

THE DILEMMA OF THE HORNS - AN ANALYSIS OF THE KNOSSOS Mc TABLETS¹

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In the first flush of enthusiasm after the decipherment of Linear B in 1952, the emphasis was, quite naturally, on the interpretation of vocabulary words appearing on the tablets; hand in hand with this went the discussion of the relationship of Mycenaean Greek to the Greek dialects of the historical period. In these respects, much progress was made and much valuable work done. I feel, however, that the field of vocabulary words has been exploited almost to its limits; the most obvious identifications were made almost immediately after the decipherment, and words which then defied interpretation, will probably continue to do so. Some of these have given rise to a number of unlikely, not to say fantastic, interpretations, as a glance at the vocabulary index of the latest volumes of *Studies in Mycenaean Inscriptions and Dialect* will show. Until the new tablets found at Thebes are published, or substantial new finds of tablets are made, not much further progress in this field can be expected.

But a fruitful new field of interpretation of the Mycenaean texts has been opened up through the analysis of different 'hands' on the tablets, carried out mainly by E. L. Bennett² and J.-P. Olivier.³ Greater precision in the classification of Mycenaean texts has been made possible, and tablets can now be grouped together in 'sets', not only by their subject-matter, but also according to their 'hand'. Valuable studies of sets of tablets have already been made. I think amongst others of the study by M. Lejeune entitled 'Les Forgerons de Pylos',⁴ and of the valuable work done by J. T. Killen on the sheep, wool and textile tablets at Knossos.⁵ In such studies the emphasis no longer falls on individual words, or even on individual tablets, but on a set of tablets as a whole. Since the tablets are records of palace administration, comprising such things as rations given to individuals, and commodities

1. This article is the revised form of a paper read at the 9th Biennial Conference of the Classical Association of South Africa at Cape Town in January 1971. Amongst others, the following abbreviations have been used:

KN = Knossos; PY = Pylos; MY = Mycenae; *Docs.* = *Documents in Mycenaean Greek*, by M. Ventris and J. Chadwick, Cambridge 1956; *KT*⁴ = *The Knossos Tablets*, 4th edition (in course of publication).

2. E. L. Bennett, *Ath.* 46 (Atti del 2° Colloquio Internazionale di Studi minoico-micenei, Pavia 1958), pp. 328-333.

3. J.-P. Olivier, *Les Scribes de Cnossos*, Rome 1967.

4. *Historia* 10 (1961), pp. 409-434.

5. E.g. *Hermathena* 96 (1962), pp. 38-72; *Annual of the B.S.A.* 59 (1964), pp. 1-15.

owed to the palace authorities, it is evident that the numerals on the tablets are of the greatest importance. Unfortunately tablets are not always complete, and the numerals, which frequently come at the end of a tablet, have sometimes been broken off, but where numerals are present, they often provide a key to the meaning of a tablet or a set of tablets, and their importance can hardly be overrated.

The purpose of the present study is to analyse one such set of tablets, the Knossos Mc-series. It is a small set, consisting of 23 tablets only, some of them in a very fragmentary state. The latest available text of the tablets follows:⁶

Mc 1508 + 1528 + 1564

.A *150 16 CAP^f 10 [

.B da-*22-ti-jo CORN 12 *142 M 6[

v. ovis^f 50 o o-pi CORN [

Note: In v., poss. not CORN but a new ideogram.

Mc 4453 + 5798

.A]ja-*18 *150 24 [] CAP^f 17

.B] *142 M 12 CORN 24

Mc 4454 + 4458

.A da-wa-no *150 29 CAP^f 16

.B u-qa-mo/ da 150 1 *142 M 13 CORN 26

Mc 4455

.A] a-pa-sa-ki-jo *150 28 CAP^f 17

.B] ku-ta-to/ *142 M 12 CORN 24

Mc 4456 + 4477

.A] si-nu-mo-ro *150 16 CAP^f 10 [

.B] da- *22-to/ *142 M 7 CORN 14 [

Mc 4457 + 5098 + 8264

.1 to-sa *150 345 CAP^f 208 [

.2 ke[] *142 L 5 M 4 CORN 345[

Mc 4459 + 5786

.A] a-ko-ro-ta *150 23 CAP^f 15 [

.B ku-] ta-to / qe-wa-ra *142 M 10 CORN 20[

6. The text is taken from the MS of *KT*⁴ to which I had access, by kind permission of Drs. Chadwick and Killen, when I was in Cambridge recently; the final text of *KT*⁴ may well be changed in a few minor points.

