The Archaeology of Measurement

Comprehending Heaven, Earth and Time in Ancient Societies

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Measuring by weight in the Late Bronze Age Aegean: The people behind the measuring tools

Anna Michailidou

Introduction

Κατὰ δὲ Πρωταγόραν τὸν σοφώτατον πάντων χρημάτων ἄνθρωπον μέτρον εἶναι, κατὰ δὲ Θεαίτητον τούτων οὕτως ἐχόντων αἴσθησιν ἐπιστήμην γίγνεσθαι (the doctrine of the great philosopher Protagoras, that man is the measure of all things, and the doctrine of Theaetetus that, since these things are true, perception is knowledge) (Platon, Theaetetus 160 d.9). This quotation may perhaps bring to mind the Egyptian cubit, of the length of a human forearm, and its subdivisions into palms and digits. In architecture, ergonomic requirements, such as the height of a door or the measurements of a staircase, exhibit dimensions related to the human body, whose nature makes them universal and diachronic (cf. Palyvou 2005, 156 with reference to *Modular Man* by Le Corbusier). The technique of measurement by weight is very close to Theaetetus's doctrine that perception leads to knowledge, since everyone can feel which is the heavier of two objects held in the two hands. Thus the mechanism of the balance, which actually predates the invention of weights, in fact reproduces an action performed by the human body itself. In the tomb of Ka-irer, dating to the Old Kingdom of Egypt, there is a scene showing ingots being weighed in a curiously designed balance in the form of woman with arms stretched horizontally (Kisch 1965, 26; Lauer 1976, 77). Furthermore, the most widely occurring largest unit in various metric systems is the heaviest load that a man can comfortably carry on his shoulders, that is, about 30 kilos (Figure 7.1).

Initially, the purpose of a balance was to measure equality. Its first practical use was to confirm two equal parts of the same product, which could then be transported. They could be suspended from the two ends of a long pole resting on the shoulders of the bearer and measured in relation to each other upon distribution.

Figure 7.1. Ox-hide ingot of copper carried by Cretan messenger depicted in an Egyptian tomb painting of the Eighteenth Dynasty (after Karetsou & Andreathaki-Vlazaki 2000, 92, no 67).

The measurement of equality also lies behind the weighing of the deceased's heart in ancient Egyptian iconography. The weight of the heart has to be exactly the same as that of the goddess Maat, who is usually represented by her feather on the other pan of the balance (Faulkner 1985, 34, spell 125). It should be emphasized that this ancient Egyptian concept was different from the *psychostasia (kerostasia)* of the ancient Greeks, because the latter measured the *inequality* that would determine *before his death* the inevitable end of one of the two persons whose fate was being judged (Michailidou 2000a, 146 for references).

Absolute measurement started from the moment when a stone was placed on one of the pans, to balance the commodity placed on the other pan. This provided a visual and more permanent witness to the mass measured, since the stone could be kept and the weighing repeated or the initial result be checked. A survival of this concept is mentioned in an Egyptian papyrus: the tomb robbers keep the stone used as a balance weight when dividing up the

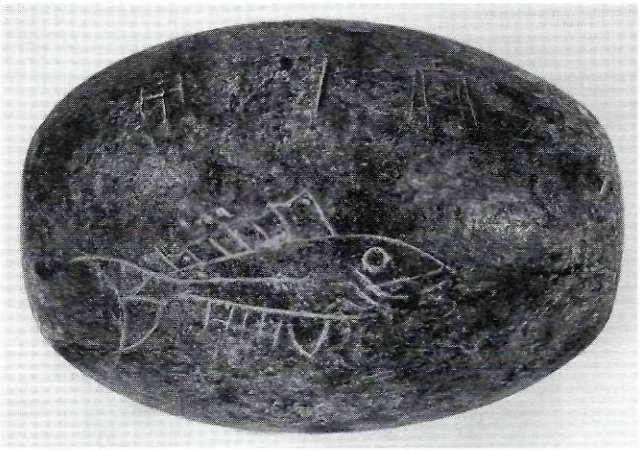

Figure 7.2. The melon-shaped stone weight from Aghia Photia, Crete, with incised Linear A inscription.

spoils from one tomb (Kemp 1991, 248). A special class of noncanonical inscribed weights from Deir el-Medina in Egypt also function as witnesses to standard weights.[1] For instance, we possess a stone with the inscription "*weight of fresh cleaned fish*", the only likely parallel in the Aegean so far found being a melon-shaped stone from Aghia Photia, Crete (Figure 7.2), with the design of a fish and a Linear A inscription on it (Michailidou 2001a, 60–65, 80, figs. 13–18; Alberti 1998).

An advance in the technique of absolute measurement is represented by the use of a series of stones of various interrelated ratios. The invention of a metric system of weight is indeed a cognitive invention,[2] ascribed by the Egyptians to their god Thoth[3] and by ancient Greeks to their hero Palamedes, of the Trojan War (Kakridis 1986). Powell refers to 'metrological organizers' in the Mesopotamian world. Thuraeu-Dangin discusses the two poles in the mechanics of the system, namely, the 'old load', traditionally the maximal weight a man could carry, and the 'new purely conventional unit' invented (in this case the Sumerian Mina).[4] Kopcke claims with regard to the Aegean that "to proclaim standards by which things can be weighed and measured appears to be a time-honoured prerogative of central authority" (Kopcke 1987, 257; Michailidou 2001a, 54). Script and metrology were certainly a means of exercising power in bureaucratic hierarchical societies, where weight-measuring tools were linked with both productive and administrative activities.

1. Material and cognitive measuring equipment

The balance

Up to the Roman period, when the development of the steelyard is attested for the first time, the normal form of the balance is the simple equal-arm balance with two pans.

Bronze weighing pans are underrepresented at ancient sites for various reasons. They tend to be poorly preserved, their metal was recycled and they were often part of a set of personal belongings. Information on the Aegean in particular is offered by the catalogues of balances by Vandenabeele and Olivier, Petruso and Pare. No truly intact balance has been found; some information on details is perhaps observable on the golden, but nonfunctional balances found in Mycenaean shaft grave III (Vandenabeele & Olivier 1979; Petruso 1992; Pare 1999).[5] The higher number of balances from tombs is a consequence of the fact that grave goods were not normally recycled. More recent finds (e.g., from Mochlos, Crete) have now augmented the samples from settlements (Soles & Davaras 2004; Brogan 2006).

Balance weights

Primarily made of stone, these are a far more common find. The balance weight is in essence the stone that measures (in Akkadian called *abnu* = stone, in Egyptian *inr* = stone). This function is represented in the following text from Deir el-Medina, inscribed on a fragment of stone, whose weight is the witness to the mass of the yarn measured:

> *12 deben, with the weight of two stones, the weight of the yarn of PN* (Michailidou 2001a, 65, which features more on the role of stone in practical processes, plus the relevant bibliography)

In contrast to Egyptian and Near Eastern balance weights, the so-called Minoan or Aegean balance weights (Figure 7.3) are of a distinctive discoid shape, very often made

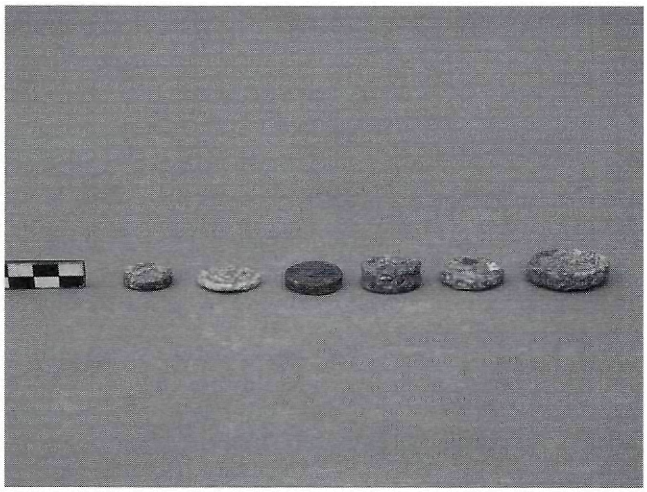

Figure 7.3. Lead discoid-shaped balance weights from the settlement of Akrotiri on the island of Thera.

