

X1X, and *X2X*. Further inspection revealed that Herdan had made an elementary but serious error which I corrected in this journal (6), and I concluded that there was insufficient reason to reject Herdan's formulation and that line-initials in the *Georgics* are randomly distributed in accordance with that formulation.

Martin's recent article acknowledged my correction of Herdan, but then went on to point out supposed further weaknesses in Herdan's approach. To begin, Martin made the important point that Herdan's method of estimating p_x needs further analysis. As we have seen, Herdan uses the ratio $n(x)/N$, i.e., the number of times that a particular letter occurs as line-initial divided by the total number of lines under consideration. In our subsequent discussion we shall call this the "local estimate". Martin made a serious error, however, in asserting that the estimate can be improved by basing the estimate "... on the occurrence of the initials of *all the words of the text*, as every word in the text has the same chance to occur at the beginning of the verse line" (7). This is incorrect, since words with an initial short syllable cannot stand at the beginning of the hexameter line in Latin. Inspection of the *Georgics* would be too tedious, but a cursory inspection of *Aeneid* 1 (8) indicates that 23 % of the words with initial *A*, 29 % of those with initial *B*, 18 % of those with initial *C* have a short first syllable. There is no point in continuing through the alphabet. But while Martin's suggestion is clearly no improvement, the notion that there might be better ways of estimating p_x seemed to me worth pursuing.

At first glance, it would seem possible to arrive at better estimates, perhaps, by counting the occurrences of all words with initial long syllables. There is,

however, the fact that considerations other than metrical shape may also militate against the initial occurrence of certain words or classes of words. For example, in *Aeneid* 1 words of dactylic shape like *abdidit*, *accipe*, *adnuis*, and *Aeolus* could conceivably occur in any foot except the last. In fact, there occur 104 in the first foot, none in the second or third, 17 in the fourth, and 228 in the fifth. Again, we have found, in the *Ars Poetica* at least, that there is a tendency far greater than one might expect to place monosyllabic words at the beginning of the line (9). This approach, therefore, did not seem promising to me. It seemed and seems to me that we do better to remain with Herdan's method, i.e., using ratios based upon the frequencies of line-initials which actually occur. It did, however, seem to me to be an open question whether we would arrive at better figures through "local estimates" or through "corpus estimates", which will be described below.

Again, in the course of his discussion, Martin offered as a hypothetical example "a Latin poem consisting of ten verse lines, the first nine of which begin with an 'A' word, the remaining one with a different initial". He then observed that the extraordinary character of this poem would not be revealed by the statistical tests employed by Herdan and me (10). This discussion is marred by the conflation of two separable hypotheses. The first hypothesis to be tested would be whether the poem in question has an unusually large number of instances of line-initial A. The second hypothesis would be whether the arrangement or ordering of the line initials is unusual or surprising to any significant degree. Given a ten-line poem in which nine of the line-initials are A, it is indeed the case that no ordering would be found very surprising. It is clear that Herdan and I devoted our attention only to the second of the above

hypotheses. It seemed to me that the first hypothesis ought to be investigated further.

Finally, Martin arrived at a very interesting refinement which had been overlooked by both Herdan and myself. This refinement consists of combining into totals all instances of recurrence with a particular gap-length. Thus, Martin found that there are 49 instances of recurrence with gap *X1X* in *Georgics* 1, whereas one might expect to find only 32. He then employed asymmetric confidence interval estimates to show that this divergence is significant at the P_{99} level (11). Despite the difficulties in Martin's approach, the idea of combining all instances of recurrences of a particular gap-length seems to me to be valuable and instructive. Adopting Martin's suggestion and using Herdan's method of arriving at p and his data for all four books of the *Georgics* 1 arrived at the following findings :

TABLE 2 .: *Actual and expected frequencies of recurrences for all initials combined in the Georgics*

GAP	ACTUAL VALUE	EXPECTED VALUE	χ^2
XX	157	161	0.08
X1X	181	147	7.63
X2X	122	135	1.16
X3X	110	123	1.27
X4X	105	113	0.50
X5X	90	104	1.75
X6X	102	95	0.44
X7X	88	87	0.00
X8X	87	80	0.53

The χ^2 value for gap-length *X1X*, 7.63, is significant at P_{99} , but not at $P_{99.5}$. The remaining χ^2 values are low and indicate that there is insufficient reason to reject the hypothesis as a whole. Nevertheless, Martin has drawn attention to a feature of the *Georgics* as a whole which is significant at his chosen level of P_{99} . While I have suggested elsewhere that an appropriate level of significance for statistical work in literature is $P_{99.9}$ (12), this, if it is to be maintained at all, must have some basis in empirical findings.

All the above considerations led me to extend the investigation to additional materials easily available to me in machine-readable form. The remainder of our discussion is based upon a corpus of 12481 lines of Latin hexameter verse.