Mc 4460

- .A] a-wa-so *150 14 CAP^f 7[
- .B]so/ *142 M 6 CORN 12[

Mc 4461 + 5781

- .A] *150[
- .B] ja-qo / da-wa-no / *142[

v. 160[

Mc 4462 + 5792 + 5808 + 5816

- .A] 'ra-wo-qo-no' *150 61 CAP^f 30
- .B ti-]ri-to / a-re *150 1 *142 M 26 CORN 52[

Mc 4463

- .A] a-pa-u-ro [] *150 10[
- .B]jo *142 M 5 CORN[

Mc 4464 + fr. + 8305 + 8615

- .A]te-ru-ro *150 12 CAP^f[
- .B se-to-i[-]ja *142 M 5[

Mc 5107 + 5123 + 5693

*150 354 CAP^f 200[

Mc 5118

- .A] CAP^f 15 [
- .B] CORN 20 [

Mc 5187

- .A]5 o *150 17 [
 - .B] CAP^f 8 *142 M 20 [
- (.B: perh. 1 at left)

Mc 5809 + 8703 + fr.

- .A] CAP^f 16[
- .B] CORN 26[

Mc 5818

- .A] te[] *150 15[
- .B] M 3[

Mc 5820

]ri-na-jo[

Mc 8447 + fr.

- .A] CAP^f 10
- .B] 10 [] vacat

Mc 8448 + fr.

.A]14

.B]10 CORN [

Mc 8452 + fr.

.A] e-[· ·] -da [

.B] i / [

Mc 8705

.o *sup. mut.*

.1]10

Mc 8708 + fr.

sup. mut.

] 6 [

All the tablets are in Hand 132, though there is some doubt about 1508 and 5187, and the more fragmentary tablets are unassigned. The tablets 4453–4457, 4459–4464 were found in the part of the building designated the ‘Armoury’ by Sir Arthur Evans; 1508 (which is a copy of the verso of 1528) and 5187 come from the East-West corridors; the rest are of doubtful provenance.

Description. The tablets form a relatively homogeneous group, most of them being c. 15 cm. long, 2,5 cm. high and 1,2 cm, thick; Mc 4460 is a little smaller than the others, while Mc 5187 has suffered seriously from the action of the fires which destroyed the palace. Most of the tablets consist of two lines of approximately the same height; the extremities of the tablets are rounded and gently tapered. The ‘odd man out’ is Mc 5107, which is not ruled, and has only one line of writing. Only two tablets (Mc 1508 and Mc 4461) are inscribed on the verso as well as the recto.

Contents. Some of the tablets begin with a place-name, often known from other sets; these place-names are usually written in larger characters, and the tablet subsequently divides into two lines, containing what is probably a man’s name in either line A or line B or both, followed by quantities of four ideograms listed in a set order. In the first line, we find the ideogram *150, which has not yet been convincingly identified, followed by *107^b, the ideogram representing a she-goat, while in the second line the ideograms are *142, also unidentified, followed by *151, which is usually interpreted as representing horns. Of the four commodities represented by the ideograms, *150, the she-goats and the horns are counted, while the fourth commodity represented by *142 comes in units of weight. This pattern is apparent in most of the better preserved tablets, but some deviation from the general

pattern is found. In Mc 1508.B the order of *142 and CORNU is reversed, while the entry on the verso introduces a new element in having the ideogram representing a ewe; there is also some doubt as to the identity with CORNU of the second ideogram on the verso. In both Mc 4454 and 4462, there is an additional entry of one unit of *150 in line B, preceded in Mc 4454 by a doubtful *da*. Mc 5187 shows traces of some sign preceding *150, transcribed tentatively as *o* in *KT*⁴; there may be the numeral]1 at the left of the second line. Mc 5107, which shows only the ideograms *150 and CAP⁵, may, like Mc 4457, be a totalling tablet, as the numbers of the commodities listed there are much larger than elsewhere.

The Words Appearing on the Tablets

It is evident that the words written in larger characters at the beginning of some of the tablets are place-names, since they occur as place-names in other KN tablets. Some of these are place-names which occur nowhere else, such as *u-qa-mo* in Mc 4454 and *ja-go* in Mc 4461. The rest are common place-names on the KN tablets; *ku-ta-to* in Mc 4455, possibly to be restored in Mc 4459, *da*-*22-*to* in Mc 4456, *se-to-i-ja* in Mc 4464 are all found elsewhere, particularly on the D tablets, which are records of sheep and wool; in Mc 4462 the restoration *ti-ri-to* is feasible in view of the frequent occurrence of this place-name at KN, particularly, it may be noted, in the D tablets. Of these, *da*-*22-*to* occurs four times in the lines before *se-to-i-ja* in KN As 40, in the line before *ku-ta-to* in G 464, with *ti-ri-to* in Dx 1239; it is also found on an inscribed jar from Eleusis. These three seem to be important centres in Crete, and *da*-*22-*to* seems to occupy a central position in relation to *se-to-i-ja*, *ku-ta-to* and *ti-ri-to*; but as yet no entirely convincing identification with any known Cretan site has been suggested. It has been pointed out that *Τρίτα* is an old name for Knossos (Hesychius), and *se-to-i-ja* could be *Σηταία*,⁷ but the *o* for *a* in the Mycenaean form is unexplained. If the identification of *se-to-i-ja* with *Σηταία* is correct, it could point to a location in E. Crete; but the identification is too uncertain to be of positive value.

