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February 1972

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CONCERNING TWO MYCENAEAN PICTORIAL SHERDS FROM KOUKLIA (PALAEPAPHOS), CYPRUS**

V. Karageorghis*, Frank Asaro, and I. Perlman†

INTRODUCTION

Mycenaean pottery of the pictorial style is rather scarce on the west coast of Cyprus as compared with the large quantities found on the south and east coasts. This may, of course, be accidental, as no major excavations of Late Bronze Age sites have yet been undertaken in the Paphos area. The site of Kouklia (Palaepaphos), however, may one day produce much more than has hitherto been known, especially Mycenaean pottery of the 14th and 13th centuries (Mycenaean III A and III B). Already, recent excavations by a British expedition from St. Andrews and Liverpool, and a German expedition of the Deutsches Archäologisches Institut, Berlin, have shown how important this site much have been during the 12th century B.C. (Late Cypriote III) and have brought to light a large amount of Mycenaean III C:I pottery.¹ To the naked eye, the fabric and decoration seem to be sufficiently distinctive to suggest regional variations among such wares. Considerable quantities of late 13th century pottery have also been found at Kouklia, of the type which is usually known as Rude Style, decorated with pictorial representations.² This pottery is considered by all scholars who are involved in the controversy over the origin of the Mycenaean pottery found in Cyprus and the Levant in general, as of Cypriote manufacture.³ Earlier, "good Mycenaean" pottery of the Mycenaean III A and III B periods is scarce, as already mentioned above, but not lacking altogether.

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**The present report was written in Berkeley while one of the authors (V.K.) was there in the autumn of 1971 as Regents' Lecturer.
In the pictorially decorated category, we know of two fragments which
have been published: one from a 14th century chariot crater and another, again
from a crater, decorated with what appears to be a "Minoan Lady." This second
fragment, found in 1952 by the British Expedition from St. Andrews and Liverpool
was considered for some time as lost, but it has been recently rediscovered and
was given to the Cyprus Museum in 1971 (Plate 1). Its importance for the
stylistic study of pictorial vase-painting was recognized by Catling, who pub-
lished it in great detail in 1971 and who attributes it to the early 14th century
B.C. It was found at site "Evreti," east of Kouklia village. Its fabric is
described by Catling as follows:

Compact buff clay, fired fairly hard. Finely,
polished, almost lustrous yellow surface inside
and out; lustrous dark brown paint, dilute to
golden brown for some of the fine brush strokes.

The same site "Evreti" produced another fragment from an open bell
 crater, decorated with the forepart of a bull in front of a tree motif, (plate 2)
which was first published by one of the present writers (V.K.) and ascribed to
the early part of the Rude Style period, dating chronologically to the last
quarter of the 13th century. The form of the crater, with its high shoulder
tapering inwards, its sharply angular out-turned rim is characteristic of the
Rude Style which, at its initial stages, shows distinct influences from the
art of carving on ivory. There are up to now, seven such vases of the early
Rude Style, all decorated with bulls, five found in Cyprus and two at Ras Shamra. The figure drawing is neat but bold, and the fabric, though quite distinct
from the "good Mycenaean" ware of the Mycenaean III A and III B periods, is not
totally debased; the surface has a whitish slip, and the paint is semi-glossy,
usually dark brown when thickly applied, but rather washy and of lighter color
when thin lines are used to render the anatomical details of the animals' bodies.
We know that the quality of figure drawing and of the fabric degenerate gradu-
ally during the subsequent "ripe" period of the Rude Style until they become
quite debased.8

