 13.3 + 4.0 = 17.3 cm for the extant portion of fol. 86^{r}. Subtracting this from the expected text block height of 20.8 cm leaves us with 3.5 cm—exactly five lines of text at the standard height.

of our earliest witnesses to the text.[20] In the case of Heb 11:4, I showed that two models of average line lengths both substantially favor the shorter reading proposed by Kilpatrick and printed by Peterson over the longer reading printed by Ebojo. In the case of Phil 1:1, I showed that the proposed method in isolation is insufficient to vindicate Skeat's reconstruction of a shorter text on five lines or Ebojo and Peterson's reconstruction of the standard text on six lines. In this case and in others like it, additional evidence must be incorporated if we hope to clarify matters.

Such evidence can be incorporated in the form of prior probabilities. In the case of Phil 1:1, we could scale the likelihoods of five- and six-line reconstructions by the prior probabilities of five- and six-line lacunae based on codicological data. We could even scale the likelihood of a textual reconstruction itself by priors informed by scribal tendencies[21] and the shape of the textual tradition. Skeat's shorter reconstruction of Phil 1:1–5 becomes more compelling as the transcriptional probability of omission by haplography grows (assuming that his proposed shorter readings arose at the hands of scribes) or, if one of the proposed shorter readings is assumed to be original to Paul, as the intrinsic probability of that reading grows. How one might quantify these prior probabilities is a subject for another paper, but it can be left for now as a challenge to the reader.

20 Further discussion of this variant can be found in S.C. Carlson, *The Text of Galatians and Its History*, WUNT 2/385 (Tübingen: Mohr Siebeck, 2015) 188.

21 For a tabulation of various types of changes in early papyri, see J.R. Royse, *Scribal Habits in Early Greek New Testament Papyri*, NTTSD 36 (Leiden: Brill, 2008).