CORRELATIONS BETWEEN COMPOSITION AND PROVENANCE OF MYCENAEAN AND MINOAN POTTERY

(PLATES 28–34)

FOREWORD

THIS investigation into the compositions of Minoan and Mycenaean pottery fabrics was carried out in Oxford at the Research Laboratory for Archaeology and the History of Art by permission of the Director, Dr. E. T. Hall. Mrs. E. E. Richards, co-author of this report, was in charge of the investigation, latterly with the assistance of Mrs. A. Millett. The potential importance of the work undertaken was first suggested by Mr. M. S. F. Hood, then Director of the British School at Athens. Mr. Hood has maintained lively interest in the investigation, and has made many valuable suggestions about the course it should take, as well as providing much of the sherd material. In this connexion we are greatly indebted to Dr. J. Papadimitriou, Director-General of Antiquities in Greece, for granting the necessary export permits. We are also grateful to Mr. M. R. Popham, for scraping selected sherds in the Herakleion Museum and in the Stratigraphical Museum at Knossos, and to Dr. N. Platon, then Ephor of Antiquities in Crete, for allowing this to be done. Sherds from Thebes in the University Museum, Reading, were loaned by Mrs. A. N. Ure; the Rev. Dr. A. J. Arkell provided a set of Mycenaean sherds from Tell el Amarna from the collections in University College, London. Fragments from Rhodes were given by the Department of Greek and Roman Antiquities in the British Museum through the kindness of Mr. D. E. L. Haynes and Mr. R. A. Higgins. Other sherds were provided from the reserve collection in the Ashmolean Museum. The sherds tested in the course of the investigation are now housed in the Ashmolean,[1] with the exception of the group from Thebes (Reading).

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GENERAL INTRODUCTION

The solution to many problems in the archaeology of the Aegean Late Bronze Age lies in the correct identification of the place of manufacture of individual vases and vase fragments. Obviously, such problems do not arise with the vast bulk of pottery found on Minoan and Mycenaean sites in Crete and Greece themselves. It is a reasonable assumption that sites such as Knossos, Phaistos, and Mallia on the one hand, Pylos, Mycenae, and Volos on the other, manufactured virtually all their own wares for themselves. But at the same time it is also clear that pottery must have figured in trade and other forms of exchange between the main Aegean centres; such material has in the past had to be distinguished from local products by the traditional criteria of shape, fabric, and ornament. It is here that the marked technical and decorative homogeneity that runs through so much Minoan and Mycenaean pottery, irrespective of its source, raises serious difficulties of interpretation. The Mycenaean origin of a vase found in Crete—or vice versa—may be extremely probable, yet doubt lingers for want of some additional—and objective—criterion to support the judgement. As the Minoan and Mycenaean

[1] Accession numbers 1962.357–76. The sherds scraped in museums in Crete are, of course, excluded. A summary description of this material is given in the Appendix.

worlds were drawn into closer and closer association, with their material cultures coming more and more to resemble one another, the farther our confidence in making such judgements recedes.

From L.M. I/L.H. I onwards there is increasing evidence for eastward and westward expansion from the Aegean, evidence which is largely ceramic. There has been not a little dispute about the precise source of Aegean imports found in Egypt and the Syro-Palestinian area: are they Minoan, or are they Mycenaean?[2] Correct discrimination would help to clarify the manner—and its timing—in which Crete was supplanted by Greece as the dominant mercantile power in the east Mediterranean.

In other cases, problems arise over Mycenaean pottery alone. Within Greece itself at few points can headway be made in isolating regional ceramic groups by traditional methods. Though, again, it is obvious that the main sites produced their own pottery, there must have been exchanges between them in which pottery surely played a part. Suspicions there may be that individual pieces are alien to the sites where they have been found, but nothing like certainty is possible. We meet the same problem in a rather different aspect when we turn to the rich finds of Mycenaean pottery outside Greece. From Myc. IIIA I onwards no region in the east Mediterranean has more Mycenaean pottery than Cyprus. The earliest finds are clearly imports; later, in the second half of the thirteenth century, Cypriot-made copies become obvious. But between these limits is a mass of material, including the important class of Pictorial vases, whose origin is controversial.[3] Was it made in the Mycenaean home-lands and exported to Cyprus in the course of trade? Was it made in Cyprus in Mycenaean colonial settlements? This problem may be carried a stage farther, to the Mycenaean III pottery from Egypt, particularly that from Tell el Amarna, and from Syria, notably the finds at Ras Shamra and Tell Atchana. Was such pottery exported from Greece, or was it exported from factories in Cyprus or, conceivably, was it even locally made?

There is a clear case for a search for new ways to help solve such problems of identity; one possibility has now been partly explored by the present investigation.

Introduction

The fabric of pottery consists of about 50 per cent. or more of silica (SiO_2), mostly chemically combined with the oxides of aluminium, calcium, and magnesium. Apart from these, iron in the form of various oxides is present, as well as a long list of minor and trace constituents. All these are present in the clay from which the pottery was made, but the numerical values of their individual concentrations, i.e. the quantitative as opposed to the qualitative analysis of the two media will be different for two reasons. 'Raw' clay is not usually suitable for making fine pottery; it has to be refined and processed in various ways which lead to changes in its composition. The firing process results in the loss of water which gave the clay its original plastic quality; this leads to a change in the absolute, rather than in the relative, concentrations. Even if it were possible therefore to identify the ancient clay-pits, the correlation of the fabric of the pottery with the clay from which it was supposed to have been made could only be carried out in the broadest outline. It was therefore decided to confine the study to the end product of the various factors: the pottery itself.

[2] See, for example: A. J. B. Wace and C. Blegen, *Klio* xxxii (1939) 131ff.; H. J. Kantor, 'The Aegean and the Orient in the Second Millennium B.C.', *AJA* li (1947), esp. 33ff.; and A. Furumark, 'The settlement at Ialysos and Aegean history *c.* 1550–1400 B.C.', *OpArch* vi (1950), esp. 203ff.

[3] See F. H. Stubbings, *Mycenaean Pottery from the Levant* (1951).

Earlier work[4] has shown that while no qualitative differences appear to exist between the composition of pottery of different provenance, it is possible to find systematic quantitative differences. It was therefore decided to test the suggestion that pottery fabrics of the Aegean Late Bronze Age might also differ significantly from one another in this respect, according to their provenance. If they existed, such differences could be used as an ancillary means towards identifying the place of manufacture of critical vases and fragments. It might be disputed whether an Aegean vase found in Egypt was Minoan or Mycenaean; suppose it could be shown that the composition of Minoan and Mycenaean pots was easily differentiated, then it should be possible to have recourse to some method which will yield this information. Spectrographic techniques are particularly suitable for this purpose since under appropriate experimental conditions it is possible to analyse a specimen weighing no more than 10 mg. for 10–15 elements, the concentrations of which may vary over a range covering four powers of ten (say 10–0·001 per cent.), with an accuracy of 20 per cent. or better. It is the exact proportion of the major constituents which cannot readily be determined by this method; these, however, vary comparatively little from case to case. The experimental errors are liable to be systematic rather than random, which is preferable provided the analyses are done by the same method in one laboratory and are used for *comparison* purposes. Achievement of the same degree of *absolute* accuracy as of *reproducibility* is only necessary should several laboratories collaborate in compiling the data.

When we carried out the experimental work a compromise had to be made between the completeness of the information about a particular sherd and the total number of sherds analysed. In view of the nature of the problem it seemed preferable to analyse a large number of samples (some 500 individual sherds) in order that the results could be treated by statistical methods. This meant, however, that data were obtained for only a selected nine of the possible total of some twenty-five constituents.[5]

The choice was made partly on the basis of analyses of clay minerals available in scientific literature, and partly on the basis of previous experience with ancient pottery;[6] but mainly as a result of a pilot programme[7] on forty sherds each from Knossos and from Mycenae, carefully chosen for the experiment by Mr. M. S. F. Hood. These sherds were analysed under one set of experimental conditions[8] for calcium (Ca), aluminium (Al), magnesium (Mg), iron (Fe), sodium (Na), titanium (Ti), chromium (Cr), nickel (Ni), manganese (Mn), zirconium (Zr), and vanadium (V). The determination of potassium (K), gallium (Ga), strontium (Sr), barium (Ba), lead (Pb), and rubidium (Rb) was carried out under quite different experimental conditions. In this latter group no systematic differences were observed in the very small traces of Ga, Sr, Ba, Pb, and Rb which were found to be present, while the potassium content of both sets of sherds remained very close to 2·5 per cent. It therefore did not add a criterion for distinguishing between them, and the second type of experiment was discontinued for subsequent samples. All the elements present in amounts of 0·5 per cent. or more which could be determined by means of the first type of experiment were retained in the final selection, which also includes the trace elements Cr, Mn, and Ni. The other two V and Zr did not give consistent results. The

[4] E. V. Sayre, A. Murrenhoff, and C. F. Weick, 'The non-destructive analysis of ancient potsherds through neutron activation', *Brookhaven National Laboratory, Report No. BNL 508 (T–1222)* (1958). E. V. Sayre and R. W. Dodson, 'Neutron activation study of Mediterranean potsherds', *AJA* lxi (1957) 35. E. E. Richards, 'Spectographic analysis of Romano-British mortaria', *Archaeometry* ii (1959) 23 and iii (1960) 25.

[5] Prelim. Reps. Reference Clay Minerals, *Am. Petroleum Inst. Res. Project* 49 (1951).

[6] Ibid. *Archaeometry* ii 23 and iii 25.

[7] H. W. Catling, A. E. Blin-Stoyle, and E. E. Richards, 'Spectographic analysis of Mycenaean and Minoan pottery (Interim Report)', *Archaeometry* iv (1961) 31.

[8] E. E. Richards and K. F. Hartley, 'Spectographic analysis of Romano-British pottery', *Nature* clxxxv (1960) 194.

minimum and maximum amounts of the selected elements encountered in the course of the entire project are given in Table 1. It is evident from this table that the greatest variations in concentration occur in the cases of Mg, Ca, Cr, Mn, Ni, and Na, and it may be anticipated that these elements will prove to be most useful in characterizing the type of composition of a sherd (cf. FIG. 3).

TABLE 1

Ca	0·8–32	Ti	0·4–1·9
Mg	0·8–15	Mn	0·007–0·27
Al	6–32	Cr	0·015–0·5
Fe	2·8–15	Ni	0·001–0·2
Na	0·3–3		

STATISTICAL BACKGROUND

If knowledge of the chemical composition of the fabric of pottery is to be useful in comparing and contrasting sherds of different provenance, some method of estimating the randomness among sherds of the same provenance has to be chosen. This can be done with a predetermined degree of certainty by means of standard statistical methods which involve certain assumptions. The justification for these assumptions appears to some extent in the process of applying them.

The average value of the concentrations of each of the selected constituents is found for each set of sherds (preferably at least ten) from a particular site. This set is referred to as a 'group' and treated statistically as a 'sample' from a 'normal' population. A 'normal' population is such that if a histogram is drawn or a frequency distribution is plotted for a very large 'sample' from the same population, the shape of the graph is a symmetrical bell, with its apex at the average value. Occasionally it was found that sherds from the same site divided themselves into two distinct groups, both 'normally' distributed about their mean values for the distinguishing elements. Sets of sherds which were believed to be different on archaeological grounds were not treated as members of the same population even if they were from the same site, and this division is indicated in Table 2, which lists the provenance of all the sherds which have been analysed. In the tables and figures which follow, roman numerals are used to distinguish different groups from the same site, whatever the reason for the division.

The amounts of any particular constituent present in the individual members of the group will fluctuate about the mean value for that group. To reduce the influence of experimental error on these fluctuations to a minimum the method was tested and improved at the outset of this project until the standard deviation associated with the experimental technique was less than the standard deviation obtained from sherds in the same group; i.e. the fluctuations observed when the *same* sherd was analysed say ten times were much smaller than if a sample of ten sherds *in the same group* was analysed instead.

By means of statistical procedures concentration ranges can be calculated for reasonably well-defined groups. The limits of these ranges are called 'confidence levels', since they depend on the degree of certainty with which one wishes to be able to predict the probable composition of any other from the same group. For archaeological work the choice of an 80 per cent. level of confidence seemed reasonable. This means that *in the long run* 80 per cent., i.e. four out of five, sherds belonging to the same population should have concentration within the calculated range. For a given confidence level, the width of the range depends on the magnitude of the deviations from the mean of the individual analyses which have contributed to it. In this way we get 'good' groups, with narrow ranges, easily distinguishable from other groups, and also indistinct groups resulting from wide ranges. While the average concentrations of the different constituents may

differ for different groups, they can only be said to be *distinguishable* with 80 per cent. confidence if the ranges of at least *one* of the constituents do not overlap. Bearing in mind that more samples will have compositions nearer the average than at the extreme of the range, we can still make some distinctions between groups even when there is some overlap of the

TABLE 2

Ref. no.	*Provenance*		*No. of sherds analysed*
	MAINLAND OF GREECE AND EUBOEA		
1	Argolid	Mycenae	40 PLATE 28 (*a*)
2	Argolid	Berbati	20
3	Corinth	Korakou	10
4	Megarid	Megara Minoa	20 PLATE 28 (*b*)
26†	Achaia	Aigira	20
25†	Laconia	Ayios Stephanos	20
5	Attica	Perati	12
6	Boeotia	Thebes	22 PLATE 29 (*a*)
7	Euboea	Amarinthos	16 PLATE 30 (*a*)
8	Thessaly	Volos	20 PLATE 29 (*b*)
27†	Thessaly	Argyropoulis	20
9	Thessaly	Marmariani	20
	CRETE		
10		Knossos	40
11		Ayia Triadha	10
12		Gournia	10
13		Palaikastro	10
14		Tylissos	10
15		Zakro	10
	Selected sherds from the Stratigraphical Museum, Knossos		13
	THE ISLANDS		
16	Melos	Phylakopi	42 (32+10) PLATES 30 (*b*) and 31
17	Rhodes	Ialysos	40 (20+†20)
28†	Chios	Emporio	33
	CYPRUS*		
18		Arpera Chiflik	20 (10+10) PLATE 32 (*b*)
19		Enkomi	20 (10+10) PLATE 33 (*a*)
20		Hala Sultan Tekke	20 PLATE 32 (*a*)
	EGYPT		
21		Tell el Amarna	20 PLATE 33 (*b*)
	NORTH SYRIA		
22		Tell Atchana	10 PLATE 34 (*a*)
	* For purposes of comparison a small number of sherds of specifically Cypriot types were analysed from the following sites: Arpera Chiflik; Beuyuk Kaimakli, *Evretadhes*; Dhenia, *Mali*; Dhiorios, *Aloupotrypes*; Nicosia, *Ayia Paraskevi*; and Pyla, *Verghin*.		10 PLATE 34 (*b*)

† These sherds arrived at a very late stage of the work; they have been analysed, but the results for them could not be included in all the Tables and Figures.

extremes of the ranges, provided that the average values of several of the constituents for one of them lie *outside* the ranges for the other.

