



*The increase in the  
print-run of the 42-line Bible  
with two corrections to recent censuses*

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INTRODUCTION

It is well known that some pages of the 42-line Bible (the ‘Gutenberg Bible’)<sup>1</sup> were set and printed twice (giving rise to two editions of these pages), due to an apparent decision to increase the total print-run, taken at some point after printing had begun.<sup>2</sup> The print-run initially planned, and the percentage by which it was increased, are not known with any certainty.<sup>3</sup> One of the goals of the authors’ current research is to try to quantify, by statistical means, what that percentage increase was, by analysing the number of pages of each edition of the relevant sheets, in the four streams of composition which can be identified for the composition and printing of the book.

To this end, we have examined available censuses of the 42-line Bible that also include details about the setting of each of those pages which are known to exist in first and second editions. We took as our starting-point the censuses by Paul Schwenke published in 1923 and Paul Needham in 1985.<sup>4</sup> The first is a century old and can be considered obsolete today; a good many new copies and fragments have been identified since 1923, and some of those listed by Schwenke have now been studied in greater detail. But Schwenke’s census is, to our knowledge, the first to contain a systematic table showing the edition of each of the relevant pages, thus allowing a first estimate of the approximate increase in the print-run, which is roughly thirty percent. Needham’s article of 1985 is an exhaustive study of the paper supply used in different stages of the printing work, and contains another such table, representing a more complete and accurate survey; while Schwenke’s research was mostly confined to German-speaking countries, Needham’s travels and direct inspections ranged more widely.

There exist several other good censuses, notably by Seymour de Ricci (1911), Ilona Hubay (1979), and in the recent monograph by Eric M. White (2017). White’s very thorough and well-produced book contains, among other things, the most complete account so far published of the surviving copies, both complete and fragmentary, with records of the first, second and third edition sheets

1. GW 4201; ISTC ib00526000 (see the Bibliography below).

2. Some pages of some copies were composed a third time (the so-called ‘replacement settings’), for reasons unrelated to the increase in the print-run (see Needham (1985b), section 5.V).

3. Much has been written about the possible print-run of the 42-line Bible (see, for example, Needham (1985b), pp. 308–314). On the letter of Aenius Sylvius Piccolomini of March 1455, mentioning both 158 and 180 copies, see Martin Davies, ‘Juan de Carvajal and early printing ...’, *The library*, 6th series, 18:1 (September 1996), pp. [193]–215.

4. Schwenke (1923) and Needham (1985b).

found in each; also included are copies with no current location, 'notional copies' (believed to have existed at one time), doubtful reports and 'ghost' copies. White's census is therefore the most up-to-date and the best reference source currently available.<sup>5</sup>

We compared White's census with Needham's and found that both included what we suspected to be two errors, so determined to examine reproductions of the copies in question and make certain. By comparing the same page in different copies it is not difficult to tell which setting each belongs to, but such comparisons are not always easy to achieve, and those compiling surveys cannot be expected to compare every page of every copy with another, or even be able to see every copy. It is therefore quite possible that further errors exist in the latest survey (White's) which will only be revealed by later research.

The mistakes in question involve the copies described as v2 and P24 by both White and Needham (the former following the latter's numbering scheme), corresponding to copies currently held by the Huntington Library in San Marino (California), and the Houghton Library of Harvard University at Cambridge (Massachusetts). Copy v2, printed on parchment (the 'v' prefix signifies 'vellum'), lacks only two leaves, while copy P24, on paper, is one of the twenty complete copies known. Both surveys state that both sides of the fifth leaf and the recto of the sixth leaf in the second gathering of the second volume (leaves [B]5 and [B]6r)<sup>6</sup> in v2 are in the second setting, when they are in fact in the first; and that the same pages in P24 are in the first setting when they are actually in the second. Thus the data for these two copies appears to have been transposed. The fact that these particular pages are involved is related to the nature of the evident increase in the print-run as it affected the second gathering in volume II of the Bible, which will be explained more fully in the next section.<sup>7</sup>

