The Production, Circulation and Consumption of Ceramic Vessels at Early Neolithic Knossos, Crete.

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CHAPTER TEN

EARLY CERAMIC TECHNOLOGY AT KNOSSOS

In the absence of direct observation or oral testimony, study of the materials, techniques, concepts and individuals which constituted ancient ceramic production, must necessarily rely on indirect evidence. Conventionally, this has taken several forms from evidence of excavated production locations, firing installations, tools and wasters, to the study and analysis of finished ceramics (e.g. Wilson & Day 1994; Whitelaw et al. 1997; Shaw et al. 1977, 2001). In addition to these, however, much can also be gained from an analysis of the social, economic and environmental context within which production activities must be situated (Costin 1991:2-3; see Chapters 3-4): this includes consideration of such things as distribution of raw materials, how ceramic vessels were consumed, the scale of the community in which production was taking place, the potential relationship to other production activities, as well as concepts of value. Thus, this discussion of EN ceramic production will proceed from direct analysis of ceramic material, via other forms of archaeological evidence to a more general contextual analysis of the changing ways in which ceramic vessels were produced at Knossos and, as will be argued, at other settlements on Crete during the various phases of EN.

10.1 Previous Approaches to Early Neolithic Ceramic Production

Early Neolithic ceramic production at Knossos is currently understood to have been almost entirely local to the site. Clay is thought to have been selected from 'the immediate vicinity', processed and then tempered with powdered gypsum from the nearby Gypsades Hill (Furness 1953:95; 103; n.16). This was essentially the only ceramic technology in use: "there is no example of tempering with sand or organic material" (Furness 1953:103). This view is also supported by Evans: "virtually all [sherds are] from locally made pottery of very similar fabric" (Evans 1973:133). EN vessels were carefully formed and generally better burnished than later vessels, their surfaces varying in quality from coarse to fine burnish with no prior use of slip (1953:95, 103, 110). Fine ware only differs from coarse ware in its thinner walls and better 'levigation' and more careful burnish: only later did clear coarse and fine categories emerge (1953:109). Furness considers EN firing to be poor and more irregular than in later phases, but still sufficient to produce adequate strength (1953:103). Coarse ware is often variegated due to irregular firing, to a greater extent than fine ware (1953:95). Consistent with an evolutionary perspective, the next phase, ENII, sees some improvements in firing and clay processing with less variation in colour on the same surface and with 'large white grits' less often visible in the break (1953:117). ENII also sees changes both in the range of finishing methods used and in the types of design (see Washburn 1983:144ff.; Broodbank 1992:53-7).

Evans supports Furness' observations of fabric, forming and firing adding little that is new (Evans 1964:194; 196). He does, however, emphasise how the very earliest pottery at the site "bears all the marks of being the product of a fully developed tradition of potting" (cf. also A. Evans 1921:35), and by that he appears to means a complex range of shapes, with 'much arbitrary detail' and a complex range of handle types, all skilfully formed and fired (1964:196; 1968:271). Since occupation of the site precedes the first appearance of pottery, Evans argues that ceramic technology must therefore have been introduced in this developed form from elsewhere, the most likely candidate, in view of stylistic similarities, being south-west or coastal Anatolia (Evans 1968:273-4; 1971:115). This view has been challenged by Broodbank, who prefers to explain the development of ceramic technology purely in terms of indigenous processes (Broodbank 1992:49; see Chapter 2).

All previous studies have emphasised the stylistic homogeneity of the Neolithic sequence at Knossos, from the earliest to latest levels (Mackenzie 1903:158-9; Furness 1953; Evans J.D. 1964:194; Manteli 1993a:42). This is conventionally viewed as indicating a very gradual process of change (cf. Vagnetti & Belli 1978:126), often characterised as conservative (e.g. Evans 1971:114; Manteli 1996:132). Ceramic styles are commonly held to show no evidence for contact with other areas of the Aegean and thus demonstrate the *isolation* of Knossos until the end of the Neolithic (see Section 12.1).

These statements, when collected together constitute a clear picture of ceramic production and may be summarised thus:

- EN ceramic technology was first developed elsewhere (Anatolia?) and then later introduced 'fully developed' to Knossos/Crete (but cf. Broodbank 1992:49);
- Most if not all EN pottery at Knossos was locally made, using a single technology (single 'gypsum tempered' fabric; consistent low-firing; restricted range of shapes);
- Production was essentially in the household domestic mode: variations within the assemblage merely represented variations between different households producing within this mode over space and time;
- Ceramic development during EN was *conservative* or undynamic in the way it adhered to a restricted shape repertoire over a millennium;
- Pottery styles demonstrate an *isolation* from the rest of the Aegean and indeed from the rest of Crete.