It is now clear that the groups of sherds from Mycenae, Megara Minoa, Berbati, and Korakou are not distinguishable by these criteria and they are therefore treated as members of *one*

population. Since there are over 100 sherds from these sites taken together, it is possible to test the assumption that this population is 'normal' in the statistical sense described above. The other possibility[9] is that the population is 'log-normal', i.e. that the bell-shaped distribution is only obtained if the logarithms of the concentrations are plotted against the frequency of occurrence. The Ca and Mg content of the 100 sherds from the above sites were plotted both ways and the result for Ca is shown in FIG. 1. Both linear and logarithmic plots lead to symmetrical distributions. Other, more stringent, numerical tests of 'normality' were also applied. Using the log-normal distribution, the calculated statistics showed a marginal improvement in the

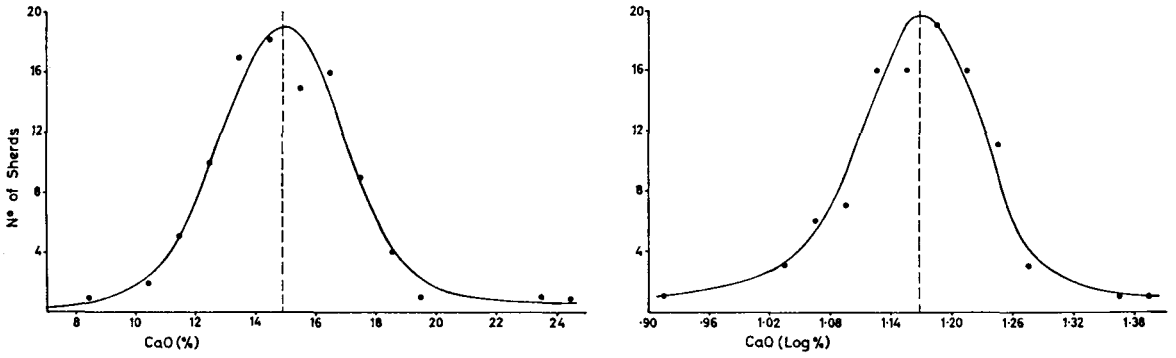

FIG. 1

shape of the curve from one point of view, while there was a marginal deterioration from another point of view. No over-all benefit was gained which would justify the additional labour implied in the use of logarithms, and therefore the groups were treated according to the 'normal' distribution law.

SELECTION OF MATERIAL AND DESCRIPTION OF EXPERIMENTAL METHOD

The distribution of sites from which sherds have been tested is shown on the map, FIG. 2, and in Table 2. Here also each site is given a reference number by which it can be found in the various Tables and Figures. The first need was to examine material from major sites in Crete and Greece, for unless significant differences were detected at this stage, further work would have been fruitless. When it was found that the samples tested from Mycenae and from Knossos formed two distinct groups, it was clear that more extended tests were justified.

Within the limitations imposed by the difficulty of obtaining sherds from this site or that, as wide an area as possible has been covered in Greece and Crete. Thessaly is represented by Volos, Marmariani, and Argyropoulis; Central Greece has Thebes. Sherds from Amarinthos enabled the island of Euboea to be included. Attica is poorly represented by Perati, on the east coast. From the Megarid (Megara Minoa) by way of Corinth (Korakou) into the Argolid (Mycenae and Berbati) there is a more representative choice; the rest of the Peloponnese is rather thinly covered by Ayios Stephanos in Laconia and Aigira in Achaea. Five major sites have been tested in Crete in addition to Knossos; though material from Phaistos was not available, sherds from Ayia Triadha partly compensate for its absence.

Beyond the Greek mainland and Crete, the island settlements are represented by Rhodes (Ialysos) and Chios (Emporio). Melos (Phylakopi) offered a complex of fabrics, some thought

[9] L. H. Ahrens, 'The lognormal distribution of the elements', *Geochim. et Cosmochim. Acta* v (1954) 49. E. V. Sayre and R. W. Smith, 'Compositional categories of ancient glass', *Science* cxxxiii (1961) 1824.

to be locally made, others to be imported from a variety of sources. Finally, sherds from three sites in Cyprus (Enkomi, Hala Sultan Tekke, and Arpera Chiflik) were examined, together with others from Egypt (Tell el Amarna) and North Syria (Tell Atchana). This was done in order to compare the data established for the producing centres with that from areas to which Aegean pottery was traded or in which it was locally imitated. Use was also made of the results by examining thirteen sherds from Knossos selected for their non-Knossian appearance.

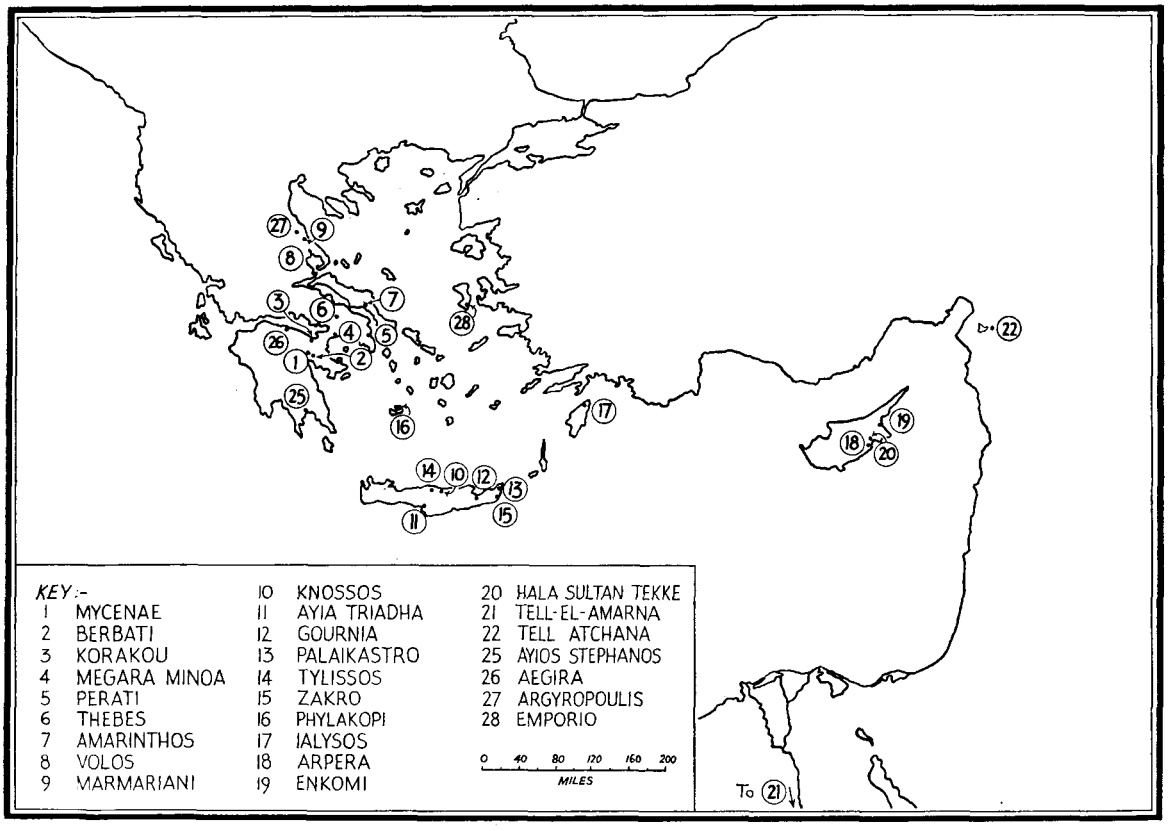

FIG. 2

In most cases the date of the sherds chosen for testing falls within the period 1400–1150 B.C., covered by the Late Minoan III and Late Helladic III phases. Some Cretan sherds, however, are as early as Late Minoan I; Phylakopi sherds include some L.H. I–II material.

For greater clarity, some of the tested sets of sherds are illustrated, PLATES 28–34. The numbered sets are those in which more than one of the groups described below were present.

The specimens for analysis were prepared by flaking off a few slivers from the cross-section of the sherd. The outside edges of the slivers were carefully removed to avoid contamination by the slip which usually has a different composition. The material from the inside of the fabric of the sherd is finely ground in an agate mortar, and after being mixed with a fixed proportion of a mixture of graphite, ammonium sulphate, and lithium carbonate, it is weighed into graphite cups and arced under controlled conditions. The light emitted by this arc is photographed in a Hilger Large Quartz spectrograph. The intensities of certain spectral lines, which are specially

chosen from among the very many which appear in the spectrum of this type of sample, are an empirical measure of the quantities of the elements which have given rise to those lines. It is only by comparison with the intensities of the same lines in the spectra of chemically analysed samples that absolute values for the concentrations can be obtained. For the trace elements Cr, Ni, Mn no chemically analysed standard samples were available. The calibrations for these were obtained by making up synthetic mixtures with the appropriate small concentrations. It is the difficulties in calibration which may lead to the systematic errors in the absolute values of the concentrations referred to in the Introduction. For our purposes the analytical results could equally well have been expressed in arbitrary units since we only wish to know that, for example, there is on the average nearly twice as much Mg in Cretan as in Mycenaean samples.

Results

The average values and the ranges of the concentrations for all the groups are collected in Table 3. This also shows the number of samples in a particular group and that number as a percentage of the total number of sherds from that site. The number of samples in a particular group gives an indication of the reliability of the average: the more analyses have contributed to that figure the more nearly will it represent further members of that group. The percentage figure is of interest because it shows that, for instance, nearly all (90–100 per cent.) of the sherds supposed on archaeological grounds to be probably Mycenaean imports, but found at Enkomi, Hala Sultan Tekke, and Arpera Chiflik (Cyprus), do in fact fit into groups which turn out to have Mycenaean type (A) compositions. Also, when two groups are found at the same site it may be significant whether a larger or smaller proportion resembles a type of composition encountered elsewhere: e.g. 64 per cent. of Theban sherds were found to have Cretan type (B) compositions while only 23 per cent. resembled type (A); the remaining 13 per cent. were different again (Table 5).

A way of illustrating the differences and similarities between groups is shown in FIG. 3. Here the average values of those elements, already referred to in the Introduction, which show the greatest over-all variation are plotted on vertical axes and the points are joined up. A 'composition pattern' for each group results, and they can easily be compared. Before we classify the groups into types, however, the possible overlap of the ranges must be taken into account. FIG. 4 is a graphical representation of the numerical data in Table 3, but it is easier to use than the table. The diagram consists of vertical lines at positions corresponding to the average concentrations of the various constituents, while the ranges are indicated by horizontal diamonds. It is only necessary to place a ruler in line with one of the averages to see whether it falls within the range of *any* of the groups. The same process is applicable in finding the possible origin of 'odd' sherds, Table 5 (*a*). The use of a logarithmic concentration scale for both FIGS. 3 and 4 is only a matter of convenience, to enable a spread over a power of ten to be confined in a reasonable space.

It is clear from Table 3 and the diagrams that with the exception of two small groups the Cretan sherds are very similar. They were combined into a single population and used to characterize a type (B), Ref. no. 24. For the same reason groups 1–4 were also averaged and they represent the other most frequently recurring type of composition, type (A), Ref. no. 23. If anything, this coalition of the groups emphasizes the distinctions which were already apparent when the original samples from Mycenae and Knossos were compared: there is *no* overlap between the Mg, Cr, and Ni ranges and these elements can be used to decide whether a third group resembles type (A) or (B).

TABLE 3

Ref. no.	Provenance	n	% of total	OXIDES OF: Magnesium MgO	Calcium CaO	Aluminium Al_2O_3	Iron FeO	Sodium Na_2O	Titanium TiO_2	Chromium Cr_2O_3	Manganese MnO	Nickel NiO
1	Mycenae	40	100	3·5±0·4	14·7±3·8	13·1±2·8	6·6±1·4	0·76±0·32	0·63±0·09	0·065±0·017	0·079±0·012	0·014±0·006
2	Berbati	20	100	4·3±0·7	14·9±2·6	16·1±2·6	7·6±1·5	1·14±0·56	0·74±0·13	0·061±0·014	0·092±0·015	0·010±0·004
3	Korakou	9	90	4·4±0·9	15·3±2·9	11·6±2·6	8·6±1·3	1·02±0·61	0·73±0·14	0·062±0·021	0·091±0·028	0·023±0·010
4	Megara Minoa	15	75	4·1±0·5	14·7±3·0	16·0±2·1	7·2±1·4	1·08±0·38	0·76±0·11	0·057±0·009	0·080±0·010	0·011±0·006
5	Perati	11	92	5·7±2·5	21·6±7·7	12·4±2·4	9·5±2·5	0·92±0·32	0·77±0·15	0·17 ±0·03	0·110±0·059	0·040±0·010
6a	Thebes I	5	23	4·1±1·0	14·5±6·5	13·6±4·2	5·8±1·2	1·11±0·34	0·80±0·11	0·049±0·012	0·076±0·042	0·012±0·002
6b	Thebes II	14	64	7·3±1·5	13·6±4·2	13·3±4·0	7·4±1·5	0·99±0·45	0·90±0·17	0·13 ±0·03	0·073±0·015	0·036±0·012
7a	Amarinthos I	11	69	2·6±0·5	6·4±1·8	14·8±3·2	6·1±0·6	1·46±0·26	0·68±0·07	0·035±0·016	0·081±0·015	0·007±0·006
7b	Amarinthos II	5	31	5·3±1·8	14·1±6·4	10·9±2·9	7·5±1·5	1·01±0·43	0·76±0·21	0·15 ±0·04	0·069±0·027	0·036±0·013
8a	Volos I	7	35	5·8±2·1	17·4±9·4	14·2±3·9	7·7±1·3	1·34±0·48	0·78±0·19	0·074±0·026	0·103±0·031	0·020±0·011
8b	Volos II	13	65	3·9±1·5	6·6±1·1	16·2±3·1	5·9±1·1	1·63±0·37	0·72±0·15	0·040±0·014	0·092±0·017	0·007±0·004
9	Marmariani	20	100	6·1±0·7	10·4±1·9	16·0±2·8	8·7±1·6	1·70±0·32	0·99±0·12	0·084±0·017	0·13 ±0·02	0·016±0·008
10	Knossos	40	100	6·3±1·7	11·8±3·1	11·2±2·6	8·0±1·5	1·07±0·38	0·81±0·20	0·12 ±0·03	0·073±0·017	0·030±0·009
11	Ayia Triadha	9	90	6·9±2·9	13·0±3·1	13·1±3·9	8·4±1·8	1·05±0·35	1·01±0·20	0·106±0·039	0·091±0·014	0·023±0·010
12	Gournia	9	90	7·7±2·8	12·1±2·3	11·1±3·6	10·8±2·8	1·36±0·46	1·03±0·29	0·142±0·061	0·086±0·022	0·040±0·011
13	Palaikastro	3	30	2·5±1·2	3·3±1·0	20·6±4·5	7·8±0·8	0·92±0·09	0·96±0·28	0·027±0·007	0·083±0·040	0·003±0·002
14	Tylissos	10	100	7·8±2·7	12·3±5·7	13·5±5·1	10·7±2·7	0·89±0·41	1·07±0·19	0·174±0·062	0·112±0·032	0·037±0·015
15a	Zakro I	5	50	2·1±1·0	2·5±1·4	18·0±4·1	7·4±4·0	0·61±0·26	0·93±0·29	0·039±0·017	0·021±0·013	0·006±0·002
15b	Zakro II	4	40	7·0±1·0	8·5±1·8	13·8±3·7	9·0±2·3	1·11±0·21	1·00±0·15	0·091±0·015	0·070±0·013	0·020±0·003
16a	Phylakopi I	5	16	4·1±0·4	2·4±0·4	14·5±2·0	5·7±1·5	0·95±0·22	0·66±0·10	0·14 ±0·02	0·077±0·026	0·018±0·004
16b	Phylakopi II	22	69	4·4±0·6	15·3±2·5	15·2±2·9	7·9±1·6	1·20±0·30	0·83±0·14	0·064±0·016	0·087±0·017	0·014±0·006
16c	Phylakopi III	10	100	2·3±0·5	16·2±3·6	11·7±3·6	4·1±0·6	1·50±0·18	0·48±0·11	0·037±0·008	0·064±0·018	0·004±0·001
17a	Ialysos I	9	45	9·7±0·9	7·4±1·7	9·9±1·2	10·1±1·3	1·40±0·16	1·09±0·08	0·16 ±0·02	0·063±0·007	0·053±0·008
17b	Ialysos II	10	50	4·0±0·6	14·4±6·6	13·0±2·1	8·0±1·0	1·26±0·23	0·73±0·10	0·068±0·016	0·069±0·020	0·018±0·005
18a	Arpera Chiflik I	10	100	5·8±1·7	18·3±3·7	11·3±2·5	10·7±2·1	1·48±0·31	0·92±0·21	0·070±0·021	0·095±0·025	0·010±0·002
18b	Arpera Chiflik II	9	90	3·9±0·6	15·8±1·1	16·4±2·6	7·3±1·6	0·88±0·43	0·92±0·19	0·063±0·014	0·086±0·013	0·014±0·004
19a	Enkomi I	10	100	5·4±2·2	14·3±3·1	13·5±3·1	9·9±2·0	1·42±0·37	0·96±0·28	0·12 ±0·09	0·084±0·023	0·014±0·009
19b	Enkomi II	10	100	3·6±0·8	14·7±4·8	14·6±3·9	7·1±1·0	0·84±0·42	0·93±0·17	0·067±0·020	0·083±0·028	0·012±0·005
20	Hala Sultan Tekke	19	95	4·1±0·5	15·8±2·9	16·5±2·7	8·0±1·6	0·94±0·24	0·76±0·11	0·070±0·013	0·091±0·021	0·013±0·007
21	Tell el Amarna	18	90	4·1±0·5	16·2±3·0	17·6±3·5	8·9±1·7	1·15±0·30	1·07±0·14	0·058±0·008	0·086±0·014	0·013±0·004
22	Tell Atchana	10	100	4·9±0·5	17·4±2·8	18·7±3·1	7·9±1·7	1·05±0·46	0·96±0·06	0·069±0·004	0·096±0·006	0·014±0·003
23	Averages of Group 1–4	81	93	3·9±0·7	14·8±3·2	14·6±3·2	7·1±1·6	0·97±0·54	0·69±0·13	0·058±0·015	0·084±0·015	0·013±0·005
24	Cretan Averages	81	81	6·9±2·2	12·1±3·5	12·4±3·5	9·0±2·7	1·11±0·38	0·93±0·24	0·126±0·055	0·083±0·029	0·031±0·014
27†	Argyropoulis	16	80	4·3±1·4	5·9±2·1	17·2±4·7	7·6±2·5	2·2±0·51	0·84±0·17	0·028±0·008	0·099±0·034	0·003±0·001
26†	Aigira	20	100	4·8±1·2	15·1±5·5	15·7±3·2	7·5±2·2	1·14±0·48	0·82±0·24	0·062±0·017	0·102±0·027	0·019±0·007
25†	Ayios Stephanos	20	100	3·5±0·9	10·5±4·8	15·4±3·5	6·7±1·2	0·96±0·28	0·74±0·10	0·056±0·012	0·070±0·029	0·013±0·004
17b†	Ialysos II	12	60	4·9±1·1	15·1±4·3	18·4±4·8	8·4±1·9	0·88±0·31	0·76±0·17	0·065±0·014	0·101±0·029	0·015±0·007
17c†	Ialysos III	7	35	12·9±2·2	14·9±3·1	8·0±2·9	12·7±1·4	0·51±0·23	1·34±0·30	0·33 ±0·09	0·128±0·029	0·13 ±0·05

