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GOTHIC LETTER (AND PHONEME) STATISTICS

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Abstract

This paper is an attempt to account for the number and frequency of individual characters in the Gothic corpus. The first section explains the foundation of this statistical study, i.e. the text used and the number of characters in the main text of individual Gothic documents. The second section contains a more detailed study of all the characters in the Gothic manuscripts, and in a subsection an attempt is made to extend this study to phonemes (or principal speech sounds). The third section treats the numerals and the fourth concludes. All numbers occurring in the Gothic corpus are listed in the Appendix.

1. Introduction

The present paper is, in a sense, a continuation of that in *Chatreššar 2009* (Snædal 2009).¹ In that paper, various statistics concerning Gothic morphology were presented but here an attempt is made to account for the number and frequency of individual characters (and principal speech sounds) in the Gothic corpus. The topic is not character frequency in connection with word frequency as in Joos (1942), though the frequency of *q*, for example, is obviously strongly connected to the frequency of the verb *qīpan* 'say'.

Here, *character* is used as a cover term, divided into *letter* and *numeral*, as in Gothic the characters of the alphabet are also used to denote numbers, i.e. a=1, b=2, kg=23 etc. Two characters are used solely as numerals.

¹ I wish to thank Jost Gippert and the peer reviewers of the present journal for their corrections and improvements. All the shortcomings of this paper are, of course, my responsibility.

The text used includes all the Gothic documents and is based on Snædal (2005). Therefore, it is basically the same text as used in Snædal (2009) but before counting the text was cleaned for all conjectures, i.e. additions, deletions and corrections made by various editors. Therefore, uncorrected errors such as e.g. *qiqiþiþ* for *qīþiþ* or *fridamma* for *frodamma* are kept, but corrections made in the manuscripts (by their scribes) are accepted. Nasal suspension marks and ligatures have been expanded but the abbreviations of *nomina sacra* have been kept unaltered. Where part of a leaf has been destroyed, e.g. in the deed from Naples, the completely destroyed letters are omitted even though they are easily reconstructed. In such cases, remnants of letters, that are not identifiable outside the context, are counted as conjectured. The same holds true for letters which have faded beyond recognition and others which have been eaten almost completely by holes in the parchment. The intention was to come as close to the manuscripts as possible. Thus, the problems mentioned in Snædal (2009: 153–154) relating to the counting of letters are overcome. The number of characters given here, however, can of course not be 100% exact but the proportions of the letters should be correct. The text contains 67,570 words (tokens) and these words contain 348,367 characters. Included are 145 numbers (0.2% of the tokens), containing 247 numerals or 0.07% of the characters. The results are shown in Table 1. For information on the manuscripts, see Braune, Heidermanns (2004: 10–15).

	Letters	Numerals	Total	%
Codex Argenteus	176,557	21	176,578	50.69
Codex Ambrosianus A	80,008	73	80,081	22.99
Codex Ambrosianus B	72,526	2	72,528	20.82
Codex Ambrosianus E	10,655	8	10,663	3.06
Codex Carolinus	2,994		2,994	0.86
Codex Ambrosianus D	2,456	106	2,562	0.73
Codex Ambrosianus C	1,706		1,706	0.49
Deed from Naples	608	12	620	0.18
Gotica Veronensia	274	2	276	0.08
Codex Gissensis	135		135	0.04
Deed from Arezzo	116	3	119	0.03
Codex Vindobonensis 795	85	20	105	0.03
	348,120	247	348,367	100

Table 1. The number of characters in the main text of individual Gothic documents

It should be pointed out that the Argenteus contains half of the main text and the three biggest manuscripts taken together almost 95%. The five smallest fragments as a whole contain less than 0.5%. Included in the main text are 725 characters (0.21%) from 103 words in 67 marginal glosses. The *Folium Spirensis* is here included within the Argenteus. Its text contains 798 characters or 0.45% of that codex. The Codex Taurinensis and the Calendar are included within the Ambrosianus A. The Calendar contains 345 characters, 280 letters and 65 numerals in 40 numbers. This amounts

to 0.43% of that codex. The Calendar is responsible for the relatively large number of numerals in the Ambrosianus A but within the main text of that manuscript they number only eight. The Codex Vaticanus Latinus 5750 is included in the Ambrosianus E. The Ambrosianus D (the fragment of the Book of Nehemiah) contains relatively many numbers or 51. Then, twelve numbers are found in the short text of the Vindobonensis. The numerals are dealt with separately in section 3. Table 2 shows the number of individual characters (not separating letters and numerals).

Character		Number	%
Ǻ	a	67,887	19.49
Ɔ	b	5,312	1.53
ǻ	d	12,977	3.73
Ʒ	e	13,665	3.92
ƒ	f	5,085	1.46
Ɔ	g	9,191	2.64
h	h	10,705	3.07
o	h	1,508	0.43
i, i	i, i	48,677	13.97
Ɔ	j	10,455	3.00
Ɔ	k	4,994	1.43
ǻ	l	8,466	2.43
Ɔ	m	12,883	3.70
Ɔ	n	31,248	8.97
o	o	6,283	1.80
Ɔ	p	1,034	0.30
u	q	1,947	0.56
Ɔ	r	10,535	3.02
s	s	26,685	7.66
t	t	10,036	2.88
Ɔ	þ	17,203	4.94
u	u	19,863	5.70
Ɔ	w	8,563	2.46
x	x	432	0.12
z	z	2,727	0.78
Ɔ	Ɔ	4	0.001
↑	↑	2	0.0005
		348,367	100

Table 2. The number of individual characters (letters and numerals) in alphabetical order

The order of the characters in Table 2 is the usual alphabetical order. Here Wulfila's characters are shown in the first column but throughout the paper the usual transliteration is used as in the second column. In fact, there are more characters in the manuscripts, both letters and numerals, than found in the main text. The next sections will account for them.

2. Letters

Above, characters in the main text were counted. Now the letters will be treated separately. In the third column of Table 3 the number of letters in the main text is given, i.e. when numerals have been subtracted. The order is by descending frequency. In the following columns, various letters are collected from the margins of the manuscripts for which the main text (and marginal glosses) has already been counted. Here also are collected letters from two documents not counted so far, i.e. the so-called *Gotica Parisina* and the fragments of the lead tablet from *Hács Béndekpuszta*; the former never was, and the latter is no longer, a continuous text. See below for further detail.