#### THE PRINTING WORK AND THE INCREASED PRINT-RUN

The 42-line Bible (B42) was the first large-scale book to be printed with moveable type in Europe. Experiments were no doubt undertaken by Gutenberg before the technology attained a sufficient level for such large-scale book-production, probably dating back to his return to Mainz in 1448, and possibly to his earlier years in Strasbourg. Indeed, some minor works were evidently printed in parallel with the B42, including two indulgences, set largely in other types, which were printed at Mainz in 1454 and 1455, while the Bible was in production.<sup>8</sup> The printing work necessary to create the B42 was, according to several indicators, begun around January

5. See White (2017), pp. 307–353.

6. The collation formula for an ideal copy of the 42-line Bible (ignoring cancellations due to second and third editions of certain leaves) is: Vol. I: [A–I<sup>10</sup> K<sup>10</sup>(K8+χ1) L<sup>10</sup> M<sup>10</sup> N<sup>6</sup>(N4+χ1) O–Aa<sup>10</sup> Bb<sup>10</sup>(Bb7+χ1) Cc<sup>10</sup>(Cc9+χ1) Dd–Ii<sup>10</sup> Kk<sup>+</sup>] (324 leaves); Vol. 2: [A–Q<sup>10</sup> Rr S–Dd<sup>10</sup> Ee<sup>12</sup> Ff<sup>10</sup>(Ff7+χ1) Gg<sup>10</sup> Hh<sup>10</sup> Ii<sup>4</sup>(Ii3+χ1) Kk<sup>10</sup>] (319 leaves, the last two blank). Four additional leaves bearing a *Tabula rubricarum* were also printed, but rarely survive.

7. For a full account see White (2017), chapter 2, 'The work of the books', and the references therein, notably Needham (1985a) and (1985b), and Schwab (1987).

8. See GW 06555, ISTC ic00422400 and GW 06556, ISTC ic00422600 (describing 'six issues' and 'seven issues' respectively, actually variant impressions); and Janet Ing, 'The Mainz indulgences of 1454/5: a review of recent scholarship', *The British Library journal* 9:11 (Spring 1983), pp. 14–31. The types in question are the DK ('Donatus und Kalendar'), I30 and I31 types, all of which existed in some form by 1454. For the suggestion that the Catholic icon-type may also have existed at this period see Paul W. Nash, *The mystery of the Catholic icon* (London: Printing Historical Society, forthcoming).

1452.<sup>9</sup> Some other undated works, which often survive only as fragments, might have been printed during or before production of the 42-line Bible; these include the so-called *Sybillenbuch*, several editions of the Latin grammar known in English as the *Donat*, and an astronomical calendar calculated for the year 1448.<sup>10</sup>

Although our knowledge of Gutenberg's early life and educational background is slight, it is accepted that he belonged to a patrician family on his father's side, had a good education, learned a trade (that of goldsmith), and shared a house with professional coin-makers (whom he may have observed practising die-cutting, punch-cutting and metal-casting techniques). He may have studied at Erfurt University. Many sources provide further information (certain or, more often, hypothetical) on Gutenberg's personal life and family background.<sup>11</sup>

Seen in its context, we must believe that the printing of the 42-line Bible was a very well-prepared enterprise, from the preparation of a copy-text to the manufacture of the typefaces, presses and inks, the design of the page, the organisation of the work, and the commercial management of the project (probably undertaken by Fust). Once the printing was completed, the sheets had to be rubricated, and some at least were bound. This work of finishing was probably undertaken elsewhere (not in the Mainz printing-office), at the expense of the buyer of each copy.<sup>12</sup> Due to its physical size, the edition was usually bound in two volumes (in some cases, in three or four), and is usually collated as such.

Many incunabulists refer to the leaves and gatherings of the 42-line Bible with a simplified form of the conventional bibliographical formula, as follows: the volume is indicated with I or II (on the assumption of the usual two-volume division), and the gatherings are assigned arabic numerals, following the sequence of quire-numbers written in some copies in the fifteenth century. In this notation, volume I consists of thirty-three gatherings designated I-1 to I-33, and volume II has thirty-two gatherings, II-1 to II-32,

9. The starting date is uncertain, but may not have been before the second loan of money from Fust to Gutenberg, which took place in 1452. We agree with Gottfried Zedler (in *Die sogenannte Gutenbergbibel: sowie die mit der 42 zeiligen Bibeltype ausgeführten kleineren Drucke* (Mainz: Verlag der Gutenberg-Gesellschaft, 1929) in his interpretation of the 'Helmasperger instrument' that the first loan was meant for the building of the apparatus (typesetting

equipment and presses), and the second was not in fact a loan but the constitution of a society or partnership for the 'werck der bücher'. The creation of the B42-type could not, we believe, have been achieved without the skills of Peter Schoeffer, who was probably involved by 1452 (see Johann Trithemius, *Compe[n]diu[m] ... de origine regum et gentis Francorum ...* (Moguntina: Per Ioannem Schöffer, 1515), L3v (colophon). On Schoeffer see Rangel (2020), chapter 11.