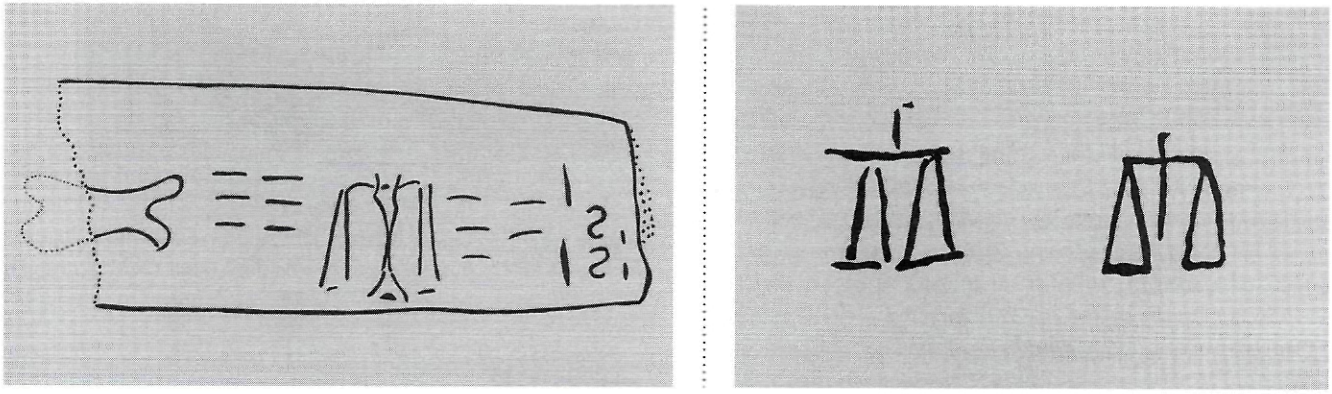

Figure 7.4. On the left, the Linear B tablet KN Oa 730 with the record of ingots, 60 in number, followed by the sign for the balance functioning as metrogram for one talent in Linear B script (after CoMIK, vol. I). On the right, the sign for the balance in Linear A script.

of lead and as a rule uninscribed, although sometimes marked with signs, some of them being related to the mass of the weights (Petruso 1992, 61). Balance weights of stone, whether discoid or of some other shape, are also in use in the Aegean of the Late Bronze Age, naturally so, since stone is the appropriate material for precision weighing.

Only occasionally are balance weights found in a set and even more rarely together with their scale pans. Petruso, Michailidou, Alberti and Aravantinos provide details on the social context of balance weights in the Aegean era. Such weights derive from palaces; settlements, especially ports; sanctuaries and tombs (Alberti 2003; Aravantinos in Aravantinos & Alberti 2006; Michailidou 1999; Petruso 1992; see also Alberti, Ascalone & Peyronel 2006) and are also found in shipwrecks (Bass 1997; Pulak 2000) .

Written sources

Records of weight, balance weights and the weighing process itself are attested in texts from the Near East and Egypt. In the Aegean, however, in texts of the Linear B script, the only evidence provided concerns the recording of quantities of certain products, found following special ideograms-metrograms denoting units of weight (cf. Petruso 1992, 19, table 1). Linear B ideogram *118, a pictogram of the balance (Figure 7.4), is the sign for the largest unit of weight, the so-called talent (of around 30 kilos weight). There are no similar metrograms in the Linear A script, perhaps apart from the sign of the balance (Michailidou 2000a, 133), which only on four occasions is isolated and followed by numbers;[6] in most of the Linear A tablets this sign is part of a word, though often occurring at the end of the word. However, the existence of klasmatograms, in both Linear A and the Cretan hieroglyphic scripts (Bennett 1950; 1980; Karnava 2001), is a secure indication of the presence of measuring, as opposed to mere counting. It is most probable that the basic ratios remained the same and that it was only the mode of recording that changed from the Linear A, which features fractions of a larger unit, to Linear B, which involves multiples of integer fractional quantities, represented by the metrograms (Michailidou 2004, 317–318 with views for and against this view).

The metric system

The Minoan/Aegean unit of 61–65.5 grams is the distinctive unit of the Late Bronze Age Aegean, particularly in Crete and the Cyclades during the New Palace era (Evans 1906; Caskey 1969; Parise 1971; Petruso 1992; Michailidou 1990; for a chronological panorama of all the Bronze Age period, see Alberti 2005). Other units have been proposed for previous periods in certain areas (Petruso 1978; Rahmstorf 2003; 2006) or for the Late Mycenaean period (Petruso 2003).[7] As Andrew and Sue Sherratt have rightly pointed out, "Aegean civilization was undoubtedly culturally independent, in that it retained its own languages and developed its own style; but its growth can only be understood in the context of its interaction with these larger economic structures", that is, the Levant, Mesopotamia and Egypt (Sherratt & Sherratt 1991, 355). Whilst there were differences in the metric systems used in these areas, certain equivalences between foreign systems facilitated accounting and inter-regional trade. The best example is provided by Ugarit, where the 'Western Syrian' mina of 470 grams represented the meeting point for four metric systems, with the differences beginning at the level of its division into shekels (Parise 1984; for more references to this subject cf. Michailidou 2004, 316–317; see also Rahmstorf, this volume; particularly instructive on the subject of metrological interconnections is the article by Zaccagnini

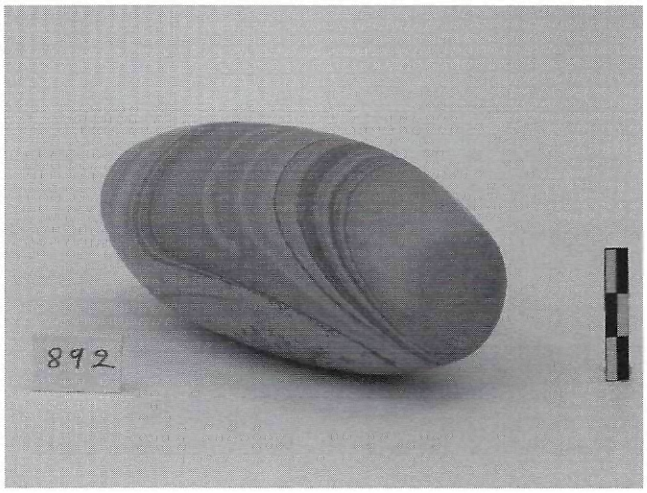

Figure 7.5. A stone balance weight from Akrotiri on Thera of the weight-value of the Syrian mina.

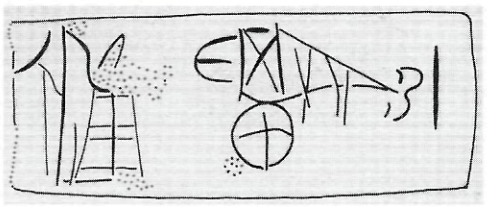

Figure 7.6. The Linear B tablet KN Sc 245+5064 displaying the ideogram for chariot, followed by one digit (after CoMIK, vol. I).

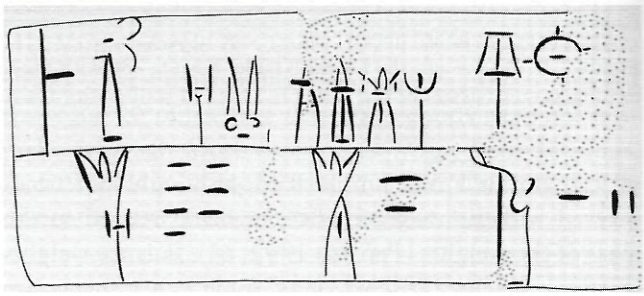

Figure 7.7. The Linear B tablet KN F(2) 852+8071. At the extreme top right is the numeral sign for 10,000 immediately preceded by the ideogram for grain (after CoMIK, vol. I).