Thus, the current picture for EN Knossos/Crete views ceramic production as comprising a *single* production technology, which, following its initial adoption, was maintained in *isolation.* All pottery consumed at Knossos was produced at the site. Change was so slow as to merit the description *conservative*; there was a *curation* of a restricted set of techniques for over a millennium with possible technological 'improvements' only occurring during ENII.

In the next section an analysis of the different production technologies present in the EN sequence at Knossos will be presented. Beginning with clay selection and paste preparation and ending with firing practices, this will draw together the results of the various macroscopic and microscopic analyses, which have already been presented in detail in previous chapters. In the process the validity of previous views of EN ceramic production will be assessed.

10.2 Clay Selection and Paste Preparation

Thin-section petrology has allowed the characterisation of around fifty different fabrics within the ENI-II assemblage at Knossos (see Chapter 6). Each fabric has been characterised as separate on the basis of differences in clay groundmass and/or large non-plastic inclusions. In the majority of cases these fabrics, which have been defined at a microscopic level, can also be distinguished macroscopically (see Section 6.3). Contrary to what was previously thought about EN ceramics (single 'gypsum' source), these fabrics testify to the selection and utilisation of a wide range of different clays and tempers (cf. Plates 1-18) and therefore the presence at EN Knossos of not one ceramic technology but many.

10.2.1 Exploring EN Paste Variation: Differences and Consistencies

Careful petrographic study of groundmass and non-plastics suggests that in many cases EN fabrics exhibit distinct mineralogical differences. In the majority of these cases the most obviously distinctive feature of the fabric is the non-plastics present. However in some instances there are strong indications that the clay groundmasses of these fabrics are also different. For example, since Fabrics 6 (altered igneous rocks) and 10 (serpentinite) are both characterised by the presence of altered igneous rocks, which probably both link to the same geological series (i.e. the Ophiolite series; see Appendix III), one might conceivably expect to see a close relationship between them. However, serpentinite is entirely absent from Fabric 6 and the altered igneous rocks characteristic of Fabric 6 are entirely absent from Fabric 10. Moreover the clay groundmass of Fabric 6 contains doleritic rock fragments, while that of Fabric 10 contains mafic rocks. In this way Fabrics 6 and 10 not only testify to the selection and utilisation of quite different clay and temper sources, neither of which occur within the immediate area of Knossos (<5km), but also that this selection apparently remained consistent within either fabric over the duration of ENIa-b (c.1400 years). Other fabrics which exhibit some sort of mineralogical association between clay and temper are Fabric 12, which comprises a groundmass rich in quartz and feldspar in association with large granodiorite rock fragments (see

Plate 14) and Fabrics 8, 11, 19, 26, 35 where a clay groundmass containing metamorphic rock fragments is dominated by large metamorphic non-plastics (see Plates 12, 17). Other examples of such distinctiveness and consistency can be found in fabrics described in Chapter 6.

However, not all fabrics are so distinct from each other; in a number of cases different fabrics share the same basic mineralogy. Fabrics 1a, 1b, 1c, 1d, 1e, 1f, 1g, 1h and 1i essentially share the same basic groundmass and differ primarily in the form and distribution of their limestone tempers (see Plates 1-6). The closeness of the mineralogical links between Fabrics 1a-i is best demonstrated by Fabric 3, which shows a join between a coil in Fabric 1b and a coil in Fabric 1d. Fabrics 2a-e also have very similar groundmasses and again these fabrics differ primarily in the form of their limestone tempers and the presence or absence of grog (see Plates 7-10). To complicate matters further there are also close links in the form of limestone inclusions between some fabrics in 1a-i and fabrics in 2a-e. However despite the existence of clear links between these fabrics and the consequent potential for overlap it is striking that in relatively few cases do Fabrics 1a-i and 2a-e threaten to merge completely with one another; moreover when this happens most clearly, such as in Fabrics 1a-c or 1d-e, it occurs in circumstances which suggest the chronological development (ENIc-II) of a finer fabric out of an earlier (ENIa/ENIb) coarser one.

In other words despite the existence of clear links between Fabrics 1a-i, individual fabrics also demonstrate some consistently reproduced differences. Thus Fabrics 1a-c do not contain grog or types of biomicrite, which are such a feature of Fabrics 1d, 1e and 1g (cf. Plates 1-3). Moreover Fabrics 1a-c consistently contain a finer-grained sparite than the sparite found in Fabrics 1d, 1e, 1f, 1g and in Fabrics 2a and 2c. This consistency is underlined by the ease with which these technologically similar fabrics can be separated macroscopically (see Chapter 6). These more subtle fabric differences also correlate with subtle differences in form and finish. Although a broadly similar range of forms and finishes are found in each of Fabrics 1a-i and 2a-e, certain forms and finishes are nevertheless specific to certain groups of fabrics (see Chapter 7): for example during ENIc-II a distinctive miniature offset rim is confined to Fabrics 1b/c, while painted and brushed decoration is confined to Fabrics 1d/e. The meaning of these more subtle differences and consistencies in form, fabric and finish remains unclear: certainly the close links in mineralogy and the presence of coils of Fabric 1b and 1d together in the same vessel strongly suggest a common provenance for Fabrics 1a-i.