10. GW M41981, ISTC is00492500; GW 8678, ISTC id00314800 (for example); and GW 1285, ISTC ip00749500. See Rangel (2020), table 9, and pp. 412–420, for a list of surviving editions printed in Mainz, in the period 1445–1460. An English-language source, albeit now somewhat outdated, is Margaret Bingham Stillwell, *The beginning of the world of books 1450 to 1470: a chronological survey ... with a synopsis of the Gutenberg documents* (New York: Bibliographical Society of America, 1972). Much of the dating in both sources is inevitably speculative.

11. For an English summary see Albert Kapr, *Johann Gutenberg: the man and his invention* (translated from German by Douglas Martin, Aldershot: Scolar, 1996). See also Rangel (2011) and Rangel (2020), pp. 70–79 (for a genealogical table of Gutenberg's family, updated from that of Schenk (1900)).

12. Some copies were rubricated and illuminated in Mainz (see Eberhard König, 'The influence of the invention of printing on the development of German illumination', *Manuscripts in the fifty years after the invention of printing* (edited by J. B. Trapp, London: Warburg Institute, 1983), pp. 85–94) at the expense and under the probable supervision of Fust and Schoeffer, probably after Gutenberg had left the partnership. This is the case for the Burgos (P35), New York (P38) and Göttingen (V6) copies (see Fig. 1). The Burgos copy was used as copy-text for Fust and Schoeffer's 48-line Bible of 1462 (see Mayumi Ikeda, 'Illumination and rubrication of two Gutenberg Bibles', *Gutenberg-Fahrbuch* 87 (2012), pp. 71–92); and that at New York includes replacement (third) settings which were prepared after the edition was complete (Needham (1985b)). All three copies include second-edition sheets, but this is not necessarily indicative of late completion.

comprising the preliminary letter of St Jerome and Genesis to the Psalms in the first volume, and Proverbs to Revelation in the second. Most of the gatherings were made up of ten leaves, five full sheets or bifolia. Within each gathering, leaves are assigned arabic numerals in sequence, and pages are indicated with 'r' or 'v' for recto and verso. Thus, the natural reading order of the first gathering begins I-1-1r, I-1-1v, I-1-2r etc. While this system is hardly elegant and does not match the collation formula for the book, it is practical and has been adopted here for the sake of consistency with other sources.<sup>13</sup>

There were several streams of production for the 42-line Bible. The work commenced almost simultaneously with two streams of composition (not necessarily two printing presses) working in parallel. To allow them to progress independently, they started at distant points in the text, with gatherings I-1 and I-14. Some time afterwards a third compositor (or team of compositors) began work, and then a fourth, beginning with gatherings II-1 and II-17 respectively. Still later in the course of production, it is possible that two further streams of composition began, though this is not universally accepted and is not relevant to our discussion.<sup>14</sup> It is generally assumed that the pages in each sequence of composition were set and printed *seriatim*, that is to say in the natural reading order. This has occasionally been questioned,<sup>15</sup> but this is again not relevant here, since it is safe to assume *seriatim* setting in the cases of all the leaves discussed below.

Gutenberg and his associates started setting and printing pages of the Bible having decided upon the print-run and probably bought enough paper (and parchment) to complete the edition, having calculated how many sheets each copy would require. It is clear that, for practical reasons, once a page was set and locked into a forme, the number of copies in the planned edition was printed before the type was removed from the press and distributed ('dissed') back into the cases. However, after 155 pages (out of an ultimate total of 1275) had been printed, the decision was evidently made to increase the edition-size. At this point, three of the four production streams were mid-way through the printing of a gathering (the second stream had reached the end of gathering I-16). In these three ten-leaf gatherings only the following had been printed (and the type dissed):

Gathering I-4, pages 1r, 1v and 2r  
 Gathering II-2, pages 1r-6r  
 Gathering II-17, page 1r

13. Some sources punctuate the references differently, with spaces, solidi or other punctuation marks between the elements rather than hyphens. The gatherings in this system relate to those in the formula in note 6 as follows: Vol. 1: [A-Kk]=I-1-I-33 (324 leaves); Vol. 2: [A-R]=II-1-II-16 ([R]1 being treated as II-16-1r), [S-Kk]=II-17-II-32 (319 leaves).