	%	In text	UM	Col.	A	L	Vin	P	H	In total	%
1. a	19.50	67,879	127		17	44	4	1	38	68,110	19.30
2. i, ï	13.98	48,653	115	376	20	44	4		24	49,236	13.95
3. n	8.97	31,241			8		3		23	31,275	8.86
4. s	7.66	26,679			1	6	3		14	26,703	7.57
5. u	5.70	19,860	35		24		5	1	7	19,932	5.65
6. þ	4.94	17,199	105	374	7		5	1	12	17,703	5.02
7. e	3.92	13,652					4		5	13,661	3.87
8. d	3.73	12,968			4		4	1	4	12,981	3.68
9. m	3.70	12,874	36	752	9		3		8	13,682	3.88
10. h	3.07	10,697	117	376			4		5	11,199	3.17
11. r	3.02	10,518	117	378	9		3		4	11,029	3.12
12. j	3.00	10,444				44	3		4	10,495	2.97
13. t	2.88	10,031				44	2		4	10,081	2.86
14. g	2.64	9,177					3			9,180	2.60
15. w	2.46	8,563					2	2	9	8,576	2.43
16. l	2.43	8,453	35	376		44	4	1	3	8,916	2.53
17. o	1.80	6,282	22	376		44	3	1	1	6,729	1.90
18. b	1.52	5,287					5		3	5,295	1.50
19. f	1.46	5,084			3		4	1	3	5,095	1.44
20. k	1.42	4,960	35	376	12	44	3			5,430	1.54
21. z	0.78	2,719					3		1	2,723	0.77
22. q	0.56	1,937					3			1,940	0.55
23. hu	0.43	1,503					3		2	1,508	0.43
24. p	0.30	1,034					2		1	1,037	0.29
25. x	0.12	426					3			429	0.12
	100	348,120	744	3,384	114	314	85	9	175	352,945	100

Table 3. The sum of letters in the Gothic corpus

Some explanations of this table are necessary, but for information on the manuscripts the reader is again referred to Braune, Heidermanns (2004: 10–15).

UM: In the upper margin of certain pages in the Argenteus there are running titles indicating the present Gospel. They are so organised that in every other opening there is a *·pairh·* in the upper margin of the verso page, but an abbreviation of the Evangelist's name on the recto page, i.e. *·map·*, *·ioh·*, *·luk·* or *·mar·*. In most cases there are two short strokes above *pairh* and the abbreviations of the names, but in a few cases one long stroke. These are 93 cases of *pairh* (Mt 10, Jh 23, Lk 35, Mk 25), giving 464 letters, as in one case there is a scribal error *paih* (in Lk, p. 158, fol. 129v). The number of the name abbreviations is as follows: *map* 11, *ioh* 22, *luk* 34 and *mar* 23. These number 90 cases, giving 270 letters, but in addition to this there is one monogram in Mark, in the upper margin of p. 279, fol. 59r. Here it is taken as *mr*, so the result becomes 272 letters. (One such monogram is found in the Folium Spirensis, in the explicit of Mark, and it has already been counted with the main text.) It should be noted that the upper part of these letters has often fallen victim to marginal cutting, making the strokes above them invisible. In one case (p. 323, fol. 51r) *mar* has been almost completely cut off. In total, this means a 736-letter addition to the Argenteus. A compendium for *pairh* and a monogram for *mappaiu*, found in the upper margin of Ambrosianus C, are also counted in this column. The former is made of *p*, *r* and *h* but the latter of *m* and *p*, so this gives five letters. (One such *prh* is in the Folium Spirensis, in the explicit of Mark, and has already been counted.) Ebbinghaus (1989: 277 [2003: 274]) was able to read *lu* from the abbreviation *luk* once in the upper margin of page two of the Gissensis, three letters.

Col.: Under the text on each page in the Argenteus there are four columns containing the numbers of the so-called Eusebian sections of the Gospels. The first column contains the section number(s) of the present page in the present Gospel but the other three contain the numbers of the parallel sections of the other Gospels (if there are parallels). Above each column is the abbreviation of the Evangelist in question. For John and Luke the same abbreviations are used as in the upper margin, but for Matthew and Mark monograms are used, made up of *mp* and *mr* respectively. The number is as follows: *mp* 374, *ioh* 376, *luk* 376 and *mr* 378. The reason why the number is not always the same is that in one case *mp* is written instead of *mr* (p. 22, fol. 11v) and in three cases *mr* is written for *mp* (p. 66, fol. 97v; p. 67, fol. 98r; p. 127, fol. 114r). This, then, means an addition of 3,384 letters. To be precise, one should say 2,632 letters and 742 monograms.

A: In the Ambrosianus A there are remnants of running titles in the upper margin of the epistles to the Corinthians and Ephesians. They appear to be divided in the following way between the verso and the recto page: *du kaurin|bium* and *du aifai|sium*. In total this gives 114 letters, only counting what is legible; see further Friedrichsen (1939: 87–88) and Ebbinghaus (1979: 191–192 [2003: 60–61]). The latter maintains that such titles are also found in the Ambrosianus B but I am unable to confirm that.

L: In the Ambrosianus B lessons are indicated in the margin with the word *laiktjo* 38 times and *laiktsjo* six times (cf. Snædal 2005: XV). This gives 314 letters in total.

Vin: These are the letters in the alphabets of the Vindobonensis. As a whole they add 85 letters. What remains is considered to be the main text.

P: These are the nine letters from Wulfila's alphabet found in the so-called *Gotica Parisina*. The same leaf also contains some Biblical names transcribed from Gothic but these are in Latin letters and consequently not counted here.

H: These are the letters on the fragments of the lead tablets from Hács Béndekpuszta according to Harmatta (1996/97: 3–5; cf. Streitberg 2000: 507–514).

The result is that 4,822 letters are added, or more precisely, perhaps, 3,311 letters and 755 monograms.

