

Justinian and Mathematics: An Analysis of the Digest's Compilation Plan.¹

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The compilation of the Digest is almost universally accepted as having been executed by three distinct committees, each responsible for reading and excerpting from their particular allocation of ancient Roman legal books (libri). Recently, it has been argued that the reading and excerpting process was further delegated, with each committee containing two subcommittees. However, this view has proved quite contentious. In this article I argue that the Digest was indeed organized at the subcommittee level. I further argue that its final appearance was the result of a pre-ordained plan that the volume of the Digest should amount to precisely five percent - calculated in terms of lines per book - of the total number of libri collected and read. Finally, I show how the precision inherent in this compilation plan can be used to define the Digest's timetable; as well as to identify which of the commission's six named commissioners was responsible for each of the subcommittees.

INTRODUCTION

The major task of the emperor Justinian's Second Law Commission was the compilation of the *Digest*, a collection of existing Roman private legal writings. It took three years to complete, being authorized on 15 December 530 with the issuing of *C. Deo auctore*, and promulgated in *C. Tanta* on 16 December 533. It was issued in a single volume of fifty books.² The commission was chaired by Tribonian, who initially held the post of quaestor, and also included the following commissioners: Constantinus, a senior legal government official; Theophilus, dean of the law school in Constantinople; Dorotheus, a renowned professor of law summoned from Beirut; Anatolius, also a professor of law from Beirut; and Cratinus, another law professor from Constantinople.³ The Digest together with the *Institutes* and the *Codex Iustinianus* comprised the *Corpus Iuris*, of which Kunkel wrote: 'For as the Bible was to the theologians so was the *Corpus Iuris* to the jurists of the Middle Ages. It was the repository of all wisdom'.⁴

The first major advance towards discovering the method used to assemble the *Digest* occurred in 1820 when Bluhme proposed that the original books of legal writings had been excerpted in an orderly manner to produce four masses (bodies of text), which were

¹ The ideas presented in this paper were first developed in my 1996 Honours thesis, 'Justinian and Mathematics: an analysis of the organizing structure of the *Digest*', which was submitted to the University of Melbourne on 23 December 1996. A copy of this work is held in the Department of Classics and Archaeology, The University of Melbourne, Vic. 3052, Australia. My supervisor was Dr. Roger Scott.

² *C. Deo auctore*, in T. Mommsen and P. Krueger (eds.), *The Digest of Justinian*, 4 volumes (English trans., A. Watson, ed.), Philadelphia, 1985, vol. 1, xlvi-xlix. English trans. of '*C. Tanta*', in *ibid.* lv-lxiv.

³ *C. Tanta* 9.

⁴ W. Kunkel, *An Introduction to Roman Legal and Constitutional History*, 1st edition, (trans. J.M. Kelly), Oxford, 1966, 170.

subsequently combined, during an editing stage, to form the *Digest*.⁵ Bluhme also argued that these four masses had been assigned to three committees, which he named the Sabinian, the Edictal and the Papinian. The smaller fourth mass, the Appendix, was later added to the end of the Papinian mass.⁶ Subsequently, Krueger made some minor amendments to Bluhme's list, which shows the order in which the committees excerpted their material. This revised list is called the Bluhme-Krueger Ordo (or BK Ordo).⁷ Bluhme's model has generally withstood all criticism.⁸

In 1969, A. Honoré embarked upon a detailed study of the *Digest*, intending to shed further light upon its method of compilation. This major scholarly enterprise culminated with the publication of *Tribonian* in 1978.⁹ Honoré's research methodology consisted of two quite distinct forms of analysis. Firstly, he attempted to establish a stylistic norm for Tribonian's works, mostly as found in the constitutions of Justinian drafted during the two quaestorships of Tribonian.¹⁰ These marks of style were then used more widely to identify the contributions made by Justinian, Tribonian and others to the compilation of the *Digest* and the *Institutes*. Secondly, Honoré carried out a numerical analysis of the *Digest* text, as regards the number of lines per book excerpted from each of the original *libri*, and he attempted to show how these excerpts were assembled to compile the *Digest* as it appears in the BK Ordo. Noting various features of the BK Ordo within each of the three masses, Honoré proposed that the three committees were further divided into subcommittees for the purpose of excerpting. Furthermore, each committee is said to possess a senior and junior commissioner, who were initially titled A-B, C-D and E-F respectively; subsequently, each letter was identified with one of the six named commissioners.

Honoré's thesis received a mixed response, but one that was primarily concerned with the qualitative 'stylistic analysis' aspect of this work.¹¹ The quantitative component of Honoré's 'compilation model' has received considerably less attention. However, in 1985, D. Osler published a paper that rigorously dealt with just this aspect, and he strongly argued that the numerical basis of Honoré's theory is invalid.¹² Subsequent research by D. Mantovani is

⁵ A. Honoré, *Tribonian*, London, 1978, 150.

⁶ *Tribonian* (n.5 above) 150.

⁷ *Tribonian* 149.

⁸ *Tribonian* 151 and n.106.

⁹ Various articles had appeared in the intervening years: A. Honoré and A. Rodger, 'How the *Digest* Commissioners worked', 87 *ZSS* (1970), 246-314 - although a joint work it is made clear that Rodger's role is 'essentially subordinate' (ibid. 246); A. Honoré, 'Justinian's *Digest*: Work in Progress', 88 *Law Quarterly Review* (1972), 30-56 (henceforth 'Work in Progress'); idem., 'Justinian's *Digest*: Following the Trail', 88 *Law Quarterly Review* (1972), 530-42 (henceforth 'Trail'); idem., 'The distribution of the *Digest* texts', 89 *ZSS* (1972), 351-362; idem., 'The editing of the *Digest* titles', 90 *ZSS* (1973), 262-304; idem., 'The background to Justinian's Codification', 48 *Tulane Law Review* (1974), 859-93; and idem., 'Labeo's *Posteriores* and the *Digest* Commission', in A. Watson, ed., *Daube Noster*, Edinburgh, 1974.

¹⁰ *Tribonian* 70.

¹¹ P. Birks, 'Other Men's Meat: Aquilian Liability for Proper Use', 16 *Irish Jurist* (1981), 141-185; idem., 'Honoré's Ulpian', 18 *Irish Jurist* (1983), 151-181, esp. 151; A. Cameron, 'Book review of *Tribonian*', 69 *JRS* (1979), 199-201; H. Evjen, 'Book Review of *Tribonian*', 76 *CJ* (1980), 368-370; B. Frier, 'Law on the installment Plan', 82 *Michigan Law Review* (1984), 856-868, esp. 861, 867; W. Gordon, 'Book review of Ulpian', 98 *CR* (1984), 232-234; A. Lewis, 'Book review of *Tribonian*', 94 *EHR* (1979), 848-850; F. Miller, 'A New Approach to Roman Jurists', 76 *JRS* (1986), 272-280, esp. 278; A. Rodger, 'Behind the Scenes of Roman Law', 3 *Oxford Journal of Legal Studies* (1983), 382-404, esp. 385; C. Starr, 'Book Review of *Tribonian*', 73 *CW* (1979), 47; and P. Stein, 'Book Review of *Tribonian*', 38 *Cambridge Law Journal* (1979), 207-209.

¹² D. Osler, 'The Compilation of Justinian's *Digest*', 102 *ZSS* (1985), 129-184. This paper also includes a fuller list of responses to Honoré's 'compilation model'.

also directly relevant to this aspect of Honoré's model.¹³ I will return to the substance of Osler's criticisms below, but it is first necessary to explain certain aspects of Honoré's model regarding his allocation of texts to the six *Digest* subcommittees.

The legal texts assigned by Honoré to each subcommittee were arrived at by selecting alternate sections from each committee mass to form an odd and even-numbered stream of texts, which were then allocated to group headings (numbered I-XLIII).¹⁴ Within each committee each subcommittee was theoretically said to receive an equal number of books. However, in practice, complete parity was not achieved because of complicating factors linked to the different excerpting methods employed (i.e. joint excerpting and successive excerpting) to allocate particular books to the odd and even-numbered streams. At the heart of Honoré's compilation theory is the assertion that within each committee the two commissioners worked to a very detailed timetable. Tribonian is considered the great organizer whose expertise was essential to convincing Justinian of the *Digest's* practicability by demonstrating 'precisely how the work could be terminated in three years...'¹⁵ This timetable was based on the assumption that the Sabinian and Edictal committees would excerpt seven books a week, and the Papinian committee five books a week.¹⁶ Tribonian is said to have originally intended that the Sabinian and Edictal committees were to receive an equal distribution of books (559 1/2), though due to other factors the actual number of books they excerpted amounted to 546 and 573 respectively.¹⁷ The Papinian committee received a reduced allocation of only 409 books, which was fixed at 5/7th of the Edictal figure of 573 books so as to allow Constantinus - the senior commissioner of the Papinian committee according to Honoré - extra time for his official duties.¹⁸ Also, when the excerpting stage began on 15 December 530 it was planned that the three committees should finish excerpting about 9 July 532.¹⁹ Furthermore, it was intended from the start of the commission's work that each committee was 'required to work at a stated and invariable rate', finishing each group of books in strict conformity with their respective daily or weekly timetable.²⁰ However, within each group of books, the two commissioners could vary their pace, with the proviso that they finish the group concurrently.²¹

When Honoré's 'timetable' model is judged against the actual excerpting practices of the subcommittees a number of problems and inconsistencies seem apparent. It may be instructive at this point to discuss one such example, to both more fully understand the methodology used by Honoré, and to show why an alternative to Honoré's fixed timetable hypothesis has to be found in order to explain the final structure of the *Digest*. The example I

¹³ Unfortunately, I have been unable to obtain a copy of D. Mantovani, *Digesto e masse bluhmiane*, Milan, 1987. However, I did obtain a copy of D. Osler, 1988 (publ. 1991), 'Following Bluhme: a note on Dario Mantovani, *Digesto e masse bluhmiane*', in *Iura: rivista internazionale di diritto romano e antico*. Based upon Osler's paper, Mantovani would appear to provide no definitive argument to demonstrate the correctness of his thesis. Rather, its validity must still be judged in competition with other competing interpretations of the evidence. In contrast, I believe that the mathematical and statistical arguments presented to support the validity of my thesis provide a degree of quantitative 'proof' not normally found in such essentially literary topics.

¹⁴ See *Tribonian*, Appendix One, pp. 257-286, for full details.

¹⁵ *Tribonian* 141.

¹⁶ *Tribonian* 142.

¹⁷ *Tribonian* 168-169 and 'Summary of whole *Digest*' Table, 286.

¹⁸ *Tribonian* 169.

¹⁹ *Tribonian* 171.

²⁰ Trail (n.9 above) 535.