And so it would seem that an important, general feature of EN fabrics is their consistency. While some variation within individual petrographic groups occurs (e.g. see Chapter 6, Fabric 5a), this internal variation is never so great as to compromise the grouping[1]. Thus in many cases fabrics testify to a consistency in the association of particular clays with particular tempers. Moreover this consistency can in many cases be traced for over a millennium from ENIa to ENIc and often into ENII. As has already been demonstrated in Chapter 7, this consistency often also extends to particular forms and finishes, with some fabrics proving to correlate closely to groupings based on form, finish and frequency. Here it is worth noting that a very similar pattern of consistency occurs at EN (Greek) Franchthi, where "the consistency in the formulation of the clay bodies and their relative frequencies over a very long period of time indicate that the choice of materials was neither random or uninformed" (Vitelli 1989:19).

10.2.2 Fabric Diversity, Frequency and Provenance

Fabric diversity would appear to be a consistent feature of early Aegean ceramic assemblages, however in previous studies it has been interpreted largely in terms of the selection of a wide variety of raw materials by potters *local* to the site in question (see Chapter 2). Such interpretations were criticised for failing to consider the validity of alternative explanations, such as non-local production and exchange. The results of the detailed macroscopic and microscopic study of the EN ceramic assemblage at Knossos (presented in Chapters 6-9) provide an ideal opportunity to explore the validity of the TLP hypothesis with respect to ceramic production and consumption at Knossos.

In order for the TLP hypothesis to be valid for Knossos, petrographic analysis would have to be able to demonstrate for most, if not all fabrics, that their clay groundmasses and/or large non-plastics are compatible with a provenance within the local area of Knossos (<5km). However, in a number of cases both clay and temper are incompatible with such a provenance: good examples of this are Fabrics 10 (serpentinite and a clay groundmass rich in mafic rocks) and 12 (granodiorite rocks and a clay rich in quartz and feldspar). The raw materials in Fabric 12 are only compatible with a source in the Mirabello Bay, East Crete (c.70km from Knossos); moreover petrographic samples of Fabric 12 match Neolithic comparative from this area (see Chapters 6-7). Other fabrics would appear to have even more distant sources: for example Fabrics 31 (rich in biotite mica) and 35 (blueschist) are most likely to originate from raw material sources located beyond Crete (see Plates 16 and 17).

In order to explain the production of these fabrics under the TLP model, one has to postulate a model of long distance radiating procurement of *both* clay *and* temper by local Knossian potters, perhaps involving round trips of between 150 and 500km. Unfortunately, such a model for procurement receives no support from comparative ethnography. In his well-known cross-cultural comparison of ethnographic studies of ceramic raw material exploitation Arnold noted (1985:32-52) that from a sample of 111 individual cases c.33% of potters travel less than 1km for their clay, while 84% travel less than 7km. The most common maximum is a round-trip from the production loaction to the raw material source and back of around one day. Those potters that travel further than 7km only very rarely travel longer than one day, but have access to better forms of transportation, such as canoes. For temper, in a smaller sample of 31 cases, 52% of potters travel less than 1km, while 97% travel less than 6-9km.

These examples therefore strongly suggest that the production of at least some fabrics took place at locations situated at some distance from Knossos. In view of the strong ethnographic data in favour of a close link between the resident location of groups of potters and the raw materials which they use for

[1] In a number of such cases it was suggested that this internal variation may plausibly relate to

pottery production it seems likely that these different production locations correlate closely with the existence of different settlements. The correlation of ceramic production locations with settlement locations is also suggested by:

(i) the presence of suitable tools within a settlement context (Knossos): rubbers, burnishers, schist pot stands, needles[2];

(ii) the availability of crushing/grinding tools for the processing of clay and temper; it is most likely that tools normally associated with food processing, such as querns, were used;

(iii) the accidental incorporation of organic matter into ceramic pastes may indicate that paste preparation forming took place within the same environment as the processing of cereals (cf. also the use of organic temper in Fabric 15);

(iv) the local availability of suitable raw materials;

(v) the likelihood that permanent open settlements were the main centres for the consumption of ceramics.

If this identification of non-local production is correct then the presence of these fabrics at Knossos can only be explained in terms of exchange (see Chapter 12).