When the Evreti Mycenaean III A fragment with "Minoan Lady" (referred
to later also by its laboratory serial number, PPAP120) was exhibited at the
site museum at Kouklia side by side with the Rude Style fragment with the bull
and tree motif (PPAP119) one of the present authors (V.K.) was struck by the
similarity of their fabric, slip and paint; in fact, had it not been for the
two centuries which separate the two fragments stylistically, one might prima
facie suggest that the two fragments belonged to the same vase. Consequently,
small chips of these two sherds were taken for laboratory analysis in Berkeley
to find out if the similarity which was striking to the naked eye existed also
in the chemical composition of the clay. Any close affinity found would be of
crucial importance. Although the two fragments came from the same site, they
belong, stylistically, to two distinct classes of pottery, one (PPAP120)
thought by several scholars to have been imported from the Greek Mainland9
and the other (PPAP119) universally accepted as of Cypriote manufacture. An
exploration of the possible scope of application of laboratory analysis for
deducing pottery provenience as an adjunct to expert stylistic examination is,
of course, a central objective of such inter-disciplinary studies at the
moment.
CYPRIOTE POTTERY IN GENERAL

A large number of analyses have been made on Cypriote sherds which cannot be presented in this report. These pieces were excavated at a number of different sites and represent most of the styles and periods known to Cypriote archaeology. In assessing the results in the present report, it might prove useful to know something of the picture evolving from the wider array of analyses.

The analyses done to date present a set of clues which prove to be extremely complex and suggest prudence in drawing quick conclusions on questions of provenience, particularly where one is concerned with relations between different sites within Cyprus. This is not to suggest that the many problems posed cannot be disentangled eventually, but rather that it behooves us to state as explicitly as possible alternative explanations imposed by our limited present state of knowledge.

An ideally simple situation would result if each site of pottery making had a single source of clay which was used by successive cultures. Then all pottery of different periods and stylistic variants would only differ in composition by virtue of different practices in refining the clay. Experience obtained in this laboratory indicates that such sites do exist, but that these are probable exceptional situations rather than the rule. On Cyprus, we are finding complexities regarding clay sources which may be grouped under two headings: (a) gross differences, and (b) fine variations. The latter topic is of greater concern in the study reported here.

(a) Gross differences in clays. If we confine our attention to a particular period, say Late Bronze Age, we find that the potters often used distinctively
different types of clay for different styles. This raises intriguing questions whose answers may well include technological explanations as well as reasons based on esthetics. For example, White Slip Ware was made from a type of clay vastly different in composition from that used in any other pottery style. The potters apparently could recognize the type of clay to use for these wares wherever they may have worked because it seems a priori unreasonable that the vast quantities of White Slip Ware were all made in one center. Some added evidence for diversity of sources lies in the fact that there are a considerable number of chemically distinguishable types of White Slip Ware. The point to make is that all of these were fashioned from a type of clay geochemically vastly different from others so far encountered in pottery.

In a similar vein, Base-Ring Ware was also made from a type of clay with distinctive chemical composition. In this case, however, Late Bronze Red Slip and Black Slip wares not infrequently appeared with the Base-Ring type of composition. Other pottery styles will not be mentioned here in the interests of brevity even though some conclusions can also be reached on these.

(b) Fine variations. It has already been inferred (but not satisfactorily proved) that potters from a single site availed themselves of distinctively different types of clay. We shall now turn to the question of local variability of clay composition of the same geochemically generic type.

When sizeable numbers of sherds of one type from one site are analyzed, it is generally found that a considerable fraction fall into a compact chemical group whereas others do not. Of these others, sometimes another group can be made which can be distinguished from the larger group only because the method of analysis is sensitive enough to show up very small differences.
The analyses themselves do not tell us whether this "sub-group" represents imports from a place with clay of virtually identical composition or whether the clay merely represents a minor local variation.

The multi-dimensional aspects of this general problem of provenience is quite apparent from the experience already obtained. It will obviously be necessary to make a great many analyses before the many details can be explained with some confidence. We have indulged in this brief survey so that the reader may appreciate our care in reaching conclusions and to visualize how they might be reinforced or modified by further work.

PROVENIENCE OF TWO MYCENAEAN FRAGMENTS
FROM KOUKLIA

The chemical compositions of the two Mycenaean sherds described in the introduction will be compared with each other and with reference materials in order to obtain evidence concerning provenience. The tabulated data designate these two fragments as PPAP119 and PPAP120 which numbers pertain to the "Rude Style" and "Minoan Lady" sherds respectively.

