Minoan Crete (Map 5).

Shortly after the beginning of the third millennium B.C., those Cretans known as Minoans made their first appearance in the island which was to be their undisputed territory for over a thousand years, and in which some of their descendants are surely living yet. Theirs was to be one of the most spectacular of all ancient civilisations, and their achievements in the fields of art, architecture, jewellery and pottery are so impressive that, although the evidence for it is less direct, it is no surprise to find that they also excelled in the production of textiles.

This evidence consists chiefly of tools, many of which are quite different from those of the preceding Neolithic period, suggesting that the newcomers were from somewhere beyond the shores of Crete. They probably arrived with spinning and weaving techniques already well-developed, for their earliest settlements bear witness to cloth production. The E. M. II site of Kyrtos, already mentioned for its possible facilities for scouring, dyeing and fulling (page 59 ff. above), also possessed whorls and loomweights in numbers which were at least sufficient to supply its own needs, and perhaps also a small surplus for export. 1

Although spindle whorls are not as numerous as might have been expected, loomweights occur in almost every Minoan settlement, great or small, in numbers which suggest a textile

industry so thriving that it may well have contributed considerably to the island's wealth.

Nor was it mere quantity that was being produced. Figurines indicate that even in the earlier periods Minoans were fond of gaily patterned clothing, while the frescoes of later times leave no doubt of it.

The renown of these textiles apparently extended beyond Crete. In the Late Bronze Age, if not earlier, looms equipped with a Minoan type of weight were being used in the Cyclades, on Rhodes, and even in some parts of the Greek mainland, while the complex designs on the kilts of the 'Keftiu' were carefully detailed on wall paintings in Egyptian tombs; significantly, the 'tribute' they carried included pieces of cloth.

The classification of Minoan textile tools is hampered by the usual problems of dating and terminology. Two systems of terminology, recording the same sequence of events, are at present in operation. One is the traditional tripartite division into Early, Middle and Late Minoan, with appropriate sub-divisions and sub-phases of sub-divisions. This system has some disadvantages: E. M. I and II are relatively distinct, but the division between E. M. III and M. M. Ia is not always clear, and it was in this early part of the Middle Minoan period that the first great palaces arose. M. M. Ib continues until M. M. III at many sites, M. M. II being chiefly confined to Knossos. M. M. III saw the rebuilding of the palaces after a major catastrophe. This means that both the first and second palaces had their origins
in the middle Minoan period, and minor objects are often
classified as merely middle Minoan, without any indication as
to whether they belong to the earlier palace period, or the
later. The excavators' task is probably made difficult by
the fact that the new buildings were often established on
the ruins of the old. L. M. ia and L. M. 1b are well-defined,
with many sites finally destroyed in L. M. 1b. L. M. II
represents a hypothetical but generally accepted period of
Mycenaean rule at Knossos. Although there is disagreement
over its subdivisions, L. M. III usually represents post-
destruction reoccupation or building.

The more recent scheme, proposed by Professor
1
Platon, divides the Minoan period into four phases; pre-
palatial, protopalatial, neo-palatial, and post-palatial.
This is both logical and convenient - but most of the sites
relevant to this thesis had been excavated before he pro-
posed it. For this reason it will be necessary to adhere
largely to the older terminology.

Fortunately none of its anomalies causes too much
difficulty in the present case, for some tools were used
throughout the Minoan period, showing little or no change,
while others appeared for a shorter time, which can usually
be clearly defined.

a) Spindle Whorls.

The most interesting thing about Minoan whorls is
that there are so few of them. Clay whorls in a variety of

types were used throughout the period, and a few bone, ivory, and possible stone whorls have also been found, but their numbers would seldom have been adequate to supply all the thread needed by the island's many looms at any one time.

There are two possible explanations for this. One is that the thread was spun out in rural districts and brought into the settlements only for weaving. The other, and more likely, is that Minoans made their whorls from a perishable substance such as the wood used today. Wood-carving, and perhaps even a lathe, might well have been within the scope of Minoan ingenuity.

1) Clay Whorls. One of the very few E.M. I settlements so far excavated, Debla in the White Mountains of West Crete, had two whorls amongst the débris of jugs, basins and stone tools found on the floor of its largest building. They had been carefully formed from the same clay as the jugs. One was a slightly rounded conical shape, and the other, which bore traces of a reddish slip, was biconical (Fig. 41a, b). Another whorl of this very early period was a conical one of "bucchero" found in the cave at Arkalokhori. Two possible sub-Neolithic whorls, one biconical and one a very low, wide cone, are published from Kastellos, a settlement on a hill above the Lasithi Plain.

The E. M. II settlement of Myrtos produced the

1. J. Tzedakis and Peter Warren, A.A.A. Vol. V (1), 1972, pp. 66 - 72. The whorls are not mentioned in this preliminary report, and I should like to thank Dr. Warren for allowing me to include them in the thesis.
2. J. Haszidakis, B.S.A. Vol. XIX, 1912-1913, p. 42, Fig. 4m.
3. H. W. and J. D. S. Pendlebury and M. B. Money-Coutts, B.S.A. Vol. XXXVIII, 1937-1938, p. 55, Fig. 23 (10).
largest collection of Minoan whorls yet published. Four clay whorls came from the site’s earlier, E. M. Ila phase, and twenty eight from its later, E. M. IIb phase, or from mixed contexts. Between them they exhibited every basic Minoan whorl shape: straight-sided, convex-sided and concave-sided cylindrical; truncated conical; symmetrical and asymmetrical biconical; spheroid; and flat discoid. The cylindrical types predominated, twenty two being in this category. Five were truncated conical, four biconical, one spheroid, and one discoid. The whorls from the earlier, Ila phase, were cylindrical and biconical types. (Pl. XLa, b, c top centre).

Three of the whorls were decorated with, and twelve others showed traces of red, reddish-brown or dark brown paint. A cylindrical whorl from the earlier phase, No. 26, must be one of the prettiest whorls found in the Bronze Age Aegean. It is covered with orange-brown paint except for a central reserved band, on which are painted solid circles (Pl. XLc, top centre). Two whorls from the later phase are decorated, the biconical No. 157 with red-brown rings round each end, and a paler band round its circumference (Pl. XLa, centre), while the truncated conical No. 151 bears both traces of red-brown paint and four pairs of vertically-incised lines (Pl. XLa, right).

The Myrtiot whorls are of fair size, with an average diameter of just over four centimetres; and the diameter

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1. Peter Warren "Myrtos", 1972, pp. 215, 228 - 229, Figs. 99, 100, Pls. 73 E, 77 F, 78 A.
2. The site was occupied only in E. M. Ila and b.
3. Peter Warren 1972 op. cit., p. 215, Fig. 99, Pl. 73 E. See also ibid., I.L.N. 17th Feb., 1968, pp. 26, 27.
4. Peter Warren 1972 op. cit., p. 229, Fig. 99, Pl. 78 A.
5. Peter Warren 1972 op. cit., pp. 151, 229, Fig. 100, Pl. 78 A.
range of their holes (circa 0.4 - 0.8 cms.) indicates that they were designed for spindles of a size similar to today's.

A few other Early Minoan sites have produced an occasional whorl. Two came from Krais, north of the Lasithi Plain. One was biconical, the other plano-convex, with diameters of 4.0 and 3.4 cms. respectively. A small, flattened spheroid whorl was found at Kastri near Palaikastro in East Crete. Two were picked up at Melidhoni and Vira Episkopi, unexcavated sites where the surface sherds were predominantly Early Minoan; the Melidhoni one is a truncated cone, the Vira Episkopi example, flattened spheroid, and both diameters are in the 4.0 - 5.0 cms. range. There are four small, flat discoid whorls (diameters 2.0 - 3.0 cms.) in the east apothekos of Herakleion museum, labelled as having been found between two tholoi at Koumasa, which makes an E. M. I - M. M. I date likely; but they do not appear to be mentioned in Xanthoudides' report. Three whorls found in trials on the Kastellos hill above Lasithi were of E. M. I - M. M. I date, biconical, and 3.5 - 4.0 cms. in diameter.

Very few Middle Minoan whorls have been published. A small, biconical whorl (diameter 3.0 cms.) was found outside a house doorway in the lower stratum at Stoul Kouse in the Mesara, so probably belongs to the period of the

1. S. Marinatos, Delton Vol. 12, 1929-1930, p. 121, par. 45, Fig. 19.
2. L. H. Sackett and M. R. Popham, B.S.A. Vol. 60, 1966, p. 305, Fig. 19, No. 43.
3. Sinclair Hood, Peter Warren and Gerald Cadogan, B.S.A. Vol. 59, 1964, pp. 58 - 59, Fig. 7, nos. 1, 2.
4. S. Xanthoudides "The Vaulted Tombs of Mesara", 1924, p. 49.
6. S. Marinatos, Delton Vol. 9, 1924-1925, pp. 69, 73 - 74, Fig. 105.
palaces. A plano-convex one from Zakro may also be from this era. Five whorls of probable or certain M. M. I - III date came from Kastellos. Two were biconical and carried a ring of incised dots, a decoration reminiscent of the Neolithic period. The others were plain biconical, thick flat discoid, and rounded cylindrical or globular; their diameter range was 2.5 - 4.4 cms. The same report mentions "a few whorls" found in an M. M. IIIb/L. M. ia house at Sklavokampos near Tylissos. Two L. M. 1 whorls from Myrtos-Pirghos, a site on the south coast, four kilometres west of Myrtos (Fournou Korifi), were of the same types as the two last-mentioned Kastellos ones (Fig. 41c, d). An L. M. 1b discoid whorl from Zakro was again decorated with incised dots. Two whorls found in L. M. III buildings at Hondrou Viannou were also of the discoid type.

"Many spindle whorls - some of clay, the majority of steatite" were found at Gournia. It is quite likely that steatite whorls were not used for spinning (see below, page 441 ff.), and it is not clear whether the descriptions in the text refer to steatite or clay whorls. Neither numbers nor period are given. Although Gournia was founded

4. H. W. and J. D. S. Pendlebury and M. B. Money-Coutts 1938 op. cit., p. 55, Fig. 23, No. 22, Pl. III (3), No. 22.
5. H. W. and J. D. S. Pendlebury and M. B. Money-Coutts 1938 op. cit., pp. 55, 65, Fig. 23, No. 37, Pl. III (3), No. 37.
7. I should like to thank Mr. Gerald Cadogan, director of the Myrtos-Pirghos excavations, for allowing me to include these whorls in the thesis.
Early Minoan period, and there was some L. M. III re-
occupation, most of the site's remains are L. M. I, and
therefore the seven clay whorls stored in the west apotheke
of Herakleion museum may belong to that period - but of
course there is no certainty of this. Two are biconical,
three low biconical, and one is a small, flattened spheroid
type (Fig. 41f, g). The biconical whorls have a diameter
range of 4.0 - 5.0 cms., and one of them is decorated with
incised lines raying out from the hole. The seventh whorl,
a very low truncated cone with a slightly rounded profile,
has circles which look as though they have been impressed
with a thick reed (Fig. 41e).

In the same apotheke there is a whorl from Palai-
kastro. Its form is that of a sphere flattened top and
bottom, and its convex sides are adorned with closely-spaced
vertical incisions, which bear traces of red paint (Fig. 41h).
A piece of wood or bone is preserved in its hole, possibly
the only fragment of a Minoan spindle now in existence (see
below, page 272). It is not possible to date the whorl;
Palaikastro was occupied from E. M. I to L. M. III, with
1 M. M. Ia and b, and L. M. I remains predominant.

The sub-Minoan settlement of Karphi above the
Lasithi Plain provides an interesting contrast with the
earlier sites in the matter of clay whorls. Seventy
cylindrical whorls were found, many made from broken kylix
stems; twenty eight conical whorls; seven biconical, one of
which bore impressed dots; and two "bell-shaped" whorls.

1. L. H. Sackett and M. R. Popham, B.S.A. Vol. 60., 1965,
p. 249 for the period of the site's occupation. The whorl
is an unpublished one from the earlier excavations.
2. H. W. and J. D. S. Pendlebury and M. B. Money-Coutts,
The types of site in which clay whorls are found are worth noting. Debla was three small buildings and the remains of a fourth. Myrtos (Fournou Korifi), Gournia and Kastri were provincial settlements, Kastellos a settlement or perhaps only a couple of houses. Sklavokampos was a large country house; the Myrtos-Pirghos whorls came from the outbuildings of a country villa; the Stou House site was a middle Minoan house. Only Palaikastro perhaps merited the title of town.

The relationship between the palace sites and clay whorls is interesting, for their numbers do not increase in proportion to the populations of these larger centres. In the palace buildings proper, in particular, they are seldom or never found. Only a few are mentioned in the reports on Kato Zakro, a site with otherwise overwhelming evidence for a textile industry; no Minoan ones seem to be recorded in the publications of Phaistos and Mallia; and, most striking of all, in the six thick volumes of the "Palace of Minos", not one post-Neolithic whorl is mentioned.

It is unlikely that this apparent dearth of clay whorls is owing to lack of publication. The apothekes of Herakleion museum contain box after box with Minoan loom-weights, but spindle whorls are rare.

The obvious implication is that clay whorls, while sometimes used in provincial settlements and country houses, were not favoured in the palaces. Either the great ladies who inhabited the latter were, like the weaver of Fife's wife, too 'gentle' to spin, or they demanded whorls of a material more elegant than clay.
It is difficult to draw valid general conclusions from so small a body of material. Biconical shapes were common, as they were throughout prehistoric Greece (except the Early Bronze Age Peloponnese). The cylindrical types so favoured at Myrtos (Fournou Korifi) had one or two Late Minoan representatives, and so probably continued to be used throughout the Minoan period; their predominance at sub-Minoan Karphi is interesting. Flattish whorls, sometimes straight-sided so that they are like very low cylinders, sometimes rounded in a flattened spheroid shape, were again found in both Early and Late Minoan times, and therefore were presumably used in Middle Minoan Crete also. Conical whorls do not seem to have been popular after the Early Minoan period. Diameters usually fall within the 3.0 - 5.0 cm. range. While there are no parallels so far for the painted patterns on the Myrtiote whorls, traces of paint are not uncommon, and incised decoration, sometimes quite original, was also used. It is probably fair to say, however, that the majority of the whorls were plain.

Although the biconical and discoid shapes, and simple incised decoration were used at Neolithic Knossos, and may represent some continuance, the other Minoan whorls are not reminiscent either of earlier Cretan whorls, or of whorls from elsewhere in the contemporary Aegean. This statement is reinforced by the fact that after the Early Minoan period, most Minoan whorls are unlikely to have been made of clay.

2) Bone, Ivory Whorls. Bone and Ivory are materials that naturally suggest themselves as alternatives to clay, and both survive the ravages of time quite well, but very few such whorls have been found. One ivory whorl came
from Krsi, and one from Sphoungaras in East Crete. Several bone whorls are recorded from Mallia, two of them decorated.

3) Stone Whorls and Discs. Flat, centrally-pierced stone discs have been found at a few sites, and are sometimes classified as whorls; and those that are over two centimetres in diameter, and have a central hole large enough to accommodate a spindle, may have served that purpose. Such a one is the maroon schist disc reported from Myrtos, but other discs from the same site are probably too small. Four steatite "whorls" found in an Early Minoan 'vaulted tomb' at Kounama in the Mesara plain, which are said to have one flat and one convex side, may just possibly have been used for spinning, though they are small (diam. 2.0 - 2.5 cms). A flattish steatite whorl is known from Krsi, and flat discs are mentioned at Gournia, although it is not clear whether they are of steatite or clay. A small, conical limestone whorl was found in house Z at Mallia. Karphi, as well as having over a hundred clay whorls, produced two flat limestone discs, and five cylindrical, one biconical and seventy-three conical steatite whorls.

These steatite 'whorls', usually conical or truncated conical in shape, seem to make their first appearances in or near the Early Minoan 'vaulted tombs' of the Mesara. The

1. S. Marinatos, Delion Vol. 12, 1929-1930, p. 123, par. 53, Fig. 16.
3. J. Deshayes and A. Desseigne, Mallia Maisons II, 1959, p. 73, Pls. XXI, 2, 4; XXX, 2.
5. Peter Warren 1972 op. cit., p. 230, Fig. 100, Nos. 161 - 164, Pl. 73E, top left and right.
6. S. Xanthoudides "The Vaulted Tombs of Mesara", 1924, p. 49, par. 4, Pl. XXXII, Nos. 870-873. The illustration is not helpful.
7. S. Marinatos 1930 op. cit., p. 121, par. 48, Fig. 15.
9. J. Deshayes and A. Desseigne 1959 op. cit., p. 73, Pls. XXI, 2; XXX, 3.
plano-convex ones from Koumab have been mentioned above (previous page); those from Early Minoan Porti look conical in illustration; those from an early Middle Minoan context at Kalathiana are certainly the orthodox shape. Xanthoudides' opinion that these objects were "small for spindle whorls, and may have been buttons or pin-heads, or even pendants" is worth noting. Two steatite whorls were found at Tylissos, and the majority of Gournia's whorls were of this material. They were also placed in Late Minoan cemeteries, as at Episkopi and Phaistos. As already noted, they continued to be necessary in sub-Minoan times at the settlement of Karphi.