By a careful process of elimination and comparison all the groups, a total of some thirty-seven, can be classified into a dozen or so types: some much more widespread than others. This classification is summarized in Table 4. Elements which have been particularly important in making a particular decision are mentioned in the 'remarks'. In summing up, we must emphasize that these analytical results are quite definite in *differentiating* groups of sherds from

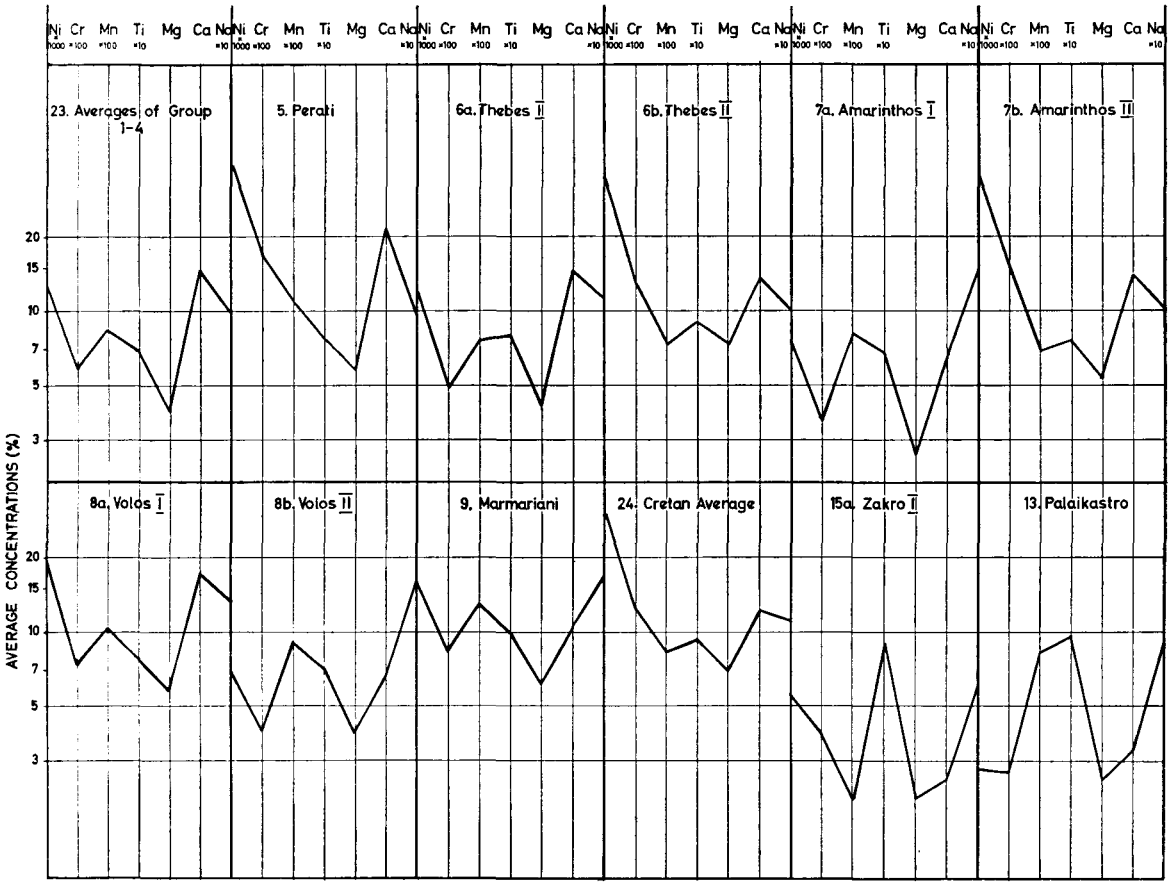

FIG. 3, PART ONE

one another; if two groups are found to have the *same* type of composition, however, it is only *likely* but not *certain* that they are related to one another, by export or proximity in origin. The possibility of the independent recurrence of the same type of composition remains, even at widely separated sites (q.v. Thebes and Crete).

The analyses of individual sherds which either have not been included in the group corresponding to their provenance or which have no group to compare them with are given in Table 5 (*a*), 5 (*b*), or 5 (*c*).

COMMENT ON THE RESULTS OF THE INVESTIGATION

It must be emphasized that this was primarily an exploratory investigation. Its object was to establish whether there are differences in composition of regional significance amongst the

pottery fabrics of the Aegean Late Bronze Age. When it was found that such distinctions could be drawn within Crete and Greece, the results were applied to tests made on a limited number of samples from problem regions. The work was not intended as an exhaustive survey of the production centres or of the areas to which Aegean pottery was traded or where local imitations of it were made. Such archaeological inferences as are drawn are tentative, and will no doubt need revision when further work has been carried out.

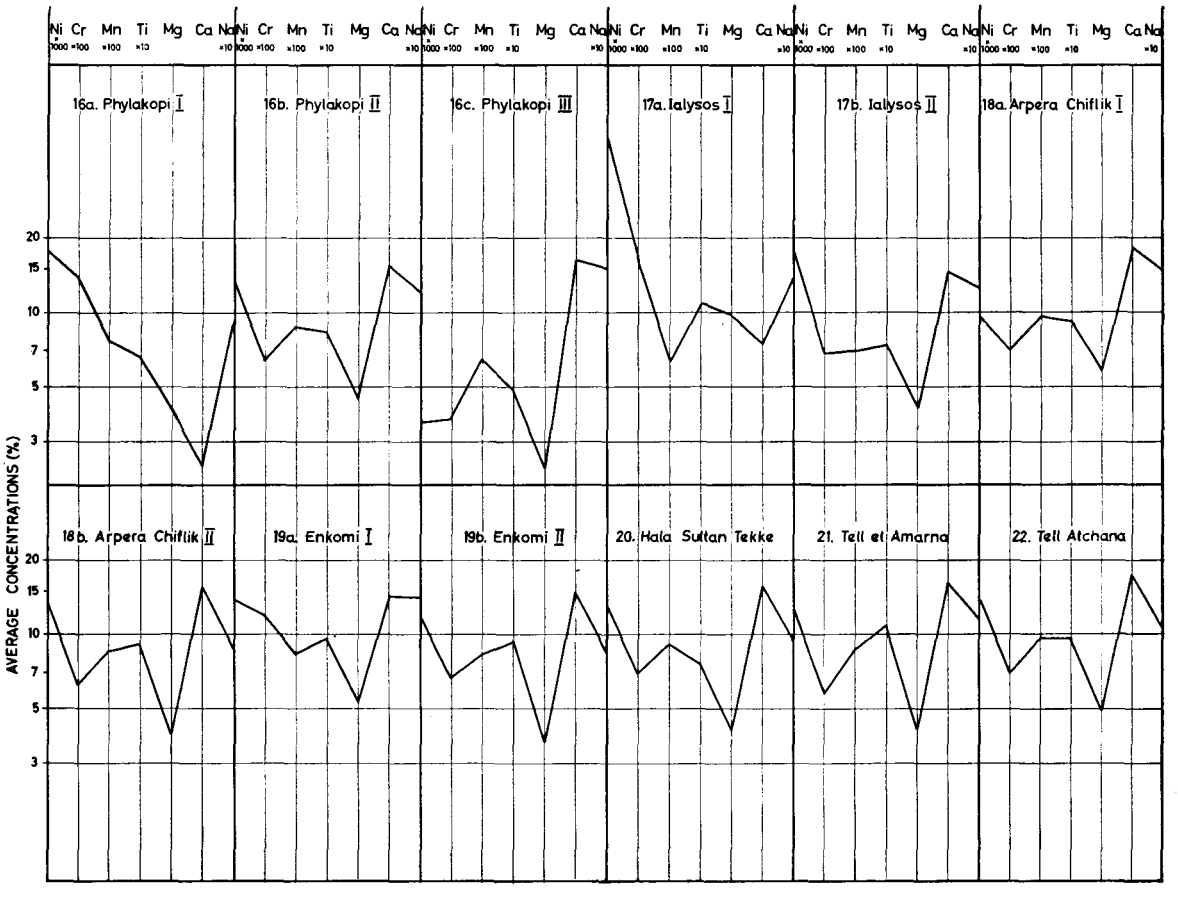

FIG. 3, PART TWO

THE GROUPS (see Table 7, FIGS. 5 and 6)

Group A

This fabric is overwhelmingly predominant. Almost exactly 50 per cent. of the material tested was found to belong to it. The uniform results from Mycenae, Berbati, Aegira, and Ayios Stephanos show clearly that it is characteristic of much, at least, of the Peloponnese. Whereas other groups were represented in the material from Korakou and Megara Minoa, Group A is dominant at these sites too, and we may conclude that its manufacturing range extends at least as far north and east as the Megarid. Though it is present at Thebes, it amounts to less than a quarter of the sherds tested, which may well mean that it occurs there only as an import. For the present, Group A may be referred to as the Peloponnesian group, always recognizing that

TABLE 4. *Classification of Groups*

Ref. no.	*Group*	*Serial no. of sherds in the group*	*Type*	*Remarks*
1	Mycenae	1–40	A	The average of these four groups characterizes this main type
2	Berbati	1–20		
3	Korakou	1, 3–7, 9, 10		
4	Megara Minoa	1, 3, 4, 6–9, 11–14, 16–20		
10	Knossos	1–40	B	The average of these six groups characterizes this main type
11	Ayia Triadha	1–4, 6–10		
12	Gournia	1–6, 8–10		
13	Palaikastro	4		
14	Tylissos	1–10		
15b	Zakro II	4–7		
5	Perati	1–7, 9–12	C	Distinct from E (Cr, Ni, Ti, Na) and from B (Ca)
6a	Thebes I	1, 3, 4, 6, 8	A	
6b	Thebes II	5, 7, 9, 11–21	B	
7a	Amarinthos I	1, 5–9, 11–16	D	
7b	Amarinthos II	2–4, 8, 10	B (E)	B more likely (Mn, Al, Cr)
8a	Volos I	1, 2, 4, 5, 8, 17, 20	E (B)	Not C (Cr)
8b	Volos II	3, 6, 7, 9–19	D	
9	Marmariani	1–20	E	
15	Zakro I	1, 2, 8–10	F	
13	Palaikastro	5, 7, 8	(G)	Too few samples to define type
16a	Phylakopi I	1, 7, 15, 20, 17	H	Very distinct group
16b	Phylakopi II	2–6, 9–14, 16, 18, 19, 22–26, 28, 30, 32	A	
16c	Phylakopi III	1–10	I	Sherds believed to be local
17a	Ialysos I	1, 3–6, 10–16, 18, 19, (38)*	J	Cf. K
17b	Ialysos II	2, 7–9, 11, 13–15, 17, 20 (22, 24, 25, 27–29, 31, 32, 35–37, 39)*	A	
17c	Ialysos III	(21, 23, 26, 30, 33, 34, 40)*	K	Sherds in much better physical condition than J
18a	Arpera Chiflik I	15–24	L	Sherds believed to be local imitation of A(Fe)
18b	Arpera Chiflik II	1–9	A	
19a	Enkomi I	11–20	M	Sherds believed to be local imitation of A(Cr)
19b	Enkomi II	1–10	A	Sherds believed to be Mycenaean imports
20	Hala Sultan Tekke	1–20	A	
21	Tell el Amarna	1–6, 8–12, 14–20	A	
22	Tell Atchana	1–10	A	
25	Ayios Stephanos	(1–20)*	A	
26	Aegira	(1–20)*	A	
27a	Argyropoulis I	(12, 14, 17, 20)*	B	
27b	Argyropoulis II	(1–11, 13, 15, 16, 18, 19)*	D	

* These samples arrived too late to be included in all the tables and diagrams.

it spreads at least as far as the Megarid, on the one hand, and that the future may show more groups in other parts of the Peloponnese.

