STUDIES IN LATIN HEXAMETER POETRY

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This article is a continuation of my recent investigations into the nature of the Latin hexameter, especially the variety and repetition to be found in the use of the sixteen possible metrical patterns (exclusive of spondaic verses). My examination of Vergil's procedure in his authentic works reveals that, after the more dactylic *Eclogues*, he established his normal practices in the *Georgics* and the *Aeneid*, but the many unusual features in *Aeneid* X–XII indicate that these three books failed to receive their final metrical revision.[1] Vergil, beginning with the *Eclogues*, lessened the heavy concentration of his predecessors on eight of the sixteen patterns, and Horace displays in his hexameter poetry an even greater interest in variety, with the frequencies of the first eight patterns showing a steady decrease from *Satires* I to the *Ars Poetica*—one of many metrical features which argue for the late composition of the *Ars*.[2]

Both Vergil and Horace use *dsss* more frequently than any other pattern, and Vergil's treatment of *dsss* in the *Aeneid* is particularly significant: although the overall percentage of *dsss* is 14.39, in many speeches and episodes it ranges from twenty to thirty per cent, in others from three to six per cent; it is high in narrative and descriptive passages, and especially in those dealing with divinities and with Rome, Roman history, and Augustus; it is low in emotional and dramatic scenes, those in Vergil's "subjective style"; in other words, we find a

[1] See G. E. Duckworth, "Variety and Repetition in Vergil's Hexameters," *TAPA* 95 (1964) 9–65, hereafter cited as **Duckworth, *Vergil*.** This article is basic for definitions and illustrations of many terms used below: variety in sixteen-line units, repeat clusters, repeats and near repeats, opposite and reverse patterns, shift in fourth-foot texture in repeated patterns, etc.

[2] See G. E. Duckworth, "Horace's Hexameters and the Date of the *Ars Poetica*," *TAPA* 96 (1965) 73–95, hereafter cited as **Duckworth, *Horace*.**

strict correlation between Vergil's use of *dsss* and the style and subject matter of the epic.[3]

In my analyses of the metrical procedures of both Vergil and Horace, I made several comparisons with the techniques of the earlier hexameter poets, as I did also in discussing the dactylic nature of Ovid's poetry in an attempt to prove that the *Halieutica* could not, for metrical reasons, be the work of Ovid.[4] But these brief comments on the earlier poets did not give a sufficiently clear picture of their treatment of the hexameter. I wish, therefore, to present on this occasion more detailed information concerning Vergil's predecessors. An examination of Ovid's hexameters in the *Metamorphoses* will follow, as it will be helpful to have as complete a picture as possible of Roman metrical procedures both before and after Vergil when, in the third section of this article, I analyze the hexameter poems of the *Appendix Vergiliana* and consider again the problem of their authenticity.

Since I discuss several different authors and a variety of poems, I shall keep the statistical tables at the end of this article to a minimum, and I give there only the pattern totals and the major frequencies.[5] The relevant material on variety, repeated patterns, fourth-foot texture, and opposite and reverse patterns in adjacent lines is presented in the text.

I. VERGIL'S PREDECESSORS

In this section I discuss Ennius (404 verses of fragments), Lucilius (605 verses of fragments), Cicero (*Aratea* and 265 verses of fragments), Lucretius, and Catullus LXIV.[6] I shall treat them together under the

[3] See G. E. Duckworth, "Vergil's Subjective Style and its Relation to Meter," *Vergilius* 12 (1966) 1–10. Cf. also Duckworth, "Hexameter Patterns in Vergil," *PVS* 5 (1965–66) 39–49, for a brief summary of the *Vergilius* article and that in *TAPA* 95 (above, note 1).

[4] The authentic works of Ovid regularly have twenty dactyls and twelve spondees in the first four feet of the eight most frequent patterns; in the *Halieutica* we find thirteen to eleven dactyls and nineteen to twenty-one spondees; see G. E. Duckworth, "The Non-Ovidian Nature of the *Halieutica*," *Latomus* 25 (1966) 756–68.

[5] See below, Table 2. Republican Poets; 3. Ovid, *Metamorphoses*; 4. *Appendix Vergiliana*. On Table 5, see below, note 106.

[6] My scansions and percentages are based on the following texts: Ennius: E. H. Warmington, *Remains of Old Latin*, Vol. 1 (LCL 1935); see Duckworth, *Vergil* 13, note 11. Lucilius: Warmington, *op. cit.*, Vol. 3 (LCL 1938). Cicero: A. Traglia, *Ciceronis*

appropriate headings in an attempt to show clearly their similarities and differences and to reveal the changing trends, if any, from the time of Ennius to the middle of the first century B.C.

Statistics based on fragments are unsatisfactory at best, and it is of course impossible to discuss the use of repeated, opposite, and reverse patterns in adjacent lines in the case of Ennius and Lucilius, where many of the fragments consist of only one verse. On the other hand, a total of four or six hundred verses is sufficient to give an approximate idea of the metrical patterns favored and the frequency with which they were used.[7]

The eight patterns preferred by the Republican poets are as follows, according to order of frequency:

	Enn.	Lucil.	*Arat.*	Cicero frag.	total	Lucr.	Cat. LXIV
dsss	2–3	2	1	1	1	1	1
ddss	5–6	5–6	3	2	2	2	3
dsds	8	4	7–8	4	5	3	4
sdss	2–3	1	4	3	3	4	2
ssss	1	3	2	5–6	4	7	5
ddds			7–8	7	8	5	8
ssds	4	5–6	5	8–9	7		7
sdds		7	6	5–6	6		
dssd	7			8–9		6	6
ddsd						8	
sdsd		8					
sssd	5–6						

Ennius, the father of the Latin hexameter, favored *ssss*, the opposite of *dddd*, which had been Homer's most frequent pattern in both the *Iliad* and the *Odyssey*,[8] and Lucilius chose *sdss* as his most frequent pattern. Beginning with Cicero, *dsss* emerges as the first pattern and continues as the favorite not only in Lucretius (also in each of the six

Poetica Fragmenta (Rome 1950, 1952). Lucretius: C. Bailey, *Titi Lucreti Cari De Rerum Natura Libri Sex*, Vol. 1 (Oxford 1947). Catullus: R. A. B. Mynors, *C. Valerii Catulli Carmina* (OCT 1958). I use here and elsewhere the abbreviations LCL (for Loeb Classical Library) and OCT (for Oxford Classical Texts). I exclude from my statistics seventy-three spondaic verses, as follows: Ennius, eight; Lucilius, two; Cicero, *Aratea*, one; Lucretius, thirty-two; Catullus LXIV, thirty.

[7] On Ennius, see also Duckworth, *Vergil* 14–15.

[8] See Duckworth, *Vergil* 13–15.

books) and Catullus LXIV, but likewise in Vergil and Horace. The first four patterns in Lucretius are also those of Vergil's *Aeneid*, in exactly the same order, but it is only Cicero (both *Aratea* and total) whose first eight patterns are identical (but in slightly different order) with the first eight patterns in the *Aeneid*.[9] As a result, we have a fourth-foot spondee in each of the first eight patterns, the only instance of this in Latin hexameter poetry before the *Aeneid*. All this suggests that Cicero was perhaps more influential on the later poets and especially Vergil than is often realized, and supports the statement of Ewbank:

> This unconsciously close correspondence, therefore, which exists between the two poets goes to prove that Cicero's feeling for rhythm and arrangement was very closely allied to that of Virgil. . . . Hence, in this matter of the 'spondaic fourth' Cicero, with unerring instinct, pointed the way to his great successor.[10]

The tables given above do not indicate the absolute frequencies of the various patterns and therefore throw no light on the variety and repetition to be found in the different poets. These will be shown in the following tabulation of percentages for the first, the first four, and the first eight patterns, with the distribution of spondees and dactyls in the first eight patterns:

	Enn.	Lucil.	Cicero			Lucr.	Cat.
			Arat.	frag.	total		
% 1st pattern:	15.35	16.86	17.95	18.87	18.28	20.20	27.59
% 1st four:	41.34	47.60	59.08	55.47	57.39	54.34	67.90
% 1st eight:	65.35	74.21	82.88	81.13	82.26	79.81	90.98
First eight—							
Spondees:	22	21	20	20–21	20	18	20
Dactyls:	10	11	12	12–11	12	14	12
4th-foot spond.:	6	7	8	7–8	8	6	7
1st-foot dact.:	4	3	4	4–5	4	6	5

[9] For comments on earlier metrical analyses of Cicero's poetry, see Duckworth, *Horace* 75, note 9.

[10] W. W. Ewbank, *The Poems of Cicero* (London 1933) 48, who compares Cicero and Vergil on the basis of the earlier statistics (on Vergil) compiled by S. Lederer, "Ist Vergil der Verfasser von 'Culex' und 'Ciris'? Zugleich ein Beitrag zur Geschichte des Hexameters," *Jahres-bericht über das K. K. Akademische Gymnasium in Wien* (Wien 1890) 14–30. Cf. G. B. Townend, in T. A. Dorey (ed.), *Cicero* (London 1965) 127–28: "Such evidence as there is supports the conclusion that Cicero's ear for the cadences and rhythms of words was largely responsible for some at least of these advances which the Augustans were to appropriate to their own use."

There is much of interest here, and I shall summarize the salient points as follows:

1. Ennius, the first of the Latin hexameter poets, differs from Homer in many respects: his favorite pattern, *ssss*, with a frequency of 15.35 per cent, is the opposite of *dddd*, Homer's most frequent pattern at 19.93 per cent.[11] Ennius' percentages for the first four and first eight patterns, 41.34 and 65.35 respectively, are low compared to the corresponding percentages in Homer, 57.99 and 84.34. The distribution of spondees and dactyls in the first eight patterns (first four feet only) is in Ennius twenty-two spondees and ten dactyls, the exact opposite of Homer's ten spondees and twenty-two dactyls. Winbolt says of Ennius: "He over-emphasises the contrast with Greek, in the manner of pioneers."[12] No other Republican poet has *ssss* as the first pattern or such low percentages for the first, first four, and first eight patterns.

2. Lucilius is likewise heavily spondaic, with twenty-one spondees and eleven dactyls in his first eight patterns, and these eight now comprise about three-quarters of the total verses, instead of two-thirds as in Ennius. His choice of *sdss* as favorite pattern is most unusual; *sdss* appears first elsewhere only in short poems whose authenticity is much debated.[13] The percentage of *sdss* is 16.86, that of the second most frequent pattern (*dsss*) is only 10.41. Had we the complete hexameter works of Lucilius extant instead of short fragments, it seems probable that *sdss* would still be the most frequent pattern.

3. I have purposely listed for Cicero both the *Aratea* and the fragments; in spite of minor variations in the first eight patterns, the results for the *Aratea* and the total verses of Cicero are almost identical: *dsss* the favorite pattern; the frequency percentages for the first, first four, and first eight patterns approximately the same; the fourth foot always a spondee, with the resultant distribution of spondees (twenty) and dactyls (twelve) also the same. These facts provide added validity for

[11] I am speaking here of the non-spondaic verses. The percentage of *dddds* in Homer's spondaic verses is slightly higher, 20.68.

[12] S. E. Winbolt, *Latin Hexameter Verse* (London 1903) 114. On the spondaic nature of Ennius' verse, see also A. Cordier, *Les débuts de l'hexamètre latin: Ennius* (Paris 1947) 65–69.

[13] These include the *Dirae* (see below, pp. 98–101), the *Copa* (see below, note 118), and the *Halieutica* (see above, note 4).

the totals and percentages given for Ennius and Lucilius, which are based on short fragments only.

4. The percentages of the first pattern show a steady increase: Ennius, 15.35; Lucilius, 16.86; Cicero, 18.28; Lucretius, 20.20;[14] Catullus LXIV, 27.59. Such a heavy concentration on one metrical pattern was obviously distasteful to the Augustan poets. Vergil reduced the first pattern to 14.38 (*Eclogues*, 13.09; *Georgics*, 15.81; *Aeneid*, 14.39) and in Horace's hexameter poetry it is even lower, 12.67 (with the lowest percentage in the *Ars Poetica*, 10.32).

5. The percentages of the first eight patterns likewise increase from Ennius, 65.35, to Catullus LXIV, 90.98.[15] Catullus' heavy concentration on eight patterns results in a repetitious monotony unparalleled in the Republican poets. A musician with sixteen notes at his disposal would not be making the most of his instrument if he used half of the notes only nine per cent of the time.[16]

6. As to the distribution of spondees and dactyls in the first eight patterns, there is little change from Ennius to Catullus. Cicero and Catullus LXIV have twenty spondees and twelve dactyls, and we find the same totals in Vergil's *Georgics* and *Aeneid*[17] and in Horace's hexameter poems as a whole. The distribution in Lucretius is eighteen spondees and fourteen dactyls, but there is considerable variation among the individual books: I (nineteen spondees, thirteen dactyls), II, and V (eighteen spondees, fourteen dactyls each) form a more spondaic

[14] The percentage range of the first pattern in the individual books of the *De rerum natura* is from 17.88 (Book I) to 23.10 (Book V). W. A. Merrill, "The Lucretian Hexameter," *UCPPh* 5 (1922–23) 253–334, gives approximately the same percentages for each book, with the exception of Book II where "nearly 11 per cent" (p. 282) is obviously an error for "nearly 19 per cent"; Merrill's 218 instances of *dsss* in II, divided by 1,174 (I assume he includes in his totals the spondaic verses listed in his tabulation), produce a percentage of 18.57. With this correction, Merrill's range is from 17 per cent (Book I) to 22.50 per cent (Book V).

[15] Lucretius (79.81) is slightly lower than Cicero (82.26). The range in Lucretius is from 78.19 (Book II) to 82.99 (Book V).

[16] Catullus' *Epithalamium* (LXII), also in hexameters, has an even higher percentage for the first eight patterns, 92.54, although that of *dsss*, the most frequent pattern, is only 20.89 (27.59 in LXIV). Usually *sddd* (the opposite of *dsss*) is one of the least frequent patterns; in this poem it has second place, as it provides the oft-repeated refrain: *Hymen o Hymenaee, Hymen ades o Hymenaee*. Townend (above, note 10) 124, apparently overlooks LXII when he refers to Catullus as "represented by a single poem in hexameters, 'The Marriage of Peleus and Thetis' (64), in some 400 verses."

