A CALLIMACHEAN REFINEMENT TO THE GREEK HEXAMETER[1]

A NEW 'LAW' AND SOME OBSERVATIONS ON GREEK PROCLITICS

I should like to draw attention to a metrical phenomenon observable in the hexameters of Callimachus and propound a 'law' which so far as I know has not been remarked on before;[2] the accompanying discussion involves some refinements to our understanding of the metrical effect of proclitics of general importance to Greek metrical studies.[3] In analysing the data I have made use of some standard statistical methods which could in my view be used throughout the whole field of Greek metrical studies with great profit (to emphasize this I have presented the evidence as thoroughly as seemed possible).[4] The analysis also provides some detailed evidence useful for a comparison of Callimachus, Apollonius Rhodius, Theocritus, and Aratus, and the earlier writers by whom the Hellenistic poets were influenced.

The phenomenon is to be found in the second half of the hexameter, and for convenience, though with a certain reluctance, I shall use the notation of Hermann Fränkel,[5] with the additional sign Co for a diaeresis after the sixth element, with which I shall be particularly concerned. Thus:

[2] I discuss a practical application of this new 'law' to the restoration of a recently-discovered papyrus fragment of Callimachean elegiacs, *Antinoopolis Papyrus* 113, fr. 1 (b) on pp. 269 ff. below.

[3] Throughout this article I have used the abbreviation Maas for: P. Maas, *Greek Metre* (Oxford, 1962; translated by Hugh Lloyd-Jones).

[4] Our understanding of the Greek hexameter, for example, would certainly be fundamentally re-established, if not revolutionized, if all known examples were to be analysed on a computer according to their most important characteristics (syllable lengths, caesurae, diaereses, elisions, word-ends, sentence-ends, colon-ends etc.) and then subjected to tests for statistical association amongst any or all of these characteristics. The task would be very tedious, but simple.

[5] 'Der homerische und der kallimachische Hexameter', *Göttinger Nachrichten* (1926),

197–229, reprinted and expanded in *Wege und Formen frühgriechischen Denkens* (München, 1960), 100–56. G. S. Kirk, *Yale Classical Studies* xx (1966), 76–104 questions the validity of Fränkel's C1 caesura on the grounds that the unit from B to C1 would be 'unnaturally short'. Kirk does not indicate how long a unit must become before it can be considered to be of 'natural' length, and himself concedes (pp. 91 f.) that statistically the C1 caesura is significant. This is the important factor, for the strength of Fränkel's approach lies in its emphasis on normative behaviour: only on this basis can the *effect* of divergent phenomena be assessed. Kirk on the other hand offers explanations which concern only the *historical origins* of the phenomena discussed. (More convincing arguments for qualifying Fränkel's conclusions are given by A. M. Dale, 'Greek Metric 1936–1957', *Lustrum* ii (1957), 30–2.) Kirk also questions Fränkel's assumption that the metrical cola are potential sense-units: fortunately this question is not relevant to the present discussion, but it must be objected here that Kirk's sample from *Iliad* 16 is far too small to be of any statistical relevance, and also that in his analysis he falsely assumes that sense-structure in Greek is identical with syntactical structure.
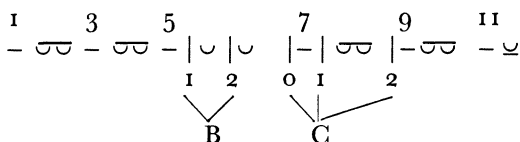
The observation which I wish to make is this:

In Callimachus a diaeresis at Co is accompanied not only by the regular 'main' caesura at B1 or B2, but also by

(a) diaeresis at C2 (the 'bucolic' diaeresis)

and (b) syntactical colon-end *either* at the B caesura, *or* at C2, *or* at both. The colon-end is almost always such that the syntactic unit comes to a quite distinct (even if temporary) close, usually with sufficient finality to require, or at any rate suggest, punctuation in modern editions. I have used the symbol 'P' for colon-end in the following discussion.[1]

Thus, e.g.:

vi. 24   οὔπω τὰν Κνιδίαν, ἔτι | Δώτιον | ἱρὸν ἔναιον
or i. 16   αὐτίκα δίζητο ῥόον | ὕδατος, | ᾧι κε τόκοιο
or fr. 77   Ἧλιν ἀνάσσεσθαι, Διὸς | οἰκίον, | ἔλλιπε Φυλεῖ

Lines such as

Il. 1. 105   Κάλχαντα πρώτιστα κάκ' | ὀσσόμενος προσέειπε
or Od. 23. 233 ὡς δ' ὅτ' ἂν ἀσπάσιος γῇ | νηχομένοισι φανήῃ

are not acceptable to Callimachean practice.

There are in Callimachus about 1,690 hexameter lines complete enough for the above observation to be tested.[2] Of these, 50 lines have diaeresis at Co:[3] all 50 have diaeresis at C2, and 48 of them have colon-end at B1/2 and/or C2. The two exceptions to (b) are instructive, not alarming:

fr. 75. 50   ἐκ δὲ γάμου κείνοιο μέγ' οὔνομα μέλλε νέεσθαι
fr. 177. 33   ἱπόν τ' ἀνδίκτην τε μάλ' εἰδότα μακρὸν ἀλέσθαι

μέγ' οὔνομα is almost a single word-unit, inasmuch as it is a noun-equivalent to μεγαλώνυμος; μάλα, which inevitably coheres closely with the following verb and is quite frequently used at this position in other Hellenistic authors where the Callimachean practice is contravened (see below, p. 267), is here little more

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[1] Also the symbols XP for 'no colon-end' (either at B or C2) and XC2 for 'no bucolic diaeresis'.