It should be mentioned that *i* occurs 8,619 times in the third column. This amounts to 17.7% of all the *i*-s. One occurrence that should have been in the beginning of the first subscription of the deed from Naples and another in the deed from Arezzo have been extracted. The trema is invisible in the three instances where it is to be expected in *Gotica Veronensia*. Some 398 occurrences in the abbreviation *ioh* and three in the alphabets of the *Vindobonensis* need to be added. Therefore, in total there are 9,020 occurrences of *i*, or 18.3%, so the proportion of the whole increases a little. The use of the trema is described in Braune, Heidermanns (2004: 22). It should be stressed that although the trema is always used in the marginal abbreviation *ioh* of the name *Iohannes*, it is never used in the abbreviations of the name *Iesus*, *iīs*, *iūs*, *iū*, *iūa*, *iūis*. But of course it is used when the name is written in full: *iesus*, *iesuis*.

As mentioned above, the order of the letters in Table 3 is that of decreasing frequency in the main text. In the additional columns, which are not based on a continuous text, it is more a matter of random chance which letters occur. It can be seen from the last two columns that the order does not change much. Nevertheless, *m* moves to place 7 so *e* becomes no. 8 and *d* no. 9. Also, *l* changes place with *w* and *k* moves up to place 18 so *b* becomes no. 19 and *f* no. 20. The proportions change a little but not substantially.

One more thing should be mentioned. In the Gothic texts, nasal suspension marks are used relatively frequently. Their number is given in Table 4; the second and third columns show the number of suspensions for *n* and *m* respectively. This table also gives an overview of the ligatures.

	n	m	ht	rþ	þr	mm	mu	ns	nd	na	ne	nn	nu	ur	on	au
CA	279	67	8	2	1		1									
A	40	13						7	7	2	1	1				
B	96		1													
E	71	15						5		1	1	1	1	2	1	
Car	14	2		2												
C	3	2				1								1		
D	2															
Vin																1
	505	101	9	4	1	1	1	12	7	3	2	2	1	3	1	1

Table 4. The number of nasal suspension marks and ligatures

Proportionally, 1.6% of the *n*-s and 0.7% of the *m*-s are written with a suspension mark. In total there are twelve ligatures in the Argenteus but eighteen in the Ambrosianus A so there they are proportionally much more frequent. It is notable that in the Ambrosianus A the first letter of a ligature is always *n*. Nasal suspension marks and ligatures are used quite frequently in the Ambrosianus E (Skeireins) in proportion to the size of the text; eleven ligatures in total and all but one of them contain *n*. The ligatures of vowels and consonants are also worthy of note. In the Ambrosianus B, the suspension mark for *n* is relatively frequent but only one ligature occurs.

The Argenteus is written in gold and silver ink. In total 11,762 letters or 6.6% of the main text is written in gold. It should be noted that included in this number are thirteen suspension marks for *n* and six for *m*, along with 176 abbreviations for the nomina sacra. The abbreviations of the names of the Evangelists in the Eusebian columns mentioned above are written in gold, i.e. all the letters in the column labelled Col. (3,384), comprising 2,632 letters and 742 monograms.

As mentioned above, the abbreviations of the nomina sacra are kept intact. It is fair to say that the letters left out by the abbreviations are indeed missing in the text. If these letters, along with missing letters from *pairh marku* (explicit of Mk), *pawlaus* (incipit of Eph), *kaulaussaium* (explicit of Col), *aipiskaupaus* (Calendar) and *diakon* (twice in the deed from Arezzo) were counted, 5,878 letters could be added to the main text. That is a growth of 1.69%. The main text then contains 353,998 letters, so with the additional material given in Table 3 the final results would be 358,823. The number (and order) of the additional letters is given in Table 5.

	%	In text	Add.	Total	%
1. a	19.50	67,879	472	68,351	19.31
2. i	13.98	48,653	759	49,412	13.96
4. s	7.66	26,679	957	27,636	7.81
5. u	5.70	19,860	1,444	21,304	6.02
7. e	3.92	13,652	542	14,194	4.01
10. r	3.02	10,518	849	11,367	3.21
11. j	3.00	10,444	434	10,878	3.07
13. t	2.88	10,031	415	10,446	2.95
16. l	2.43	8,453	2	8,455	2.39
17. o	1.80	6,282	2	6,284	1.78
20. k	1.42	4,960	1	4,961	1.40
24. p	0.30	1,034	1	1,035	0.29
			5,878		

Table 5. The missing letters from nomina sacra etc. added to the main text

The only change in the order of the letters is that *h* moves down to place 12 while *r* and *j* move up to places 10 and 11 respectively. The proportions change a little as can be seen by comparing the second and the last columns. The proportion of each of the remaining letters diminishes slightly, i.e. between 0.1% and 0.01%.

2.1. Sounds or phonemes

It is tempting to try to get a little closer to the number of the principal speech sounds or phonemes in Gothic. An attempt is made in Table 6 by counting separately all the four digraphs: *ai*, *au*, *ei* and *iu*. The same number has been subtracted from the number of the letters *a*, *i*, *u* and *e*. Not surprisingly, /a/ is by far the most frequent phoneme although it is not as prominent proportionally as the letter *a*.² On the other hand, /i/ has fallen from place 2 to place 3, /u/ has fallen from place 5 to place 6 but /e/ from place 7 to place 20. The phonemes denoted with digraphs are ranked so that /ai/ is in place 9, /ei/ in place 17 and /au/ in place 19. By far the most infrequent is /iu/ in place 28, less frequent than /p/ and outranking only the velar nasal (see below) and /x/. The number of *x*-es outside the abbreviation for *Xristus* is only eleven.

The velar nasal [ŋ] is written with a single *g* before *g*, *k* and *q* 675 times, with *gg* in 40 instances, once with *gn*, and with an *n* six times. This means 722 occurrences. In Table 6 the number of /g/ and /n/ has been reduced accordingly, so /g/ moves down by two places but /w/ and /l/ move up by one each. The velar nasal is the next most infrequent sound but it is considerably more frequent than /x/. Perhaps it would be more consistent to count [ŋ] with /n/ as an allophone but then the fact is lost that this sound has its own orthographical representation. Altogether [ŋ] and /n/ would be 31,956 or 9.95%. (It should be noted that there are 62 instances in four stems of the cluster *ggw* coming from PGmc **-ww-*, but *ggw* with an original nasal occurs 35 times, also in four stems, not counting the scribal error *unmanarigwai* 2 TimA 3:3.)

