The reconstruction proposed here is based on mathematical calculations. Methodologically, the aim of these calculations is to estimate the location of each fragment in the original scroll, on the basis of the extant material signs in 4Q415 and 4Q414. In contrast to common research goals in the exact sciences, these calculations do not aim to produce results reflecting precise numbers, but rather to offer an estimate, along with an evaluation of the margin of error. The fact that the proposal coheres with additional data narrows down the initial margin of error and bolsters the case for this basic reconstruction. Moreover, parts of the reconstruction – in particular, the order of fragments in the reconstructed scroll – stand independently and do not depend on the calculations.

The digital representation of fragments’ borders was initially carried out by Davis in the reconstruction of *Apocryphon of Jeremaia* (4Q385). The SQE team adopted this method and developed it further. The method entails a digitization of Steudel’s earlier suggestion to prepare photocopies of all the fragments of a manuscript in order to identify corresponding traces of decay.

The images of fragments 2 and 11 were enhanced using an image manipulation program. **Fragment 2** contains a join of a small triangular fragment on the bottom-left side of column 2ii (documented separately in PAM 41.860 and PAM 42.456, and joined in PAM 43.549). We rotated the triangular fragment 2° counterclockwise in order to correct its location and align lines 7-9. In addition, a small piece of the fragment, at the end of line 7, is absent in the new IAA image. Using GIMP, we removed the image of the missing piece from PAM 43.459 and pasted it into the IAA image. The IAA image of **fragment 11** shows that parts of its right side were detached and pasted back with Japanese paper. As a result, the lines are not straight. We used GIMP again in order to align these lines, by rotating the small top-right piece 3°counterclockwise and moving the bottom-right piece 2 mm to the right.

Due to the resemblance of the script in 4Q418a to that in 4Q415, both in form and in size, the amount of text in a given area of the scroll can be presumed to be similar in 4Q418a and in 4Q415. On this basis, we can estimate the amount of text between fragments 11 and 6 in the layout of 4Q415.

Text written in the script of 4Q415 and in the script of 4Q418a

Assuming that 4Q415 contained 28 lines, the width of the blank column between fragments 11 and 6 in the layout of the scroll is 8.2cm (tab. 1, 28 lines). The margin of error for the column width ranges from –1.6 cm to +2.9 cm, according to the possible column width range discussed above.

Figure 20 presents the composite text, with the text of 4Q418a 15 13 written in green, and the text of 4Q418 167a 167b written in blue.

If this is correct, the vertical damage at the right edge of fragment 11 may be due to the seam between the columns. The distance between the damage and the hypothetical seam ranges between 9.9 cm and 10.3 cm. As I will demonstrate in §8.1 sec. 6, this distance is approximately equal to the circumference of the scroll at this point.

These distances are measured on the basis of the location of fragments in a digital canvas that simulates the open scroll. In the next stage, we will explore the meaning of these data for the reconstruction of the rolled scroll.

Due to the poor preservation of the scroll, we cannot determine the direction in which the scroll was rolled. However, the vast majority of scrolls that were found in a rolled state had been rolled with the end of the scroll on the inside.[[1]](#footnote-1) Therefore, I have assumed that this scroll, too, was rolled in that fashion, i.e. with the beginning of the text on the outside.

The leather of 4Q415 is characterized by SH as medium-thin (SH, “A. Instruction,” 41). Although the value of d is greater than the upper value given by Stegemann, this increase was already attested in several layers of 11QPsa. Since the leather is not thick, we can conclude that the scroll was not rolled tightly.

Measurement of the distance between the beginning of column IV ( i.e. 1.1 cm after the end of column III) and the end of the lines in fragments 1i and 2ii gives a column width of 8.3 cm.

This paper proposed a reconstruction of seven consecutive layers in 4Q415, applying the Stegemann method. The reconstruction was examined repeatedly and shown to correspond with all the relevant material data. Nonetheless, as in other material reconstructions, there is a margin of error.

Since the reconstruction is limited to seven columns, there is no advantage in carrying out detailed calculations of the margin of error for the placement of each fragment. These calculations are only required when reconstructing a long scroll. In such cases, an error in the positioning of the first fragment causes a cumulative error in the positioning of all the other fragments throughout the scroll.

In order to estimate the margin of error in the reconstruction suggested here, it is helpful to isolate the two central claims informing the reconstruction and evaluate the certainty of each separately.

*Wad of Fragments 1, 2, 6, 7, 9, 10, 11*

The recurring patterns of damage in fragments 1, 2, 6, 7, 9, 10 and 11 constitute significant markers for the material reconstruction of the scroll and for determining the relative position of the fragments within the scroll. Since the fragments of 4Q415 were found scattered, the recurring patterns of damage were identified through the physical shape of the fragments, i.e. similarities in the borders of the respective fragments. The level of certainty in this case is lower than in cases in which fragments were preserved in a wad. Nonetheless, the fragments discussed here constitute three groups with corresponding points of damage; their positions in the scroll demonstrate incremental growth, which coheres with all three groups of corresponding points. This fact bolsters the claim that the fragments were wadded and were damaged while the scroll was rolled.

*Order of the Fragments*

The order of the fragments is a key factor in the reconstruction process. This order is drawn from indicators such as seam preservation, intercolumnar margins, ruling, and spaces between lines. It does not depend on calculations or measurements, and therefore its level of certainty is high.

The material reconstruction is based on several distinct but mutually-compatible factors: the positioning of the fragments according to the Stegemann method; external material signs in the fragments; information drawn from the verso (4Q414); and the presumed number of lines in the scroll. The consistency between the distance between the fragments and the column division based on the verso, along with the consistency with abundant additional material evidence, bolsters the reconstruction and constitutes an important criterion for assessing its plausibility.

 Moreover, the reconstruction of 4Q415 is based on the reconstruction of 4Q418a (§4.1). However, the reconstruction of 4Q415 also affects 4Q418a, as it partially fills in the missing text between the fragments of 4Q418a. Successfully applying data from 4Q418a to 4Q415, and vice versa, increases the chance that these reconstructions reflect the actual state of these copies.

In addition, the reconstruction of 4Q415 also coheres with the current information drawn from 4Q418, a further copy of *Instruction*. This information includes material signs in the fragments which comprise textual overlaps with 4Q415, as well as the initial material reconstruction of 4Q418.

All of these considerations indicate that the core of the reconstruction of 4Q415 is stable and has been established on abundant evidence. The margin of error may slightly alter the values produced by the calculations or the positioning of the fragments, but will not significantly affect the order of the fragments or the arrangement of the main text of the scroll.

1. Tov, *Scribal Practices*, 40. [↑](#footnote-ref-1)