1999–2001). With regard to the Aegean system, balance weights of this system have been found in Ugarit (Courtois 1990, 121), possibly also one weight in the Uluburun wreck (Pulak 2000, 264), while the Syrian mina itself is present at Akrotiri (Figure 7.5). The so-called Minoan or Aegean standard of 65.5 grams was defined by Evans as the fifth multiple of the Egyptian unit of gold (13 grams) and by Zaccagnini as the 10th multiple of a Near Eastern shekel of 6.5 grams (Evans 1906; Parise 1971; 1981; Zaccagnini 1986; De Fidio 1998–1999; Michailidou 2004). With regard to any *intentional* equivalences between the various systems of weight, the Minoan unit of 61–65 grams could have acted as a control on the value of both gold (that is, five Egyptian *deben* of gold of ca. 13 grams) and silver (eight Egyptian *shaty* of silver of ca. 7.6 grams), while the heavier unit of 67 grams was equivalent to eight Babylonian shekels, of 8.40 grams. It seems that particular weight-values functioned as keys to interconnections among the various systems of weight and that actual balance weights were intentionally manufactured of these values (e.g., Michailidou 2004, 317; for correlating weighing systems and the masses of metal artifacts see also Lassen 2000; Michailidou 2001b) .

2. Commodities to be measured by weight

Accounting of commodities, whether in production, storage or circulation of any kind, is commonly attested in Near Eastern texts, whether in administrative or private archives, and even in letters. In Aegean Linear B tablets, men and women are counted, as are animals, domestic equipment, weapons and chariots (Figure 7.6). The numerals used consist of signs denoting the digit (vertical stroke), the decade (horizontal stroke), the hundred (circle) and the thousand, all of them common in both the Linear A and Linear B scripts. Only in Linear B is there a specific sign denoting the unit of 10,000 (Figure 7.7), a fact that suggests that Mycenaean bureaucrats needed to record greater volumes than did the Minoans. This may be one of the reasons why the Minoan unit, of 61–65.5 grams, though incorporated as a value in Mycenaean accounts (Aravantinos 1995; Petruso 2003), in Chadwick's view, concealed behind the recorded quantity P 3 (Chadwick 1976, 104), is replaced by the recording unit of ca. 1,000 grams, that is the Mycenaean double mina (the so-called metrogram M), a value frequently employed in Anatolia and the Near East also.

For commodities exchanged in long-distance trade, we have the archaeological evidence derived from shipwrecks. Especially helpful in this discussion is the Uluburun wreck, since, in Pulak's view, its load may represent a royal gift destined for some Mycenaean port (Pulak 2005a, 295). How was the merchandise on board measured? Almost 151 balance weights were also found on board. On the basis of textual evidence we suggest that the domed, heavier weights were not used for foodstuffs in general, since commodities such as barley, wheat, flour, pulses, oil, wine, beer and figs are commonly reckoned in various Near Eastern texts by volume, rather than by weight. On the other hand, ivory would be counted when transported or

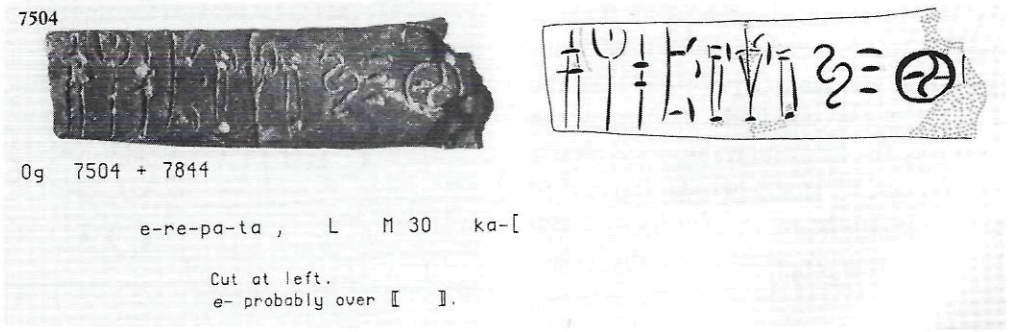

Figure 7.8. The Linear B tablet KN Og 7504+7844 recording one talent (or 30 double minas) of ivory, recorded as *e-re-pa-ta* (after CoMIK, vol. III).

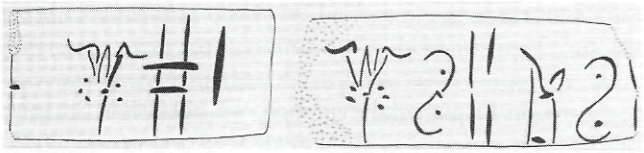

Figure 7.9. Linear B tablets KN Np (2) 860 and Np (2) 861 displaying the ideogram for saffron (extreme left), followed by metrograms for weight and numerals (P 4 and N 1) (after CoMIK, vol. I).

stored as a whole elephant tusk but be measured by weight as fragments (as found in Uluburun: Yalçin, Pulak & Slotta 2005, 583, fig. 83) because ivory is recorded by weight (Figure 7.8) in a tablet from Knossos (Trantalidou 2001, 276; also Pare 1999 with reference to Herodotus's mention of 20 big elephant tusks). A good piece of evidence in this direction is the discovery of balance weights along with half-worked ivories in the so-called Ivory Workshop at Thebes, of LH IIIB1 date (Aravantinos in Aravantinos & Alberti 2006). Taking into account additional evidence from Near Eastern texts, we may conclude that several commodities were accounted by weight, these being metals, wool and goat's hair, linen (possibly also counted in bundles: Chadwick 1976, 153–154), yarn, textiles (e.g., when tested in relation to the raw material used, otherwise officially recorded by numbers), ropes (apart from cases involving measuring of length), alum, wood (occasionally, otherwise mostly counted by pieces), ivory, precious stones, hides (sometimes, otherwise mostly counted, see Trantalidou 2001, 277–87); also some condiments, perfume and dyes (Sarpaki 2001) such as ponikijo, red safflower and saffron (Figure 7.9), the majority of the rest being measured by volume. Also weighed are celery, wax and tendons. As for foodstuffs, there were only some cases of loaves being recorded by weight (they were normally counted), fish (which are normally counted or measured by volume) and possibly meat.

3. Activities involving weighing

The process of weighing is attested in Near Eastern texts as part of economic activities related to manufacture, transportation/transmission and exchange at various levels.[8] In the Aegean Linear B texts, the *ta-ra-si-ja* mode of production[9] is based on the weighing of the raw material distributed to artisans and then of the finished products delivered by the craftsmen. This system was used in the production of textiles, in bronze working and chariot wheel production. Otherwise, fewer details regarding weighing are recorded in the Linear B texts (Michailidou 2001b).

With regard to long-distance transportation, in antiquity ships or caravans of donkeys and mules were used. The Old Assyrian traders transporting tin and textiles to Asia Minor employed their own balance weights to check their merchandise, but they also counted it by donkey loads.[10] Each donkey carried 65 kilos, divided into two packets, which meant that the net merchandise was two talents plus an extra amount for various expenses. Today villagers in Crete often calculate 50 kilos for each side of the donkey, but distances in Crete are shorter.