Group A is widely distributed outside the Greek mainland but not, we believe, as a local product. In Crete, for example, it appears in very small amounts at Knossos[10] and Palaikastro. It is well represented at Phylakopi. It occurs in Rhodes in a surprisingly high proportion to the groups—J and K—which seem to represent local Rhodian manufacture. Nowhere, however, is it so noticeable as in the east Mediterranean. Mycenaean pottery from three major sites in

[10] Two out of thirteen sherds selected from the Stratigraphical Museum for their non-Knossian appearance: Table 6, nos. 7 and 8.

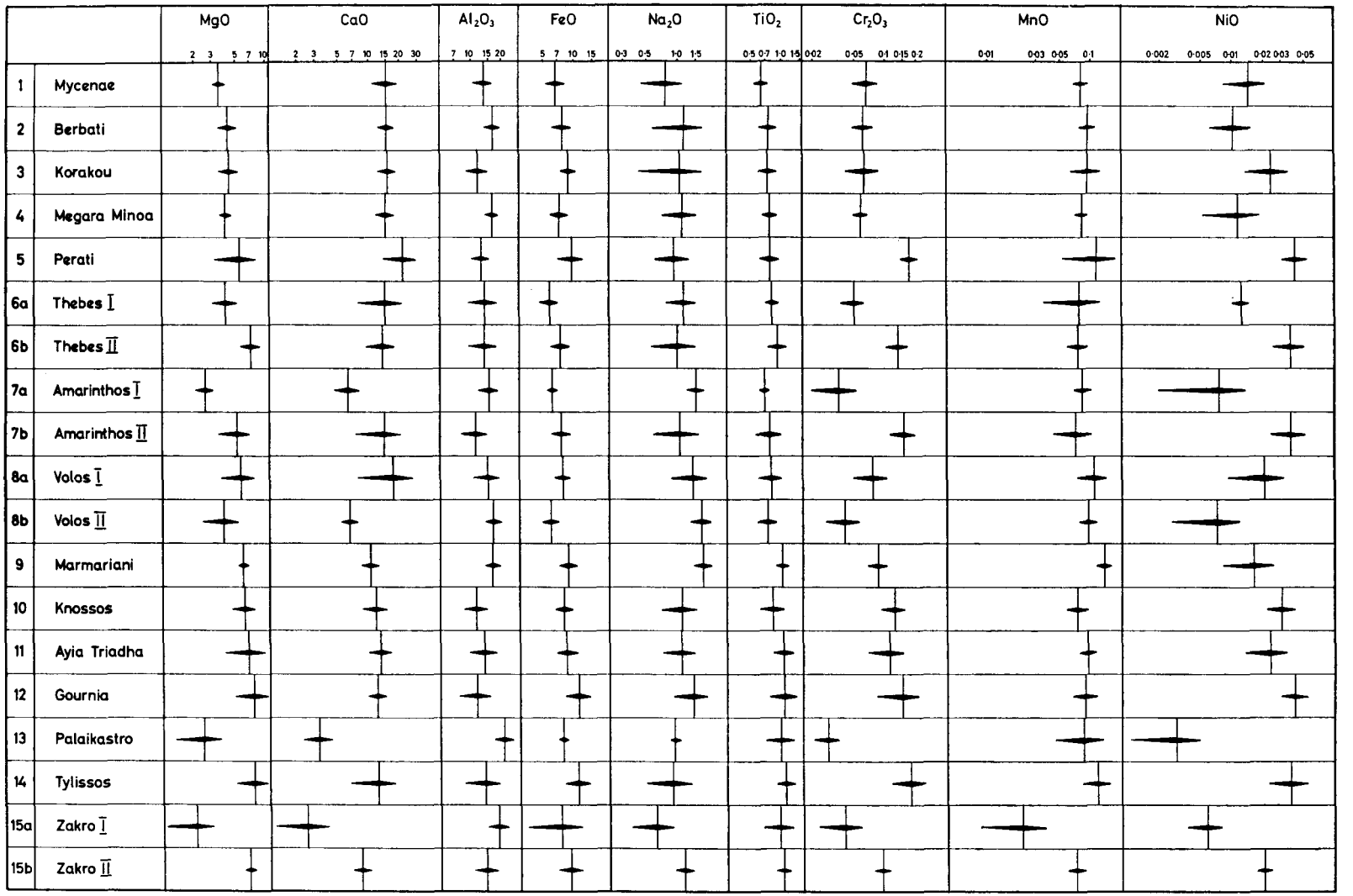

FIG. 4, PART ONE

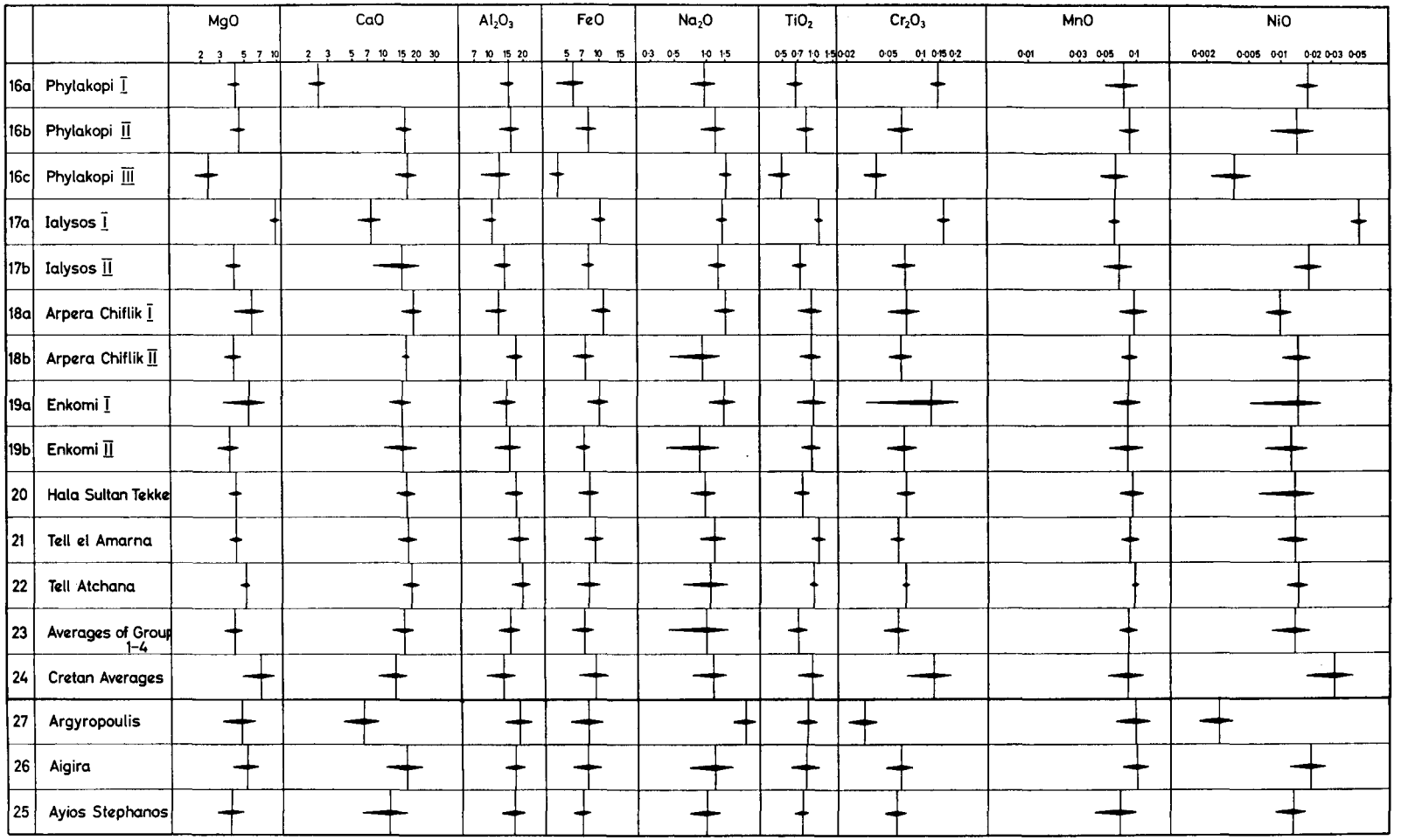

FIG. 4, PART TWO

TABLE 5 (*a*)

Provenance	*Serial no.*	Mg	Ca	Al	Fe	Na	Ti	Cr	Mn	Ni	*Type*
Korakou	8	5·8	11·0	11·2	10·4	0·53	0·84	0·11	0·11	0·038	B
Megara Minoa	5	5·6	8·5	14·0	7·4	1·03	0·81	0·14	0·067	0·023	B
	10	5·5	9·0	11·6	7·5	0·95	0·76	0·17	0·069	0·026	B
	12	4·5	14·3	13·9	6·5	1·76	0·66	0·11	0·045	0·016	(B)
	15	5·7	8·3	16·0	8·5	1·25	0·94	0·16	0·070	0·023	B
Perati	8	5·9	11·9	20·5	9·0	1·55	1·0	0·077	0·14	0·016	E
Thebes	2	2·3	4·6	16·8	6·2	1·45	0·85	0·023	0·063	0·005	D
	10	12·8	14·7	8·6	10·3	0·72	1·29	0·29	0·11	0·09	K
	22	10·9	17·3	14·3	11·2	0·66	1·12	0·21	0·12	0·067	K
Argyropoulis	14	5·4	5·2	16·0	7·4	1·65	0·76	0·070	0·095	0·013	D
	12	5·8	9·3	23·5	11·5	0·98	1·02	0·093	0·080	0·015	B
	17	5·7	11·8	10·4	6·0	1·52	0·76	0·14	0·12	0·031	B
	20	9·0	11·7	17·7	10·8	1·01	1·36	0·15	0·089	0·035	B
Gournia	7	8·6	14·7	15·6	17·4	0·75	1·28	0·20	0·16	0·068	(K)
Palaikastro	1	3·4	11·9	12·7	7·4	0·97	0·90	0·070	0·061	0·021	A
	2	4·3	13·1	15·2	6·7	0·92	0·87	0·047	0·080	0·011	A
	3	3·1	11·7	16·8	8·0	0·93	0·87	0·025	0·068	0·0027	A
	9	1·7	1·9	16·6	6·2	0·69	0·78	0·022	0·028	0·0029	F
	10	10·6	14·5	15·2	13·9	0·84	1·32	0·23	0·14	0·052	(K)
Phylakopi	8	7·2	18·0	13·8	8·8	0·97	0·95	0·24	0·11	0·028	B
	27	5·6	11·5	10·1	9·0	1·3	0·86	0·11	0·085	0·028	B
	29	7·5	8·7	15·4	~10·0	1·6	1·16	0·11	0·056	0·022	B
	31	1·6	1·2	16·9	6·4	0·84	0·82	0·020	0·049	0·0015	F
Arpera Chiflik	10	3·3	10·1	15·7	5·7	0·72	0·72	0·058	0·054	0·011	(A)
Tell el Amarna	13	3·3	21·0	10·8	7·1	0·92	0·73	0·057	0·14	0·012	(A)

TABLE 5 (*b*)

Provenance	*Serial no.*	Mg	Ca	Al	Fe	Na	Ti	Cr	Mn	Ni	
Korakou	2	4·5	4·9	13·9	7·7	1·35	0·94	0·11	0·042	0·026	
Megara Minoa	2	2·6	12·1	8·4	6·7	1·61	0·45	0·11	0·046	0·026	
Ayia Triadha	5	13·2	16·1	26·8	19·4	2·36	1·58	0·25	0·20	0·039	
Palaikastro	6	3·0	8·3	20·4	9·0	0·89	1·00	0·081	0·034	0·014	
Zakro	3	2·2	6·4	8·6	3·7	1·73	0·59	0·024	0·024	0·0042	
Phylakopi	21	6·0	5·5	<23·6	7·2	1·14	0·81	0·17	0·11	0·019	
Ialysos	12	4·7	5·7	14·0	8·2	1·14	0·88	0·17	0·054	0·033	
Tell el Amarna	7	2·4	10·2	20·3	7·6	0·61	1·11	0·021	0·048	0·0026	These sherds are unlike any of the groups

TABLE 5 (*c*) (*see Table 2* ad fin.)

Cyprus Local Types

Provenance	*Serial no.*	Mg	Ca	Al	Fe	Na	Ti	Cr	Mn	Ni	*Plate ref.*
Mali		5·5	17·0	13·4	7·9	1·61	0·93	0·082	0·076	0·012	PLATE 34. 5
Evretadhes		4·4	18·8	11·3	7·9	1·04	0·78	0·083	0·082	0·013	,, 34. 1
Aloupotrypes	1	5·3	17·0	12·0	8·3	1·75	0·90	0·073	0·14	0·011	,, 34. 3
	2	7·4	10·2	15·6	10·3	1·54	1·13	0·085	0·11	0·013	,, 34. 4
Arpera Chiflik	11	8·3	5·9	26·0	15·0	1·2	0·98	0·049	0·11	0·0041	,, 34. 7
	12	2·6	3·0	15·6	6·8	0·66	0·74	0·026	0·064	0·0026	,, 34. 8
	13	8·0	5·7	21·0	12·8	0·88	1·03	0·20	0·11	0·012	,, 34. 9
	14	9·1	5·7	23·8	13·6	0·63	0·90	0·18	0·11	0·014	,, 34. 10
Ayia Paraskevi		3·9	3·5	13·7	10·0	1·06	0·76	0·019	0·059	0·0012	,, 34. 2
Verghin		5·3	6·1	15·7	8·1	1·28	0·98	0·052	0·11	0·0071	,, 34. 6

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Cyprus, from North Syria, and from Egypt all belongs to this group; no other Aegean group has yet been found in the material tested from this large area.

Group B

This is the group *par excellence* of Crete. One hundred per cent. of the material from Knossos[11] and Tylissos conformed to its pattern, 90 per cent. of that from Gournia and Ayia Triadha. Zakro and Palaikastro, in the extreme east of the island, have it only as a minority ware, and it probably only occurs on these sites as an import.