TABLE 3 : *Corpus of Texts in Machine-readable Form* (13)

AUTHOR AND WORK	NUMBER OF VERSES
Lucretius, <i>De Rerum Natura</i> 1	1102
Lucretius, <i>De Rerum Natura</i> 3	1091
Catullus, <i>Carmina</i> 64	407
Vergil, <i>Eclogues</i>	829
Vergil, <i>Georgics</i>	2188
Vergil, <i>Aeneid</i> 1	756
Vergil, <i>Aeneid</i> 4	705
Vergil, <i>Aeneid</i> 12	952
Ovid, <i>Metamorphoses</i> 1	778
Ovid, <i>Metamorphoses</i> 12	628

TABLE 3 (cont'd)

AUTHOR AND WORK		NUMBER OF VERSES
Lucan,	<i>Bellum Civile 1</i>	690
Lucan,	<i>Bellum Civile 10</i>	547
Statuis,	<i>Achilleid 1</i>	961
Valerius Flaccus,	<i>Argonautica 1</i>	847
		12481

Our empirical findings are listed in Appendices 1.1-14, showing for each work the number of times each line-initial occurs and the number of times it recurs with gaps from *XX* to *X8X*.

On the basis of these findings, we established corpus-norms for the occurrence of each letter of the alphabet as line-initials. The number and percentage for each letter follows :

TABLE 4 : Number and percentage of times each letter occurs as line-initial in corpus (14)

LETTER	NUMBER	PERCENTAGE
A	1281	10.26
B	67	0.54
C	977	7.83
D	607	4.86
E	991	7.94
F	390	3.12

TABLE 4 (cont'd)

LETTER	NUMBER	PERCENTAGE
G	66	0.53
H	561	4.49
I-J	1274	10.21
L	217	1.74
M	431	3.45
N	1052	8.43
O	346	2.77
P	871	6.98
Q	776	6.22
R	170	1.36
S	1064	8.52
T	724	5.80
U-V	616	4.94

Given our corpus norms, we proceeded to see if authors deviated significantly in their distribution of line-initials. It is, of course, questionable to assume that the percentages found in our corpus can be taken as typical of Latin hexameter poetry, but the corpus does represent a first approximation, despite its heavily Vergilian character (43.5 %).

We begin by listing below the works in which highest and lowest percentages of each line-initial occur.

TABLE 5

INITIAL	HIGH	%	LOW	%	CORPUS PERCENTAGE
A	<i>Georgics</i>	12.25	Ovid, 1	7.07	10.26
B	Ovid, 12	1.11	Lucretius, 1,3	0.0	0.54
C	Catullus 64	11.03	<i>Aeneid</i> 12	6.30	7.83
D	<i>Aeneid</i> 4	7.38	Catullus 64	2.94	4.86
E	Lucretius, 1	9.40	Catullus 64	3.43	7.94
F	Ovid 1	4.37	Lucretius 3	1.10	3.12
G	Stattius 1	1.15	Ovid 1	0.0	0.53
H	<i>Eclogues</i>	6.02	Lucretius 3	2.83	4.49
I-J	Val. Fl. 1	12.16	Catullus 64	6.86	10.21
L	Stattius 1	3.02	Lucretius 1	0.90	1.74
M	Lucan 10	4.95	Catullus 64	1.96	3.45
N	Lucretius 1	12.62	Val. Fl. 1	4.96	8.43
O	<i>Aeneid</i> 1	3.44	<i>Aeneid</i> 4	1.84	2.77
P	Val. Fl. 1	8.38	<i>Aeneid</i> 4	5.25	6.98
Q	Catullus 64	11.03	Stattius	3.96	6.22
R	Lucan 10	2.20	<i>Eclogues</i>	0.60	1.36
S	Lucretius 3	10.33	Ovid 12	6.69	8.52
T	Val. Fl. 1	7.91	Lucretius 3	3.02	5.80
U-V	Ovid 12	6.85	Catullus 64	3.43	4.94

There are sizable differences noted in the above and we proceeded to measure them with a two-way classification test of independence. Our most startling finding is not even noted in the above table since the test also depends on the length of the work involved. In that instance, the instance of line-initial Q, the χ^2 finding for Catullus 64 is 15.91 which is significant at $P_{99.95}$, but the finding for Lucretius 1 is a huge 40.96, while the finding

for Lucretius 1 and 3 combined is a staggering 89.54. Other findings significant at the $P_{99.95}$ level were, in descending order, *Q* in Lucretius 3, *N* in Lucretius 1, *T* in Lucretius 3, *F* in Lucretius 3, *C* in Lucretius 3, *N* in Lucretius 3, and *N* in Valerius Flaccus 1. (*Q*, *C*, and *N* all in Lucretius 3 are also not noted in the above table).