[2] This figure is accurate to within ten lines: fragmentary papyri make an exact figure impossible.

[3] This includes fr. 384. 59 where the text is lacunose: the line almost certainly contains a Co diaeresis, and although nothing certain can be ascertained about colon-end, Hunt's supplement (see Pfeiffer), even if incorrect, does show that colon-end is not impossible. I have excluded frr. 7. 27, 528. 1 since ὁ δ' is almost certainly anaphoric (see below, pp.

262 f.). Fr. 536 fails at the bucolic diaeresis, but it seems more than reasonable to assume that there was colon-end there, and I have done so. Fr. 575 is lamentably corrupt, but my observations in this article on the Co diaeresis go some way to resolving the difficulties. The diaeresis at Co almost certainly requires colon-end either before ὄφις or after αἰόλος: since ὥστ' ἐξ ὀχεῆς seems to make sense only if taken with ὄφις we should probably punctuate after αἰόλος and make ὄφις an object of comparison with the unknown subject of αὐχέν' †ἀναύχην†, rejecting Pfeiffer's suggested interpretation (i. 402–3).

than a variation for εὖ in a standard Homeric formula, so that μάλ᾽ εἰδότα too can be regarded as virtually a single word-unit (cf. A. Wifstrand, *Von Kalli-machos zu Nonnos* (Lund, 1933), 57 on i. 78). In each of the two cases where Callimachus does not follow his usual practice of colon-end, therefore, the Co diaeresis, though not to be argued away, is weak.

An analysis of metrical practice in all other important Hellenistic authors will show that Callimachus is quite distinct in avoiding a Co diaeresis without these accompanying conditions; but before giving such an analysis I must make an important digression. A constant problem in metrical studies has been caused by appositives: does such-and-such a word cohere closely enough with what follows or precedes it to exclude the possibility of a metrical break in between? The answer can often make a very significant difference to studies of caesura-patterns and word-shapes.[1] Fortunately, in Hellenistic poetry the question is not quite such an open one as in earlier poetry, since many types of words are unambiguously appositive; but there are still some categories where uncertainty is possible and where careful definition is required. With reference to the metrical phenomenon under discussion here, let me first say that the list of appositives given by H. Fränkel in the first Appendix to his article on the Greek hexameter (*Wege und Formen*, 143) seems to me to be accurate. But it is not complete: I believe it can be demonstrated that there is one further class of words which is prepositive in the hexameter. Fränkel's list of appositives is:

1. the article,
2. prepositions,
3. relative pronouns,
4. conjunctions, co-ordinative or subordinative, and conjunctive particles,
5. anaphoric pronouns,
6. negatives,
7. enclitics.

To this must be added an eighth item: preverbs in tmesis. The phenomenon to which I am referring is exemplified by:

Call. iii. 236   'Ημέρηι, οὕνεκα θυμὸν ἀπ᾽ ἄγριον εἵλεο παίδων
A.R. 2. 691   δὴ τότε οἱ κεραῶν ἐπὶ μηρία θήσομεν αἰγῶν
A.R. 3. 291   ὡς δὲ γυνὴ μαλερῶι περὶ κάρφεα χεύατο δαλῶι

To begin with Callimachus: in addition to the line quoted above there are two other examples, frr. 18. 8 and 571. 1,[2] in which a preverb in tmesis immediately precedes the seventh element, but where, if the Co diaeresis is admitted, there is no colon-end at either the B caesura or C2.[3] Are these exceptions to the usual Callimachean practice described above? To take the inquiry further we need to go to other Hellenistic writers, and in particular to Apollonius, who has

[1] Thus, for example, E. G. O'Neill, jun. in his very sizable work 'The localization of metrical word-types in the Greek hexa-meter', *Yale Classical Studies*, viii (1942), 105–78 decided that it was safer to treat all appositives as metrically independent (pp. 108 ff.), but at the same time was compelled to remark 'they constituted *quasi-units*, phrases that cohered just closely enough to *suggest* single words' (p. 110). And H. N. Porter, who followed this treatment of appositives as independent in a very impor-tant article ('The early Greek hexameter', *Yale Classical Studies*, xii (1951), 17 n. 33), nevertheless also insisted on making 'seman-tic' not 'phonetic' units the significant metrical elements (p. 37).

[2] Fr. 384. 21 may be another preverb in tmesis, but the text is very fragmentary. For the word-pattern cf. Theocr. 3. 21.

[3] In fr. 75. 62, which has a preverb in tmesis before Co with colon-end at B2, note the delayed particle which supports our treating μετ᾽ οὕνομα as a single word-unit.

a sufficient number of preverbs in tmesis at this position to provide a conclusive answer. First let us look at Apollonius' usual practice with regard to the Co diaeresis in general.