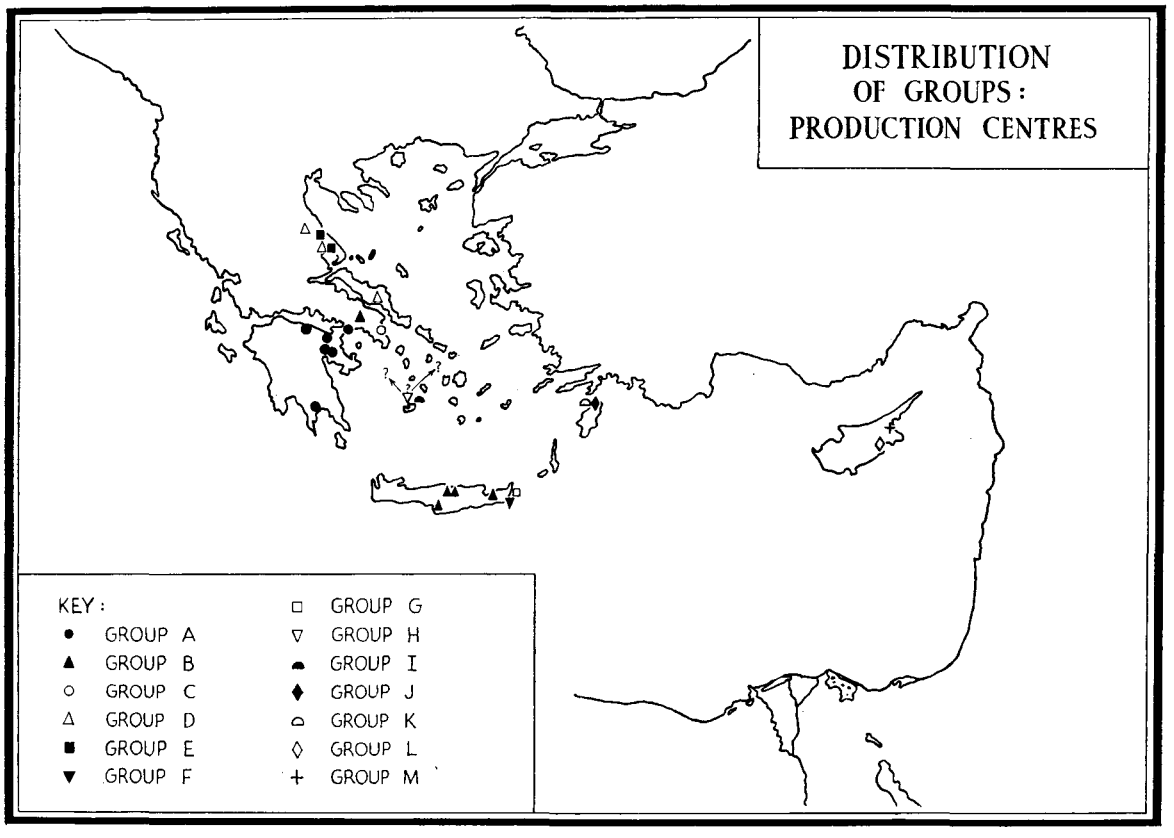

FIG. 5

Its appearances outside Crete are a little puzzling. Some, of course, could be interpreted as Cretan exports, such as the few examples at Korakou and Megara Minoa, and those at Phylakopi and Chios. It is its preponderance at Thebes, where it accounts for fourteen out of twenty-two samples, that is less readily explained. It seems at least as probable that local Theban pottery and the Cretan group present an instance of the recurrence of the same type of composition at different sites, as that there could be so high a proportion of Minoan ceramic imports in this Mycenaean town. Five sherds from Amarinthos seem likely to belong to Group B—if B is indeed local to Thebes as well as to Crete, these Euboean specimens ought, no doubt, to be ascribed to

[11] This, of course, takes no account of the specially selected sherds; see note 10.

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Boeotia rather than Crete, and the same may be true of four Group B sherds from Argyropoulis in north Thessaly.

Group B was not found amongst the material from Rhodes and sites eastward.

Group C

This is so far unique to eastern Attica, at Perati. Future investigation must determine whether this is typical of Attica, or a very local group of limited significance. The sherds were in a poor physical condition.

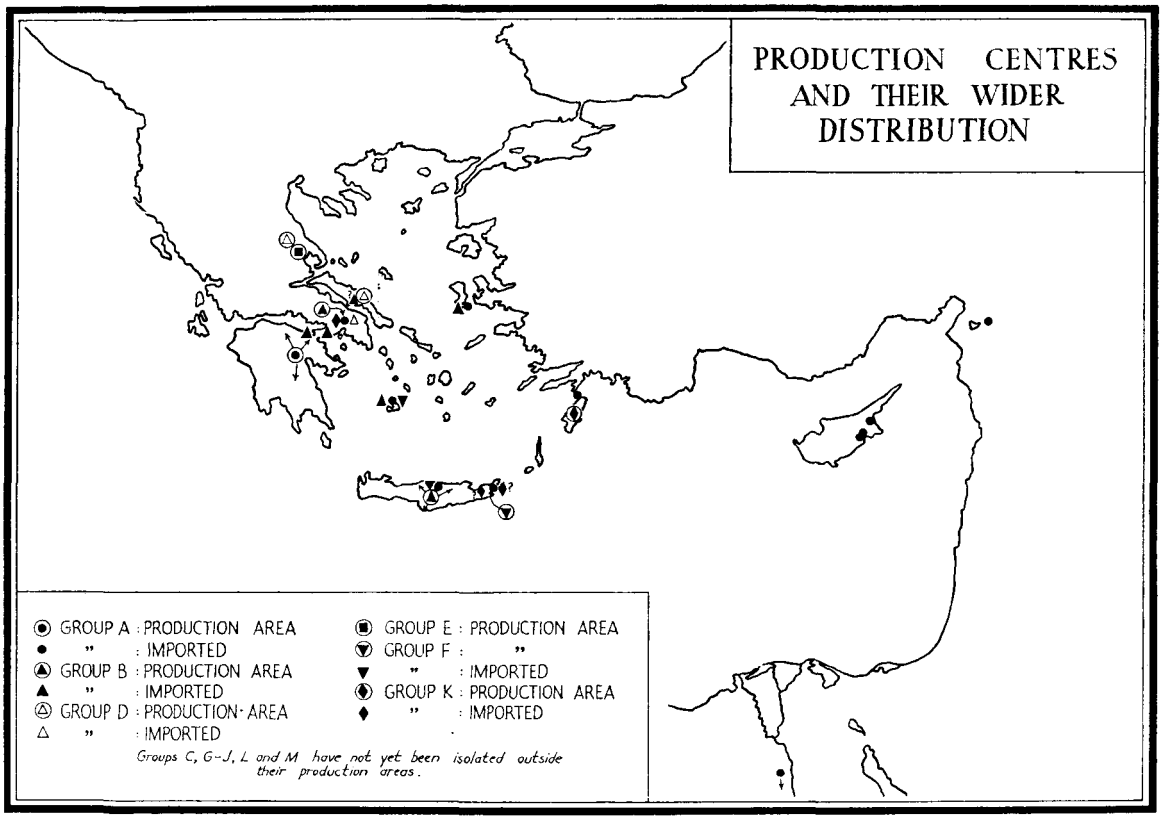


FIG. 6

Groups D and E

Though these two have a general similarity, they are sufficiently distinct to be treated as individuals. With the exception of a Group D outlier in Thebes, they are confined to Euboea and Thessaly. Group D provides most of the material from Volos and 80 per cent. of the Argyropoulis series. E has a narrower distribution, but covers all the Marmariani sherds and 35 per cent. of the Volos material. There is no trace of these two groups in the Peloponnese, in Crete, or in the eastern Mediterranean.

Groups F and G

These two small groups appear to be local to east Crete. Apart from one sherd of Group F from Phylakopi, they are restricted to Zakro and Palaikastro. F appears to be Zakro-made,

with a singleton at Palaikastro. G—which is admittedly based on a tiny volume of material—is at present unique to Palaikastro.

Group H (PLATE 30(*b*), nos. 1, 7, 15, 17, 20)

A group which was only isolated at Phylakopi, where it accounts for about 18 per cent. of the total number of non-Melian sherds tested. It is wholly distinct from Group I, which must represent Melian fabric, and we assume that we are here dealing with imports from some Mycenaean production centre which has yet to be isolated.

Group I (PLATE 31(*b*))

A very satisfactory outcome of testing the Melian material was that the sherds attributable on archaeological grounds to manufacture in Melos itself should form so distinct a group, nowhere else recorded.

Groups J and K

These are Rhodian, Group K also occurring twice at Thebes and having possible single outliers at two Cretan sites, Ayia Triadha and Zakro. There is a strong family resemblance between the two groups;[12] it would be useful to extend the examination of Rhodian material further to investigate the relationship. Their non-appearance in Cyprus is noteworthy.

Groups L and M (PLATES 32(*b*) and 33(*a*))

When the material to be tested from Cyprus was selected, a choice of two kinds of Mycenaean pottery was made from Arpera Chiflik and from Enkomi. Ten sherds from each site were chosen which appeared likely, on grounds of fabric, paint, and finish, to have been made in the west and imported to the island; another ten from each site were picked out which, by the same criteria, appeared not to be imports but rather local imitations of Mycenaean. In the case of the third Cypriot site—Hala Sultan Tekke—all twenty sherds were considered likely to be imports. It was very interesting, therefore, to find that from all three sites the sherds estimated to be imports should produce a homogeneous result which fitted them into Group A. This took on an added significance when it was found that the sherds from Arpera thought to be locally made belonged to a new group, Group L, and that the similar material from Enkomi gave yet another group, Group M. More thoroughly to check the results from Cyprus, a further test was carried out on ten Late Cypriot sherds (see PLATE 34(*b*)), including White Slip and Base Ring wares. The results were heterogeneous (see Table 5 (*c*)), but included nothing resembling Group A.

Chios

Very late in the investigation thirty-three Mycenaean sherds from Emporio in Chios were examined. These produced heterogeneous results, including a few type A and a few type B compositions. The sherds were, in general, harder than most other material previously examined. Chios appears to be like Cyprus in having a considerable range of widely differing local fabrics.

General Observations

The results from the producing centres are perhaps less satisfactory than might have been hoped for. The sites of the Peloponnese which have so far been examined are indistinguishable

[12] Group J is the only instance where the sherds were visually distinct in fabric.

from one another. Against this, however, it has to be remembered that the area covered is limited—no work, for example, has yet been done in Messenia. It is not clear how far Group A extends beyond the Megarid; more tests are needed on sites in Attica to see if the northern limits lie there. Pottery from other groups is extremely rare in the Group A area, and appears only on the fringe, at Korakou and Megara Minoa; these belong to Group B, and may be Cretan or Boeotian. On the other hand, Group A pottery is very widely distributed beyond the production area (see FIG. 6) along the sea-lanes through the Aegean to Cyprus, North Syria, and Egypt. After 1400 B.C., at any rate, it appears as though the Mycenaean states whose pottery belongs to Group A had a virtual monopoly of this eastern trade. Relations of this kind with the rest of Greece were very restricted; only at Thebes is there Peloponnesian pottery.

TABLE 6. *Results of Analyses on Sherds from The Stratigraphical Museum, Knossos*

Serial no.	Mg	Ca	Al	Fe	Na	Ti	Cr	Mn	Ni	*Type*
1	7·2	15·6	12·6	8·2	1·23	0·89	0·12	0·068	0·025	B
2	1·0	0·88	20·8	4·2	0·64	1·38	0·034	0·0071	0·0066	F
3	8·3	13·5	14·1	10·3	1·34	1·10	0·15	0·062	0·035	B
4	8·9	16·7	19·0	11·0	1·41	1·17	0·15	0·12	0·033	B
5	1·4	1·2	17·0	5·8	1·04	1·05	0·034	0·041	0·0064	F
6	7·3	12·5	11·4	7·1	1·35	0·83	0·091	0·055	0·026	B
7	3·8	11·4	10·2	8·1	1·21	0·70	0·078	0·057	0·023	A
8	4·8	14·4	16·9	7·5	1·05	0·76	0·055	0·12	0·014	A
9	7·9	15·3	12·2	11·1	1·29	1·07	0·14	0·051	0·041	B
10	0·95	1·7	15·7	3·4	0·62	0·99	0·029	0·0083	0·0041	F
11	3·6	13·3	14·9	10·7	0·67	0·80	0·16	0·085	0·011	—
12	3·2	14·5	12·7	10·2	0·61	0·79	0·31	0·11	0·013	—
13	6·4	10·2	17·2	13·7	0·77	1·13	0·14	0·082	0·033	B

Boeotia, as illustrated by Thebes, produced a fabric (Group B) which cannot be separated from the main fabric of Crete. It is a guess that the Group B wares detected in Thessaly and Euboea are Boeotian, not Cretan. Besides her own products, Thebes has pottery from the Peloponnese, Thessaly, and possibly Rhodes, which suggests that the site handled a fair amount of overland trade, a role for which her geographic position well fits her.

The products of Thessaly and Euboea are quite distinct from the rest of Greece. Though the distribution of the two groups D and E is such that we cannot define individual territory for each one, their collective identity is not in doubt. The only outside contact of these groups is with Thebes, where a single occurrence of Group D was recorded. The specimens of Group B found in Euboea and Thessaly—the only imported wares found in the area—are more likely to be Boeotian than Cretan.

The pattern obtained in Crete would have been more useful had it not been that Group B, the chief Cretan fabric, appears so profusely in Thebes. Although more work on Theban pottery is obviously desirable to see whether this difficulty is capable of resolution, it is clearly safer to assume the independent occurrence of the Group B fabric at Thebes as a local product rather than try to insist that Group B finds in Thebes must be Minoan imports, although this does remain a conceivable explanation. The inconvenience of this parallelism between Crete and Thebes in Group B is a little offset by the occurrence of two quite *minor* Cretan groups at Zakro and Palaikastro. They help to illustrate exchanges between sites in Crete itself, for both have material belonging to the main Cretan group, while the Zakro fabric appears at Palaikastro. Their wider distribution is so far limited to a Zakro-made piece at Phylakopi. Wares imported to Crete include the Peloponnesian Group at Knossos (amongst the sherds from the

Stratigraphical Museum specially selected for test for their non-Knossian appearance, Table 6) and at Palaikastro. Ayia Triadha and Palaikastro each has a sherd which is likely to be Rhodian. The diversity of fabrics identified at Palaikastro may be connected with the convenience of its position as a staging port for vessels trading both within the Aegean and farther to the east.

The results from Phylakopi are amongst the most rewarding of the whole investigation. Five distinct groups are recognizable amongst the forty-two sherds tested from this site. One of these, Group I, represents the locally made Melian imitations of M.M. III–L.M. I painted wares; this group is found nowhere else. This marked difference draws a very satisfactory distinction

TABLE 7. *Topographic Analysis of the Types*

No. of sherds tested	*Site*	*Groups*													*Rogues*
		A	B	C	D	E	F	G	H	I	J	K	L	M	
40	Mycenae	40	×	×	×	×	×	×	×	×	×	×	×	×	×
20	Berbati	20	×	×	×	×	×	×	×	×	×	×	×	×	×
20	Ayios Stephanos	20	×	×	×	×	×	×	×	×	×	×	×	×	×
20	Aegira	20	×	×	×	×	×	×	×	×	×	×	×	×	×
10	Korakou	8	1	×	×	×	×	×	×	×	×	×	×	×	1
20	Megara Minoa	16	3+1	×	×	×	×	×	×	×	×	×	×	×	×
12	Perati	×	×	11	×	×	×	×	×	×	×	×	×	×	1
22	Thebes	5	14	×	1	×	×	×	×	×	×	2	×	×	×
16	Amarinthos	×	?5	×	11	×	×	×	×	×	×	×	×	×	×
20	Volos	×	×	×	13	7	×	×	×	×	×	×	×	×	×
20	Marmariani	×	×	×	×	20	×	×	×	×	×	×	×	×	×
20	Argyropoulis	×	4	×	16	×	×	×	×	×	×	×	×	×	×
40	Knossos	×	40	×	×	×	×	×	×	×	×	×	×	×	×
10	Tylissos	×	10	×	×	×	×	×	×	×	×	×	×	×	×
10	Ayia Triadha	×	9	×	×	×	×	×	×	×	×	×	×	×	1
10	Gournia	×	9	×	×	×	×	×	×	×	×	?1	×	×	×
10	Zakro	×	4	×	×	×	5	×	×	×	×	×	×	×	1
10	Palaikastro	3	1	×	×	×	1	3	×	×	×	?1	×	×	1
42	Phylakopi	22	3	×	×	×	1	×	5	10	×	×	×	×	1
41	Ialysos	23	×	×	×	×	×	×	×	×	10	7	×	×	1
20	Arpera Chiflik	9+1	×	×	×	×	×	×	×	×	×	×	10	×	×
20	Enkomi	10	×	×	×	×	×	×	×	×	×	×	×	10	×
20	Hala Sultan Tekke	20	×	×	×	×	×	×	×	×	×	×	×	×	×
20	Tell el Amarna	19	×	×	×	×	×	×	×	×	×	×	×	×	1
10	Tell Atchana	10	×	×	×	×	×	×	×	×	×	×	×	×	×
503	Totals	246	104	11	41	27	7	3	5	10	10	11	10	10	8

between the wares produced on the spot and those brought to it from outside. Of the imported wares, Group H is interesting, but tantalizing. It is formed of sherds archaeologically indistinguishable from normal Mycenaean III pottery. It is obviously non-Melian, but has not been found anywhere else; its origin must remain anonymous until future work manages to isolate its source. The presence of the two Cretan Groups B and F was to be expected; it is, indeed, a little surprising that they are not more widely represented. Much the greater part of the painted pottery which should on grounds of style be dated to the period after the fall of Knossos turns out to belong to the Peloponnesian group. It is also clear, however, that the Greek mainland had had a considerable share of relations with Melos in L.H. I–II—see PLATE 31(*a*), where all but nos. 21, 27, 29, and 31 are Peloponnesian.[13] The diverse results from Melos are

[13] The respective roles of Crete and Greece in Melos are discussed by Furumark in *OpArch* vi. 192 ff.

an appropriate reflection of its commercially important position midway between Crete and the Greek mainland and as a port of call for traffic sailing to or from the east Mediterranean.