[17] On the *Eclogues*, see below, p. 90.

group, and the remaining books have a larger proportion of dactyls: III and IV (sixteen spondees and sixteen dactyls each), VI (seventeen spondees, fifteen dactyls). On the basis of enjambement Büchner argues that Books I, II, and V were earlier than III, IV, and VI.[18] Bailey accepts Büchner's conclusions and says: "The study provides an almost unique opportunity of tracing the gradual development of Lucretius' conscious art."[19] Bailey gives other arguments (e.g. Memmius is mentioned eleven times in I, II, and V, but his name does not occur in III, IV, and VI) which also indicate that I, II, and V are closely connected and were written first.[20] It is significant that the distribution of spondees and dactyls in the individual books gives added support to the grouping favored by Büchner and Bailey.[21]

In the discussion of variety and repetition to follow, I limit myself to Cicero's *Aratea*, Lucretius, and Catullus LXIV. Short fragments such as those of Ennius and Lucilius prove little when we deal with sixteen-line units and repeated, opposite, or reverse patterns in adjacent lines.

The average number of metrical patterns per sixteen-line unit is as follows: Cicero, 8.5; Lucretius, 8.6, with a range from 8.3 (Books V, VI) to 8.9 (Books I, II); Catullus, 7.0. The low average in Catullus is not surprising when we recall that eight of the sixteen patterns comprise all but nine per cent of the total verses. The average of the patterns in Vergil (*Eclogues*, 9.7; *Georgics*, 9.3; *Aeneid*, 9.4) and Horace (*Satires*, 9.3; *Epistles*, 9.8) is thus considerably higher than in the Republican poets. This is reflected also in the percentages of units with eight or more patterns: Cicero, 82.76; Lucretius, 76.10; but Catullus, an amazingly low 30.43; compare with these Vergil, *Eclogues*,

[18] K. Büchner, *Beobachtungen über Vers und Gedankengang bei Lucrez* (Berlin 1936 [=*Hermes*, *Einzelschriften*, Heft 1]) 63–66. Cf. J. Mewaldt, "Lucretius," *RE* 13.2 (1927) 1669.

[19] Bailey (above, note 6) 123.

[20] Bailey (above, note 6) 32–37.

[21] The percentage range of sixteen-line units containing eight or more patterns is from 85.29 in I to 68.75 in VI. The percentage in the earlier books (I, II, and V) as a group is 79.57, considerably higher than 72.57, that in the other three books; this implies a greater desire for variety in the books written first. Also, reverse patterns are more frequent in I, II, and V than in the other books; see below, note 35. On the other hand, V is unlike I and II in its percentage both of the most frequent pattern (23.10) and of the first eight (82.99); these are higher than the corresponding percentages in III, IV, and VI; see above, notes 14 and 15, and cf. Table 2, below.

97.87; *Georgics*, 92.59; *Aeneid*, 92.79; Horace, *Satires*, 85.22; *Epistles*, 97.12. In these respects, as in others, Cicero reveals a greater interest in variety than do either Lucretius or Catullus and foreshadows the procedure of Vergil and Horace.

The occurrence of the same pattern in one or two successive lines is fairly common, but the repetition of the same pattern four or five times in succession is usually rare; the results for the latter are as follows:

	Four times	One every *x* lines	Five times	One every *x* lines
Cicero:	1	479.0	0	—
Lucretius:	13	564.2	6	1,222.5
Catullus:[22]	1	377.0	0	—
Vergil:	11	1,164.7	2	6,406.0
Horace:	0	—	1	4,080.0

"Repeats" (the same pattern occurring two or more times in succession) and "near repeats" (the same pattern separated by one or two verses) often produce "repeat clusters," which I define as the same pattern occurring six or more times in sixteen or fewer lines; the comparison of the Republican and the Augustan poets in this respect is:

	No. of clusters	One every *x* lines
Cicero:	8	59.6
Lucretius:[23]	149	49.2
Catullus:	13	29.0
Vergil—		
Eclogues:	3	275.0
Georgics:	15	145.5
Aeneid:[24]	49	200.1
Horace—		
Satires:	14	150.7
Epistles:	12	163.9

[22] When we consider the high percentages in Catullus LXIV of the first pattern (27.59), the first four (67.90), and the first eight (90.98), it is surprising to find only one fourfold repetition (*ddss* in 328–331) and no fivefold repetition; but in 99–104 *sdss* occurs *six* times in succession; neither of these, it will be noted, is *dsss*, the most frequent pattern.

[23] The range in Lucretius is from one every 39.1 lines in Book V to one every 68.5 lines in Book II.

[24] In *Aeneid* I–IX we find one cluster every 271.0 lines; in X–XII they appear more than twice as often, once every 119.9 lines; this is one of many features which indicate that the last three books of the *Aeneid* did not receive a final metrical revision; see Duckworth, *Vergil* 49–53.

These figures show conclusively the extent to which Vergil and Horace sought to avoid a heavy concentration of the same metrical pattern within a few lines. Cicero has the fewest repeat clusters among the Republican poets, but they occur two or three times as often as in Vergil and Horace, and they are twice as frequent in Catullus as in Cicero.

The relative frequency of repeats and near repeats is as follows:

	Cicero	Lucretius	Catullus
R, one every *x* lines:	11.4	8.8	7.0
R+NR, one every *x* lines:	3.9	3.6	3.0

We thus have a steady increase in the frequency of both repeats and near repeats from Cicero to Lucretius[25] to the excessive monotony of Catullus. The avoidance of such repetition on the part of Vergil and Horace is little short of revolutionary; if Cicero is their model, they both go well beyond him:

	Vergil	Horace
R, one every *x* lines:	12.5	13.0
R+NR, one every *x* lines:	4.7	4.8

Vergil's *Eclogues* marks the sharpest break with the earlier poets in this respect (repeats, once every 13.1 lines, repeats and near repeats, once every 5.1 lines), but in general Horace avoids both repeats and near repeats slightly more than Vergil does.[26]

I give below the figures for the two most repeated patterns in the Republican poets (*dsss* and *ddss* in Cicero and Lucretius, *dsss* and *sdss* in Catullus LXIV):

	Cicero	Lucretius	Catullus
1st R, % total R:	40.48	37.60	44.44
2nd R, % total R:	16.67	22.04	24.07
Combined % total R:	57.15	59.64	68.51
1st R+NR, % total R+NR:	24.39	36.30	41.60
2nd R+NR, % total R+NR:	22.76	21.35	24.0
Combined % total R+NR:	47.15	57.65	65.60

[25] The range of repeats in the individual books of the *De rerum natura* is from one every 7.5 lines (III) to one every 11.2 lines (I); the range of repeats and near repeats is from one every 3.2 lines (III, V) to one every 4.2 lines (I); Book I thus reveals a greater regard for variety than do the later books.

[26] For the totals in the individual works, see Duckworth, *Horace* 79.

In all three poets, the two most repeated patterns account for a large percentage both of the total repeats and of the total repeats plus the near repeats, with the combined percentages in each case increasing steadily from Cicero (57.15 and 47.15) through Lucretius to Catullus (68.51 and 65.60). With Vergil and Horace we find a surprising decrease in the combined percentages of the two most repeated patterns (*dsss* and *dsds*), as follows:

	Vergil		Horace	
	Georg.	*Aeneid*	*Satires*	*Epistles*
Combined R, % total R:	44.63	40.94	33.95	28.28
Combined R+NR, % total R+NR:	47.93	38.82	35.47	32.18

As Cicero's percentages are the lowest of the three earlier poets, so Vergil's are highest for the *Georgics* and are close to those of Cicero; from the *Georgics* to the *Aeneid* to the hexameter works of Horace we have a steady decrease, and Horace's percentages in the *Epistles* are less than half those of Catullus. Again we see how the two Augustan poets completely reversed the metrical trends of the late Republic.[27]

One means of introducing variety into repeats and near repeats is to change the fourth-foot texture from homodyne to heterodyne, or from heterodyne to homodyne.[28] The percentages for fourth-foot homodyne and for change in repeats and near repeats, with the resultant differences, are as follows:

	Cicero	Lucretius	Catullus
% 4th-foot homodyne:	44.79	47.66	60.44
Repeats, % of change:	50.0	49.82	35.19
Differs from homodyne %:	+5.21	+2.16	−25.25
R+NR, % of change:	45.53	48.07	33.60
Differs from homodyne %:	+0.74	+0.41	−26.84

Again the extent to which Catullus is out of line is apparent: unusually high percentage of fourth-foot homodyne and almost no desire to change the fourth-foot texture in repeats and near repeats. Cicero has the lowest homodyne percentage of the three Republican poets listed

[27] For additional details concerning *dsss* and *dsds* repeats and near repeats in Vergil and Horace, see Duckworth, *Vergil* 61 (=Table 2); *Horace* 94 (=Table 3).

[28] See Duckworth, *Vergil* 45–49; *Horace* 80–81.

above,[29] about three percent less than that of Lucretius.[30] As Jackson Knight says, "Vergil is exceptional in his figure for fourth-foot homodyne. He has it a little more often than once in every three verses."[31] Vergil's percentages (*Eclogues*, 39.73; *Georgics*, 36.08; *Aeneid*, 37.78) are thus much lower than those in the earlier poets, and he consistently varies the texture in the repeats and near repeats; the increase over the homodyne percentages is as follows: *Eclogues*, +9.48; *Georgics*, +7.42; *Aeneid*, +6.71.[32]

In the case of opposite patterns in adjacent lines (e.g. *sddd* and *dsss*), we find the following variation:

	Cicero	Lucretius	Catullus
Opposites, one every *x* lines:	79.8	30.8	37.7
Favorite opposite:	*sssd–ddds* *ssds–ddsd*	*sdsd–dsds*	*sdss–dsdd*
% of total opposites:	33.33 each	22.69	33.33

Cicero shows little interest in having a pattern preceded or followed by its opposite; in the *Aratea* opposites occur once every 79.8 lines, but he apparently introduced them considerably more often in his later poetry. Statistics based on patterns in adjacent lines can be very misleading in the case of fragments and tend to give too low a frequency; even so, the average for the fragments is higher than that in the *Aratea*, one every 53.0 verses (total for Cicero, one every 67.6 verses). We should expect a low frequency in Catullus, since the opposites of his eight most frequent patterns can appear only 9.02 per cent of the time; surprisingly enough, however, we find one opposite

[29] If we include the fragments of Cicero, the percentage of fourth-foot homodyne is 46.17, still slightly lower than that in Lucretius. On the basis of fragments only, the percentages of fourth-foot homodyne in Ennius and Lucilius are 43.56 and 46.79 respectively.

[30] The range for fourth-foot homodyne in the individual books of Lucretius is from 44.72 (IV) to 49.59 (III). On homodyne and heterodyne in Lucretius, see V. P. Naughtin, "Metrical Patterns in Lucretius' Hexameters," *CQ* 2 (1952) 152–167.

[31] W. F. Jackson Knight, *Accentual Symmetry in Vergil* (Oxford 1950) 36; see Duckworth, *Vergil* 43.

[32] For details, see Duckworth, *Vergil* 47–49 and 64–65 (=Table 4). In *Aeneid* I–IX, the increase is +10.50; in X–XII, −1.79; this is another argument for the lack of revision in *Aeneid* X–XII; see above, note 24. For Horace's higher percentage of fourth-foot homodyne (48.54) and the resultant lack of change in repeated patterns, see Duckworth, *Horace* 80–81.

combination every 37.7 lines. Three of the seven occurrences of *dsdd* are with its opposite; *sddd* appears only twice (152, 231) and each time it is preceded by *dsss*. In Lucretius the percentage of *sddd* with *dsss* is 35.63, that of *ssdd* with *ddss* 25.64.

The frequent use of opposites in adjacent lines as a means of introducing metrical variety apparently begins with Lucretius, one instance every 30.8 lines (with a range from 23.3 in Book I to 42.5 in Book V) and is favored especially by Vergil (*Eclogues*, 19.6; *Georgics*, 20.9; *Aeneid*, 23.1) and Horace (21.4).[33]

Although opposite combinations are rare in Cicero, we find an unusual fondness for reverse patterns in adjacent lines:

	Cicero	Lucretius	Catullus
Reverses, one every *x* lines:	24.0	51.3	53.9
Favorite reverse:	*sssd–dsss*	*sssd–dsss*	*ssds–sdss*
% of total reverses:	55.0	39.86	71.43

Reverses thus appear in Cicero more than twice as often as in the other two poets;[34] in this respect Cicero seems to have had little influence on either Lucretius[35] or Catullus, although all three poets are similar in their desire to combine *sssd* with *dsss*; the percentages of *sssd* verses preceded or followed by *dsss* are: Cicero, 64.71; Lucretius, 40.14; Catullus, 40.0.

An unusually high proportion of Catullus' reverses (71.43 per cent) consists of *ssds–sdss*. Vergil in the *Aeneid* likewise selects *ssds–sdss* as his favorite reverse (percentage of total reverses, 40.08),[36] as does Horace

[33] The use of opposites in adjacent lines becomes increasingly frequent in Horace's later hexameters (*Satires* I, one every 32.1 lines; *Satires* II, 20.8; *Epistles* I, 21.0; *Epistles* II, 16.3). See Duckworth, *Horace* 81–82.

[34] If we include the fragments of Cicero, the reverses are still amazingly frequent, one every 27.6 lines.

[35] The figure for Lucretius is high (one every 51.3 lines) because of Book IV, which has only eleven reverses, one every 115.0 lines; the range in the other books is from 33.2 (I) to 60.2 (III). Adjacent reverse patterns are much more frequent in I, II, and V (91, one every 40.7 lines) than in III, IV, and VI (52, one every 69.8 lines). This too confirms the division by Büchner and Bailey into an earlier group and a later group of books (see above, p. 73) and indicates that in his use of reverses Lucretius was closer to Cicero in his early period.

[36] Cf. Duckworth, *Vergil* 38, where Vergil is said to favor *sssd–dsss* in the *Aeneid*; this is true (29.56 per cent of the *sssd* patterns are preceded or followed by *dsss*) but *ssds–sdss* is slightly more frequent (101 instances to 87).

(percentage of total reverses, 46.04). In the frequency of his reverses Vergil at first stands closer to Lucretius and Catullus than to Cicero, but he steadily increases their use (*Eclogues*, one every 55.0 lines; *Georgics*, 46.4; *Aeneid*, 38.9), and Horace continues the trend (*Satires*, 29.3; *Epistles*, 29.4), with the result that reverse patterns in adjacent lines occur in his hexameter poetry almost as frequently as in Cicero's *Aratea* (reverses are most frequent in the *Ars Poetica*, one every 25.0 lines, almost identical with Cicero's 24.0).

I summarize briefly the most significant points mentioned above.

1. In both Ennius and Lucilius we find a heavy concentration on spondees in the first eight patterns, but relatively low frequency percentages for the first, first four, and first eight patterns. Beginning with Cicero, repetition of the same pattern, with correspondingly higher percentages, increases through Lucretius and culminates in the monotonous emphasis of Catullus on eight patterns only (90.98 per cent). With Vergil everything is different: greater variety, less repetition and fewer repeat clusters, lower percentages.