The combination *gw* is attested 99 times and only once is it not accompanied by the velar nasal. (The exception is *bidagwa* ‘beggar’ which is considered by many to be a scribal error for **bidaga* or **bidaga*. The form *unmanarigwai* in 2 TimA 3:3 is obviously a scribal error since Ambrosianus B has *-riggwai*. In the Gothic corpus, *g* is written seven times for expected *gg* and *gg* just as often for expected *g*.) In comparison with *q* and *h*, *gw* is in fact extremely rare and would be by far the most infrequent sound. That could be the reason why it did not get a separate character. Perhaps, though, these sounds were not entirely comparable: *gw* represented a sound combination, [gw], whereas *q* and *h* each represented a single sound, [k^w] and [x^w] respectively.

² The digraphs *ai* and *au* are treated as one unit each in Tables 6 and 9 but the variants they supposedly denoted, i.e. short monophthongs and long monophthongs/diphthongs, are dealt with in the text below and shown in Table 7.

		%	In text	UM	Col.	A	L	Vin	P	H	In total	%
1.	a	15.62	50,160	34		1		4	1	29	50,229	15.42
2.	n	9.73	31,234			8		3		23	31,268	9.60
3.	i	8.57	27,516	22	376	15		4		13	27,946	8.58
4.	s	8.31	26,679			1	6	3		14	26,703	8.20
5.	þ	5.36	17,199	105	374	7		5	1	12	17,703	5.43
6.	u	4.05	12,986	34		9		5	1	5	13,040	4.00
7.	d	4.04	12,968			4		4	1	4	12,981	3.98
8.	m	4.01	12,874	36	752	8		3		8	13,681	4.20
9.	ai	3.70	11,868	93		5	44			7	12,017	3.69
10.	h	3.33	10,697	117	376			4		5	11,199	3.44
11.	r	3.28	10,518	117	378	9		3		4	11,029	3.39
12.	j	3.25	10,444				44	3		4	10,495	3.22
13.	t	3.12	10,031				44	2		4	10,081	3.09
14.	w	2.67	8,563					2	2	9	8,576	2.63
15.	l	2.63	8,453	34	376		44	4	1	3	8,915	2.74
16.	g	2.62	8,421					3			8,424	2.59
17.	ei	2.55	8,203							3	8,206	2.52
18.	o	1.95	6,276	22	376		44	3	1	1	6,723	2.06
19.	au	1.82	5,851			11				2	5,864	1.80
20.	e	1.70	5,462					4		2	5,468	1.68
21.	b	1.65	5,287					5		3	5,295	1.62
22.	f	1.58	5,084			3		4	1	3	5,095	1.56
23.	k	1.54	4,960	34	376	12	44	3			5,429	1.67
24.	z	0.85	2,719					3		1	2,723	0.84
25.	q	0.60	1,937					3			1,940	0.60
26.	hþ	0.47	1,503					3		2	1,508	0.46
27.	p	0.32	1,034					2		1	1,037	0.32
28.	iu	0.32	1,029							1	1,030	0.32
29.	[ŋ]	0.23	722								722	0.22
30.	x	0.13	426					3			429	0.13
		100	321,104	648	3,384	93	270	85	9	163	325,756	100

Table 6. Number and frequency of phonemes (speech sounds) in Gothic

Note that disyllabic *ai* occurs 26 times, disyllabic *au* 40 times (cf. Braune, Heidermanns 2004: 45): *ja-u* (14), *sa-u* (2), *swa-u* (6), *ga-unled-* (2), *ga-u-hva-sehvi* (1), *ga-u-laub-* (2), *hva-uþ* (1), *Kafarnaum* (11), *Naumis* (1). There is no occurrence of disyllabic *ei* but 131 of disyllabic *iu* (cf. Braune, Heidermanns 2004: 38): *niun* (3), *niundon* (4), *niune* (1), *niunhund* (1), *niuntehund(is)* (2), *stiur* (4); in most cases there is a morpheme boundary between *i* and *u*: *ni-u* (73), *biuhti* (2), *biuhtja* (4), *biuhts* (2), *sium* (12), *siuþ/-d* (9), *bi-u-gitai* (1), *hailidedi-u* (1), *Aifaisium* (3) etc. There are 82 occurrences of the combination *aiu*: *habai-u* (1), *qimai-u* (2), *siai-u* (1), *sumai-uh* (1), and case forms like *Maþþaiu* and *Fareisaium* (the 280 *iu* in the abbreviation *ius* etc. have also been extracted). In the upper margin in the Ambrosianus A there are seven cases of disyllabic *iu* in *-þium* and *-sium* but only one of *-þaium*.

It can be seen that the phonemes denoted with digraphs also occur in the additional material. By far the most frequent is /ai/ (150 cases), thanks mainly to *þairh* and *laiktjo*. The next is /au/ (13), then /ei/ (3) and lastly /iu/ (1)

It is well known that Gothic orthography does not distinguish between short and long vowels. It would require a separate study to count separately short and long /a/ and /u/. Besides, the quantity of these vowels is not known in every instance. When it comes to the digraphs *ai* and *au* there is controversy about what sounds they represent. It is agreed, however, that they represented short monophthongs, arising from a lowering of original /i/ and /u/ before /h/, /hʷ/ or /r/, i.e. approximately [ɛ, ɔ]. The same pronunciation is assumed for the vowel of the reduplicating syllable in the preterit of the reduplicating verbs. This assumption rests on the fact that in Gothic the digraphs are used to transcribe Greek ε and ο in loanwords and Biblical names. Lastly, it is disputed if the digraphs also represented long, low monophthongs, [ɛː, ɔː], originating in Proto-Germanic diphthongs, or if the diphthongs were still preserved in Gothic so the digraphs also represented [ai] and [au]. This question will not be dealt with here but an attempt will be made to find the frequency of the short, low monophthongs (denoted by /aí/ and /áu/), the long monophthongs/diphthongs (denoted by /ái/ and /áu/), and the occurrences in loanwords and Biblical names (denoted by /ai/ and /au/). An overview is given in Table 7.