14. For a recent account of the printing chronology of the B42 see Rangel and Alabert (2012). The chronological table in that paper was also included (with coloured keys) in Rangel (2011, p. 519).

15. See Schwab (1987) and Rangel and Alabert (2012), section 3.

Thus, at this point, all three streams were working on partially-printed sheets within these gatherings, as follows:

- I-4-2r had been printed, while 2v and the conjugate 9r-9v were blank
- II-2-6r and the conjugate II-2-5r-v had been printed, while 6v was blank
- II-17-1r had been printed, while 1v and the conjugate II-17-10r-10v were blank

In the case of pages II-4-2v, II-2-6v and II-17-1v (the pages following the last-printed first-edition pages) we cannot be sure, of course, that they had not been printed when the decision to enlarge the edition was made, only that the type had not yet been dissed, for the print-run of these pages was evidently the higher number and they have not been found in a second setting; but whether this is because one or two impressions were made from the type set for these pages is impossible to know.

It was presumably the case that the piles of paper (and parchment) which had already been prepared and partly printed for these gatherings were enlarged with blank sheets (as many as were necessary to increase the print-run to the new number decided upon), and these were printed with pages I-4-2v, II-2-6v and II-17-1v etc. This would have left some of the sheets in each of these gatherings with blank pages before the pages mentioned (i.e. on I-4-1r-2r, II-2-1r-6r and II-17-1r). These blank pages were later printed from the second-edition formes, but it is unclear when this was done. It may have been almost at once, or it may be that these sheets were placed in storage and only perfected after the rest of the printing had been completed. Some evidence for the relative dating of this aspect of the printing work comes from the papers used for the first- and second-edition sheets. The second editions of complete gatherings were almost all printed on the same paper-stock (watermarked with an *ox passant*) which was also used for the later-printed sheets of the edition, suggesting that these sheets were reprinted towards the end of production. However, this evidence may be read differently. If the *ox-passant* paper was acquired when the decision was made to increase the edition-size (which occurred relatively early in the course of printing, after only some twelve percent of the book had been printed), then this paper could obviously have been used to print the second-edition sheets before work continued on printing the rest of the book, or while that work was under way. In any case, those sheets in gatherings I-4, II-2 and II-17 which bear second-edition pages present different

Fig. 1. Page II-1-1r of the 42-line Bible (second setting). Copy on parchment at the Niedersächsische Staats- und Universitätsbibliothek, Göttingen (2 Bibl 1,5995:2). The illumination is probably contemporary Mainz work. Reduced from 400 × 285 mm. Courtesy of the Niedersächsische Staats- und Universitätsbibliothek (creative commons licence PDM 1.0).

paper evidence, being printed on the same stocks (watermarked with an oxhead) used for the bulk of the edition, in the same states used for the earliest-printed sheets.<sup>16</sup>

As mentioned, copies of the Bible were often sold as unbound gatherings, and it seems that no distinction was made between first- and second-edition gatherings in the warehouse, so that copies show different balances of these quires. Of the thirty-five surviving copies which include all the sheets in question, twenty-two include a mixture of first- and second-edition gatherings (see Fig. 1), while the remaining thirteen are exclusively from the first edition. Combining the two settings in the same gathering was far rarer. This mixing could occur only in gatherings I-1, I-2 and I-3 (possible with any of their sheets, but with only one case observed in surviving copies), I-4 (only possible within the first two sheets, but no cases are known), I-14, I-15 and I-16 (possible with all five sheets, with two cases observed), and II-1 and II-2 (possible with all five sheets, with six cases observed in II-2 only). This makes sense when one considers likely warehouse practice, the sheets of each gathering (in one or other setting) being kept together, with only occasional mixing, due either to accident or to the intentional replacement of one (perhaps damaged) sheet with another. This applies to all gatherings except II-2, which is discussed in the following section.