Again, we must be clear as to what the above results mean. The test is designed to deal with the following situation. Suppose that we are confronted by two samples. One sample (Lucretius 1 and 3) consists of 2193 units of which 234 (10.67 %) are *Q*, and the other (the remainder of the corpus) consists of 10288 units of which 542 (5.27 %) are *Q*. The null hypothesis is that both samples are drawn from a single population. If it is appropriate to view these as samples drawn from parent populations, then we would reject the null hypothesis because our finding is significant at the $P_{99.95}$ level. We would conclude that these samples are not drawn from the same parent population, but rather from two different parent populations. But what sort of entities do we imagine these parent populations to be? One reasonable notion would be that they are somehow the stores of potential line-initials available or at issue for each poet, but in the end, we shall be reduced to the following tautology: the probability that Lucretius will begin a line with *Q* is 0.1067, while the average for the rest of the corpus is 0.0527.

We can hope to escape this tautology by examining other modes of estimating p_x , i.e., the probability that a particular letter (*x*) will occur as line-initial. We have already rejected Martin's suggestion above, but it seems reasonable to hypothesize that the store of line-initials in our corpus is a

better estimation than the actual frequency of a particular letter in a particular work. The hypothesis may be formulated as follows : the probability that a particular letter x will occur as line-initial (p_x) is an undetermined constant dependent upon the nature of the Latin language and the constraints of the hexameter verse. Given this assumption, one may conclude that the data drawn from the corpus as a whole will constitute a better basis for estimation than the data from each individual work. Corpus frequencies, therefore, ought to produce better estimates of recurrences than local frequencies. If they do not, then the hypothesis should be rejected.

There is little point in looking at instances where corpus frequency and local frequency are almost the same. But where they are widely divergent, as in the case of line-initial Q in Lucretius, we may do as follows. Assuming that the unusually high number in Lucretius 1 and 3 is accidental and that a better value for $p(Q)$ is 0.0527, we see which value in the Herdan formulation is a better estimator of the actual recurrence of Q .

TABLE 6 : Actual and expected frequencies of initial Q in Lucretius 1 and 3

GAP LENGTH	ACTUAL	LOCAL EXPECTED ($p = 0.1067$)	CORPUS EXPECTED ($p = 0.0527$)
XX	24	24.97	8.48
X1X	17	22.30	7.95
X2X	16	19.92	7.46
X3X	17	17.80	6.99
X4X	19	15.90	6.56
X5X	13	14.20	6.15

TABLE 6 (cont'd)

GAP LENGTH	ACTUAL	LOCAL EXPECTED ($p = 0.1067$)	CORPUS EXPECTED ($p = 0.0527$)
X6X	15	12.68	5.77
X7X	15	11.34	5.41
X8X	12	10.13	5.07

The superiority of the value based on the local frequency is manifest. This is not peculiar to Lucretius. Whenever the local frequencies are sizably different from the corpus frequencies, the local frequencies have proven to be the better basis for estimation of recurrences. Herdan's insight is thereby vindicated, and the local frequencies are a better basis for estimation than the corpus frequencies.

Finally, we applied Martin's insight of combining all instances of recurrence of a given gap-length to our entire corpus. We also generated expected values on the basis of local estimators (i.e., based on the frequencies of line-initials in each work individually) and on the basis of corpus estimators.

TABLE 7 : Actual and expected frequencies for all initials in corpus

GAP	ACTUAL	LOCAL ESTIMATOR	χ^2	CORPUS ESTIMATOR	χ^2
XX	1005	923	7.20	876	18.85
X1X	879	843	1.49	806	6.52
X2X	743	771	0.98	743	0.00
X3X	681	706	0.85	685	0.02

TABLE 7 (cont'd)

GAP	ACTUAL	LOCAL ESTIMATOR	χ^2	CORPUS ESTIMATOR	χ^2
X4X	672	648	0.85	632	2.47
X5X	537	594	5.37	583	3.55
X6X	542	545	0.01	538	0.02
X7X	479	502	1.01	497	0.62
X8X	397	458	7.99	460	8.49

These results are interesting for a number of reasons. First, it is reasonable to conclude once more that the local estimator is better than the corpus estimator. Indeed, the corpus estimator is to be rejected at the level of $P_{99.95}$. On the other hand, the local estimator is not terribly good either. It is to be rejected at the $P_{99.5}$ level but not at $P_{99.95}$.

When we inspect the results more closely we see that there is a major difficulty for the corpus estimator in arriving at a good estimate for XX (gap-length 0). This finding alone is to be rejected at the level of $P_{99.95}$. The local estimator is significantly divergent at P_{99} but not at $P_{99.5}$.

It is remarkable, however, that the local finding for $X8X$ is significantly divergent at $P_{99.5}$ but not at $P_{99.9}$. This is the highest finding for the local estimator, and it brings us squarely back to the problem of establishing a reasonable level of significance. To be very brief, if we are

going to accept the finding for *XX* as significant, then there is no good reason for us not to accept the finding for *X8X* as significant also. But while we are prepared to accept the notion *a priori* that poets may have exercised some non-random effect on *XX* and perhaps also *X1X*, I tend to agree with Martin that gap-lengths larger than *X3X* lose their perceptive impact on the reader rather rapidly (15). One cannot, however, both adopt a level of P_{99} and reject the finding for *X8X*. It is for considerations such as these that I continue to assert that $P_{99.95}$ is an appropriate level of significance for this sort of work.