The connection or otherwise of these objects with textiles will be discussed in the chapter on the Late Bronze Age, as they were found in great numbers in the later Mycenaean tombs. It is only necessary to note here that they originated in Crete in the Early Minoan period, and while useful in settlements, were also very suitable as grave goods.

b) Spindles.

An early publication of tombs in the Aghia Triadha - Phaistos vicinity illustrates a cylindrical ivory object of the right size and shape for a spindle (Fig. 54a). The insertion of a bronze pin up its centre, and the carving round the unbroken end recall an ivory spindle which was found, complete with whorl, in a Late Bronze II tomb at Megiddo.

1. S. Xanthoudides "The Vaulted Tombs of Mesara", 1924, p. 69, Pl. XXXIX, Nos. 674, 675.
2. S. Xanthoudides 1924 op. cit., p. 87, Pl. XLVIII, middle row.
3. S. Xanthoudides 1924 op. cit., p. 49 - see also p. 69.
4. J. Hazzidakis, A.E. 1912, p. 217, No. 16, Fig. 26.
5. H. E. Hawes "Gournia", 1908, p. 31.
7. Luigi Savignoni "Scavi e Scoperte nella Necropoli di Phaestos", 1905, p. 111, paras. 40, 41, Fig. 76.
8. Luigi Savignoni 1905 op. cit., p. 45, Fig. 33.
Israel. Ivory spindles are also known from the late Mycenaean cemetery at Perati (see below, page 439 ff). The excavator of the Phaistos specimen, however, suggested that it might be a mirror handle. The scrap of spindle stuck in the whorl from Palaikastro has already been mentioned (page 268 above), and no other examples are known.

c) Spinning Bowls.

Spinners in ancient Egypt and Palestine are thought to have sometimes used an accessory known as a spinning bowl. This was a shallow, open bowl with from one to four interior handles, which were often grooved on the underside as though worn by the passage of thread. Bowls with several handles, which are the more usual, would have been useful for preventing the separate strands from tangling, and for helping to preserve an even tension, during the doubling process (see page 78 above), while the rarer, single-handled bowls may have been used to contain a rove (see page 71 above), which would have been kept in order by being passed under the handle and up to the spinner. The containers illustrated in Figs. 4 and 5 may well be schematic representations of spinning bowls.

Bowls like these were found at several Minoan sites. Some came from an Early Minoan tholos tomb in

1. P. L. O. Guy "Megiddo Tombs", 1938, pp. 170-171, Fig. 175, Pl. 84, 1.
the Mesara, and another is known from an M. M. I tomb in the same area. Two single-handled examples, one almost complete, the other fragmentary, are among the many finds which suggest that the making of textiles was an important occupation at Myrtos (Fournou Korifi) (Fig. 54b).

These bowls supposedly originated in Egypt, where they were used from the XIth to the XXIst Dynasties, and spread to Palestine, where they are found from the Late Bronze Age to the seventh century B.C. As the latter part of the XIth Dynasty is the appropriate equivalent of M. M. II, however, the Cretan bowls are older than any so far found in Egypt. Their use does not appear to have been common in Greece or Crete, though; the only other examples, which are of a rather different type, are from Middle Helladic - early Mycenaean burials at Volimidia in Messenia.

d) 'Spindle Stands'.

Two stones bearing hollows apparently caused by rotation were found at Myrtos, one of them in Room 58, in which the greater number of the site's loomweights was discovered (page 59 above). This led to the suggestion that

1. S. Marinatos, Deltion Vol. 13, 1930-1931, p. 161, Fig. 23.
2. S. Xanthoudides "The Vaulted Tombs of Mesara", 1924, Pl. 42, no. 5033.
3. Peter Warren "Myrtos", 1972, pp. 153, 208 - 209, Fig. 91, Nos. P 700, P 701, Pl. 68B.
6. S. Marinatos, Praktika 1964, pp. 87, 98, Fig. 1, No. 7, Pl. 80a, e.
they might be 'spindle stands', or ἑρμαῖ. The modern Greek boat-shaped shuttle has a cane bobbin suspended on a wire across its centre, which allows the thread to run freely as the shuttle is thrown from side to side on the horizontal pedal loom. These bobbins are refilled by being mounted on top of a rod which is rotated in one hand, while the other leads thread to it from a skein-winder, or ἀνφημα. The bottom of the rod rests on a stone, and eventually wears a hollow in it, so the theory is very plausible. The only objection to it is that it is unlikely that the elaborate shuttle described above was then in use. It is neither necessary nor suitable for the vertical warp-weighted loom, where the shuttle has to be passed through the shed by hand; even in classical times, thread wound on a stick sufficed (Pls. VIIIc, IXa).

E) Loomweights.

If the small number of whorls found in Minoan Crete is puzzling, the same cannot be said for loomweights. After a modest beginning at E. M. Iii Myrtos, where a mere thirty weights were discovered, in later periods they confronted their excavators in "tens", "hoards", "a multitude", "a heap of over four hundred". Professor Platon,

1. Peter Warren "Myrtos", 1972, p. 228; see also pp. 52, 215; Fig. 99, Nos. 141, 142, Pl. 77 D, E.
2. I have seen this process in Apeiranthos, Naoussa, and Tylissos, Crete.
echoing an earlier report about the same site, says of the loomweights at Kato Zakro that they are "vast in numbers and varied in form", and his remarks might well be applied to the whole of Minoan Crete.

The variations in form include flat discs; cubes and other parallelepipeds; globes, plain and grooved; drums, and, more rarely, cylinders; truncated pyramids and cones; and perhaps large, thick, centrally-pierced discs.

1) **Flat Discoid Loomweights** (Map 10). These weights are the most numerous, widespread, and the most typically Minoan of all the weights. In their small way, they are as truly representative of Minoan culture as double axes and horns of consecration, and when found beyond Crete may be considered as an indication of Minoan presence.

These weights may be round, oval or 'pear-shaped' in outline. They may have one, two, or in one case, three holes near their tops, which are often, but not always, flattened or grooved (Figs. 42 - 46; Pls. XLIb, c; XLIa, b, c; XLIIa, b). They may be as little as 4.0 - 5.0 cms. in height (Fig. 45a, b), or as much as 11.0 - 12.0 cms. (Fig. 44b), but the majority are 7.0 - 10.0 cms. Their thickness is nearly always in the 1.5 - 3.0 cm. range. Single holes are usually quite large (diameters 0.8 - 1.5 cms.), but pairs of holes may be smaller (diameters 0.5 - 0.9 cms.). The holes sometimes show signs of thread wear (Pl. XLIc, left). The weight of the discs varies according to size, from as

little as 50 grams to as much as 350, with the majority between 100 and 200 grams. They are usually plain, but may sometimes have a self-slipped finish, more rarely a coloured wash, usually red or black. Occasionally they are marked with incised signs (Fig. 45c; Pl. XLIa), or seal stamps; both forms of marking were probably used to indicate sets.

The flattened or grooved tops of many of these weights have often given rise to comment. Hazzidakis pointed out long ago that the groove seemed designed to accommodate a rounded handle. Peter Warren suggests that the weights, divided into two groups, were fastened to two rods or bars, of which the front one would have acted as a kind of primitive heddle. This would have meant that the weaver had to stoop to ankle level to draw the bar forward, and would then have needed some means of holding it forward while the shuttle was passed through and the weft beaten up. Every second weft would have had to be darned in by hand. With so many difficulties, the invention of the heddle, as described previously (page 92 ff. above) would seem to be almost inevitable.

The weights which equipped the looms in Pl. VIIIa and d were made with grooves simply because the weights from which they were copied had grooves. At first they were merely attached to bunches of warps (Pl. VIIIa), and each time the heddle was moved, the weights (which, like Minoan ones, were quite well-fired), struck against each other,

3. They imitate those found in L.H. II - L.H. IIIa contexts at Nichoria, Messenia - see chapter on Late Bronze Age.
producing a sound like a set of bells, not unpleasant in tone, but so noisy that it became unbearable after half an hour's work. The problem was eventually solved by fastening the weights to two bars, in the manner suggested by Dr. Warren (Pl. VIIId). This did not eliminate the noise entirely, but it did reduce it to less than a quarter of its former volume. It also prevented the weights from twisting their bunches of warps.

Flat-topped weights would be almost as effective as grooved ones for fitting flush against the rod, but Dr. Warren is rightly puzzled by those which are neither. One explanation may be that most of the noise is made by the back set of weights, those which are moved backwards and forwards by the action of the heddle. It is not so important to tether the front set, although, as they also move a little, it is advisable. Another possibility is that weights with rounded tops belonged to weavers who were not sensitive to noise!

If the silencing effect of the rods was desirable on a loom with only twenty weights, how much more so must it have been when there were over four hundred in question. When all the looms which once stood on the floor above the 1 Loomweight Basement at Knossos were in operation, M. M. IIIb life in the palace would have been quite impossible if such a device had not been employed.

These weights, in all their variations - grooved,

flattened or rounded on top, single, double, even triple-holed, plain, or showing traces of paint, were already present in both phases of the E. M. II settlement at Myrtos (Fournou Korifi) (Pl. XLC, bottom row; d, left and centre). At the neighbouring site of Myrtos-Pirghos they were in continual use from E. M. III to L. M. Ib, when the settlement was destroyed (Figs. 42a, 45a, b, 46b).

They also occurred as early as E. M. II at Palaiokastro, where one bearing the impression of an Early Minoan seal was found. The practice of marking weights with seal impressions seems to have been virtually confined to Palaiokastro, but most of them were on cuboid weights. There is one later discoid example, and two which have incised signs, the first (which may be Early Minoan) a double axe, and the second, a cross. The latter weight (Fig. 45c) is very unusual in having its hole pierced through the longer horizontal axis. Dawkins noted seventy four discoid weights with two holes, and sixty with one during the course of his earlier excavations, and the recent excavations have added another ten. All the latter are from Late Minoan contexts except for one (Fig. 46c) which was in a level that contained

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1. Peter Warren "Myrtos", 1972, pp. 212, 220 - 221, Fig. 96, Nos. 7, 75, 77, 78, 79, Pls. 73 B, 74 A.
2. I should like to thank the director of the Myrtos-Pirghos excavations, Mr. Gerald Cadogan, for allowing me to include this material in the thesis.
5. Edith Eccles 1940 op. cit., p. 48, No. 34, Figs. 33, 34.
6. Edith Eccles 1940 op. cit., p. 49, No. 44, Fig. 41.
7. Edith Eccles 1940 op. cit., p. 49.
8. Edith Eccles 1940 op. cit., p. 47.
9. L. B. Sackett and M. R. Popham, B.S.A. Vol. 60, 1965, p. 304, Fig. 19, Nos. 30, 27.
both E. M. III and L. M. IIIc material (Fig. 46c). At least two are to be dated to L. M. III, indicating that their use continued after the L. M. Ib destruction.

Discoid weights were among the "vast numbers of clay objects pierced for suspension" found by Hogarth at Kato Zakro. They are also one of the predominant types among the "vast numbers" excavated more recently by Professor Platon; many of them, having fallen from rooms on the second floor of the palace during its destruction, are of L. M. Ib date, but they were also found in earlier contexts.

The type was certainly in use at Gournia in L. M. I, but no indication is given as to whether it occurred earlier.

At Mallia, a site which displays a very great variety of loomweights, discoid weights were found in M. M. I contexts, in the palace itself, in the neighbouring houses, and even in the cemeteries, a rare occurrence.

3. D. G. Hogarth, B.S.A. Vol. VII, 1900-1901, p. 128, Fig. 33, No. 1; see also pp. 139, 141, 142.
7. F. Chapouthier and R. Joly, Mallia II, 1936, pp. 9, 37, par. 11, Pl. XVIIIG - j.
8. J. Deshayes and A. Dessemerre, Mallia Maisons II, 1959, p. 73, Pl. XXII (2); Oliver Felon, B.C.H. Vol. 90, p. 579, Fig. 23.
9. H. and M. van Effenterre, Mallia - Site et Nécropoles II, 1963, p. 81, Pl. XXXIII.
The two-hole variety seems to have been preferred at this site.

The earliest occurrence of discoid loomweights at Knossos appears to have been in the M. M. Ia houses below the circular structures known as koulouras in the West Court. The hundreds of weights found in an M. M. IIb context in the Loomweight Basement have already been mentioned (Figs. 43b, 44a; Pl. XLIIa). Others have been discovered in recent excavations in the Royal Road area to the north of the palace.

The discoid weights found at Tylissos were presumably used in the Late Minoan Villas which constitute the major remains - but the site was inhabited from Early Minoan times.

Other sites where discoid weights have been found

1. H. W. and J. D. S. Pendlebury, B.S.A. Vol. XXX, 1929-1930, p. 73, par. 8, Pl. XIIa, No. 27; P.M. IV, p. 71, Fig. 51, No 27.
2. A. J. Evans, B.S.A. Vol. VIII, 1901 - 1902, p. 24; P.M. I, p. 253. Forty four of these weights are preserved in the Stratigraphical Museum at Knossos (Box 1194). Nine are fragmentary. The other thirty five clearly came from three different sets. The first set, to which the weight in Fig. 44a belongs, consists of weight weights, weighing 135 - 161 grams, an average of 149 grams. The second set, represented by the weight in Fig. 43b, has eleven surviving members, with a range of 138 - 160 grams, an average of 155 grams. The third set, in which the weights are similar to those of the second, but wider across the top, had sixteen survivors, a weight range of 143 - 201 grams, an average of 150 grams. These sets are almost certainly incomplete. The comparatively limited range of weights suggests that all three sets might have been employed in the production of a fairly standard textile.

There is another discoid loomweight from a context east of the South East Lustral Area, in Box 1379.
3. in excavations conducted for the British School at Athens by Sinclair Hood, and Peter Warren, whom I should like to thank for this information.
include the M. M. I house at Chamaizi; the M. M. IIIb/
L. M. Ia house at Sklavokampos; the settlement and shrine
at Koumaza; the unexcavated E. M. II - M. M. I site of
Galatas in the far west; the settlement at Kastellos, in
an M. M. III context; the palace at Phaistos, and the villa
at Aghia Triadha (Fig. 44b).

In Late Minoan times, perhaps earlier, the use
of these weights spread beyond the shores of Crete. The
Minoans had had a settlement at Kastri on Kythera since the
beginning of the Middle Minoan period, but the earliest dis-
coid weights found there were only from the M. M. IIIb/
L. M. Ia period. They continued in use until the end of
L. M. Ib.

Discoid weights are reported from the 1896-1899
excavations at Phylakopi on Melos, one group being found in
a Third City context, but there is no indication as to
whether the others came from the earlier cities or not.

1. S. Xanthoudides, A.E. 1906, p. 148; H. W. and J. D. S.
Pendlebury and M. B. Money Coutts, B.S.A. Vol. XXXVIII,
1937-1939, p. 55.
2. H. W. and J. D. S. Pendlebury and M. B. Money-Coutts
1938, loc. cit.
3. H. W. and J. D. S. Pendlebury and M. B. Money-Coutts
1938, loc. cit.
4. Sinclair Hood, B.S.A. Vol 60, 1965, p. 108, Fig. 4, No. 8.
5. H. W. and J. D. S. Pendlebury and M. B. Money-Coutts 1938
op. cit., pp. 55, 56, Fig. 25, No. 45, Pl. III (3) No. 45.
205-209, Figs. 59 - 60, Pls. 59, 60. Part of a block-
shaped weight with two holes, bearing an incised Linear
A 'distaff' sign was also found in an M.M. IIIb context.
8. T. D. Atkinson et.al. "Excavations at Phylakopi", 1904,
p. 17.
One of the weights bears an incised Linear A 'distaff' sign. A group of weights from the 1911 excavations is seen in Pl. XL1c.

Preliminary reports on the current excavations at Akrotiri on Thera constantly mention and frequently illustrate large numbers of discoid weights, which would be the contemporaries of those found in the later palace period in Crete. Weights used in the Minoan settlement at Trianda (lalysos) on Rhodes also belong to this period.