#### THE STRANGE CASE OF GATHERING II-2

Perhaps the most perplexing phenomenon observed in extant copies of the 42-line Bible is that all six of the cases of a gathering in volume II having mixed first- and second-edition sheets are found in gathering II-2, and follow the same pattern. The four outer sheets are of the first edition, while the central sheet (II-2-5-II-2-6) is of the second. Moreover, there is no surviving quire showing the reciprocal situation, with the central sheet from the first setting, and the other four from the second. The probability that this happened by chance is extremely low.

We agree with Paul Needham in that the only reasonable explanation is that, when the first page of the fifth sheet (II-2-5r) was to be printed, a smaller number than usual of sheets was delivered to the press.<sup>17</sup> Pages 5r, 5v and 6r were printed in this reduced quantity. Then, page 6v was printed in the regular quantity, a certain number of as-yet-blank sheets having been added to the pile, to complete the intended initial print-run, and finally some additional sheets were added, to ensure the total matched the new print-run. At a later stage (how much later is unknown), all the incomplete sheets were sent back to the press, where the blank

16. See Needham (1985b), pp. 307–308, 321–334, whose dating suggests that the second-edition sheets were printed during the later phases of printing the edition.  
17. *Ibid.*, p. 322.



**I**n prologo sancti ieronimi  
 dicitur in parabolas salomonis  
 ungar epistola quos iungit sacerdoti  
 um: nullo carta non dividat: quos  
 xpi nedit amor. Comentariorum in osee  
 amos. et zacharia malachia. q  
 politis. Scripsisse: si licuisset pre vali  
 tudine. Mitis solacia sumptuum  
 notarios nros et librarios sustenta  
 tis: ut vobis potissimum nem deludet  
 ingeniu. Et ecce te lacere freques turba  
 diuisa postetiu: quasi aut equu sit me  
 vobis esurientibus alijs laborare: aut  
 in ratione dati et accepti: cuiq; preter  
 vos obnox? sum. Itaq; lōga egrota  
 tione fradus. ne paritus hoc anno re  
 ticer? et apud vos mutus essem. ridui  
 opus nomini vro consecraui. interpi  
 rationē videlicet triū salomonis vo  
 luminū: mas loth qd̄ hebrei parabola  
 vulgata editio p̄bia vocat: coelest̄  
 que grece eccliaften. latine d̄ionatore  
 possum? dicere: srastrim. qd̄ i lingua  
 nram verit̄ rantiū cāricos. Fecit et  
 panarcos. ihu filij sraach liber: et ali  
 pseudographus. qui sapientia salo  
 monis inscribit. Quos priorē hebra  
 ricum repei: nō eccliaficum. apud la  
 tinos: sed parabolas p̄notatum. Cui  
 iudi erat eccliaften. et cāricū cāricos: ut  
 similitudinē salomonis. nō solū nu  
 meto librorū: sed etiā materia: gene  
 re coequaret. Secūdu apud hebreos  
 nullq; est: quia et ipse filius grecam  
 eloquentiā redoler: et nōnulli scriptorū  
 veterū hūc esse iudei filonis affirmāt.  
 Sicut ergo iudith et ijob et macha  
 beorū libros. legit quidē eos ecclia. sed  
 inter cānotas scripturas nō recipit:  
 sic et hec duo volumina legat ad edi  
 ficationē plebis: nō ad auctoritatem  
 eccliaficorū dogmatū cōfirmādam.

Si cui sane septuaginta interpretum  
 magis editio placet: habet eā a nobis  
 olim emendatā. Neq; etiā noua sic cu  
 dim? ut vetera destruat. Et tamē cū  
 diligentissime legerit. sciat magis nra  
 scripta intelligi: que nō in teccū vas  
 trāfusa coacuerit: sed statim de prelo  
 purissime emēdata recte. suū sapore ser  
 uauerit. **Incipiūt parabole salomo. i. c.**