Nevertheless, some new warnings are clear. Given our rather eccentric finding for *X8X*, it may well be that a corpus or sample of 12481 verses is not sufficiently large for our purposes. It would be of some interest to see within our present corpus whether gap-lengths of larger size produce equally eccentric results. On the other hand, I am prepared to believe that a larger sampling would indicate some non-random character to the findings for *XX* and *X1X*. My own intuition is comforted by the fact that instances of *XX* outnumber those of *X1X* (unlike the unusual finding for the *Georgics*) (16). For one, such a finding conforms more closely with the Herdan model. Secondly, intuition suggests that recurrences without interval or brief interval would be more frequent since they are a necessary concomitant of anaphora and such devices. There can be no question that the poets employ such. For example, *Aeneid* 1 contains 48 instances of line-initial *N*. The Herdan formulation estimates three instances of *XX*, but there are actually seven. Two of these instances (11. 664-65 and 751-52) are cases where successive lines begin with the same word. Just so, the repetition of *non* at the beginning of 1. 527 and 1. 529 seems rhetorically effective. There is no reason to believe that these repetitions are not

deliberate, but they are cases where deliberation or choice is aimed at the entire word rather than at the line-initial. We have not attempted to estimate probabilities for the recurrence rates of identical words. (The word *nate* occurs four times in *Aeneid* 1, three of these initially, including 11. 664-65). It is a different sort of problem.

It seems to me reasonable, therefore, to advance the following untested hypothesis : if we eliminate instances of anaphora and the like, we shall find the Herdan model describes the distribution of line-initials very well. Within the limits of our present corpus there is not sufficient evidence to reject the hypothesis that the poets pay no deliberate attention to the succession of line-initials as such, and this is the case even if we make no allowances for such recognized devices as anaphora and the like. There is some reason to believe, however, that such allowances would be necessary if a larger corpus were inspected.

Oberlin College
Department of Classics

Nathan A. GREENBERG

NOTES

- (1) W. MARTIN, *A Note on Herdan's Theory of the Recurrence of Initial Phonemes*, in *RELO* N° 2, 1973, pp. 1-17.
- (2) G. HERDAN, *The Calculus of Linguistic Observations*, s'Gravenhage, Mouton & Co, 1962, pp. 79-85.
- (3) This example was cited in my previous discussion of this issue :
N.A. GREENBERG, *Line Initials in the Georgics*, in *RELO* N° 4, 1972, pp. 55-58.
- (4) Herdan's formulation, as noted above, is :

$$E(A_{xrX}) = (N-r-1) \cdot p_A \cdot p_A \cdot (1-p_A)^r$$

where $E(A_{xrX})$ is the expected number of recurrence of line-initial A with gap-length r . p_A is established as n/N where N is the total number of cards and n is the number of A-cards in the deck. This is inaccurate for our concrete example which does not allow replacement. The proper formulation for the concrete example (without replacement) is :

$$E(A_{xrX}) = (N-r-1) \cdot \frac{n}{N} \cdot \frac{n-1}{N-r-1} \cdot (1 - \frac{n-1}{N-2}) \dots (1 - \frac{n-1}{N-r})$$

which can be rewritten as :

$$\frac{n! \cdot (N-r-1)! \cdot (N-n)!}{(n-2)! \cdot N! \cdot (N-n-r)!}$$

Given the numbers involved, there is little reason not to use the simpler Herdan formulation.

- (5) These are the limits dictated by the χ^2 test at the $P_{99.95}$ and P_{99} levels of significance. If one uses the asymmetric confidence interval estimates suggested by Martin (*op.cit.*, pp. 11 ff.), then the P_{99} limits are approximately 50 and 20. (It should be noted that this mode of estimation differs in that one begins with actual numbers and then accepts or rejects the statistical model on the basis of the number of instances predicted). There is no obvious reason to prefer one test to the other. Without entering a technical debate, we simply note Martin's peculiar observation concerning the χ^2 test : "... it often treats phenomena so globally that they become blurred and distinctions are lost" (*op. cit.*, p. 7). This seems gratuitously harsh. One may properly derive from this statement the conclusion that sometimes these awful things do not happen.
- (6) N.A. GREENBERG, *Op. cit.* At that time my program generated χ^2 values for each letter of the alphabet which began more than 5 % of the lines in the *Georgics*. As noted there, only a few of these χ^2 values were significant at the modest level of P_{95} . Only one initial, *Q*, at only one gap-length, *X6X*, was significant at the P_{99} level, which is not surprising, given the large number of χ^2 values generated. The remaining few significant values were due to conflation with initial *Q* at *X6X*.
- (7) W. MARTIN, *Op. cit.*, p. 6. The emphasis through use of italics is Martin's.