Aghia Irini on Kea, the settlement which had the set of Early Bronze Age flat oval weights (page 233 ff. above), also produced over six hundred flat discoid weights of the Minoan kind; some of the variations are seen in Pl. XL1b, and Figs. 43a, 46a, and a set of twelve, all incised with a pair of parallel lines, in Pl. XL1a, Fig. 43a. No dates are available for these as yet, and the site was inhabited throughout the Bronze Age.

Finally, from L. H. II onwards, some mainland sites adopted a form of weight which, while not always classifiable as a Minoan discoid type, seems very likely to have

1. On display in the National Archaeological museum, Athens, Case 64, middle shelf.
3. G. Monaco, Clara Rhodos Vol. X, 1941, pp. 53, par. 2, 64, par. 6, 96, 97, Fig. 45.
4. I should like to thank Prof. J. L. Caskey, of the University of Cincinnati, for allowing me to examine these weights and include them in the thesis.
5. Nos. K8.320 - K8.331. They had a weight range of 175 - 223 grams, an average of 196 grams. The dimensions of K8.323, a typical example, were ht. 8.8 cms., max. width 8.1 cms., max th. 2.8 cms., hole dia. 1.0 cms.
been adapted from it (see page 448 ff. below).

Although these flat discoid weights became so distinctly Minoan, it has been seen that similar weights were being used in the Early Bronze Age Aegean, and in Early and Middle Bronze Age Anatolia (page 233 ff. above), at sites that were no more likely to have been under Minoan influence than Crete was under theirs. Chronology does not help, as the weights appeared almost simultaneously at Myrtos, and in the Anatolian outpost at Thermae on Lesbos. As it is improbable that either group of weights was derived from the other, and as, despite this, their resemblance is quite strong, it is possible that both may have stemmed from a common source, at present unknown to us; and that from this they developed independently in Anatolia, and Crete, and their respective spheres of influence.

Although it is not easy to differentiate between the Minoan and Anatolian weights, some distinctions may be made. Flattened, or, particularly, grooved tops, and pairs of holes as opposed to single ones, appear to be Minoan innovations. The Anatolian weights often have a more ovoid outline, and a hole set farther from the top, than the Minoan ones (cf. Pls. XXXVIIa, right centre, b, left; XXXVIIIa, b, with Pls. XLo, d, XLIIa, b, c, XLIIIa, b). The Early Bronze Age weights of Kea also have a highly smoothed, almost burnished surface, which is foreign to Minoan weights, but it is not possible to tell from illustrations whether this is also true of the other flat weights in the Anatolian tradition.

The later weights from Kea are in an anomalous
position. On the one hand it would be natural to suppose that they were descended from the Early Bronze Age weights - but on the other, they are indistinguishable from Minoan weights, many having two holes (Fig. 46a) and grooved tops (Fig. 43a). While it is possible that in Kea the two hypothetical branches of flat weights may have been reunited, I think it much more likely that the later weights were in the Minoan tradition. There is ample evidence of Kea's links with Minoan Crete, particularly in the period of the later palaces; in one case L. M. Ib vases and "numerous" loom-weights were found in the same room.

A new type of weight appears in Troy VI (Pl. XXXVillic). It is flatter than the weights of Troy II and IV, and rounded in outline instead of being flattened at the base (see pages 229, 235-236 above, and cf. Pl. XXXVlic and Pl. XXXVillic). Troy VI was a period in which the site made "a definite break with the old native tradition of the Early Bronze Age" and had very little to do with the rest of Anatolia; its relations were almost all with the west. Evidence of contact with Crete was slight, but definite.

Only ten of the new weights were found. The majority of

4. C. Blegen et al. 1953 op. cit., p. 5.
5. C. Blegen et al. 1953 op. cit., p. 17.
6. C. Blegen et al. 1953 op. cit., pp. 17, 61, 74, 97, 147, 227 Note 4, 230, 305 - 306. In addition, a bone plaque (No. 35-308, Fig. 304, p. 29) has an incised scallop design which was a standard Minoan cloth pattern - it appears on the jackets of the Ladies in Blue from Knossos.
7. C. Blegen et al. 1953 op. cit., p. 31.
them were "characterized by a distinctive groove along the upper edge." Furthermore, one had an incised cross like those sometimes seen on Minoan weights (cf. Fig. 46c). Six came from the Pillar House, a building which had Minoan overtones in its architecture. While Minoan influence on Troy VI was almost negligible, it seems highly probable that at least one family of Minoan descent was living there, or that some Trojan had a Minoan wife, for the Troy weights, though found on Anatolian soil, are clearly in the Minoan tradition. Although it is not possible to prove any connection in our present state of knowledge, it may be worth mentioning that flat discoid weights were being used in Mesopotamia more than a millennium before their earliest appearances in Anatolia and the Aegean. Those found in 'Ubaid levels at Tal 'Uqair, with their single holes near the edge, look remarkably like Minoan weights.

2) Spherical weights. While many of these weights are, as their name implies, perfectly globular, for others 'spherical' is little more than a courtesy title. Some are so flattened as to be oval rather than round in cross-section, while others are so elongated that they may be described as cylinders with rounded ends (Fig. 47a, b, c; Pl. XLIIc, e). With the exception of an early group at Myrtos (Fig. 48a, b), they are usually well-fired, with a plain but well-smoothed finish. Some show traces of paint, usually red, but this is

2. C. Blegen et al. 1953 op. cit.; Fig. 305, No. 34-87.
not common. Their diameter range is 5.0 - 12.0 cms., with
the majority between 6.0 - 8.0 cms. Their centrally-placed
holes are large (diameters 0.7 - 1.7 cms.) and often show
signs of thread wear, which indicates that they hung with
the perforation horizontal. They are the heaviest form of
Minoan weight, which suggests that they may have been used
for thick, heavy-duty textiles such as bags, blankets and
cloaks; 200 grams is a very light weight, and it is not
uncommon for larger specimens to weigh over 500 grams.
They were in use as early as E. M. IIb, and were known in
the Middle Minoan period, but seem to have been particularly
popular in L. M. I - III.

The first occurrence of these weights is, predictably, at Myrtos, although not until the site's second and
final E. M. IIb phase. Nineteen of these weights were re-
covered, ten of them in or near Room 59, the room in which
the spouted tub discussed earlier (page 59 above) was situat-
ed. It is reasonable to presume that these ten came from
one loom, which either stood in Room 59 or directly above
it. While some of the Myrtos weights were as smooth,
rounded and well-finished as any later examples of the type

1. Circumstances did not always permit the weighing of weights,
and this particular type presented difficulties as some
were heavier than the 500 gram limit of the scales used.
A sample group of ten from the Unexplored Mansion at
Knossos weighed from 235 grams to over 500 grams, with an
average weight of 270 grams for the nine weights of less
than 500 grams. For weights over 500 grams, see Peter
2. Peter Warren 1972 op. cit., p. 54, Fig. 21, pp. 221 - 222,
Fig. 96, Nos. 33, 34, 38, Pl. 74 B.
(Pl. XLd, right), others were of very coarse fabric, roughly finished and poorly fired. Their shapes were irregular, some being spheroid, but flattened at each end (Fig. 48b), others almost cylindrical or drum-shaped (Fig. 48a).

Spherical weights were in use in the M. M. I house at Chamaizi. Hazzidakis, excavator of Tylissos, speaks of their being found in heaps in Middle Minoan levels. They were among the many weights in houses Zβ and Zγ at Mallia, where they were probably of M. M. III/L. M. I date. Dawkins found a hoard of them in a Late Minoan house in Block E at Palaikastro, and Bosanquet yet more of them in House B's Room 10 at the same site. They were in use at the villa at Vathypetro, and at Aghia Triadha.

At present it looks as though spherical weights may only have been introduced at Knossos in the Late Minoan period, although future finds could overstep this impression. One or two are preserved from the area of the bronze saws in the South House, where they would presumably be of L. M. Ia

1. Peter Warren "Kytos", 1972, p. 221, Fig. 96, No. 88, Pl. 74B, Fo. 82.
2. Peter Warren 1972 op. cit., p. 221, Fig. 96, No. 84.
3. Peter Warren 1972 op. cit., p. 221, Fig. 96, No. 83.
6. J. Deshayes and A. Desenne, Mallia Maisons II, 1959, p. 73, Pl. XXII, 2, 3.
7. While the main remains of these houses are of the new palace period, they were founded on the remains of M. M. I structures. It was not always possible to judge which building phase the finds belonged to — see J. Deshayes and A. Desenne 1959 op. cit., p. 81 ff.
10. S. Marinatos, Praktika 1952, p. 594, Fig. 7. The majority were of the grooved type discussed below, but there were a few plain ones amongst them.
11. Over a score, displaying a wide range of sizes, are preserved in the east apothke of the Herakleion museum.
12. In the Stratiographical Museum at Knossos, Box 1612. There are others in Boxes 1214, 1235, 1379 and 1380.
date. A number have been recovered in the recent excavations at the Unexplored Mansion, in an L. M. II destruction deposit (Fig. 47). "A large number of perforated clay loomweights, more globular in form" than the flat discoid ones of the Loom-weight Basement, found by Sir Arthur Evans above the floor of the passage to the north of the Shrine of the Double Axes, may be of the type under consideration, and in such a context would probably have been L. M. III.

Globular weights were also found in L. M. III buildings at a site near Viannos, Khondros Kephala.

It must be remarked that these spherical weights often bear a strong resemblance to those of Servia and Lianokladhi (page 223 ff. above); but on the evidence now available, it is difficult to suggest any connection.

3) Grooved Spherical Weights. These weights, which do not seem to have been invented before the new palace period, probably developed from the plain spherical weights. They are rather smaller and lighter than the latter, with diameters commonly 4.0 - 8.0 cms., and a weight range of 85 - 375 grams. They are inclined to adhere more strictly to the spherical shape, which is, however, broken by grooves extending from one end of the central hole to the other. These are usually two to four in number, although examples with up to a dozen are

1. M. R. Popham, Archaeological Reports 1972-1973, pp. 50 - 61, N.E. p. 51, Fig. 4. I should like to thank Mr. Popham, the director of the excavations, for allowing me to examine these and the other weights from the site, and to include them in the thesis.
4. A sample group of fourteen from the Unexplored Mansion had a weight range of 85 - 372 grams, with an average of 169 grams.
not unknown (Figs. 49a, b, c, 50a; Pl. XL1Id, e). The
grooves often retain traces of paint, usually red, sometimes
black. It would be pleasant to suggest that the different
grooves held different groups of coloured threads, but such
an explanation does not seem technically feasible. It is more
likely that they served the same purpose as the grooves in the
flat discoid weights (page 277 ff. above). Thread wear shows
that, like the plain spherical weights, they hung with their
perforations horizontal, and in this way whichever groove came
uppermost could be lashed to the rod.

It was weights of this type that were found in such
numbers at Vathypetro, the inland, upland villa which had ten-
tative claims to a weavers’ workshop (page 62 above). They
were used at Knossos, a particularly fine hoard of them coming
from an L. M. II cupboard in the Unexplored Mansion (Figs. 49,
50a, Pl. XL1Id, e). They are known as far west as Tylissos,
and as far east as Palaikastro. They do not appear to have
been used beyond Crete.

4) Cylindrical Weights. Some of the more irregular
Myrtiot spheroidal weights might well be described as cylin-
drical (page 286 ff. above), and may therefore be the

261, 269, 272; Praktika 1952, p. 594, Figs. 4 – 7.
2. M. R. Popham, Archaeological Reports 1972-73, p. 51, Fig. 4.
There are occasional weights of this kind from the main
palace area in boxea of sherds in the Stratigraphical muse-
num, e.g. Box 1295 - Grand Staircase - Area of the S. E.
Column Bases.
3. J. Hazzidakis, A.E. 1912, p. 219, Fig. 26.
305, No. 41, (PK62/10), Fig. 19.
prototypes of other cylindrical weights occasionally found in Crete. These differ from them, however, in having their perforation along their greatest length, whereas the Myrtos weights, squat and more drum-shaped, have a diameter at right angles to the hole, which is as large as or larger than the diameter through the hole. These weights are to be distinguished from the more elongated spherical weights in being roughly finished, poorly fired, and flatter at the ends. They too were hung with their perforations horizontal (Pl. XLIIf).

They were among the many types of weight found in house Ζβ at Mallia. There were two in House B's Room 29 at Palaikastro, and another five in Room 10 in the same block. There is an unpublished one from Koumboa in the east apotheke of Herakleion museum. Two were among the many spherical and grooved spherical weights in the Unexplored Mansion (Pl. XLIIe, f). Some were found with the plain spherical weights in the rooms of the L. M. III settlement at Khondros Kephala near Viannos. They can scarcely be called typical Minoan weights.

It has been seen that weights of this kind were common in Early Bronze Age Greece (page 218 ff. above), and there is one claim for their continued use in the Middle

1. The unbroken weight in Pl. XLIIf, from the Unexplored Mansion, weighed 250 grams. I was unable to weigh any others.
2. J. Deshayes and A. Desenne, Mallia Maisons II, 1959, p. 73, Pl. XIII, 3.
5. N. Platon, Fraktika 1957, Pl. 68β, p. 145.
Helladic period, at Eutresis (see page 220 above). Apart
from this, they disappear from the mainland at the end of the
Early Bronze Age. They were found by Zahn on Thera "with
1
Cycladic wares", and recently another group of them has
been discovered in the current excavations at Akrotiri (Pl.
2
XXXIIIa). These are presumably the equivalent of L. M. I
in date. They are known from Phylakopi on Melos, but their
date there is uncertain. Finally, they appear in Mycenaean
3
Miletus (Pl. XXXIIIb). Scarcey any Middle Cycladic
settlements except Phylakopi have been excavated. Is it
possible that cylindrical weights continued to be used in
the islands after they had been abandoned on the mainland,
and spread from them to Crete and Miletus in the Late Bronze
Age?

5) Drum-shaped weights. The American Richard
Seager, in a very brief account of his excavations at Vasil-
iki, the E. M. II settlement south of Gournia, mentions that
he found many clay weights of a type also known from Gour-
5
nia (Fig. 50c). These are neat, well-finished, well-fired,
straight-sided, flat-ended, short cylinders or drums, small
enough for the smallest to be taken for spindle whorls, were
it not for the string wear in their central perforations.
Again they were used with the hole horizontal.

1. A. J. B. Wace and M. S. Thompson "Prehistoric Thessaly",
1912, p. 283.
2. S. Marinatos "Excavations at Thera IV", 1970, p. 26,
Pl. 46b.
3. T. D. Atkinson et al. "Excavations at Phylakopi", 1904,
p. 214.
30, Pl. 18, No. 4.
5. R. B. Seager "Excavations at Vasiliki" in H. B. Hawes
"Gournia", 1908, p. 49; H. B. Hawes, 1908 op. cit., p.
31; both, Pl. III, 7.
They seem to have been confined to a very few sites. They were found in the palace and elsewhere at Mallia; and three very fine specimens of serpentine, with clearly-marked string wear, were among the L. M. II weights from the Unexplored Mansion (Fig. 50b, Pl. XLIIIa). They do not seem to have been used beyond Crete.

5) **Four-hole Cuboid Weights.** Often correctly but ponderously described as parallelepipeds, these weights are clay blocks, sometimes square in plan, but more often rectangular. They are pierced with four parallel holes, one in each corner, usually running along the longest axis. In this respect they differ from the Cretan Neolithic weights, which were probably their forerunners; these were perforated through their shortest axis. The Minoan weights are smaller, more neatly formed, and better fired than the earlier ones. They are made of finer clay than that used for the other types of Minoan weight, and their not infrequent coating with slip or paint, usually black, their occasional adornment with seal stamps or incised symbols, and their comparatively light weight, all suggest that they were used for fine and special work (Fig. 51a, b, Pl. XLIIIb).

1. F. Chapouthier and R. Joly, Mallia II, 1936, pp. 9, 37, Pl. XVIII, 1; H. and M. van Effenterre, Mallia - Site et Necropoles II, 1963, Pl. XXXIII.
2. They weighed 269, 220 and 190 grams. I was not able to weigh any clay ones from other sites.
3. Weights from the earlier excavations had lengths of 4.5 - 8.0 cms., and widths x thicknesses of 3.5 x 3.5 cms. to 5.0 x 7.5 cms. - Edith Eccles in R. W. Hutchinson, B.S.A. Vol. XL, 1939-1940, p. 47. Weights from the recent excavations fell within these dimensions.
4. Those from the recent excavations had a weight range of 86 - 286 grams, and an average of 154 grams - based on a sample of ten weights that were complete enough to weigh.
They hung, as did the neolithic weights, with their perforations horizontal, and, despite the improved quality of manufacture, these holes often became worn away and broken (Fig. 51a). The four apertures were often very small, as little as 0.3 - 0.4 cms (Fig. 51b), so that if threads were inserted in bunches, which seems unlikely, the yarn would have had to have been remarkably fine. An alternative would be a single cord passed through each hole and knotted to form a loop, so that four bunches of warps could be attached to the loops. These weights, however, must have been designed for a particular type of weaving - one for which ordinary single- or double-holed weights of other kinds would not have been suitable. A tentative explanation is that they might have been used for a form of tablet weaving (see page 186 ff.); in this case only one thread would have been inserted in each hole, which would account for their narrowness. This method of weaving can produce a variety of patterns both in colours, and in the texture of the weave itself. It is tedious, and only appropriate for narrow widths of cloth, or braid; but the Minoans had a predilection for coloured pattern weaves, and their costumes required both braid and narrow widths of cloth (pages 310 - 311, 316 - 317, 341, 345 below), so the explanation is not entirely unlikely.