Those rare examples, where provenance is more clear, open up the possibility that other fabrics, which are equally rare but of unclear provenance, could also have been produced in settlements other than Knossos. This in turn suggests that the opposite might also be true, namely that those fabrics which occur most frequently at Knossos are most likely to be locally produced. Fabrics 1a-i and 2a-e comprise the most frequently occurring single group of fabrics and together account for c.40-80% of the EN assemblage during any one period (see Figures 9.3-4). The close mineralogical and technological links between these fabrics and their compatibility with the geology local to Knossos would also indicate a local provenance for this group. Other frequently occurring fabrics (i.e. Fabrics 5a, 6 and 8), exhibit strong similarities in form and finish with Fabrics 1a-

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the practice of clay mixing (see Chapter 6).

i, 2a-e and are broadly consistent with a north-central Cretan provenance, although inconsistent with an origin within the local area (<5km) of Knossos (see Section 7.6 Group 1). Indirect support for such interpretations of provenance is provided by a consideration of the form and finish of the rarer fabrics. In general it is the rare or unique fabrics (i.e. Group 3, Fabrics 24-35), which exhibit the greatest differences in form and finish from those fabrics whose frequency and mineralogy would suggest were produced locally to Knossos (i.e. Fabrics 1a-i, 2a-e).

If correct this interpretation of fabric diversity at EN Knossos also has a number of serious wider implications:

(1) It suggests the possibility that previous studies of early ceramic assemblages from sites around the Aegean may have seriously underestimated not just the nature, dynamics and complexity of ceramic production and consumption, but also the importance of ceramics as exchange items and even the extent of exchange itself (cf. Chapter 2).

(2) It implies that intensive/extensive surveys have consistently failed to detect early (Aceramic - EN) settlement on Crete, as well as possibly in other parts of the southern Aegean[3]. It would appear that Neolithic settlements are often discovered either where the Neolithic land surface is close to the modern (e.g. caves) or where earlier surfaces are accidentally discovered during excavation below or near later remains, such as Knossos, Katsambas, Pelekita, Nerokourou, Phaistos (see Appendix I).

(3) These results also suggest the possibility that fabrics, which have been identified as consistently occurring in very low quantities at other Neolithic sites in the Aegean, may, contrary to previous interpretations, have provenances which are not local to the site in question: for example at EN

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[2] Discovery of production debris, however, need not mean that production took place as the place of discard: comparative ethnographic data suggest that waste from production in sedentary communities is usually collected and discarded away from work areas (Murray 1980).

[3] Recent discussion of the types and quantities of material, which surveys in the southern Aegean normally find, has led to the recognition that early prehistoric material is significantly

Franchthi a consistent pattern of fabric occurrence has been established with 'Lime Ware' and 'Sandy Ware' consistently frequent (c.80-90%) and 'Andesite Ware', 'Ungritted Ware', 'Serpentinite Ware' and 'White Ware' consistently rare (Vitelli 1989:19; 1993:208-9).

10.2.3 Clay Processing and Clay Mixing

The clarity with which individual fabrics can be distinguished is partly a function of the coarseness of the clays used. In most cases clays, once selected, seem not to have been subject to intensive processing designed to produce a very fine clay (e.g. levigation). Large non-plastic inclusions rarely exceed 3-4mm, which suggests that if any larger material existed it was either removed or broken down during crushing and grinding. The process of crushing and grinding up a clay may be compared to the almost identical domestic activity of crushing and grinding cereals: it is likely that the same tools and techniques for crushing and grinding were used in each case (see Sillar 1996:265-71; Runnels 1985:33). Mortars are found from the very earliest pottery-bearing stratum (stratum IX) (Evans 1964:144-6), although wooden vessels could also have been used[4].

A feature of many EN fabrics is the phenomenon of clay mixing (see Chapter 6, Fabrics 1a-i, 5a-b, 6, 8, 19)[5]. The presence of clay streaks and more often clay pellets of different composition may suggest the incomplete mixing of two clays. For example Fabric 5a consistently testifies to the mixing of quartz-rich red clay containing mica (biotite, muscovite) and metamorphic rock fragments with another perhaps quartz-poor clay (see Plates 11, 21-2). The composition of the red clay can clearly be seen in the large darker-coloured clay pellets which are a particular feature of this fabric. In other fabrics, such as Fabric 1a, two very similar clays appear to have been mixed, namely a fine calcareous clay containing very few inclusions and a fine calcareous clay rich in ostracods

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under-represented (see Bintliff et al. 1999). In this respect the early Neolithic landscape of southern Greece largely remains a 'hidden landscape'.

[4] cf. the use of the wooden *koitano* by present day potters in Greece (P. Day pers. comm.).