Weight in transportation was a factor that also influenced units of volume. This accounts for why the largest pure unit of dry measure in the Linear B texts, which is always indicated by the particular dry-commodity ideogram itself (Figure 7.10), consists of 10 units of 9.6 litres, that is, 96 litres, whilst the largest liquid measure, again denoted by the relevant ideogram of the commodity, equals only three units of 9.6 litres, that is, 28.8 litres (Palaima 2005, 269; for other absolute values cf. also Chadwick 1976, 106). The weight of a litre of oil, a little lighter than the water equivalence of 1 l. = 1 kg, is much heavier than a litre of wheat. The largest unit of volume of a commodity, whether dry or liquid, was in fact the content of a standard sack made of some material such as leather, wool, goat hair, or of a jar or a basket.[11] The

most typical jars used in long-distance marine trade as containers of organic materials or manufactured items are the Syro-Canaanite jars, the Cypriot jars and the Aegean stirrup-jars made in standard volumes, which allowed one to estimate the quantity transported merely by counting the number of jars.[12] Standardization of stirrup-jars is also found in the large quantity of 1,800 jars recorded in one Linear B tablet from the palace archive of Knossos (Figure 7.11). Most pottery containers, of course, could be used during their life to convey different commodities. Herodotus (III.6) explains that though wine was imported to Egypt from Greece and Phoenicia, no wine jars were found because people in Egypt gathered the containers after use in Memphis, filled them with water and sent them to the Syrian desert. In connection with this, Rutter makes the interesting remark that the Aegean stirrup-jars carried by the Uluburun ship were in fact in secondary use (cited in Bachhuber 2006, 347). Moreover, their fabric points to a variety of different production centers, mostly on Crete (Pulak 2005a, 297, citing Day 1999, 68), whence they very probably made their first journey, containing oil or wine.

Linear B tablets, given that they function only as "system-internal mnemonic texts" (Palaima 2005, 274, n. 15), do not contain information on long-distance trade; the only – indirect – evidence is some references to ship construction and manning of ships or some records of foreign names of commodities or 'ethnic' names of individuals or groups (Palaima 1991). In Malcolm Wiener's view, texts related to long-distance expeditions will have been written on materials other than clay, more suitable for surviving storage over the longer period needed for such expeditions (cf. Wiener 1999).

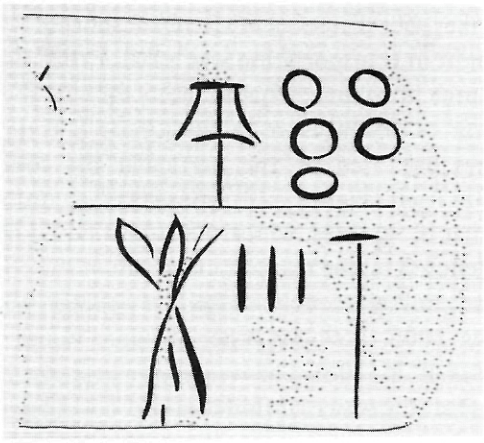

Figure 7.10. The Linear B tablet KN F(2) 853+5947+6035 recording quantities of grain (500+) and olives ((3 and 1/10 +) measured in units of capacity for dry commodities (after CoMIK, vol. I).

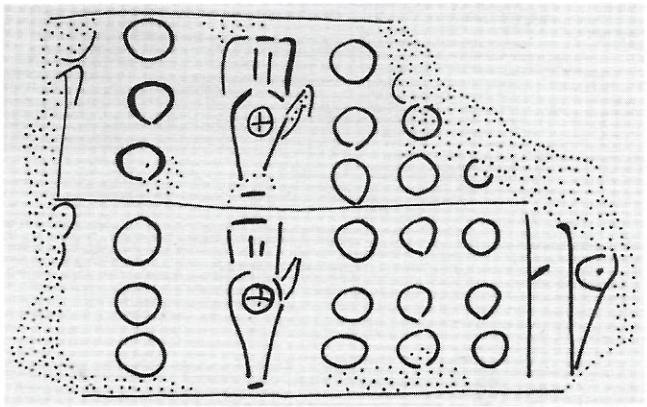

Figure 7.11. The Linear B tablet KN K 700 displaying the account for 1,800 stirrup-jars in two entries of 900 each (after CoMIK, vol. I).

Turning to pictorial evidence, we note that, in spite of the rich repertoire in Aegean wall paintings, there exists no surviving depiction of weighing. This is only partially to be explained by the Aegean avoidance of subjects drawn from everyday activities. The only exception so far comes from a little farther afield, from the island of Cyprus, on a vase from Enkomi (see Pare 1999, 474–476 for a summary of the various views on this depiction). Strangely enough, representation of weighing is also extremely limited in Near Eastern iconography (there are very few on seal iconography: e.g., *OIP* 47, no. 42). On the other hand, however, scenes of craftsmen weighing, accompanied by captions, are abundant in Egyptian iconography, in relation to gold measuring and jewellery making. Weighing tools depicted as being employed in industry were either the large freestanding balance, with balance weights shown nearby, or the smaller portable balance. Such portable balances are also depicted in the hands of traders, as is the case of an Egyptian who receives, either for his own or his master's account, the merchandise offered by a Syrian (in a scene from the tomb of Kenamun, Eighteenth Dynasty: Kemp 1991, 253–254, fig. 86). In this scene it is clear that what is to be weighed by the Egyptian is the product given in exchange, rather than the jar of wine. Thus balance weights were necessary both for measuring the mass of the merchandise offered and for estimating the value of the means of payment in return, presumably consisting here of metal or spices (Kemp 1991, 253; James 1984, 256). It is no surprise that the only mathematical problem presented in the Rhind Mathematical Papyrus referring to weighing (no. 62) deals with this subject of the evaluation of metals (Robins & Shute 1987, 50).

So, we now turn to the importance of weighing activity in the evaluation of commodities. Recalling once more that Πάντων χρημάτων μέτρον ἄνθρωπος

('man is the measure of all things') and that *Χρήματα* (lit. 'money') means 'that of which I am in need' (*ἔχω χρεία*) and thus *πράγματα, ἀγαθά* ('property', 'goods', 'wealth'), we can now proceed to the phrase that *χρήματα δὲ λέγομεν πάντα ὅσων ἡ ἀξία νομίσματι μετρεῖται* ("wealth we call all that deserve to be measured by coins") (Aristotle, *The Nikomachean Ethics* IV, 1,2). Hence the variation in the meanings of the words 'money', 'currency' and 'coinage' becomes comprehensible. In pre-coinage societies, such as the Bronze Age Aegean and its neighbours, we are dealing with the commodities that were in demand, and it has rightly been noted that "what was spreading can be summarized as consumer demand" (Sherratt & Sherratt 1991, 355–356). Certain commodities became trade goods par excellence and they were actually occasionally used as means of payment. The cheapest of these was barley, measured in volume, and the most universally acceptable were metals, measured by weight, with silver serving also as a denominator of value. James rightly points out that even in Egypt, where the barter system involved goods being traded against goods, 'value' came in time to mean 'metal value', which he defines as an almost monetary conception (James 1984, 257).

Anna Sacconi has recently put forward the view that monetary indications are present in some of the Linear B texts (Sacconi 2005). I have also recently suggested that Minoan economy was partly a monetary, albeit pre-coinage, economy. For instance, nonfunctional metal axeheads, in particular when made of precious metals, may have functioned as gifts made by the state in return for services, and therefore as means of payment. Axeheads cut from copper plate, such as those found in the sanctuary of Juchtas on Crete, may have functioned as cheaper forms of currency. In both instances small axeheads are perhaps definable as *sacred* money (Michailidou 2003; 2005, 22, fig. 9).

To return to activities more humble than the estimation of the exchange value of merchandise: many aspects of everyday life would be unknown to us, had not the texts survived. In industry wax, for instance, was weighed:

> *7 minas of wax for coating the doors*

was the amount needed for a matrix (?) for the construction of a bronze door, while bitumen (measured by weight) and whitewash were also used for doors, the latter being measured in volume or weight (1–1½ kg for one door) (Salonen 1961, 115–116). In the Assyrian Lexicon under the entry for 'whitewash' (*gassu*), there is a comment on magic drawings relating to a particular text:

> *with whitewash I drew (a picture of) the Fighting Twins inside the Door* (CAD, *sv gassu*: text: *AoF* XIV 150.215 f)

This recalls the Theran wall painting of the fighting twins (Doumas 1992, Pl. 79), which, located as it is on the upper floor between two doors, perhaps had the semiotic meaning of guarding the entrances to the private room and to the room with the depositories. In the following section we will look more closely at the material and textual evidence from Thera, which will enable us gradually to progress from the tools of measurement themselves as found, to their owners, as hypothesised.