2. The division of the books of the *De rerum natura* into an earlier group (I, II, V) and a later group (III, IV, VI) receives strong support from the distribution of spondees and dactyls in Lucretius' first eight patterns (I, II, and V being more spondaic), and also both from the percentages of sixteen-line units with eight or more patterns (higher in I, II, and V) and from the frequency of the reverses (more numerous in I, II, and V).

3. Cicero was the first to make *dsss* the favorite pattern not only for the Republican poets but also for Vergil and Horace. He established the distribution of twenty spondees and twelve dactyls for the first eight patterns, and was the only poet before Vergil (in the *Aeneid*) to have a fourth-foot spondee in each of these same eight patterns. The frequencies and percentages of Vergil and Horace are in general much closer to those of Cicero and mark a definite trend away from the metrical procedures of Lucretius and especially Catullus; this can be seen in their avoidance of repeats and repeat clusters, and especially in the lower percentages of the two patterns with the largest number of repeats and near repeats, also in the higher percentages of change in fourth-foot texture, and in the steadily increasing use of reverse patterns in adjacent lines.

Cicero is thus a kind of milestone from which Lucretius and Catullus move in one direction, the easier road toward greater repetition and monotony, while Vergil and Horace advance in the opposite direction toward greater variety of every kind—the more uncharted route. The important conclusion to be drawn is that there is no straight development in metrical procedures from the Republican to the Augustan poets. Townend says:

> Altogether Cicero, even in his earliest work, stands relatively close to Virgil. Lucretius, writing appreciably later, demonstrates the dangers of assuming that verse-technique advances in a straight line from one poet to another. . . . He is scarcely influenced by the advances already achieved by Cicero, if not before. Catullus, again, occupies a special position as a member of a school of deliberate innovators who copied the Greek Alexandrines. . . .[37]

Büchner therefore is correct in stating that metrically Cicero is an important bridge to the Augustans.[38]

II. THE EPIC HEXAMETER OF OVID

Ovid's use of hexameter patterns in the *Metamorphoses* is very unlike what we find in Vergil and Horace and in fact differs strikingly also from the metrical practices of the Republican poets. Otis refers to "the un-Virgilian character of Ovid's metric" in the *Metamorphoses* and says:

> He sacrificed most of the weight, gravity, and *ethos* of Virgil's hexameter to rapid and unbroken movement. . . . Ovid puts in everything (dactyls, regular pauses, coincidence of ictus and accent, rhyme, alliteration, grammatical simplicity and concision) that will speed up and lighten; leaves out everything (elision, spondees, grammatical complexity, clash of ictus and accent, overrunning of metrical by sense units) that will slow down and encumber his verse.[39]

[37] Townend (above, note 10) 126.

[38] K. Büchner, "Tullius," *RE* 7A.1 (1939) 1266: "Nimmt man alles zusammen so wird C. zu einer wichtigen Brücke zu den Augusteern"; see also 1260.

[39] B. Otis, *Ovid as an Epic Poet* (Cambridge 1966) 74, 76. This gives a very different impression of Ovid's hexameter technique from that which we find in R. S. Radford, "The Juvenile Works of Ovid and the Spondaic Period of His Metrical Art," *TAPA* 51 (1920) 149: "He is the greatest artist in verse that Rome produced, the supreme master both in the elegy and in the epos."

Similarly, Jackson Knight stresses the dactylic nature of Ovid's hexameter verse:

> Ovid's verse technique uses the well-known resources of dactylic metre, but uses them with a lavish freedom unknown and perhaps unsought before. Economy is not wanted. Ovid seems to like almost as many dactyls as he can get, and often, except in the middle of the verse, almost as many coincidences of word-accent and metrical ictus as can easily be contrived.[40]

The most frequent pattern in the *Metamorphoses* is not *dsss*, as Lee wrongly implies on the basis of Book I, where *dsss* is first with a percentage of 13.97; Lee says:

> There would probably be alterations of emphasis if the count were extended to include all fifteen books of the poem, but I do not believe they would be big enough to upset the broad conclusions drawn from an examination of only one book.[41]

Unfortunately Lee is in error here. Ovid's procedure in I does *not* give a true picture, for in the poem as a whole *ddss* is first (13.08 per cent) and *dsss* is second (12.57 per cent). It is interesting that the percentage for the first pattern is almost identical with that in the *Eclogues* (13.09) and much lower than any of the first-pattern percentages in the Republican poets.

When we recall how consistently the poets from Cicero through Vergil and Horace preferred *dsss* as their favorite pattern, the procedure of Ovid in this respect is most unusual, to say the least; he varies the position of *dsss* from book to book as follows: first in I, III, V, VIII, IX; second in II, IV, XII, XIII, XIV; third in XI and tied for third place (with *ddss*) in X; fourth in VI; and fifth in both VII and XV (where the respective percentages are 10.47 and 10.77). No such variation in the use of *dsss* had appeared in the earlier poets,[42] where *dsss* is first in each book of the *De rerum natura* and the *Georgics*, in ten of the twelve books of the *Aeneid*, and in each of Horace's hexameter collections.

The following comparison of the eight most frequent patterns in the

[40] W. F. Jackson Knight, "Ovid's Metre and Rhythm," in N. I. Herescu (ed.), *Ovidiana: Recherches sur Ovide* (Paris 1958) 111.

[41] A. G. Lee (ed.), *P. Ovidi Nasonis Metamorphoseon, Liber I* (Cambridge 1953) 33.

[42] With the exception of Vergil's more dactylic *Eclogues*, where *dsss* is first in X and tied for first place in VI and VII (with *ddss* and *sdss* respectively), second in IV and VIII, tied

Aeneid and the *Metamorphoses*[43] will be of interest; I give relevant percentages and the distribution of spondees and dactyls:[44]

	Aeneid	*Metamorphoses*
% first pattern:	14.39	13.08
% first four:	46.95	48.37
% first eight:	72.78	81.62
First eight patterns—		
Spondees:	20	12
Dactyls:	12	20
4th-foot spondee:	8	4
1st-foot dactyl:	4	8

The percentage of Ovid's first eight patterns, 81.62 (with a range from 78.80 in Book VI to 84.92 in XIV) is much higher than that in the *Aeneid*, 72.78 (cf. Horace, *Satires*, 69.99; *Epistles*, 66.76) and marks a return to the higher frequencies of Cicero and Lucretius.

The most striking difference between Ovid and Vergil is in the distribution of spondees and dactyls in the first four feet of the eight most frequent patterns: *Aeneid*, twenty spondees and twelve dactyls; *Metamorphoses*, twelve spondees and twenty dactyls, the exact opposite of what we find in the *Aeneid* and unlike anything that we have seen in earlier Latin hexameter poetry. We may say, therefore, that metrically Ovid is far more "Homeric" than Vergil and almost as "Homeric" as Homer himself; the distribution of spondees and dactyls in Homer's first eight patterns (*Iliad* and *Odyssey*) is ten spondees and twenty-two dactyls.[45] One easy way to distinguish the first eight patterns of Ovid from those of Vergil is this: in the *Aeneid* the fourth

for third place in V (with *ddss*, *ssss*, and *dssd*), tied for fourth place in III (with *sdss* and *ddds*), seventh in I and IX, and fifteenth in II (the low frequency in II results in part from the emotional nature of the poem; see Duckworth, *Vergilius*, No. 12 [1966] 9, note 12). There seems to be a definite relation here between Vergil's use of *dsss* and the date of the individual poems; II (*dsss* fifteenth) and III (*dsss* tied for fourth place) are considered the earliest of the collection, and X, the only pastoral with *dsss* in undisputed first place, is the latest, whereas VI and VII (*dsss* tied for first place in each) are among the later poems; on the chronology of the *Eclogues*, see G. E. Duckworth, "Recent Work on Vergil (1940–1956)," *CW* 51 (1957–58) 123; B. Otis, *Virgil: A Study in Civilized Poetry* (Oxford 1963) 131–133.

[43] All statistics for the *Metamorphoses* are based on the edition of F. J. Miller (LCL 1916).

[44] See also Duckworth (above, note 4) 759, where I include the *Halieutica*.

[45] See Duckworth, *Vergil* 13–15.

foot is always a spondee; in the *Metamorphoses* the first foot is always a dactyl.

If we examine the eight most frequent hexameter patterns in Ovid's elegiac poetry, we find also that, with the exception of the *Medicamina* (fifty hexameters only), all the poems, from the earliest to the latest, exhibit the same characteristics: high percentages, from 78.84 (*Amores*) to 89.27 (*Fasti*); the same distribution of twelve spondees and twenty dactyls, with the first foot always a dactyl.[46] These facts should be kept in mind when scholars assign to Ovid works of uncertain authorship, e.g. the hexameter poems in the *Appendix Vergiliana*, where there is no such predominance of dactyls.

Additional statistics for the *Metamorphoses* are the following: the number of patterns per sixteen-line unit averages 8.9 (with a range from 8.6 in Book XIV to 9.1 in VI); this is higher than in the Republican poets but lower than in Vergil and Horace. The percentage of units with eight or more patterns is 86.35 (ranging from 77.36 in XIV to 91.30 in X), again higher than in the Republican poets (and Horace's *Satires*) but lower than in Vergil and Horace's *Epistles*. Repeat clusters occur on an average once every 112.5 lines (range from one every 80.0 lines in IV to one every 208.0 lines in XII) and in this respect Ovid stands closer to Vergil and Horace than to Cicero, Lucretius, and Catullus. Repeats average one every 10.7 lines (range from 9.1 in III to 12.7 in I) and repeats and near repeats one every 4.1 lines (range from 3.6 in IV to 4.7 in VI), somewhat more frequent than in Vergil and Horace, but considerably less so than in Lucretius and Catullus. The two most frequently repeated patterns in the *Metamorphoses* are *dsss* (202 repeats, 504 repeats and near repeats) and *ddss* (173 repeats, 496 repeats and near repeats). The combined repeats of these two patterns comprise 33.57 per cent of the total repeats, and the repeats and near repeats of these two patterns are 34.14 per cent of the total repeats and near repeats. These percentages are surprisingly low, very unlike those in the Republican poets, even lower than those in Vergil, and resemble the corresponding percentages in Horace's *Satires* (33.95 and 35.47 respectively).[47]

[46] See Duckworth (above, note 4) 764. My statistics for Ovid's elegiac poetry are based on the totals of the patterns as given by Tr. Costa, "Formele Hexametrului la Ovidiu," *Publius Ovidius Naso* (Bucarest 1957 [=*Biblioteca Antică Studii* II]) 236–275.

[47] See above, p. 76.

In his frequency of fourth-foot homodyne Ovid reverts to the practice of the Republican poets (as had Horace); actually, the percentage of fourth-foot homodyne in the *Metamorphoses*, 50.0 (with a range from 45.28 in VIII to 53.29 in XIV), is considerably higher than that in Cicero's *Aratea* (44.79) and Lucretius (47.66) and is surpassed only by that in Catullus (60.44) and in Horace's *Epistles* (52.08).[48] Ovid's percentage of change in fourth-foot texture is 46.91 for repeats and 46.19 for repeats and near repeats; this is higher than in Vergil (except in the *Georgics*, where the percentage of change for repeats and near repeats is 47.10), but with a fourth-foot homodyne percentage of 50.0 we have a difference of −3.09 for repeats and −3.81 for repeats and near repeats. In all the earlier poets so far discussed we find a percentage of shift of texture higher than that of fourth-foot homodyne, with the exception of Catullus (−25.25 and −26.84 respectively) and Horace's *Epistles* (− 5.40 and −2.29 respectively).[49]

The *Metamorphoses* contains a total of 407 opposite patterns in adjacent lines, an average of one every 29.3 lines; this frequency resembles that of Lucretius (one every 30.8 lines) and is considerably lower than that of Vergil and Horace.[50] Ovid's most frequent opposite is *sdsd–dsds*, which comprises 22.11 per cent of the total opposites. Again this is similar to Lucretius (*sdsd–dsds*, 22.69 per cent of the total opposites) and also to Vergil's *Georgics* (*sdsd–dsds*, 23.58 per cent); the opposite combination *sdsd–dsds* is also the favorite in Vergil's *Aeneid* and Horace's *Epistles*, but the percentages are much lower (16.04 and 18.69 respectively).

The percentage of *ssdd* patterns (sixteenth in order, with a total of 146) preceded or followed by *ddss* (first in order, with a total of 1,561) is 30.14; this is a higher proportion than is found earlier in hexameter poetry (cf. Lucretius, 25.64 per cent; Vergil, *Georgics*, 26.92 per cent).[51] The percentage of *sddd* with *dsss* is 27.73, close to that in the *Aeneid*,

[48] The percentage for Horace's hexameter poems as a whole is 48.54, that for the *Satires* only 45.24.

[49] The *Ars Poetica* is unique in this respect, with a difference of −12.38 and −2.92 respectively; see Duckworth, *Horace* 81, 89. On the differences in the *Ciris* (−2.84 and +1.53) and the *Moretum* (−10.25 and −5.33), see below, pp. 89, 93; and 89, 97.

[50] See above, p. 78 and note 33.

[51] Catullus has 33.33 per cent of *ssdd* with *ddss*, but this hardly counts, as there are only three instances of *ssdd*, one with *ddss*; on the *Ciris*, see below, note 82.

29.38, and in Horace, *Satires*, 28.89; Lucretius is higher (35.63) as is Vergil in the *Georgics* (35.71). The percentage of *sssd* with *ddds* is 17.58; this likewise is closer to the *Aeneid* (15.54) than to the other poets (including Horace, 6.84).

In regard to reverse patterns in adjacent lines, we find in the *Metamorphoses* 304 instances, one every 39.3 lines, about the same frequency as in the *Aeneid* (one every 38.9 lines). The most frequent reverse is *dsdd–ddsd*, which in earlier poetry is first only in Vergil's *Eclogues* (and there only seven occurrences); in Cicero, *Aratea*, and in Catullus LXIV there are no instances of *dsdd–ddsd*. In the earlier poets the favorite reverse is usually *ssds–sdss* (Catullus; Vergil, *Georgics* and *Aeneid*; Horace, *Satires* and *Epistles*). Ovid has 216 instances of *dsdd–ddsd*, 71.05 per cent of the total reverses, a high proportion paralleled only by that of *ssds–sdss* in Catullus, 71.43 per cent.[52] The percentage of *dsdd* preceded or followed by *ddsd* is 24.0; no such percentage for this particular reverse had appeared in the earlier poets; the highest previously was in Vergil, *Georgics*, 18.46.[53] Ovid's percentage of *sssd* patterns with *dsss* is 24.85, similar to those of Horace (*Satires*, 24.76; *Epistles*, 22.35). In the earlier poets, the corresponding percentages are much higher (with a steady decrease from 64.71 in Cicero's *Aratea* to 29.56 in the *Aeneid*).