²¹ *Tribonian* 171-72.

have chosen comprises Groups XL-XLIII of the Papinian mass.²² Turning first to Group XLII, which contains Scaevola's *digesta* (books 1-40) and Lab. 8 Paul *epit.* (8 books),²³ we see that these books are divided into four sections (i-iv). Commissioner E excerpted sections (i), Scae. *dig.* 1-13 and (iii), Scae. *dig.* 30-40, and commissioner F excerpted sections (ii), Scae. *dig.* 14-29 and (iv), Lab. 8 Paul *epit.*

Group XLII.

| | | lines/book |
|-------------------------------|--|------------|
| Scaevola: <i>digesta</i> | | |
| (i) Bks 1-13 | 69, 49, 10, 48, 142, 43, 118, 9, 32, 30, 52, 0, 6 lines | av. 46.8 |
| (ii) Bks 14-29 | 74, 176, 260, 197, 260, 118, 227, 276, 359, 59, 111, 70, 47, 86, 121, 58 lines | av. 156.2 |
| (iii) Bks 30-40 | 4, 26, 11, 33, 9, 0, 0, 0, 0, 0 lines | av. 7.5 |
| (iv) Lab. 8 Paul <i>epit.</i> | Number of lines 299 | av. 37.4 |

As seen from these figures, both E (46.8 to 7.5) and F (156.2 to 37.4) show a marked reduction in their rate of excerpting, in lines per book (lpb), between their respective first and second sections. Honoré notes this type of 'collapse' as a regular occurrence, and writes: '[w]hen they [the commissioners] were approaching the end of an assignment [i.e. a group] and were pressed for time, there would come a point at which the rate of extraction per book dropped to a minimum.... Then in the very last book or books the rate picks up again, since the commissioner now knows that he is going to reach the end in time'.²⁴ To explain the collapse between sections (i) and (iii) (i.e. in a ratio of 6.2:1), Honoré suggests that it may be partly due to the preoccupation of chairman E with other business, and partly to the 'division of the *digesta* into codices, which may have meant that the chairman did not have these books [i.e. books 30-40] available to him while his colleague was reading books 14-29'.²⁵ In order to finish the group on time, commissioner E had to then hastily complete section (iii), thereby causing him to excerpt less text. However, the collapse between sections (ii) and (iv) (i.e. in a ratio of 4.2:1) is surely also significant, yet it cannot be similarly explained since, according to Honoré's argument, commissioner F should have excerpted section (iv) before beginning section (ii), and while he waited for commissioner E to finish with books 1-13. Neither can this collapse be reasonably assigned to the different subject-matter in section (iv), since it is excerpted at a rate almost equal to that in section (i) when commissioner E was under no time pressure.

Honoré argues that the rate of excerpting is indicative of the work rate of each commissioner.²⁶ However, the evidence does not support this view. As regards the average excerpting rate over both their sections in Group XLII, E contributed 28.8 and F 116.6 lpb. This means that overall F excerpted more than four times as much as E and, furthermore, that F was still excerpting in section (iv) at a 30 percent higher rate than E's average (i.e. 37.4 compared to 28.8 lpb). But in Group XL the excerpting rates are almost completely reversed, with E now averaging 129.7 and F only 39.4 lpb. While in Group XLI, E averaged 5.8 and F 37.4 lpb. And it is only in Group XLIII that both commissioners actually achieve approximate parity with average excerpting rates of 14.4 and 19.0 lpb respectively.²⁷ Honoré

²² *Tribonian*, Appendix One, 278-286.

²³ *Tribonian* 163 and Appendix One, 285.

²⁴ *Tribonian* 162.

²⁵ *Tribonian* 163.

²⁶ Honoré, Work in Progress (n.9 above), 47.

²⁷ *Tribonian* 283-285.

identifies E as Constantinus and F as Cratinus, and he goes on to argue that following the Nika revolt - which he estimates would have approximately coincided with the beginning of excerpting the Appendix mass (Groups XLI-XLIII) - Constantinus was required for extra magisterial duty, which would explain his low excerpting rate during the Appendix as compared to his rate during the main Papinian mass.²⁸ In the three groups of the Appendix, F averaged 61.8 lpb compared to E's 18.8 lpb, a ratio of 3.3:1. However, in the last three groups of the main Papinian mass, E averaged 85.5 lpb compared to F's 28.5 lpb, a similar ratio of 3:1. So what significance, if any, should be attached to the reduced work rate of E during the Appendix? Honoré's answer is to compare the figures from the Appendix with the average excerpting rate of Constantinus and Cratinus over the whole of the main Papinian mass: 'the chairman and his junior colleague kept pace with one another, E in fact averaging 77 lines per book to F's 69'.²⁹ But such a comparison is inappropriate in this context. Rather, what should be compared is their relative excerpting rates within each group of the *Digest* mass since, according to Honoré's timetable model, the two commissioners within each committee excerpted their allotted number of books according to the same strict time limit.

When the 'Summary of Papinian mass' table is examined one can see a dramatic difference between the contemporaneous group excerpting rates of the two commissioners E and F. A very similar disparity is found between the excerpting rates of the two commissioners A and B in the 'Summaries of Sabinian mass' table, and between commissioners C and D in the 'Summaries of Edictal mass' table. Furthermore, there is a general decline in the sequential group excerpting rates from the beginning to the end of each mass, which in itself is inconsistent with the explanation that groups were excerpted to a strict timetable, since had that been a controlling factor then the excerpting rate decline should have been limited to within each group, and not have extended over the whole *Digest* mass.³⁰

JUSTINIAN'S '5 PERCENT COMPILATION LIMIT' PLAN

The above findings would appear inexplicable in terms of Honoré's timetable model. So what alternative solution might then explain Honoré's detailed findings regarding the division of labour between the two commissioners within each of the three committees? Despite the considerable variability in the excerpting rates of the commissioners within and between groups, when the 'Summary of whole *Digest*' table is examined we witness the striking figures which Honoré's analysis has revealed. The average rates of excerpting (in lpb) for commissioner A (91.10) and B (92.60) are almost identical, as are C (66.82) and D (67.68) and, though not quite equal, E (60.60) and F (67.24) are reasonably close. Such a result immediately indicated to me that these figures could not have arisen by chance alone, and so there must have been some underlying, and unseen, organizing factor at work in controlling the final structure of the *Digest*.

To see what this factor is let us examine the calculated excerpting rates of the six commissioners in more detail:

$$A = 91.1, B = 92.6 \quad C = 66.82, D = 67.68 \quad E = 60.60, F = 67.24$$

Because of the almost identical values of C, D and F, I provisionally assumed that E's

²⁸ *Tribonian* 170-71.

²⁹ *Tribonian* 168.

³⁰ See *Tribonian* 268, 278 and 286 for relevant tables.

original rate of excerpting had also been fixed at the average value for these three commissioners, i.e. at 67 lpb to the nearest whole number. The average excerpting rate for A and B is similarly calculated to be 92 lpb. Now the number 67 is very close to 75 percent of 92. If, for the moment, we accept these figures (incorrectly as it turns out in the case of E) then one achieves the following arithmetical relationship:

$$\begin{aligned} A:B:C:D:E:F &= 1:1:3/4:3/4:3/4:3/4 \text{ (accurate to approximately 2 percent)} \\ &= 2:1 \ 1/2:1 \ 1/2 \text{ (at the committee level)} \end{aligned}$$

The sum of these six proportionally related numbers (i.e. $2 \times 1 + 4 \times 3/4$) equals 5. And to see why the number 5 is so important we must turn to *C. Tanta*, where Justinian tells us that nearly 2,000 *libri* containing 3,000,000 *versus* (lines) were reduced to 150,000 *versus*.³¹ While these figures were exaggerated in all three respects in terms of the final composition of the *Digest*, what had previously not been recognised was the significance of the relationship of the three numbers, i.e. that 150,000 is exactly 5 percent of 3,000,000, and that one Roman *libri* would have nominally measured 1,500 lines (3,000,000 lines divided by 2,000 *libri*).³² Furthermore, Justinian had predetermined that the *Digest* should contain 50 books.³³ And 150,000 lines divided by fifty equals 3,000 lines per book, which is exactly twice the nominal length of the original *libri*. This degree of precision should inform us that Justinian must also have limited the number of lines to be included in the *Digest*, since books were clearly of a limited size, be that 1,500 or 3,000 lines.³⁴

The above findings strongly suggest that the controlling factor responsible for the final appearance of the *Digest* was the requirement that it be limited in length to 5 percent of the total number of *libri* from which it was compiled. And, indeed, Justinian surely makes this point clear when he writes, regarding the *Digest* project, that he entrusted Tribonian with ‘the task of collecting together and transmitting, *with a certain reduction in volume* [my emphasis], the most learned works of ancient times...’³⁵ Since 5 percent of 1,500 lines equals 75 lines, this latter figure would have been the intended average rate of excerpting from each of the *libri* made available to the commission in Constantinople. Now it is clear from *C. Tanta* that many more books were read than those which were finally included in the *Digest*, for we read, regarding the large quantity of books collected by Tribonian, that: ‘the authors of this work did not read through those books only from which they took the laws they have included; they read many others in which they found nothing useful or new to extract and insert in our *Digest*, and which with good judgment they rejected.’³⁶ We can draw two important conclusions from this passage. Firstly, many more books were read than finally made their appearance in the *Digest*. And secondly, all the books originally gathered together by the commission in Constantinople were treated with equal respect and consideration,

³¹ *C. Tanta* 1.

³² The actual length of a *liber* varied so that 1,500 lines (or 10,000 words) was considered the average. See Honoré, ‘The background to Justinian’s Codification’ (n.9 above), 872.

³³ *C. Deo auctore* 5.

³⁴ Pugsley also realised that there must have been limitations on the size of the *Digest*, though he chose to think primarily in terms of the number of books. He noted that, ‘there must have been guidelines as to quantity’, and he further suggested that the original intent ‘was to reduce two thousand books to fifty, 2½ % of the original, or about 40 lines per book’. See D. Pugsley, ‘Some reflections on the compilation of Justinian’s *Digest*’, 19 *Irish Jurist* (1984), 350-559, at 353. However, as regards any guideline for this reduction, he adds that: ‘it is difficult to see how we could calculate it. This line of enquiry therefore runs into the sands...’, *ibid.* 354.

³⁵ *C. Tanta* 1.

³⁶ *C. Tanta* 17.

irrespective of whether or not extracts were finally taken from them to include in the *Digest*. Therefore, the final length of the *Digest*, as regards the total number of lines permitted, would have been calculated according to the total number of books collected by the commission, and not just those presently found in the *Digest*. Indeed, it would be a strange form of argument to exclude those books from which no extracts were taken, while, at the same time, counting all other books as equal, irrespective of the widely differing numbers of lines which they each contributed.

One line (*versus*) of a Roman *libri* averages 39 letters, and one line of Lenel's *Palingenesia*, on which Honoré's calculations are based, averages about 43 or 44 letters, or approximately 43.5 letters.³⁷ 1 Lenel line therefore = $1 + 4.5/39 = 1.12$ *versus*. Excluding any material lost at the editing stage of the *Digest*, Honoré found that from a total of 1,528 books that appear in the *Digest*, there were 113,301 remaining Lenel lines, which equates to an average excerpting rate of 74.15 lines per book.³⁸ This number of Lenel lines equals $113,301 \times 1.12 = 126,897$ *versus*. If, as previously argued, the commission was limited to excerpting at an average rate of just 75 lines from all the books they read, then 126,897 *versus* would translate into $126,897/75 = 1,692$ books.