The other words entered on the tablets are probably men's names. Of these, *da*-*22-*ti-jo* (Mc 1508) is almost certainly the ethnic (used as a personal name?) of the place-name *da*-*22-*to* referred to above; it occurs again in F 669, and the fem. (or neut. plur.) is found in obscure contexts in L 544 and V 756. *da-wa-no* (Mc 4454, 4461) is found in a list of men's names in As 1517 and also in Ga 423 v. followed by *e-we-de*]. *a-ko-ro-ta* (Mc 4459) occurs at Mycenae (MY Go 610, Oe 115) and, if the reading is correct, also at Pylos (PY Fn 837); *a-wa-so* (Mc 4460) recurs in KN Db 1099, Db 1246; *ra-wo-go-no* (Mc 4462) is found in KN B 798, and in the genitive *ra-wo-go-no-jo* in Da

7. *Docs.* p. 147.

1650, D1 928. There is no means of telling whether *a-re* (Mc 4462) is the same as the theonym *a-re* which occurs with other divine names in Fp 14. All the other names on the Mc tablets occur here and nowhere else. Of the men's names, only a few have a Greek flavour; *ra-wo-go-no* is probably *Lāwo-q^uhonos*, but the possibility that this word might be a trade-name is not to be ruled out, as it occurs in a list of words on KN B 798, some of which could be occupational names, e.g. *o-pi-te-u-ke-we*. *Agrotās*, whether a man's name or occupational name, has been suggested for *a-ko-ro-ta*⁸, and *a-pa-u-ro* could be *Aphauros* or *Apaulos*⁹, but the names like *si-nu-mo-ro* and *qe-wa-ra* have a very un-Greek sound and appearance.

Of the names which recur on other tablets, *a-wa-so* appears in the 'shepherd' position on two Db tablets; *ra-wo-go-no* appears with ideogram *103, a variation of the VIR ideogram, in B 798; it is found in the genitive in the 'collector' or 'owner' position in Da 1650, D1 928. If the same men are referred to in the Mc as in the D tablets, this could imply some connexion between sheep husbandry and the activities covered by the Mc tablets; but identity of name does not necessarily prove identity of person; it could simply be a case of two people with the same name.

Of the names appearing with *da-wa-no* in KN As 1517, *qa-ra-jo* recurs on the recto of Ga 423, while *da-wa-no* appears on the verso of the tablet, followed by the possibly incomplete and as yet uninterpreted *e-we-de*]. Though there is no guarantee that the same two people are referred to by these names, it may be significant that in the only two occurrences of *da-wa-no* outside the Mc tablets, he is accompanied by *qa-ra-jo*.

On the whole, the place-names and personal names on the Mc tablets do not appear to be of great significance in determining the meaning of this set of tablets.

Ideograms and Numerals

We turn now to the ideograms on the tablets; it is here that the main difficulties of interpretation lie, and that possible clues to interpretation may be found. The first thing to notice is that of the ideograms occurring here, three are restricted to the Mc tablets (though CORNU, or a variant, also appears on two Sp tablets), and that only *107^b, the she-goat ideogram, reappears elsewhere (i.e. in the C series at KN and also at PY). This in itself sets the Mc tablets in a class on their own.

Of the four ideograms, *151 was from its shape immediately identified by Sir Arthur Evans¹⁰ as the ideogram representing horn (transcribed CORN (U) in accordance with the principles laid down by the 'Wingspread' Convention

8. Morpurgo, *Mycenaeae Graecitatis Lexicon*, s.v. *a-ko-ro-ta*.

9. *Docs.* p. 415.