The first comparison of compositions will be made between these sherds and a group of MycIIIC:1 sherds from Kouklia which had been analyzed previously. The reference group consists of 19 pieces, all from the excavation of Maier at the Evreti site. In Fig. 1, the values for each element in PPAP119 and 120 are shown as the two thin bars at the left in each box. The next thicker bar is the mean value for the 19 sherds in the reference group and the batched zone indicates the spread in composition expressed as the standard deviation, $\sigma$. The numerical data upon which these bar-graphs are based are tabulated in-
Table 1 for those interested in the actual numbers. It will be recalled that in a normal statistical distribution, two out of three members of a statistical assemblage fall within +1σ of the mean value. Before providing more detailed discussion, the conclusion will be stated; namely, that both PPAP119 and PPAP120 likely have the same provenience as the reference group and, therefore, the same as each other. We shall first examine the basis for this claim of common provenience and then the question of whether the locality is Kouklia.

The supposition is made that the 18 elements used for diagnostics may be treated as independent variables and that the variation of each element follows a normal distribution curve. On the basis of much work done to date, we are convinced that any shortcomings in terms of strict validity are not serious. A sherd may then be compared with a reference group as follows: It fits the group if only about six elements of 18 fall outside of 1σ, and of these, only one element should depart by as much as 2σ. It should be realized that we are dealing with the statistics of small numbers, and there are other hazards involving systematic errors, so the criterion just outlined cannot be applied blindly.

When PPAP120 is compared with the group of 19 MycIIIC:1 sherds, we find that seven elements lie outside of 1σ and one of these, Ta, is off by 3.5σ. If it were not for the single element Ta, this would be as good a fit as can be expected. A test is available to see if this particular sample had been contaminated with Ta, but the results indicated that it was not. The point remains unexplained and troublesome. Since everything else agrees well enough, it seems likely that we are confronted with an unusual perturbation of statistics on this element. (Below, this sherd will be compared with other
pottery groups to get better perspective on variations encountered. When PPAP120 is compared with a group of MycIIIC:1 sherds from Enkomi, it was found that 12 elements lay outside of 2σ, five elements of these were beyond 5σ, and one was as high as 17σ. The odds for "not belonging" are astronomical in such a case.

The same comparison can be made between PPAP119 and the group of MycIIIC:1 ware from Kouklia. The results are much the same as for PPAP120. The fit is as good as can be expected, with one "wild" element, in this case, Na. This single discrepancy is not considered serious because Na is very pervasive as a contaminant, and wild values are not uncommon in otherwise well-behaved materials.

The evidence seems to us very strong that both PPAP119 and PPAP120 were made at the same place as the group of MycIIIC:1 wares also excavated at Kouklia. Therefore, where reference is made in the following discussion to the provenience of the MycIIIC:1 group of 19 pieces, it should be kept in mind that we are at the same time discussing the provenience of PPAP119 and 120. It remains now to examine the evidence as to whether all of these were made locally. This is a different (and more difficult) question than that of whether one can rule out specific places as sites of origin. This latter point will be discussed first.

One of the questions to be answered in this study is whether the "Minoan Lady" sherd has a chemical composition which conforms with that of the fine MycIII A and B wares thought to be unique to the Greek mainland. A large number of specimens of these wares excavated at a number of sites in Greece are currently being analyzed, and the results on one such group from Mycenae are presented in Fig. 1 and Table 1. Although this study is not yet completed,
we know that these wares are distinctly similar to each other, at least when drawn from a number of sites in the Argolid. The group from Mycenae (Fig. 1) is quite representative of much of the material which has been analyzed so far. It is seen that the materials from Kouklia are grossly different: for example, the "Minoan Lady" (PPAP120) as compared with the group from Mycenae falls within 1σ for only 1 element; it falls outside of 2σ for 16 elements, and of these, 9 elements are beyond 5σ and 4 elements beyond 10σ. This gross difference lends some perspective to the fine distinctions discussed above in trying to decide whether PPAP120 belonged to the group of MycIIIC:1 wares from Kouklia.

As already mentioned, Fig. 1 also shows a group of MycIIIC:1 ware from Enkomi and again it is seen that there are great differences. This group will be discussed further below.