There is no record as yet of these weights being found in a purely Early Minoan context, but as only two major settlements of the period have been excavated, this is not so surprising. Hogarth found one in an Early Minoan burial cave at Zakro, and they were certainly in use by M. M. I, being among the types of weight discovered in the house at

1. Many of them were found on a rubbish heap just outside a settlement at Petas, near Siteia; the heap was otherwise composed largely of Kamarae ware. Many more of them occurred in the settlement at Zakro, in both Middle and Late Minoan contexts; some had incised designs. Large numbers are mentioned in reports on Palaikastro, where they were used from M. M. Ia to L. M. Ib, with one example coming from a mixed E. M. III/L. M. IIIc context. (Fig. 51a, b, Pl. XLIIIb). Ten of the weights from the earlier excavations carried seal impressions, and the fact that the same impression was sometimes found on two or three weights suggests that sets were marked in this way, perhaps to denote individual ownership, as was the case in classical times. One other weight was decorated with a carefully

4. D. G. Hogarth 1901 op. cit., p. 128, Fig. 39; Ergon 1968, p. 128.
7. Those from the more recent excavations are from Middle Minoan contexts, or from mixed contexts including Middle Minoan sherds (L. H. Sackett and M. R. Popham 1965 op. cit., p. 305); but Dawkins found them in his 'L. M. II' house in Block (R. M. Dawkins, 1904 op. cit., p. 207; Edith Eccles 1940 op. cit., p. 47); and Bosanquet in B 10, in a context of the 'early Mycenaean period, ending only with the fall of Zakro', so presumably L. M. Ib. (R. C. Bosanquet 1903 op. cit., p. 283 Note 1).
10. Edith Eccles 1940 op. cit., p. 48, pars. 32, 33, Fig. 32.
incised fish. 1 Slipped or painted finishes were often used. Altogether the Palaikastro weights give a very pleasant impression of their former owners. Mallia, where they were found in the palace, is the most westerly site at which these weights have been discovered. 2 This means that they are confined to east Crete, and, were it not for the Mallia examples, there would be none west of Chamaizi, itself just west of Siteia. It is also interesting that none have been found at Knossos, although this is the site at which they seem likely to have originated. If this origin be accepted, it looks very much as though earlier native neolithic users of cuboid four-hole weights were driven eastwards by the arrival of the first Minoans, a situation with curiously Eteocretan overtones. There are suggestions of neolithic survival also in the settlement at Kastellos above Lasithi - the incised biconical whorl, which puzzled its excavators by its close resemblance to an example from one of the Late Neolithic houses at Knossos, yet could not be dissociated from its M. M. III context; 4 and a broken loomweight, again M. M. III, which has the size, shape and appearance of the Knossos neolithic cuboid weights.

Two weights resembling this type were found overseas. One from Phylakopi was made of polished black and white limestone, and had five holes. The other was the

1. Edith Eccles in R. W. Hutchinson, B.S.A. Vol. XL, 1939-1940, p. 49, par. 45, Fig. 42.
2. F. Chapouthier and R. Joly, Mallia Maisons II, 1959, pp. 9, 37, par. 11, Pl. XVIII.
4. H. W. and J. D. S. Pendlebury and M. B. Money-Coutts, B.S.A. Vol. XXXVIII, 1937-1938, p. 54, Fig. 23, No. 20.
E. H. II Lerna weight (page 239 above) complete with seal impressions, but with only two holes. Apart from these rather doubtful parallels, the type was confined to east Crete.

7) Single-hole Cuboid Weight. A small weight of the cuboid type, but with a single, central perforation, was found in recent excavations at Palaikastro, in an L. M. I - III context (Fig. 53a).

8) Tall Blocks and Pyramids. Five weights from the earlier excavations at Palaikastro, all marked with the same seal, are described as being parallelepipeds with rounded angles and a single perforation from side to side. It is difficult to know whether they are similar to the single-hole cuboid weight described above, or whether they are like some tall block-weights from Mallia, which have one or two horizontal holes a little below the top. Their given height (7.0 - 9.0 cms.) suggests the latter. Some of the Mallia examples taper very slightly towards the top, so that they might almost be called truncated pyramids (Fig. 52a, b). The latter description is certainly applicable to weights found at Gournia and Zakro. It is interesting that at the latter site, they are considered, with cuboid weights, as one of the "older" types. An example with a single

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1. L. H. Sackett and M. R. Popham, B.S.A. Vol. 60, 1965, p. 305, par. 42, Fig. 19.
2. Edith Eccles in R. W. Hutchinson, B.S.A. Vol. XL, 1939-1940, p. 49, par. 38, Fig. 23.
3. J. Deshayes and A. Desenne, Mallia Maisons II, 1959, p. 73, Pl. XXII (2); and those in Fig. 52a, b, from the east apothake of Herakleion museum.
hole came from Karphi, but, together with a conical one, was thought to be of slightly later date than the site. Four small pyramidal loomweights from Knossos, published as being possibly L. M. IIIa, are indistinguishable from a type still in use at the site as late as the Roman period, and I think they may be of a later date than the one proposed for them.

Block weights or severely truncated pyramidal weights with two holes instead of one occasionally occur.

The type of weight under discussion is not common in Minoan Crete, and such examples as do exist appear, like the cuboid weights, to be confined to East Crete.

9) Other Weights from Mallia. Conical weights, and thick, flat, centrally pierced discs are mentioned among the weights from houses 2β and 2γ at Mallia. The discs might be taken for whorls, were it not for their size; the holes are sometimes slightly off-centre (Fig. 53b). It is not certain that they were loomweights.

10) Stone Weights. Limestone pebbles with a natural hole in them, and often of a useful piriform shape, are to be picked up on many beaches in Greece. These, when found in settlements, may well have been employed as weights of some kind, and, as is proved by the one which was found with a group of clay weights at Gournia, were sometimes used on the loom (page 302 below). Several were found at Myrtos, one at

2. M. R. Popham "The Destruction of the Palace at Knossos", 1970, p. 19, Fig. 15c.
3. J. Deshayes and A. Dessene, Mallia Maisons II, 1959, p. 73, Pl. XXII, (2).
4. J. Deshayes and A. Dessene 1959 op. cit., p. 73, Pls. XXII (2), (3).
5. Peter Warren "Myrtos", 1972, p. 238, Fig. 105, Nos. 217 - 220.
arsi, two at or near Platanos in the Mesara, one at Tylissos, and there were some amongst the hoard of clay weights that Bosanquet found in House B at Palaikastro. It is not clear whether the "twenty pierced stones" found with several clay weights in Room XIV in Hogarth's House 1 at Zakro (Fig. 3) were of this kind, or whether they were stone rings like those described below.

f) Stone Ring Weights.

These doughnut-shaped stone objects are made from flat, round pebbles, with a central perforation neatly drilled from both sides. Their presence in dye-works has been noted (pages 56, 58, 59 above), but their exact function is unexplained. There is no reason why they should not have been used as loomweights, but they are not often found in groups, which mitigates against such a use. They were known throughout the Minoan period, occurring at Myrtos (Fig. 53d), Sphourgaras, Vasiliki, Gournia, and, in an L. M. 1b context, at Palaikastro.

g) Unpierced Spools.

Unpierced clay bobbins or spools of the type which first made their appearance in the Aegean in the Early Neolithic

1. S. Marinatos, Deltion Vol. 12, 1929-1930, p. 121, par. 47, Fig. 15, No. 47.
2. S. Xanthoudides "The Vaulted Tombs of Mesara", 1924, p. 106.
3. J. Haziidakis, A. E. 1912, p. 219, Fig. 26, No. 22.
10. L. H. Sackett and M. R. Popham, B.S.A. Vol. 60, 1955, p. 313, Fig. 24, No. 102.
lithic period (page 123 ff. above) were found in E. M. I - II graves at Aghia Photia. They do not seem to be reported again until the Late Minoan period at Knossos, where they occurred in the same passage as Sir Arthur Evans' "more globular" loomweights (page 289 above), a juxtaposition which does suggest that they were connected with weaving. They enjoyed a sudden increase in popularity at the very end of the Mycenaean Age on the mainland (page 454 below), and this situation is reflected in Crete by finds from L. M. IIIc levels at Palaikastro (Fig. 53c, Pl. XLIIIc), and at Karphi, where they were found in groups in some of the rooms; once again, their excavators suggest that "they were probably used in weaving." Their possible uses have already been discussed (page 124 ff. above). Their presence in graves is unusual, and points to their being articles valued by certain individuals.

h) Needles.

Two needles found in the Hill House, to the east of the main settlement at Gournia, are the most clearly illustrated examples to date (Fig. 54c). One has a cast eye, while the other, rather finer, has an eye formed by a thin loop of metal turned back and smoothed into the main body of the tool. Others were found in House E at Mallia, at Knossos near Palaikastro, and at Karphi. The needles, though fine

1. K. Davaras, A.A.A. Vol. IV (3), 1971, pp. 395, 397, Fig. 2.
3. L. H. Sackett and M. R. Popham, B.S.A. Vol. 60, 1965, p. 308, Nos. 45 - 50, Fig. 19, Nos. 46, 47, 50.
5. H. B. Hawes "Gournia", 1908, p. 34, Pl. IV, Nos. 38, 39.
(6.2 - 0.3 cm. thick) are extraordinarily long, those from Gournia being circa 14 cm., and the one from Kouramesos, 19.7 cm. The largest modern straight needles, such as darning and packing needles, do not usually exceed 9 cm.; anything longer would be very clumsy for sewing. The Minoans probably had smaller, finer needles for this purpose, which would not have survived the almost inevitable corrosion. The very long needles which remain may well have been used in pattern weaving, for which their length would be an advantage rather than a liability.

1) Weaving Hooks

Several bronze, unbarbed hooks from Gournia are published with the suggestion that they "must have been used in textile work". Another is known from Mallia. I cannot suggest how they may have been used.

2) Looms

Little trace remains of all the Minoan looms, other than their loomweights. This is partly because their frameworks were of wood, which in Greek conditions is a perishable substance, and partly because they nearly always seem to have been situated on the upper floors of buildings. This is indicated by the weights' being found scattered, rather than in rows, and by their being so often in the fill of rooms, rather than on floors. A few sites, however, have evidence which may provide some information about the looms themselves.

The first is Myrtos (Fournou Korifi). In Room 58,

1. Darning itself is a form of weaving rather than sewing.
2. H. B. Hawes "Gournia", 1908, p. 34, Pl. IV, Nos. 40 - 42.
the room where most of the spherical loomweights were found, analysis of the wood charcoal remains showed that they were predominantly of oak, probably the hard and durable quercus ilex, and while these could be from building material, they could equally well represent the framework of the loom to which the weights belonged.

The second is at Gournia. Along the south wall in Room 18 of House Fd, an L. M. I building, "a horizontal black streak in the earth 35 cms. above the floor showed where there had been a wooden shelf, now burned or rotted away, and, on the shelf, fourteen loomweights." Thirteen of these were discoid ones with single holes, and the fourteenth was a pear-shaped stone.

The "stored on a shelf" explanation may be correct. When a warp-weighted loom is not in use, the weights, which are not attached to the framework in any way, must be stored, which explains why they are sometimes found in jars, or heaped up in a convenient place like the cupboard in the Unexplored Mansion. The fact that the Gournia loomweights were in a row, their natural position when attached to a loom, is suspicious, and one wonders whether they were not in use when the house was destroyed. The fact that they were 35 cms. above floor level makes it likely that they, too, fell from the floor above, but if the floor gave way before the loom was

4. E.g. S. Marinatos "Excavations at Thera I", 1968, p. 24, Fig. 27.
well on fire, the whole machine may have fallen fairly intact, and been consumed in the room below. The black streak would then represent some part of the loom framework, a cross-strut or perhaps the hypothetical bar to which the loomweights were attached (page 277 ff. above). Its position below the weights would have been owing to a reversal during the fall. A third alternative is that the loom was in situ on the ground floor, but on a raised platform.

Room 13 in the villa at Vathypetro is tentatively referred to as a weavers' workroom, and remains of loom beams are mentioned in one of the reports, but the interpretation is never insisted upon, and the fact that loomweights were found in the spouted tub, blocking its outlet, makes it likely that, once again, they fell from above.

The excavator of a small country house at Aghia Varvara, a little to the north-east of the palace at Mallia, claims to have found a possible loom foot in situ. This is a small, rectangular sandstone block, with four hollows, arranged in a row, cut in it (Fig. 54d). The two outer ones are approximately 6 x 8 cms., and 4 - 5 cms. deep. The two central ones are larger (15 x 15 cms., 7 cms. deep), more rounded, and have apparent drainage channels from their outer edges to one side. The suggestion is that the two outer holes supported the wooden uprights, a purpose for which they appear somewhat shallow; and that the two central basins collected any excess olive oil which might drip from the

2. S. Marinatos 1951 op. cit., p. 272. The guard at the site also points out blackened marks on the walls of Room 13 as the place where a loom stood.
5. Oliver Peiri, B.C.H. Vol. 90, 1966, p. 568 ff., Figs. 13, 14, 15; in Room 4 on the plan, Fig. 4.
warps after treatment in the Homeric manner already referred to (page 97, note 3 above). They would, however, be inadequate for such a purpose, as the drips spatter over a wide area, but do not fall in sufficient quantity to allow collection for reuse. If a loom were mounted in this 'loom foot', the uprights would be only 43 cms. apart, and as at least 5 cms. clearance (preferably more) is necessary on each side of the cloth, this means that the width of any cloth which could have been produced would have been only 20 - 30 cms. wide. Some articles of Minoan clothing, such as flounced skirts, certainly required only narrow widths of cloth, but for general household purposes - hangings and coverings - it would have been very inconvenient. Finally, although a not very impressive total of eleven weights was found scattered throughout the house, none was on or near the 'loom foot', which is where one might have expected to find them. No weights were even found in the same room as the object, although one was outside its doorway, and others were in adjoining rooms; once again, it looks as though they fell from above.

The weights alone prove that textiles were being made at Aghia Varvara; and there were as well two cooking pots set in a rubble bench, suitable for (though not necessarily used for) washing and dyeing fibre; and murex shells, among others, were found. The interpretation of the stone with hollows as a loom foot, however, while it cannot be entirely ruled out, seems highly unlikely.

1. When weaving a piece of cloth 30 cms. wide, I found it necessary to lay down newspaper over an area 60 cms. wide, and 30 cms. from front to back.
2. Oliver Pelon, B.C.H. Vol. 90, 1966, p. 560, Fig. 9.
3. Oliver Pelon 1966 op. cit., p. 584, Fig. 32 (2).
k) Patterned Cloth.

Not a rag of *patterned* cloth has survived from prehistoric Greece, and when trying to determine whether any such existed, and what its appearance may have been, the evidence is usually limited to subjective judgments on 'textile-inpired' pottery designs. In Minoan Crete, however, there is no such problem, as from E. M. II onward there are representations of clothed human figures in the forms of anthropomorphic vases and figurines, and on painted reliefs and frescoes. These archaeological finds provide so clear a record, that not only is it possible to attempt to compile a primer of Minoan textile designs, but to trace the development of those designs from the comparative simplicity of their earliest stages to their elaborate maturity - and their final abandonment.