However, this is not quite the whole story for we remain uncertain whether any lines were lost during the editing stage. Pace Honoré, I cannot see the need for two drafts of the *Digest* prior to final publication; and, indeed, the changes made during this proposed second draft are judged to have been 'relatively few'.³⁹ As for whether a significant number of lines were lost during the presently proposed first (and only) editing stage, this cannot be answered with certainty. However, the stipulation by Justinian that the ancient texts should be gathered together and transmitted 'with a certain reduction in volume' (above) - and which I argue to be precisely 5 percent - strongly suggests that only minor additions and/or deletions were made to the excerpted material during the editing phase. The need to reduce the ancient works to a mere 5 percent of their original volume was difficult enough, and one presumes heart-breaking for the legally trained commissioners, but to then freely discard even more material at the editing stage, that might seem just too perverse.

Now it seems reasonable to assume that all three committees were initially expected to read the same number of books during the very extended period that the excerpting phase of the *Digest* lasted; and that all six commissioners were more or less as industrious with their time as each other. Furthermore, one may assume that all three committees were expected to finish excerpting concurrently, as otherwise the editing stage would have been unnecessarily delayed. That all three committees did indeed finish excerpting about the same date is indicated by the fact that the last ten books belonging to the Sabinian committee (Iav. 10 post. Lab.) were transferred to the Papinian committee to read.⁴⁰ This minor transfer of books would suggest that the Papinian committee had only just finished their excerpting work as the last twenty, or so, books of the Sabinian committee remained to be read. That being the case then the Papinian committee would also have been expected to read about the same

³⁷ In my 1996 thesis I had been under the misapprehension that the length of line used in Honoré's calculations was the same as the length of line in the original Roman *libri*, as any difference in length between these two sources would clearly have had a complicating affect. However, I was lulled into believing that they were the same length because of the closeness of Honoré's calculated figure of 74.15 lpb - which so happens to be the approximate average excerpting rate value for the whole *Digest* project, as found in the '*Summary of whole Digest*' table (in *Tribonian* 286) - and the theoretical value of 75 lpb derived from 5 percent of 1,500 *versus*. I now understand that this supposition is incorrect from figures that appear in a draft copy of a paper soon to be published by Professor Honoré, and which was kindly sent to me to read.

³⁸ *Tribonian*, '*Summary of whole Digest*' Table, 286.

³⁹ *Tribonian* 185.

⁴⁰ *Tribonian* 267, n.7.

number of books as the average for the other two committees. Not surprisingly, then, 1,692 books divided equally among the three committees equals 564 books each, which is almost exactly the same number of books (actually 559 1/2) which Honoré calculated were originally allocated to both the Sabinian and Edictal committees.⁴¹

If we assume that the actual number of books read by the commission was 1,692, and taking into account that one Lenel line equals 1.12 *versus*, then Honoré's calculated average excerpting rate of 74.15 Lenel lpb would be increased to 75 lpb, as I previously calculated to be the predetermined rate for the original *libri*. To the degree we are willing to allow lines to have been lost at the editing stage, so, in direct proportion, the number of books read by the commission will be increased, in line with the overriding condition that the commission was instructed to excerpt precisely 5 percent of the original material. If we proceed with the figure of 1,692 books as that which was read by the commission, then the 'many other' books referred to in *C. Tanta*, and from which nothing was extracted, can now be calculated as 1692 - 1528 = 164 books. While 1,692 books still falls well short of the nearly 2,000 mentioned by Justinian - though it should be emphasised that this figure was merely a guess by Tribonian during the preliminary investigation stage⁴² - it is still a suitably larger number than the 1,528 books which ended up in the *Digest*.

It may also be worth noting at this point that the actual number of books read by the commission, with their corresponding affect on the average excerpting rate figures calculated by Honoré, do not alter the previous argument that Honoré's findings, regarding the average excerpting rates of the six commissioners, are a direct result of Justinian's '5 percent compilation limit' plan. This is because I treated the actual excerpting rate figures of commissioners A-F as ratios.⁴³ One should also note that the division of 5 percent between the three committees in the ratio of 2:1 1/2:1 1/2 (as discussed above) would only produce a reduction to 5 percent of the original mass of texts if each committee were allocated the same number of books. This is because the Sabinian committee was excerpting at a third higher rate than both the Edictal and Papinian committees. The final distribution of excerpted books saw the Sabinian and Edictal committees with approximately equal numbers, and the Papinian committee with about 5/7th the average of the other two committees. This unequal distribution would then have required a certain fine tuning at the point where the final number of books allocated to each committee was established, in order that the total reduction of ancient legal writings was limited to just 5 percent of the original. No adjustment needed to be made for any unequal distribution of books between the two commissioners within each committee, since, as previously argued, they would each have been excerpting at the same initially defined rate.

We are now in a position to explain the sudden, and dramatic, collapse in the excerpting rate of commissioner E during the 118-book Appendix section (Groups XLI-

⁴¹ *Tribonian* 169.

⁴² *C. Tanta* 1.

⁴³ However, in order that the six commissioner's altered excerpting rates would still remain in the same relative proportions, one must assume that the 164 books, from which no extracts were taken, were proportionally distributed amongst the six subcommittees (in direct relation to the number of books they actually excerpted) for the purpose of fixing the overall excerpting rate of each committee, even though it was the Papinian committee which read the overwhelming majority of these books. Such a policy seems eminently reasonable, otherwise one would be introducing an unpredictable bias towards the committee which happened to have the larger number of books deemed not to contain any material of value. When this new calculation is done the revised figures become, in lpb: A (92.1), B (91.1); C (67.6), D (68.5); E (61.4), F (68.1); average of A + B = 91.6; average of C + D + F = 68.1; A + B as a percentage of C + D + F = 74.3 percent. This latter value is then just 0.7 percent below the figure of 75 percent that I calculated was the originally ordained theoretical relationship between the excerpting rates of the Edictal and Papinian masses as a percentage of the excerpting rate assigned to the Sabinian mass.

XLIII, and above). Commissioner E had been excerpting at an average rate of 77.78 lpb during the previous 143 1/2 books in the Papinian mass, but he excerpted an average of only 18.81 lpb for his allocation of 59 Appendix books; the relevant figures for Commissioner F in the main Papinian mass and in the Appendix are 69.41 and 61.83 lpb respectively.⁴⁴ The Appendix books were discovered sometime after the commission had started its work of excerpting.⁴⁵ It may be assumed that these books arrived from regional centres of learning outside of the immediate environs of Constantinople. It would have been completely inefficient and impractical to expect the provinces to deliver to the commission all the ancient legal books they possessed, before the commission had drawn up a list of those that were already available in Constantinople. Furthermore, it would not have been possible to know the final number of books which would make up the Appendix until the Papinian committee had finished excerpting the Papinian mass, and so have reached the cut-off date for a final calculation of the number of books from which the *Digest* would be composed, including those books from which no material was excerpted. Up until this date the commissioners could still have retained the preliminary notion that the commission would have had nearly 2,000 books from which to excerpt. Noting that the excerpting profile of all the commissioners began high (i.e. above their average excerpting rate) and finished low (i.e. below their average excerpting rate),⁴⁶ then it is clear that they must have 'borrowed' some lines during the early stage of excerpting, knowing that they would have had to repay the 'borrowed' lines during the later stage of excerpting. However, when the final number of *libri* became fixed at only 1,692 books - or whatever higher number, less than 2,000, we judge to have been the actual number read - then the number of books within which the 'borrowed' lines were to be repaid suddenly shrank, thereby requiring that the actual average excerpting rate for the books read, after the cut-off date, had to be even more sharply reduced than would have been the case had the commission had the full 2,000 books to distribute among the three committees.

Rather than all the commissioners sharing equally this necessary late cut in excerpting rates, the main burden would seem to have fallen disproportionately upon commissioner E, whose rate of excerpting in the Appendix fell so sharply and, consequently, whose overall excerpting rate was reduced from the average value of the other three commissioners in the Edictal and Papinian committees, of approximately 67 percent, to approximately 60 percent. This would equate to commissioner E having lost about 1,060 lines that he would otherwise have excerpted. These lines removed from commissioner E may have been required by the Sabinian and Edictal committees, and presumably because they could simply not restrict themselves to their proportionate line count without leaving out material from their later books that the commission deemed of greater importance. If this explanation is accepted - and it seems the only logical conclusion that I can think of - then it says two important things. Firstly, that Justinian's 5 percent compilation limit was strictly adhered to, otherwise commissioner E could have been allowed his initially allotted 67 percent excerpting rate, and without making even a 1 percent difference in the overall excerpting rate of the commission. Secondly, since it would clearly define two distinct bodies of text within the Papinian committee, it would help to substantiate Honoré's thesis that the excerpting work of each committee was further divided among subcommittees.

I previously proposed that the original allocation of excerpting rates was calculated on the basis that there were 2,000 books to be evenly distributed among the three committees. The allocation of excerpting rates to subcommittees A - F, in accordance with our

⁴⁴ *Tribonian*, 'Summary of Papinian mass' Table, 286.

⁴⁵ *Tribonian* 151.

⁴⁶ See *Tribonian*, 'Summary' Tables, 268, 278 and 286.

hypothesized ratio of 1:1:3/4:3/4:3/4:3/4, would have divided the available 450 (6 x 75) lines, per six book group, as follows: 90:90:67 1/2:67 1/2:67 1/2:67 1/2. When it eventuated that only 1,692 books (or thereabouts) were to be included in the *Digest*, it became necessary (in order to maintain the overall 5 percent compilation limit) to make the following minor adjustments from these provisional values, such that the average rate for C, D and F remained essentially the same at 67.25 lpb, the average rate for A and B increased from 90 to 91.85 lpb, and the value for E was reduced from 67.5 to 60.5 lpb. These figures are not meant to be taken as gospel, since clearly they would change according to which books, with their corresponding rates of excerpting, were allocated by Honoré to each of the six commissioners. However, the possibility that Honoré is far wrong in his division of books must be considered very low, for otherwise one would have to accept that he so happened to divide the *Digest* books between the respective subcommittees that, by chance alone, he achieved the actual figures for the excerpting rates of subcommittees A - F that are in such close agreement with the most logical theoretical figures derived from dividing Justinian's overall 5 percent figure between three committees, and six subcommittees. Nonetheless, one must test the possibility that his results were accidental, and that the excerpting rate was fixed not at the subcommittee, but rather at the committee, level.

To test the hypothesis that the excerpting rate was fixed at the subcommittee level, we need to calculate the probability that Honoré could have arrived at his figures for subcommittees A - F by chance alone. This argument obviously excludes the possibility that he had intentionally set out to achieve the excerpting rate figures which he did, or that he unintentionally arrived at those figures by virtue of some non-random aspect of his calculations. Any knowledgeable understanding of Honoré's compilation model would rule out the first possibility; and I have eliminated the second possibility in my statistical calculations (see Appendix 1 below). Considering the variability in excerpting rates between the individual books of the *Digest*, and within and between the group excerpting rates, as found by Honoré, then common sense would indicate a high improbability that the average excerpting rates for A (91.10) and B (92.60) would have deviated by such a small amount from their mean value (of 91.85) by chance alone; or that the values for C (66.82) and D (67.68) would have deviated by such a small amount from their mean value (of 67.25) by chance alone. The situation with the Papinian mass is somewhat different, since, according to previous argument, the different rates of approximately 60 and 67 lpb were deliberately chosen for commissioners E and F, at a late stage of the *Digest* project, in order that the overall rate of reduction would be precisely five percent. Therefore, we cannot argue the 'null hypothesis' that the actual values for E (60.60) and F (67.24) occurred by chance alone. The results found, in Appendix 1 (below), demonstrate that the probability that the figures for subcommittees A and B occurred by chance alone is 6.78 percent, and that for subcommittees C and D the probability is 3.59 percent. Therefore, for just these four subcommittees, the probability that Honoré's figures could have occurred by chance alone is: 6.78% x 3.59% = 0.24%, or less than 1 in 400.