**P**arabole salomonis  
 filij dauid regis isrl:  
 ad sciendā sapienci  
 am et disciplinā: ad  
 intelligendā verba  
 prudentie et suscipi  
 endā erudi  
 tionē doctrine: iusticiā  
 et iudiciū et equitatē: ut deus paruulū  
 astutia: et adolecentia scientia et intel  
 lectus. Audies sapiēs sapiētorū eic: et  
 intelligis gubernada possidebit. An  
 aduertit parabola et interpretatio  
 nem: verba sapiētiū et enigmata eorū.  
 Timor dñi p̄cipiū sapiētie. Sapiē  
 tiam atq; doctrinā stulti despiciūt.  
 Audi fili mi disciplinā patris tui et ne  
 dimittas legem matris tue: ut addatur  
 gratia capiti tuo: et torques collo tuo.  
 Fili mi si te laudauerit peccatores: ne ac  
 quiescas eis. Si dixerit veni nobiscū  
 insidiemur sāguini. abscondam? rēdi  
 culas extra insontem frustra. Deglutia  
 mus eū sicut infernus vinetum et inte  
 grum. q̄si descendentem in lacū: omnē  
 p̄iosā substantiā reperiem? implebim?  
 domus nraa spolijs. fortem mitte no  
 biscum. marcupiū sit unum omnū  
 nrm: fili mi ne ambules cū eis. Pro  
 hybe pedem tuū a semitis eorū. Pedes  
 etiā illoꝝ ad malū currūt: et festināt ut  
 effundant sāguinem. Frustra autem  
 iacit rete ante oculos p̄natorū. q̄pi q;  
 contra sāguinē suū insidiemur: et

Presentium Julij...  
 non...  
 dicitur...

pages 5r, 5v and 6r were printed. Since these pages had to be composed again, they are naturally of the second edition.

Needham attributes the accident in gathering II-2 to human error. This is possible indeed, but it could have been detected easily. From the twenty-eight surviving quires, six show the mixed pattern, suggesting a shortfall in the sheet numbers of around twenty-two percent. The workmen at press might well have noticed, if nothing else, a reduction in the time necessary to print the first page of this sheet on the pile of paper at hand. Furthermore, the error appears not to have been discovered until at least the third page of the gathering had been printed and the type dissed. Given the high level of planning and control shown in other aspects of the work, we suggest that human error in counting sheets is not the most likely explanation. Could a shortage of paper have led to fewer copies of this particular sheet being printed? Even knowing that this sheet would be printed in fewer copies, it may have been seen as more economical to continue the cycle of setting, proofing, printing and dissing without interruption, to have at least a number of copies finished as soon as possible. It is even possible that it was this paper shortage which triggered a rethink of the print-run by Fust and Gutenberg at this point in production (although intimations of a higher than anticipated demand for the book were no doubt also a factor). When the new supply of paper (and parchment) arrived, page II-2-6v could have been printed (or continued to be printed), and the work continued, with the second-edition pages being printed on the sheets later. As already noted, Needham's study of the watermarks in the Bible suggests that, around the time the print-run was increased, paper with different watermarks, probably corresponding to a different purchase, began to be used.<sup>18</sup> However, the paper used for the second-edition sheets in gathering II-2 was of the same two types which were used for the rest of this gathering, and for all the likely early-printed sheets of the edition.

Whether the result of human error or due to a paper shortage, for the purposes of estimating the increase in the print-run, all the mixed gatherings II-2 should be counted with the pure first-edition quires. Indeed, the relevant sheets would have been of the first edition, had the printing followed its normal course. That something unusual happened with gathering II-2 is supported by the rarity of mixed gatherings in general, the fact that no 'complementary mixing' has been observed in this gathering, and that the proportion of mixed and pure first-edition quires compared to pure second edition coincides exactly with that of gathering II-1 and is very similar to that observed in the other pure gatherings.

18. Needham (1985b), pp. 325–332.



## THE HARVARD AND HUNTINGTON COPIES

The first of the errors in the B42 censuses involves copy P24 owned by Harvard University, and was discovered and reported by Richard Schwab, while examining that copy for other purposes.<sup>19</sup> In a series of papers,<sup>20</sup> Schwab and his collaborators in the Physics Department of the University of California, Davis, analysed the ink of several copies of the Bible, and other contemporary documents, by means of the ‘Proton-Induced X-ray Emission’ (PIXE) technique, also referred as the ‘proton milliprobe’.<sup>21</sup> This technique allows the chemical elements present in a specimen to be analysed, and was initially used to make adjustments to the chronological table first published by Schwenke in 1923 and refined (using a technique similar to that used for the alignment of DNA sequences) by the present authors in 2012.<sup>22</sup>

We agree with Philip Teigen that the conclusions of these analyses must be read with caution.<sup>23</sup> The samples were small and the variability of the measured results large. However, a more thorough ink-analysis is unlikely to take place in the near future, because of logistical and financial obstacles. Until new evidence is found, the contributions of Schwab and the team at Davis are certainly valuable.