The answer to the question of whether the "Minoan Lady" and its reference group (MycIII:1 ware from Kouklia) are indeed local to Kouklia is more complex. If all of the sherds analyzed from Kouklia made up a single compact chemical group, one might reasonably assume that this composition is representative of local clays. However, all of the wares excavated at Kouklia were not the same in composition. In addition to the reference group of 19 sherds, there were 18 others which did not fit this group. These, in turn, were not homogeneous and could be separated into five other groups, one with six members and one with only two members. These groups were not grossly different from each other or from the group of 19 sherds. It is possible that all of these merely reflect a diversity of clay sources used in that single area. In order to illustrate how one of these small groups relates to the group of 19 sherds, the latter group has been entered on Fig. 2 along side of the group of six sherds...
just mentioned. It is seen that, for the majority of the elements, these two groups are indistinguishable, but for some, there are substantial differences; for example, Sc, Th, and Na. The general similarity of all these wares does not prove that they are all local, but this would seem a reasonable hypothesis to entertain pending the accumulation of further evidence.

Also entered in Fig. 2 is the group of 11 sherds from Enkomi, previously shown in Fig. 1. Here again, not all the MycIIIC:1 wares analyzed belong to this group, and another group of 10 sherds from Enkomi is entered. In the case of Enkomi, we can be more sure that both of these groups are local, because we have analyzed a much larger collection of wares embracing many styles, and the two groups shown in Fig. 2 have chemical parallels among these diverse ceramics. Furthermore, samples of grey clay from the Enkomi Village area\textsuperscript{12} were analyzed and agreed quite well with the ancient potteries shown in Fig. 2.

The point being made by these comparisons concerns the mounting evidence that potters from a single site employed different clay sources which are readily distinguishable by a sensitive method of analysis. If this is so, the rather similar wares from the Kouklaia area may well be local to that site. None of these arguments are entirely convincing at this stage, but it should also be recognized that even such complex situations can likely be resolved by sufficient sampling and analysis.

CONCLUSIONS

The evidence outlined above is quite convincing that PPAP119 (Rude Style) and 120 (Minoan Lady) have the same provenience, and that they were
made from the same clay source as were the preponderance of MycIIIC:l wares also excavated at Kouklia. It is not rash to assume that these were all made at Kouklia, particularly in view of the evidence that this was probably the most important Late Bronze Age site in Western Cyprus. Even taken by itself, the "Minoan Lady" vessel very definitely does not come from the same clay sources responsible for the fine Mycenaean ware of the IIIA and IIIB periods found on Greece and as imports in other places.

As we now consider in addition the stylistic differences between PPAP119 and PPAP120, we are led to two divergent interpretations, the resolution of which is of some importance in the general problem of Mycenaean pottery in the Levant, particularly in Cyprus. (1) If these two vessels are indeed two hundred years apart as the stylistic criteria demand, this would simply mean that Mycenaean wares encompassing this particular time span were made at Kouklia. To support this view, one should search for other examples of locally-made Mycenaean pottery of the 14th century. (2) If, on the other hand, careful search should reveal no other evidence for local manufacture of Mycenaean ware during the 14th century, one might conclude that the "Minoan Lady" is of a later date. If this should prove correct, this vessel becomes an unusual example of "14th century artistry" practiced at a later date.
ACKNOWLEDGEMENTS

We give our thanks to Mrs. Helen Michel, Miss Suzanne Halvorsen, Duane Mosier, and Edward Minasian of the Lawrence Berkeley Laboratory for their invaluable contributions to the analyses presented in this report.

The Mycenaen wares from Mycenae used in this report are from a much larger collection from the Greek mainland and Crete, assembled for us by Professor Åke Akerström of the Swedish Institute in Athens. We are grateful to him for his considerable efforts in managing this collection and to Professor S. Marinatos, Inspector General of Antiquities and Historical Monuments of Greece, for his fine cooperation in making this collection available to us.
REFERENCES

1. For a general account on Late Bronze Age Kouklia, see F. G. Maier, "Excavations at Kouklia (Palaepaphos), Third Preliminary Report: Season 1968", *RDAC* 1969 33ff., where references to previous literature is given; see also *idem* "The cemeteries of Old Paphos", *Archaeologia Viva* 3(1969) 116ff.