CRITICISMS OF HONORÉ'S 'COMPILATION MODEL'

I referred above to the important paper by Osler, whose findings, if substantiated, would cast considerable doubt on Honoré's theory regarding the compilation of the *Digest*, especially as it relates to the division of each of the three committees into subcommittees, and with each subcommittee responsible for excerpting a specific body of work. Osler argues that if Honoré's division of works between the subcommittees can be shown to be contradictory, and/or internally inconsistent, then the numerical foundation of his theory must be considered

invalid.⁴⁷ It will prove instructive to closely examine the specific criticisms made by Osler, since his main findings can be shown to actually support Honoré's division of texts among the six subcommittees, but only when understood in terms of Justinian's '5 percent compilation limit' plan. Osler's analysis is carried out in two stages: firstly, dealing with works excerpted jointly; and secondly, with works excerpted successively. This division of texts according to 'excerpting type' appears in Bluhme's list, and is central to the methodology employed by Honoré to argue the merits of his model.

A) *Joint Excerpting*

In Bluhme's list, the majority of classical works follow one another in succession. However, with longer works, such as the commentaries on the Edict and the *ius civile*, they were generally first divided into sections, and it was these sections, rather than the work as a whole, which were read successively.⁴⁸ According to Honoré's theory the two commissioners within each committee worked simultaneously on these different sections, with the 1st Commissioner responsible for the odd-numbered sections and the 2nd Commissioner responsible for the even-numbered sections - i.e. they excerpted the works jointly. Furthermore, this division of labour between the two commissioners is said to be identifiable by means of two distinct 'styles' of excerpting that correspond to the odd and even-numbered sections. Osler lists the four indicia used by Honoré to distinguish between the styles of the two commissioners, according to whether they excerpted the odd or even-numbered sections, as follows: 1) the rate at which each commissioner worked; 2) the length of extracts made by him; 3) his preference for one type of subject-matter over another; and 4) his preference for one author over another.⁴⁹ Let us now examine Osler's critique of each of these four indicia in turn.

1) The rate at which each commissioner worked.

Osler is initially somewhat confused about precisely what Honoré means by the rate at which each commissioner worked, but he finally settles on the speed at which books were read by each of the commissioners.⁵⁰ He next presents a table of works excerpted jointly, detailing the number of books read in Honoré's odd-numbered (A and C) and even-numbered (B and D) sections, in both the Sabinian and Edictal masses.⁵¹

| | | |
|---------------------------|------------|------------|
| Sabinian mass: Group I | A 68 1/2 | B 33 1/2 |
| II | A 36 1/2 | B 28 1/2 |
| VI | A 30 | B 9 |
| VII | A 8 | B 3 |
| XIV | <u>A 4</u> | <u>B 4</u> |
| Total | 147 | 78 |
| Edictal mass: Group XVIII | C 38 2/3 | D 25 1/12 |
| XIX | C 50 1/12 | D 34 1/6 |

⁴⁷ Osler (n.12 above) 184.

⁴⁸ Osler 135.

⁴⁹ Osler 137.

⁵⁰ Osler 138.

⁵¹ Osler 139. The Papinian mass is not included since it contains only one case of joint excerpting (Group XXXII), *ibid.* n. 31.

| | | | |
|-------|------|-------------|-------------|
| | XXI | C 36 | D 34 |
| | XXVI | <u>C 39</u> | <u>D 31</u> |
| Total | | 163 3/4 | 124 1/4 |

With just one exception - Group XIV, where the same number of books was read - the odd-numbered sections contain more books than the even-numbered sections. Osler argues that these figures would mean that the commissioners responsible for the odd and even-numbered sections were working at quite different rates, and that this would appear incompatible with Honoré's claim that, in works excerpted successively, 'the compilers went to very great lengths to distribute an exactly equal number of *libri* between the two commissioners.'⁵² Honoré has countered this difficulty by suggesting that this difference in reading rates was, 'in order to expedite the work and perhaps because the assistants [i.e. the barristers] were available only irregularly...'⁵³ Although this explanation does indeed seem implausible,⁵⁴ one is still forced to recognise the consistent pattern of the odd-numbered sections having more books than the even-numbered sections within each of Honoré's groups. If we ignore Group XIV, where commissioners A and B read just four books each, then the probability of such a consistent pattern occurring by chance alone is an unlikely 1 in 128.

This consistent pattern of there being more books assigned to the even-numbered, as compared to the odd-numbered, sections is clearly not an outcome that Honoré would have favoured, as it is quite contrary to the logical conclusions derived from his timetable model, thereby requiring that he must make certain ad hoc and improbable suggestions to account for this pattern. However, once Honoré's timetable model is rejected, then there is absolutely no reason to assume that during joint excerpting the odd and even-numbered sections were allocated exactly equal numbers of books. With both commissioners within each of the Sabinian and Edictal committees excerpting at the same predetermined rate (as previously argued), it made absolutely no difference which of the two committee members excerpted which book, or how many books, provided that the committee maintained its overall reading timetable. This was clearly advantageous, as it meant that during joint excerpting the work could continue apace, even when one of the commissioners was absent. Indeed, the consistently unequal distribution of books found above would strongly suggest that this pattern was not accidental, and that it reflected outside commitments of commissioners B and D, of the Sabinian and Edictal committees respectively, during the joint excerpting phase.⁵⁵

2) The length of extracts made by a commissioner.

Osler notes the considerable variation in the average group excerpting rates (for the three masses) between the odd and even-numbered commissioners, and he underlines the commissioner within each group who excerpts the most, claiming that no consistent pattern emerges: in the Sabinian mass, A excerpts more lines than B in 7 groups out of 17; in the Edictal mass, C excerpts more lines than D in 7 groups out of 13; and in the Papinian mass, E excerpts more lines than F in 7 groups out of 13.⁵⁶ This is said to be evidence contradicting Honoré's 'hypothesis of a single Commissioner responsible for the odd and even-numbered sections respectively.'⁵⁷ However, once again, when the timetable model is rejected, these

⁵² Osler 139.

⁵³ Honoré and Rodger (n.9 above) 249.

⁵⁴ Osler (n.12 above) 140, 141 and n.35.

⁵⁵ See section 'IDENTIFICATION OF COMMISSIONERS', below.

⁵⁶ Osler (n.12 above) 145.

⁵⁷ Osler 142, 145.

figures are exactly what one would expect from the two commissioners within each committee, as it demonstrates a consistent pattern, in line with our hypothesis that the commissioners were excerpting to a fixed and equal rate (albeit approximate in the case of E and F). In order that the two commissioners should arrive at the same average excerpting rate for their particular mass, it follows that their respective group rates must oscillate about the mean excerpting rate for that committee, so that each commissioner would approximately share the high and low excerpting rate values with his colleague. Of course, this theoretical situation would vary slightly depending upon how many books are assigned to each group, but nonetheless should be approximately correct, as Honoré's figures testify.

3) The preference for one type of subject-matter over another.

This stylistic characteristic is totally subsidiary to indicia 1 and 2 above, and is only used by Honoré to try to identify the personalities of the two commissioners within each committee.⁵⁸ Therefore, whether the two commissioners within each committee favoured one type of subject-matter over another is not significant in testing Honoré's central thesis.

4) The preference for one author over another.

This stylistic characteristic would appear to have been the catalyst for Honoré to devise his theory that the excerpting process was carried out at the subcommittee, rather than the committee, level.⁵⁹ And, of course, there is every reason to imagine, other factors being equal, that individual commissioners would have had a preference for some ancient authors over others. However, the difficulty in establishing a statistically significant pattern of preference for one author over another is that, unlike with Honoré's timetable model, the commissioners were, in fact, not always at liberty to choose their preferred authors. Rather, they had to conform to an overall fixed excerpting rate, which would have put severe constraints on precisely which authors, and which subject-matter, each commissioner deemed worthy of inclusion in the *Digest*.

B) *Successive Excerpting*

The second stage of Osler's critique deals with works excerpted successively, and in particular Honoré's division of the Bluhme list into groups each 'consisting of two "Lots" which contain an equal number of *libri*'.⁶⁰ As an example to demonstrate this concept let us examine Groups III, IV and V, which are placed between Groups II and VI (excerpted jointly) and which therefore may be treated as a self-contained sequence.⁶¹

The works are:

| | | | |
|-----------|--------|---------------------------|------------------|
| Group III | A 10 | Ulp. 10 <i>disp.</i> | |
| | B 11 | Ulp. 10 <i>omn. trib.</i> | |
| IV | A 12 | Ulp. 6 <i>op.</i> | |
| | B 13 | Ulp. 6 <i>cens.</i> | |
| V | A 14 a | Iul. <i>dig.</i> 1-62 | Total = 62 books |

⁵⁸ Osler 145.

⁵⁹ *Tribonian* 153.

⁶⁰ Osler (n.12 above) 153.

⁶¹ For a discussion of the group selection criteria, see Honoré and Rodger (n.9 above) 251, 263-264. I have included in this example the subcommittee identification, A and B, and the BK Ordo. Number, 10-20.

| | | |
|---|---|------------------|
| B 14 b Iul. <i>dig.</i> 63-90 | } | |
| 15 Alf. <i>var.</i> 7 <i>dig. epit.</i> | } | |
| 16 Paul 8 <i>epit.</i> Alf. <i>dig.</i> | } | |
| 17 Iul. 1 <i>ambig.</i> | } | Total = 63 books |
| 18 Iul. 4 Urs. <i>Feroc.</i> | } | |
| 19 Iul. 6 <i>Minic.</i> | } | |
| 20 Africanus 9 <i>quaest.</i> | } | |

Groups III and IV are each composed of two distinct sections which can readily produce an equal division of texts (of 10 + 6 books each). The ‘split’ between Iul. *dig.* 62 and Iul. *dig.* 63 was made by Honoré because he noticed a dramatic drop in the excerpting rate profile of the books at this point. The first 62 books average 49.2 lpb while the last 28 average only 11.54 lpb; and, furthermore, the sudden ‘collapse’ in excerpting rate at book 62 appears extremely pronounced.⁶² If this characteristic split could be shown to be significantly representative of distinct excerpting practices, then the neat division of Group V into two almost equal sections, together with the numerical equality of Groups III and IV, would considerably advance Honoré’s theoretical model of lots containing an equal number of books, and would thus support the broad outlines of his distribution of the *Digest* mass between subcommittees. Osler maintains that unless the various explanations Honoré offers for determining where the commencement and ending of a group must fall are irrefutable, then ‘the numerical basis of the theory will be undermined’.⁶³ Osler’s criticism of these ‘explanations’ is presented under three headings: 1) Bluhme’s Split Works; 2) Divided Works; and 3) Sandwich Groups.⁶⁴

1) Bluhme’s Split Works.