Apollonius is not as strict as Callimachus in his limitation of Co: Co is *not* always followed by a C2 diaeresis, and does *not* need to be accompanied by colon-end—in 66 per cent[1] of cases A.R.'s practice is the same as that of Callimachus. A comparison with Co preceded by preverbs in tmesis shows a strong contrast:

	Examples	XC2	(as percentage)	XP	(as percentage of Co + C2 total)
Co without preverbs	203	8	4	62	32
Co preceded by preverbs[2]	30	2	7	19	68

Only 9 (30 per cent) of the examples of Co preceded by a preverb in tmesis follow the Callimachean practice; non-Callimachean practice is twice as frequent. Thus preverbs in tmesis before a Co diaeresis seem to be such that restrictions which are otherwise totally applicable (as with Callimachus), or largely applicable (as with A.R.) are no longer effective.[3] This is confirmed by a simple χ^2 significance test on A.R.:[4] a test on C2/XC2 and P/XP figures, in both cases comparing normal Co situations with Co when preceded by preverbs in tmesis, is significant at the 1 per cent level, and we should therefore assume that preverbs in tmesis belong to a different class from the other examples of Co in A.R.

Preverbs in tmesis are on the whole a feature of epic poetry: they are found scarcely at all in the other authors covered in this survey (never in this position, for example, in Theocritus, Moschus, or Bion), and certainly not frequently enough to allow any reliable statistical conclusion, but what little evidence there is could point in the same direction. Aratus offers two examples, of which v. 910 has XC2, v. 967 has XP; Nicander also offers only two examples,

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[1] Percentages have been rounded off to the nearest 1 per cent throughout this article.

[2] The number of examples includes 4. 1312 περὶ δ' ὀξύταται θέρον αὐγαί, where περί, though an adverb, has the same status as a preverb and as such is probably responsible for the metrical abnormality (XC2) of ὀξύταται (see the conclusion above).

[3] In Callimachus elision may play a part in weakening the CO diaeresis: both the three examples cited above of preverbs in tmesis + XP and the other examples accompanied by the usual restrictions (see below, p. 265, n. 2) have elision (either of the preverb or of a following particle) at the diaeresis. However, the number of examples is too small to draw any firm conclusion, and in A.R., of the 21 examples where a Co diaeresis is weakened by a preceding preverb in tmesis, only 6 have elision. In the other Hellenistic authors dealt with below the number of examples is again too small for

significant conclusions, but Arat. 967 does not have elision, the other 5 examples do.

[4] Throughout this article I have made great use of the χ^2 test for independent samples. This tests the hypothesis that any difference in frequency of occurrences of the phenomenon under investigation in two samples can be attributed entirely to random effects without the need to assume an underlying difference. The result, the 'level of significance', gives the probability of mistakenly or falsely rejecting this hypothesis of no difference. If the level of significance is 5 per cent or less, this means that the chance of such discrepancies between the observations arising from random effects is at most 1/20, and we then reject the hypothesis and may consider the two samples to belong to different classes. If the level of significance is more than 5 per cent it will not cause us to reject the hypothesis, and on this evidence we may group the two samples together.

Ther. 225 having XC2, *Alex.* 526 having XP. Only [Theocr.] 25. 146 and [Moschus] 4. 108 have preverbs in tmesis before Co which are accompanied by the two Callimachean restrictions. Preverbs in tmesis are omitted in the figures given below, but I have appended a full list of those passages affected.

Two further points need to be made. First, Fränkel included in his list of appositives anaphoric pronouns.[1] So far as I know, he was the first to suggest that anaphoric pronouns might be prepositive, and since he did not himself present any evidence[2] it may be helpful if I state that research for this discussion completely confirms his suggestion. The evidence is very simple, since it concerns only the C2 diaeresis.[3] First, in Callimachus there are three examples of anaphoric pronouns before an apparent Co diaeresis where Callimachus' normal practice of conjoining a C2 diaeresis is ignored. E.g. iii. 169,

$$\pi\acute{\alpha}\nu\tau\epsilon\varsigma \; \acute{o}\mu\hat{\omega}\varsigma \; \kappa\alpha\lambda\acute{\epsilon}o\upsilon\sigma\iota\cdot \; \sigma\grave{\upsilon} \; \delta' \; \mathring{A}\pi\acute{o}\lambda\lambda\omega\nu\iota \; \pi\alpha\rho\acute{\iota}\zeta\epsilon\iota\varsigma,$$

and similarly iv. 35,[4] 215.[5] Clearly the Co diaeresis is not effective, unless these three passages are to form a uniquely coherent group of exceptions. So in other Hellenistic authors anaphoric pronouns give rise to quite exceptional behaviour. In A.R. there are 52 examples of anaphoric pronouns before the Co diaeresis: of these 17 have XC2 (33 per cent), whereas otherwise in A.R. only 4 per cent have XC2. Similarly, in Aratus the frequency of XC2 where Co is preceded by an anaphoric pronoun is 25 per cent as compared with 7 per cent otherwise, in Theocritus 27 per cent as compared with 8 per cent, in Nicander 57 per cent as compared with 12 per cent. χ^2 testing on those figures which are large enough indicates in each case that anaphoric pronouns may be assumed to form a separate class.[6] I have therefore considered all anaphoric pronouns

[1] For a definition of which see E. Schwyzer, *Griech. Gramm.* ii. 24 f.

[2] Indeed, Fränkel's remark on p. 147 n. 1 leaves very ambiguous the question whether the third person $\acute{o} \; \delta\acute{\epsilon}$, $\mathring{\eta} \; \delta\acute{\epsilon}$, etc. are to be considered as prepositives; in relation to the Co diaeresis at any rate, it is clear that these are no different from the other first- and second-person anaphoric pronouns.