[5] Clay mixing was found to be a feature of EN (West Mediterranean) ceramics from the site of Balma Margineda in Andorra, where in a small sample (11 vessels) Barnett found that 2 in

and foraminifera. In sample 97/92 (Fabric 19), the incomplete mixing of a calcareous clay rich in foraminifera and a red clay rich in quartz can clearly be seen in the form of a large clay pellet.

10.2.4 Tempering

Large non-plastics, whether deliberately added as temper or naturally occurring in a clay, act to promote an even loss of water, to reduce the degree of shrinkage during air and heat-assisted (firing) drying and to increase clay workability (Rye 1976). They thus help to minimise the risk of failure in the clay body during ceramic production. In this way the deliberate addition of temper acts to make a clay more coarse and thus constitutes a deliberate manipulation of the natural properties of a clay.

Petrographic study of the non-plastics present in each EN fabric at Knossos strongly suggests that in the majority of cases crushed large non-plastics were added to the prepared clay or clay mix as temper. The crushing of temper may, like the crushing of clay, have been achieved using stone mortars. A number of fabrics, well-represented at Knossos, are tempered with different forms of limestone (fine-grained sparite, coarse-grained sparite, bioclastic, calcareous siltstone, euhedral calcite), occasionally some of these limestone tempered fabrics also received small quantities of grog (cf. Fabrics 1d, 2b, 2e) (see Plates 1-10). The existence of a number of limestone-tempered fabrics, which are likely to originate in and around Knossos, raises the possibility that there might have been a local limestone tempering tradition. It has been suggested that a limestone-tempering tradition may have existed in the vicinity of Franchthi (Vitelli 1993a:208; cf. Weinberg 1962:168). However, the degree to which such a 'tradition' around Knossos might more simply reflect those types of raw materials which were available in the local area, should caution against over-confidence (see Appendix III). Certainly limestone is only one of a wide variety of types of temper which have been identified in EN fabrics at Knossos: other fabrics are tempered with igneous rocks (e.g. granodiorite), metamorphic rocks (phyllite,

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local fabrics may testify to clay mixing (1991:27-32; cf. also Wijnen 1993:322 on clay preparation at EN (Greek) Sesklo).

schist) or grog (see Plates 11-18). In addition, and contrary to previous assessments (see Furness 1953:103), there are also fabrics which testify to the use of sand (Fabrics 16, 18) or organic temper (Fabric 15). The EN ceramic assemblage at Knossos therefore indicates the use of an extremely wide variety of tempers.

10.2.5 Raw Material Selection

The general continuity shown in the choice and processing of clays and tempers suggests that these practices answered well to the demands of ENI ceramic production. Certainly the general coarseness of the fabrics is likely to have facilitated the rapid forming of large vessels and to have helped a vessel to survive the stresses of fast firing (see Sections 10.3, 10.5; Rye 1981:31). Some studies of early ceramic production have claimed that early ceramics constituted a revolution in the processing of food and/or in container technology (e.g. Brown 1989; see Chapter 2). In this way ceramic containers are viewed as economically or functionally optimising. If optimisation was indeed a factor in the adoption of pottery then one might expect to see it influence the selection of particular raw materials for particular categories of vessel intended for a particular function. However, in the few examples where study of use-alteration suggests that a certain type of vessel may have been used for cooking or heating (cf. Fabrics 1d, 1i, 4, 8; see Section 13.3.1), this function generally seems not to have influenced choice or processing of raw materials. Rather in all cases there are other vessel types in the same fabrics which show no signs of heating and would have been put to a variety of uses (see Section 13.3.1).

The only possible exception to this rule is provided by the restricted range of vessels produced in an organic-tempered fabric (Fabric 15) (see Plates 16, 45). Although these vessels are very fragmentary with usually only the rims surviving, it would appear that they correspond to large, coarsely finished, open shapes. Some sherds in this fabric have traces of burning on their interiors suggesting the possibility that these vessels were used for some form of cooking activity involving indirect heating (see Section 13.3.1); this would also help to explain their very fragmentary nature. Examples of the use of organic-tempered fabrics for cooking pots can be found in both the ethnographic and archaeological literature (see Sassaman 1995:225). In terms of performance characteristics, organic-tempered vessels weigh less than equivalent rock-tempered vessels, require less time and care to make and, although both types can withstand the same amount of repeated heating, organic-tempered vessels will abrade more rapidly and when heated externally will transfer heat more slowly to the vessel contents (see Skibo et al. 1989:122-46). Organic-tempered vessels are therefore not good conductors of heat and are therefore not appropriate for direct methods of heating. However, it has been argued that organic-tempered vessels could have acted as good insulators of heat and would thus have been more suited to indirect methods of heating, such as 'stone boiling' (Reid 1989:174). In addition the use of organic temper produces a high number of voids which increase toughness (Kilikoglou et al. 1998). In this way the EN use of organic temper may have facilitated the construction of these very large vessels, increased their manoeuvrability through gains in the ratio of size to weight as well as increased their effectiveness as insulators for indirect heat cooking, a use which is suggested by the confinement of traces of burning to their interiors. In this way the choice of organic material as temper for vessels produced in Fabric 15 may have had some relationship to the function of these vessels, whether storage or cooking.