- (8) Data conveniently available in W. OTT, *Metrische Analysen zu Vergil Aeneis Buch I*, Tübingen, Niemeyer, 1973.
- (9) N.A. GREENBERG, *Metrical Expectations in the Ars Poetica*, in *RELO* N° 3, 1970, p. 129.
- (10) *Op. cit.*, p. 5.
- (11) W. MARTIN, *Op. cit.*, pp. 8-12. The χ^2 value for Martin's finding is 8.51 which is significant at $P_{99.5}$. As we have seen, Martin's method for arriving at p is not acceptable. If one uses Herdan's method to arrive at the expected number of recurrences with gap-length $X1X$, the result is either 34.95 or 34.53 depending upon whether one uses the frequencies for the first or for all four books of the *Georgics*. Neither of these is significant by Martin's test, although they come close. The χ^2 values of 5.25 and 5.66 are significant at $P_{97.5}$ but not at P_{99} .
- (12) See N.A. GREENBERG, *The Hexametrical Haze*, in *RELO* N° 4, 1970, pp. 59-60, and *Words and Syllables : Four Eclogues*, in *RELO* N° 2, 1970, pp. 44ff. Martin's reason (*op.cit.*, p. 16, note 15) for adopting a level of P_{99} is not adequate.
- (13) I have throughout relied upon Herdan's data for the *Georgics* despite the fact that these are not beyond suspicion. For example, Table 13a in Herdan (*op. cit.*, p. 81) indicates that line-initial L with gap $X7X$ recurs 6 times in *Georgics* 4. This is surely an error. Herdan's Table 14 (*op. cit.*, p. 83) indicates

that line-initial *L* is found only 6 times *in toto* in *Georgics* 4.

- (14) We have preserved throughout the convention originated by Herdan and maintained by Martin of making no distinction between vocalic and consonantal *I* or *U*.
- (15) W. MARTIN, *Op. cit.*, p. 17, n. 19.
- (16) It is a noteworthy and rather embarrassing happenstance that the χ^2 finding for *X1X* in the *Georgics* was with one exception, the highest found for any gap length in any work within the corpus. The next highest finding was 6.89 for *X4X* in Lucretius. No other finding was significant at P_{99} . The one exceptional case was a finding of 13.22 (significant at $P_{99,95}$) for *X3X* in *Eclogues* 8, but this is clearly due to the use of refrains in that poem.

APPENDIX 1.1

Lucretius, *De Rerum Natura* 1

LINE INITIAL	N ^o	XX	X1X	X2X	X3X	X4X	X5X	X6X	X7X	X8X
A	92	11	7	4	3	5	8	5	3	0
B	0	0	0	0	0	0	0	0	0	0
C	107	12	6	9	6	6	8	7	4	6
D	56	2	5	0	3	2	0	3	3	1
E	105	7	8	13	7	8	7	6	6	3
F	20	1	1	0	0	0	0	0	1	0
G	3	0	0	0	0	0	0	0	0	0
H	32	2	1	2	0	1	1	0	0	0
I-J	81	7	2	6	3	5	8	2	3	0
L	10	0	0	0	0	0	0	0	0	0
M	29	1	0	1	2	2	1	0	0	2
N	141	26	17	16	8	7	7	4	4	6
O	30	3	1	1	1	0	0	3	0	0
P	72	2	1	3	4	3	6	3	3	1
Q	118	16	7	7	7	7	8	11	10	3
R	17	0	0	0	0	1	0	0	0	0
S	93	8	7	7	6	8	3	5	6	5
T	41	4	2	2	1	1	1	0	1	0
U-V	55	3	4	0	2	3	1	4	0	2

APPENDIX 1.2

Lucretius, *De Rerum Natura* 3

LINE INITIAL	N°	XX	X1X	X2X	X3X	X4X	X5X	X6X	X7X	X8X
A	103	12	4	7	6	9	3	5	8	9
B	0	0	0	0	0	0	0	0	0	0
C	119	14	18	11	10	10	1	6	6	4
D	57	4	4	2	0	2	4	3	3	1
E	94	7	7	7	7	7	4	6	6	3
F	12	0	0	0	0	0	0	1	1	0
G	2	0	0	0	0	0	0	0	0	0
H	31	1	0	0	0	1	0	1	2	1
I-J	86	10	7	6	4	6	8	2	2	3
L	12	0	1	0	0	0	1	0	1	0
M	34	1	1	1	1	0	1	2	0	1
N	125	14	15	9	9	12	4	12	5	5
O	30	0	0	1	1	1	0	1	1	0
P	69	4	5	2	2	6	4	5	3	4
Q	116	8	10	9	10	12	5	4	5	9
R	7	0	0	0	0	0	0	0	0	0
S	113	9	10	9	12	12	11	7	4	2
T	33	0	1	0	1	1	4	0	0	0
U-V	48	4	4	2	2	2	1	1	2	0