To summarize these various aspects of Ovid's procedure as a hexameter poet, I shall list the salient points mentioned above under four headings:

1. Ovid resembles the Republican poets in the following respects: high percentage of the first eight patterns and high percentage of fourth-foot homodyne; the frequency of opposite patterns in adjacent lines is similar to that in Lucretius; the most frequent opposite in both is *sdsd–dsds*, and it comprises almost the same percentage of the total opposites.

2. Ovid stands between the Republican poets and Vergil: number of patterns per sixteen-line unit, percentage of units with eight or more

[52] The totals in Catullus are small, only seven reverses, five of which are *ssds–sdss*; on the *Dirae* (*Lydia*), with an *sssd–dsss* percentage of 75.0, see below, p. 101.

[53] Compare Lucretius, 12.92; Vergil, *Eclogues*, 16.28; *Aeneid*, 9.92; Horace, *Satires*, 7.41; *Epistles*, 17.02 (total Horace, 12.57).

patterns; frequency of repeat clusters; frequency of repeated patterns in adjacent lines, and also of repeats and near repeats.

3. Ovid's practice is that of Vergil and/or Horace: low percentage of the most frequent pattern; relation of the most frequent repeats and near repeats to the total repeats and near repeats; percentages of *sddd* preceded or followed by *dsss*, and of *sssd* preceded or followed by *ddds*. Ovid's frequency of reverse patterns in adjacent lines is similar to that in the *Aeneid*; his percentage of *sssd* with *dsss* resembles that in Horace.

4. Ovid's *Metamorphoses* is unlike all earlier poetry (excluding, of course, his own previous works) in many important respects: the unusual treatment of *dsss*, from first position to fifth in the different books; the (almost Homeric) distribution of twelve spondees and twenty dactyls in the first eight patterns; the low percentage of change in fourth-foot texture in relation to fourth-foot homodyne (surpassed only by that in Catullus LXIV); the high percentage of *ssdd* preceded or followed by *ddss*; the choice of *dsdd–ddsd* as the most frequent reverse, with an abnormally high percentage of *dsdd* preceded or followed by *ddsd*. These differences between Ovid and the earlier poets, especially in the distribution of spondees and dactyls in the first eight patterns, are so great that it seems foolhardy to assign poems of uncertain authorship to Ovid if these same poems resemble Lucretius or Vergil more closely in their metrical structure.

III. THE "APPENDIX VERGILIANA"

I turn now to the hexameter poems of the *Appendix Vergiliana*—the *Culex*, the *Ciris*, the *Moretum*, the *Dirae* (*Lydia*), and the *Aetna*. I shall make no attempt to repeat or even summarize the many different arguments already advanced for and against the authenticity of these poems. At the end of the nineteenth century they were considered spurious by most scholars; forty years ago they were accepted as the work of Vergil by many writers (including several distinguished Americans, e.g. E. K. Rand and Tenney Frank), and in recent years they have again been rejected, with the exception of certain of the *Catalepton*.[54] Many metrical and verbal tests were applied to the poems

[54] See G. E. Duckworth, *Structural Patterns and Proportions in Vergil's Aeneid* (Ann Arbor 1962) 93–94. For brief summaries of recent scholarly work on the *Appendix*, see Duckworth, "Recent Work on Vergil," *CW* 51 (1957–58) 92, 116–117; 57 (1963–64)

without conclusive results. It is my hope that an examination of variety and repetition in the hexameter poems of the *Appendix* may throw new light on their metrical structure and indicate which of the poems might be by Vergil and which are almost certainly not authentic.[55]

The following table gives the percentages of the most frequent pattern, the first four, and the first eight, also the distribution of spondees and dactyls in the eight most frequent patterns.

	Culex	*Ciris*	*Moretum*	*Dirae*	*Aetna*
Most frequent:	*ddss*	*dsss*	*dsss*	*sdss*	*dsss*
% 1st pattern:	15.69	18.46	15.83	16.85	14.47
% first four:	46.08	51.92	50.83	54.49	48.58
% first eight:	77.45	77.12	77.50	82.02	72.01
1st eight patterns—					
Spondees:	16	18	16	18	21
Dactyls:	16	14	16	14	11
4th-foot spondee:	6	6	6	6	7
1st-foot dactyl:	6	6	6	6	4

Certain scholars have assigned one or more of these poems to Ovid. Radford, for instance, believes that the *Culex*, *Ciris*, and *Aetna* formed part of Ovid's *carmina iuvenalia*, written in an early, more spondaic period, before he developed the dactylic style of his mature works,[56] and in a later article he assigns the *Dirae* and the *Moretum* also to

195–197. The metrical structure of the various poems is treated by K. Büchner, *P. Vergilius Maro: Der Dichter der Römer* (Stuttgart 1956) 68–157 *passim* [="Vergilius," *RE* 8A.1 (1955) 1088–1177]. For additional bibliography, see also the following editions: 1. *Culex:* A. Salvatore, *Appendix Vergiliana* 1 (Torino 1957) xix–xxi; 2. *Ciris:* A. Haury, *La Ciris, poème attribué à Virgile* (Bordeaux 1957) xliii–xlix; Salvatore, 1.xvii–xix; 3. *Moretum:* Salvatore, *Appendix Vergiliana* 2 (Torino 1960) xxxix–xl; 4. *Dirae* (*Lydia*): C. Van der Graaf, *The Dirae, with Translation, Commentary and an Investigation of its Authorship* (Leiden 1945) 44–122 *passim*, 147–149; Salvatore, 2. xxxvii–xxxviii; 5. *Aetna:* W. Richter, [*Vergil*] *Aetna* (Berlin 1963) 22–23; F. R. D. Goodyear, *Incerti Auctoris Aetna* (Cambridge 1965) 213–215.

[55] My statistics are based on the new edition of the *Appendix Vergiliana* by W. V. Clausen, F. R. D. Goodyear, E. J. Kenney, and J. A. Richmond (OCT 1966) and therefore differ slightly from earlier metrical analyses, for example, those of Lederer (above, note 10) 14–30; C. Plésent, *Le Culex: Étude sur l'alexandrinisme latin* (Paris 1910) 431; L. G. Eldridge, *Num Culex et Ciris Epyllia ab eodem poeta composita sint quaeritur* (Freiburg 1914) 6–12.

[56] Radford (above, note 39) 160–163.

Ovid's early years;[57] believing that Ovid "first composed in spondees,"[58] he ascribes to this hypothetical early period much of the Tibullan corpus also (the Lygdamus elegies, the Sulpicia elegies and letters, the Cornutus and Messalinus elegies, and the hexameter *Panegyric to Messalla*). Others, although they do not postulate an early spondaic period, see a metrical similarity between poems of the *Appendix* and the works of Ovid; e.g. Plésent says, "en particulier, les formes de l'hexamètre du *Culex* sont à peu près celles d'Ovide,"[59] but he is definitely in error here. As I have already stated,[60] the authentic works of Ovid, from the *Heroides* and *Amores* to the *Tristia* and *Epistulae ex Ponto*, all have the same characteristics: high percentages for the first eight patterns (all 80.0 or more with the exception of the *Amores*, 78.84), a distribution of twelve spondees and twenty dactyls in these same eight patterns,[61] and a first-foot dactyl in each. Neither the *Culex* nor the other poems of the *Appendix* resemble the poetry of Ovid in these respects. A distribution of sixteen spondees and sixteen dactyls in the first eight patterns (*Culex*, *Moretum*) is certainly not Ovidian, and even less so is that of eighteen spondees and fourteen dactyls (*Ciris*, *Dirae*), while the *Aetna*, with twenty-one spondees and eleven dactyls, is more spondaic in this respect than any of the poets so far considered, with the exception of the fragmentary Ennius and Lucilius, and Horace in *Satires* I and *Epistles* I and II. The high percentages of the first eight patterns in Ovid is paralleled only by that of the *Dirae* (82.02).

In the following table (Table 1) I give the more important details on variety in sixteen-line units, repeated patterns and fourth-foot texture, and opposite and reverse patterns in adjacent lines.

[57] R. S. Radford, "The *Priapea* and the Vergilian Appendix," *TAPA* 52 (1921) 156–161.

[58] Radford (above, note 39) 151; he adds: "Latin being a highly spondaic language, it seems just about as possible for a youthful poet to lisp in Chinese or in Choctaw as in Latin dactyls."

[59] Plésent (above, note 55) 33, note 3. He does not, however, accept Ovidian authorship, but (pp. 497 ff.) favors the view that the *Culex* was written by one of the *poetae minores* in the circle of Asinius Pollio shortly after Vergil's death.

[60] See above, p. 83 and note 46.

[61] With the exception of the *Medicamina* (see above, p. 83); I do not consider the *Halieutica* to be the work of Ovid (see above, note 4). Radford (above, note 39) 163 accepts the *Halieutica* as genuine, but assigns it to the imaginary early spondaic period.

TABLE I

	Culex	*Ciris*	*Moretum*	*Dirae*	*Aetna*
Patterns per 16-line unit:	9.6	9.1	9.3	8.6	9.2
% units with 8 or more:	100.0	87.50	100.0	70.0	87.18
Same pattern, 4 or more times:	0	0	0	0	0
Repeat clusters, one every *x* lines:	204.0	86.7	120.0	89.0	212.0
% fourth-foot homodyne:	36.76	44.30	33.33	39.78	33.18
Repeats—					
one every *x* lines:	18.5	12.7	9.4	11.1	11.4
% 4th-foot change:	45.45	41.46	23.08	43.75	42.86
differs from homodyne %:	+8.69	−2.84	−10.25	+3.97	+9.68
Repeats and near repeats—					
one every *x* lines:	4.5	4.3	4.8	3.7	4.3
% 4th-foot change:	45.06	45.83	28.0	43.75	38.10
differs from homodyne %:	+8.30	+1.53	−5.33	+3.97	+4.92
Two favorite repeats:	*dsss* *ddss*	*dsss* *ddss*	*dsss* *ddss*	*sdss* *dssd*	*dsss* *sdss*
% of total repeats:	31.82	56.09	38.46	37.50	44.64
R+NR, % of total R+NR:	38.46	49.17	40.0	43.75	39.40
Opposites, one every *x* lines:	18.4	32.5	15.0	89.0	22.7
favorite opposite:	*sdds–dssd*	*ssds–ddsd* *ssdd–ddss*	*dsdd–sdss* *sdsd–dsds*	*dddd–ssss* *sdds–dssd*	*dsdd–sdss*
% of total opposites:	27.27	25.0 each	25.0 each	50.0 each	35.71
Reverses, one every *x* lines:	29.1	65.0	60.0	44.5	31.8
favorite reverse:	*sssd–dsss* *sddd–ddds* *ssds–sdss*	*sssd–dsss* *ssds–sdss*	*sssd–dsss* *ssds–sdss*	*sssd–dsss*	*ssds–sdss*
% of total reverses:	28.57 each	37.50 each	50.0 each	75.0	55.0

On the basis of this table, and that given above on the frequencies of patterns and the distribution of spondees and dactyls, I turn now to the individual hexameter poems and discuss the implications of the statistics for the authenticity of each.

The *Culex*. Radford, who assigns the *Culex* to Ovid, states that it is "the unusually high ratio of DSSD and of DDSD which is as a rule the true distinguishing mark of Ovid's works, mature and juvenile alike."[62] With the exception of the *Medicamina* (50 hexameters only),

[62] R. S. Radford, "Tibullus and Ovid," *AJP* 44 (1923) 299.

these two patterns vary in Ovid's poetry from first to fifth place.[63] In the *Culex* we find *dssd* and *ddsd* in third and eighth position respectively. But there is no argument here for Ovidian authorship. These same two patterns are tied for fourth place in Vergil's *Eclogues*.[64]

Actually, the first eight patterns of the *Culex* are those of the *Eclogues* in slightly different order; I list below the order of the patterns as they appear in the two works:

	dsss	*ddss*	*dsds*	*sdss*	*ddds*	*sdds*	*dssd*	*ddsd*
Culex:	2	1	5	7	4	6	3	8
Eclogues:	2	1	3	6	7	8	4–5	4–5

This identity of patterns does not necessarily imply Vergilian authorship (the percentages of the first, first four, and first eight patterns are higher: *Culex*, 15.69, 46.08, 77.45; *Eclogues*, 13.09, 41.45, 69.09 respectively), but it could well be an argument for dating the composition of the *Culex* in the middle of the first century B.C. If a later poet attempted to imitate the patterns and frequencies of the *Eclogues*, it seems strange that he did not include lower percentages in the first eight patterns, especially since these percentages in the *Eclogues* mark so sharp a departure from the higher frequencies of Cicero, Lucretius, and Catullus.

Numerous other similarities between the *Culex* and the *Eclogues* are apparent, and I give in parentheses the corresponding frequencies and percentages for the *Metamorphoses* (abbreviated as *M*) to prove how very different Ovid's procedure is in almost every respect: the distribution of spondees and dactyls in the first eight patterns in both the *Culex* and the *Eclogues* is sixteen and sixteen (*M*, twelve spondees and twenty dactyls).[65] The average number of patterns per sixteen-line unit is

[63] In the *Metamorphoses*, *dssd* and *ddsd* are third and fifth. The most recent study of all the patterns in Ovid's poetry, that of Costa (above, note 46) 236–275 *passim*, gives the following order for *dssd* and *ddsd*: first and fourth in *Heroides* 16–21 and *Tristia*; first and fifth in *Fasti*; second and first in *Heroides* 1–15 and *Ibis*; third and fourth in *Amores*, *Ars Amatoria* III, *Epistulae ex Ponto*; third and fifth in *Remedia* (as in *Metamorphoses*); fifth and third in *Ars* I–II. In the *Medicamina*, *dssd* is tied for third place (with *dddd*, *ddss*, and *sdsd*) but *ddsd* is tied for twelfth place (with *sdds* and *ssds*); the totals here are too small to be of significance.

[64] R. S. Radford, "The Culex and Ovid," *Philologus* 86 (1930–31) 102–104, ignores the *Eclogues* and argues for the similarity of the *Culex*-patterns to those in Ovid.