Osler argues that the equal division of works into groups, as envisaged by Honoré, could be similarly arranged into other groups made up of different collections of books; and he particularly finds fault with the collapse argument used by Honoré to make his division between sections and between groups. Osler first demonstrates, as an example, that the texts in the Sabinian mass numbered 32-63 in the Bluhme list may be divided into various alternative sections to those proposed by Honoré, and he further infers that constructing such alternative sections could be extended to many more of Honoré’s group divisions. However, he adds that this in itself would not necessarily refute Honoré’s division into groups, simply that it is ‘sufficient to demonstrate that no argument whatsoever proceeds from the numerical division alone.’⁶⁵ I previously argued that each commissioner within both the Sabinian and Edictal committees was expected to excerpt at precisely the same rate as his colleague. The fact that Honoré’s average excerpting rate figures for the two commissioners within both these committees is not quite equal would then offer the opportunity to fine-tune Honoré’s groups so as to bring the rates even closer together. In this context, Osler’s suggested alternate groups might have some validity.

2) Divided Works.

Osler is here concerned with the type of division discussed above in relation to Iulianus *digesta*, where a split occurs at books 62/63. Honoré has cited this same

⁶² *Tribonian* 162.

⁶³ Osler (n.12 above) 161.

⁶⁴ Osler 163-169, 170-177 and 177-184 respectively.

⁶⁵ Osler 161.

phenomenon in relation to Papinian's *quaestiones* and Scaevola's *Digesta*.⁶⁶ The essence of his argument is that these three large works were split 'at a point determined not for any reason of subject-matter but in order to make up an appropriate even number of books.'⁶⁷ However, Osler has revealed that this phenomenon of a collapse in excerpting rate is not restricted to the three cases quoted above, but 'in fact is universally maintained in this... genre of Roman "problematical" juristic literature, casuistic works with such titles as *Quaestiones* and *Responsa*, and including also the works called *Digesta*'.⁶⁸ There are two sections to these works, a larger one that follows the order of the Praetor's Edict, followed by a shorter section dealing with *leges*, *senatus consulta*, and imperial *constitutiones*. Osler continues: 'if we investigate these works by counting lines extracted per book by the *Digest* compilers, we find that the universal rule is that very much less material is taken from the books in the "statutory" section'.⁶⁹

The first point to be made here is that in Honoré's three examples (Table 1, nos. 1-3, below) the division of works to make up lots of an equal number of books is completely contained within these individual groups. Therefore, even if one were not to accept Honoré's hypothesis as to why the sudden and dramatic decline in excerpting rate occurred in these three works, we must still seek an explanation as to why it occurred at just those particular points. That the collapse should have occurred by chance alone, and yet somehow have managed to make up lots containing an equal number of books, seems improbable. And this would apply equally well whether Osler's argument concerning the Edictal and statutory sections is valid or not. Osler does not deny this dramatic fall in excerpting rate, rather he stresses that it is incompatible with Honoré's timetable model,⁷⁰ and rightly so. Turning to Table 1, let us first deal with Honoré's three examples.

- 1) In Papinian's *Quaestiones* the Edictal section comprises books 1-28 and the statutory section books 29-37, and Honoré introduces his split between books 29 and 30.⁷¹ Using Honoré's criterion, books 24-29 average 124.7 lpb and books 30-35 only 15.7 lpb. Using Osler's criterion, the Edictal books 23-28 average 115.5 lpb and the statutory section 39 lpb. However, there is now no longer the obvious collapse in excerpting rate, since the statutory section begins with book 29 that has a value of 162 lines.
- 2) In Julian's *Digesta* the Edictal section comprises books 1-58 and the statutory section books 59-90, and Honoré introduces his split between books 62 and 63.⁷² Using Honoré's criterion, books 57-62 average 60 lpb and books 63-68 only 11.7 lpb. Using

⁶⁶ Honoré and Rodger (n.9 above) 262 and 265 respectively.

⁶⁷ Honoré and Rodger 262.

⁶⁸ Osler (n.12 above) 174.

⁶⁹ Osler 175.

⁷⁰ Osler 171-72.

⁷¹ Osler 176, n.100. In order to measure the degree of collapse in the excerpting rate, using both Honoré and Osler's criteria, I have calculated the average excerpting rates for the six books either side of the split. This is clearly an arbitrary number of books but is, nonetheless, superior to the methods used by both Honoré and Osler for two reasons. Firstly, as can be seen from Table 1, there are a variable number of books included in their calculations, which undermines the statistical consistency required in this sort of comparison. Secondly, the greater the number of books either side of the split which are included in the calculation of average excerpting rate, then the less we focus on the actual change in excerpting rate which occurs at the split, and the more our calculation will be affected by the long term downward trends in excerpting rates which are evident within, and between, groups. See *Tribonian*, Appendix One.

⁷² Osler 177, n.101.

Osler's criterion, the Edictal books 53-58 average 52.7 lpb and the statutory books average 57.3 lpb, so that there is little change in the excerpting rate. However, once again, there is now no obvious collapse in excerpting rate, since the statutory section begins with books 59-62 (having values of 28, 79, 97 and 97 lines respectively).

- 3) In Scaevola's *Digesta* the Edictal section comprises books 1-29 and the statutory section books 30-40, and Honoré introduces his split precisely between books 29 and 30.⁷³ However, in this case, Honoré makes up his two lots of equal numbers of books by combining section (i), books 1-13, with section (iii), books 30-40, and section (ii), books 14-29, with section (iv), Lab. 8 Paul *epit.* As previously detailed (above), there is not only a dramatic collapse in excerpting rate between sections (ii) and (iii) but also an even greater increase in excerpting rate between sections (i) and (ii). Books 8-13 average 21.5 lpb and books 14-19 average 180.8 lpb, a ratio of 1:8.4. Books 24-29 average 82.2 lpb and books 30-35 average only 13.8 lpb, a ratio of 6:1. Since the Edictal material comprises sections (i) and (ii), the dramatic increase between these two sections would seem inexplicable in terms of Osler's argument.

We continue by quantifying the collapse in excerpting rates evident in Osler's seven examples (See Table 1, nos. 4-10, below). There is no requirement here for a break according to Honoré's theory of a change of commissioner, since these works are either in groups jointly digested or in groups of two equal lots of undivided works.⁷⁴

- 4) In Papinian's *Responsa*, books 8-13 average 208.8 lpb and books 14-19 average 40.7 lpb.
 5) In Paul's *Quaestiones*, books 11-16 average 82.7 lpb and books 17-22 average 30 lpb.
 6) In Paul's *Responsa*, books 10-15 average 86.8 lpb and books 16-21 average 19.7 lpb.
 7) In Scaevola's *Quaestiones*, books 8-13 average 19.5 lpb and books 14-19 average 8.7 lpb.
 8) In Modestinus's *Responsa*, books 8-13 average 64.5 lpb and books 14-19 average 9.3 lpb.
 9) In Marcellus' *Digesta*, books 16-21 average 40.2 lpb and books 22-27 average 19.3 lpb.
 10) In the Celsus *Digesta*, books 22-27 average 31.5 lpb and books 28-33 average 9.8 lpb.

We can now simply add together the figures just calculated for Honoré's criterion (nos. 1-3) and for Osler's criterion (nos. 1-10), and compare the relative average collapse.

For Honoré's criterion the collapse ratio is: $(124.7 + 60 + 82.2):(15.7 + 11.1 + 13.8)$
 $= 266.9:41.2 = 6.5:1$

For Osler's criterion the collapse ratio is:

$(115.5 + 52.7 + 82.2 + 208.8 + 82.7 + 86.8 + 19.5 + 65.5 + 40.2 + 31.5):$
 $(39 + 57.3 + 13.8 + 40.7 + 30 + 19.7 + 8.7 + 9.3 + 19.3 + 9.8)$
 $= 784.4:247.6 = 3.2:1$ ⁷⁵

⁷³ Osler 176, n.99.

⁷⁴ Osler 177.

⁷⁵ Admittedly this is not precisely the basis upon which Osler made his criticism of Honoré's hypothesis. In that case, Osler calculated the separate excerpting rate collapse within each of the works (nos. 1-10) and not as I am doing by taking the average value for all the works. However, the method I have adopted is completely acceptable because I previously showed that each committee is excerpting to a fixed average rate per book, so

Therefore, despite the collapse in excerpting rate due to Osler's hypothesis - that very much less material is taken from books in the statutory sections as compared to the Edictal sections - there is still a significant residual collapse (in the ratio of approximately 2:1) consistent with Honoré's hypothesis, i.e. that the division of works was made in order to create equal lots to be excerpted at the subcommittee level. Furthermore, Osler's hypothesis does nothing to explain the dramatic collapse in excerpting rates noted above in Honoré's examples. And, if Honoré's hypothesis can be shown to be highly probable for these three examples, then his argument for their having been two commissioners working independently within each committee is similarly enhanced.

3) Sandwich Groups.

Osler's principal criticism of this category of division of works into equal lots is that it 'again rests upon [Honoré's] assumption that the rate of excerpting indicates the speed at which a Commissioner was working.'⁷⁶ In the remaining pages of his article, Osler then goes on to show that such an assumption is inconsistent with the total group evidence. However, this legitimate refutation of Honoré's compilation assumption does not mean that his division of works into equal lots is any less valid. I previously argued in relation to 'Joint Excerpting' that the evidence, while inconsistent with Honoré's timetable model, was, in fact, totally consistent with the two independent commissioners within each committee having excerpted to an equal and predetermined average excerpting rate. This same excerpting rate characteristic is found in the group examples that Osler uses to refute Honoré's timetable model. In the five groups he discusses in detail, Osler argues that, according to Honoré's assumption, the number of lines excerpted by the 2nd Commissioner within each group should always exceed those of the 1st Commissioner, a position which he then demonstrates not to be the case.⁷⁷ Yet, despite the great variability found in the ratio of the excerpting rates between the 1st and 2nd commissioner - measuring as much as 6.4:1 for Group XLI and as little as 1.1:1 for Group XX - the total average excerpting rate ratio between the 1st and 2nd commissioner for all five groups almost reaches parity at 1.3:1. And this close proximity in the average excerpting rate for the two commissioners, over this significant body of works, is precisely what our hypothesis, of a fixed excerpting rate for each committee, would clearly predict.

In conclusion, Osler's paper fails to disprove Honoré's principal discovery that the excerpting phase of the *Digest's* compilation was carried out at the subcommittee, rather than the committee, level. However, he does succeed in pointing out many logical inconsistencies in Honoré's timetable model. Concerning the criteria used by Honoré to compose his groups, Osler fails to explain the statistically improbable event that in groups excerpted jointly the odd-numbered sections consistently contained more *libri* than the even-numbered sections. As regards the other clearly quantifiable criterion - that is, the sudden and dramatic collapse in the excerpting rates in 'Divided Works' which were split to form groups of an equal number of *libri* - Osler, having discovered half a truth, namely that the statutory sections contain significantly less material than the Edictal sections, failed to exhaust his enquiry,

that the excerpting rates within each work are inextricably linked. However, even when we calculate the average rate for the individual works, as carried out by Osler, produce a sum-total, and finally calculate the average of that value, then the difference is not great. The respective ratio for Honoré's hypothesis becomes 6.3:1 and for Osler's hypothesis 3.5:1.