[3] Naturally, since $\acute{o} \; \delta\acute{\epsilon}$, etc. inevitably involve a preceding colon-end. There are only three passages in the material covered by this article where a pronoun with no connecting particle might be considered anaphoric: Theocr. 1. 59, 131, neither of which exhibits colon-end, and A.R. 4. 499, which has colon-end at C2. Whereas the Theocritean passages involve the use of $\tau\acute{\upsilon}$ to strengthen an imperative, the example in A.R. contains a substantive article, without supporting particle, $\tau o\grave{\upsilon}\varsigma \; \pi\epsilon\acute{\iota}\sigma\epsilon\mu\epsilon\nu$ (this is rare outside Homer, who does not use $\tau o\acute{\upsilon}\varsigma$ so, but cf. *Il.* 4. 53 $\tau\grave{\alpha}\varsigma \; \delta\iota\alpha\pi\acute{\epsilon}\rho\sigma\alpha\iota$: see B. L. Gildersleeve, *Syntax of Classical Greek*, § 528; Schwyzer, *Griech. Gramm.* ii. 20 f.). $\tau o\acute{\upsilon}\varsigma$ here may be prepositive since it is deictic, just as is the anaphoric article.

[4] Although it is not in any way incorrect to regard the $\sigma\acute{\epsilon}$ here as anaphoric to v. 29, prepared by $\tau\grave{\alpha}\varsigma \; \mu\acute{\epsilon}\nu$ in v. 34, even so the XCo could also be explained as due to the $o\mathring{\upsilon}\kappa$ being retrospective and cohering with $\sigma\acute{\epsilon}$, not $\check{\epsilon}\theta\lambda\iota\psi\epsilon\nu$.

[5] This line illustrates a further important metrical point: as Fränkel, 145 n. 2, pointed out, no break is possible after $\check{\alpha}\rho'$ because of Hermann's Bridge, and $o\mathring{\upsilon}\kappa$-$\check{\alpha}\rho'$-$\check{\epsilon}\mu\epsilon\lambda\lambda\epsilon\varsigma$ must form a single word-unit. Usually an enclitic cannot absorb the force of a preceding prepositive, but can act only as a bridge. Thus the $\check{\alpha}\rho'$, which as a conjunctive particle is enclitic, does not absorb the preclitic force of $o\mathring{\upsilon}\kappa$ which must be passed on to $\check{\epsilon}\mu\epsilon\lambda\lambda\epsilon\varsigma$. The point is strikingly made with iii. 7 $\kappa\alpha\grave{\iota}$ $\pi o\lambda\upsilon\omega\nu\upsilon\mu\acute{\iota}\eta\nu$ $\mathring{\iota}\nu\alpha$ $\mu\acute{\eta}$ $\mu o\iota$ $\Phi o\hat{\iota}\beta o\varsigma$ $\acute{\epsilon}\rho\acute{\iota}\zeta\eta\iota$: a diaeresis after $\mu o\iota$, a monosyllabic eighth element, would be a unique example of a practice which Callimachus conspicuously avoids (Maas, § 92): however, $\mu o\iota$ is an enclitic, and as such does not absorb the preceding $\mu\acute{\eta}$, and so $\mu\acute{\eta}$-$\mu o\iota$-$\Phi o\hat{\iota}\beta o\varsigma$ must form a single word-unit for metrical purposes (which, let it be said, usually reflect sense-structure in examples of this sort: $\mu\acute{\eta}$ qualifies $\Phi o\hat{\iota}\beta o\varsigma$ not $\mu o\iota$).

[6] The test is significant in A.R. at the 0·1 per cent level, in Theocritus at the 5 per cent level, in Nicander at the 2 per cent level.

prepositive, but since there can occasionally be some doubt as to whether a pronoun is anaphoric or not[1] I have appended to the statistics below a list of all passages excluded because of an anaphoric pronoun, indubitable or ambiguous.

Lastly, there is one further small class of cases to be considered. i. 75 reads:

$$\ddot{\omega}\nu\ \dot{\epsilon}\rho\dot{\epsilon}\tau\eta s,\ \ddot{\omega}\nu\ \pi\acute{a}\nu\tau a\cdot\ \tau\acute{\iota}\ \delta'\ o\dot{\upsilon}\ \kappa\rho\alpha\tau\acute{\epsilon}o\nu\tau os\ \dot{\upsilon}\pi'\ \dot{\iota}\sigma\chi\acute{\upsilon}\nu;$$

If this line has a Co diaeresis it is the sole exception to Callimachus' practice of always supporting a Co diaeresis with a C2 diaeresis. It may be sufficient to regard the negative as enclitic (it modifies τί, not κρατέοντος), but it is also possible that τίς/τί is to be regarded as prepositive. The evidence is inconclusive, for there are few passages outside Callimachus where a possible Co is preceded by τίς/τί: A.R. 4. 379, Theocr. 1. 78, 82, 3. 6, 4. 1, 5. 6, 15. 89, 16. 13, 17. 116, [Theocr.] 8. 17, 23. 4, 27. 49, 52, Mosch. 2. 135, 139, Bion 1. 39. Of these 16 passages 3 have XC2 (Theocr. 15. 89, 16. 13, Bion 1. 39): for Theocritus the frequency of XC2 is higher than otherwise (25 per cent as compared with 8 per cent), as it is with the other bucolics (16 per cent compared with 8 per cent). The indications are that τίς/τί is prepositive, but the sample is too small to be statistically significant.[2] For the sake of consistency I have omitted from the figures below examples of Co preceded by τίς/τί:[3] the actual difference to the results whether they are included or not is negligible.