4. Akrotiri on Thera: A settlement case study

Akrotiri was a settlement of an urban character, which flourished around the middle of the second millennium (LM IA), during the period when the Cretan Linear A script and the 'Minoan' metric system of weight were expanding. This site enjoys the advantage of not belonging directly to the Minoan palace system or to the – later – Mycenaean bureaucratic environment. Moreover, a significant quantity of the original household equipment has survived, protected by the layers of pumice produced during the eruption of the volcano.

Regarding the distribution of lead weights in this settlement, several points are to be noted. Apart from the fact that weights have been found in almost every building, there is the particular feature whereby whole groups of weights have been found in the same house, sometimes even in the same room. Such is the case of the West House, where 26 discs were found in the storeroom of the upper floor. This group also incorporates a lead weight of 3 kilos, that is, of the same value as that of the particular Mycenaean unit for wool (LANA). In the same house, the great number of loom weights, over 400, indicates that a weaving workshop functioned on the upper floor. Thus these 26 balance weights may have been used for weighing wool (Tzachili 1990; Michailidou 1990). Tzachili emphasizes that traces of measuring are a strong indication that the producer is not the same person as the consumer, because people rarely count goods if they produce them for their own consumption (Tzachili 2001b, 178). In Tzachili's view, cloth making at Akrotiri was the work of specialized weavers, which accounts for the fact that loom weights are not found in every house (Tzachili 1990, 385). To date, at least three weaving workshops have been identified on the upper story of three houses, whilst in two of them collections of lead weights have also been found (Michailidou 1990, 417–418).[13] Thus

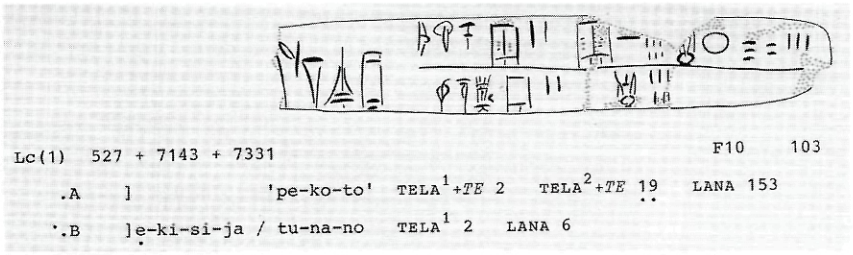

Figure 7.12. The Linear B tablet KN Lc (1) 527+7143+7331 with entries for textiles TELA + *TE* amd TELA *tu-na-no*, followed by the unit of wool (LANA) in quantities required for these qualities of cloth (after CoMIK, vol. I).

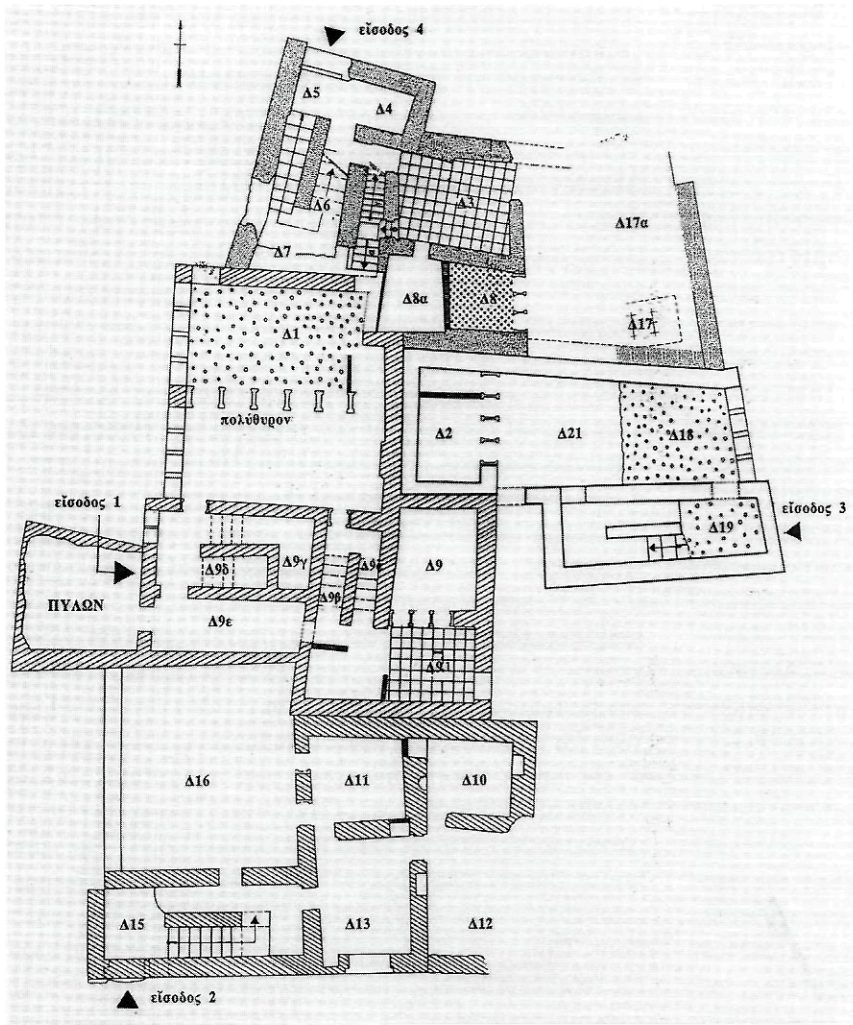

Figure 7.13. The four houses of Complex Delta at Akrotiri, upper floor level (after Michailidou 2001c). The tablets were found in the storeroom below the room Δ 18, in the House with entrance 3 on its eastern side.

cloth producers were able to weigh the raw material for themselves, as they did perhaps in some connection to the type of cloth in demand. The range in quantity of wool needed for particular types of textiles is confirmed by the Mycenaean Linear B tablets. We have, for example, three units of wool (LANA) for the cloth TELA *tu-na-no* or 7 units of wool for the cloth TELA + *TE* (Figure 7.12). Some varieties of cloth are known even from Linear A texts (as TELA + *KU* and TELA + *ZO*), whilst a new unknown variety (TELA + *SE*) is recorded at Akrotiri, attested by Boulotis on the Linear A tablet THE 8 found in one of the four houses of Complex Delta (Figure 7.13). Another fragment of a tablet from the same house records about 46 sheep. It would seem, then, that only the record of quantities of wool, not in any case a frequently attested activity in Linear A, is missing or not preserved (Boulotis 1998; 2008, 82).[14] Boulotis emphasizes the point that, if one were right in supposing that the occupant of this house supplied the wool from his flocks, thereafter receiving and recording the textiles on tablets kept in his own house, this situation would indicate a pre-stage of the *ta-ra-si-ja* mode of production, known to us only from the later Mycenaean archives (Boulotis 2008, 86). Textiles were recorded by numbers on the Linear B tablets (e.g., Tzachili 2001b), as they also were in the fewer instances on Linear A tablets. However, it is in Akrotiri itself that the only record in Linear A of a great number of textiles (200+) has been found. Tzachili has emphasized that evidence for weaving is concentrated in ports. We may then wonder to what extent cloth production at Akrotiri was export oriented.