⁷⁶ Osler (n.12 above) 179.

⁷⁷ Osler 181. The groups examined are XLI, XXIV, XIII, XX and XXXVI, *ibid.* 179-83.

which would have shown that there still remained a significant residual effect consistent with Honoré's proposal that the 'Divided Works' were excerpted by separate individuals.

Justinian wrote, in *Deo auctore*, that, 'we have found the whole extent of our laws which has come down from the foundation of the city of Rome ... to be so confused that it extends to an inordinate length and is beyond the comprehension of any human nature'.⁷⁸ The problem with the existing body of Roman law was therefore its great size and unwieldy disposition, requiring that the commission find a solution that would make it ordered and manageable. In this regard, Honoré's timetable plan would have been very risky, as it would have handed over complete responsibility for the excerpting process to the six commissioners, with all their individual traits and preferences. The most competent and conscientious of the commissioners would certainly have been more judicious in their excerpting than the less competent and less conscientious members, which in itself would have been a major flaw in the *Digest* plan's design. On the other hand, Justinian's '5 percent compilation limit' plan was conceptually brilliant: it combined great simplicity with complete control over the whole *Digest* project; it decided the number of committees, and that each committee would have two commissioners excerpting independently of each other; it established the relative importance of the Sabinian mass over the Edictal and Papinian masses; and it predetermined the precise volume of the finished work.

THE *DIGEST* TIMETABLE

We learn from *Deo auctore* (15 December 530) that Justinian had by this date already assembled in his palace in Constantinople the six commissioners, as well as the barristers, who were to work on the compilation of the *Digest*.⁷⁹ This date would then seem the most appropriate to begin the excerpting phase. That the Appendix mass had not arrived by this date⁸⁰ is unimportant, since I previously argued that the initial excerpting rates assigned to each of the three committees was based upon the provisional belief that the ancient legal texts amounted to some 2,000 *libri*. When the *Digest* was completed Justinian gave instructions to Tribonian, Dorotheus and Theophilus to prepare a new student's textbook, the *Institutes*. This work is known to have been finished by 21 November 533.⁸¹ The excerpting and editing of both these works was then completed in just less than three years.

I calculated above that the minimum number of *libri* read by the commission was 1,692, though one cannot exclude the possibility that the maximum number read might have amounted to a few more. Furthermore, these *libri* were surely evenly distributed among the three committees, even though the Papinian committee contributed only 409 books from its allocation to the *Digest*, the rest being deemed to contain nothing of value. Each committee would therefore have been expected to read 564 books. Since the editing phase could not begin until the excerpting phase had finished, an equal distribution of books among the three committees must surely mean two things. Firstly, that the committees were intended to read their allotted books at the same rate. And secondly, that all three committees were meant to finish their excerpting phase at approximately the same time (as previously discussed). The only plausible rate at which the commission could have read the *Digest libri* was at an

⁷⁸ C. *Deo auctore* 1.

⁷⁹ C. *Deo auctore* 3.

⁸⁰ Tribonian 151.

⁸¹ C. *Imperatoriam* 3, in J.A.C. Thomas (trans.), *The Institutes of Justinian: text, translation, and commentary*, Amsterdam, 1975, 1.

average of one book per day per committee, since the alternatives are either impossible or highly improbable. At half a book per day per committee, and even using the lowest figure of 564 books, then even the excerpting phase of the *Digest* could not have been completed in three years. At two books per day, that is, one book per commissioner per day, and even using the highest possible figure of 667 (2000/3) books, then the excerpting phase would have been completed in a little over a year. This is clearly too short a time frame, as it would have left over one and a half years for the editing phase. Considering the projected duration of the *Digest* project, it seems unreasonable (at least to the modern observer) to imagine that the commissioners were expected to work seven days per week, so let us assume that their Sabbath was a day of rest and prayer. To have been expected to work six days per week but to excerpt seven books per week⁸² has little conceptual attractiveness. If we proceed upon the basis that each commissioner excerpted an average of three books per week, then the excerpting phase would have taken 94 (564/6) weeks, or 1 year 10 months. The excerpting stage therefore finished about the middle of October 532, 22 months on from 15 December 530.

At the editing stage, the Commission brought together the excerpted texts from the three masses to compile the 50 books of the *Digest*. Honoré argues that the *Digest* book rather than the *Digest* title was used as the editorial unit, and that books 30-32 formed a single unit for editorial purposes.⁸³ If we accept that each committee had to submit a draft of two books per month,⁸⁴ that is, one book per commissioner per month, then the drafting phase took 8 (48/6) months for each commissioner to complete drafting his section of the *Digest*. The editing was therefore finished about the middle of June 533, leaving 5 months for the *Institutes* project to be completed. At an editing rate of half a book per commissioner per month, the *Digest* could not have been completed in time, and at a rate of two books per commissioner per month, the *Institutes* would be allocated far too long a period compared to the much larger *Digest* project.

Was 5 months sufficient time to execute the *Institutes* project? Although there is little dispute over how many commissioners compiled the *Digest*, the situation is not so clear as regards the *Institutes*. Three commissioners, Tribonian, Dorotheus and Theophilus were cited in *C. Imperatoriam* as members of the *Institutes*' subcommittee, but Huschke argued that only Dorotheus and Theophilus took part in the drafting, with Tribonian playing a supervisory role.⁸⁵ However, Justinian had commanded the commission to bring the *Digest* 'to a satisfactory end as speedily as possible...'⁸⁶ Subsequently, in *C. Tanta* (16 December 533), it is written that, 'in hastening to issue these laws in our third consulship we have done well...'.⁸⁷ Bearing in mind this stated need for (responsible) speed in the commission's work, one must agree with Honoré that Tribonian could not simply have confined himself to a supervisory role.⁸⁸ And yet the argument in favour of an equal division of books, that is, 4 books divided between 2 commissioners, is totally in accordance with what we already know of the practice devised for the compilation of the *Digest*.

How then to best resolve a situation that at first sight appears contradictory? Let us suppose that Theophilus and Dorotheus simply excerpted the first two books, in like manner

⁸² *Tribonian* 172.

⁸³ Honoré, 'The editing of the *Digest* titles' (n.9 above) 274.

⁸⁴ *Tribonian* 185.

⁸⁵ Cited in *Tribonian* 189.

⁸⁶ *C. Deo auctore* 14.

⁸⁷ *C. Tanta* 23.

⁸⁸ *Tribonian* 190.

to the practice adopted during the excerpting phase of the *Digest* project. Books 1 and 2 were then handed over to Tribonian for editing. The inclusion of references to Justinian's legislation was made at this stage.⁸⁹ With the editing of the *Digest* just completed, Tribonian would no doubt still have had some organizational tasks to supervise while Theophilus and Dorotheus excerpted the first two books, such as, consulting with Justinian over any last minute changes required to the *Digest*, and preparing copies for subsequent distribution once it had been authorised by the emperor. A different situation would have arisen following the excerpting stage for books 3 and 4, because now there are three commissioners (assuming Tribonian had finished the editing of books 1 and 2 by this point) who are available to edit two books. As the most senior member, Tribonian must surely have delegated this work to his junior colleagues, since, even if he chose to edit one of the books himself, he certainly would not have delayed the editing of the second book while two eminent commissioners stood idly by.

What evidence is there for this proposal? Huschke argued that there is a difference in style between, on the one hand, books 1 and 2 and, on the other, books 3 and 4; stylistic differences which he attributed to Dorotheus and Theophilus respectively.⁹⁰ In addition, he argued that: three passages in book 2 ascribe to Tribonian the credit for proposing certain of Justinian's legislative reforms, but that such references do not occur in books 3 and 4; and that a number of passages contain references to earlier or later parts of the text, but always within the half in which the reference occurs.⁹¹ Of these passages there are six references dealing exclusively with books 1 and 2, and two of these (i.e. 33 percent) involve cross-references between books 1 and 2, which is consistent with one person having edited both books. However, of the fourteen passages cited in the second half, all but two (i.e. 14 percent) - *Inst.* 4.13.2 and *Inst.* 4.1. pr. - remain within their respective books, which statistically speaking should indicate a greater probability that these two books were independently edited. Another argument used by Huschke was to cite references in books 3 and 4 that indicate that the editor was unaware of what had been said in books 1 and 2.⁹² All these arguments are consistent with the two halves of the *Institutes* having been the responsibility of different editors, though not quite as Huschke imagined.

As regards constructing the timetable for the *Institutes*, we can be guided by another finding of Huschke, namely that *Inst.* 4.18 was an addendum to a draft which originally stopped at *Inst.* 4.17, and was probably by the same author as edited books 1 and 2.⁹³ This would then signal another contribution of Tribonian. Let us assume that the commissioners were as industrious during the *Institutes* as they had been during the *Digest*, where each book required 1 month to edit, and where the average time to excerpt the *libri* for each of the 48 books was 22 months divided by 8 books per commissioner, which equals approximately 2 1/2 months per book per commissioner. However, instead of the 1,692 *libri* read for the *Digest*, the *Institutes* used only a handful of *libri*, primarily the *Institutes* and *res cottidianae* of Gaius, as well as the *Institutes* of Marcian, Florentinus and Ulpian, and perhaps those of Paulus, plus several references to Justinian's own legislation.⁹⁴ One can then reasonably suggest that instead of 2 1/2 months to excerpt the *libri* for each book of the *Institutes*, a figure of 1 1/2 months per book seems more realistic as a hypothetical starting point. The

⁸⁹ Tribonian 189.

⁹⁰ Cited in Tribonian 189.

⁹¹ Cited in Tribonian 204, 205.

⁹² Cited in Tribonian 206-07.

⁹³ Cited in Tribonian 200.

⁹⁴ H.F. Jolowicz, *Historical introduction to the study of Roman law*, Cambridge, 1932, 498-99.

excerpting of books 1 and 2 would then have taken 1 1/2 months for Theophilus and Dorotheus to complete, at which time they were passed over to Tribonian who required a further 2 (2 x 1) months to edit them. Upon completion of excerpting books 1 and 2, Theophilus and Dorotheus immediately started excerpting books 3 and 4, which were finished 1/2 a month before Tribonian had completed editing books 1 and 2. These two commissioners then proceeded to edit books 3 and 4, which would have been completed 1 month later, and 1/2 a month after Tribonian had finished editing books 1 and 2. This 1/2-month period would have allowed Tribonian time to compose *Inst.* 4.18 for inclusion in book 4, before the two books were presented to Justinian for approval. Might not Tribonian have excerpted books 1 and 2, while, at the same time, Theophilus and Dorotheus excerpted books 3 and 4? Were this to have been the case then Tribonian would have finished excerpting and editing books 1 and 2 after 3 1/2 months. Meanwhile, Theophilus and Dorotheus would have required only 2 1/2 months to excerpt and edit books 3 and 4. For Tribonian to have written the last title of the *Institutes* (4.18) would then have incurred an even longer delay in presenting the finished work to Justinian, which is clearly less attractive an alternative than Tribonian having written 4.18 while he waited for Theophilus and Dorotheus to finish editing books 3 and 4. That 4.18 may have been an afterthought is suggested by the fact that 1.1.4 seems to have been added onto the end of the first draft of title 1.1 so as to link up with 4.18.⁹⁵

The *Institutes* project would then have taken 4 months to complete, ending about the middle of October. Justinian makes clear that once this stage was finished, he received and scrutinized the work.⁹⁶ This task could have been carried out during the 1 month remaining until the promulgation of *C. Imperatoriam* on 21 November 533. A total period of 6 months would have elapsed between finishing the editing phase of the Digest in mid-June and the promulgation of *C. Tanta* on 16 December 533. One may imagine that this was sufficient time for Justinian to scrutinise the completed *Digest*, and to allow time for it to be copied.