The following table gives the statistical information necessary for a study of the Co diaeresis in Greek hexameter poetry down to the end of the Hellenistic period. The first ten lines give information for those parts of 'Homer' and 'Hesiod' of which enough remains to permit statistical analysis. All figures except those for the *Iliad* and *Odyssey* are based on a complete survey of the material. Previous analyses of caesurae and diaereses have restricted themselves to samples, usually of 1,000 lines, when surveying Homer, Callimachus, and Apollonius Rhodius: this is a very hazardous thing to do, since there is no *a priori* reason why a metrical phenomenon should be evenly represented, even within a fairly large number of lines. Such caution is particularly necessary with the Co diaeresis: it is not very common, and when it does occur it has a strong tendency to appear in clusters[4]—unusual rhythms are often self-suggestive. The first 1,000 lines of Apollonius produce results very different from the second 1,000 lines (the difference is to the extent of almost 100 per cent). Similarly in Homer any one book of the *Iliad* or *Odyssey* may give results very different from another,[5] and to provide an adequate sample I have used

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[1] Indeed it is of course a common epic device to place an article in an anaphoric position even though the article turns out to be definitive (cf. A. Svensson, *Gebrauch des bestimmten Artikels* (Lund, 1937), Exkurs II, pp. 141–52 who touches on this point): the momentary ambiguity serves to heighten interest. e.g. A.R. 3. 270 Χαλκιόπης ἀίουσα. τὸ δ' αὐτίκα πᾶν ὁμάδοιο / ἕρκος; so A.R. 3. 1169, 1361, 4. 454, 1446, Aratus 255, 309, 411, Mosch. 2. 122, also Call. i. 27 (on which see Svensson, op. cit. 59–60), iv. 77, though as an epic device it is very rare in Callimachus (fr. 523 looks like another Callimachean example).

[2] Only 4 of these 16 passages (none of them those with XC2) involve elision, which is therefore probably not to be considered as a possible influential factor (cf. above p. 261 n. 3).

[3] The Callimachean passages omitted, in addition to the exception noted above, are: frr. 262, 682, ii. 31, iv. 212, E. 1. 5, E. 42. 5. All have C2 diaeresis and usual colon-end.

[4] e.g. the sequence of Co examples in Theocr. 1 runs: 11, 12; 40; 62, 67; 78, 82, 83, 86; 102, 103.

[5] G. S. Kirk, *Yale Class. Stud.* xx (1966), 76 n. 2, defends the 1,000-line sample usually used: 'Homeric colometry is remarkably

Work	1 L Lines	2 A Co	3 B $Co+C_2$	4 C $Co+XC_2$	5 D $Co+C_2+XP$	6 A/L	7 C/A	8 D/B
						expressed as percentages		
1. Iliad	3,081	130	124	6	49	4·2 (3·6–5)	4·6 (2–9)	39·5 (31–48)
2. Odyssey	3,104	118	101	17	34	3·8 (3·2–4·5)	14·4 (9–21)	33·7 (25–43)
3. Theogony	1,022	27	21	6	13	2·6 (1·7–3·8)	22·2 (9–39)	61·9 (41–80)
4. Works	828	35	28	7	5	4·2 (2·9–5·8)	20·0 (9–35)	17·9 (6–34)
5. Shield	480	20	19	1	5	4·2 (2·5–6·2)	5·0 (0–19)	52·6 (31–74)
6. Fragments of Hesiod	750	27	21	6	10	3·6 (2·4–5·1)	22·2 (9–39)	66·7 (45–85)
7. H.H.Dem.	486	10	9	1	14	2·1 (1–3·5)	10·0 (0–35)	44·4 (15–76)
8. H.H.Ap.	547	22	21	1	4	4·0 (2·5–5·9)	4·5 (0–17)	42·9 (23–64)
9. H.H.Herm.	580	9	7	2	9	1·6 (0·7–2·7)	22·2 (3–53)	57·1 (22–89)
10. H.H. Aphr. I	293	16	14	2	7	5·5 (3–8·6)	12·5 (1–32)	50·0 (25–75)
11. Callimachus	1,690	50	50	0	2	3·0 (2·2–3·9)	0 (0–2)	4·0 (1–11)
12. Aratus	1,154	43	40	3	14	3·7 (2·7–5)	7·0 (1–16)	35·0 (21–50)
13. A.R.	5,835	203	195	8	62	3·5 (3–4)	3·9 (2–7)	31·8 (25–38)
14. Theocr.	1,963	75	69	6	12	3·8 (3–4·8)	8·0 (3–15)	17·4 (9–27)
15. [Theocr.]	652	28	25	3	11	4·3 (2·9–6·1)	10·7 (2–25)	44·0 (26–63)
16. Mosch.	196	9	9	0	4	4·6 (2·1–8·1)	0 (0–10)	44·4 (15–76)
17. [Mosch.]	251	4	4	0	1	1·6 (0·4–3·5)	0 (0–22)	25·0 (0–72)
18. Bion	213	8	7	1	3	3·8 (1·6–6·8)	0 (0–42)	42·9 (11–78)
19. [Bion]	31	0	0	0	0	0 (0–3)	—	—
20. Nicander	1,588	25	22	3	1	1·6 (1–2·3)	12·0 (3–27)	4·5 (0–17)
21. 'Other bucolics' (15+16+17 +18+19)	1,343	49	45	4	19	3·6 (2·7–4·7)	8·2 (2–17)	42·2 (28–57)

See *Notes to Table* on the next page.

books 4, 5, 16, 17 of the *Iliad* (3,081 lines), and books 5, 6, 13, 14, 21, 22, 23 of the *Odyssey* (3,104 lines).[1] I have analysed only those Homeric Hymns which are long enough to provide an adequate sample, and I have kept Theocritus separate from pseudo-Theocritus.