10. Evans, *The Palace of Minos at Knossos* IV, pp. 832-836.

in 1961). He identified the horn as that of the Cretan wild goat, *Capra Aegagrus Cretensis*, or *agrimi* goat, a sub-species of the *Capra Aegagrus* Erxleben, originally found from Sind in the East, through Persia and Asia Minor to Crete and the Cyclades in the west. That a species of wild goat was known in the Aegean in Minoan times, is shown by numerous illustrations of wild goats on seals and rings and occasionally on vases and frescoes. A few examples must suffice. Several seals shows huntsmen stabbing wild goats.¹¹ Two wild goats are seen on a sardonyx ring from Avdu, near Lyktos, harnessed to a chariot.¹² One of the finest examples of a wild goat occurs on a stone vase from Zakro.¹³ From the Homeric poems, too, it is evident that the wild goat was plentiful in the Aegean world in the period when these poems were composed. We think of the description of the goat hunt by Odysseus and his companions on the island nearest to the country of the Cyclops.¹⁴ Goats pursued or brought down in the chase by dogs appear as the subjects for similes.¹⁵ The goats represented in Minoan and Mycenaean art closely resemble the *agrimi* goat which is still found, though in depleted numbers, on Crete and on Erimomilos to the present day. In Evans' time, they were confined to the White Mountains, Mount Ida and the Lasithi range. He tells that Spratt in 1865 saw a herd of about 40 near the summit of Ida.¹⁶ Brehm¹⁷ speaks of herds of between 40 and 50 animals on most of the mountains of Crete, and of smaller herds on Erimomilos. According to Walker,¹⁸ herds consist of between 5 and 20 individuals, led by an old female. More recently, we hear that the goat on Crete is confined to the gorge of Samaria (N. of Ayia Roumeli) and 2 or 3 dozen on the island of Theodhoro (ancient Akytos) w. of Khania.¹⁹ For an illustration of the goat, see Walker, *op. cit.*, p. 1474, also Evans, *op. cit.* IV, fig. 814. A fine example of the *agrimi* goat is also to be seen on a stamp recently issued in Greece. There is a striking similarity between the horns of the goat as represented on the ancient monuments, and as described and illustrated by zoologists. Brehm²⁰ describes the horns as big and strong, often more than 80 cm. long in older animals. The horns, which are fairly close together at the base, have a pronounced upward and backward curve, but are not twisted. In the case of old males, the horns almost form a semicircle, and have up to 12 knobs or

11. Evans, *op. cit.* IV, figs. 558,559.

12. Evans, *op. cit.* IV, fig. 803.

13. Page, *The Santorini Volcano and the Destruction of Minoan Crete*, Plate B 1.

14. *Od.* 9.116 ff., 152 ff.

15. e.g. *Il.* 15.271.

16. Evans, *op. cit.* IV, p. 833, note 2.

17. Brehm, *Tierleben* III (3rd ed. 1893), p. 190.

18. Walker, *Mammals of the World* II (1964), p. 1474.

19. Bowman, *Albatross Guide to Crete*, pp. 66,180,183.

20. Brehm, *Tierleben* III, p. 190ff.

protuberances, which are an indication of age. The ideogram *151 on the Mc tablets certainly resembles the horns of the *agrimi* goat, even showing the knobs on the outer side, and there can be little doubt about the correctness of the identification of this ideogram with the horns of the Cretan wild goat.

But the interpretation of ideograms *150 and *142 is still a matter of dispute. The ideogram *150 which appears first on the list, is said to resemble the ideogram for goat, sex not specified, preceded by what looks like the syllabic sign for *ra*. Alternatively, the second part of the ideogram has been equated with the uninterpreted syllabic sign *22. Ventris and Chadwick²¹ tentatively suggested that *150 might be the ideogram for the buck *agrimi*, the doe not needing to be distinguished from the domesticated nanny-goat when used in the same context as the buck. Some connexion with *λαισήϊον* is also tentatively suggested; this suggestion is picked up and expanded by Stella,²² who identifies the ideogram with *λαισήϊον* in *Il.* 5.453 and 12.426, and believes that it represents a small shield of animal hide with the hair left on it. What the *λαισήϊον* was, is still a matter of conjecture, as Lorimer points out;²³ there is no compelling reason for identifying any type of shield on these tablets, and in any case, if the ideogram is an abbreviation of *λαισήϊον*, we should have expected *ra*₃ rather than *ra*. With regard to the second part of the ideogram, it differs from both the goat ideogram and the syllabic sign *22, in that the vertical stroke has moved over to the extreme right of the sign; it may therefore be necessary to abandon any association of this ideogram with goats, but what to put in its place is still an open question (cf. Sacconi, *SMEA* 3, p. 103).

Just as much of a puzzle is ideogram *142, which looks like the syllabic sign *qe* with a small leaf-like appendage at the top left. Ventris and Chadwick,²⁴ noting the similarity between this ideogram and *172 of the KN U tablets, which does not have the dots in the circle but has *ke* or *ke + ro* as adjuncts, suggested that both these ideograms could represent *κηρός* 'beeswax'; but the uncertainty of the etymology of *κηρός* (perhaps from **κᾶρός*) makes it unsafe evidence for establishing the identity of the ideogram. It is unlikely that these two ideograms represent the same commodity, as *142 is weighed, and *172 is counted (though I suppose it is not impossible for a commodity to be both weighed and counted; bread is bought in loaves, units which are counted, but one can have 1 lb. or 2 lb. loaves, and, if I am not mistaken, bakers keep records of bread sold, not in loaves but in pounds).

With regard to the numerals on the tablets, it is to be noted that there is no obvious connexion between the numbers of ideogram *150 and the numbers of she-goats, nor between the numbers of *150 or of the she-goats and

21. *Docs.* p. 302.