The above arguments lead to the following timetable:

| | |
|-----------------------|---|
| 15 December 530 | <i>Deo auctore</i> promulgated and <i>Digest</i> excerpting phase begun |
| Middle of October 532 | Excerpting phase finished and drafting phase begun |
| Middle of June 533 | <i>Digest</i> draft finished and <i>Institutes</i> project begun |
| Middle of October 533 | <i>Institutes</i> draft finished |
| 21 November 533 | <i>C. Imperatoriam</i> promulgated |
| 16 December 533 | <i>C. Tanta</i> promulgated |

IDENTIFICATION OF COMMISSIONERS

The precision of Justinian's '5 percent compilation limit' plan even allows us to assign, with a good degree of confidence, each of the six named commissioners to their appropriate subcommittees. The relative weighting given to the Sabinian mass, as regards its superior excerpting rate, must mean that it was considered the most important of the three masses. It therefore surely follows that Tribonian was chairman of this committee. When I previously discussed 'Joint Excerpting', it was seen that more books were consistently assigned to the even-numbered, as compared to the odd-numbered, sections in both the Sabinian and Edictal committees. On the other hand, the two commissioners in the Papinian committee excerpted almost precisely the same number of books. To my mind, the most plausible explanation for

⁹⁵ Tribonian 200.

⁹⁶ *C. Tanta* 11.

this relative excerpting-rate profile is that the odd-numbered commissioners in the Sabinian and Edictal committees, B and D, were Tribonian and Constantinus respectively. I believe that this unequal distribution of books was deliberate, and that it reflected outside commitments of Tribonian and Constantinus during the joint excerpting phase.

If there were one historical event which must surely have had an impact on the commission's work then it would undoubtedly be the Nika riots, which began about the middle of January 532.⁹⁷ This date would have been 13 months after the commission began its work in mid-December 530. According to the above-argued timetable, this would equate to one 13/22nd of the total time taken during the excerpting phase, and which translates in the Sabinian committee (which excerpted from a total of 546 books) to about book 323 (i.e. $13/22 \times 546$). Note then that Group VI of the Sabinian committee began with book 326. The two previous groups (IV and V), totalling 137 books, had shared the work equally between commissioners A and B. Then, in Group VI A read 30 books to B's 9, and in Group VII A read 8 books to B's 3. During the remaining groups belonging to the Sabinian committee, A and B again shared equally the books to be read. Combining the 50 books in Groups VI and VII, A read 3.2 times the number of books read by B. At an average of 6 books per week per committee (see above), the reading of these two groups would have lasted almost two months, that is, from mid-January to mid-March 532. In the previous two groups excerpted jointly (I and II), the respective ratios of books read by A to those read by B, are 2.0:1 and 1.3:1. Therefore, even in comparison to these other two cases of joint excerpting, Groups VI and VII are quite anomalous. And they are even more anomalous when compared to the groups excerpted jointly in the Edictal committee, where the highest ratio of books read by C compared to those read by D is only 1.5:1 (in Groups XVIII and XIX). In light of this combined evidence – namely: 1) that we can independently argue that Tribonian must surely have been the senior commissioner on the Sabinian committee; 2) that there is such a dramatic difference in the reading rates of commissioners A and B in Groups VI and VII; and 3) that such a close chronological synchronism has been achieved between the beginning of the Nika riots and our calculated date for beginning reading Group VI - I strongly believe that Tribonian was intimately involved in the political and legal ramifications associated with the Nika riots and its aftermath. This finding might seem counter-intuitive, since Tribonian is known to have lost his position as quaestor only a few days after the Nika riots began, though he retained his position as chairman of the *Digest* commission and he continued to be a very valued official in Justinian's court.⁹⁸ One might therefore be led to assume that after the Nika riots Tribonian had more, not less, free time on his hands to devote exclusively to the work of the commission. Nonetheless, the evidence would seem to contradict this position. While it may have been politically expedient for Justinian to remove Tribonian from the office of quaestor, it would appear that during the following two months the emperor particularly required his expertise, albeit from behind the scenes.⁹⁹

The remaining commissioners can now be distributed among the three committees in their order of seniority:¹⁰⁰ Theophilus becomes the senior commissioner on the Papinian committee; Dorotheus the assistant to Tribonian; Anatolius the assistant to Constantinus; and Cratinus the assistant to Theophilus. That Tribonian, Theophilus and Dorotheus appear in the

⁹⁷ *Tribonian* 54-55.

⁹⁸ *Tribonian* 55-56.

⁹⁹ Also note the respective ratios of those books read by A to those read by B in the first two groups of the Sabinian mass (2.0:1 and 1.3:1 respectively). One may again readily imagine that Tribonian was particularly busy during this earliest phase of the commission's work.

¹⁰⁰ Seniority is here denoted by the order in which the six commissioners are introduced in *C. Tanta* 9, and the order of the three commissioners who worked on the *Institutes* in *C. Tanta* 11.

same order when assigned as commissioners to the *Institutes* project would support this view of their relative status within the imperial court, so that Theophilus should become the chairman of the third committee. Dorotheus, whom Justinian esteemed for his very great reputation and renown, would have received the important post of Tribonian's assistant on the Sabinian committee. Finally, this arrangement of commissioners neatly ties in with the excerpting behaviour of commissioners E and F during the Appendix mass. As previously argued, once the final number of *libri* to be included in the *Digest* was established at approximately 1,692, E was forced to accept a reduction in his initially allocated excerpting rate, from approximately 67 to 60 lines per book, in order that the *Digest* not exceed the 5 percent excerpting limit imposed by Justinian's compilation plan. This unenviable duty would then have fallen to Cratinus, the least senior member of the commission. Furthermore, it is now possible to suggest why the Papinian committee, when compared to both the Sabinian and Edictal committees, excerpted significantly fewer books. If this difference was not wholly attributable to the content of the un-excerpted books, then it could have been related to the fact that both Theophilus and Cratinus may have continued some teaching duties in the Constantinople law faculty; an obligation which may have made it difficult for them to conscientiously read all of their allotted number of books at the required rate. Dorotheus and Anatolius, as visiting professors from Beirut, would presumably not have been so burdened. And, indeed, this proposal is supported by the fact that both commissioners A and C excerpted almost exactly the same number of books (303 and 301 respectively), figures which were significantly higher than those of any of the other commissioners, and a full 50 percent higher than the number of books excerpted by commissioners E and F (202 1/2 and 206 1/2 respectively). To sum up, the commission would have been composed as follows:¹⁰¹

| | <i>Sabinian</i> | <i>Edictal</i> | <i>Papinian</i> |
|-----------|-----------------|------------------|-----------------|
| chairman | Tribonian (B) | Constantinus (D) | Theophilus (F) |
| assistant | Dorotheus (A) | Anatolius (C) | Cratinus (E) |

Appendix 1: Statistical Calculations.¹⁰²

The purpose of this appendix is to calculate the statistical probability that the average excerpting rates (in lines per book) found by Honoré, for the specific selection of books he allotted to the six subcommittees (A-F), could have occurred by chance alone. Since the figures for all the individual books of the *Digest* are not published in *Tribonian*, and were neither readily available nor easily calculated, I therefore relied upon the most detailed breakdown of the figures found in *Tribonian*, 'Appendix One', and supplemented with the individual figures supplied by both Honoré and Osler for the books detailed in Table 1 (below). In total there were 704 data entries from just over 1,500 books, a more than satisfactory degree of detail for the purpose required. In Table 2 (below), the figures from 'Appendix One' include the group classification in Roman numerals, and the subcommittee classification in capitals. For example, Group I contained the 51 books of *Ulp. Sab.*, the 36

¹⁰¹ Cf. Honoré (in *Tribonian* 166-67), who analyses the various legal interests of the commissioners within the CJ to apportion committee posts to the various named commissioners.

¹⁰² This appendix occupied 20 pages of tables and calculations in my 1996 Thesis. As it is not practical to present this degree of detail here, I have only included a description of the methodology employed, and the results obtained. However, if requested, I would be willing to supply the relevant tables and calculations by e-mail. My address is: <pj_furlong@yahoo.com.au>

books of *Pomp. Sab.* and the 16 books of *Paul Sab.* As regards the 51 books of *Ulp. Sab.*, these are detailed in Table 2, in strict numerical order, according to whether they were excerpted, according to Honoré, by the odd-numbered (A) or even-numbered (B) commissioner. The same procedure was adopted for the books of *Pomp. Sab.* and *Paul Sab.*, and for the remaining groups in the Sabinian committee, as well as both groups in the Edictal committee, whose odd and even-numbered commissioners were C and D respectively. The Papinian committee has not been included in this exercise because, as argued above, the average excerpting rates of commissioners E and F, for the Appendix *libri*, were deliberately altered, and so one cannot test the null-hypothesis that they are randomly arranged.

It was then necessary to compare Honoré's allocation of books to subcommittees A, B, C and D with a random allocation of books to four subcommittees which I called A', B', C' and D'. In order that this comparison should be identical in all other respects, I maintained the same ratios, in terms of the number of books allocated by Honoré to the odd and even-numbered sections (as found in *Tribonian*, Appendix One), for subcommittees A'-D'. This, in turn, means that the same number of books in subcommittees A-D will appear in subcommittees A'-D' respectively. For example, in Group I, sections (i-ix),¹⁰³ the section length ratios (in number of books) between subcommittees A and B are: 20-16, 9-4, 15 1/2-10 1/2, 14-3 and 10-0.¹⁰⁴ Since some of the data for the Sabinian mass occurred in 1/2-book units, it was necessary to convert all the figures given in 1-book units into 1/2-book units to facilitate the arithmetical manipulation of the data by computer. The full data for the ratio of section lengths allocated by Honoré in the Sabinian mass is found below in Table 3, row 1. Based on these ratios I used the 'Microsoft Excel Random Number Generation' facility to create 20 other sets of values for A' and B'. I have included, as an example, the first of these alternative sets of ratios in row no. 2. The excerpting-rate figures (in lpb) in Table 2 were then allocated to subcommittees A' and B' by creating alternate odd and even-numbered streams of books using the randomly generated section length ratios. The total number of lines were then calculated for the A' and B' subcommittees, and this figure was divided by the number of books in each subcommittee to give the average excerpting rates for A' and B', as shown below (A' av., B' av., in Table 3, row nos. 1 and 2). The relevant average excerpting rate figures for the remaining sets are also given in row nos. 3-21.