While Schwab’s team was examining the Harvard copy, they noticed that the composition of the ink on pages II-2-5r, 5v and 6r was different from that found on other pages in the gathering, and on pages they described as ‘being printed concurrently’.<sup>24</sup> The ink seemed to indicate that the Harvard pages were printed much later, ‘after all parts of the first setting were completed’.<sup>25</sup> This conclusion seems extreme, but the different inks certainly suggest that these second-edition pages were printed at a different time and/or by a different press-team from the rest of the pages in the Harvard copy, including II-2-6v; and the ink is chemically very like that used to print some (but not all) of the second-edition pages in the Doheny copy, indicating the same diversion from the printing course of the first edition for some of these second-edition sheets.<sup>26</sup> On visual examination, Schwab realised that the pages in the Harvard copy belonged to the second edition, while Schwenke’s census had reported them as belonging to the first. Needham’s census was published two years before Schwab’s paper, and could not therefore take this discovery into account. But this observation by Schwab went unnoticed, and the error was reproduced in White’s book, and is also present in Füssel’s account of the 42-line Bible.<sup>27</sup>

19. See Schwab (1987). The Harvard University copy is currently on display at the Widener Library, but is held by the Houghton Library (shelfmark Hub. 40).

20. Richard N. Schwab *et al.*, ‘Cyclotron analysis of the ink in the 42-line Bible’, *Papers of the Bibliographical Society of America* 77:3 (1983), pp. 285–315; Schwab *et al.*, ‘New evidence on the printing of the Gutenberg Bible: the inks in the Doheny copy’, *Papers of the Bibliographical Society of America* 79:3 (1985), pp. 375–410; Schwab *et al.*, ‘Ink patterns in the Gutenberg New Testament: the proton milliprobe analysis of the Lilly Library copy’, *Papers of the Bibliographical Society of America* 80:3 (1986), pp. 305–331; Schwab (1987); Schwab, ‘An “ersatz” leaf in the Doheny Gutenberg Bible, volume I’, *Papers of the Bibliographical Society of America* 81 (1987), pp. 479–485; and Needham (1985a).

21. For an explanation of PIXE and its application to the analysis of the ink, see Bruce H. Kusko *et al.* ‘Proton milliprobe analyses of the Gutenberg Bible’, *Nuclear instruments and methods in physics research* B3:1 (1984), pp. 689–694; T. A. Cahill *et al.* ‘Gutenberg’s inks and papers: non-destructive compositional analyses by proton milliprobe’, *Archaeometry* 26:1 (1984), pp. 3–14; and Richard N. Schwab, ‘The history of the book and the proton milliprobe: an application of the PIXE technique of analysis’, *Library trends* 36 (1987), pp. 3–84.

22. See Schwenke (1923) and Rangel and Alabert (2012).

23. See Philip M. Teigen, ‘Concurrent printing of the Gutenberg Bible and the proton milliprobe analysis of its ink’, *Papers of the Bibliographical Society of America* 87:4 (1993), pp. 437–451.

24. Schwab (1987), pp. 407–408.

25. *Ibid.*, p. 408.

26. *Ibid.*

27. White (2018), pp. 311–312; Füssel (2018), p. 45.



**Explicit canticum superius Canticum canticorum**  
Hauriet me osculo oris sui. Quia meliora sunt ubera tua vino: fragrantia unguentis optimis. Oleum effusum nomen tuum: ideo adolescentule dilegerunt te. Trahe

**I**nter lingua silvarum: sic dilectus meus inter filios. Sub umbra illius quem desideraveram sedi: et fructus eius dulcis gutturi meo. Introduxit me rex in cellam vinariam: ordinavit in me caritatem. Fulcite me floribus. Sperate me malis: quia amore languero. **Leua eius** sub capite meo: et delecta illius amplectabitur