As the nature of cloth is largely decided by the use to which it is to be put, an understanding of Minoan costume is necessary. *Feminine* attire, standardised as early as E. M. III/M. M. I, consisted of a short-sleeved jacket or bodice which exposed the breast but was tightly laced at the waist, a long, full skirt, at first a plain bell shape, but by M. M. IIIb usually flounced, or flounced and divided into long, frilled trousers or culottes; an apron was sometimes worn over the skirt, and the waist was often clinched by an ornate belt. Male dress, also established as early as M. M. I, was simply a loin-cloth or cod-piece, a very brief wrapper or kilt which usually left one thigh exposed, and a belt. This remained the proper

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costume for active sports like bull-leaping and boxing, but in L. M. Il was supplemented by a new form of ceremonial dress, a longer kilt without a cod-piece, which dipped to a weighted point in front. The men's kilts may have been composed of simple rectangular lengths of cloth, although there are indications that the later ones were cut to shape (page 324 below); but the ladies' skirts, and, especially, their jackets, would have required elaborate cutting, fitting and stitching, which indicates that the cloth used was relatively fine and well-woven, for coarse 'homespun' cloth unravels easily, and is difficult to shape and sew. The garments which only required small quantities of cloth - bodices, belts and kilts - very often displayed an ornate all-over design, but the skirts were usually plain, or in very simple patterns like stripes, bands, spots and checks; such simplicity was often atoned for by rich pattering round the hemline, representing either a woven wor- der, or the addition of braid - and braid was used lavishly to bind seams and trim edges.

The earliest evidence for costume comes, once again, from Myrtos, a site which, much indebted to its conscientious and imaginative publication, might well serve as a textbook on Minoan textile production. A curious anthropomorphic vase was found in circumstances suggesting a shrine. This quaint, long-necked, bell-bodied figure, clasping her E. M. Il jug, is decorated with painted panels both back and front (Fig. 55a, 3 b). It is suggested that these might represent tabby weave,

1. P.M. II (2) m pp. 725 ff., 730 ff., 751.
but the size and open nature of the pattern seem more indicative of a simple check design in the cloth (Fig. 55c). There is no doubt that she is intended to be shown as clothed, for down each of her sides there is a seam, sewn in a form of button-hole or blanket stitch (Fig. 55b), and bearing a strong resemblance to the decorative seam finish used on the woollen cloaks and jackets sold in Greek tourist shops today. Both the stitching and the check pattern are executed in red, which may well represent a colour actually used in weaving at the site; several of the sources of red dye (page 42 ff. above) are likely to have been available in the locality. Check patterns are very simple indeed to produce (page 107 above; Pl. VIIId), and yet very colourful and effective. The Early Minoans at Myrtos could not have made a better choice for their first multicoloured fabrics.

An E. M. III anthropomorphic vase from Koumasa (Pl. XXIIva) who, like the goddess of Myrtos, clasps a jug, has three vertical decorated panels down her front, which, if they are cloth patterns, indicate an advance in technique, in that they combine vertical and diagonal lines; while this is still not difficult (cf. Pl. VIIia), it does necessitate the use of a true pattern weave. The central panel consists of linked lozenges or diamonds contained between two vertical lines, and the two flanking panels also consist of pairs of vertical stripes with diagonal fringes attached to them (Fig. 55d). This could also be interpreted, however, as two pieces of braid decorating a garment which is laced up the front.

There can be no doubt about the combination of vertical, horizontal and diagonal lines which form the patterns decorating the clothes of a lady from the cemetery at Mallia (Pl. XLIVb). She is of particular interest because she is among the first to wear the standard Minoan feminine attire - an open-fronted jacket which nevertheless apparently covers the breasts, a rudimentary skirt, and several necklaces. The curious pattern on the 'skirt', a series of barred rectangles, set and linked diagonally (Fig. 55f), may be meant to represent frills. The jacket is trimmed with three different braid patterns, a zig-zag (Figs. 55e, 59c), and angular, interlocking Ss, and Zs (Fig. 58a), all enclosed between parallel bands.

Another anthropomorphic jug from Mochlos (Pl. XLIVc) wears an unusual costume which appears to consist of an undergarment bordered with two pairs of horizontal lines enclosing a zig-zag or wave pattern, and an overgarment with a decorated yoke, from which two long, narrow panels of cloth hang down both back and front. This outer garment looks as though it has been made up of narrow widths of cloth which have been joined. The zig-zag pattern on the skirt (Fig. 55h) is very similar to that which borders the jacket of the Mallia vase; but the design of interlocking arcs on the 'yoke' (Fig. 56b), though similar to the interlocking S pattern, is new, each pair only needing to be joined to form a series of linked spirals. The most interesting design, however, is that on the hanging panels. This is a very large double

2. R. B. Seager "Explorations in the Island of Mochlos", 1912, p. 64, XIIIg, Figs. 32, back row, left, 34.
spiral (Fig. 56c) which, as a rounded design, is much more
difficult to weave than a geometric shape. The rectangular
nature of the relationship between warp and weft causes all
woven patterns to be angular in reality, but a carefully
constructed design can give the illusion of roundness (Fig.
10a, b), and the finer the weave, the more successful this
illusion will be.

An M. M. I figurine from Petsofa, heroine of at
least two articles by her discoverer, J. L. Myres, is
interesting as an early exponent of standard Minoan female
costume, but disappointing in her choice of cloth; her
belled skirt has an attractive, but very simple pattern of
vertical and diagonal lines.

All the patterns which appear on these early
figures - checks, stripes, bands, combinations of horizontal,
vertical and diagonal lines, zig-zags, lozenges or diamonds,
and, above all, spirals, remained in use in later periods.

A series of interlocking double spirals (Fig. 56d)
which decorate the edge of the apron of the M. M. IIIb Snake
Goddess found in the Temple Repositories at Knossos (Pl.
2 XLVa) may be considered as a rounded version of the angular
Ss and Zs which bordered the jacket of the Mallia vase, or as
a linked rendering of the interlocking Mochlos arcs, and are
obviously related to the Mochlos double spiral. The bodice
of this goddess is also decorated with double spirals, which
here constitute one of the earliest examples of an all-over
pattern (Fig. 56e). Another such pattern, consisting of

VIII; J. L. Myres, Man, Vol. XL, Jan. 1950, p. 1 ff.,
Pl. A, Fig. 1.
2. F.M. I, p. 560 ff., frontispiece, Fig. 359.
dotted, linked double spirals fitted between solid and
dotted chevron bands was found amongst a heap of fresco
fragments of mixed dates, which was found below a later
threshing floor at Knossos. Series of sprouted single
spirals were used on the braid edging the jackets of the
figures in the M. M. III Ladies in Blue fresco from Knossos
(Fig. 581), and very similar braids are shown on another
M. M. III fragment from the same site, and in an L. M. Ia
fresco from Aghia Triadha (Fig. 58j). Pairs of opposed
single spirals were used to form a heart-shaped motif on
a flounced skirt in the L. M. Ib Procession fresco from
Knossos (Fig. 57e), and this motif forms one of the elements
in a diamond lattice pattern (Fig. 55 1) on one of the kilts
in the same work of art.

The simple zig-zag pattern of the Mallia and
Mochochos vases is repeated on the braid bordering the jacket
of the Knossian L. M. Ia fresco known as the Dancing Girl.
The only alteration is the addition of dots (Fig. 58d). A
related all-over pattern occurs on an ... M. Ib stucco frag-
ment found a little to the south of the Procession fresco
fragments. Evans thought of this as forming part of one of
the older kilt and codpiece outfits. The pattern consists
of a series of bands panelling a pattern of dotted zig-zags

1. P.M. III, p. 37, Fig. 20.
2. P.M. I, p. 546 ff., Fig. 397, P.M. II (2), p. 730 ff.,
   Fig. 457b.
3. P.M. II (2), p. 681, Fig. 431.
4. P.M. II (2), p. 732 ff., Fig. 459a.
5. P.M. II (2), p. 732 ff., Fig. 450, Supplementary Pl. XXV,
   Group A, No. 7.
6. P.M. II (2), p. 726 ff., Fig. 460, Supplementary Pl.
   XXVII, Group C, No. 21.
7. P.M. III, pp. 369 - 373, Coloured Pl. XV.
8. P.M. II (2), p. 751, Fig. 488.
with the spaces filled with broken triangles (Fig. 57f).

Other examples of all-over zig-zag designs were among those on robes shown on fragments of stucco from the Threshing Floor Heap. In one of these, the zig-zags are blocked in in solid colour, which emphasises the likeness of this pattern to the curved, flame-like pattern Evans nicknamed the notched plume or adder mark. Braid on the jacket of the central Lady in Blue displays a double version of this design, in which the series of points down each side interlock without touching, forming a curved zig-zag of contrasting colour down the middle (Pl. XLIv0; Fig. 58f). The same braid is to be seen on a hem in the later Procession fresco. The L. M. Ib Cupbearer, who probably formed part of the Procession fresco, has a larger, single version of the pattern round the bottom of his kilt (Pl. XLIVd; Fig. 58e), and the hems of two other figures in the Procession fresco have a design of opposed adder marks with their apaxes meeting, which leaves a series of campaniform shapes in a contrasting colour down the centre of the braid (Fig. 58g).

Two of the simpler early patterns, the barred rectangles of the Mallia vase's skirt, and the combined vertical and diagonal stripes of the Petsofa figurine's, are respectively echoed in the jacket and flounced skirt of

1. P.M. III, p. 37 ff., Figs. 21, 22, 25d, 27.
2. P.M. III, p. 38, Fig. 27.
4. P.A. II (2), p. 721 ff., Fig. 450, Supplementary Pl. XXV, Group A, No. 4.
5. P.M. I, p. 550; P.M. II, pp. 704 - 712, 725 - 726, Figs. 443, 452; Coloured Pl. XII.
6. P.M. II (2), p. 721 ff., Fig. 450, Supplementary Pl. XXV, Group A, Nos. 1, 6.
another figurine, The M. M. IIIb votary with the leopard cap from the Temple Repositories at Knossos (Pl. XLVb). Many of the M. M. IIIb fashion-plates in the miniature frescoes, also from Knossos, contented themselves with simple vertically-, horizontally-, or diagonally-banded fabrics in both skirts and jackets; but such simplicity may have been dictated by the scale of the work. Three L. M. Ia female figures frescoed on the walls of the recently discovered "Room of the Ladies" at Thera, however, give a similar impression of very ornate costumes made from comparatively plain cloth, stripes, bands, and dotted lines being the only ornaments.

It is difficult to decide whether the plain check of the Myrtos figurine continued to be produced. An M. M. III ivory sacrificial knot displays a check pattern, but it is set diagonally (Fig. 55i), and it is not possible to judge whether the cloth was woven on the straight like the Myrtos stuff, and then cut on the cross or bias, or whether it was actually woven as a diagonal pattern. The latter could have been achieved either by plaiting or finger-weaving (cf. Pl. LVIIIId), a method suitable for such a narrow width of fabric; or by a pattern weave (page 107 ff. above). The same remarks apply to the checked cloth which provided the chief alternative to stripes for the ladies in the miniature frescoes.

1. P.M. I, p. 501 ff., Figs. 360a, b, 361, 362a.  
2. P.M. III, pp. 46 ff., 56 ff., Figs. 28 - 32, 34, Coloured Pls. XVI - XVIII.  
4. P.M. I, p. 430, Fig. 303.  
5. i.e. cut diagonally.  
6. For a well-illustrated account of this type of weaving, see G. M. Crowfoot, F.R.S. 1945, pp. 75 - 88.  
7. P.M. III, pp. 46 ff., Figs. 28 - 31, Coloured Pls. XVI - XVIII.
The linked diamond or lozenge pattern first seen on the Koumasa vase, if it does not represent lacing, is in fact a partial form of a diagonal check, and this design is repeated round the hem of the (restored) skirt of the Snake Goddess (Pl. XLVa; Fig. 55g). One of its earliest occurrences in an all-over form, a kind of diamond lattice, is on the apron of the Snake Goddess’s votary. Here the pattern gains interest from being barred by two horizontal lines in the top of each lozenge (Pl. XLVb; Fig. 55j). A closely-related design is shown in the Ladies in Blue fresco, only here it is the bottom half of each lozenge which is barred with a number of horizontal lines. The intersections of the diagonals are marked with a dot (Fig. 55k). This occurs again on one of the kilts in the Procession fresco (Fig. 55 l). Evans interprets these dots as beads threaded on the intersections of an embroidered net. Each lozenge is filled with a motif consisting of the two opposed spirals already mentioned, two diverging upright strokes between them, and a series of two solid arcs and one dotted one above them.

Whether such a pattern was actually woven, or embroidered, will be discussed below. This, the ultimate in diamond lattice designs, provides an interesting contrast with the possible humble beginnings of the pattern on the Koumasa vase.

As well as repeating and elaborating upon older patterns, by the last years of the old palaces, Minoan weavers, already at the height of their powers, were producing new designs of the greatest complexity and variety, and

1. P.M. II (2), p. 734, Fig. 457a.
2. P.M. II (2), pp. 733 - 734.
3. P.M. II (2), pp. 725 ff., 733 - 734, Figs. 456c; 450, Supplementary Pl.XXVII, Group C, No. 21.
these continued to be de rigueur until the end of L. M. 1b.

Interlocking lines of linked medallions are displayed on an M. M. IIIb faience votive girdle from the Temple Repositories at Knossos (Fig. 57a) and on an L. M. 1a fresco from Pseira (Fig. 57b). The Knossian medallions are decorated with alternating curved crosses contained within dotted circumferences, and asterisks consisting of six thin strokes terminating in dots; those from Pseira with clusters of four spirals, again contained within a dotted frame, and pairs of entwined outlines of approximately campaniform shape.

Overlapping scales provide the motif on the cloth of the jackets of the M. M. III Ladies in Blue. Each scale has a triply scalloped outline, and its base is marked with two arcs, the upper one dotted, the lower one a solid line (Pl. XLIVd, Fig. 57c). The same pattern, but with the substitution of a solid arc for a dotted one, formed part of what was probably a sea-scape in a fragmentary fresco from the Second City at Phylakopi, and occurred on a bone plaque found in Troy VI (page 285, note 6, above). A somewhat different design of overlapping scales is shown on one of the kilts in the Procession fresco. Here the outline of each scale is simply rounded, but marked with double lines enclosing a row of dots. Each scale contains a motif consisting of a small diamond with a concave arc to each side below it.

1. P.M. I, p. 506, Fig. 364c.
3. P.M. I, p. 546 ff., Fig. 397; P.M. II (2), p. 731, Fig. 457b.
4. T. D. Atkinson et al. "Excavations at Phylakopi", 1904, p. 72, Fig. 60.
5. C. Blegen et al. "Troy Vol. III", 1953, p. 29, Fig. 304, No. 35-308.
6. P.M. II (2), pp. 725, 731, Fig. 456b; 450, Supplementary Pl. XXVII, Group C, No. 20.
and below that, four centrally-placed bars of diminishing size (Fig. 57d)

Cruciform patterns may not have been introduced till the early years of the new palace period. The earliest extant example is a very complex one shown on a flounced divided skirt in a fragmentary fresco from Aghia Triada, which Evans assigns to the 'post-seismic' phase of M. M. 111b (Fig. 1). Similar designs of interlocking crosses are seen on the L. M. 1b kilts of one of the figures in the Procession fresco (Fig. 56i) and of the Cupbearer himself (Pl. XLIvd, Fig. 56h). The latter is of particular interest in that the centre and extremities of each cross are decorated with the dotted rosette which was to continue as a textile motif both in Mycenaean and in Classical times (pages 110 above; 478 below). A simpler cruciform design, in which the crosses merely join, is displayed on the jacket of the Little Priestess from Akrotiri, Thera (Fig. 56f). The painting gives the impression of a network of thick, white threads over a finer blue background, an effect which could be achieved by either weaving or embroidery.

Designs of even greater complexity than those already described were not unknown. The two faience votive robes from the Temple Repositories were decorated with clumps of crocuses executed in a relatively free manner which perhaps indicates embroidery; but the repetitive nature of

2. P.M. II (2), pp. 731, 733, Figs. 450, 456d, Supplementary Pl. XXVI, Group C, No. 22.
3. P.M. II (2), pp. 731, 733, Figs. 443, 452, 456e, Coloured Pl. XII.
4. S. Marinatos "Excavations at Thera V", 1972, cover, Pl. J; Ergon 1971, p. 195, Fig. 232.
a band of crocuses round the hem of the larger robe is suggestive of weaving (Fig. 58a). The jacket of an incomplete figurine from Phylakopi also displays a floral motif, a quadruple device of white lily petals, overlaid by a red and orange cross, and surrounded by white chevrons. Melians apparently rejoiced in garments more than usually gorgeous, for the kilt of a fragmentary figure in a Second City fresco seems to have been adorned with "two birds placed back to back with wings outspread". The wings bear the familiaradder marks. These were apparently a standard textile convention for feathers, because they also appear on the wings of a griffin which was among the designs depicted on robes in the scraps of frescoes found in the Threshing Floor Heap. Other designs from the same group include double flutes, bulls' heads, sphinxes and rosettes. The rosettes may indicate braid, and braid so decorated appears very faintly on a side seam in the Procession fresco. The hem of the central figure in the same fresco displays bands of triglyphs and half rosettes alternating with barred lines and a band of solid circles (Fig. 58b). This pattern, perhaps composed of rows of different braids, has no close textile parallels, but, as Evans was quick to note, has strong affinities with architectural mouldings and friezes.