22. Stella, *La Civiltà Micenea*, p. 80.

23. Lorimer, *Homer and the Monuments*, p. 194ff.

24. *Docs.* pp. 290,302.

the numbers of horns. But it is remarkable that, in the tablets which are reasonably complete, the number of horns is always twice the number of the units of weight in which ideogram *142 is entered on the tablets. Any interpretation of the Mc tablets must take note of this fact, which cannot be a mere coincidence. Only Mc 4457 shows a deviation from this 1:2 ratio: here 154 kg. of *142 occur with a total of 345 horns. It may be worth noting, in passing, that this is the only Mc tablet on which we find an odd number of horns (a unicorn in the herd?!). It was noted by Ventris and Chadwick²⁵ that the numbers of the ideograms on each of the tablets except Mc 4457 occur approximately in the proportion of 5:3:2:4; Killen and Olivier²⁶ express the values on Mc 4457 in the ratio of 5:3:2:5. By adding up the entries (existing or restored) on 14 of the individual tablets, they obtain the totals 333, 194, 143 kg., 286 for the four commodities listed; but it is possible to arrive at different totals. From an addition of the numbers (existing and restored) on 16 tablets where the numerals are reasonably certain (omitting Mc 4457 and 5107) I arrive at the totals 366, 203, 168 kg., 336 for the four commodities.

Killen and Olivier point out that the differences between the totals of the individual tablets and the numbers on Mc 4457 cannot be expressed in the same ratio as one finds on the individual tablets, so that the differences between the two totals cannot be explained merely by assuming the loss of one or more tablets. Mc 4457 cannot therefore be a straight total of the individual tablets. This is borne out by the totals I obtained, two of which (the totals of *150 and *142), even show a surplus over the numbers on Mc 4457. To explain the discrepancy between the numbers on Mc 4457 and the totals obtained by adding the numbers on the individual tablets, Killen and Olivier suggest that Mc 4457 represents a provisional aggregate, while the individual tablets are records of the actual returns. They try to reconcile the differences between the two totals by rounding off the fractions, sometimes to the higher number, sometimes to the lower, and suggest that the deviations from the proportion 5:3:2:4 could be explained by applying a rebate of 5% on the quantities of the first two commodities, and that the differences between the proportions 5:3:2:4 and 5:3:2:5 could be explained by assuming a rebate of 20% on the last commodity. This is very ingenious, but, as the authors themselves admit, it would imply that the scribe responsible for these tablets had a definite ability in mathematics, and also that an advanced and sophisticated theory of mathematics was used in the keeping of the palace accounts.

I feel sure that the picture is obscured by the fragmentary state of some of the tablets and the possible incompleteness of the set, and that the actual solution may be very much simpler. If one examines the extant tablets, or at least the better preserved ones, it appears that they can be divided into three groups. The first, and largest, group consists of tablets which begin with a

25. *Docs.* p. 303.

26. Killen-Olivier, *BCH* 92 (1968) pp. 128f.

place-name, after which the text divides into two lines, containing one personal name and the ideograms. The tablets in this group are Mc 4453, 4455, 4456, 4460, 4463, 4464. The tablets of the second group, which consists of 4454, 4459 and 4462, also have a place-name in initial position, followed by two names (though *da* on 4454 is very uncertain). In 4454 and 4462 there is an additional entry of *150 in the second line. The third group consists of 1508 and 5187; these happen to be tablets which were found in a different part of the palace, and which are possibly in a different hand. They differ from the other tablets in other respects also. In 1508, as mentioned above, the order of *142 and *151 is reversed, and there is an additional entry on the verso, while 5187 has 5 and a doubtful *o* in line A, and a possible numeral 1 in line B to the left of the ideograms.

A clue to the problem of the numbers may perhaps be found if one compares Mc 4455 with Mc 4459, and Mc 4456 with Mc 1508. If *ku-ta-to* has been correctly restored on 4459, this tablet and 4455 could be entries from the same place. In 4455 there is only one personal name, *a-pa-sa-ki-jo*, in 4459 there are two, *a-ko-ro-ta* and *qe-wa-ra*. The difference between the numerals on 4455 and 4459 is a difference of 5, 2, 2, 4 for the four commodities, i.e. very nearly the proportion assumed by Ventris and Chadwick. It is tempting to see in 4455 an assessment to be aimed at, at the centre *ku-ta-to*, with *a-pa-sa-ki-jo* as the person responsible for collecting the assessment, while 4459 could represent the actual delivery, brought in by *a-ko-ro-ta* and *qe-wa-ra*. Similarly, 4456 could represent the assessment aimed at at *da-*22-to*, while 1508 represents the actual delivery by someone merely referred to as 'the man from *da-*22-to*'. Here the assessment is very nearly met, falling short only by 1 kg. of *142 and two horns. The entry on the verso might be the 'penalty' or 'fine' for failure to meet the assessment – a very severe penalty, and one that implies a high value for *142 and *151, if 1 kg. of *142 and two horns are worth 50 ewes. But leaving the interpretation of the entry on the verso on one side, the comparison of 4455 with 4459, and of 4456 with 1508 suggests that the tablets which have a place-name followed by one personal name represent an assessment to be met, and that originally there was a corresponding tablet for each centre, recording the actual delivery, of which 4459 and 1508 are representatives. The totalling tablet Mc 4457 could then be a record of the sum of the actual deliveries, though there is no means of checking the correctness of this in view of the fragmentary state of some of the tablets.