APPENDIX 1.3

Catullus, *Carmen* 64

LINE INITIAL	N°	XX	X1X	X2X	X3X	X4X	X5X	X6X	X7X	X8X
A	45	5	4	5	2	5	3	3	1	4
B	1	0	0	0	0	0	0	0	0	0
C	45	0	6	9	3	3	4	0	3	3
D	12	1	0	0	0	0	1	0	0	0
E	14	0	0	0	1	1	0	0	0	0
F	11	0	1	0	0	1	0	0	0	0
G	3	1	0	0	0	0	0	0	0	0
H	20	2	0	0	0	0	1	2	1	2
I-J	28	2	4	1	3	4	0	0	2	0
L	12	1	1	1	1	0	0	2	0	0
M	8	0	0	1	0	0	1	0	0	0
N	43	9	6	3	1	1	1	2	3	1
O	10	0	0	0	1	0	0	0	1	0
P	32	5	2	1	1	3	0	2	0	0
Q	45	5	3	3	3	3	5	5	0	2
R	5	0	0	0	0	0	1	0	0	0
S	30	1	1	3	2	3	3	3	3	0
T	29	4	2	1	3	0	1	0	1	1
U-V	14	0	0	0	1	1	1	2	0	0

APPENDIX 1.4

Vergil, *Eclogues*

LINE INITIAL	N ^o	XX	X1X	X2X	X3X	X4X	X5X	X6X	X7X	X8X
A	81	8	12	7	4	8	3	3	4	3
B	5	0	0	0	1	0	0	0	0	0
C	65	5	3	5	4	0	4	2	3	5
D	55	5	5	3	7	2	2	2	0	0
E	63	4	2	5	3	6	6	1	4	0
F	26	0	1	2	1	2	0	0	0	0
G	3	0	0	0	0	0	0	0	0	0
H	50	6	7	3	2	1	0	1	2	1
I-J	92	11	12	8	8	8	6	3	4	0
L	13	0	0	0	0	0	1	0	0	1
M	31	1	0	0	2	2	0	0	3	0
N	81	15	7	3	7	1	4	4	3	3
O	23	1	1	0	1	0	0	0	2	0
P	63	7	4	6	5	2	1	2	6	2
Q	33	1	3	0	2	2	1	1	2	0
R	5	0	0	0	0	0	0	0	0	0
S	68	5	8	6	3	1	5	3	4	2
T	40	2	4	1	2	1	0	1	1	2
U-V	32	3	0	1	1	1	1	4	1	0

APPENDIX 1.5

Vergil, *Georgics*

LINE INITIAL	N ^o	XX	X1X	X2X	X3X	X4X	X5X	X6X	X7X	X8X
A	268	32	32	20	19	20	16	16	13	12
B	14	0	0	0	0	0	1	0	0	0
C	148	10	6	12	11	13	5	10	2	5
D	80	2	1	1	3	1	1	2	3	4
E	200	14	22	11	11	10	6	8	9	11
F	83	1	4	7	1	1	4	4	2	1
G	13	0	0	0	0	0	0	0	0	0
H	97	2	8	0	4	4	4	1	5	1
I-J	230	26	25	22	16	11	12	6	16	11
L	38	1	0	0	0	1	0	0	6	0
M	66	4	1	1	1	3	0	4	2	3
N	161	14	12	9	8	10	6	10	3	11
O	51	3	2	0	2	0	1	2	1	0
P	157	9	13	10	6	4	7	12	6	3
Q	120	12	10	2	2	10	8	11	3	4
R	28	0	0	0	2	1	0	0	0	0
S	205	16	28	17	15	8	13	12	10	9
T	125	9	9	6	5	5	4	2	5	7
U-V	104	6	8	4	4	3	2	2	2	5

APPENDIX 1.6

Vergil, *Aeneid* 1

LINE INITIAL	N°	XX	X1X	X2X	X3X	X4X	X5X	X6X	X7X	X8X
A	87	11	6	9	9	5	7	2	0	2
B	8	0	0	0	0	0	0	0	0	0
C	49	5	3	4	3	2	3	2	2	1
D	25	0	0	0	1	2	0	0	3	0
E	53	5	5	3	3	3	1	2	0	1
F	21	0	0	0	0	2	0	1	1	0
G	5	0	0	0	0	0	0	0	0	0
H	41	1	1	1	4	0	3	0	6	1
I-J	85	10	10	8	16	6	1	1	2	5
L	15	0	0	0	0	0	0	0	1	0
M	32	3	1	3	0	0	1	2	1	1
N	48	7	2	4	1	0	1	1	4	0
O	26	1	2	2	1	0	2	2	1	0
P	56	4	3	5	5	2	3	3	1	3
Q	39	3	0	2	1	2	2	1	0	0
R	15	0	0	1	0	0	1	0	0	1
S	53	6	5	4	0	3	0	7	2	2
T	56	4	7	7	0	5	2	2	2	2
U-V	42	2	1	2	2	2	3	0	3	3