**Explicit libri canticorum. Incipit canticum canticorum**  
Hauriet me osculo oris sui. Quia meliora sunt ubera tua vino: fragrantia unguentis optimis. Oleum effusum nomen tuum: ideo adolescentule dilegerunt te. Trahe

**I**nter lingua silvarum: sic dilectus meus inter filios. Sub umbra illius quem desideraveram sedi: et fructus eius dulcis gutturi meo. Introduxit me rex in cellam vinariam: ordinavit in me caritatem. Fulcite me floribus. Sperate me malis: quia amore languero. **Leua eius** sub capite meo: et delecta illius amplectabitur

**Canticorum primum capitulum.**  
Hauriet me osculo oris sui. Quia meliora sunt ubera tua vino: fragrantia unguentis optimis. Oleum effusum nomen tuum: ideo adolescentule dilegerunt te. Trahe

**I**nter lingua silvarum: sic dilectus meus inter filios. Sub umbra illius quem desideraveram sedi: et fructus eius dulcis gutturi meo. Introduxit me rex in cellam vinariam: ordinavit in me caritatem. Fulcite me floribus. Sperate me malis: quia amore languero. **Leua eius** sub capite meo: et delecta illius amplectabitur



In the same paper of 1987, while pointing out the error in published descriptions of the Harvard copy, Schwab and his collaborators noted that ‘Most of the surveys erroneously record that pages of the second setting are also found on sheet 5 of quire II 2 in the Huntington Library vellum copy’.<sup>28</sup> No references are given, but it is true that most sources record the Huntington copy as containing second-edition sheets in gathering II-2.<sup>29</sup> This seemed to be another case of Schwab’s observations having been overlooked, and so we were eager to check the setting of the relevant pages in this copy ourselves, and asked for help from the Huntington Library. Stephen Tabor, Curator of Rare Books, kindly took and sent us accurate photographs of the three pages, showing that Schwab was indeed right and that all three are of the first edition rather than the second.

Fig. 2 shows a detail of page II-2-5v in the Huntington copy, compared with details from the Göttingen copy (first setting), and that at the Harry Ransom Center of the University of Texas, Austin (second setting).<sup>30</sup> As can be seen, there is no difficulty in attributing a page to a particular edition when one is able to compare the settings directly. Differences in the first column are subtle. But the seven lines of the second column show obvious differences, the most noticeable of which are in the first line: in the first setting, the line starts and ends with the complete words ‘inter’ and ‘dilectus meus’, whereas in the second it starts with part of the previous word ‘malus’ and ends with the contracted forms ‘dilect[us] me[us]’. Differences can also be appreciated in the spacing, especially around the colons. To be rigorous in identifying the different editions, one must be aware that there can be small differences between copies of pages bearing the same setting, due to stop-press variants.<sup>31</sup> However, this is not the case here.

How did these errors in assigning editions to pages in these copies come about in the first place? Are they related somehow? In a personal communication, Eric White suggested a very likely explanation.<sup>32</sup> Paul Schwenke did not examine the Harvard and Huntington copies himself, but instead received, in the early twentieth century, intelligence about them from the American printing-press manufacturer Robert III Hoe (1839–1909), who was the owner of both copies at that time.<sup>33</sup> It seems likely that Hoe accidentally transposed the data on the settings in gathering II-2 in these two copies before he sent it to Schwenke.

*Opposite: Fig. 2.* Details from the 42-line Bible (II-2-5v). From top to bottom: the Huntington copy (first setting), the Göttingen copy (also first setting), and the Austin TX copy (second setting). Actual size.

28. Schwab (1987), p. 407.

29. See for example Hubay (1979), Needham (1985b), Schwenke (1923) and White (2017).

30. Fig. 2 shows details of the beginning of the *Canticum canticorum*. According to Eric White (2018, pp. 117, 213), the rich illuminations of the first two copies (both printed on parchment) were executed in Mainz and Leipzig respectively. The copy at Austin, TX (printed on paper), is much more modest, with pen-and-ink work in two colours only; this copy could have been acquired by a monastery and illuminated in the scriptorium there.

31. See Agata (2003) and Agata (2007).

32. E-mail from Eric White, 5 May 2019.

33. See Schwenke (1923), p. 18, note 2.

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