[65] The distribution of sixteen spondees and sixteen dactyls in the *Culex* and the *Eclogues* is thus midway between that of twenty and twelve in Cicero, Catullus, Vergil's

high, 9.6; *Eclogues*, 9.7 (*M*, 8.9); with 100 per cent of the units containing eight or more patterns; *Eclogues*, 97.87 per cent (*M*, 86.35). The percentage of fourth-foot homodyne is low, 36.76; *Eclogues*, 39.73 (*M*, 50.0); with a marked increase in the percentage of change in fourth-foot texture, +8.69; *Eclogues*, +9.48 (*M*, −3.09). Repeat clusters appear once every 204.0 lines; *Eclogues*, once every 275.0 lines (*M*, once every 112.5 lines); and repeated patterns in adjacent lines once every 18.5 lines; *Eclogues*, 13.1 (*M*, 10.7).[66] The *dsss* repeats and near repeats comprise 15.38 per cent of the total repeats and near repeats; *Eclogues*, 15.53 per cent (*M*, 17.21); and they comprise 29.17 per cent of the total occurrences of *dsss*; *Eclogues*, 28.41 (*M*, 33.60). The combined total of repeats and near repeats of the two most frequently repeated patterns (*ddss* and *dsss*) provide 38.46 per cent of the total repeats and near repeats; *Eclogues*, 39.75 (*M*, 34.14). Opposites occur on an average once every 18.4 lines; *Eclogues*, once every 19.6 (*M*, once every 29.3); and *ssdd* is preceded or followed by *ddss* 28.57 per cent of the time; *Eclogues*, 26.92 per cent (*M*, 30.14 per cent).

In all these respects the *Culex* reveals a metrical technique amazingly similar to that of the *Eclogues*[67] and very unlike that of the *Metamorphoses*. Only in the frequency of reverse patterns in adjacent lines do we find a major divergence: *Culex*, one every 29.1 lines; *Eclogues*, one every 55.0 (*M*, one every 39.3);[68] but the percentage of *dsdd* preceded or followed by *ddsd* is similar: *Culex*, 14.29; *Eclogues*, 16.28 (*M*, 24.0).

The fact that Columella in Book X of his *Res Rustica*, written in hexameters as an avowed imitation and continuation of Vergil's *Georgics*,[69]

Georgics and *Aeneid*, and Horace on the one hand, and that of twelve and twenty in the works of Ovid on the other.

[66] The number of repeats and near repeats every x lines is 4.5; this is somewhat closer to the *Metamorphoses* (4.1) than to the *Eclogues* (5.1); but compare the *Georgics* (4.5).

[67] Plésent (above, note 55) 483–485 comments on many similarities in the versification of the *Culex* and the *Eclogues*, which he attributes in part to the influence of Alexandrian models on the two poets.

[68] Cf. Cicero, *Aratea*, one reverse every 24.0 lines; *Aratea* and fragments, one every 27.6 lines.

[69] Columella says in X, praef. 3, that Silvinus has urged "ut poeticis numeris explerem Georgici carminis omissas partes, quas tamen et ipse Vergilius significaverat posteris se memorandas relinquere"; see Vergil, *Georg.* IV, 116–119, 147–148. It is surprising to find that Columella's hexameters are in many respects Ovidian rather than Vergilian; see below, pp. 103-4, 106.

knew and used passages in the *Culex*[70] has been taken as evidence that Columella, like Statius and Martial, viewed the poem as authentic.[71]

The many metrical similarities betwen the *Culex* and the *Eclogues* indicate that Vergil could have composed the epyllion. Is he the author? Two factors here seem especially important: the higher percentages in the first eight patterns, and the low percentage of fourth-foot homodyne; if a later poet attempted to compose a poem such as Vergil might have written in his youthful days,[72] why did he imitate Vergil's low homodyne and not his low frequencies? On the other hand, no poet before Vergil has such a low homodyne percentage; are we to believe that Vergil in this respect followed an unknown minor poet? It seems preferable to assume that the *Culex* is by Vergil, written earlier than the *Eclogues*, before he introduced greater variety by eliminating excessive repetition in the eight most frequent patterns.[73]

The *Ciris*. If the *Culex* could be a composition of the youthful Vergil, the same can hardly be said for the *Ciris*.[74] The very fact that the *Ciris* has fifteen spondaic verses, one every 35.7 lines, would indicate that it was written neither by Vergil (*Eclogues*, one spondaic verse every 276.0 lines; *Georgics*, one every 437.4; *Aeneid*, one every 409.6) nor by Ovid (*Metamorphoses*, one every 323.5 lines).[75] In this respect, the *Ciris* is far closer to Catullus LXIV, where we find thirty spondaic verses, or one every 13.6 lines.[76]

[70] H. Weinold, *Die Dichterischen Quellen des L. Iunius Moderatus Columella in seinem Werke De Re Rustica* (München 1959) 41–44.

[71] Weinold (above, note 70) 57–59.

[72] This is the view of E. Fraenkel, "The Culex," *JRS* 42 (1952) 1–9.

[73] On the basis of mathematical symmetry, the *Culex* seems more Vergilian than do the other poems in the *Appendix*; see Duckworth, *Structural Patterns* (above, note 54) 94–96.

[74] Cf. Eldridge (above, note 55) 66; Büchner (above, note 54) 98: "Die Verstechnik der Ciris ist *toto coelo* von der des Culex verschieden." See Lederer (above, note 10) 26, 29; on the basis of metrical arguments he considers the *Culex* by Vergil, the *Ciris* not.

[75] The frequency of spondaic verses in the other works of Ovid is as follows: *Heroides* 1–15, one every 238.4 lines; *Amores*, one every 613.0 lines; *Ars Amatoria* III, one every 406.0 lines; *Fasti*, one every 245.2 lines; there are no spondaic verses in *Ars* I–II, *Remedia*, *Heroides* 16–21, *Tristia*, *Ibis*, or *Epistulae ex Ponto*. I use here the statistics compiled by Costa (above, note 46) 236–275.

[76] M. Schuster, "Valerius," *RE* 7A.2 (1948) 2393, wrongly gives the number of spondaic verses in Catullus LXIV as twenty-seven, as does Townend (above, note 10) 126. C. J. Fordyce, *Catullus* (Oxford 1961) 277–278, lists the number as thirty, but he refers to lines 94 and 174 as spondaic; these have dactyls in the fifth foot; the lines are doubtless

The first pattern of the *Ciris*, *dsss*, has a high percentage of 18.46, unlike the corresponding percentages in Vergil (*Eclogues*, 13.09; *Georgics*, 15.81; *Aeneid*, 14.39), but similar to that in Cicero (*Aratea* and fragments, 18.28).[77] The percentage of the first eight patterns (77.12) resembles that of the *Culex* (77.45), but that of the first four is higher (*Ciris*, 51.92; *Culex*, 46.08); the *Culex* here is in a Vergilian range, and the *Ciris* is not.[78]

In the *Ciris*, the patterns per sixteen-line unit average 9.1, higher than in the Republican poets and in Ovid's *Metamorphoses*, but somewhat lower than in Vergil and Horace (and the *Culex*). Repeat clusters occur once every 86.7 lines, considerably less often than in the Republican poets, but two or three times as frequently as in Vergil and Horace (cf. *Culex*, one every 204.0 lines; *Metamorphoses*, one every 112.5 lines). Fourth-foot homodyne is 44.30 per cent, and the percentage of change in repeated patterns is −2.84; these are most un-Vergilian, and again unlike the *Culex* (36.76, +8.69).

The following table gives comparative percentages for *dsss* repeats and near repeats:

	dsss repeats		*dsss* R and NR	
	% repeats	% *dsss*	% R+NR	% *dsss*
Ciris:	39.02	16.67	34.17	42.71
Culex:	9.09	4.17	15.38	29.17
Eclogues:	15.87	11.36	15.53	28.41
Georgics:	29.38	15.07	31.33	43.77
Aeneid:	22.18	12.40	23.15	34.66
Horace:	20.06	12.19	21.21	34.62
Metamorphoses:	18.08	13.47	17.21	33.60

The differences between the *Culex* and the *Ciris* are here amazing, and in every instance but one (repeat and near repeat percentage of total *dsss* in the *Georgics*) the percentages in the *Ciris* are higher than those

misprints for 96 and 274. [The anonymous referee of this paper, to whom I am much indebted, suggests that the high frequency of spondaic lines both in the *Ciris* and in Catullus LXIV may be due to that in their Callimachean models.]

[77] In Ovid's *Metamorphoses* as a whole the first pattern is 13.08 per cent (almost identical with that in Vergil's *Eclogues*) and the range is from 11.99 (Book VI) to 15.71 (Book II). In no work of Ovid does the overall percentage of the first pattern go beyond 17.50 (*dssd* in the *Tristia*).

[78] Cf. Vergil's *Eclogues*, 41.45 (including the abnormally high 72.58 in *Eclogue* IV, where Vergil imitates the frequencies of Catullus LXIV); *Georgics*, 48.99; *Aeneid*, 46.95.

in the three authentic works of Vergil. Also, and this seems especially significant, the percentages in each column show a steady increase from the *Culex* through the *Eclogues* to a high point in the *Georgics*, with a marked falling off in the *Aeneid*.[79] The percentages of Horace and Ovid reveal that the trend away from heavy concentration on *dsss* repeats and near repeats continues throughout the Augustan poets.[80] We have here additional evidence, I believe, that the *Ciris* was composed neither by Vergil nor by Ovid, and also that metrically it belongs to the middle of the first century B.C. These same *dsss* percentages of the *Ciris* in relation to those in the Republican poets are as follows:

	dsss repeats		*dsss* R and NR	
	% repeats	% *dsss*	% R+NR	% *dsss*
Ciris:	39.02	16.67	34.17	42.71
Cicero:	40.48	19.77	24.39	34.88
Lucretius:	37.60	21.20	36.30	50.17
Catullus:	44.44	23.08	41.60	50.0

These percentages indicate clearly that the author of the *Ciris*, in his use of *dsss* repeats and near repeats stands far closer to the Republican poets than to Vergil, Horace, and Ovid. Also, the first eight patterns in the *Ciris*, in almost the same order, are identical with the first eight patterns of Lucretius:[81]

	dsss	*ddss*	*dsds*	*sdss*	*ddds*	*dssd*	*ssss*	*ddsd*
Lucretius:	1	2	3	4	5	6	7	8
Ciris:	1	2	3	5	4	7–8	7–8	6

[79] We must, of course, remember that in both the *Culex* and the *Eclogues* the most frequent pattern is not *dsss* but *ddss*, and that in both works *ddss* has more repeats and near repeats than does *dsss*. The four corresponding *ddss* percentages for the *Culex* are 22.73; 7.81; 23.08; 32.81; for the *Eclogues*, 31.75; 18.52; 24.22; 36.11. These are still much lower than the *Ciris* percentages (with one exception; *Eclogues: ddss* repeats comprise 18.52 per cent of the total occurrences of *ddss*; *Ciris: dsss* repeats are 16.67 per cent of the total *dsss*). In the *Metamorphoses* of Ovid the *dsss* repeats and near repeats are more numerous (202 R, 504 R+NR) than those of *ddss* (173 R, 496 R+NR), even though *ddss* is the most frequent pattern.

[80] The *dsss* percentages in Horace are approximately the same for the *Satires* and the *Epistles*; see Duckworth, *Horace* 94 (=Table 3). This suggests that the change from the *Georgics* to the lower percentages in the *Aeneid* may have been influenced by Horace's procedure in the *Satires*.

[81] See R. B. Steele, *Authorship of the Culex* (Nashville 1930) 40–41. Steele, however, reverses the order of *ddds* and *sdss* in the *Ciris*, also that of *dssd* and *ddsd*, thus making the similarity of the patterns in the *Ciris* and the *De rerum natura* appear greater than it actually is.

In his use of opposite and reverse patterns in adjacent lines, the author of the *Ciris* likewise follows the procedure of the Republican poets; the statistics for opposites every *x* lines are: *Ciris*, 32.5; Lucretius, 30.8; Catullus LXIV, 37.7; but *Culex*, 18.4; *Eclogues*, 19.6; *Georgics*, 20.9, etc.[82] In the case of reverse patterns we have every *x* lines: *Ciris*, 65.0; Lucretius, 51.3; Catullus, 53.9; *Culex*, 29.1; *Eclogues*, 55.0; *Georgics*, 46.4; *Aeneid*, 38.9, etc. Reverse patterns thus appear less frequently in the *Ciris* than in any other work in Republican and Augustan poetry.[83]

In summary, we have strong evidence of non-Vergilian authorship and every indication that the *Ciris* is to be dated in the late Republic; it should not be considered post-Vergilian.[84] Those who argue from the many so-called Vergilian echoes that the *Ciris* is to be dated later must face these questions. Why in so many respects are the metrical procedures identical with those of the late Republic? Would a poet of the early Empire be so oblivious of the greater variety introduced into hexameter verse by Vergil and Horace? This seems possible, but hardly probable. Perhaps we have here an added argument

[82] The percentage of *ssdd* preceded or followed by *ddss* is 57.14. There is nothing like this among the other poets; the closest approach is in Catullus LXIV, 33.33 per cent, and in the *Metamorphoses*, 30.14; cf. Lucretius, 25.64; *Culex*, 28.57; *Eclogues* and *Georgics*, each 26.92; *Aeneid*, 20.0; Horace, 21.43.

[83] The nearest in frequency is the *Moretum*, one every sixty lines; see below, p. 97.

[84] The pseudo-Tibullan *Panegyricus Messallae* in 212 hexameters, usually dated between 31 and 27 B.C., resembles the *Ciris* in several respects: the percentage of the first eight patterns is 76.88, close to the 77.12 percentage in the *Ciris*; the distribution in the first eight patterns is eighteen spondees and fourteen dactyls, as in the *Ciris* (and Lucretius); the average number of patterns per sixteen-line unit is 9.1, as in the *Ciris*; the *dsss* repeats and near repeats comprise 34.67 per cent of the total repeats and near repeats, and in the *Ciris* the percentage is 34.17; the frequency of opposites is one every 26.5 lines, in the *Ciris* one every 32.5 lines. There are differences as well: *sdds* and *sdsd* appear in the first eight patterns in place of *sdss* and *ddsd*; repeat clusters are less frequent, one in 212.0 lines (*Ciris*, one every 86.7 lines). The percentage of fourth-foot homodyne is an unusually low 32.08 (the influence of Vergil?), but 44.30 in the *Ciris*; reverses one every 26.5 lines (cf. Cicero, one every 24.0 lines), but in the *Ciris*, one every 65.0 lines. [The referee suggests a comparison of the *Ciris* with Germanicus Caesar and Manilius, statistics for whom are discussed below in connection with the *Aetna*. The differences, however, far outnumber the similarities; e.g. the *dsss* repeats comprise 39.02 per cent of the total repeats in the *Ciris*, but 23.53 per cent in the *Aratea* of Germanicus and 32.67 in Manilius; cf. Cicero, 40.48; Lucretius, 37.60; Catullus, 44.44. The few similarities result from the fact that the didactic poets of the first century A.D. resemble Vergil's *Georgics* in many respects. I find no evidence here for a later dating of the *Ciris*.]

to support Skutsch's theory that the author of the *Ciris* was none other than Cornelius Gallus and that it was Vergil who borrowed phrases and lines from the work of his friend.[85]

The *Moretum*. Statistics based on short poems such as the *Moretum* (122 verses) and the *Dirae* (183 verses) are naturally less conclusive than those derived from longer works containing several hundreds or thousands of verses. In the case of the *Moretum*, however, we find a number of striking resemblances to the *Culex* and the *Eclogues* which might favor Vergilian authorship.