If this interpretation is correct, the totals arrived at above by adding up the numerals on the 16 best preserved tablets are obviously wrong, but they could provide a further argument in favour of the interpretation. The surplus shown in these additions for *150 and *142 would be the result of adding up the same entries (i.e. the numbers of the assessment and the actual delivery) twice over.

How the 'odd man out', Mc 5107, fits into this picture, is still an open

question. It is tempting to see in this tablet an intermediate stage in the records, i.e. a draft entry of the first two commodities only, on an unlined tablet of a slightly different size – the equivalent perhaps of a rough jotting on a ‘scrap-pad’. It is interesting to note that the totals on this tablet differ only slightly from the totals of the first two commodities on Mc 4457, i.e. 354:345, 200:208. The difference between 354 and 345 could be explained by assuming a transposition of the tens and units, an error which is very easy to make, especially in a language which, like Afrikaans, says ‘driehonderd viere-en-vyftig’ instead of ‘three hundred and fifty-four’. This could mean that 354 on the draft 5107 was the original total, which was wrongly transferred to the ‘fair copy’ as 345.

It remains to consider what the *o* read on Mc 1508 (verso) and on Mc 5187 means. Does it have the same significance as *o* on the PY Ma tablets, which also list ideograms in a set order, and where *o* probably indicates that some part of an annual assessment is still owing? In both cases in the KN Mc tablets the reading *o* is too uncertain to allow any definite conclusions to be made about its meaning.

The Purpose of the Tablets

Any attempt at interpretation of the tablets must try to establish what the purpose of this set could be. One possibility is that the ideograms could represent commodities used for the construction of some artefact. So Evans²⁷ believed that the horns entered on the tablets were intended for the construction of a certain type of bow, usually referred to as the composite bow. This is a type of bow which was generally associated with foreigners by the Greeks in contrast to the European or ‘self’-bow. The ‘self’-bow was usually constructed from a single piece of wood, while the composite bow, which according to Lorimer²⁸ continued in use in Asia Minor in recent times, is shown by extant examples to consist of three main materials: a wooden stave, along the inner face of which strips of horn are let into a groove (‘horn’ here means *keratin*, the highly flexible sheath which encloses the osseous core of the horn). Along the back dry sinew is moulded and protected from damp and concealed from sight by a type of bark, and then the whole is securely lashed together. A description of the materials used in bow-making can be found in the following example from Ugaritic Literature:

And Aqhat the Hero replies:
‘The mightiest sinews of Lebanon,
The mightiest tendons from buffaloes,
The mightiest horns from wild goats,

27. Evans, *op. cit.* II, p. 50, note 2; IV, pp. 832–836.

28. Lorimer, *op. cit.*, pp. 276ff.

The . . . from the tendons of a bull,
The mightiest stems of reeds:
Give such to Kothar and Hasis,
So that he may fashion a bow for her,
An arc for the Progenitress of Heroes'.²⁹

The horn on the inner face, being more flexible than wood, takes more crushing than the wood of a single-stave bow would stand, and acts as a spring. The sinew on the outer side is again more tensile, so that a composite bow could be bent to a far greater extent, and the range and penetrative power of an arrow would be far greater than in the case of a single-stave bow. Such bows are recognisable in art from the reverse curvature of the tips.

To the best of my knowledge, no actual examples of bows from Bronze Age Greece or Crete have been found, nor are bows as such mentioned on the tablets. But the existence of bows is implied from arrow-heads found both on the Mainland and on Crete, notably in the 'Armoury' at Knossos, where a large store of arrow-heads was found in the charred remains of wooden boxes, with clay sealings attached. One of these (Ws 1704) has the word *pa-ta-ja* (prob. *paltaiā*) and the ideogram representing an arrow. In the same part of the building a tablet was found (R 4482) bearing the arrow ideogram followed by the high numbers 6010 and 2630, thus 8640 arrows in all. At Pylos, too, the word *pa-ta-ja* occurs, in the dat. plur. *pa-ta-jo-i*, on a tablet recording contributions of bronze for arrows and spears. The existence of bows is also implied from the occurrence on a Pylos tablet (PY An 207) of the word *to-ko-so-wo-ko*, usually interpreted as *toxoworgoi* 'bowmakers', and at Knossos (KN V 150) of the word *to-ko-so-ta*, which could be a personal name *Toxotās* or an occupational name, meaning 'archer'.