	Number	%		Number	%
aí	2,289	19.29	áu	1,684	28.78
ái	8,780	73.98	áu	3,814	65.19
ai	799	6.73	au	353	6.03
	11,868			5,851	

Table 7: Frequency of the supposed variants denoted by *ai* and *au*

In the main text there are 543 *aih*, 260 *aihʷ* and 1,581 *air*, or altogether 2,384 occurrences. They are analysed as follows: The combination /aih/ occurs 452 times, /aihʷ/

260 times and /áir/ 1,491 times. Included are 28 occurrences in the reduplicating syllable. (In Table 7 further 86 occurrences of reduplicating /ái/ are included, i.e. when not followed by /h/, /hv/ or /r/.) The long monophthong/diphthong also occurs before /h/ and /r/ so the combination /áih/ is attested 89 times and /áir/ seventeen times. In loans and Biblical names /aih/ occurs twice and /air/ 73 times.

The main text has 367 *auh* and 1,590 *aur* or altogether 1,957 occurrences that have been analysed as follows: The combination /aúh/ occurs 206 times and /aúr/ 1,478 times (/aúhv/ is not attested). The long monophthong/diphthong also occurs here, so /áuh/ is attested 161 times and /áur/ 62 times. Also, /aur/ occurs 50 times in loans and Biblical names.

Therefore, the digraphs *ai* and *au* do not always represent original monophthongs when they occur in the environment before *h*, *hv* or *r*; in some instances they stand for original diphthongs. Nevertheless, it should be stressed that the quantity/quality in all instances is not uncontroversial but the overall picture is as described above.

The frequency of these variants should be looked at. If inserted into Table 6, the long monophthong/diphthong /ái/ would be in place 13 (2.73%, 8,780), a little more frequent than /w/. The long monophthong/diphthong /áu/ would take place 23 (1.19%, 3,814) and have a frequency between /k/ and /z/. The short monophthong /ái/, with the *ai*-s in loans and Biblical names added, would take place 24 (0.96%, 3,088), i.e. between /ái/ and /z/. The short monophthong /aú/, with the *au*-s in loans and Biblical names added, would be in place 26 (0.63%, 2,038), i.e. between /z/ and /q/.

The variation in writing *i* ~ *e* ~ *ei* in the Gothic corpus should also be considered (Braune, Heidermanns 2004: 31, 33, 37). In Table 8 an overview is given. Variants in Biblical names and loanwords are left out, as they may reflect a variation between $\iota \sim \eta \sim \epsilon\iota$ in the spelling of the Greek 'Vorlage'.

	/e/	%		/i/	%		/ei/	%
e	5,368	98.28	i	27,500	99.94	ei	8,150	99.35
i	20	0.37	e	13	0.05	i	9	0.11
ei	74	1.35	ei	3	0.01	e	44	0.54
	5,462			27,516			8,203	

Table 8. Variation in writing of the phonemes /e/, /i/ and /ei/

Table 8 shows that it is actually only the variant *ei* for /e/ which has some frequency. The other variants are very infrequent. The numbers in the last line of the table should be fairly accurate about the number of these **phonemes**, so they have been inserted into Table 6.

Other variations among the vowels should be mentioned too. The variants *i* for *ai* and *ai* for *i* outweigh each other (twice each). The same is true of *u* for *au* in the dative and genitive singular in the inflexion of the *u*-stems and *au* for *u* in the nominative

and accusative singular (25 times each). Other cases of this sort are not worth mentioning (Braune, Heidermanns 2004: 44, 45, 101–102). *u* is written for *o* four times and *o* for *u* approximately ten times but the correct numbers have been inserted into Table 6 (Braune, Heidermanns 2004: 34, 35, 36).

The remaining phonemes can be said, by and large, to have the same frequency as the corresponding letters.

In Table 9 the missing phonemes from the *nomina sacra* etc. have been added to the main text (cf. Table 5 above). Here the addition is 5,439, increasing the total to 326,543 (i.e. by 1.67%) and with the additional material given in Table 6 the final figure becomes 331,195.

	%	In text	Add.	Total	%
1. a	15.62	50,160	33	50,193	15.37
3. i	8.57	27,516	758	28,274	8.66
4. s	8.31	26,679	957	27,636	8.46
6. u	4.04	12,986	1,006	13,992	4.28
9. ai	3.70	11,868	1	11,869	3.63
10. r	3.28	10,518	849	11,367	3.48
11. j	3.25	10,444	434	10,878	3.33
13. t	3.12	10,031	415	10,446	3.20
15. l	2.63	8,453	2	8,455	2.59
18. au	1.82	5,851	438	6,289	1.93
19. o	1.95	6,276	2	6,278	1.92
20. e	1.70	5,462	542	6,004	1.84
23. k	1.54	4,960	1	4,961	1.52
27. p	0.32	1,034	1	1,035	0.32
			5,439		

Table 9. The missing phonemes from *nomina sacra* etc. added to the main text

Here there are some minor changes in the order of the phonemes; /h/ has moved down to place 12 but /r/ moves up to place 10 and /j/ to place 11; /o/ and /au/ change places. The proportions change a little, as can be seen by comparing the second and the last columns. The proportion of each of the remaining phonemes diminishes between 0.1% and 0.01%. Finally, if the abbreviations *gpa* and *gpb* are to be expanded to *guda* and *gudis*, the number of /d/ should increase by 496 (giving 13,465 or 4.12%). The same amount should then be subtracted from /p/ (giving 16,703 or 5.12%). The order of these phonemes will not be changed.

3. Numerals

In Table 10 an overview is given of the number of numerals found in the Gothic corpus. More details are given below.