1. P.M. I, p. 506, Figs. 364a, b, 377.
2. J. L. Myres, B.S.A. Vol. IX, 1902-1903, pp. 368-369, Fig. 1.
3. T. D. Atkinson et al. "Excavations at Phylakopi", 1904, p. 74, Fig. 61.
4. P.M. III, p. 40, Fig. 25a.
6. P.M. II (2), p. 721, Fig. 450, Supplementary Pl. XXV, Group A, No. 4.
Two very simple patterns complete the Minoan textile repertoire. The dots so often used as a subsidiary element in outlining and embellishing other patterns (Figs. 56b, 57a, b, c, d, f; 58d) occasionally provide the major motif, as on the aprons of the Snake Goddess and an incomplete votary, the sleeves of one or two ladies in the miniature frescoes, the braid on the sleeves of one of the figures from the Threshing Floor Heap (Fig. 58k), and that edging the fragmentary L. M. 1b older style kilt (Fig. 58 l). Another type of braid consists of striped borders of varying thicknesses, which enclose series of bars in two alternating colours. Those illustrated in Fig. 58m, n, and o, all appear in the miniature frescoes. The first (Fig. 58m) was still in use at the time of the Procession fresco. The second (Fig. 58n) survived until at least L. M. II, when it bordered the garments in the fresco known as the Captain of the Blacks. The third lasted even longer, being seen again on the L. M. III Aghia Triadha sarcophagus (Pl. XLVIIC) in company with other very plain striped and banded braids (Fig. 58p, q, r).

Many of the patterns seen on Minoan cloth are not confined to textiles. The diamond lattice, linked

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4. P.M. II (2), p. 751, Fig. 486.
5. P.M. III, pp. 47 ff., 67 ff., Figs. 29 - 32, Coloured Pls. XVI - XVIII.
6. P.K. II (2), p. 725 ff., Fig. 450, Supplementary Pl. XXVII, Group C, Nos. 20, 21.
7. P.M. II (2), pp. 755 - 757, Coloured Pl. XIII.
9. J. D. S. Pendlebury "The Archaeology of Crete", 1939, Fig. 4, No. 6; Fig. 9, Nos. 1, 2, 5, 7; Fig. 16, Nos. 2, 3, 6, 9; Pls. IX, 2; X, 1, 2.
lozenges, zig-zags, adder marks, interlocking arcs, rows
of Ss and Zs, spirals of all kinds, dotted outlines, scales,
linked medallions, asterisks, rosettes, dotted rosettes,
even quadruple lilies, and crocuses, and the triglyph and
half-rosette design of the central figure in the Procession
fresco, are all to be seen on pottery. The architectural
nature of the last-named motif has already been noted (page
316 above). The spiral appears in many different Minoan art
forms, on ceilings, walls, stone vases, in sculpture
and metalwork, and on seals. Evans thought the quadruple
spiral cluster in the Pseira medallion pattern might have been

1. J. D. S. Pendlebury "The Archaeology of Crete", 1939, Fig.
16, No. 9.
2. J. D. S. Pendlebury 1939 op. cit., Fig. 4, No. 2; Fig. 9,
No. 8; Fig. 16, No. 7; Fig. 17, No. 9; Fig. 18, No. 35.
3. J. D. S. Pendlebury 1939 op. cit., Fig. 23, Nos. 1, 2, 4,
6; Fig. 37, No. 10; Fig. 38, No. 10.
4. J. D. S. Pendlebury 1939 op. cit., Fig. 18, No. 24.
5. J. D. S. Pendlebury 1939 op. cit., Fig. 17, No. 7; Fig. 18,
Nos. 23, 25; Fig. 23, No. 6; Fig. 37, No. 16; Fig. 38,
No. 12.
6. J. D. S. Pendlebury 1939 op. cit., Fig. 18, Nos. 5, 7, 17,
18, 19, 26, 36; Fig. 22, Nos. 8, 10, 11; Fig. 25, Nos. 8,
9; Fig. 27, No. 5; Fig. 36, Nos. 1, 2, 3, 5, 10.
7. J. D. S. Pendlebury 1939 op. cit., Fig. 16, Nos. 10, 14, 17,
18; Fig. 22, No. 4.
8. J. D. S. Pendlebury 1939 op. cit., Fig. 38, No. 6.
9. J. D. S. Pendlebury 1939 op. cit., Fig. 22, No. 4.
10. J. D. S. Pendlebury 1939 op. cit., Fig. 17, No. 9.
11. J. D. S. Pendlebury 1939 op. cit., Fig. 27, No. 10; Fig.
37, No. 14; Fig. 38, Nos. 5, 8, 9.
12. J. D. S. Pendlebury 1939 op. cit., Fig. 17, No. 15; Fig.
36, Nos. 1, 2, 8, 11; Fig. 38, No. 10.
13. J. D. S. Pendlebury 1939 op. cit., Fig. 27, No. 6.
14. J. D. S. Pendlebury 1939 op. cit., Fig. 36, No. 12.
15. J. D. S. Pendlebury 1939 op. cit., Fig. 38, No. 7.
17. P.M. I, pp. 249, 322, 323, 335, 335, 337, 351, 370 - 375, 411,
525; P.M. III, pp. 31, 281, 294, 302, 324, 343, 378, 379,
18. P.M. II (2), p. 599; P.M. III, pp. 21, 26; P.M. IV (1),
p. 91.
19. P.M. I, pp. 112 - 113; P.M. II (1), p. 165; P.M. II (2),
21. P.M. I, pp. 111, 117, 121, Figs. 61a, 66, 87, Nos. 3c, 5;
P.M. IV, p. 248, Figs. 186, 187g, m, o, p.
derived from Egyptian scarabs of the Middle Empire, but a very similar design appears on an E. M. III Cretan seal. The interlocking cruciform motif seen at Knossos and Aghia Triadha, may well have been anticipated by another E. M. III seal design; Evans believed that the Aghia Triadha textile pattern provided the inspiration for an Egyptian ceiling, and the resemblance is certainly striking. Scale patterns decorated landscapes, plaques (page 314 above), and inlays, as well as pottery and cloth. With a people interested in as many forms of art as the Minoans were, artistic borrowing is to be expected rather than otherwise, and the fact that not all textile motifs were originally of textile origin, nor limited to textiles, does not detract from their claim to have been used as such, when they are seen clearly depicted on clothing.

Three generations of Egyptians who recorded 'Kefriu tributaries' on their tomb walls have put us in the fortunate position of being able to see Minoan textiles as others saw them, and these illustrations confirm the use of a great number of the most popular of the motifs. Kefriu who visited Hatshepsut's architect Senmut, still wearing the older costume of short kilt and codpiece, display the well-known patterns of zig-zags (filled in like those from the Threshing Floor Heap - page 311 above), and interlocking Ss on their belts; and the man with the latter has his kilt edged with a dotted braid similar to that in Fig. 68k. The artist employed by Thutmose III's vizier Rekhmire, so observant that he noticed the

2. J. D. S. Pendlebury "The Archaeology of Crete", 1939, p. 88, Fig. 12, No. 3.
3. P.M. I, p. 121, Fig. 90a.
4. P.M. II (2), pp. 732 - 733, Fig. 459a, b.
6. P.M. II (2), p. 737, Fig. 470.
change in fashion from the codpiece and kilt to the L. M. Ib
dip-fronted longer kilt, records zig-zags, combinations of
vertical and horizontal lines, linked lozenges, diamond lat-
tices, spirals, linked and otherwise, and dots as major and
subsidiary motifs on both cloth and braid (Pl. XLVla); even
a design which Evans was no doubt quite right in claiming as
"clearly Egyptian" shares its dominant feature, pairs of
single opposed spirals, with two Minoan-depicted textiles (cf.
Figs. 55 l, 57e). The only pattern not known from Minoan
textile representations is the double foliaceous band (Pl. XLVla,
bottom right figure), and this was common on contemporary
Minoan pottery. The 'tributaries' who came to Rekhmore's
son Menkhpeperasonb (Pl. XLVlb, c) displayed the same textile
motifs as those who had known his father, although sometimes
more ambitiously arranged. Spirals alternate with dotted
zig-zags and chevrons in the main body of one kilt, instead
of being confined to the borders. A diamond lattice pattern
has each lozenge ornamented and filled. A very ornate free
field design again takes the pairs of opposed spirals as its
basis. Another, much destroyed, includes a floral motif of
an Egyptian type - but an Egyptian type which had been adopted
by Minoans. Many Minoan braids - barred, dotted, striped,
with linear zig-zags, filled zig-zags, zig-zags with dots like
that of the Dancing Girl from Knossos (cf. Fig. 58d), linked
lozenges, and spirals, are all represented. The only 'foreign'

2. P.M. II (2), pp. 739 - 745, Fig. 473.
3. P.M. II (2), pp. 744 - 745, Figs. 480 - 481.
4. N. and N. de Garis Davies "The Tombs of Menkhpeperasonb,
Amenmose and Another", 1933, Pls. lV, V.
5. Figure bearing spotted bull's head and cloth.
6. Figure with tray of loaves (?), cloth and ewer.
7. Figure bearing cup with two bull's heads and rhyton.
8. Figure with Phryton, ewer and cloth.
9. P.M. II (2), P. 477 ff., Fig. 935.
element is once again the double foliate band of Minoan pottery.

It is usually accepted that the Keftiu are Minoans, the identification being based on the offerings they carry, their costumes, their coiffures, even their physiognomy, and Egyptian artists have been praised for their accurate delineation. In the matter of textile motifs, however, they have been done less than justice. Evans criticises the patterns for being "of a vague geometrical kind ... also depicted on the clothes of Syrians and other foreigners", and the artists for having "recourse to spiralform or coiled motives not found on the remains that we possess of the 'Procession Fresco'" - although he himself recalls its use on the Snake Goddess' apron.

He and another authority are disturbed by the fact that some of the patterns seem to be Egyptian. So they are - but there is ample evidence, much of it collected by Evans himself (pages 318 - 319 above) that the two races did adopt each other's motifs. It is also true that the Keftiu/Minoans had no monopoly over the 'geometric' patterns, nor even the spiral, but the fact that every design that appears on a Keftiu garment, save only the foliate band of Minoan pottery, can be corroborated from Minoan textile illustrations, surely speaks volumes for the perception of some Egyptian artists. Hutchinson's remarks that "these patterns do not occur on Egyptian kilts, nor are they arranged in the same way on any other Egyptian garment so far as I remember, and it may therefore at least be argued that they were intended to give the general effect of a

3. P.M. II (2), pp. 744 - 745, Figs. 480 - 481.
Keftiuan kil" seems to provide a fair conclusion. I think one may take the Egyptian representations as a reliable, if incomplete, reproduction of the Minoan/Keftiu textile repertory, the Minoan designs which are missing from it being the very complex ones, such as the cruciform, medallion and scale patterns.

A question which naturally arises, is how all these patterns, particularly the more advanced ones, were executed. Sir Arthur Evans often spoke of them as embroidered, and this is one of the possibilities. Wace, with his wide knowledge of textiles, was able to suggest a number of different alternatives, including embroidery, weaving, braid, bead-work, and even appliqué, applied metal-work and painting. He reinforced his suggestions with examples of these forms of decoration found on cloth from New Kingdom Egypt. By applying common sense and a knowledge of dressmaking, he was further able to establish some criteria for distinguishing which patterns were woven, and which were more likely to have been achieved by one of the other methods.

Patterned bands round the hems of bell-shaped skirts could not have been woven in one piece with the rest of the garment, for such skirts must be cut with a curved lower edge if the hem is to hang evenly, and such cutting would slice through a woven border pattern - so that borders like the row of crocuses on the votive robe (Fig. 58a), and the linked lozenges of the Snake Goddess' hem (Fig. 55g; Pl. XLVg), must either have been embroidered after the garment was made up, or

4. A. J. B. Wace 1927 op. cit., p. 29, Fig. 1.
else woven separately and applied as a braid. The same remarks apply when a pattern has to follow a curved edge, as do the spirals round the Snake Goddess’ apron (Fig. 56d, Pl. XLI a). It is interesting that while, for the reason given, Wace felt that the linked lozenges of the Snake Goddess’ hem were probably embroidered, he thought the closely related diamond lattice ("diaper") pattern on the apron of the Snake Goddess’ votary (Fig. 55j; Pl. XLIVb) had probably been woven. This underlines the fact that similar patterns may well have been produced by different methods under different circumstances.

Patterns which appear to conform to the lines of a garment, such as the complex spiral design on the Snake Goddess’ jacket (Fig. 56e; Pl. XLIVa), and the quadruple lily on the back of the bodice of the Phylakopi figurine, Wace thought more likely to have been applied by embroidery or other means after the clothes had been made up, but this cannot be proved conclusively, and he did not insist upon it. When cutting a garment from patterned cloth, one naturally cuts so that the design will be in a position where it will appear to best advantage, and in harmony with the shape of the garment.

Wace’s most interesting observation is that the ornate cruciform pattern on the Aghia Triadha frilled divided skirt (Fig. 56g) must have been made from cloth with an inwoven pattern, as it has been sliced through by the cut of the garment. This seems an entirely valid interpretation, and, on these grounds, a number of other more elaborate patterns,

3. A. J. B. Wace 1927 op. cit., p. 30, Pls. VI (2), VII.
including the scale (Fig. 57d), diamond lattice (Fig. 55 i) and opposed spiral (Fig. 57e) designs of the Procession fresco, the scale pattern of the Ladies in Blue (Fig. 57c; Pl. XLIVd), and the cruciform pattern of the Cupbearer's kilt (Fig. 56h; Pl. XLVd), among others, are all woven patterns.

This brings home a point which cannot be sufficiently emphasised: all these designs are well within the compass of the warp-weighted loom.

Any pattern consisting of horizontal, vertical and diagonal lines or shapes - any geometric pattern - is so simple to weave that it is scarcely worth the trouble of producing it by any other means. Any rounded shape or pattern may be woven if the design is well thought out, and executed in a comparatively fine weave (pages 108 - 110 above). Every Minoan textile motif, including the advanced ones mentioned above, and even griffins, sphinxes and bulls' heads decorated with elephants' tusks, could be woven, if desired, on a warp-weighted loom as simple as those in Pls. VIII - XI, by either of the methods shown in Fig. 10. The only limiting factors are the skill - and patience - of the weaver.

To take a concrete example: the patterned cloth in Pl. VIIIa, though it was actually produced in only two colours, was woven with four 'shuttles', one for the background, and one for each of the vertical rows of motifs. It could

1. P.M. II (2), Supplementary Pls. XXV (7), XXVII (20, 21).
2. P.M. I, Fig. 397.
3. P.M. II (2), Colour Pl. XII, Figs. 443, 452.
4. P.M. III, p. 40, Fig. 25.
5. Minoan looms may not necessarily have been as simple as these. They could, for instance, have been equipped with small stick heddles like those on today's carpet looms, which lift only a section of the warp at a time to facilitate pattern weaving - see p. 108 above.
6. For the three subsidiary 'shuttles', simple wound hanks of wool were found convenient.
equally well have been woven in four different colours, with the motif set closer together. It would then have appeared as elaborate as a Minoan pattern. The Aghia Triadha cruciform design, which looks so complex, is in fact on much the same level. It is merely a skilful, repetitive, interlocking arrangement of a very simple geometric shape, executed in only three colours, red, white and blue (Fig. 56g). Wace suggested that the cloth had been cut on the bias, and, if so, the 'arms' of the crosses would have lain vertically and horizontally when the cloth was on the loom. Once the pattern had been worked out (which admittedly would require expertise), even a beginner with a diagram or a piece of cloth to copy could produce it; it would only be a matter of carefully counting the correct numbers of warp threads between which (for tapestry weave - page 108 above), or before which (for weft insertion - page 109 above), the three weft colours had to pass. An experienced worker who knew the pattern would not even have needed to count (page 109, note 2, above).

At first glance, Minoan textiles appear very rich in colour - yellow, blue, white, black, brown, russet, orange, and red. Only green is never shown on clothing in frescoes, though it sometimes appears on models of sacred knots (page 48 above). It is instructive, however, to examine the combinations of these colours in representations of cloth. All the early examples (Fig. 55c - f, h; Fig. 56a - c), are executed in only two shades. The same is true of many of the later patterns (Fig. 56g, i - j; Fig. 56d - f; Fig. 57c, f; Fig. 58a) and nearly all the braids (Fig. 58c - r). Even designs

which are multicoloured, like the 'architectural' border of the main figure of the Procession fresco (Fig. 53b), only require the use of two or three colours in any one section of the pattern. The Fsaira medallions (Fig. 57b) are achieved with only three colours; the cruciform pattern of the Cup-bearer's kilt (Fig. 56h) would need all its four colours - red, blue, orange-yellow and brown - to be woven together, and this is the maximum requirement. Such restricted colour combinations argue in favour of woven patterns.