The position revealed at Ialysos in Rhodes is a little unexpected. While a local Rhodian fabric seems clearly to have been isolated in Groups J and K, the number of the Peloponnesian Group A—more than 50 per cent. of the sherds tested—is surprisingly high. It appears that a considerable volume of the Mycenaean pottery of Rhodes was brought to the island from the west. On the other hand, Rhodian products occur at Thebes and probably at Palaikastro and Ayia Triadha as well. The lack of Rhodian pottery in Cyprus, North Syria, and Egypt is striking.

The investigation promises to have done much to clarify the situation in the Levant. For Cyprus there is now an objective standard whereby to distinguish between imported Mycenaean pottery and locally made imitations. The imported pottery belongs exclusively to the Peloponnesian group. There is added interest from the fact that imitation Mycenaean at Enkomi and Arpera belong to two different groups, and there is promise here of new information about exchanges within Cyprus itself. Peloponnesian products are met again at Tell Atchana in North Syria. Peloponnesian, too, is the Mycenaean pottery from Tell el Amarna.

H. W. CATLING
E. E. RICHARDS
A. E. BLIN-STOYLE

APPENDIX

Description of sherds scraped in Herakleion and Knossos (M. R. Popham)

KEY TO SAMPLES

Zakro (Herakleion Museum)

1. Tortoiseshell ripple glazed. L.M. IA.
2. Tortoiseshell ripple glazed. L.M. IA.
3. Zakro floral type. Dark on light.
4. Zakro spiral type. Dark on light.
5. Zakro floral type cup. Dark on light.
6. Zakro horizontal foliate band. Dark on light.
7. Jug fragment with foliate band (could be Knossian).
8. 'Wood grain'. Dark on light.
9. Zakro type spiral. Light on dark.
10. ? Light on dark.

Palaikastro (Herakleion Museum)

1. Marine style with argonauts (probably Knossian).
2. L.M. IA floral bowl applied white.
3. L.M. IA floral bowl.
4. Large L.M. IA spiral jug.
5. Jug with spirals. ? L.M. IIIA.
6. L.M. IA foliate band on large jug.
7. Pyxis with scale-and-leaf pattern L.M. III = Unpublished Objects 81, fig. 65 (2).
8. L.M. III scale pattern.
9. Light on dark cup.
10. Foliate band on large jug. L.M. IB (could be Knossian).

Ayia Triadha (Herakleion Museum)

1. Coarse decorated sherd.
2. L.M. I cup.
3. L.M. IB foliate band on jug; fabric seems not to be Knossian although the decoration is.
4. L.M. IB degenerate (i.e. ? local) 'pendant'. *FM* 38.
5. L.M. IA cup.
6. L.M. IB Marine vase, whorl shells (almost definitely Knossian).
7. L.M. IA cup.
8. L.M. IA tortoiseshell ripple cup.
9. L.M. IA debased tortoiseshell ripple cup.
10. L.M. IA jug fragment.

Tylissos (Herakleion Museum)

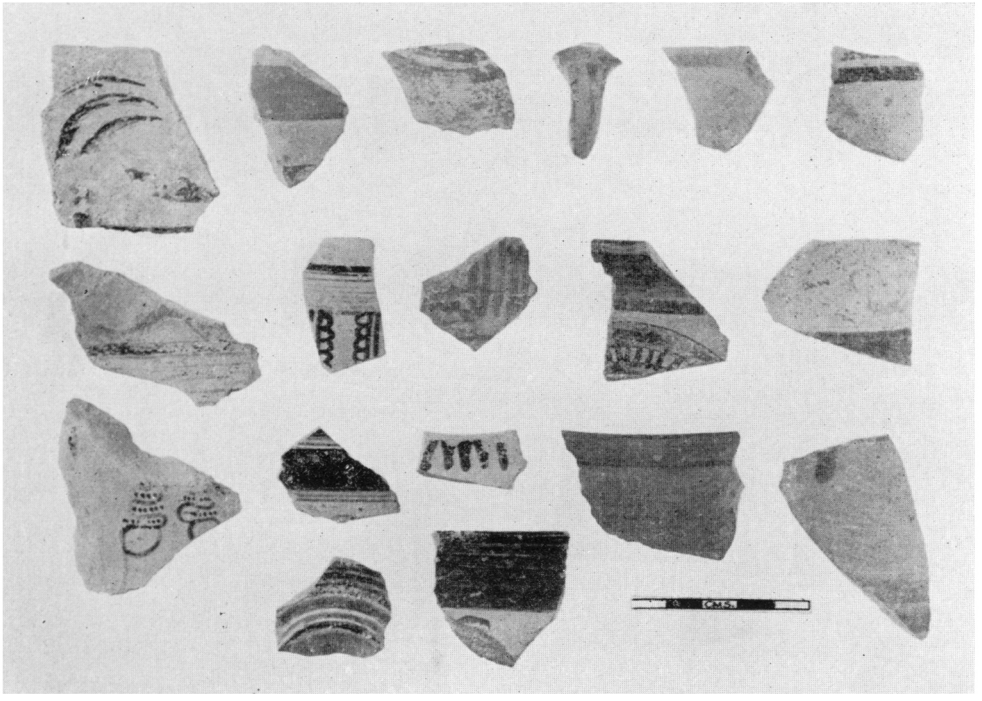
1. Plain bowl. ? L.M. IIIB.
2. ? L.M. IB.
3. Champagne glass. L.M. III.
4. L.M. IIIB or C.
5. Plain kylix foot.
6. Plain cup.
7. Decorated. L.M. IIIB or C.
8. ?
9. Plain kylix.
10. Plain red cup with splash ornament inside.

Gournia (Herakleion Museum)

1. Gournia-style rhyton.
2. ? L.M. I jug.
3. Scale pattern cup. ? L.M. IB.
4. L.M. IA jug.
5. Large jug, usual Gournia style.
6. Large jug, usual Gournia style.
7. Large jug. L.M. IA spirals.
8. Large jug. L.M. IA.
9. Black-glaze Vaphio-type cup.
10. Large vessel with rockwork.

Sherds of Mycenaean Type (Stratigraphical Museum, Knossos)

1. P.I.14. Antithetic spiral bowl with L.H. IIIB/C style ornament (not definitely non-Knossian fabric).
2. P.I.14. Kylix with early flower. ? L.H. IIIA (not definitely Mycenaean but not Knossian fabric).
3. P.I.7. Mycenaean fragment.
4. Q.III.3. Mycenaean kylix fragment.
5. P.I.14. Kylix body with cross-hatched stars; not Knossian.
6. P.I.14. Bowl rim. L.H. IIIB/C.
7. P.I.14. Bowl rim. ? IIIB; not Knossian.
8. Q.II.2. Straight-sided alabastron (certainly Mycenaean).
9. P.I.8. Antithetic spiral bowl highly burnished (probably Mycenaean).
10. Q.II.1. Kylix fragment (possibly Mycenaean, not Knossian).
11. Box L III 13A; Mycenaean type sherd with dotted whorl shell, looks Mycenaean in fabric.
12. Box L III 13A; Mycenaean type sherd with linked double whorl shell; looks Mycenaean in fabric.
13. Box M IV 5; shallow cup with Mycenaean type tailed spiral; not of Knossian fabric and could well be Mycenaean.



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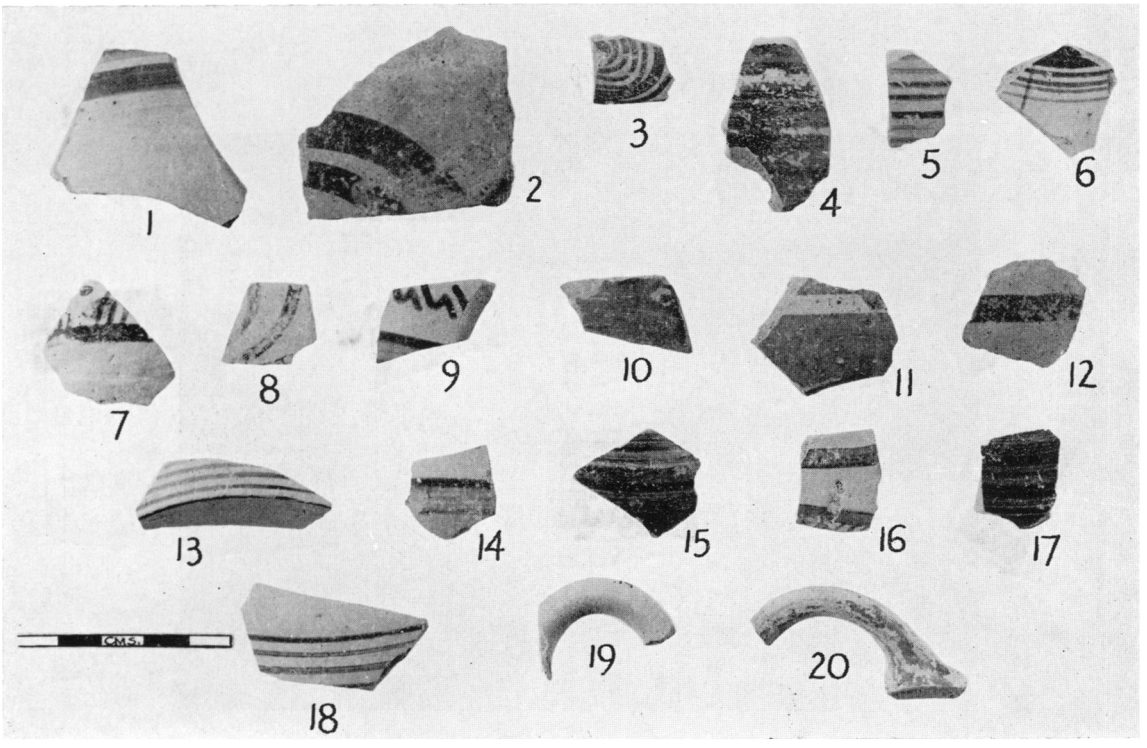
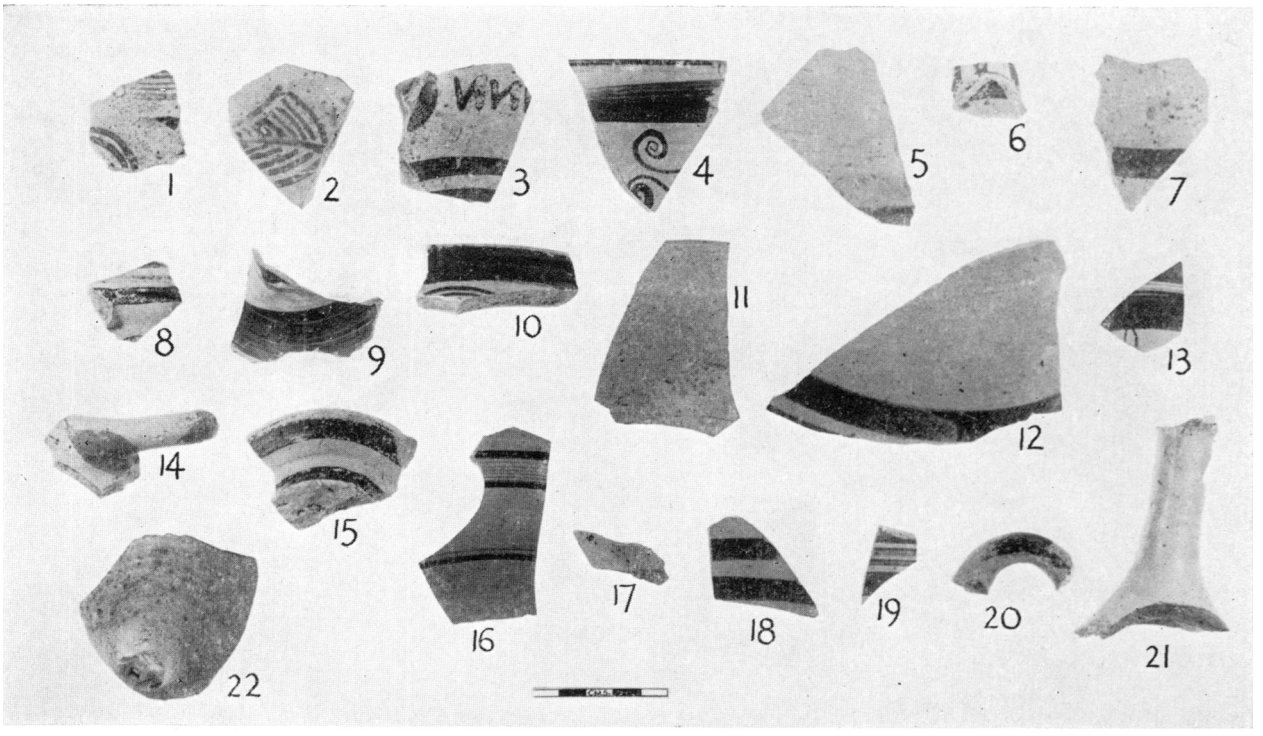


(b)

MYCENAEAN AND MINOAN POTTERY: COMPOSITION AND PROVENANCE

SHERDS FROM (*a*) MYCENAE AND (*b*) MEGARA MINOA.

https://doi.org/10.1017/S0068245400013812 Published online by Cambridge University Press



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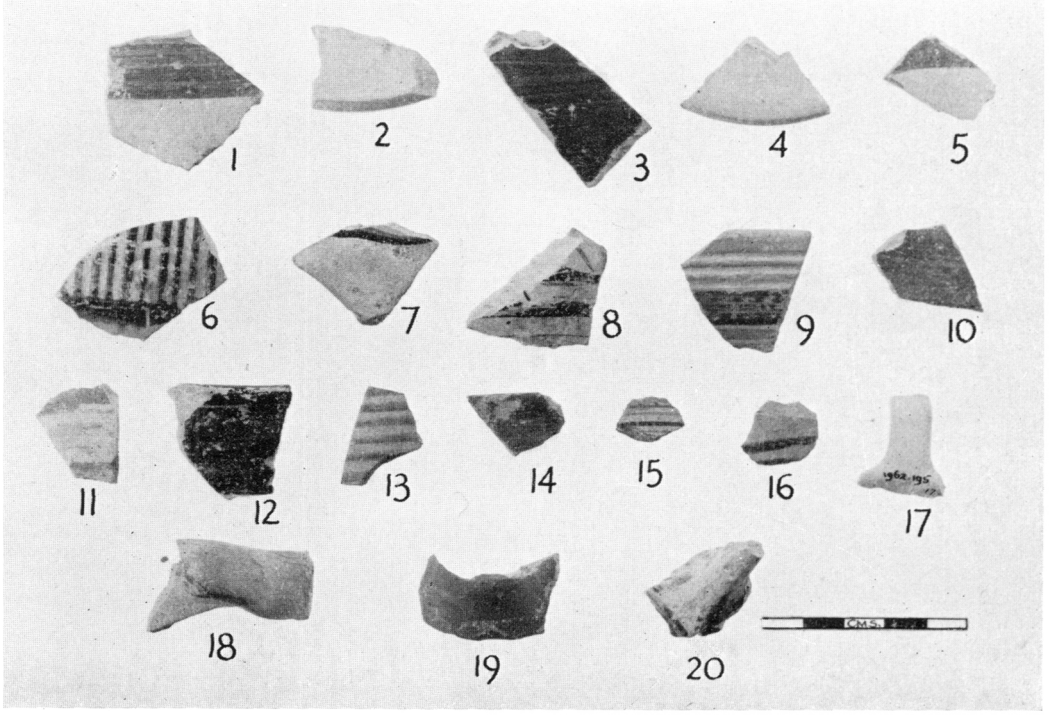

(b)

MYCENAEAN AND MINOAN POTTERY: COMPOSITION AND PROVENANCE

SHERDS FROM (*a*) THEBES AND (*b*) VOLOS (IOLCHOS).