The existence of the bow in the Aegean in the Bronze Age is also proved by a number of representations of the bow in art. So far, there is no clear evidence for the composite bow in mainland art, but there are some examples of what might be the composite bow in Cretan art. The composite bow appears to be the weapon of a male figure on a clay sealing,³⁰ and one of the signs appearing on the Phaistos Disk has been interpreted as an unstrung composite bow.³¹

In Homer, the bow is associated more with foreigners than with Greeks; e.g. the Lycians are particularly famous for their archery. In the *Iliad*,³² special mention is made of the bow of Pandaros. There the bow is described as having been made of the horns of a wild goat joined at the butt-ends and tipped with gold. I am no expert in archery, but am inclined to think that

29. 2 Aqhat VI.I, 20–25 (in Gordon, *Ugarit and Minoan Crete*, p. 126f.).

30. Evans, *op. cit.* II, p. 831, fig. 548.

31. Evans, *op. cit.* I, p. 652, fig. 483, no. 11; IV, p. 835; Lorimer, *op. cit.* p. 278.

32. *Il.* 4.105 ff.

uch a bow would have been as useful on the battlefield or in hunting as the horns hung up as trophies by modern safari-hunters. That Odysseus' bow, which is an essential part of the action of the *Odyssey*,³³ was a composite bow, is very likely, and that it was unfamiliar to the suitors is obvious, as they tried to string it standing, not squatting or sitting down, bracing the bow under one thigh and over the other knee, as is the correct position for the stringing of the composite bow.

Was Evans right in his conjecture that the horns listed on the tablets were used in the manufacture of composite bows, and that *agrimi* goats were kept in a semi-domesticated state on Crete to ensure a regular supply of horns? It is a theory which has found its way into a number of works on Minoan and Mycenaean weapons.³⁴ I consider that it is by no means as certain as Evans and these others say. First, what evidence have we for believing that *agrimi* goats were kept in a semi-domesticated state on Crete in the Bronze Age? The seal, perhaps, showing wild goats harnessed to a chariot (but then lions are also so represented). Evans based his theory of semi-domestication on his interpretation of ideogram *142 as the herd sign + a circle with dots, representing grains of corn as food for the flocks, but this interpretation of *142 and of Evans' 'herd'-sign is no longer accepted. Further, modern analogies show that semi-domestication of the wild goat would have been very difficult, as Evans himself admits.³⁵ Dr. Ludwig von Lorenz-Liburnau³⁵ tells of two Cretan *agrimi* goats given to the imperial menagerie at Schönbrunn in 1897; they were able to leap over a fence 3 metres high. It is hard to visualise a herd of 208 she-goats, the number given on Mc 4457, together with males and young goats, being kept in captivity in Minoan Crete. On the other hand, the wider context in which the Mc tablets are found, might support the connexion with bows. The other tablets or sets of tablets found in the 'Armoury' are the Sd, Sf, most of the Sg and So tablets, which deal with types of chariots and with wheels (also with the unidentified *245 in Sg 4465), Sk 8149, which lists helmets and other pieces of armour, Sp 4451 and 4452, which also have an ideogram representing horns, a few Nc tablets dealing with the ideogram represented by the syllabic sign SA, E 4466, a wheat tablet, R 4482 and the sealings Ws 1704 and 1705, which deal with arrows, U 4478 with the ideogram *177 and a number of X tablets, of doubtful content. In addition to Hand 132 in which the Mc tablets are written, there are at least four hands responsible for the chariot and wheel tablets,³⁶ and three other hands, 133, who wrote the Nc tablets, 202, to

33. *Od.* 21,53 ff., 393 ff.

34. Lorimer, *op. cit.*, p. 279; Wace and Stubbings, *Companion to Homer*, p. 520; Snodgrass, *Arms and Armour of the Greeks*, p. 24.

35. Evans, *op. cit.* IV, p. 834; Von Lorenz-Liburnau, *Wiss. Mitt. Bosn. Hercegovina*, Wien, 6 (1899), p. 867.

36. Olivier, *Les Scribes de Cnossos*, pp. 110,127 f.

whom U 4478 is assigned, and 206, who wrote tablet Sk 8149. About 18 tablets are unassigned to a hand. The general picture is of an office or department in the Armoury dealing with equipment for war (if the chariots are war-chariots), with a few oddments like grain and SA thrown in. Certainly material for bows would fit into this picture; but apart from the fact that horn could have been used for making bows, and that it could be argued that one of the few items missing from this part of the archive are bows, we really have insufficient evidence to support Evans' contention that these tablets refer specifically to horn used in the manufacture of bows. In most of the tablets listing military equipment, the ideogram for the item of equipment is usually found; no ideogram for 'bow' appears on these tablets, or has as yet been identified on other tablets. As regards the other ideograms, she-goats could, I presume, be a source of gut for bow-strings, but the other two commodities are too uncertain to enable one to identify them without hesitation with any of the other materials required for the manufacture of bows. So I believe that we cannot with certainty say that the Mc tablets list materials to be made into bows by Minoan *toxoworgoi*, and it seems that we must look elsewhere for an interpretation of the tablets.