	In text	In sec. n.	Col.	Gather.	Total	%
a '1'	8	72	149	2	231	4.32
b '2'	25	72	155	1	253	4.73
g '3'	14	65	147	4	230	4.30
d '4'	9	68	155	2	234	4.37
e '5'	13	66	161	4	244	4.56
q '6'	10	67	155	3	235	4.39
z '7'	8	69	147	3	227	4.24
h '8'	8	65	143	2	218	4.07
þ '9'	4	66	152	3	225	4.20
i '10'	24	89	204	7	324	6.05
k '20'	34	68	190	7	299	5.59
l '30'	13	59	137	7	216	4.04
m '40'	9	66	131	2	208	3.89
n '50'	7	49	119		175	3.27
j '60'	11	44	113		168	3.14
u '70'	3	51	125		179	3.34
p '80'		59	145		204	3.81
q '90'	4	59	164		227	4.24
r '100'	17	207	480	1	705	13.17
s '200'	6	82	285		373	6.97
t '300'	5	23	134		162	3.03
w '400'					0	0.00
f '500'	1				1	0.02
x '600'	6				6	0.11
h '700'	5				5	0.09
o '800'	1				1	0.02
↑ '900'	2				2	0.04
	247	1,466	3,591	48	5,352	100

Table 10. Numerals in the Gothic corpus

The second column in Table 10 contains those numerals occurring in the main text. As already mentioned, these comprise 145 numbers and they contain 247 numerals, 4.61% of the numerals. Below, numerals in individual documents are accounted for.

In the Argenteus there are seventeen numbers or 21 numerals. That is only 0.01% of the characters in the main text of that manuscript.

The Calendar in the Ambrosianus A contains 345 characters or 0.4% of the text. Therein 40 numbers are found, containing 65 numerals. That amounts to scarcely 19% of the characters in the Calendar. There are seven other numbers in this manuscript, containing eight numerals. All these numbers except one are found in the incipit and explicit of the numbered epistles. The numerals amount to 0.09% of the total number of characters in the main text of this manuscript.

In the Ambrosianus B there is only one number, containing two numerals, and it is erroneously written as *·di·* instead of *·id·* (i.e. 14; Gal 2:1). Here the order of the morphemes in *fidwortaihun* has obviously influenced the scribe; apparently, he wrote a *d* for *fidwor* and then an *i* for *taihun*.

The Ambrosianus E (Skeireins) contains six numbers and eight numerals. It accounts for somewhat more than 0.07% of the characters of this manuscript or near-average.

In the Ambrosianus D (Nehemiah) there are 51 numbers which contain 106 numerals. That amounts to more than 4% of the text of that manuscript.

The deed from Naples contains eight numbers, altogether twelve numerals or scarcely 2% of the characters. There is one number in the deed from Arezzo which is composed of three numerals, i.e. 2.5%.

There are two numbers in the Gotica Veronensia and two numerals or 0.7% of the characters.

There are twelve numbers in the Vindobonensis containing 20 numerals or 20% of that text.

In sec. n.: The third column contains the numerals from the numbers in the margin of the manuscripts dividing them into sections or lections. In the Argenteus these are the numbers of the so-called Eusebian sections used to find parallel texts in the other Gospels as mentioned above. In the Argenteus there are 605 such numbers (Mt 84, Jh 141, Lk 188, Mk 192) with 1,381 numerals. In the Ambrosianus A there are seventeen sectional numbers with 21 numerals, in the Ambrosianus B 52 numbers with 60 numerals and in the Carolinus three numbers with four numerals. Altogether there are 677 numbers and 1,466 numerals or 27.39% of the numerals as a whole. It should be noted that only the legible numbers from the palimpsests have been counted and the questionable and “invisible” ones ignored.

Col.: The numbers in the Eusebian columns under the text in the Argenteus must also be taken into account. These numbers are 1,511 (Mt 176, Jh 345, Lk 460, Mk 530). Altogether they contain 3,591 numerals, which is more than two-thirds of the numerals or 67.09%.

Gather.: Finally, there are the numbers of the gatherings in some of the manuscripts. These are 22 in the Argenteus or 40 numerals, one in the Ambrosianus A or one numeral, one in the Ambrosianus B or two numerals, one in the Carolinus or one numeral, one in the Ambrosianus C or two numerals. Also counted here is one

big *g* in Ambrosianus A (in the right margin at the end of 1 CorA 11:2; p. 163, fol. 61v) and an unexplained *r* in Ambrosianus C (at the beginning of Mt 27, p. 4). Altogether these 48 numerals amount to only 0.9% of the numerals.

The outcome is that the number of the numerals in the Gothic corpus is 5,352 or 1.49% of all the characters.

In Table 10 the alphabetical order of the characters has been kept, but it is obvious that *·r·* '100' is by far the most frequent numeral, followed by *·s·* '200' and then *·i·* '10'. The numerals *·f·* '500' and *·o·* '800' are the least frequent, attested only once each. Note that *·w·* is **not** attested as '400'. Castiglione (see Gabelentz/Löbe 1843: 354) and Uppström (1864–1868) read it in Esdras 2:15 (i.e. Neh 7:20) but the number in question is not *·w·n·d·* '454' but *·x·n·d·* '654' (cf. Streitberg 2000: 485, Snædal 2005: XXVII). A list of the attested numbers is given in the Appendix.

4. Conclusion

In Table 11 the additional letters and numerals have been added to Table 1. It now becomes clear that the addition as a whole is 9,930 characters, proportionally 2.77% of all the characters. It can also be seen that the proportion of the Argenteus has grown somewhat, and that of the Ambrosiani A and B has decreased. Letters in the main text total 97.16%, numerals in the main text 0.07%, additional letters 1.35% and additional numerals 1.42%.

	Letters	Numerals	+lett.	+num.	Total	%
Codex Argenteus	176,557	21	4,120	5,012	185,710	51.83
Codex Ambrosianus A	80,008	73	114	23	80,218	22.39
Codex Ambrosianus B	72,526	2	314	62	72,904	20.35
Codex Ambrosianus E	10,655	8			10,663	2.98
Codex Carolinus	2,994			5	2,999	0.84
Codex Ambrosianus D	2,456	106			2,562	0.72
Codex Ambrosianus C	1,706		5	3	1,714	0.48
Deed from Naples	608	12			620	0.17
Gotica Veronensia	274	2			276	0.08
Codex Gissensis	135		3		138	0.04
Deed from Arezzo	116	3			119	0.03
Codex Vindobonensis 795	85	20	85		190	0.05
Gotica Parisina			9		9	0.003
Hács Béndekpuszta			175		175	0.05
	348,120	247	4,825	5,105	358,297	100

Table 11. Number of characters in individual manuscripts

Finally, we hope that these statistics will be useful for studies of Gothic orthography and phonology. They should at least be borne in mind, e.g. concerning the digraphs *ai* and *au* and variation in the writing of some of the vowels.