APPENDIX 1.7

Vergil, *Aeneid* 4

LINE INITIAL	N°	XX	X1X	X2X	X3X	X4X	X5X	X6X	X7X	X8X
A	67	7	7	0	3	5	5	2	3	2
B	2	0	0	0	0	0	0	0	0	0
C	48	1	6	2	4	1	1	1	3	2
D	52	5	2	3	1	4	2	4	4	1
E	55	3	5	2	2	2	3	1	6	2
F	21	2	2	0	1	2	1	0	0	0
G	6	0	0	0	0	0	0	0	0	0
H	40	2	2	2	5	0	1	3	1	1
I-J	70	7	6	6	5	3	3	0	5	7
L	14	0	0	1	0	0	1	0	0	0
M	26	0	1	3	1	0	2	0	0	0
N	56	7	5	5	5	0	2	0	2	5
O	13	1	1	0	0	1	0	0	0	0
P	37	0	3	1	3	0	2	2	2	4
Q	43	3	0	4	3	1	4	2	0	2
R	11	0	1	0	0	0	1	1	0	0
S	66	9	8	6	2	2	4	3	1	2
T	53	5	5	2	4	3	0	1	3	2
U-V	25	2	3	1	0	0	1	0	1	0

APPENDIX 1.8

Vergil, *Aeneid* 12

LINE INITIAL	N°	XX	X1X	X2X	X3X	X4X	X5X	X6X	X7X	X8X
A	107	15	11	9	6	5	9	4	3	3
B	8	1	0	0	0	0	0	0	0	0
C	60	6	4	7	1	2	2	3	2	6
D	56	1	5	1	4	5	3	1	2	2
E	66	5	4	2	4	3	3	2	2	3
F	32	0	1	2	0	1	0	1	0	0
G	3	0	0	0	0	0	0	0	0	0
H	49	0	3	4	3	7	2	1	1	0
I-J	113	13	14	15	5	6	5	8	4	4
L	17	1	0	0	0	0	0	0	1	0
M	28	0	0	0	1	2	0	0	1	0
N	62	4	5	4	1	5	1	3	4	2
O	30	6	1	0	0	4	1	1	1	1
P	61	4	4	4	7	4	1	1	2	0
Q	40	0	0	2	0	0	0	4	3	1
R	9	1	0	0	0	0	0	0	0	0
S	92	12	11	9	2	6	6	2	5	4
T	67	8	3	4	4	6	5	3	3	0
U-V	52	4	1	3	2	2	1	3	3	2

APPENDIX 1.9

Ovid, *Metamorphoses* 1

LINE INITIAL	N°	XX	X1X	X2X	X3X	X4X	X5X	X6X	X7X	X8X
A	55	3	2	4	2	10	2	0	3	2
B	5	0	0	0	0	0	0	0	0	0
C	71	11	7	1	6	2	4	4	1	3
D	37	2	0	5	2	1	1	2	1	1
E	70	4	9	6	2	4	2	5	2	4
F	34	1	1	0	1	2	0	1	1	0
G	0	0	0	0	0	0	0	0	0	0
H	25	1	1	1	0	2	0	2	1	0
I-J	83	7	9	5	8	10	1	4	5	2
L	13	0	0	0	0	0	1	0	0	0
M	31	2	2	1	1	2	2	0	1	2
N	74	12	8	2	9	4	6	3	2	0
O	26	2	0	0	2	1	1	1	0	0
P	57	4	3	1	3	4	5	3	0	2
Q	43	5	4	1	0	1	3	0	0	1
R	6	0	0	0	1	0	0	0	0	0
S	58	3	2	7	4	2	3	3	0	2
T	39	3	3	2	1	1	1	0	1	1
U-V	51	6	2	4	1	3	3	0	1	2

APPENDIX 1.10

Ovid, *Metamorphoses* 12

LINE INITIAL	N°	XX	X1X	X2X	X3X	X4X	X5X	X6X	X7X	X8X
A	71	7	13	4	3	2	5	3	3	4
B	7	1	0	0	0	0	0	0	0	0
C	49	7	2	2	3	2	1	2	3	2
D	25	3	0	0	2	0	1	1	1	0
E	52	3	2	2	6	6	4	5	1	2
F	27	0	0	0	0	2	0	0	1	2
G	4	0	0	0	0	0	0	0	0	0
H	32	0	0	2	2	2	0	1	1	2
I-J	57	5	5	8	2	3	5	3	3	0
L	9	0	0	0	0	0	0	0	0	0
M	31	1	1	2	0	1	0	3	2	2
N	40	3	3	2	0	1	2	3	2	1
O	15	1	0	2	0	0	1	0	0	0
P	42	6	1	0	3	2	2	2	2	1
Q	34	3	0	3	2	2	2	3	1	1
R	9	1	0	0	0	1	0	0	0	0
S	42	3	2	1	2	3	3	4	2	2
T	39	3	1	3	2	2	2	2	2	1
U-V	43	1	2	2	4	2	3	3	1	2