Columns 1–5 contain the data used, columns 6–8 the results of tests upon which are based the 'law' stated at the beginning of this article and the more specific observations made in the following pages. Column 6 shows the frequency of occurrence of the Co diaeresis, column 7 the frequency of variance with the Callimachean practice of always accompanying a Co diaeresis with a bucolic diaeresis, column 8 the frequency with which the Co diaeresis fails to be

consistent.' This is simply untrue: individual books may differ to the extent of 200 per cent. Also, as can be seen here, the *Iliad* and *Odyssey* are very different from one another.

[1] The Homeric poems are so large that sampling is inevitable; however, I have taken samples much larger than those normally used, and the results should be that

much more reliable. The sample sizes were chosen by taking one book and analysing the data, adding a second book and re-analysing the data, etc., and adopting a sample several books larger than the point at which the series of accumulative data showed definite consistency.

Notes to Table

1. I have excluded from this list epigrammatists of the *Greek Anthology*, since only three authors offer anywhere near enough material to provide a fairly stable sample (though they offer too little information for analysis by statistical testing): Dioscorides, Antipater of Sidon, and Meleager. The figures are not very interesting:

	1	2	3	4	5
Diosc.	256	5	5	0	1
Antip.	308	10	10	0	3
Mel.	412	18	15	3	1

The figures for Leonidas of Tarentum, however, are surprising. Gow and Page (*The Greek Anthology: Hellenistic Epigrams*) divide those epigrams which they consider to be by him into two sections: those headed Λεωνίδου Ταραντίνου in the MSS. of the Anthology (i–xxxiii), and those whose heading has no ethnic (xxxiv–xcii). Of the authorship of the latter they are quite confident: 'it may safely be said that in the great majority of cases the latter class is as certainly the Tarentine's as the former' (vol. ii, p. 309). Yet the figures for the two classes, such as they are, are very different:

	1	2	3	4	5
Leon. Tar.	204	1	1	0	0
Leon.	216	6	6	0	2

2. Excluded from the figures are: (a) preverbs in tmesis—Call. frr. 18. 8, 75. 62, 384. 21(?), 571. 1; iii. 174, 236; iv. 209; Arat. 910, 967; A.R. 1. 755; 2. 201, 232, 381, 536, 691, 699, 1043; 3. 157, 261, 291, 295, 879, 959, 1068, 1268; 4. 34, 316, 331, 367, 685, 1208, 1272, 1283, 1312(?), 1327, 1352, 1425, 1596, 1779; [Theocr.] 25. 146; [Mosch.] 4. 108; Nic. *Ther.* 225, *Al.* 526. (b) anaphoric pronouns—Call. fr. 7. 27(?); i. 9; ii. 61(?), 104; iii. 77; iv. 13, 170, 255; v. 55; vi. 82, 89; Arat. 83, 346, 571, 903; A.R. 1. 320, 343, 386(?), 764, 790, 1329(?), 1347; 2. 19, 27, 40(?), 92, 97, 466, 559, 561(?), 633(?); 771, 824, 932, 983, 1013, 1036, 1196, 1236; 3. 122(?), 127, 142, 284, 442, 661, 805, 823, 1008, 1289, 1304, 1308; 4. 106, 163, 219(?), 410, 499(?), 539, 595, 691, 911, 952, 1014, 1342, 1493, 1522, 1586, 1602, 1714; Theocr. 1. 35; 2. 59, 131; 13. 47, 70; 15. 128; 17. 53, 71; 22. 88, 113, 167, 183, 203; 24. 12, 56, 72; [Theocr.] 9. 1, 27; 19. 3; Mosch. 2. 17(?); [Mosch.] 4. 16; Bion 10. 9; Nic. *Ther.* 106, 354, 387, 412; *Al.* 169, 193, 379. I have also omitted Theocr. 3. 21 (see Gow ad loc.) and 5. 142, 15. 53 in which I assume ἴδ' ὡς to be a single word-unit. I have omitted [Mosch.] 3. 118, since it is arguable that there is no break between καί and εἰ.

3. For the fragments of Hesiod I have used the edition of Merkelbach and West; the number of lines available for analysis at B and C is of course approximate, for as with Callimachus the text is unknown or uncertain in many parts of the papyri.

accompanied also by colon-end at the B caesura or at C2. The numbers in brackets in each of these columns are most important: they indicate the confidence limits of each result. In themselves the simple results are inadequate for purposes of comparison, which must consider the *range* of possible frequencies of which this particular frequency is typical (thus taking into account, e.g., the other works by the same author which have now been lost: one would expect new papyri of previously lost works to show frequencies which fall within the range defined by the confidence limits). For example, two results of 8 per cent and 10 per cent might appear at first glance to be closely comparable: however, their confidence limits might show that whereas the first frequency is typical of the range 7·5–9 per cent, the second is typical of 9–12 per cent. The confidence limits are calculated on how much evidence is available, and the more evidence there is the smaller will be the range defined by the confidence limits. The confidence limits shown in the table have been calculated by means of the Fisher Transform[1] and are taken at the 5 per cent level.