Appendix

What follows is a list of the attested numbers. Frequency is shown in parentheses. The most frequent number is *·b·* (24), followed by *·e·* (21), *·a·* (20) and *·ib·* (19). The numbers which are also found with a point (·) between the numerals are marked with an asterisk * (once) and ** (twice), most often in the Ambrosianus D (Nehemiah).

As can be seen, all numbers up to 254 are attested but 255 is missing, as are some numbers up to 354. Higher numbers than 354 are only fifteen. Two errors are listed at the end of the table. The first is found in a Eusebian column (Lk, p. 229, fol. 165r) and should be read as two separate numbers, ‘8’ and ‘30’, but it is written as a single number. The second is the misspelling of ‘14’ in GalB 2:1 mentioned above.

Note that the numeral *·†·* for 900 is not used in Nehemiah 7:39 but instead we find *niun hunda ·ug·* ‘973’. It appears also to have been the case in 7:13 as the leaf begins with *hunda ·m·e·* but here the number 945 is expected. Even though the numeral *·ƿ·* for 90 is used once (7:25), in 7:21 the number ‘98’ is written as *niun<te>hund jah ·h·*. In this connection it should be stressed that the numeral for 900 only occurs in the Vindobonensis twice in the numbers from Genesis. The numerals *·ƿ·* and *·†·* are both missing in the alphabets written there. Therefore, it must be a mistake when Ebbinghaus (Braune, Ebbinghaus 1981: 14) removed the character ƿ from the Vindobonensian alphabet but kept †. Both or neither of these characters should be in the alphabet. It should be reiterated that the numeral *·w·* for 400 is not attested. The form of the numbers has been standardised here but it is described in some detail in Braune, Heidermanns (2004: 22).

1	·a· (20)	14	·id· (10)	27	·kz· (12)
2	·b· (24)	15	·ie· (13)	28	·kh· (8)
3	·g· (16)	16	·iq· (9)	29	·kþ· (7)
4	·d· (15)	17	·iz* (16)	30	·l· (14)
5	·e· (21)	18	·ih· (11)	31	·la· (7)
6	·q· (15)	19	·iþ· (8)	32	·lb· (7)
7	·z· (17)	20	·k· (11)	33	·lg· (7)
8	·h· (13)	21	·ka· (12)	34	·ld· (8)
9	·þ· (10)	22	·kb· (9)	35	·le· (10)
10	·i· (12)	23	·kg· (15)	36	·lq· (11)
11	·ia· (10)	24	·kd· (11)	37	·lz· (13)
12	·ib· (19)	25	·ke· (12)	38	·lh· (11)
13	·ig· (10)	26	·kq· (12)	39	·lþ· (9)

40	·m·	(16)	84	·pd·	(8)	128	·rkh.**	(8)
41	·ma·	(10)	85	·pe·	(18)	129	·rkþ·	(7)
42	·mb·	(8)	86	·pq·	(9)	130	·rl·	(7)
43	·mg·	(6)	87	·pz·	(11)	131	·rla·	(6)
44	·md·	(8)	88	·ph·	(9)	132	·rlb·	(7)
45	·me*	(8)	89	·pp·	(7)	133	·rlg·	(9)
46	·mq·	(10)	90	·ƿ·	(13)	134	·rld·	(7)
47	·mz·	(11)	91	·ƿa·	(10)	135	·rle·	(7)
48	·mh·	(10)	92	·ƿb·	(11)	136	·rlq·	(2)
49	·mp·	(12)	93	·ƿg·	(11)	137	·rlz·	(4)
50	·n·	(13)	94	·ƿd·	(15)	138	·rlh·	(2)
51	·na·	(8)	95	·ƿe*	(11)	139	·rlþ·	(5)
52	·nb*	(10)	96	·ƿq·	(16)	140	·rm·	(3)
53	·ng·	(10)	97	·ƿz·	(12)	141	·rma·	(5)
54	·nd·	(11)	98	·ƿh·	(15)	142	·rmb·	(4)
55	·ne·	(9)	99	·ƿþ·	(9)	143	·rmg·	(2)
56	·nq·	(10)	100	·r·	(16)	144	·rmd·	(6)
57	·nz·	(10)	101	·ra·	(9)	145	·rme·	(4)
58	·nh·	(12)	102	·rb·	(11)	146	·rmq·	(5)
59	·np·	(13)	103	·rg·	(10)	147	·rmz·	(6)
60	·j·	(16)	104	·rd·	(10)	148	·rmh.*	(5)
61	·ja·	(11)	105	·re·	(16)	149	·rmp·	(4)
62	·jb·	(9)	106	·rq·	(9)	150	·rn·	(6)
63	·jg·	(12)	107	·rz·	(11)	151	·rna·	(4)
64	·jd·	(10)	108	·rh·	(13)	152	·rnb·	(3)
65	·je·	(7)	109	·rþ·	(10)	153	·rng·	(4)
66	·jq*	(10)	110	·ri·	(12)	154	·rnd·	(4)
67	·jz·	(10)	111	·ria·	(10)	155	·rne·	(2)
68	·jh·	(7)	112	·rib*	(14)	156	·rnq*	(6)
69	·jþ·	(12)	113	·rig·	(4)	157	·rnz·	(2)
70	·u·	(13)	114	·rid·	(8)	158	·rnh·	(5)
71	·ua·	(11)	115	·rie·	(7)	159	·rnþ·	(6)
72	·ub·	(11)	116	·riq*	(17)	160	·rj·	(6)
73	·ug·	(10)	117	·riz·	(10)	161	·rja·	(5)
74	·ud·	(14)	118	·rih·	(10)	162	·rjb·	(6)
75	·ue·	(9)	119	·riþ·	(14)	163	·rjg·	(2)
76	·uq·	(10)	120	·rk**	(15)	164	·rjd·	(5)
77	·uz·	(11)	121	·rka·	(8)	165	·rje·	(9)
78	·uh·	(10)	122	·rkb*	(10)	166	·rjq·	(5)
79	·up·	(11)	123	·rkg*	(7)	167	·rjz·	(3)
80	·p·	(12)	124	·rkd·	(3)	168	·rjh·	(5)
81	·pa·	(7)	125	·rke·	(9)	169	·rjþ·	(5)
82	·pb·	(12)	126	·rkq·	(5)	170	·ru·	(6)
83	·pg·	(14)	127	·rkz·	(6)	171	·rua·	(3)