In some instances, decorative techniques may have been combined. The production of the medallion patterns, for example, would probably be facilitated if details like the asterisks (Fig. 57a) and spiral clusters (Fig. 57b) were embroidered after the main pattern had been woven. Those diamond lattice patterns which display a small circle at each intersection (Fig. 55k, l) may possibly illustrate the combination of a woven pattern and beaded netting.

Where no other criteria exist for deciding by what method patterns were produced, common sense would suggest that anything repetitive, in restricted colour combinations, is likely to have been woven; but that very ornate designs which require many colours, much detail, and occur only once - bulls' heads, griffins, sphinxes, back-to-back swallows - although not beyond the weavers' powers, would probably have been more expeditiously rendered in embroidery.

1) Plain Cloth.

In a room opening off a continuation of the Corridor of the Procession, Evans found pieces of a fragmentary fresco

1. P.M. II (2), pp. 733-734.
which showed a man riding in a palanquin, and, in startling contrast to the dazzling robes of the Procession fresco, and indeed all previous minoan cloth, his costume, like those of his attendants, was white.

This is one of a small number of frescoes from Knossos which have puzzled many scholars by their dissimilarity to the majority. The others are the Campstool fresco; the associated female head known as La Parisienne; the Captain of the Blacks; and a recently-published fragment of a chariot scene. They are different in style, more careless, even slapdash, in execution, and show modes of dress different from any seen previously.

Evans assigned the Palanquin scene to L. M. Ia, the Campstool fresco and La Parisienne to L. M. Ib, and the Captain of the Blacks to L. M. II. Pendlebury followed him in this, but R. W. Hutchinson "on style alone" would prefer an L. M. II date for the Campstool fresco and La Parisienne, and Mark Cameron, in publishing the chariot scene, suggests an L. M. II - L. M. IIIa date both for it and for the others. Both the modes of dress, and the type of cloth used in them, support this contention. On these grounds, the

2. P.M. IV, p. 361 ff., Figs. 318, 323, Coloured Pl. XXXII B, C. D.
3. P.M. IV, p. 385, Fig. 317, Coloured Pl. XXXI E.
7. P.M. 11 (2), 770; P.M. IV, p. 396.
8. P.M. IV, p. 386.
paintings on the L. m. lll Aghia Triadha sarcophagus may be added to this group.

All that can be said about the robes in the Palanquin fresco is that they are white, they are decorated with plain dark braid applied diagonally, they cover their wearers' chests - a most un-minoan fashion - and they may have extended to their ankles (Pl. XLVIIa).

The costumes of the youths on the campstools (Pl. XLVIIb) and La Parisienne have short sleeves, and do envelop their owners from neck to ankles. They are made from blue, yellow and white cloth arranged in bands, and interspersed with braid of the simplest striped and barred varieties (Fig. 58m, o, r). Each band of colour is marked with vertical lines, which seem to suggest shadowed creases in a light, clinging fabric, rather than woven stripes. This is particularly true of La Parisienne's sleeve, the "diaphanous texture" of which Evans noted. This comment is very interesting, because although woollen cloth of exceedingly fine quality may be woven, it is doubtful whether it could ever be described as diaphanous - but the epithet is one which may readily be applied to fine linen. It is difficult to know whether the bands in the skirts are merely bands, or whether they are meant to represent flounces. If the latter, they are of a limp, clinging kind, quite different from the formal and ornate arrangements seen in the miniature frescoes, or on the Snake Goddess's votary.

Evans compared the Palanquin robes and the

2. F.M. IV, p. 385.
Campstool dresses both with each other, and with a type of long garment seen on seven seals, four of which, apparently undated, came from the Knossos area - and three from the Vaphio tomb on the Mycenaean mainland. 1 I believe another mainland parallel, unavailable to Evans, now exists in the person of the lyre player from L. H. IIIb Pylos. 2 The curious Doric chiton type or overfold in his costume is owing to reconstruction, and could equally well have been restored as short sleeves. The skirt consists of narrow, clinging frilled bands of varying, but plain colours, and all these bands are again marked with strokes which seem to indicate vertical creases or pleats rather than stripes. Similar garments are worn by the riders in the chariots at each end of the Aghia Triadha sarcophagus, and possibly by the very fragmentary driver in the Knossos chariot scene.

Long garments of a slightly different kind are to be seen on those of the figures on the side panels of the Aghia Triadha sarcophagus who are not dressed in skins (Pl. XLVI1lc). These are again short-sleeved, and cover the wearer from neck to ankle. They are of a very specific style; there are only two parts, the back and the front, in which sleeves, bodice and skirt are all cut in the one piece. The garment follows the contours of the body to the waist, then gradually widens to the hem. This, the sleeve edges, and the seams up the sides and across the shoulders, are bound with braid (Fig. 58o, p. q, r). The cloth used is

4. Mark A. Cameron, Arch. Anz. 1967, Fig. 12.
either plain, or decorated with diagonal stripes. Blue and yellow are the predominant colours. Evans was no doubt right in reconstructing six hems in the Procession fresco on the same lines as these garments, although the rest of its figures are in orthodox Minoan fashions. The Aghia Triadha robes have another parallel, however - L. H. IIIb Pylos also has its Procession fresco, which included at least three votaries with the close-cropped heads seen in the Palanquin fresco, on the Captain of the Blacks, and the male figures of the sarcophagus, and long gowns cut on exactly the same lines as the Aghia Triadha ones. Furthermore, a cropped version of this garment, reaching only to the knee, but of exactly the same very distinctive cut, was the everyday wear of Mycenaean warriors, hunters, grooms and travellers in chariots - indeed the latter may have worn the longer version, for the sides of their carriages obscure their lower halves (page 465 ff. below).

Pendlebury's "smart Minoan officer", the Captain of the Blacks (Pl. XLVc), who is engaged in the thoroughly un-Mycenaean activity of running, was presumed by Evans to be wearing one of the L. M. Ib dip-fronted kilts, but his garment, which is of plain yellow cloth, with never a hint of decoration save in the black and white braid (Fig. 58n), is very much briefer than any depicted in either Minoan or Egyptian frescoes. It seems more likely that he is actually sporting a neat pair of shorts - like those worn by some of

1. P.M. II (2), p. 721, Fig. 450, Supplementary Pl. XXV, Group A, Nos. 1 - 6.
the Mycenaean at Pylos when on active duty.

The various costumes in these frescoes have some interesting points in common. All are different from any previous Minoan styles. Almost all are made of plain cloth, and the few that are not, are only striped. Some of the braids used are of standard Minoan types, but they are of the simplest striped, barred and plain varieties (Fig. 58m - r); only the hems in the Procession fresco show anything more ambitious (Fig. 58f, g). All the garments except that of the Captain of the Blacks are ankle length, have short sleeves, and cover the wearer's chest. Finally, all these 'foreign' styles, without exception, have Mycenaean parallels.

The theory of a Mycenaean dynasty at Knossos in L.M. II is not new - it has been current for over thirty years. It is based on changes in art styles, changes in pottery, a sudden increase in weapons, and, above all, a change in the official written language. To this list may be added a change in cloth, from patterned to plain, and a change in costume, from Minoan to Mycenaean.

As the first evidence for these costumes comes from Crete, not the mainland, it may be argued that the Mycenaean borrowed them from the Minoans; it is certainly true that the well-established Minoan female dress, the open-fronted bodice and flounced skirt, was so adopted, and the codpiece and kilt were sometimes depicted in Mycenaean bull-leaping scenes. Sir Arthur Evans himself, however, writing at a time when

the Pylia frescoes were still buried beneath a Messenian olive grove, felt that the long robes - 'gaberdines' as he called them - had been introduced from abroad, and suggested that they were sacerdotal garments of eastern origin. Much depends on the dating of the frescoes, especially that of the rider in the palanquin. If this is indeed an L. M. la work, then it is just possible that a new style of religious vestment came from the Orient to Crete, was worn there for one or two generations, was seen there by Mycenaeans, and adopted by them in a long form for special occasions, and a short form for everyday wear. If, however, the later date for the frescoes be the correct one, it is stretching credulity too far to suppose that the new hierarchical eastern vestments arrived in Knossos at the same time as the Mycenaeans, who immediately adapted them to their own more commonplace needs. The far more obvious explanation is that to what was in any case their normal wardrobe, the Mycenaeans added some forms of Minoan dress. The L. M. Ib dip-fronted kilt does not appear to have made its way to the mainland, nor do any of the elaborately woven/embroidered textiles. The greater part of all cloth depicted in mainland frescoes is plain, and when a pattern is attempted, the motifs are of the simplest, and widely spaced (page 469 ff. below).

Pendlebury, writing in 1939, remarked "a curious gap in the Minoan mentality is the lack of historical sense. No picture exists of any scene which can be described as a record of a historical event". This statement could never

2. Evans notes its affinities with the Campstool fresco, and points in common between the latter and the Captain of the Black - P.M. IV, p. 398.
have been applied to the mycenaean, in whose frescoes soldiers fall from towers, boars are hunted, and warriors fight savages across rivers; and the miniature frescoes recently discovered at the Cycladic, but Minoan-oriented site at Akrotiri, with their expeditionary shipping, drowning men, walled cities, seizure of booty and mycenaean warriors, seem not only to commemorate an actual historical event, but one in which at least islanders and mycenaean, if not Minoans and mycenaean, acted in concert.

There are various suggestions as to how a mycenaean dynasty may have obtained its foothold in Knossos. Hutchinson's succinct summarising up is "conquest, a dynastic marriage, or by coup d'état of a mycenaean general serving over a Minoan army." how, if great events were being recorded on frescoes in the Aegean as early as L. M. 1a, and if it be acknowledged that it was certainly a mycenaean custom, if not a Minoan one, to record important incidents on palace walls, the group of Knossian frescoes under consideration may perhaps be regarded in a new light.

Mycenaean are abroad in the Aegean, and displaying military prowess as early as L. M. 1a (the Akrotiri miniature frescoes). They are neither unknown nor unwelcome at L. M. 1b Knossos, for six of them are allowed to take part in an important religious ceremony (the Procession fresco).

1. G. Rodenwaldt "Der Fries des Megarons von Mykenai", 1921, p. 30 ff., Pl. II; the colour plate entitled "Palast und Kampfszene - Fragment".
2. G. Rodenwaldt "Tiryns Vol. II", 1912, p. 125 ff., Fig. 55, Pl. XIII.
6. On present evidence, Akrotiri was destroyed in L. M. 1a - Ergon 1968, p. 93.
The exalted position of the central figure in the Palaququin fresco is underlined by the facts that he was important enough to ride in a palanquin, important enough to be well-attended, and, above all, important enough to be commemorated in a fresco (the style of which cries out against its assigned L. M. Ia date). The short hair seen in the fresco is the most common style for males on the mycenaean mainland; the physiognomy of the remaining faces is mycenaean; and the robes, certainly non-minoan, appear to be mycenaean. Is this the arrival of the new dynasty? If so, his advent seems to have been peaceful, perhaps even welcome. The young people in the Campstool fresco are minoan in coiffure and feature, but have adopted the new (mycenaean) fashions. They are perhaps the jeunesses dorée of L. M. Ib, or, more probably, L. M. II - Ila Knossos, and no doubt their parents anticipated Pendlebury in lamenting their decadence. They seem to be proposing a toast; are they celebrating some triumph of the new dynasty? A chariot scene is painted in an island which had little record of the horse before the fifteenth century; mark Cameron, publishing the fresco,

1. Minoans and mycenaean have different types of noses. The minoan nose is slightly indented below the brow ridge, has a straight or slightly aquiline bridge, and, though long, has an attractive, rounded, slightly retroussé tip - e.g. the Cupbearer's nose (see F. M. I, p. 8, Fig. 2). Mycenaean noses, like classical Greek noses, continue in a straight line from forehead to bridge; they are inclined to be very long, straight or slightly concave, and their most distinguishing feature is the sharp, drooping tip, which gives them an inquisitive air. The noses on the Warrior Vase are the most extreme example, but similar noses are to be seen on nearly every male figure in the Phylai frescoes. As well as the palanquin's attendants, the Captain of the Blacks and some of the minor characters on the Aghia Triada sarcophagus have 'mycenaean' noses.
2. La Parisienne, especially, has a very minoan nose - see note 1 above.
believes its subjects to be mycenaean. The Captain of the Blacks, smart, and an officer, but, with his cropped hair, long nose, hasty stride and Mycenaean shorts, certainly no Minoan, leads his colourd mercenaries at the double. Is this why the newcomers are welcome — for their troops and their chariots? Is it hoped that they will be able to stave off some impending disaster? If so, the hope is vain. The inhabitants of the Unexplored Mansion, no doubt wearing both Minoan costume and Mycenaean, will soon be fleeing from the building, while the conflagration sends the Minoan weights attached to looms standing in the upper apartments crashing down to join those stored below. This will be but a bitter prelude to the destruction of the palace itself, including that new throne room which will later be copied with suspicious faithfulness at Pylos, as will another type of Minoan weight (page 448 ff. below). The last weavers to work in the area of the palace proper will probably be those in the room above the passage to the north of the Shrine of the Double Axes (page 289 above); and when they abandon their looms, although others will flourish later in the environs of the site, no more textiles, Minoan or Mycenaean, intricate or plain, woollen or linen, will ever again be woven in the Palace of Minos.

m) Wool and Linen.

It is probable that wool has always been the chief textile fibre used in Crete. Sheep were being bred in the island, and doubtless woollen cloth being woven, long before the arrival of the Minoans (pages 192 - 193 above), and the topography not only of the Knossos area, but of the whole island was, and is, suitable for sheep-rearing. The few plains that are sufficiently rich and well-watered to permit the

cultivation of flax would have been in demand for many different crops, whereas the barren hillsides with which Crete is so liberally endowed are useless for anything but nomadic grazing. Furthermore, cold mountain slopes and sparse vegetation, though they produce poor carcasses, encourage the growth of long, fine, thick fleeces.

The newcomers who entered Crete at the beginning of the Bronze Age, perhaps already familiar with sheep in whatever may have been their place of origin, perhaps adopting the textile traditions of the native inhabitants, or possibly a blend of both, certainly continued the use of wool. Animal bones do not usually occur in great numbers in Minoan settlements, but of those that were recovered from Myrtos, over ninety percent were caprine, and the analysis of these suggests that they were bred at least as much for wool as for meat.

The use of numerous bright colours in Minoan textiles is more likely to be evidence for wool, which takes dye very readily, than for linen, which does not (page 33 above). Among the 'tribute' which the Keftiu offered to Menkhpeterrasonb were lengths of cloth (Pl. XLVIb, c). Linen would have been of little interest in the land which had been producing it since the fifth millennium B.C., but woollen cloth, seldom seen (pages 26 - 27 above), might well have

1. The Mesara plain comes nearest to providing the conditions needed for flax-growing. Crete may have been more fertile and better watered before deforestation, but its character is basically mountainous - for general discussions on such questions, see J. D. S. Pendlebury "The Archaeology of Crete", 1939, pp. 1 - 7; R. W. Hutchinson "Prehistoric Crete", 1962, pp. 36 - 37, 38 - 40, and N.B. p. 41.
2. Some of the world's finest merino wool is produced in Tasmania because of the existence of such conditions.
been prized for its novelty, especially if woven in gaudy colours and gay foreign patterns - barbaric, no doubt, but not unattractive in their way.

It may be argued that woollen fabric is unsuitable for wear in the Cretan summer, although no-one who has had to work at Knossos in winter will deny its appropriateness for that season. Other races who lived in hotter parts of the ancient world than Crete (such as Mesopotamia - page 27 above), however, produced woollen textiles, and today's desert beduin costume includes woollen garments.

Linen would have been available from Egypt throughout the Minoan period, and Sinclair Hood may well be right in suggesting that traces of this cloth found in an E. M. 1 deposit (page 17 above) were imported. The alternative, that it was made from locally grown flax, is less likely for the reasons given above (previous page). There is no other evidence for linen until the closing years of Minoan history, when the diaphanous sleeve of La Parisienne's Mycenaean-style gown suggests its use. Scraps of cloth adhering to a sword from the Chieftain's Grave at Zafer Papoura near Knossos were described by Evans as "linen tissue", and the rather open nature of the textile, with equal numbers of threads in warp and weft - the typical linen weave - supports his contention. Even this may be an import, albeit from a different source, for the grave belongs to the period when the putative Mycenaean dynasty ruled at Knossos, and there was at least one area of the Mycenaean mainland, Messenia, which could and did.