Although in different order (*dsss* is first, *ddss*, *dsds*, and *ddds* are tied for second place), the eight most frequent patterns in the *Moretum* are the same as in the *Eclogues* and the *Culex*, with one exception: *dsdd* (tied for seventh place with *dssd*) appears in place of *ddsd* (fourth in the *Eclogues*, eighth in the *Culex*); the percentage of the most frequent pattern is 15.83, in the *Culex* 15.69; that of the first eight patterns is 77.50, *Culex* 77.45; the distribution of spondees and dactyls in the first eight patterns is sixteen and sixteen, identical with that in the *Culex* and the *Eclogues*. This seems significant, for, with the exception of Books III and IV of the *De rerum natura*, the distribution of sixteen spondees and sixteen dactyls does not appear elsewhere in Republican or Augustan hexameter poetry.

The *Moretum* averages 9.3 patterns per sixteen-line unit (*Culex*, 9.6; *Eclogues*, 9.7), and the percentage of units with eight or more patterns is 100.0 (*Culex*, 100.0; *Eclogues*, 97.87). The percentage of fourth-foot homodyne is unusually low, 33.33 (*Culex*, 36.76; *Eclogues*, 39.73), and this too argues for Vergilian authorship.[86] The frequency of repeats and near repeats is one every 4.8 lines, midway between the *Culex* (4.5) and the *Eclogues* (5.1). The *dsss* repeats and near repeats in the *Moretum*

[85] F. Skutsch, *Aus Vergils Frühzeit* (Leipzig 1901) and *II. Gallus und Vergil* (Leipzig 1906), *passim*. J. W. Duff, *A Literary History of Rome from the Origins to the Close of the Golden Age*[3] (London 1953) 355, considers this explanation the "more plausible" one. See also W. R. Hardie, "On Some Non-Metrical Arguments Bearing on the Date of the Ciris," *JPh* 30 (1907) 280–289, who suggests that Vergil cooperated with Gallus in writing the *Ciris* and contributed a number of lines to it; in this case he would have no scruple about using again lines which he himself had written or helped to write.

[86] Büchner (above, note 54) 151–152 wrongly gives the homodyne percentage as 26.0 and uses this as one of his arguments to show that the *Moretum* is metrically non-Vergilian.

comprise 31.58 per cent of the total occurrences of *dsss*: *Culex*, 29.17; *Eclogues*, 28.41.[87] Opposites appear once every 15.0 lines; *Culex*, 18.4, and *Eclogues*, 19.6; in the case of reverses: *Moretum*, one every 60.0 lines; *Culex*, 29.1, but *Eclogues*, 55.0.

In all these instances the technique of the *Moretum* resembles that of the *Culex*, or the *Eclogues*, or both. There are also differences: repeat clusters are relatively more frequent: *Moretum*, one instance, or one every 120.0 lines; *Culex*, two, or one every 204.0 lines; *Eclogues*, three, or one every 275.0 lines. Repeats are likewise more frequent, one in every 9.4 lines (*Culex*, 18.5; *Eclogues*, 13.1), and we find in the *Moretum* little interest in shifting the fourth-foot texture in repeated patterns; the percentage of change in relation to the percentage of fourth-foot homodyne is −10.25; cf. *Culex*, +8.69; *Eclogues*, +9.48. These few discrepancies in so short a poem, however, seem hardly sufficient to overweigh the importance of the many similarities pointed out above.

Another factor to consider is this: Columella concludes Book X of his *Res rustica* as follows (433–436):

> hactenus hortorum cultus, Silvine, docebam
> siderei vatis referens praecepta Maronis,
> qui primus veteres ausus recludere fontes
> Ascraeum cecinit Romana per oppida carmen.

The phrase "praecepta Maronis" is of interest here, when we realize that Columella imitated not only the authentic works of Vergil, but the *Culex*[88] and also the *Moretum*, but not the *Ciris*, *Dirae*, or *Aetna*; this implies that Columella accepted both the *Culex* and the *Moretum* as poems of the "sidereus vates."[89]

[87] The similarity in the case of repeats and near repeats is even more striking if we compare the most frequently repeated patterns, *dsss* in the *Moretum*, *ddss* in the *Culex* and the *Eclogues* (see above, note 79) as follows:

	Repeats (*dsss* or *ddss*)		R + NR (*dsss* or *ddss*)	
	% repeats	% pattern	% R + NR	% pattern
Moretum:	23.08	15.79	24.0	31.58
Culex:	22.73	7.81	23.08	32.81
Eclogues:	31.75	18.52	24.22	36.11

[88] See above, pp. 91–92.

[89] See F. L. Douglas, *A Study of the Moretum* (Syracuse 1929) 74–99; cf. Weinold (above, note 70) 49: "Bei keinem Stück der Appendix lässt sich die Nachahmung durch Columella so überzeugend herausarbeiten wie beim Moretum."

The many metrical similarities between the *Culex* and the *Eclogues* favor the conclusion that the *Culex* is the work of Vergil, and since the *Moretum* resembles so closely both the *Culex* and the *Eclogues*, it too should probably be considered as authentic.[90]

The *Dirae* (*Lydia*). When we turn to this short poem, we have not only the problem of Vergilian authorship but also that of unity—is the so-called *Lydia* (104–183) the conclusion of the *Dirae* or an independent poem? Arguments and opinions differ widely; Steele favors two poems, both by Vergil;[91] Van der Graaf says that "the Dirae is one and indivisible," and views it "as one of Vergil's juvenile poems";[92] Büchner considers the *Lydia* an independent work and denies Vergilian authorship to both poems.[93]

In the statistics on the *Appendix* given above,[94] I listed the *Dirae* (*Lydia*) as a unit. I shall now give frequencies and percentages for the *Dirae* 1–103 (abbreviated *D*) and the *Lydia* (abbreviated *L*) in an attempt to throw new light on the problem of unity as well as on the authorship of the poem (or poems).[95]

1. The favorite metrical pattern in *D* is *sdss*, with a percentage of 16.67, and in *L* it is likewise *sdss*, with a percentage of 17.11. The percentages here are similar, but higher than in the *Culex* and the three authentic works of Vergil. The presence of *sdss* as the first pattern is most unusual, for in all Republican and Augustan hexameter poetry *sdss* is first only in Lucilius (based on fragments) and in the *Halieutica*, wrongly ascribed to Ovid.[96] We have here a strong argument both for unity and against Vergilian authorship.[97]

[90] Cf. R. B. Steele, "The Authorship of the *Moretum*," *TAPA* 61 (1930) 216: "The characters Simylus and Scybale are unique, and Vergil is the only one whose experience, so far as we know, might have brought him in contact with them."

[91] R. B. Steele, *Authorship of the Dirae and Lydia* (Nashville 1931) 35.

[92] Van der Graaf (above, note 54) 134, 145.

[93] Büchner (above, note 54) 109–116.

[94] See pp. 87 and 89.

[95] My method is somewhat similar to that of Van der Graaf (above, note 54) 44–122, but he includes many other criteria (e.g. word-forms, caesura, elision) and does not touch upon metrical variety and repetition, especially the evidence from repeated, opposite, and reverse patterns.

[96] See above, note 4.

[97] Van der Graaf (above, note 54) 144 admits this: "The result of the metrical schemes on the whole does not favour the authenticity of D" (by D he means the combined *Dirae* and *Lydia*).

2. In *D*, *dssd* is tied for second place with *dsss* (13.73 per cent); in *L*, *dssd* is second (15.79 per cent) and *dsss* is third (14.47 per cent). Nowhere in Republican or Augustan hexameter poetry does *dssd* rank second until we come to Ovid.[98] This position of *dssd* in *D* and *L* also argues for unity of authorship, but does not necessarily disprove composition by Vergil (cf. *Eclogues*, *dssd* tied for fourth place; *Culex*, third place).

3. The first eight patterns are the same, except for *ddsd*, fifth place in *D* but not among the first eight in *L*; *sdds*, sixth place in *L* but no occurrences in *D*; *sdsd*, tied for eighth place in *L* but tied for tenth place in *D*. The percentages of the first four and the first eight patterns are, respectively: *D*, 53.92, 83.33; *L*, 59.21, 84.21; these percentages are most un-Vergilian and far higher than in any other hexameter poem of the *Appendix*, higher even than in the Republican poets, with the exception of Catullus. This too implies the same poet for *D* and *L*.

4. The distribution of spondees and dactyls in the first eight patterns in *D* is eighteen and fourteen; in *L*, nineteen and thirteen; total, eighteen and fourteen; cf. the *Ciris* and Lucretius, both eighteen and fourteen.

5. In *D* we find no spondaic verses, but *L* has three (136, 150, 170); this has been cited as a strong argument against unity. In Catullus LXIV, however, the spondaic verses (thirty in number) appear only at the beginning and the end of the poem; there are none between lines 119 and 252, a section including the lament of Ariadne and Aegeus' farewell speech to Theseus. It seems entirely possible that one poem could likewise have three spondaic verses with all three in the latter part of the poem. The frequency of the spondaic verses, one every 60.3 lines, though less than that in the *Ciris* (one every 35.7 lines) argues against Vergilian authorship.[99]

6. The average number of metrical patterns per sixteen-line unit is: *D*, 8.8; *L*, 8.3; these are lower than in Vergil or in any of the other poems of the *Appendix*, and resemble the averages in Cicero and Lucretius. The percentage of units with eight or more patterns is 66.67 for *D*, 75.0 for *L* (=70.0 for *D* and *L* combined). Such low percentages appear neither in Vergil nor elsewhere in the *Appendix*, and are surpassed only by the abnormal 30.43 in Catullus LXIV; the percentage in

[98] See above, note 63.

[99] See above, p. 92.

Lucretius is 76.10, with a range from 68.75 in Book VI to 85.29 in Book I.[100] Here again we can see the hand of one poet in *D* and *L* and additional evidence that the *Dirae* is to be dated in the late Republic, but is not the work of Vergil.

7. Repeat clusters occur once every 102.0 lines in *D*, once every 76.0 lines in *L* (total, once every 89.0 lines). This is less frequent than in the Republican poets, but more so than in the other poems of the *Appendix*, with the exception of the *Ciris* (once every 86.7 lines) and of course bears no relation to Vergil's procedure. We have here no argument against unity of authorship.

8. Büchner points out that coincidence of ictus and accent in the fourth foot (i.e. fourth-foot homodyne) in *D* is 46.6 per cent, which he considers "unvergilisch," and in *L* only 25 per cent.[101] This would indicate that *D* and *L* were written by two different poets. Büchner here follows the percentages given by Jackson Knight,[102] which are wrong, especially for *L*, as Van der Graaf has pointed out.[103] There are twenty-five instances of homodyne in *L*, i.e. not 25.0 per cent, but 31.65, and the percentage for *D* is 46.08, or 39.78 for *D* and *L* combined. If we disregard the homodyned Battarus refrain which appears seven times, the percentage for the remainder of *D* is 39.22, which brings it also into a Vergilian range, and makes the difference between *D* and *L* even less significant. I do not find here a strong argument against the unity of the poem, but I do not believe that the low homodyne percentage necessitates ascribing the poem to Vergil. Too many other factors speak against Vergilian authorship, and all we can conclude is that the fourth-foot homodyne percentage perhaps shows the influence of the *Moretum*, the *Culex*, and possibly the *Eclogues*.

9. Repeats average in *D* one every 10.2 lines, in *L* one every 12.7 lines; in *D* and *L* together one every 11.1 lines, about the same as in Cicero (*Aratea*) and much less frequent than in Lucretius and Catullus LXIV. *L* is in the Vergilian area, *D* is not; however, when we turn to repeats plus near repeats, *D* and *L* are very similar: *D*, one every 3.6

[100] Lucretius' percentage of units with eight or more patterns is considerably higher in Books I, II, and V as a whole than in the other three books; see above, note 21.

[101] Büchner (above, note 54) 113.

[102] Jackson Knight (above, note 31) 42; he says, "the figures suggest that it is right to regard them as two separate pieces."

[103] Van der Graaf (above, note 54) 70.

lines, *L* one every 3.8 lines; these are similar to Cicero (3.9) and Lucretius (3.6), but very different from Vergil (*Eclogues*, 5.1; *Georgics*, 4.5; *Aeneid*, 4.6). Again we have an argument against Vergilian authorship, and nothing to disprove unity or a dating in the late period of the Roman Republic.

10. The percentages of fourth-foot texture change in repeats are: *D*, 40.0 and *L*, 50.0 (combined *D* and *L*, 43.75); in repeats and near repeats, *D*, 42.86 and *L*, 45.0 (combined *D* and *L*, again 43.75); these are sufficiently close to indicate unity of authorship, but the variation in the fourth-foot homodyne percentages creates a difference from the homodyne percentages as follows: repeats, *D*, −6.08; *L*, +18.35 (combined *D* and *L*, +3.97); repeats and near repeats, *D*, −3.22; *L*, +13.35 (combined *D* and *L*, again +3.97). Since this point is closely related to item 8 above, it should not be used as a separate argument against unity of authorship.

11. The opposite and reverse patterns in adjacent lines are too few to provide evidence either for or against unity of authorship: opposites, one each in *D* and *L*; reverses, four in *D*, none in *L*. The favorite reverse in *D* is *sssd–dsss* (surprising, since *dsss* is not the most frequent pattern), comprising three of the four reverses; since *sssd* occurs only three times in *D*, it is preceded or followed by *dsss* 100 per cent of the time.

The items listed above, with the possible exception of 8 and the related 10, provide strong evidence for the unity of the *Dirae* and the *Lydia*. On all counts, Vergilian authorship is impossible, but the time of composition seems to be that of the late Republic.