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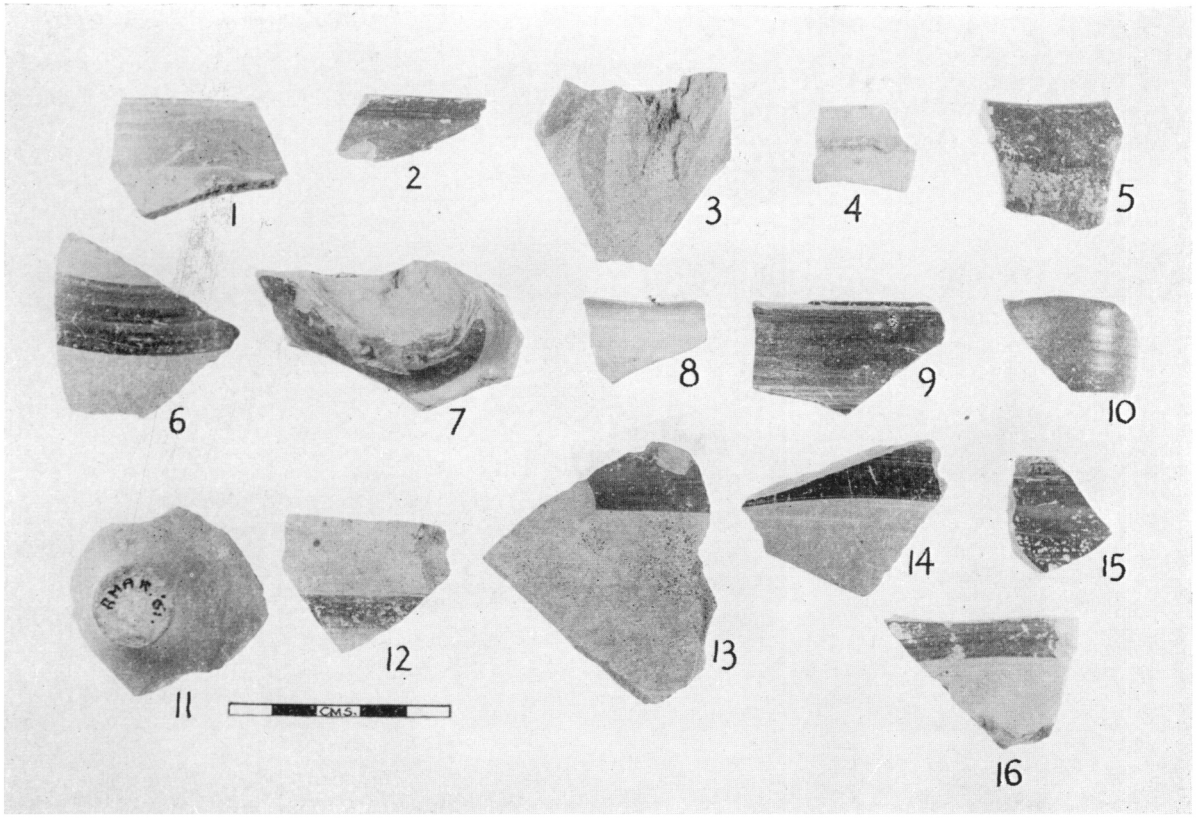

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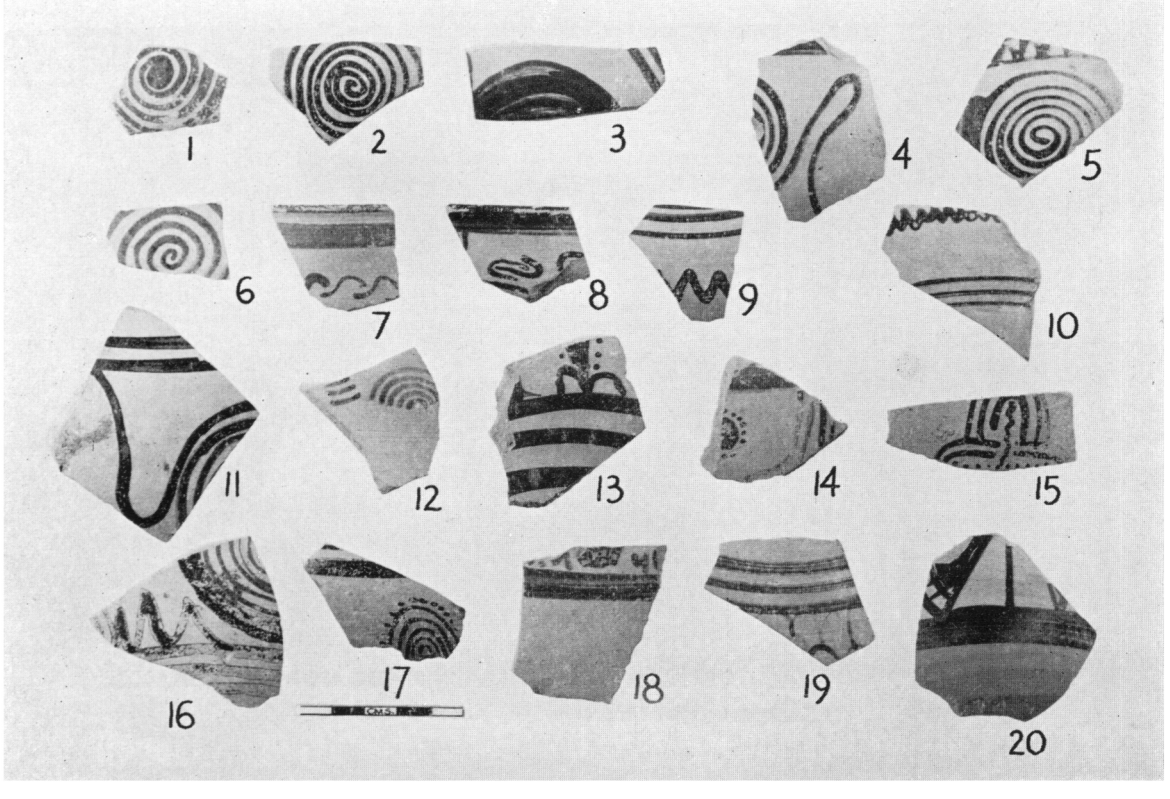
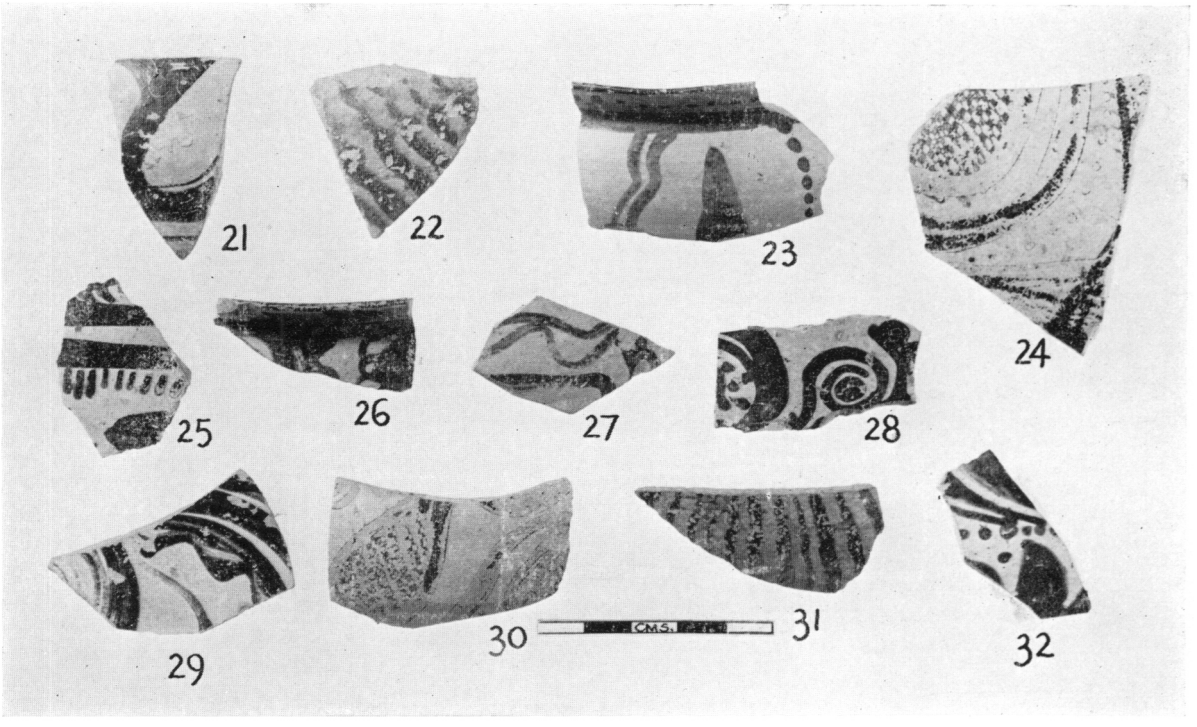


(b)

MYCENAEAN AND MINOAN POTTERY: COMPOSITION AND PROVENANCE

SHERDS FROM (*a*) EUBOEA, AMARINTHOS, AND (*b*) MELOS, PHYLAKOPI.



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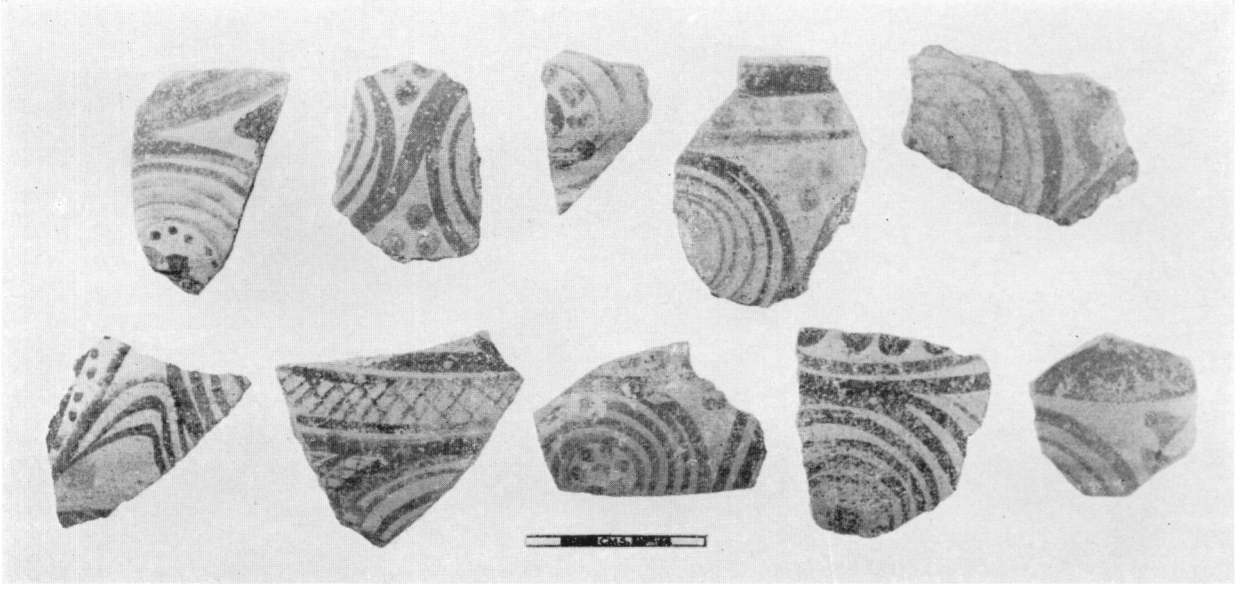

(*b*)

MYCENAEAN AND MINOAN POTTERY: COMPOSITION AND PROVENANCE

SHERDS FROM MELOS, PHYLAKOPI.