In all other cases, however, macroscopic and microscopic study of the relationship between fabric, form and finish (see Chapter 7) indicates that a comparatively similar range of shapes (open and closed) and forms of decoration (burnished, polished, incised etc.) can be found in each fabric. A similar conclusion was reached in Yiouni's study of MN (Greek) ceramics from Makri (Yiouni 1995; see Chapter 2):

> "preliminary research on the correlation between the shapes of the Makri vessels and their fabrics, was negative. All fabric types were used for the manufacture of various shapes" (1995:619).

Likewise for the MN (Greek) Peloponnese, Phelps has noted that every type of vessel - "even the large storage jars" - were constructed using basically the same 'fine Urfirnis fabric' (Phelps 1975:124). Outside the Aegean, a similar situation obtains at the Early Neolithic (West Mediterranean) site of Balma Margineda in Andorra, where Barnett notes that "both highly decorated and undecorated vessels of various forms and wall thicknesses" were produced in each fabric (Barnett 1991:32). And so in all of these examples of earlier Neolithic ceramic production, including also now the data from Knossos, there is almost no clear correlation between fabric, form or function. In other words, although these different vessel categories were used in a variety of ways (storage, cooking, serving, transportation; see Section 13.3), which necessitated different performance requirements and subjected vessels to a variety of different stresses, no differences in paste preparation can be identified for different shapes. This situation stands in sharp contrast to that observed for later Bronze Age ceramic production in the prehistoric Aegean (Kilikoglou, Vekinis, Maniatis & Day 1998:274): for example study of ceramic production in and around Knossos during the LN and EBA periods suggests that different vessel forms and finishes correspond to different paste recipes (Wilson & Day 2000:57). In this way study of EN fabrics suggests a much simpler picture of paste production and reveals little evidence to suggest that EN raw material selection and paste preparation was *preoccupied* with either structural mechanics or functional optimisation[6]. This in turn suggests that raw-material selection was governed by an altogether different set of constraints.

It has been argued above that for some fabrics the selection of raw materials can be *demonstrated* to have taken place at distant locations outside Knossos. This interpretation relies on the likelihood that EN potters were as influenced by factors of time and distance as potters of the ethnographic present or near-present (Arnold 1985). It is inevitable, therefore, in view of this reliance on the principle of local procurement, that proximity to production location

[6] Similar conclusions have been independently reached in ethnographic studies by Day (1991; forthcoming) on East Cretan potters and Livingstone Smith on Faro potters in northern Cameroon (Livingstone Smith 2000:36-8): clay processing techniques could not be explained in terms of adaptation to performance-related and/or environmental constraints, rather it would seem that choice of clay preparation techniques was more a question of habit and specifically where a potter first learnt to process clay.

emerges as a significant factor behind raw material selection. The degree of circularity inherent in this argument is acknowledged, however additional support for a local procurement of raw materials is suggested by the frequency with which different fabrics occur at Knossos and how that correlates with geological source (see Section 10.2.2): the most frequently occurring fabrics (Fabrics 1a-i, 2a-e) are compatible with a local provenance, while those fabrics, whose raw material sources must lie at some distance, such as Fabric 12 (Mirabello Bay) or Fabric 35 (off-island), are extremely rare.

A notable feature of a number of fabrics represented at Knossos is the presence of tempers that may bear some relationship to the non-local raw materials used to manufacture other artefacts, such as ground stone axes[7]. A similar relationship was noted at Franchthi between 'Andesite Ware' and the presence of millstones made from Aeginetan andesite and it was proposed that the millstones were selected as a temper source by local Franchthi potters (Vitelli 1993a:208; see below). Such an explanation, cannot, however hold for Knossos, since in many cases study of the clays, which comprise phyllite-tempered fabrics, indicates that they are also contain phyllite fragments and thus cannot be immediately local (<5km) to Knossos. Thus, despite the potential availability of phyllite and other rock types at Knossos in the form of finished artefacts, there is no evidence to suggest that local potters ever made use of such objects as sources for temper.