Detailed observations

(a) The Co diaeresis (column 6)

The occurrence of the Co diaeresis is almost entirely uniform in all the authors surveyed here. The only deviations worth noting are *H.H.Hermes*, [Moschus,] and Nicander, all of whom show deviations in other ways too (see below). However the deviation here is too slight to be regarded as of much importance in itself.

(b) The bucolic diaeresis (column 7)

A graphical representation of $C^{\frac{1}{2}}$ against $(A–C)^{\frac{1}{2}}$ related to the Fisher Transform[2] gives some evidence that the pre-Hellenistic authors are freer as a group in their use of XC2 than the Hellenistic authors, although the *Iliad*, *Shield*, and *H.H.Ap.* are closer than the other works to Hellenistic practice.[3]

Callimachus, Moschus, and [Moschus] are alone in always following a Co by a C2 diaeresis. Of the other Hellenistic authors, all of whom show a close coherence, Apollonius departs least from Callimachean practice and stands nearest to the *Iliad* amongst the ancient authors. Even though the Hellenistic authors do not differ radically from the earlier authors in the frequency with which they exhibit XC2 after Co, they do nevertheless differ in another much more important respect. XC2 occurs only under certain very limited conditions: there is no doubt that it has become a licence much more strictly avoided than before. Thus the three examples in Aratus (vv. 144, 239, 587) all exhibit stylistic anaphora or antithesis, as, e.g., v. 587,

ἀλλ' εὖ μὲν ζώνηι, εὖ δ' ἀμφοτέροισι φαεινός.

So do all three examples in [Theocr.], 8. 14, 70; 25. 49 (8. 70, 25. 49 τὸ μέν . . .

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[1] See R. A. Fisher and F. Yates, *Statistical tables for biological, agricultural and medical research* (London and Edinburgh, 1948[3]), Table XII on p. 56.

[2] See Fisher and Yates, op. cit. 13 ('Other Transformations') and Table XII on p. 56.

[3] The most surprising feature among the early works is that the *Iliad* and *Odyssey* are completely at variance: the confidence limits do not even overlap, being 2–9 per cent for the *Iliad* and 9–21 per cent for the *Odyssey*. Cf. E. G. O'Neill, jun., 'The localization etc.', *Yale Class. Studies*, viii (1942), 130–1: 'The *Odyssey* varies notably from the *Iliad*, and this variation is usually in the direction of a majority of the Alexandrians. This is true of Hesiod also, but less consistently and less markedly.'

τὸ δέ . . ., 8. 14 ἐγώ . . . τὺ δέ . . .). Similarly one of Nicander's three examples of XC2, *Al.* 111,

$$\text{ὄφρα τὰ μέν τ' ἐρύγῃσι τὰ δ' ἑψητοῖσι δαμασθείς.}$$

Stylistic anaphora and antithesis are features which often allow relaxation of usual metrical restrictions: cf. H. Hescher, *Metrische Untersuchungen am epischen Hexameter der Alexandriner* (Giessen, 1914), 9, 34, 39. Wifstrand, *Von. Kall. zu Nonn.* 23, 57, 58–9, 60–1, Keydell, *Prolegomena* to *Nonni . . . Dionysiaca*, 39, Theaetetus in Diog. Laert. 8. 48 (Gow and Page, *Hellenistic Epigrams*, i. 3368).[1]

Apollonius has eight examples of XC2 after Co, a frequency, as mentioned above, very similar to that in the *Iliad*; however, in A.R. every case has a limiting condition—the Co diaeresis is preceded by an adverb, which, cohering by nature closely to other elements in the sentence, inevitably weakens the break. Thus μάλ'/ 1. 1361, 2. 894, 3. 624; τότε/ 2. 577; εὖ/ 3. 1034; ἔτ' (ἔθ')/ 3. 1382, 4. 1039, 1683. So too the other two examples in Nicander of XC2 (*Al.* 453, 516: see above) have τότ' immediately before Co. And Bion 10. 1 reads ἔθ' ὑπνώοντι.

In Theocritus, half of the examples of XC2 occur in the colloquial first section of *Idyll* 15 (vv. 18, 66, 76), none in the bucolic poems.[2]

Thus only Theocritus in his non-bucolic poetry amongst the Hellenistic authors surveyed here does not restrict XC2 after Co to certain conditions, and in Theocritus unrestricted XC2 clearly has one particular effect (see n. 2). From all the others such lines as *Il.* 14. 206,

$$\text{ἤδη γὰρ δηρὸν χρόνον ἀλλήλων ἀπέχονται,}$$

which are common enough in Homer, are completely absent.

(c) Colon-end at B and/or C2 (column 8)

Again a graphical representation of D$^{\frac{1}{2}}$ against (B–D)$^{\frac{1}{2}}$ related to the Fisher Transform provides slight evidence that pre-Hellenistic and Hellenistic authors separate into two groups; the *Works and Days* is unique in standing with the Hellenistic group. The figures are much more suitable for χ^2 testing than were the XC2 figures, and some of the results are interesting. Among the earlier works the *Iliad* and *Odyssey* may be regarded as belonging to the same class, which also includes the four *Homeric Hymns*: here it is reasonable to talk of 'Homer', as it was not with the bucolic diaeresis. 'Homer' and 'Hesiod' (*Theogony*+Fragments, excluding the *Works and Days*, whose figures are very different), however, are very different from one another,[3] and of the earlier authors 'Hesiod' seems furthest from Callimachean practice.