4. This fragment is kept in the sherd collections of the British School of Archaeology at Athens and was seen by one of the writers (V.K.).

5. Catling, *op.cit.*


9. E.g. Catling in *BSA* 60 (1965) 219ff.

10. See note 1 above.


12. These clays were obtained from a present-day potter in Famagusta who told us that they were drawn from the vicinity of Enkomi village.
Fig. 1

The two narrow bars at the left in each box represent the values for the indicated element in the two sherds, PPAP 119 (Rude Style, bull motif) and PPAP 120 (Minoan Lady). The three wider bars represent mean values for the indicated pottery groups; the hatched zone on each is ± the standard deviation for the group: PPAP MycIIIC is a group of 19 sherds of MycIIIC:I ware excavated at Kouklia; ENK MycIIIC is for 11 sherds of similar wares from Enkomi; MYC MycIIIB is for 16 sherds of MycIIIB wares excavated at Mycenae. For convenience, the scale used is different for the different elements. The actual numbers are given in Table 1.

Fig. 2

The bars and hatching have the same meaning as in Fig. 1. All wares shown are of MycIIIC:I style. PPAP (19 pcs) is the same group from Kouklia shown in Fig. 1 and labelled PPAP MycIIIC; PPAP (6 pcs.) represents another chemical group also excavated at Kouklia. ENK (11 pcs) is the same group from Enkomi shown in Fig. 1 and labelled ENKIIIC; ENK (10 pcs) represents another chemical group also excavated at Enkomi. For convenience, the scale used is different for the different elements. The actual numbers are given in Table 2.
Fe(%) Sc Ta Cs Ti(%) Cr Th Hf La
Al(%) Lu Co Na(%) Mn U Rb Ni Ca(%)
Postscript: Dr. H. Catling was asked by one of the writers (V.K.) to express an opinion on the "Rude Style" fragment from Kouklia (PPAP 119), and he very kindly commented on it as follows:

"That is a very interesting question you put to me; naturally one feels that the fragment belongs with the Rude Style material, rather than with the main stream of III B pictorial. On the other hand, like the obverse of Enkomi 19:26, (about which there are, no doubt, several views) it stands a bit apart from the main stream of Rude Style. So my answer is equivocal, for I think the piece is equivocal." (Letter dated 4/11/1971).
<table>
<thead>
<tr>
<th></th>
<th>(1) PPAP 119 Rude Style</th>
<th>(2) PPAP 120 Minoan Lady</th>
<th>(3) PPAP MycIIIC:1 (19 pieces)</th>
<th>(4) ENK MycIIIC:1 (11 pieces)</th>
<th>(5) MYC MycIIIB (16 pieces)</th>
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<tbody>
<tr>
<td></td>
<td>X ± ε</td>
<td>X ± ε</td>
<td>M ± σ</td>
<td>M ± σ</td>
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</tr>
<tr>
<td>Fe(%)</td>
<td>4.24 ± 0.06</td>
<td>4.07 ± 0.06</td>
<td>3.92 ± 0.25</td>
<td>4.95 ± 0.16</td>
<td>5.16 ± 0.18</td>
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<tr>
<td>Sc</td>
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<td>13.45 ± 0.05</td>
<td>14.16 ± 1.00</td>
<td>20.04 ± 0.58</td>
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<td>Ta</td>
<td>1.13 ± 0.008</td>
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<td>Cs</td>
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<td>Ti(%)</td>
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<td>Cr</td>
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<td>118 ± 3</td>
<td>97 ± 11</td>
<td>325 ± 26</td>
<td>221 ± 14</td>
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<tr>
<td>Th</td>
<td>8.03 ± 0.13</td>
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<td>Hf</td>
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<td>La</td>
<td>28.6 ± 0.8</td>
<td>27.0 ± 0.7</td>
<td>27.6 ± 2.3</td>
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<td>Al(%)</td>
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<td>5.78 ± 0.14</td>
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<td>Lu</td>
<td>.319 ± 0.019</td>
<td>.282 ± 0.016</td>
<td>.303 ± 0.020</td>
<td>.337 ± 0.018</td>
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<td>Co</td>
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<td>Na(%)</td>
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<td>Mn</td>
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<td>U</td>
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<td>Rb</td>
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<td>Ni</td>
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<td>Ca(%)</td>
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<td>9.8 ± 0.8</td>
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Columns (1) and (2): Measured values (X) in the respective sherds and their errors of measurement (ε). The error, ε, gives the precision of each value according to the statistics of radioactive counting.