The work of Arnold and other ceramic ecologists has stressed the prime importance of the availability of *suitable* clay, temper and fuel sources, along with other environmental factors such as climate (e.g. Arnold 1985:20-98). These factors have at times been viewed as acting as constraints on the ceramic production. However, as the diversity of approaches to paste preparation identified at EN Knossos suggests, the Cretan environment presented a variety of options for raw material selection that varied in accordance with landscape

[7] For example, during ENI most stone axes at Knossos were made from either 'serpentine, greenstone or chlorite' (cf. Fabrics 10, 6 and 13 respectively), while phyllite of various types regularly occurs during the EN sequence, both as rock fragments and as large rounded worked lids or platforms (Warren 1968:239-40; Evans 1968:270).

location. The different fabrics represented at Knossos testify to the use of a wide range of rock tempers as well as grog and organics. All proved adequate to the task of making pottery, with many fabrics showing a consistent selection of the same or very similar raw materials for the entire duration of ENIa-b (up to c1000 years). ENI-II pastes are almost always[8] very coarse with large non-plastics, a general feature which suited the methods of forming and firing used. This sort of paste technology places few demands on the supposed suitability of local clays and tempers and in turn suggest that distribution of clay sources was not a constraint on production. In this way the requirements of EN potters seem to have been straightforward and fairly easily accommodated by whatever was available locally. Thus, when sites were first established or sources first selected, it is most unlikely that proximity to suitable clay sources was ever a factor in site choice; rather, *vice versa*, the exploitation of a particular raw material sources depended largely on their proximity to settlement.

Simple ceramic ecology therefore constitutes only the background to the question of raw material selection. Rather the evidence suggests that potters producing in a particular fabric consistently selected similar raw materials to those used by their predecessors. In this way the knowledge and techniques of clay-preparation, temper selection and paste production, once established may have become *doxa*, i.e. knowledge or values which are beyond dispute (see Chapter 2)[9]. Such knowledge may have been passed on from generation to generation, with powerful constraints mediating against change. As a result the original ideas and motivation which lay behind the first selection of clay and raw materials may have become less important to subsequent producers as time went on, while the maintenance of knowledge and values which linked them with the past may have grown in importance[10]. Indeed in view of the suggested connection between different fabrics and different ceramic-producing

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[8] Exceptions to this are Fabrics 1b, 1e, 1f and 2c, which appear during ENIc-II.

[9] In her experimental work Vitelli has also noted that familiarity with the performance characteristics of a clay might also act to mediate against the adoption of new clay sources (Vitelli 1984:114-5). This may even encourage potters to frequently use materials which they know to be unsuitable (Day, forthcoming).

communities, it is worth considering the possibility that knowledge of raw material sources and paste preparation was maintained over generations, not passively as a simple reflection of 'tradition' (i.e. that is how things are done), but rather were actively maintained because an association with particular sources and perhaps particular locations in the landscape had become bound up with notions of individual and group identity (i.e. that is how we as a group of producers do things). For example such a situation would more easily explain the practice noted in Fabric 1d of occasionally adding small quantities of grog to an already tempered paste: the small amounts of grog perform no mechanical function, since the fabric is already tempered. Such a practice thus makes little sense in terms of functional optimisation and must therefore have had some other significance. In this way against a backdrop of raw material availability, the maintenance of traditional forms of knowledge and values as well as possibly group identity emerge as potentially the most significant factors in the selection of raw materials.

10.2.6 ENIc/ENII Technological Changes in Paste Preparation

During ENIc/ENII (strata V-IV), the majority of fabrics appear to continue without apparent change. This period, however, sees the gradual disappearance of coarser limestone tempered fabrics (Fabrics 1a, 1d) and the simultaneous appearance of finer crushed limestone fabric (Fabrics 1b, 1e, 1f, 2c) (see Plates 1-10). A close mineralogical relationship both in groundmass and non-plastics can be observed between these new finer fabrics and the previous coarser ones: thus Fabric 1b relates most closely to Fabric 1a, while Fabrics 1e and 1f relate to Fabric 1d and Fabric 2c relates to Fabric 2a. By ENII these finer fabrics dominate the ceramic assemblage and it is probably these which Furness had in mind when she noted that during ENII 'large white grits' were less often visible in the break (1953:117). These changes in fabric texture and packing cannot be identified in other fabrics and would seem to be a feature peculiar to Fabrics 1a-i,

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[10] cf. also similar conclusions to be found in ethnographic work by Day (1991; forthcoming) and Livingstone Smith (2000:23-31).

2a-e. The occurrence of essentially the same paste change in these fabrics constitutes yet another link between these groups.

10.3 Forming Methods

Unfortunately the fragmentary nature of EN ceramic material and the rarity with which some fabrics occur restricts detailed comparison of forming methods to the more frequently represented fabrics (i.e. Fabrics 1a, 1b, 1d, 1e, 1f, 1i, 2a, 2b, 5a, 6, 7, 8). A notable exception to this are the rare and clearly coil-built vessels in Fabric 24, whose coil joins are often not fully smoothed over on their interior surfaces. This technique is not found on vessels in other fabrics. For more frequently represented fabrics study of the location and orientation of primary and secondary fractures, particularly horizontal fractures, combined with petrographic examination, can be used to provide an identification of the forming methods used (see Chapter 5).