The *Aetna* and post-Vergilian didactic poetry. The Donatus-Suetonius Life (18) includes the *Aetna* among the poems of the *Appendix* with the phrase *de qua ambigitur*. This expression of doubt concerning its authenticity is shared by most modern scholars,[104] who date the

[104] Not, however, by those who, in the early part of the century, accepted the poems of the *Appendix* as authentic and then used them as a source of biographical material for the youthful Vergil; see E. K. Rand, "Young Virgil's Poetry," *HSPh* 30 (1919) 155–172, who favors the view that "*Aetna* was written before the *Bucolics*, and by the same writer" (p. 169); N. W. DeWitt, *Virgil's Biographia Litteraria* (Toronto 1923) 98–107, who accepts the poem as authentic, but dates it after November, 43 B.C. T. Frank, *Vergil: A Biography* (New York 1922) 58–63, is somewhat more cautious and

poem (on the basis of language, style, meter, imitations of other poets, etc.) in the first century A.D., probably in the time of Nero or even later, but before the famous eruption of Vesuvius in 79 A.D.[105]

I had originally intended to include post-Vergilian didactic poetry and a comparison with the *Georgics* in a later article on Silver Age hexameter poetry, but the possibility, even the probability, that the *Aetna* is to be dated in this later period suggests that I combine my material on the other didactic poets with my metrical analyses of the *Aetna*. I shall, therefore, list in parallel columns the relevant frequencies and percentages, not only for the *Georgics* and the *Aetna*, but also for the *Cynegetica* of Grattius, the *Aratea* of Germanicus Caesar, the *Astronomica* of Manilius, *Res Rustica* X of Columella, and the later *Cynegetica* of Nemesianus.[106]

I give the following statistics for the first eight patterns of each of the poems (order of the patterns, relevant percentages, and distribution of spondees and dactyls):

	Georg.	*Aetna*	Gratt.	Germ.	Man.	Col.	Nem.
dsss	1	1	1	1	1	3	2
ddss	3	4	4	2	2	1	4
dsds	2	3	2	4	4	2	1
sdss	4	2	3	3	3	6–7	3
ssss	7	8		5	5		5
ddds	6		6–7		7	6–7	6
ssds	8	5	5	6	8		8
sdds		7	8		6		7
dssd	5	6		8		4	
ddsd						5	
sdsd			6–7	7			
dsdd						8	

says: "The first fruit of Vergil's studies in evolutionary science at Naples was the *Aetna*, *if indeed the poem be his*" (p. 58). The italics are mine.

[105] See, for example, the recent discussions of Büchner (above, note 54) 116–135; Richter (above, note 54) 1–7; Goodyear (above, note 54) 56–59. Cf. also F. Weissengruber, "Zur Datierung der 'Aetna'," *WS* 78 (1965) 128–138.

[106] My statistics for the post-Vergilian didactic poets are based on the following editions: Grattius: R. Verdière, *Gratti Cynegeticon Libri I Quae Supersunt*, Vol. 1 (Wetteren 1965); Germanicus: A. Breysig, *Germanici Caesaris Aratea*[2] (Leipzig 1899); Manilius: A. E. Housman, *M. Manilii Astronomica*, Editio minor (Cambridge 1932); Columella: E. S. Forster and E. H. Heffner, *Lucius Junius Moderatus Columella: On Agriculture and Trees*, Vol. 3 (LCL 1945); Nemesianus: J. W. Duff and A. M. Duff, *Minor Latin Poets* (LCL 1934) 484–512. The basic patterns and percentages for the didactic poets appear

	Georg.	*Aetna*	Gratt.	Germ.	Man.	Col.	Nem.
% 1st pattern:	15.81	14.47	12.99	16.10	17.33	14.94	15.38
% 1st four:	48.99	48.58	47.68	47.86	53.58	51.26	45.23
% 1st eight:	73.42	72.01	73.47	72.82	77.33	81.84	71.08
First eight—							
Spondees:	20	21	18	21	20	15	20
Dactyls:	12	11	14	11	12	17	12
4th-foot Sp.:	7	7	7	6	8	5	8
1st-foot Da.:	5	4	4	4	4	7	4

The didactic poets follow the practice of Cicero, Lucretius, Catullus, Vergil, and Horace in preferring *dsss* as the first pattern, *until* we come to Columella, who favors *ddss*, first pattern in Ovid's *Metamorphoses*. The percentage range for the first pattern is from a low 12.99 in Grattius to 17.33 in Manilius. Again, with the exception of Columella, the first four patterns are the same as in the *Georgics*, but in different order, with the percentages in most instances very close to that of the *Georgics* (48.99); Nemesianus is low with 45.23, Manilius high with 53.58. The percentages of the first eight patterns closely resemble that in the *Georgics* (73.42); the two exceptions are Manilius (77.33) and Columella (81.84). The first eight patterns in Manilius and Nemesianus are the same eight as in Vergil's *Aeneid*;[107] we have therefore the same distribution of twenty spondees and twelve dactyls, with the fourth foot always a spondee. Two poems are even more spondaic, the *Aetna* and Germanicus' *Aratea*, where we find twenty-one spondees and eleven dactyls in the first eight patterns, and these patterns are the same in both poems with one exception—*sdsd* in the *Aratea*, *sdds* in the *Aetna*.

Columella is unique among the didactic poets; not only is *ddss* the first pattern as in Ovid's *Metamorphoses*, but *dssd* and *ddsd* are fourth and fifth respectively; a high ratio of these two patterns is considered

below in Table 5; for the *Aetna*, see Table 4. In Table 5, I give statistics also for the fragments of Germanicus, but not for the individual books of Manilius, where we find surprisingly little variation; e.g. *dsss* is the first pattern in each book, with a range from 16.67 (II) to 18.49 (I, III); the percentage of the first eight patterns varies from 75.84 (I) to 79.03 (IV); the average number of patterns per sixteen line unit is from 8.6 (IV) to 8.9 (I, III); the percentage of fourth-foot homodyne ranges from 37.42 (IV) to 41.05 (I). Only in the frequency of reverses do we find a wide divergence; in I, one every 74.8 lines; in the other four books the range is from 48.9 (IV) down to 33.8 (III).

[107] The second eight patterns in Manilius, from *dssd* (ninth) to *sddd* (sixteenth), are in exactly the same order as the second eight patterns in the *Aeneid*; see Table 5.

"the true distinguishing mark of Ovid's works."[108] The percentage for the first eight patterns is 81.84 (*Metamorphoses*, 81.62), the distribution of spondees is fifteen and seventeen (somewhat more spondaic than Ovid, but less so than any other of the didactic poets), and seven of the first eight patterns have a dactyl in the first foot (Ovid, eight first-foot dactyls in the first eight patterns). Columella states that he is writing a supplement to Vergil's *Georgics*,[109] but he follows the metrical technique of Ovid, not that of Vergil.

And what about the *Aetna* in relation to the *Georgics* and these later poems? The choice of patterns and their frequencies are similar to those in the *Georgics* (e.g. in the case of *ssss*), but resemble also those in Grattius' *Cynegetica* (*ddss* and *ssds* in fourth and fifth position respectively in both), and perhaps even more so those in the *Aratea* of Germanicus (percentage of first eight patterns, 72.01 and 72.82 respectively; distribution of spondees and dactyls, twenty-one and eleven in each). I find nothing here to support Vergilian authorship of the *Aetna* or to disprove a dating of the poem in the first century A.D.

The comparative averages and percentages for variety in sixteen-line units, fourth-foot texture, repeated, opposite, and reverse patterns are as follows:

	Georg.	*Aetna*	Gratt.	Germ.	Man.	Col.	Nemes.
Patterns per 16-line unit:	9.3	9.2	9.4	9.2	8.8	9.1	10.0
% units with 8 or more:	92.59	87.18	90.91	90.48	86.52	88.89	95.0
Repeat clusters, 1 every *x* lines:	145.5	212.0	134.8	112.6	83.6	108.8	162.5
% 4th-foot homodyne:	36.08	33.18	50.83	35.83	39.33	44.04	31.69
Repeats—							
1 every *x* lines:	12.3	11.4	16.3	10.0	10.4	10.9	14.8
% of change:	43.50	42.86	48.48	44.12	49.38	42.50	27.27
Differs from homodyne %:	+7.42	+9.68	−2.35	+8.29	+10.03	−1.54	−4.42
R plus NR—							
1 every *x* lines:	4.5	4.3	4.9	4.5	4.1	4.2	5.2
% of change:	47.10	38.10	47.27	41.06	46.0	38.46	27.42

[108] See above, pp. 89-90 and note 63.
[109] See above, pp. 91-92 and 97.

	Georg.	*Aetna*	Gratt.	Germ.	Man.	Col.	Nemes.
Differs from homodyne %:	+11.02	+4.92	−3.56	+5.23	+6.67	−5.58	−4.27
dsss repeats[110]—							
% of repeats:	29.38	23.21	36.36	23.53	32.67	17.50	22.73
% of *dsss*:	15.07	14.13	17.14	14.68	18.09	12.96	13.89
dsss R plus NR—							
% of R+NR:	31.33	21.09	24.55	26.49	31.25	22.12	19.35
% of *dsss*:	43.77	33.70	38.57	36.70	44.20	42.59	24.0
Opposites—							
1 every *x* lines:	20.9	22.7	16.8	24.2	29.0	25.6	21.7
Reverses—							
1 every *x* lines:	46.4	31.8	38.5	32.2	45.9	33.5	46.4

The figures given above provide valuable information not only about the *Aetna* but about post-Vergilian didactic poetry as well. In general we find that the later metrical techniques resemble more or less closely those of the *Georgics*. The average number of patterns per sixteen-line unit is from 9.1 to 9.4, with the exception of 8.8 in Manilius (cf. Lucretius, 8.6; *Metamorphoses*, 8.9) and 10.0 in Nemesianus. Repeat clusters range from a low of one every 83.6 lines in Manilius to a high of one every 212.0 lines in the *Aetna* (cf. *Georgics*, one every 145.5 lines). The percentage of fourth-foot homodyne is in the Vergilian range, with the exception of Grattius (50.83) and Columella (44.04); the two lowest percentages are those of Nemesianus (31.69) and the *Aetna* (33.18). Repeats are more frequent than in the *Georgics* (one every 12.3 lines) with the exception of Nemesianus (one every 14.8) and Grattius (one every 16.3), and the frequency of repeats and near repeats is either the same as in the *Georgics* (Germanicus) or greater, again with the exception of Nemesianus (one every 5.2 lines) and Grattius (one every 4.9 lines).

The percentage of change in fourth-foot texture both in repeats and in repeats plus near repeats is considerably higher than the percentage of fourth-foot homodyne in the *Aetna*, Germanicus, and Manilius (especially similar to the *Georgics*, +7.42, in the case of repeats),

[110] Although the first pattern in Columella is *ddss*, the pattern with the most numerous repeats and near repeats is *dsss*, in third position. In the case of Nemesianus, the most frequent pattern, *dsds*, also provides the most repeats and near repeats. The four corresponding percentages for *dsds* are 27.27; 12.0; 30.65; 38.0.

whereas Grattius, Columella, and Nemesianus are all in the minus column, with a range from −1.54 (Columella, repeats) to −5.58 (Columella, repeats and near repeats). The *dsss* repeats in the *Georgics* comprise 29.38 per cent of the total repeats; in the other poems the percentages are lower, with the exception of Manilius (32.67) and Grattius (36.36). The percentage of *dsss* repeats, in relation to the total *dsss* patterns, is 15.07 in the *Georgics*; again all the other poets are lower, with the exception of Grattius (17.14) and Manilius (18.09).[111] The variation in opposites per *x* lines is from 16.8 in Grattius to 29.0 in Manilius; in reverses, from 32.2 in Germanicus to 46.4 in Nemesianus (*Georgics*, 46.4). In general, the *Aetna*, Germanicus, and Manilius are far closer to Vergil's technique in the *Georgics* than are the other three didactic poets.

I pointed out above that Columella's metrical patterns and frequencies are those of Ovid and not of Vergil. Columella's high percentage of fourth-foot homodyne (44.04; *Metamorphoses*, 50.0), the relation of shift in fourth-foot texture to the fourth-foot homodyne percentage in repeats (−1.54; *Metamorphoses*, −3.09) and in repeats plus near repeats (−5.58; *Metamorphoses*, −3.81), the low percentage of *dsss* repeats, both in relation to the total repeats (17.50; *Metamorphoses*, 18.08) and to the total occurrences of *dsss* (12.96; *Metamorphoses*, 13.47) —all these factors likewise argue in favor of the Ovidian nature of Columella's hexameters.[112]

I return now to the *Aetna*, which, as I have already shown, is similar to the *Aratea* of Germanicus in the percentages of the first eight patterns and in the distribution of spondees and dactyls. The resemblances are even more striking when we examine the frequencies and percentages based on variety and repetition, and in several instances differ considerably from the corresponding figures in the *Georgics*. I select from the table given above the following points which seem particularly significant: fourth-foot homodyne percentages: *Aetna*, 33.18;

[111] There is even less variation in the case of the *dsss* repeats and near repeats; all the poems are lower than the *Georgics*, with the exception of Manilius, where the percentage of total occurrences of *dsss* is 44.20 (*Georgics*, 43.77).

[112] As Columella in didactic poetry, although professing to imitate Vergil's *Georgics*, is Ovidian in his hexameters, so Calpurnius Siculus in pastoral and Valerius Flaccus in epic are likewise metrically far closer to Ovid than to Vergil. I hope to discuss this aspect of Silver Latin hexameter poetry in a later article.

Aratea, 35.83 (*Georgics*, 36.08); difference between the percentage of change in fourth-foot texture and the homodyne percentage: repeats, *Aetna*, +9.68; *Aratea*, +8.29 (*Georgics*, +7.42); repeats and near repeats, *Aetna*, +4.92; *Aratea*, +5.23 (*Georgics*, +11.02). The *dsss* repeats comprise 23.21 per cent of the total repeats in the *Aetna*; in the *Aratea*, 23.53 (*Georgics*, 29.38); the *dsss* repeats and near repeats make up 33.70 per cent of the total occurrences of *dsss* in the *Aetna*, 36.70 per cent in the *Aratea* (*Georgics*, 43.77). Reverse patterns in adjacent lines appear once every 31.8 lines in the *Aetna*, once every 32.2 in the *Aratea*; these frequencies are higher than in the other didactic poems, and the lowest are in the *Georgics* and in the *Cynegetica* of Nemesianus, both once every 46.4 lines.[113]

Here again we find no evidence for Vergilian authorship of the *Aetna*.[114] In almost every respect the metrical techniques of the *Aetna* as described above resemble very closely those of the *Aratea* of Germanicus. How is this to be explained? There are four possibilities: (1) the similarities are purely coincidental, but this I doubt, for they are too numerous; (2) the *Aetna* was earlier and Germanicus was the imitator; the difficulty here is that Germanicus would certainly have followed the hexameter technique of Vergil in the *Georgics* more closely than that of a minor and inferior poet; (3) Germanicus himself wrote the *Aetna*; this could well explain the many almost exact resemblances, but would create other problems: why is the *Aetna* ascribed to an "incertus auctor," and how was it added to the *Appendix Vergiliana*? (4) the author of the *Aetna* knew and was impressed by the *Aratea* and imitated as faithfully as possible the metrical technique of Germanicus Caesar. This last seems the most satisfactory solution and dates the composition of the *Aetna* in the second quarter of the first century A.D., preferably before the time of Columella and Calpurnius Siculus, when the influence of Ovid's metrical procedures becomes more noticeable.[115]

[113] Cf. also Manilius, one reverse every 45.9 lines, with a wide range from 33.8 (Book III) to 74.8 (Book I); see above, note 106.