APPENDIX 1.11

Lucan, *Bellum Civile* 1

LINE INITIAL	N ^o	XX	X1X	X2X	X3X	X4X	X5X	X6X	X7X	X8X
A	53	4	5	4	3	1	3	3	2	0
B	6	0	0	0	0	0	0	0	0	0
C	53	7	4	4	1	3	2	0	2	2
D	34	2	3	1	2	1	2	2	1	1
E	66	6	10	8	4	3	0	4	4	3
F	23	2	1	0	1	1	1	0	0	0
G	7	0	1	0	0	0	0	0	0	0
H	33	2	1	2	1	1	0	1	1	1
I-J	78	12	8	8	5	3	5	4	1	2
L	11	0	0	0	0	0	0	0	0	0
M	27	2	5	1	2	0	0	0	1	1
N	41	2	0	1	4	2	2	2	1	1
O	18	2	0	1	0	0	0	1	0	0
P	48	6	4	2	7	3	1	2	0	4
Q	38	3	2	2	1	4	0	2	2	2
R	13	0	0	0	2	0	0	0	1	0
S	58	3	9	4	5	3	4	2	0	1
T	47	6	1	1	5	2	3	1	2	0
U-V	36	0	3	1	3	2	0	1	2	0

APPENDIX 1.12

Lucan, *Bellum Civile* 10

LINE INITIAL	N°	XX	X1X	X2X	X3X	X4X	X5X	X6X	X7X	X8X
A	55	2	5	6	6	8	0	6	0	0
B	1	0	0	0	0	0	0	0	0	0
C	38	2	1	0	2	2	2	3	4	0
D	25	3	1	0	3	0	0	1	2	0
E	49	4	5	1	3	3	1	6	7	2
F	15	1	0	0	1	0	0	0	0	1
G	2	0	0	0	0	0	0	0	0	0
H	23	1	1	0	1	1	2	0	0	0
I-J	60	3	3	8	3	6	4	8	2	3
L	10	0	1	0	1	1	0	0	0	0
M	27	3	1	0	0	1	1	0	0	1
N	55	3	7	2	5	5	3	4	3	2
O	16	0	0	1	1	0	1	0	0	0
P	40	2	3	4	1	1	1	2	1	2
Q	29	1	5	0	0	3	0	0	0	0
R	12	0	1	0	1	1	1	0	0	0
S	39	3	1	4	3	1	3	0	3	0
T	26	1	1	2	2	1	0	1	0	0
U-V	25	1	1	2	3	2	0	0	0	1

APPENDIX 1.13

Status, *Achilleid* 1

LINE INITIAL	N ^o	XX	X1X	X2X	X3X	X4X	X5X	X6X	X7X	X8X
A	108	15	9	6	10	6	5	6	7	4
B	6	0	0	0	0	0	0	0	0	0
C	65	7	5	5	2	2	4	4	3	1
D	53	1	1	5	3	4	0	3	4	1
E	56	3	4	1	3	5	4	0	0	3
F	34	1	1	1	1	1	1	4	0	1
G	11	1	0	0	0	0	0	0	0	0
H	43	5	2	1	2	1	2	0	0	1
I-J	108	16	7	12	6	14	6	5	3	4
L	29	0	0	1	1	3	1	0	0	0
M	32	1	2	1	0	1	0	0	0	0
N	83	11	4	5	5	3	4	5	4	4
O	31	2	0	0	1	0	2	1	1	2
P	66	5	3	0	3	4	3	4	1	1
Q	38	0	2	0	1	0	0	1	0	0
R	16	0	0	0	0	0	1	0	1	0
S	80	7	7	6	3	3	6	6	5	2
T	62	7	4	3	3	4	2	2	1	2
U-V	40	2	0	5	2	0	2	2	1	0

APPENDIX 1.14

Valerius Flaccus, *Argonautica* 1

LINE INITIAL	N°	XX	X1X	X2X	X3X	X4X	X5X	X6X	X7X	X8X
A	89	9	7	11	6	9	5	3	4	1
B	4	0	0	0	0	0	0	0	0	0
C	60	4	1	3	6	7	3	5	4	4
D	40	2	2	2	0	4	1	1	0	1
E	48	3	4	4	1	1	2	1	1	0
F	31	2	1	1	2	1	0	1	1	0
G	4	0	0	0	0	0	0	0	0	0
H	45	0	1	5	2	1	1	2	2	0
I-J	103	14	9	6	9	9	6	10	4	4
L	14	0	0	0	0	0	1	0	1	1
M	29	1	0	1	1	2	0	1	0	0
N	42	2	0	2	6	1	0	2	0	1
O	27	0	0	3	0	0	0	0	0	0
P	71	2	6	5	4	4	1	3	2	3
Q	40	2	3	1	2	3	0	0	2	2
R	17	0	0	0	0	0	1	0	0	0
S	67	6	4	3	5	5	5	4	3	4
T	67	6	5	3	5	3	2	3	5	4
U-V	49	8	0	2	2	3	0	2	1	2