Among Hellenistic authors Callimachus is followed only by Nicander in regularly accompanying Co with colon-end. χ^2 testing suggests that the other Hellenistic authors divide into two classes. A.R., Aratus, and the 'other bucolics' are all very similar to one another; and not only do they form a coherent group, but also they can be classed with 'Homer'. Theocritus, on

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[1] Mr. Thomas Gelzer informs me that in Musaeus also many apparent deviations from usual metrical practice are the result of anaphora and antithesis. See also below, p. 268 n. 2.

[2] Two occur in *Id.* 17, where the XC2 can easily be represented as reinforcing the sentiment of the word which bridges C2 (vv. 44, 56); in the sixth case, 22. 82, the XC2 has

no obvious relation to the sense. As regards the first section of *Id.* 15 Mr. Parsons has kindly drawn my attention to 'another deliberate oddity' in this part of the poem in the unusual avoidance of the Bucolic Bridge: this too was no doubt aimed at producing a rough colloquial effect (v. Maas, p. 94).

[3] χ^2 is significant at the 0·1 per cent level.

the other hand, is different. As often in non-metrical features too, he alone
inclines markedly towards Callimachean practice. On χ^2 testing he is not to
be associated with A.R. or Aratus, and especially not with the 'other bucolics'
or 'Homer'.[1] Here is further illustration that Callimachus' attempt to break
away from the epic tradition found sympathy most with Theocritus amongst
the surviving Hellenistic poets.

There is one simple additional point to be made: the Hellenistic poets,
unlike 'Homer' and 'Hesiod', when they do not follow Callimachus' practice of
colon-end, often have a weak Co diaeresis. There is often a close syntactical
relationship which has a bridge effect, as in, e.g., A.R. 1. 1100,

καί οἱ, ὅτ' ἐξ ὀρέων **μέγαν οὐρανόν** εἰσαναβαίνῃι,

or Aratus v. 135,

ἧχί περ ἐννυχίη **ἔτι φαίνεται** ἀνθρώποισι.

This is so in about 60 per cent of those cases where Co is not accompanied by
colon-end.[2]

The restrictions which arose around the Co diaeresis were part of a general
development; none of the Hellenistic writers is as completely free in its use
as the earlier poets. However, what was negative general tendency was posi-
tively defined in a very precise if not mannered way[3] by Callimachus, as so
often. The reason for the restrictions seem obvious: to Callimachean practice
a break at Co, immediately after a break at B, fragments the rhythm of the
second half of the hexameter, whereas a further break at C2 and in particular
colon-end (and hence a major pause) at one or both of the main breaks on
either side of Co immediately draws attention away from the Co diaeresis and
hence greatly reduces its force.[4] In short, a further detail can be added to the
list of metrical refinements (Maas, 61 ff.) made or represented by Callimachus
and other writers influenced by him to the hexameter, and we now have
a further criterion by which to test anonymous lines with a possible claim to
Callimachean authorship.

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[1] With both χ^2 is significant at the 1 per
cent level.

[2] It is worth pointing out that Theocritus
stands even closer to Callimachus than
appears at first sight. 12 examples are to be
found of Co+XP, of which only *one* (16. 58)
has no exceptionally close relationship
bridging the diaeresis; of the others seven
(1. 40, 102, 2. 161, 6. 4, 33, 7. 85, 22. 201)
bridge Co with Adjective+Noun, e.g. 1. 40
μέγα δίκτυον, 2 (2. 137, 6. 39) with a forward-
looking adverb immediately before Co, 1
(1. 103) with Predicate+Verb. 26. 2 has
anaphoric repetition (see above, p. 267):

τρεῖς θιάσως ἐς ὅρος τρεῖς ἄγαγον αὖται
ἐοῖσαι.

[3] Mannered only in so far as studied
formulation in Callimachus sometimes makes
for excessive elaboration; the extra restric-
tions certainly do not stifle the rhythm of
Callimachus' poetry as they do in, e.g.,
Nicander. For example, Nicander's use of

colon-end with Co betrays a degree of
rhythmic monotony not found in Calli-
machus. Thus:

Ther. 247   ἀμφὶ καὶ εἰλίγγοις δέμας ἄχθεται
                αἶψα δὲ γυίοις

Ther. 249   ἐν δὲ κάρηι σκοτόεν βάρος ἵσταται
                αὐτὰρ ὁ κάμνων

Ther. 443   πίονα δ' ἐν σκυνίοισιν ὑπ' ὄθματα,
                νέρθε δὲ πώγων

Al. 108   καί τε σύ γ' ἢ καρύης ἄπο δάκρυον
            ἢ ἀταλύμνου

Al. 374   καὶ χλοεραὶ μίνθης ἄπο φυλλάδες
            ἠὲ μελίσσης

Ther. 164   ἀλλ' ὅταν ἢ δοῦπον νέον οὔασιν ἠέ
               τιν' αὐγήν

[4] Cf. a similar method of explanation for
certain metrical characteristics in Quintus
Smyrnaeus, Callimachus, and Nonnus in A.
Wifstrand, *Von Kall. zu Nonn.* 37–9, 39 ff.,
48 ff., 52 f.