2. P.M. IV (2), pp. 866 - 867, Fig. 852.
cultivate flax (pages 16 - 19 above; 488 ff. below).

There is one more possible source of evidence for the use of both linen and wool in Crete at this late period - the Linear B tablets discovered at Knossos. Most scholars now agree with Ventris' interpretation of Linear B as early, Mycenaean, Greek, although even this is not universally accepted. It is an experts' subject, and one is in their hands when using the necessarily hesitant and incomplete translations they provide - yet so many of these are concerned with textiles that it is impossible to overlook them.

The SA sign, tentatively recognised as the ideogram for linen, occurs on only three of the Knossos tablets, and while syllabic renditions of 'linen' and 'fine linen' also appear to indicate its use, they do not occur often enough to suggest that that use was very extensive.

The same cannot be said of wool, however, for there is a whole series of tablets dealing with wool, sheep, lengths of woollen cloth and woollen garments. J. T. Killen has used those dealing with sheep and wool to construct a very interesting theory that wool may have been one of the main sources of the wealth of Knossos in the Late Bronze Age. Although his article has been subject to some criticism, if one accepts that Linear B is correctly interpreted, his basic arguments seem to make very good sense.

The very number of tablets dealing with sheep and wool, in comparison with the total found, supports his theory; and his suggestion that flocks consisting only of rams and wethers were being kept for wool (they have a heavier fleece than ewes, and losses are lighter), and his comparison of this with practices in mediaeval England and nineteenth century Wales and Scotland, seem both plausible and eminently sensible. His ideas on the organisation of different types of flocks for different purposes, the number of beasts per shepherd, the replacement of losses, the estimation of returns in wool and lambs, are all worth considering, even if they have to be approached with more caution. Another interesting statement is that there can be "no doubt not only that the number of animals with which the palace at Knossos was concerned was extremely large, but also that its interests ranged over at least the greater part of the entire island".

However great the administrative genius of the new dynasty at Knossos, they would not have had time to found an industry so well-organised, so detailed, and so enormous; it must have been there when they came, so that what we have is in effect the Mycenaean record of a well-established Minoan industry.


The wool industry, large and well-run as it appears to have been, was only one contributory factor in a much larger organisation - the Minoan textile industry as a whole.

That such an industry existed, there can be little doubt. Even E. M. 11 myrtos had textile tools in numbers sufficient to supply a small surplus over and above its own needs; the validity of this statement becomes more apparent when it is considered that although ten of the loomweights 1 probably came from one loom, and three from another, the rest occurred singly, and are therefore probably the surviving representatives of a number of sets.

A hypothetical but reasonably concrete picture of a section of the industry in operation at Knossos may be constructed on the basis of the Loomweight Basement weights, the amounts of cloth needed for the various minoan costumes, and a knowledge of the working capacity of the warp-weighted loom.

Approximately four hundred weights were found, sufficient to equip twenty looms with the arbitrary, but likely, number of twenty weights each. The amount of cloth produced by each loom each day would vary according to the fineness of the weave, whether the work were plain or patterned, and, in the latter case, on the complexity of the design; but a modest average of half a metre of cloth, eighty centimetres in width, per loom, per day may be postulated. The width is the maximum across which it is comfortable for a single operator to pass a shuttle manually, and the low daily output takes into account the fact that preparing the warp and attaching it to the loom can take as long as, if not longer than, weaving the cloth itself (page 98, note 4 above).

3. P.M. 1, p. 253.
If, as is not unlikely, new warps were prepared in advance (page 33 ff. above) by 'specialists', and had only to be attached to the loom, the time lag between finishing one piece of cloth and starting another would have been reduced by about half, and the output proportionately increased. Adhering to the conservative estimate, however, and allowing time off for religious ceremonies, public holidays, and illness, if the twenty looms were in operation three hundred days per year, then the annual production of this one workshop would have been three thousand metres of cloth.

Against this must be set the quantities of cloth needed for the various Minoan costumes. The most lavish requirements of all are those of the female dress worn by the Snake Goddess's votary with the leopard cap (Pl. XLVb). Granting her a height of five feet five inches (165 cms.), and using this for a scale, her frilled skirt would require seven metres of cloth, which, however, need only be fifteen to twenty centimetres wide. If the rest of the fabric is calculated in eighty centimetre widths, the underskirt on which the frills must have been mounted would require one and a half metres, the apron, three-quarters of a metre, and the minute jacket as little as thirty-five centimetres in plain or suitably patterned cloth (e.g. Fig. 56a - i; Fig. 57a - b, f), but up to sixty centimetres in a one-way design (e.g. Fig. 57c - e). The total is the equivalent of four and a half to five metres of cloth eighty centimetres wide, or nine to ten days' work for one loom. The workshop could thus have supplied sufficient material for six to seven hundred such outfits per year.

1. This is the only kind of cloth that could have been woven on the hypothetical loom at Aghia Varvara - p. 304 ff. above.
The quantity of cloth required for female attire is offset by the modest demands of male dress. It is difficult to estimate how much fabric the codpiece and kilt costume needed, because some parts of it look so stiff, they may have been made of something other than cloth, such as metal or leather; the kilt section of it could be cut from less than half a metre, so that the workshop could have supplied an annual order for six thousand. The dip-fronted kilts appear to have consisted of a long, narrow, rectangular piece of cloth which was wrapped round the wearer like a beach towel; the two lower corners of the loose ends dip naturally, and the hinoans accentuated this effect by clever cutting, and by lapping one front corner exactly over the other, and weighting them. For a figure of the arbitrary height of five feet five inches (165 cms.), a piece of cloth of approximately forty-five centimetres wide and one and one third metres long would be appropriate. These kilts may have been woven either lengthways or widthways, the deep lower borders, if not separately sewn on as braid, perhaps suggesting the latter. Taking the cupbearer (Pl. XLVd) as an example, just over one third of the depth of his kilt is accounted for by the border, so that the intricate cruciform pattern is in fact only about thirty centimetres deep. If woven widthways, such a piece would require a wider loom, double the number of weights, and probably two weavers, as in Pl. Vilic. Leonard Palmer's interpretation of a tablet with a cloth sign and two (male) names as two weavers working on one piece of cloth lends colour to this suggestion. Weaving is always women's work in Homer and on Greek vases, but pairs of male weavers were known in Egypt (Pl. VIIa, b).

1. Leonard R. Palmer "mycenaeans and minoans 1965 (2nd. ed.), p. 119. In view of the numbers of minoan loomweights, the analogy of the two-beam vertical Egyptian loom is not so felicitous.
male or female, two workers on a double width loom could probably have completed the Cupbearer's kilt in two to three days, an estimate which allows both for the setting up, and the considerable complexity, but small depth, of the pattern. An L. M. 1b workshop of the same size as the M. M. 1b one above the Loomweight Basement would therefore have been able to turn out between one thousand and fifteen hundred ornate dip-fronted kilts annually.

Converting the hypothetical workshop to Mycenaean requirements, 'gaberdines' like those on the Aghia Triadha sarcophagus (Pl. XLVIIC) would have needed three and a half to four metres each (seven hundred and fifty to eight hundred and fifty garments annually); and military shorts (Pl. XLVc), three quarters of a metre (four thousand pairs per year).

The workshop has been described as specialising—making cloth for clothes only. This was probably so in fact. Four hundred loomweights, all of the same kind, do suggest the production of one type of cloth, when it is known that many other types of loomweight were available. The weights from the Unexplored mansion show a similar uniformity in that nearly all are approximately spherical (Pl. XLVle). The same is true of Vathypetro. Tylissos and Aghia Triadha have both flat discoid and spherical weights. That these are no mere regional variations is proved by Mallia, and the east coast sites of Palaikastro and Kato Zakro, which used almost every known type. It is impossible to ascertain the exact use of each variety, but it is reasonable to suggest that four-hole cuboid weights were required for some unusual work such as braid-making (pages 186 ff., 294 above), and that the heavier
types, spheres and cylinders, were used for heavy fabrics, hangings, coverings, bags and cloaks (page 287 above). The discoid weights, numerous, widespread, comparatively light, and occurring throughout the minoan period, are likely to have been the ones used for dress materials.

Specialisation is reflected in the tablets. Evans pointed out that "looms with pendant weights supply a recurring sign of the Linear Script A", and similar ideograms in Linear B show at least nine variations. Transliterations of the syllabic script refer to untranslatable types of cloth — tu-na-no, pe-ko-to, ko-u-ra, pe-ne-we-ta, nu-wa-ja-, and cloth provided with o-nu-ke, pe-ne-, and o-da-k- — as well as tentatively translated terms such as 'edged', 'clean edged', and 'dirty edged' cloth, 'royal' cloth, cloth which had been 'torn and mended', and 'double cloaks', the latter reinforcing the possibility that weavers sometimes worked in pairs. Ventris' and Chadwick's hesitant interpretation of 'pe-ko-to' as 'carded' or 'shorn' cloth may well be right. The nap is sometimes raised on woollen cloth by combing its surface with teasels, and the pile thus produced has to be shorn down to an even length. If 'ko-u-ra' might be regarded as part of the verb to shear (which is not favoured by Ventris and Chadwick), its meaning would be similar. The 'o-nu-ke', plausibly related to the Greek word for nail, claw or onyx, seem

1. P.M. 1, p. 253.
"to be ...some kind of decoration.... designed for application to garments". The decoration that was always applied to Minoan and Mycenaean garments was of course braid, and the barred varieties favoured when Linear B was being written at Knossos (page 331 above) might be considered to have the appearance of a row of claws, or to imitate the veinings in the semi-precious stone. There are tantalising glimpses of colour - purple and white fairly well established, red, yellow and grey, and simply 'coloured' also possibilities. Although meanings may be uncertain and obscure, the indication of a considerable variety of textiles is clear enough.

The weavers' workshop above the Loomweight Basement was not necessarily the only one in the earlier palace at Knossos. It was chosen as an example because the weights appear to have all fallen into the one place, instead of scattering, and because the approximate numbers are known. Remains of other workshops may have been among the debris which had to be cleared away after the M. M. III destruction.

By the time the Linear B tablets were being written, such a workshop would have been quite inadequate to make up the quantities of wool which were being sent in to Knossos from 'outlying villages'. Wool is said to have been measured at Knossos in units which weighed approximately three kilos each. Though as few as three measures of wool were recorded on tablets, quantities of several hundred units - six

hundred kilos or more - also occurred. Woollen cloth
eighty centimetres wide weighs about two hundred and fifty
grams per metre; a very heavy, lined woollen cloak weighs
about one and a half kilos; and the largest modern floccata
rugs seldom exceed twelve kilos. Therefore a quantity of
wool which was only one entry among others on a single tablet
could have provided two thousand, four hundred metres of cloth,
or four hundred cloaks, or fifty to sixty very large rugs.

Knossos was not dependent on the looms in the pal-
ace alone, nor yet on those there may have been in the town
which must have surrounded it. The 'outlying villages'
were sending in made-up cloth as well as measures of wool;
contributions varied from two to forty pieces. It would
be instructive to know how large some of these villages were,
and how far from Knossos they were situated, but of the
eighteen place names which survive on wool and textile tablets,
only Amnisos and Knossos itself are instantly recognisable;

2. The calculation is based on the weight of a length of
medium-weight Scottish tweed.
3. The weight of 3 kg. suggested for a winter overcoat (M. Ventris and J. Chadwick 1956 op. cit., p. 314) is unusually
heavy, although appropriate to some blankets.
4. These are sold by weight, and the size varies. 3m. x 4m.
is a very large one. They are rendered exceptionally
heavy by the extra weight of the thickly set tufts or
flocks; so the pieces of cloth in tablet L 250 (M. Ventris
and J. Chadwick 1956 op. cit., p. 321, No. 225) which
apparently weighed six units - eighteen kilos - each, must
have been enormous, if the equation is correctly inter-
preted.
5. M. Ventris and J. Chadwick 1956 op. cit., p. 315, No. 209 -
Lc 525.
6. F.m. ii (2), pp. 553 - 564; J. W. Graham "The Palaces of
Tylissos and Phaestos are probable, and Siteia, doubtful. The practice of outlying centres supplying textiles to a focal point does not lack parallels in Crete today. At modern, as at Minoan, Tylissos (pages 281, 288 above), the inhabitants are much concerned with weaving. Every third or fourth house seems to have a loom and the products are sent, not to Knossos, but to its near neighbour and commercial successor, Herakleion, for the tourist trade. If the 'Tu-ri-si-ja' of the tablets means 'Tylissian', history repeats itself indeed.

The recognisable place names on all the Knossian tablets, not just those concerned with wool or textiles, suggest "that the area in contact with, and probably subject to, Knossos covers virtually the whole of Crete". What is not known is whether this would also have been true before the arrival of the new dynasty, and whether the great textile centres of Palaikastro and Kato Zakro were part of the Knossos network. It is possible that their names were different in Minoan times, and are among those listed as untranslatable - but if anywhere in Crete were beyond the long arm of Knossos, it would have been these two sites on the distant east coast, each with its own harbour. Finds at Kato Zakro, in particular, suggest that the palace was very wealthy in its own

1. M. Ventris and J. Chadwick "Documents in Mycenaean Greek", 1956, pp. 141, 146 - 147, 315, 317. Phaestos is Pa-i-to (adjectival Pa-i-ti-ja); Tylissos Tu-ri-so (adjectival Tu-ri-si-ja); Siteia, Se-to-i-ja.
4. It is quite possible, for the reason given on p. 339 above.
right, and that weaving was carried on there to an extent that may well have been greater than at Knossos. There seem to have been looms on the upper floors both of several parts of the palace, and of almost every other building on the site (pages 275 - 276, 280, 295, 297). Without knowing the exact numbers of loomweights it is not possible to estimate, even approximately, the quantity of cloth produced, but it must have been very large. The many different types of loomweights suggest that many varieties of fabric were being woven, and the probable dye-works (page 63 ff., above Pl. illc, Fig. 3) are yet another indication of the professional status of the industry at this site. One wonders, indeed, whether textiles were not Kato Zakro's chief raison d'etre. Whether Knossos acted as tyrant, or broker, or agent, for this area of Crete or not, there can be no doubt that the east produced a large proportion of the island's cloth.

Why was so much cloth being produced? For whom was it intended? Farmhouses like Sklavokampos, villas like Myrtos-Pirghos, would at least have supplied their own needs. Small centres like Tylissos and Vathypetro, even if they sent textiles to a larger centre like Knossos, would certainly have retained sufficient for their own use. The same may be said of towns like Gournia and Palaikastro. It is true that the great palaces would have needed large quantities of furnishings, and clothes for officials, as some of the tablets from Knossos testify. 1 A factor which should be taken into account, however, is that at the time under consideration, most people would have possessed perhaps two sets of clothes, one

for daily wear, and one for special occasions. These would have been replaced only as they wore out - and homespun is durable. Seasonal changes of fashion demanding a constant supply of new clothes are a very recent innovation. Therefore the palaces also are likely to have been producing surplus textiles.

It is improbable that surplus textiles would have found much of a market within Crete. It is difficult to recall any Minoan settlement site which did not have its own textile tools. There may have been a small internal trade in special fabrics, but that would have been all.

The inescapable conclusion is that cloth was being exported, and the paintings on the walls of Menkheperressamonb's tomb confirm that this was the case. The Keftiu there would no doubt have been very offended to know that they had been recorded as tributaries, and are more likely to have regarded themselves as what would today be called a trade mission. Among the goods they had to offer were lengths of cloth (page 336 above, Pl. XLVIb, c). If the Minoans had the means to carry cloth to Egypt, there is obviously no reason why they should not also have supplied the Anatolian and Levantine coasts, Cyprus, Libya and Greece, all areas with which they are known to have traded, and perhaps even parts of the western Mediterranean. It is difficult to say how far the island sites with Minoan loomweights, Akrotiri on Thera, Phylakopi on Melos, Kastri on Kythera, Aghia Irini on Kea, and Trianda on Rhodes (page 282 ff. above) were under Minoan influence, or what part they played in this overseas textile trade, but their presence should not be forgotten.

It is not hard to understand why great civilisations should have arisen in parts of the ancient world such as Egypt and Mesopotamia. Crete has neither fertile land, nor great navigable rivers, nor rich mineral resources, yet it nurtured a civilisation just as admirable. How did the Minoans contrive to be famous in an obscure island, rich in a poor one? Their traditional mastery of the sea, not necessarily aggressive, may be one part of the answer, the vine and the olive, which flourished then, as now, another. Dull bureaucratic records and uninteresting heaps of loomweights surely provide the clue to a third.

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