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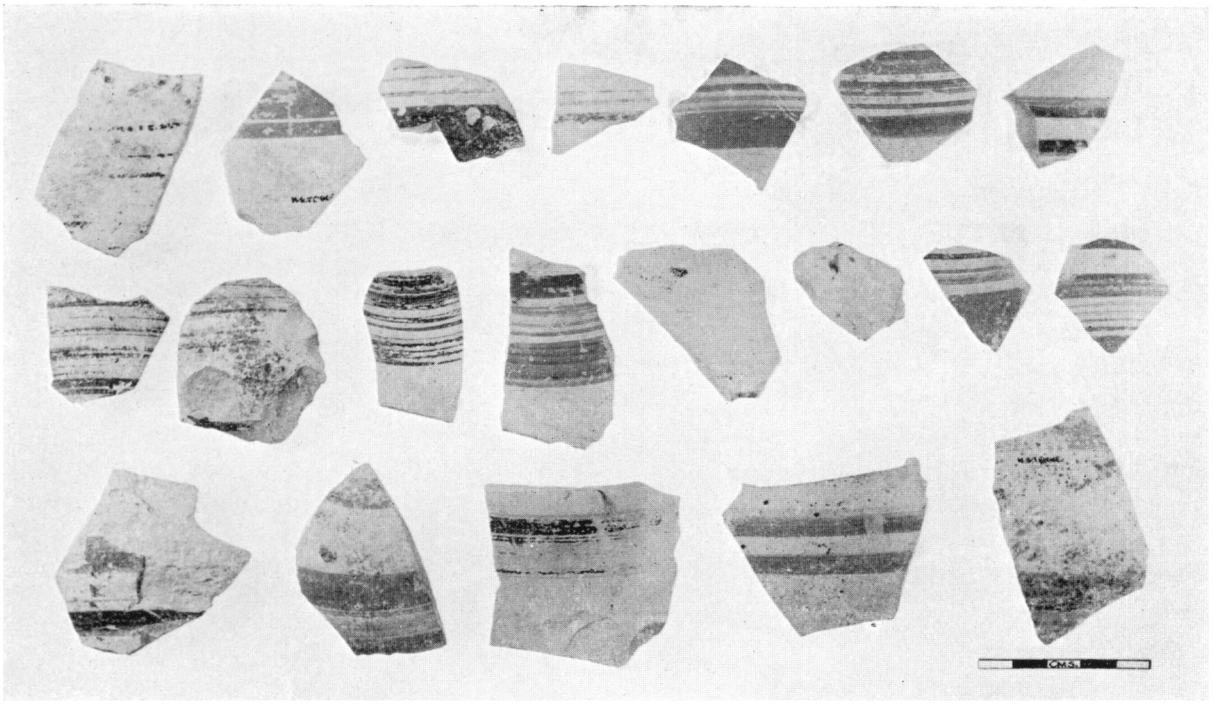

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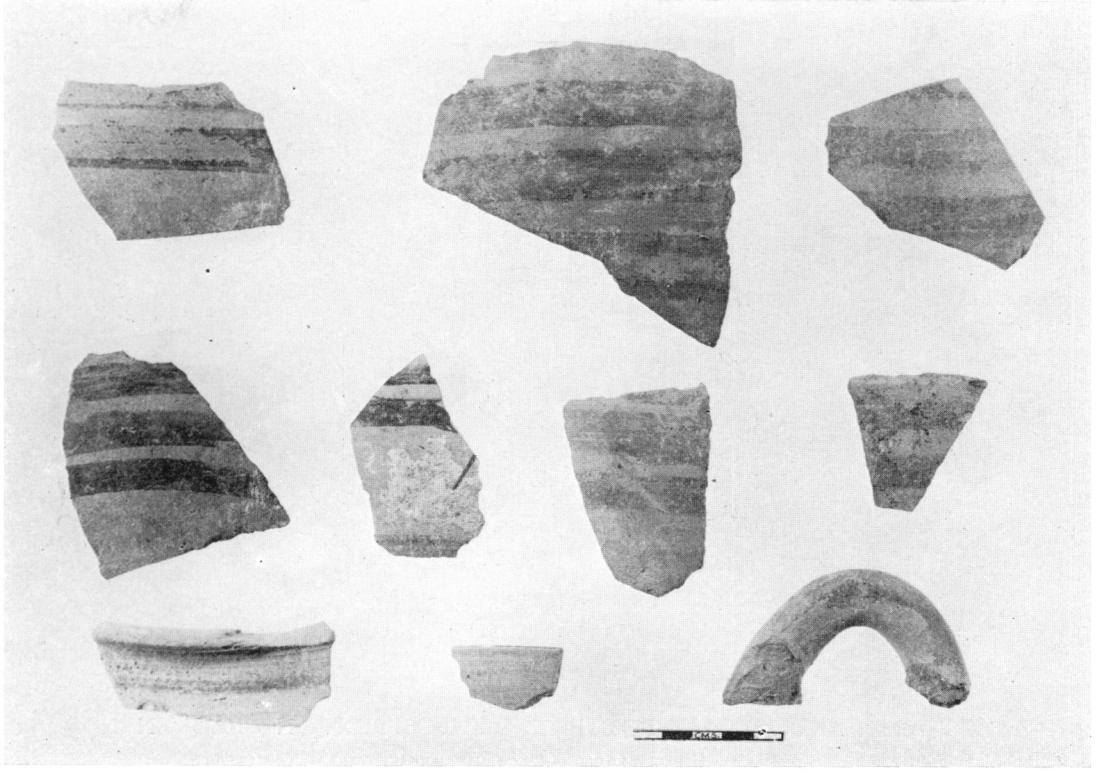

(*b*)

MYCENAEAN AND MINOAN POTTERY: COMPOSITION AND PROVENANCE

SHERDS FROM (*a*) HALA SULTAN TEKKE, CYPRUS, AND (*b*) ARPERA CHIFLIK, CYPRUS.

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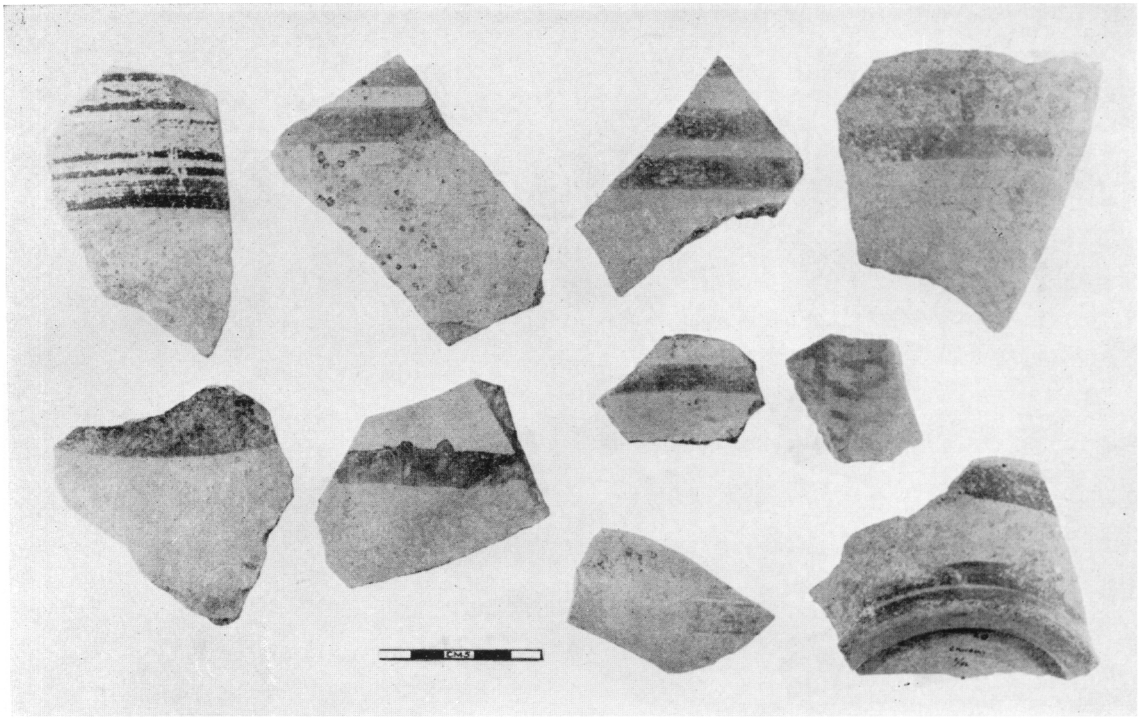

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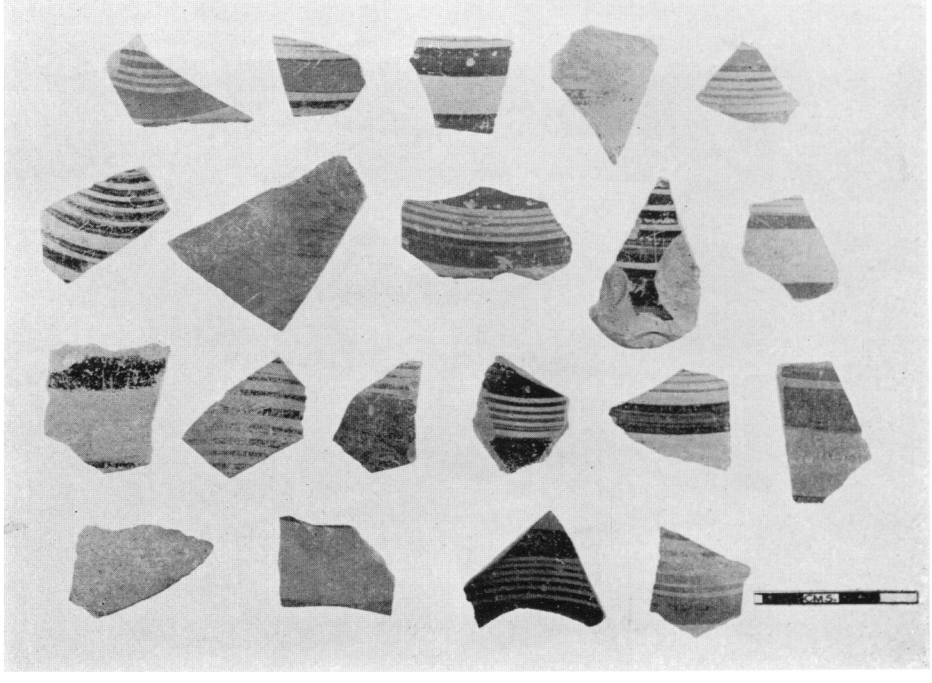

(*b*)

MYCENAEAN AND MINOAN POTTERY: COMPOSITION AND PROVENANCE

SHERDS FROM (*a*) ENKOMI, CYPRUS, AND (*b*) FROM TELL EL AMARNA, EGYPT.

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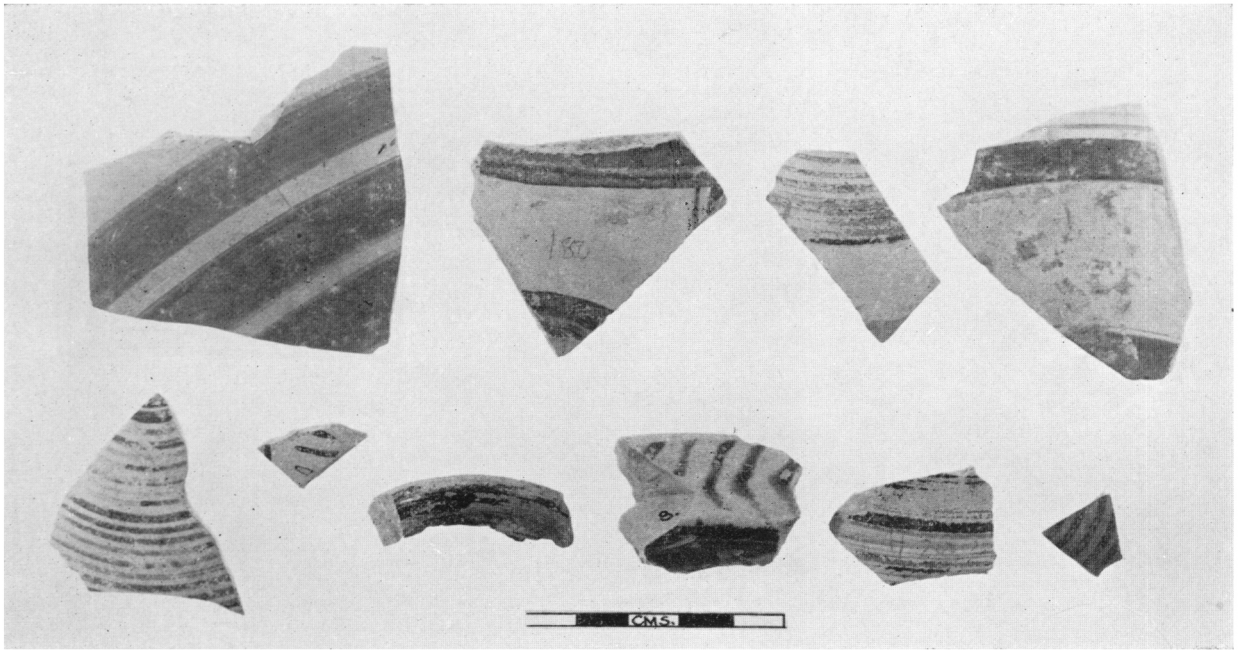

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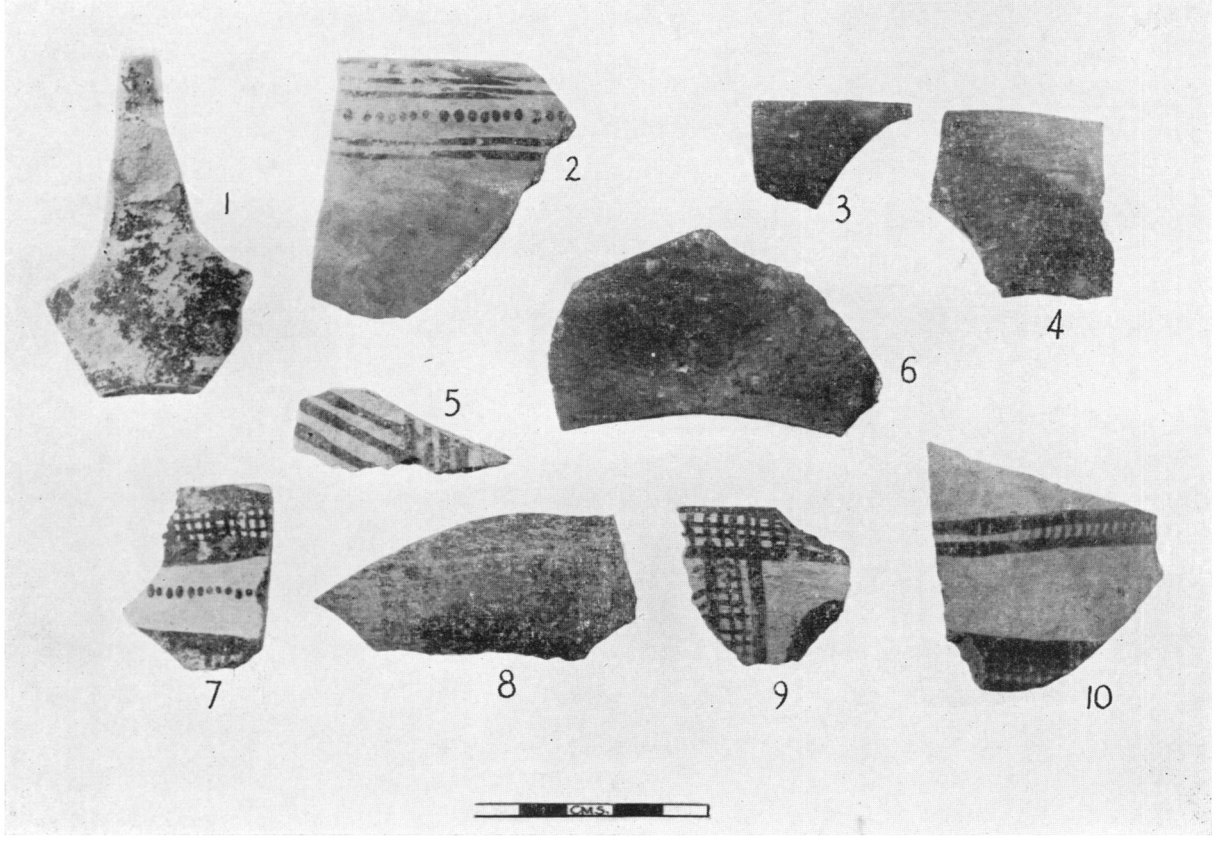

(b)

MYCENAEAN AND MINOAN POTTERY: COMPOSITION AND PROVENANCE

SHERDS FROM (*a*) TELL ATCHANA AND (*b*) CYPRUS.

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