We may recall here the trade mechanisms of the Old Assyrian traders. A number of the textiles sent from Assur were locally produced in their households, but other varieties, namely, the famous Accadian textiles, were imported to Assur, thereafter to be sent to Asia Minor via the same caravans. In Veenhof's view (Veenhof 1972), production only played a limited role in the trade, which hence consisted essentially of linking separate but somehow complementary markets. In such a case, Akrotiri may also have functioned as a port of entry and transit depot for merchandise arriving from elsewhere, such as Crete, since the occupant of the house with the tablets

was in contact with Crete, as indicated by the sealings, that is, flat-based nodules, on Cretan clay found in the same house. There are reasons for believing that the whole Complex Delta was inhabited by merchants (Michailidou 2008, 247–249; Boulotis 2008):

Lead weights were found in all four houses of this complex, together with three balances in two of the houses (for more detail see Michailidou 2008, 49). Two of the balances are from a basement storeroom with exotic material, that is, two ostrich eggs, and the balance weight of the weight-value of a Syrian mina was also found in this room (Figure 7.5), according to the late Emily Spyridon Marinatos. In another house of the same complex, the heaviest lead balance weight with a bronze handle was found, 15 kilos in weight, to be considered as a half-talent. As pointed out elsewhere, "the concentration of examples of writing observed in at least three out of the four houses in Complex Delta is possibly related to the particular finds in the storerooms of these houses and, in my view, these finds suggest that the occupants may have been businessmen or merchants. These were probably the people who came into contact with Crete (receiving and reading the sealed correspondence) and with other parts of the Mediterranean, as well" (Michailidou 2000–2001 with the discussion on the subject of literacy at Akrotiri). One may also quote the article by C. Michel, "Les marchands et les nombres", in relation again to the Old Assyrian traders, in particular with regard to the letter of a trader's son living and working in Assur, where he is also being trained in script. Evidence for the intellectual equipment required of traders is certain school texts among the Kültepe tablets that deal with problems of equivalence among commodities (Michel 1998).

Besides the involvement of people of the settlement in long-distance trade, we also need to consider measuring in their intracommunity exchanges (for other ways of practical accounting, cf. Tzachili 2002–2003). Though we lack any letters, apart from a temporary note on an 'ostrakon' of unknown purpose (Michailidou 1992–1993), we may expect for Akrotiri something similar to Renger's view for Mesopotamia: "More or less everything that played a role in the daily life of the inhabitants of Ancient Mesopotamia changed hands.... According to the letters, the following goods or objects were bought: barley, flour, oil, beer, dates, and fish, as well as more unusual foodstuffs, – such as wild doves, locust, duck-eggs –, wool, garments, shoes or sandals, oxen, sheep, and a variety of raw materials" (Renger 1984, 102, 106). In Akrotiri, capacity measures certainly facilitated the exchanges of dry and liquid agricultural staples and foodstuffs such as grain, flour, pulses, figs, olives, wine and oil. Such products could be reckoned thanks to the number of standardized pots (studied so far: cf. Doumas and Constantinides 1990; Katsa-Tomara 1990; more recently Younger 2003) and possibly recorded by the Linear A klasmatograms.[15] The heavier balance weights were capable of estimating wool masses, whilst the lighter ones, most probably of stone, may have measured the mass of precious commodities, for example, saffron, as is the case in the Linear B evidence (Figure 7.9), since saffron was gathered in the island itself, as is shown by the evidence from frescoes. A rounded sherd from Akrotiri, which bears – in my view – a postfire Linear A sign and was found in the Mill Room entrance of one of the houses of Complex Delta,[16] may have been a token perhaps functioning like the 'noduli' of the Minoan administrative system (Michailidou 2000–2001, 22–23; Weingarten 1986 suggests that noduli are dockets, i.e., receipts for work done). Abundant quantities of similar rounded sherds, not, as a rule, inscribed, come from various parts of the settlement. They may have been used as counters or tokens for intracommunity exchanges.

5. The owners and users of the weighing equipment

In settlements

To summarize our evidence from Akrotiri: lead balance weights of the Minoan/Aegean standard were found in various situations and locales:

1. They were found in almost all buildings. Thus all inhabitants may have made use of them in relation to activities involving commodities measured by weight (cf. sections 2–3).
2. In certain houses they were found in clusters, along with loom weights, suggesting that they played a particular role in textile production.
3. They were more usually found without the balance. Lead weights may not always have been used on bronze pans, and there may also have been balances of wood or basketry. Alternatively, some bronze balances may not have been left behind by the departing inhabitants. We know from Old Babylonian texts that balances were indeed often included in inherited property.
4. In particular, in the four houses of Complex Delta, weights and balances may be the property of merchants (cf. section 4).
5. Stone weights were also found. They are most appropriate for precision weighing, especially in small-scale

pans. The building called Xeste 3, adorned with the frescoes of crocus gatherers (Doumas 1992, 127 *ff*) and regarded by Doumas as being of a public character, yielded a marble weight possibly representing the imported 'Minoan' standard. Moreover, a half-fragment of a barrel-shaped hematite weight from one of the houses of Complex Delta was purposely adapted to one-third of the Minoan unit (this balance weight is of a non-Minoan shape and material: Michailidou 2006, 238–241, figs. 2 and 3).

Thus the textile producer himself presumably measured the raw material he received and then the product he produced. To gain some idea of the quantities in the chain of production, we will use Killen's results from the Linear B evidence, which, however, cannot be absolutely applied to the data from the Linear A. Since the amount of wool produced per sheep varied depending on gender, culture and time, we can present only a working hypothesis. Thus, with regard to the 46 sheep mentioned in the tablet from Complex Delta, we attempt to calculate the greatest possible production of their wool, based on the four sheep to one LANA ratio of the Linear B evidence: it will have corresponded to 11½ LANA or 34½ kilos, enough quantity for the produce of, for example, 17 *pa-we-a ko-u- ra* (of 2 kilos each). If, instead, we choose the quality TELA + *KU* because this, unlike the previous case, is actually recorded in Linear A texts, then the result will be 11 textiles, of 1 wool unit (3 kilos) each (for the preceding textiles and wool see, for instance, Killen 2001, 172). We do not know the wool amount needed for the newly attested quality TELA + *SE*, or whether indeed these textiles were of wool (Boulotis 2008, 82, refers also to the possibility that they were of silk but ultimately retains the view that they were of wool).

The user/owner of the half-talent balance weight, who was apparently living, or working, in the next house of the same complex, was able to measure by himself, perhaps by means of some wooden balance that has not survived, five units of wool (received from his neighbor?). He could also have measured a half-ingot of copper. A fragment of copper ingot has been found in Akrotiri weighing three kilos. However, a copper half-ingot of 15 kilograms was found at Mochlos, on Crete, another settlement where many balance weights and at least five sets of bronze scale pans were recovered from a variety of contexts within the LM IB community. Coming from the ceremonial centre, several town houses, the artisans' quarters and a rural farmstead, they thus testify, in the view of the excavators, to the role they played in the trade of raw materials and the production and exchange of goods (Brogan 2006; for evidence from the settlement of Poros, Crete, see Dimopoulou 1997). Of the older finds by Sieger, we may also mention here the inscribed lead weight (Figure 7.14), there being a slight possibility, on the basis of Egyptian parallels, that the Linear A inscription may be connected with ownership of the object. Such a hypothesis cannot be proved, of course, and, besides, in the Aegean there was no tradition of inscribing balance weights (Olivier 1989; Michailidou 2001a, 66).

Figure 7.14. Lead weight from Mochlos with incised Linear A inscription (after Karetsou 2000, 136, fig. 17).

In palaces

The invention of standards for measuring goods was the task of central authorities. Thus a stone 'anchor' of the weight-value of a talent from the palace at Knossos is certainly a candidate for identification as an official weight standard (Petruso 1992, Pl. 7, no. 73; Michailidou 2001a, and references therein). Since no evidence of the weighing process itself exists in the palatial Mycenaean archives, we turn to the examples in Egyptian iconography, where at least two persons are involved: the specialist(s) who deals with the function of the balance and the scribe reckoning the result. An official depicted on a large scale, who is the owner of the tomb, is frequently found inspecting the process as part of the various economic activities for which he is responsible. In the view of Vercoutter, the title *the Scribe who counts the Gold* is applied to either a person working in workshops or one who is participating in the pharaonic expeditions to gold mines. Graffiti such as *the scribe who counts the gold Anupenhab* complement captions such as *the scribe who counts the gold Harnufer* found placed over the head of the scribe in the painting from the tomb of Huy, viceroy of the Pharaoh in Nubia (Vercoutter 1959). When a weighing scene is subsequently depicted in the ideological domain (Faulkner 1985, 34), the god Thoth takes the place of the scribe and the god Anoubis the place of the balance specialist, while 14 gods

and goddesses are depicted witnessing the judgment (Vercoutter 1959; Michailidou 2000a, fig. 28).