172	·rub·	(6)	216	·siq·	(11)	262	·sjb·	(1)
173	·rug·	(5)	217	·siz·	(7)	263	·sjg·	(1)
174	·rud·	(4)	218	·sih·	(4)	266	·sjq·	(5)
175	·rue·	(6)	219	·siþ·	(8)	269	·sjþ·	(2)
176	·ruq·	(5)	220	·sk·	(11)	270	·su·	(4)
177	·ruz·	(3)	221	·ska·	(7)	271	·sua·	(1)
178	·ruh·	(7)	222	·skb·*	(7)	274	·sud·	(2)
179	·rup·	(6)	223	·skg·**	(9)	275	·sue·	(1)
180	·rp·	(7)	224	·skd·	(7)	276	·suq·	(2)
181	·rpa·	(9)	225	·ske·	(7)	277	·suz·	(4)
182	·rpb·	(11)	226	·skq·	(7)	278	·suh·	(2)
183	·rpg·	(9)	227	·skz·	(5)	279	·sup·	(3)
184	·rpd·	(9)	228	·skh·	(5)	280	·sp·	(1)
185	·rpe·	(9)	229	·skþ·	(7)	281	·spa·	(1)
186	·rpq·	(6)	230	·sl·	(6)	282	·spb·	(1)
187	·rpz·	(8)	231	·sla·	(6)	284	·spd·	(4)
188	·rph·	(8)	232	·slb·	(4)	285	·spe·	(4)
189	·rpp·	(7)	233	·slg·	(4)	286	·spq·	(1)
190	·rþ·	(7)	234	·sld·	(6)	289	·spþ·	(2)
191	·rþa·	(8)	235	·sle·	(2)	290	·sq·	(3)
192	·rþb·	(9)	236	·slq·	(2)	291	·sqþa·	(4)
193	·rþg·	(10)	237	·slz·	(2)	292	·sqþb·	(3)
194	·rþd·	(8)	238	·slh·	(3)	293	·sug·	(3)
195	·rþe·	(9)	239	·slþ·	(4)	294	·sqd·	(3)
196	·rþq·	(7)	240	·sm·	(3)	295	·sqe·	(3)
197	·rþz·	(6)	241	·sma·	(3)	297	·sqz·	(3)
198	·rþh·	(7)	242	·smb·	(7)	299	·sqþ·	(2)
199	·rþþ·	(7)	243	·smg·	(3)	300	·t·	(10)
200	·s·	(8)	244	·smd·	(4)	301	·ta·	(1)
201	·sa·	(9)	245	·sme·	(4)	302	·tb·	(4)
202	·sb·	(6)	246	·smq·	(3)	303	·tg·	(3)
203	·sg·	(8)	247	·smz·*	(2)	304	·td·	(2)
204	·sd·	(12)	248	·smh·	(2)	305	·te·	(2)
205	·se·	(7)	249	·smp·	(2)	306	·tq·	(3)
206	·sq·	(10)	250	·sn·	(2)	307	·tz·	(2)
207	·sz·	(6)	251	·sna·	(1)	308	·th·	(1)
208	·sh·	(6)	252	·snb·	(1)	309	·tþ·	(3)
209	·sp·	(9)	253	·sng·	(3)	310	·ti·	(5)
210	·si·	(5)	254	·snd·*	(3)	311	·tia·	(3)
211	·sia·	(11)	256	·snq·	(1)	312	·tib·	(1)
212	·sib·	(4)	257	·snz·	(2)	313	·tig·	(2)
213	·sig·	(5)	258	·snh·	(4)	314	·tid·	(3)
214	·sid·	(5)	259	·snþ·	(1)	315	·tie·	(4)
215	·sie·	(5)	260	·sj·	(1)	316	·tiq·	(3)

317	·tiz·	(4)	336	·tlq·	(2)	590	·fq·	(1)
318	·tih·	(6)	337	·tlz·	(2)	603	·xg·	(1)
319	·tip·	(2)	338	·tlh·	(2)	623	·xk·g·	(1)
320	·tk·	(5)	339	·tlþ·	(3)	630	·xl·	(1)
321	·tka·	(5)	340	·tm·	(3)	654	·xn·d·	(1)
322	·tkb·	(4)	341	·tma·	(3)	662	·xj·b·	(1)
323	·tkg·	(6)	342	·tmb·	(3)	666	·xj·q·	(1)
324	·tkd·	(3)	343	·tmg·	(3)	707	·huz·	(1)
325	·tke·	(4)	344	·tmd·	(3)	725	·hoke·	(1)
326	·tkq·	(2)	345	·tme·*	(3)	740	·hum·	(1)
327	·tkz·	(2)	346	·tmq·	(3)	743	·hu·m·g·	(1)
328	·tkh·	(3)	347	·tmz·	(3)	760	·hu·j·	(1)
329	·tkþ·	(5)	348	·tmh·	(3)	890	·ouq·	(1)
330	·tl·	(3)	349	·tmþ·	(3)	912	·↑ib·	(1)
331	·tla·	(1)	350	·tn·	(3)	930	·↑l·	(1)
332	·tlb·	(3)	351	·tna·	(2)	8/30	·hl·	(1)
333	·tlg·*	(3)	352	·tnb·	(1)	14	·di·	(1)
334	·tld·	(1)	353	·tng·	(1)			
335	·tle·	(1)	354	·tnd·	(1)			

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