[114] Cf. Büchner (above, note 54) 127: "Der Vers des Aetna etwas ganz anderes ist als der lukrezische oder vergilische Vers, und zwar etwa Späteres." My statistics for the *Aetna* (and the other post-Vergilian didactic poems) show, however, a much closer similarity to Vergilian than to Lucretian hexameter techniques.

[115] See above, note 112.

With the eight most frequent patterns in Latin hexameter poetry ranging from 65.35 per cent (Ennius) to 90.98 per cent (Catullus LXIV), statistics based on these eight patterns give a more accurate idea of the predilections and idiosyncrasies of the individual poets than do the figures of earlier scholars derived from a study of all sixteen patterns. Also, to the best of my knowledge, the various other criteria—variety in sixteen-line units, repeat clusters, the frequency of repeats and near repeats, shift in fourth-foot texture, the relation of the most frequently repeated patterns both to the total number of repeats and near repeats and to the total occurrence of the pattern, the frequency and nature of the opposite and reverse patterns in adjacent lines—have not hitherto been applied to the Roman hexameter poets. My studies, which began with Vergil[116] and Horace,[117] now include the Republican poets, Ovid's *Metamorphoses*, and the *Appendix Vergiliana*. I trust that the criteria will prove as valuable for the poems of the *Appendix* as they seem to have been for the other hexameter poetry.

I summarize briefly my conclusions for the hexameter poems of the *Appendix* (and we must always keep in mind that the text is often very uncertain):

1. The *Culex*, with its striking metrical similarities to the *Eclogues*, could be and probably is a youthful work of Vergil; there are also differences which are difficult to explain if the *Culex* is the work of a later forger imitating Vergil's technique.

2. The *Ciris* is definitely not by Vergil, but is to be dated in the first century B.C. The theory of F. Skutsch that Vergil borrowed phrases and lines from his friend Cornelius Gallus still seems attractive.

3. The *Moretum*, like the *Culex*, is probably by Vergil. It seems significant that Columella borrowed not only from Vergil's authentic works but also from the *Culex* and the *Moretum*.

4. The *Dirae* (*Lydia*) can not possibly be the work of Vergil, but the evidence favors the view that it is one poem rather than two and that it is to be dated in the late Republic.

5. The *Aetna*, when compared with the *Georgics* and several post-Vergilian didactic poems, belongs to the first century A.D., preferably

[116] See above, notes 1 and 3.
[117] See above, note 2.

between 25 and 50. It has amazing metrical resemblances to the *Aratea* of Germanicus Caesar, and these are best explained by deliberate imitation of the *Aratea*.[118]

[118] I have not discussed either the *Copa* (19 hexameters) or *Catalepton* IX (32 hexameters), as many of the criteria used above do not apply to elegiac verse. Although these two poems are almost too short to provide conclusions of value, they seem most un-Vergilian, e.g. percentage of first pattern: *Copa* (*sdss*), 21.05; *Catalepton* IX (*dsss*), 25.81; percentage of first eight patterns: *Copa*, 89.47; *Catalepton* IX, 90.32; percentage of fourth-foot homodyne: *Copa*, 42.11; *Catalepton* IX, 59.38. Actually these two poems resemble Tibullus II 5 (the Messalinus poem), but have even higher frequencies; the corresponding percentages in Tibullus II 5 are 22.95, 81.97, 40.98. The *Panegyricus Messallae* (see above, note 84) is not by Vergil, but it is far more Vergilian than either the *Copa* or *Catalepton* IX, with percentages of 16.98, 76.88, 32.08 respectively. The author of *Catalepton* IX imitated the *Panegyricus Messallae*; cf. R. E. H. Westendorp Boerma, *P. Vergili Maronis libellus qui inscribitur Catalepton*, Pars altera (Assen 1963) 10.

TABLE 2. REPUBLICAN POETS

	Ennius	Lucilius	Cicero			Lucretius, *De rerum natura*							Catullus
	Frags.	Frags.	*Aratea*	Frags.	Total	I	II	III	IV	V	VI	Total	LXIV
dsss	36	73	86	50	136	196	216	220	234	334	281	1,481	104
ddss	25	45	67	42	109	151	152	195	186	237	185	1,106	50
dsds	23	53	27	22	49	94	122	104	130	152	142	744	43
sdss	36	102	62	33	95	114	124	85	105	125	102	655	59
ssss	62	60	68	19	87	93	84	35	44	79	68	403	37
ddds	20	24	27	17	44	83	80	84	125	102	116	590	11
ssds	33	45	32	13	45	48	38	25	39	33	36	219	16
sdds	22	43	28	19	47	60	42	47	63	56	38	306	9
dssd	24	19	13	13	26	79	72	87	95	108	85	526	23
ddsd	16	22	15	7	22	36	61	58	64	63	67	349	5
sdsd	22	28	18	6	24	35	39	41	43	38	40	236	3
dsdd	13	22	5	5	10	23	45	37	52	40	43	240	7
sssd	25	27	17	5	22	33	28	14	18	30	19	142	5
ssdd	11	14	6	5	11	12	17	8	19	6	16	78	3
dddd	20	9	1	5	6	21	25	29	35	31	32	173	0
sddd	16	19	7	4	11	18	20	14	13	12	10	87	2
Total	404	605	479	265	744	1,096	1,165	1,083	1,265	1,446	1,280	7,335	377
Most frequent	*ssss*	*sdss*	*dsss*	*dsss*	*dsss*	*dsss*	*dsss*	*dsss*	*dsss*	*dsss*	*dsss*	*dsss*	*dsss*
% First pattern	15.35	16.86	17.95	18.87	18.28	17.88	18.54	20.31	18.50	23.10	21.95	20.20	27.59
% First four	41.34	47.60	59.08	55.47	57.39	50.64	52.70	55.96	53.36	58.64	56.56	54.34	67.90
% Second four	24.01	26.61	23.80	25.66	24.87	28.74	25.49	25.30	25.85	24.34	25.16	25.47	23.08
% First eight	65.35	74.21	82.88	81.13	82.26	79.38	78.19	81.26	79.21	82.99	81.72	79.81	90.98
First eight—													
Spondees	22	21	20	20–21	20	19	18	16	16	18	17	18	20
Dactyls	10	11	12	12–11	12	13	14	16	16	14	15	14	12
4th-foot spondees	6	7	8	7–8	8	7	6	6	6	6	6	6	7
1st-foot dactyls	4	3	4	4–5	4	5	6	6	6	6	6	6	5
Spondaic verses	8	2	1	0	1	7	7	8	5	5	0	32	30
Corrupt or bracketed	0	0	0	0	0	14	2	3	17	6	6	48	1
Total verses	412	607	480	265	745	1,117	1,174	1,094	1,287	1,457	1,286	7,415	408

TABLE 3. OVID, *Metamorphoses*

				IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	Tota
	108	110	97	104	100	78	90	115	103	80	102	79	120	120	94	1,500
ddss	86	137	94	103	79	86	107	111	96	80	105	97	137	127	116	1,561
dsds	90	90	90	94	78	64	105	97	73	82	88	72	112	103	103	1,341
sdss	32	44	28	31	27	37	43	40	29	37	32	24	47	33	37	521
ssss	9	13	9	10	10	16	12	10	13	4	9	7	7	10	15	154
ddds	69	79	67	56	68	73	79	79	69	72	61	58	77	64	81	1,052
ssds	9	15	12	15	11	14	12	13	16	15	16	10	18	12	13	201
sdds	20	27	16	17	22	23	26	23	20	21	17	14	33	14	27	320
dssd	98	99	83	110	84	84	100	96	92	77	105	63	103	80	96	1,370
ddsd	81	96	85	87	77	84	94	93	82	90	85	66	110	104	103	1,337
sdsd	29	36	23	29	15	27	40	30	35	28	27	19	40	32	38	448
dsdd	70	49	55	52	51	53	59	72	71	63	63	41	55	73	73	900
sssd	8	11	12	13	8	10	9	12	7	8	15	16	17	9	10	165
ssdd	6	12	7	11	6	9	10	5	13	11	13	12	16	4	11	146
dddd	44	35	37	51	27	43	49	53	60	61	40	35	53	50	41	679
sddd	14	19	16	17	12	16	25	16	17	10	14	11	22	14	15	238
Total	773	872	731	800	675	717	860	865	796	739	792	624	967	849	873	11,933
Most frequent	*dsss*	*ddss*	*dsss*	*dssd*	*dsss*	*ddss*	*ddss*	*dsss*	*dsss*	*ddsd*	*ddss* *dssd*	*ddss*	*ddss*	*ddss*	*ddss*	*ddss*
% First pattern	13.97	15.71	13.27	13.75	14.81	11.99	12.44	13.29	12.94	12.18	13.26	15.54	14.17	14.96	13.24	13.08
% First four	49.42	50.69	50.07	51.38	50.52	46.30	47.21	48.44	46.86	44.93	50.50	50.32	49.53	53.47	47.72	48.37
% Second four	34.15	30.05	33.10	30.75	33.04	32.50	32.21	34.34	34.30	36.94	31.44	31.57	29.79	31.45	32.99	33.25
% First eight	83.57	80.73	83.17	82.13	83.56	78.80	79.42	82.77	81.16	81.87	81.94	81.89	79.32	84.92	80.71	81.62
First eight—																
Spondees	12	15	12	12	15 or 12	12	12	12	12	12	12	12	12	12	12	12
Dactyls	20	17	20	20	17 or 20	20	20	20	20	20	20	20	20	20	20	20
4th-foot spondees	4	5	4	4	4 or 5	4	4	4	4	4	4	4	4	4	4	4
1st-foot dactyls	8	7	8	8	8 or 7	8	8	8	8	8	8	8	8	8	8	8
Spondaic verses	5	3	2	1	3	4	5	3	1	0	3	2	1	1	3	37
Bracketed or omitted	1	0	0	2	0	0	0	16	0	0	0	2	0	1	3	25
Total verses	779	875	733	803	678	721	865	884	797	739	795	628	968	851	879	11,995

TABLE 4. *Appendix Vergiliana*

	Culex	*Ciris*	*Moretum*	*Dirae* 1–103	(*Lydia*) 104–183	Total	*Aetna*
dsss	48	96	19	14	11	25	92
ddss	64	75	14	8	3	11	58
dsds	35	55	14	7	9	16	76
sdss	31	42	12	17	13	30	83
ssss	17	29	3	10	4	14	35
ddds	37	44	14	6	7	13	31
ssds	12	27	2	5	2	7	49
sdds	32	25	8	0	5	5	37
dssd	39	29	6	14	12	26	38
ddsd	30	31	3	9	2	11	29
sdsd	15	15	4	3	3	6	28
dsdd	14	9	6	2	2	4	31
sssd	8	19	4	3	1	4	18
ssdd	7	7	4	0	2	2	16
dddd	11	11	2	3	0	3	5
sddd	8	6	5	1	0	1	10
Total	408	520	120	102	76	178	636
Most frequent	*ddss*	*dsss*	*dsss*	*sdss*	*sdss*	*sdss*	*dsss*
% First pattern	15.69	18.46	15.83	16.67	17.11	16.85	14.47
% First four	46.08	51.92	50.83	53.92	59.21	54.49	48.58
% Second four	31.37	25.19	26.67	29.41	25.0	27.53	23.43
% First eight	77.45	77.12	77.50	83.33	84.21	82.02	72.01
First eight—							
Spondees	16	18	16	18	19	18	21
Dactyls	16	14	16	14	13	14	11
4th-foot spondees	6	6	6	6	6–7	6	7
1st-foot dactyls	6	6	6	6	5–6	6	4
Spondaic verses	0	15	0	0	3	3	1
Corrupt or bracketed	6	6	2	1	1	2	10
Total verses	414	541	122	103	80	183	647

TABLE 5. POST-VERGILIAN DIDACTIC POETRY

	Grattius *Cynegetica*	Germanicus Caesar *Aratea*	Germanicus Caesar Frags.	Germanicus Caesar Total	Manilius *Astronomica*	Columella *Res Rustica* x	Nemesianus *Cynegetica*
dsss	70	109	42	151	724	54	36
ddss	57	83	37	120	558	65	30
dsds	66	59	20	79	471	61	50
sdss	64	73	18	91	486	36	31
ssss	26	53	12	65	262	9	24
ddds	34	30	16	46	248	36	21
ssds	41	41	11	52	232	12	19
sdds	30	33	7	40	250	15	20
dssd	21	35	22	57	230	43	10
ddsd	21	32	17	49	159	37	17
sdsd	34	40	4	44	155	15	18
dsdd	24	34	11	45	129	24	16
sssd	20	21	3	24	72	6	7
ssdd	11	15	4	19	70	2	8
dddd	8	10	9	19	68	12	9
sddd	12	9	6	15	64	8	9
Total	539	677	239	916	4,178	435	325
Most frequent	*dsss*	*dsss*	*dsss*	*dsss*	*dsss*	*ddss*	*dsds*
% First pattern	12.99	16.10	17.57	16.48	17.33	14.94	15.38
% First four	47.68	47.86	50.63	48.14	53.59	51.26	45.23
% Second four	25.79	24.96	26.36	24.34	23.74	30.57	25.85
% First eight	73.47	72.82	76.99	72.49	77.33	81.84	71.08
First eight—							
Spondees	18	21	18	20	20	15	20
Dactyls	14	11	14	12	12	17	12
4th-foot spondees	7	6	6	6	8	5	8
1st-foot dactyls	4	4	6	5	4	7	4
Spondaic verses	0	4	1	5	5	1	0
Corrupt or bracketed	2	44	2	46	75	0	0
Total verses	541	725	242	967	4,258	436	325