More information on persons participating in weighing in the palace environment is to be gained from texts from Mari. The following are recorded as participating in a proper weighing process:[17]

1. One or two specialist/s in handling the balance, usually a worker in precious metals or possibly an administrator (Joannès 1989, 127–128, nn. 63–64).
2. The scribe reckoning the result, who was only a specialist in script. He gives various details of the process of weighing, for instance, the occasional use of a counterweight.
3. One or more persons, named *ebbú* (translated in French by Cecil Michel as the 'Prud'Homme'), are on occasion mentioned as supervising, with a view to ensuring the exactness of the weighing process.

We learn from these texts that the heavier weights used were made of lead, which is so commonly found in the Aegean, although not present in the archaeological record from Mesopotamia (cf. also Ratnagar 2003, 84). The highest weight-value mentioned for a balance weight is 10 minas (5 kg); the highest quantity weighed is 25 minas (12.798 kg). For weights greater than this, a second weighing, a third, and so on, were performed, while the lightest quantity weighed is 135 grains (6.21 grams).

We also learn about the origin of some of the balance weights. We hear of "weights of the royal service", "weights of the market", in one case "weight of the sanctuary" and weights of certain named persons. When traveling, the king of Mari took with him both balances and weights and the balance specialists themselves, who were more probably jewellery makers. During the journey (e.g., to Ugarit) they weighed the precious objects given or received. Balance specialists and their tools are also following the Mari army to Babylon. Exactness in weighing, to a degree of one shekel, was required at all stages of metal technology and was also regarded as indicative of the "valeur morale d'un fonctionnaire". This thus accounts for why the origin of the weights is mentioned (that is, whether it belongs to the royal service or not) and the presence of the *ebbú* ('honest men' or connoisseurs) is required (Joannès 1989, 127, n. 62).

The funerary context

Any attempt to conceive the meaning of weighing tools in tombs always leads to consideration of the semiotic or/and symbolic role of such tools. They were deposited in both male and female burials and were most common during the LH II, LH II-III in the Mainland and LM III in Crete (Alberti 2003). The most frequent find is the balance. Only in three or four cases is this found along with weights, although few tombs have produced only weights. The balances are carefully made and functional, and, in Alberti's view, the wide dimensional range of the pans (4.5–17.7 cm) indicates the ability to weigh masses from less than 15 grams to ca. 3 kilos (Alberti 2003). They are generally found in well-defined tombs with fairly rich grave goods. According to Pare, "it is most likely that they generally did not enter the graves invested with any profound symbolic meaning, but instead comprise elements of the deceased's personal possessions" and this leads him to the interesting conclusion that "scales and sets of weights were possessions fairly common among high status individuals in the Aegean between the 17th and 12th cent. B.C.... These people do not seem to have had a specialist function: craftsmen's tools are not found among the grave-goods, and there is no evidence for specialist merchants in the Bronze Age Aegean" (Pare 1999, 474–476). As will be considered at the end of this chapter, I think that some of these persons may have performed specialist functions. However this may be, Pare's view of them as owners of measuring tools is certainly very important.

On shipboard

Weighing tools from wrecks are "of great value due to their contemporaneous use as functioning sets within related commercial context at the time of the ship's sinking" (Pulak 2006, 47). At the same time they are more difficult to interpret, since "every item found on a ship was carried onto that ship for a purpose" (Bass 2006, 85). The explanation suggested by Bass for the Cape Gelinodya wreck of the 12th century, that it may have belonged to a private trader, a species of an itinerant smith using the 65 balance weights found on board, mostly based on a Syrian standard (Bass 1991, 73), may be consonant with the explanation offered by Stieglitz for the presence of length-measuring instruments of the itinerant architect on board a fifth-century BC ship (Stieglitz 2006, 203). Of the 151 balance weights from the Uluburun wreck, at least seven sets (of which four display sphendonoid and three domed weights) were based on the current Syrian (and Cypriote) norm of ca. 9.3 grams. Two additional sets based on a unit mass of 7.4 grams and 8.3 grams were also present. Three pairs of scale pans were found, one or two being inside a wooden box (Pulak 2000; also 2005b). Thus, at least three merchants, possibly four, who may have been Syrians or Cypriots, will have been aboard the ship, in Pulak's view,

each one being equipped with a sphendonoid set for accurate weighing of small valuable commodities, and one domed set for weighing bulkier merchandise. Pulak suggests that the merchants on board used their weights at the ports in order to estimate the value of the items received in exchange for the merchandise they delivered (Pulak 2000). However, in the Egyptian painting depicting the Syrian traders, we apparently see the opposite, if, of course, we take the depiction literarily (as the bibliography stated does) and provided that the balances here are not confined to a semiotic role, intended to underline the role of the holder as trader. Pulak further suggests that two Mycenaeans on board "acted as emissaries or envoys, accompanying a cargo of reciprocated 'gift exchange' to the Aegean" and that "they may have been the 'messengers' of ancient literary sources, returning from a 'diplomatic' mission to the Near East", naturally causing one to reflect upon their possible position in the palatial administration (Pulak 2005a, 308). He rejects the idea that they are merchants, because as merchants they would have carried their own balance weights. We are immediately confronted with the amorphous problem of how to define a Bronze Age merchant in the Aegean.[18] Thus we raise here two points for further discussion: a) On Homer's definition these Mycenaeans may have been called *émporoi*, the term primarily meaning "passengers travelling on a ship they do not own," and b) these two persons perhaps need not have carried with them on board the so-called Aegean standard weights, because any accurate weighing of the merchandise that employed the home standard will have taken place at the port of destination,[19] as has been convincingly suggested for the estimation of weight of the copper ingots (Zaccagnini 1986; Pulak 2000, 138).

Questions for further research

From this review of the evidence, the current discussion on weight metrology and relations of production evidently leads to some further questions regarding the Aegean era:

> Should we look for the use of state balance weights as against others, such as 'weights of the Market' or 'weights of the Land' (in Old Assyrian texts: Zaccagnini 2000), and to what extent would the privately owned weights have been acceptable in transactions related to the obligations to the central authorities?

In Egyptian pharaonic art and in particular in the Mari Archives relating to metals, we have remarked upon a division of labour between the person operating the balance and the scribe recording the result, together with the person(s) of higher rank inspecting the process, with a view to guaranteeing the result. The scribe is not named or even mentioned in the Linear B tablets, but is attested palaeographically. If the scribe is not the one, who then would have been the balance specialist? On the basis of the Mari evidence, it may have been the metal worker in precious metals, for instance, a *ku-ru-so-wo-ko*, or any experienced metal worker, since the virtues required for such a job are experience and loyalty.

In such a case, in response to Pare's remark that the persons buried with weighing tools do not seem to have had any specialist function, one might suggest that they were 'specialists of the balance'. Some of them were of a certain status (and in possession of the balances) and therefore seem closer to the conception of the connoisseurs on the Mari tablets.

If Dimitris Nakassis is correct in suggesting that among the *ka-ke-we* of the Mycenaean tablets there were persons of high status participating in the palatial economy, sometimes acting as entrepreneurs in the acquisition of foreign raw materials (Nakassis, forthcoming), they would perhaps be the appropriate persons to escort royal expeditions under the pretext of 'royal gifts', in particular when metal (either as raw material or prestige items) was the merchandise in demand, as was most often the case.