But where? Could the four items listed represent the products obtained from the hunting of the *agrimi* goat on Crete? That goats were hunted, is clear from representations in art of huntsmen shooting these animals (see above). If these tablets represent the products of hunting, the names on the tablets could be the names of the hunters, and the place-names the places for delivery of the products, or the site of the hunting. A pity that we know so little about the location of the place-names mentioned; if they were situated in a mountainous area, they would be the obvious haunts of wild goats. Assuming that the four commodities are the products of the wild goat, what would one expect these commodities to be? Meat, obviously; also skins, to be used as coverings or for clothing or shields; horns, to be used in the manufacture of bows, for decoration on furniture, sword-hilts and other objects. Of these products, horn has been satisfactorily identified on the tablets; the she-goat ideogram could represent the carcasses of the goats to be used as meat; ideogram *150 might represent the hide of the animal. But if this were the case, one would expect some correspondence between the numbers of the different commodities, i.e. one carcase, one skin, two horns, and this is not so. Of course, all the horns may not have been fit for use; it is said that the males often fight, splintering their horns in the process (horn splinters in the habitat of the goats testify to this);³⁷ the females, too, are said to protect their young with their horns so that their horns would splinter and not all be fit for use. This could explain the lack of correspondence between the number of goats and the number of horns, but it does not prove that the ideograms listed all represent parts of the goat. And it does not explain the mysterious

37. Brehm, *Tierleben* III, pp, 190 ff.

*142, which is weighed, and which always occurs in the ratio of one unit of weight to two horns. Which part of the goat would be weighed? Meat is the most obvious answer; but 154 kg. of meat from 208 she-goats (to take the totalling tablet Mc 4457 as an example) would be a poor return for so many goats. The female of the species is said to weigh between 50 and 55 kg. apiece, the male between 75 and 120 kg.;³⁸ 208 goats (or 208 + 345, if *150 represents the buck *agrimi*), would be expected to produce far more than 154 kg. of meat. And why the ratio of one kg. to two horns? A possible clue could be found in the fact that the horn ideogram is not reversible; the curve of the horn is always to the left, never to the right (i.e. it could represent the right horn of an animal as seen from the front). Perhaps this is to be taken seriously, and the horns listed on the tablets really do represent the right horns, which would be used for a purpose for which the left horns, because of their different curvature, would be unsuitable. The left horns would then be cut up or ground to powder and used for some other purpose. The product of these horns might then be represented by ideogram *142, which, because it was cut in small pieces, or ground to powder, would naturally be weighed. It is tempting to see in *142 a cross-section of a horn (though the shape and position of the appendage seem wrong for this).

But this is still in the realm of conjecture, and until *150 and *142 have been proved to be part of a goat, we cannot with certainty say that the four items represented on the Mc tablets derive from the Cretan wild goat. Another point raises doubts that these items are the products of hunting: if the goats were shot at the rate implied on the tablets, which were probably annual records, the *agrimi* goat population of Crete would have been decimated within a few years, and the species *Capra Aegagrus Cretensis* would long ago have been extinct.

So, according to the present state of our knowledge, the evidence for assuming that all four commodities derive from the Cretan wild goat is insufficient, and it would be unsafe to go further than to say that the Mc tablets could be a record of assessments and actual deliveries of four commodities, two of which are she-goats and horns. Until more similar tablets are found, or further joins made, there seems to be no way of solving 'the dilemma of the horns'.³⁸

38. My special thanks go to Miss Elaine Ball of Cape Town, who in our discussions of the subject brought her specialised knowledge of book-keeping to bear on the problems, and helped me to a 'scribe's' eye view of the Mc tablets.

ADDENDUM

Since this article was submitted for publication, *KT*⁴ has appeared, and I note the following changes in alphabetic prefixes of tablets quoted:

on pp. 5 and 6, G 464, now Ga
 Dx 1239, now Dv
 F 669, now E
 Da 1650, now D
 on p. 13, Sg 4465, now Sf.

	*150
	*107 = CAP(ER)
	*107 ^b = CAP(ER) ^f
	*142
	*151 = CORN(U)
	*172
	• 22
	• 60 = ra
	• 78 = qe
	*118 = L (approx. 30 kg.)
	*117 = M (approx. 1 kg.)

Fig. 1: Ideograms and Syllabograms referred to in the text.

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