Columns (3), (4), and (5): Mean values (M) and standard deviations (σ) for the indicated pottery groups. These groups were excavated at Koukla (Palaepophos), Enkomi, and Mycenae respectively.

All numbers entered are in parts-per-million unless the element bears the % sign.
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<th>(3) ENK MyciIC:1</th>
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<td>(19 pieces)</td>
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<td>(10 pieces)</td>
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<td>M ± σ</td>
<td>M ± σ</td>
<td>M ± σ</td>
<td>M ± σ</td>
</tr>
<tr>
<td>Fe(%)</td>
<td>3.92 ± .25</td>
<td>4.32 ± .18</td>
<td>4.95 ± .16</td>
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<td>Sc</td>
<td>14.16 ± 1.00</td>
<td>17.38 ± .69</td>
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<td>Ta</td>
<td>1.071 ± .077</td>
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<td>Cs</td>
<td>3.79 ± .040</td>
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<tr>
<td>Th</td>
<td>7.35 ± .53</td>
<td>5.99 ± .26</td>
<td>8.59 ± .47</td>
</tr>
<tr>
<td>Hf</td>
<td>3.13 ± .22</td>
<td>2.90 ± .09</td>
<td>3.11 ± .16</td>
</tr>
<tr>
<td>La</td>
<td>27.6 ± 2.3</td>
<td>23.1 ± 1.1</td>
<td>23.2 ± 3.0</td>
</tr>
<tr>
<td>Al(%)</td>
<td>5.58 ± .42</td>
<td>5.89 ± .24</td>
<td>6.02 ± .36</td>
</tr>
<tr>
<td>La</td>
<td>.303 ± .020</td>
<td>.291 ± .022</td>
<td>.337 ± .018</td>
</tr>
<tr>
<td>Co</td>
<td>20.21 ± 1.65</td>
<td>19.87 ± 1.90</td>
<td>27.39 ± 4.35</td>
</tr>
<tr>
<td>Na(%)</td>
<td>.354 ± .085</td>
<td>.611 ± .062</td>
<td>1.065 ± .233</td>
</tr>
<tr>
<td>Mn</td>
<td>962 ± 156</td>
<td>780 ± 108</td>
<td>1092 ± 220</td>
</tr>
<tr>
<td>U</td>
<td>1.52 ± .22</td>
<td>1.46 ± .17</td>
<td>3.70 ± .57</td>
</tr>
<tr>
<td>Rb</td>
<td>74 ± 10</td>
<td>61 ± 15</td>
<td>78 ± 18</td>
</tr>
<tr>
<td>Ni</td>
<td>92 ± 17</td>
<td>77 ± 21</td>
<td>269 ± 38</td>
</tr>
<tr>
<td>Ca(%)</td>
<td>7.3 ± 1.6</td>
<td>7.3 ± 1.2</td>
<td>12.1 ± .8</td>
</tr>
</tbody>
</table>

Column (1): Group of MyciIC:1 ware from Koukliia reproduced from Table 1
Column (2): Another group of 6 sherds of similar ware from Koukliia
Column (3): Group of MyciIC:1 ware from Enkomi reproduced from Table 1
Column (4): Another group of 10 sherds of similar ware from Enkomi

All numbers entered are in parts-per-million unless the element bears the % sign.
Plate 1. Crater sherd decorated with a "Minoan Lady".
Plate 2. Crater sherd decorated with the forepart of a bull in front of a tree motif.
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