The average excerpting rates for subcommittees A and B, as presented in Honoré's 'Summary of Sabinian mass' table, are 91.10 and 92.60 lpb respectively, which represents a deviation of +/- 0.75 from the mean value of 91.85. Whereas Honoré used various criteria to select the particular books to be allocated to each of the odd and even-numbered sections he defined in the Sabinian mass, I have simply randomly selected the books for subcommittees A' and B'. The Standard Deviation and mean of the above listed A' and B' values, from row nos. 2-21, were calculated using the 'Microsoft Excel Descriptive Statistics' facility. Assuming that these figures approximate to a normal distribution curve, we can calculate the probability that Honoré's figures for subcommittees A and B could have occurred by chance alone. With a mean of 91.57 and a standard deviation of 8.79 for the A' and B' figures, the probability of the values for A and B deviating from their mean by only +/- 0.75 is calculated to be 6.78 percent. That the mean of the A' and B' figures (of 91.57) is so close to the mean of the A and B figures (of 91.85) indicates that enough randomly generated data points were included above to approximate to a normal (Bell-shaped) distribution curve.

The relevant figures for the Edictal mass were calculated in a similar manner to those of the Sabinian mass.¹⁰⁵ The average excerpting rates for subcommittees C and D, as

¹⁰³ *Tribonian* 257-258.

¹⁰⁴ Section ix contains 10 books, not 9 as indicated in *Tribonian*, Appendix One.

¹⁰⁵ However, some minor alterations to the data in Table 2 were made to facilitate the data handling by

presented in the ‘Summary of Edictal mass’ table, are 66.82 and 67.68 lpb respectively, giving a deviation of +/- 0.43 from their mean value of 67.25. The statistical analysis of the excerpting rate deviations for C’ and D’ (as detailed in my 1996 thesis) gave a mean value of 67.03 and a standard deviation of 9.35. Again assuming that these figures approximate to a normal distribution curve, the probability that the values for C and D deviated from their mean by only 0.43 by chance alone was calculated to be 3.59 percent. The probability that Honoré could have arrived at the average excerpting rates for just the Sabinian and Edictal committees by chance alone is therefore: 6.78% x 3.59% = 0.24%, or less than 1 in 400.

Table 1.

- 1) Papinian, *quaestiones*.¹⁰⁶
Books 20-9: 227, 44, 37, 107, 6, 15, 55, 273, 237, 162 lines
30-7: 14, 23, 25, 8, 2, 22, 70, 38 lines
- 2) Iulianus, *digesta*.
Books 50-62: 9, 49, 146, 45, 103, 38, 66, 49, 15, 28, 79, 97, 97 lines
Books 63-90: 3, 45, 22, 0, 0, 0, 21, 27, 0, 0, 7, 0, 0, 0, 4, 45, 0, 8, 5, 14, 5,
16, 2, 67, 3, 5, 3, 11 lines
- 3) Scaevola, *digesta*.
(i) Books 1-13: 69, 49, 10, 48, 142, 43, 118, 9, 32, 30, 52, 0, 6 lines
(ii) Books 14-29: 74, 176, 260, 197, 260, 118, 227, 276, 359, 59, 111, 70,
47, 86, 121, 58 lines
(iii) Books 30-34: 4, 26, 11, 33, 9, 0, 0, 0, 0, 0, 0 lines
(iv) Lab. 8 Paul *epit.*: Number of lines 299, av. 37.4.
- 4) Papinian, *Responsa* (libri 19: Edictal Books 1-13; statutory Books. 14-19).¹⁰⁷
Books 1-13: 197, 178, 275, 168, 178, 305, 274, 416, 274, 103, 232, 90, 138 lines
Books 14-19: 63, 72, 50, 6, 0, 53 lines
- 5) Paul, *Quaestiones* (libri 26: Edictal Books 1-16; statutory Books 17-26).

computer. In order not to have to compute the data in one-twelfth of a book units (the lowest common-denominator of the 1/2, 1/3 and 1/4 book measurements appearing in Honoré’s figures) I converted the 1/3-book units in *Gai. ed. prov.* 7, and *Gai. ed. prov.* 23 into 1/2-book units of measurement. I also combined the 1/4 book figure for *Gai. ed. urb. praed.* no. 49 (appearing in Group XVIII) with the figure for *Gai. ed. urb. praed.* 4 1/4 books in Group XIX. This allowed me to proceed with 1/2-book measurements as in the Sabinian mass. In addition, I marginally altered the section lengths to eliminate the 1/4, 1/3 and 1/6 book section length measurements appearing in Honoré’s figures, as follows. Group XVIII: section v (7 1/3 bks. > 7 1/2 bks.); section vii (3 2/3 > 3 1/2); section viii (2 1/3 > 2 1/2); section ix (2 1/3 > 2 1/2); section xi (4 5/6 > 4 1/2); and section xiv (3 1/4 > 3). And in Group XIX: section i (3 3/4 > 4); section iv (1 5/6 > 2); section v (2 1/3 > 2 1/2); and section vi (2 5/6 > 2 1/2). The result of these changes to the section lengths meant that the C’ subcommittee had 301 books and not 300 3/4 books, and that the D’ subcommittee had 261 books and not 261 1/4 books, as given in the ‘Summary of Edictal mass’ table (*Tribonian* 278). These various changes can have made no significant difference to the outcome of our calculations, and were simply introduced to make the data computation much less cumbersome.

¹⁰⁶ For individual figures: to Papinian *quaestiones*, see *Tribonian* 161; to Iulianus *digesta*, see *ibid.* 162; to Scaevola *digesta*, see *ibid.* 163; and to Lab. 8 Paul *epit.*, see *ibid.*, Appendix One, 285.

¹⁰⁷ For individual figures: to Papinian *Responsa*, see Osler (n.12 above) 173; to Paul *Quaestiones*, see *ibid.* 175; to Paul *Responsa*, Scaevola *Quaestiones*, Modestinus *Responsa*, Marcellus *Digesta* and Celsus *Digesta*, see *ibid.* 176.

- Books 1-16: 92, 173, 315, 178, 249, 97, 130, 24, 116, 132, 72, 75, 38, 92,
168, 51 lines
Books 17-26: 43, 0, 5, 0, 73, 59, 26, 15, 45, 0 lines
- 6) Paul, *Responsa* (libri 23: Edictal Books 1-15; statutory Books 16-36).
Books 1-15: 64, 39, 108, 127, 82, 63, 90, 11, 152, 29, 78, 52, 104, 148, 110 lines
Books 16-23: 52, 5, 22, 23, 11, 6, 0, 0 lines
- 7) Scaevola, *Quaestiones* (libri 20: Edictal Books 1-13; statutory Books 14-20).
Books 1-13: 57, 100, 14, 25, 25, 140, 0, 51, 4, 0, 0, 19, 43 lines
Books 14-20: 0, 19, 6, 0, 21, 6, 0 lines
- 8) Modestinus, *Responsa* (libri 19: Edictal Books 1-13; statutory Books 14-19).
Books 1-13: 84, 56, 28, 65, 72, 83, 8, 34, 43, 229, 29, 29, 23 lines
Books 14-19: 3, 5, 4, 39, 5, 0 lines
- 9) Marcellus, *Digesta* (libri 31: Edictal Books 1-21; statutory Books 22-31)
Books 1-21: 17, 4, 55, 37, 25, 63, 91, 57, 90, 17, 4, 35, 49, 27, 96, 49, 23, 9, 27,
80, 44 lines
Books 22-31: 21, 15, 11, 0, 3, 9, 8, 14, 12, 22, 27, 28 lines
- 10) Celsus, *Digesta* (libri 39: Edictal Books 1-27; statutory Books 28-39)
Books 1-27: 25, 11, 43, 7, 71, 70, 25, 38, 6, 11, 27, 48, 4, 3, 25, 80, 28, 30, 84,
25, 36, 16, 42, 10, 39, 20, 62 lines
Books 28-39: 21, 15, 11, 0, 3, 9, 8, 14, 12, 22, 27, 28 lines

Table 2.

Sabinian mass

Group:

| I | Ulp. 51 Sab. | (no. of books) | (lines per book) |
|---|--------------|----------------|------------------|
| A | 1-14 | 14 | av. 140.4 |
| B | 15-25 | 11 | av. 281.2 |
| A | 26-29 | 4 | av. 274.0 |
| B | 30 | 1 | av. 231.0 |
| A | 31-40 in. | 9 1/2 | av. 172.0 |
| B | 40 in.-43 | 3 1/2 | av. 266.3 |
| A | 44-50 | 7 | av. 162.1 |
| B | 51 | 1 | av. 45.0 |

Table 3.

Sabinian mass

- 1) [Honoré's section length ratios, in 1/2-book units.]
40-32, 18-8, 31-21, 28-6, 20-0, 23-11, 14-10, 11-22, 25-14, 20-20, 12-12,
124-126, 22-10, 18-6, 6-2, 14-0, 16-6, 4-4, 30-30, 4-4, 20-20, 26-28, 14-14, 8-8,
20-20, 8-6, 20-20.

- $A' \text{ av.} = 103.91; B' \text{ av.} = 76.08^{108}$
- 2) 20-20, 16-6, 20-0, 31-21, 14-0, 4-4, 30-30, 20-20, 8-8, 20-20, 26-28, 22-10, 18-6, 18-8, 40-32, 124-126, 28-6, 14-10, 20-20, 23-11, 8-6, 14-14, 6-2, 11-22, 25-14, 4-4, 12-12.
 $A' \text{ av.} = 89.04; B' \text{ av.} = 95.26$
- | | |
|---|---|
| 3) $A' \text{ av.} = 89.55; B' \text{ av.} = 94.60$ | 4) $A' \text{ av.} = 96.28; B' \text{ av.} = 85.92$ |
| 5) $A' \text{ av.} = 84.88; B' \text{ av.} = 100.61$ | 6) $A' \text{ av.} = 88.39; B' \text{ av.} = 96.09$ |
| 7) $A' \text{ av.} = 105.23; B' \text{ av.} = 74.38$ | 8) $A' \text{ av.} = 88.89; B' \text{ av.} = 95.45$ |
| 9) $A' \text{ av.} = 104.35; B' \text{ av.} = 75.51$ | 10) $A' \text{ av.} = 92.66; B' \text{ av.} = 90.59$ |
| 11) $A' \text{ av.} = 88.88; B' \text{ av.} = 95.45$ | 12) $A' \text{ av.} = 95.61; B' \text{ av.} = 86.78$ |
| 13) $A' \text{ av.} = 96.65; B' \text{ av.} = 85.45$ | 14) $A' \text{ av.} = 100.11; B' \text{ av.} = 80.98$ |
| 15) $A' \text{ av.} = 91.33; B' \text{ av.} = 92.30$ | 16) $A' \text{ av.} = 79.57; B' \text{ av.} = 107.46$ |
| 17) $A' \text{ av.} = 93.34; B' \text{ av.} = 89.71$ | 18) $A' \text{ av.} = 78.72; B' \text{ av.} = 108.56$ |
| 19) $A' \text{ av.} = 103.79; B' \text{ av.} = 76.23$ | 20) $A' \text{ av.} = 102.16; B' \text{ av.} = 78.34$ |
| 21) $A' \text{ av.} = 91.16; B' \text{ av.} = 92.53$ | |

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