The Mycenaean envoys on the ship of Uluburun have been regarded as not being merchants on the grounds that the balance weights on board do not fall into the Aegean system. Perhaps, however, we should recall that at this time other systems were also functioning.[20] Apart from Ugarit, where five metric systems of weights were in use at the same time (Courtois 1990), there is Petruso's suggestion that some of the balance weights from Boeotian Thebes are based on another standard of 9.65 grams, not so far from the 9.4 and 9.3 standard of the weights on the ship (Petruso 2003). To quote also Alberti and Aravantinos: "the evidence of Thebes illustrates the cohabitation and the combination of shapes and standards of different weighing traditions ('Minoan', 'Mycenaean' and Levantine) in a Mycenaean palatial centre" (Aravantinos & Alberti 2006, 310–311). If, for the sake of argument, Thebes was the final destination of the ship's load, could the commodities have been checked on arrival by the same Levantine/Syrian standard? In any case the inhabitants of the Aegean were not ignorant of the Syrian standard, as a consequence of the spread of the Syrian mina (Zaccagnini 2000).

From Near Eastern texts we do hear of the merchant who carries his own balance weights in his leather bag. Would, however, these weights always have been those

of his *home* metric system, if they accompanied him on a journey to procure merchandise from lands employing another metric system? A *merchant* of Ur receives copper in Dilmun measured by the Dilmun weight, although, when he is back home, the amount is converted according to the Ur standard (Roaf 1982). The Syrian/Cypriot standard was the dominant system of the lands where the ship was loaded (lands where the other two standards attested aboard were also in use).

In our search for merchants, we should recall that their status need not have been the same everywhere and throughout time.[21] The fact that this trade is not specifically mentioned in the Linear B tablets probably indicates that in the Mycenaean era there was not a permanent division of labour in this domain.[22] I agree with Pulak that the Mycenaeans on board may have acted as messengers,[23] perhaps like the Cretan who acquires tin at Ugarit, as reported by a well-known tablet from Mari. They could have been, however, of any profession that gave them the required ability and knowledge, in particular with regard to *guaranteeing* the quality of the royal gift, perhaps as connoisseurs under the aegis of the ruler expecting the gift, and possessing a status similar to that of the *ebbú* as mentioned in the Mari tablets (Michel 1990). For, in Michel's view, the *ebbú* are the experts in the domain in which they operate. They know the techniques used by the artisans in weighing and are trained in calculations relating to the estimation of value of the transported merchandise, and they are also able to convert values between different systems of measure. Thus, when one such person goes to estimate a load of tin arriving by caravan, before King Zimri-Lim is to receive it, he is defined by Michel as "acheteur officiel du palais de Mari", therefore "un marchand" (Michel 1990, 212).[24] We should add also that any expert was nominated by the king for a certain task or a certain period, and, more importantly, that he was very seldom acting alone. In fact, very frequently two or more names are recorded as *ebbû* appointed by the king for the same task, which means that the presence of *two* Mycenaeans might be justified in the conduct of such transactions. The *ebbû* were also sent to act as arbitrators and their high status seems to have been of the level of the high rank ascribed by the excavator to the Mycenaeans and some of the Syrians aboard.[25] Do we perhaps have specially appointed experts/arbitrators from both ends of the journey made by the royal gift? In such a hypothesis, the absence of the 'Aegean' system – only one among the metric systems of the time – is perhaps not the decisive factor in our attempt to define the role of the messengers aboard the ship.

NOTES

1. According to Valbelle (1977) they were used '*pour une opération particulière*', as, for instance, for checking the weight of a bronze tool returned by one of the workers.
2. Colin Renfrew has defined the study of weight metrology as one of the tasks of the so-named archaeology of the mind: Renfrew 1983. See also Renfrew and Zubrow 1994.
3. For more on this subject see Michailidou 2000a.
4. The metrological organizers should have the ability of combining three factors: the numerical system at use, the heaviest load in practice and the mean value of the weight of the grain of barley (the lightest unit of the Mesopotamian system): Powell 1971, 209; Thuraeu-Dangin 1921.
5. We must note here that the Vapheio balance as displayed in the National Archaeological Museum at Athens is not intact but partially reconstructed, as I have been kindly informed by Dr. Lena Papazoglou.
6. In Linear A tablets *HT* 12, 24*β*, 38 and *KN* 2: GORILA V, 273.
7. With a distinction among the Early Mycenaean (closer to Minoan or Syrian units) and Late Mycenaean (perhaps closer to the Hittite unit).
8. We need not enter here into the subject of the 'marketless economy' (cf. more recent discussion in Clancier, Joannès, Rouillard & Tenu 2005) since even then, the activities involved in distribution, reciprocity, etc., would also require measuring.
9. The fundamental work on this subject is Duhoux 1976.
10. For this reason there is a view that *o-no* in the Linear B tablets might refer to donkey loads, but this view is not widely accepted and this word is currently connected with the concept of buying: cf. references cited in Michailidou 1999 and Sacconi 2005.
11. As was the rule for immediate neighbours to the east; to quote here Michel 2006, 7: "Tel est le cas des céreals généralement commercialisées en sacs et en jarres, de contenance standard. L' usage de ce système dans la documentation paléo-assyrienne semble de pratique courante pour tout compte d' objets ou de produits definies par une seule unitée. L' emploi d' une système decimal reposant sur un principe additif en Anatolie et en Syrie du nord rappelle la notation numérique minoenne contemporaine attesté par le linéaire A. Le systeme adopté plus tard par le hittite hiéroglyphique est identique".
12. The Syro-Canaanite jars from the Uluburun wreck fall into three distinguishable clusters of about 26.7 litres., 13 litres and 6.7 litres (Pulak 2001).
13. In the third weaving workshop, the excavation has not advanced in lower levels, so there is a small chance lead weights will appear in the future.
14. See also Michailidou 2008, 255–257.
15. One may agree with Perna (2003, 346) about the use of the same fraction to denote the volume of either a liquid or a dry material or a commodity's weight. With regard to the Phaistos tablet PH 8, to agree with him about the use

of fractions to denote the weight of the vessels registered would also imply that the metal vases recorded were standardized by weight and not by size, in itself a very important notion (cf. for the Mycenaean vases: Michailidou 2001b, Table 2). So, it is particularly important that the fraction inscribed before firing on a small jug from Mallia is regarded by Pelon as a sign of a unit of measure of capacity, because, since this jug is of clay, in this case we may be sure that it is not the weight that is meant by it (as also Perna 2003, 346).

16. Michailidou 2000–2001, 11–13. It must be pointed out here that like the weaving workshops, mill installations were not present in every house, the latter being a more important factor since in this case we are dealing with fixed architectural elements that indicate a primary space function: Michailidou 2001c, 379–380.
17. The whole paragraph here is based on Joannès 1989.
18. For more on the subject of merchants see Michailidou 2000b and in particular Michel 2005, 128.
19. Pulak himself ends his article on balance weights with the following: "On reaching the port of destination, the cargo and other merchandise would undoubtedly have been subjected to precise counting and reweighing with weights based on the Aegean mass system" (Pulak 2000, 264).
20. During the Late Bronze Age the integration of the weighing systems is almost complete, especially in the Levant: Alberti & Parise 2005, 381–382 and references therein.
21. For instance, the term *tamkārum* is not used for an official function in Old Assyrian evidence (contrary to Old Babylonian or Nuzi evidence): Michel 2005, 128.
22. For more remarks on the name of the profession see Michailidou 2000b.
23. 'Messengers' are occasionally synonymous with 'merchants' in letters of Amarna, sent by the king of Alashiya (e.g., indicatively Bachhuber 2006, 551 with references).
24. There are also cases of his being not a specialist but an eminent person who was a reliable arbitrator.
25. Pulak (2005a, 296 and 309) ascribes the highest-ranking position in the palatial administration to the Mycenaean envoys and ascribes an elite status to the Syro-Canaanite (or Cypriots?) merchants.

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