10.3.1 Coil-Building vs. 'Sequential Slab Construction'

A frequent feature of EN ceramics, particularly for larger vessels, is the occurrence of horizontal fractures. These usually occur at regular intervals down the profile of the vessel (cf. Plate 46-7). It is striking that if a vessel is carinated, horizontal fractures tend to occur at the point of carination. These fractures would seem to indicate the location of structurally weaker areas, which most likely result from the joining of two clay sections. In addition the occurrence of these horizontal fractures at regular intervals down the vessel profile suggests that such vessels were built up in stages.

When described in such terms this sequence of forming could recall that identified by Vandiver for early organic-tempered pottery from the Near East, which she termed "sequential slab construction" (Vandiver 1987; cf. 'ring-forming' in Rye 1981:67). This technique involved the "building of vessels by stacking slabs on top of one another" (Vandiver 1987:18). Sequential slab construction has subsequently been suggested as the principle forming technique used for early pottery throughout Anatolia (Moore 1995:46). A similar technique, where pots were also built up in sections or slabs, has also been identified for EN (Greek) pottery from Sesklo (Wijnen 1993:322). However, such identifications are not without their problems. For example although 'sequential slab' has been thought to characterise all ceramic production in Neolithic Anatolia (Moore), more detailed studies of ceramics from particular regions, such as the Elmali Plain (south-west Anatolia) or Ilipinar (north-west Anatolia) have instead argued that vessels were coil-built, often on pinch-pot bases (Eslick 1992:81ff.; Thissen 1993:297). Likewise in Greece, although Wijnen identifies 'sequential slab' at EN (Greek) Sesklo, coiling and pinching has been identified for EN Nea Nikomedeia and EN Franchthi (Yiouni 1996a:60-1; Vitelli 1993a). Moore has even suggested that identifications of coiling may be incorrect and that 'sequential slab construction' was much more widespread (Moore 1995:46-7).

And so, while it remains possible that different forming methods were practised at different sites, the existence of disagreements between studies of otherwise similar material assemblages (e.g. Moore and Eslick for Anatolia, Wijnen and Yiouni for northern Greece) indicates that there may also be issues of identification and interpretation to be addressed. Here the EN ceramic material from Knossos proves illustrative. As outlined above, preliminary observations of horizontal fracture lines suggest that vessels were built up in an irregular series of stages, as one might expect with 'sequential slab'. In the majority of cases little else can be added to this characterisation. However, macroscopic study allowed the identification of some sherds which preserve more information: for example a frequent feature of vessels with offset rims is the detachment of the offset rim from the body, which seems to indicate that the offset rim it was added as a coil ; in some horizontal fractures on body sherds it is clear that the join was originally between two curved elements, which had then been smoothed over; while on very rare occasions poorly-jointed coils are visible in the sherd break, indicating variously a coil-built base or a coil-built body (see Plates 47-8). Support for these observations is provided by a number of examples of coil-joins identified petrographically in thin-section (see Plates 23-5). In this way, one can argue that although EN ceramic vessels might appear to have been constructed in stages, detailed macroscopic and microscopic examination suggests that wherever there is sufficient information to determine the forming method used, this is always consistent with the use of some sort of coiling technique. The only possible exceptions to this are the decorated 'trays' of ENI, which seem to be formed from a single pinched-out piece of clay, and the 'house-models' produced during ENIc and ENII, which may have been slab-built. This study therefore suggests that identifications of 'sequential slab' should rely not just on the observation of the construction of vessels in stages or sections, but should also actively demonstrate the *absence* of coil joins. Here it is worth contrasting the methodological rigour of Vandiver's original study (1987) (xeroradiography, microscopy and experimental replication) with later identifications of 'sequential slab construction', which rely solely on macroscopic observations (e.g. Wijnen 1993; Moore 1995).

Identification of coil-building, however, does not on its own account for the regular stages at which horizontal fracture lines occur along a vessel profile. Although such fractures may now be understood as indicating the location of the weakest coil joins, this does not explain why some coil joins should be weaker than others nor why these weaker joins should occur at regular intervals along a vessel profile. The most plausible explanation for this is that vessels were coil-built in stages: i.e. once several layers of coils had been joined, these were left to harden slightly so as to be better able to take the weight of the next series of coils without being distorted. Experimental attempts to replicate this method of construction of large diameter vessels[11] confirmed that once 3-5 layers of coils had been added such vessels began to sag noticeably: study of fracture lines and sherd breaks confirms this number of coils as an approximate optimum[12].. It remains unclear whether each layer was added as a single coil or whether a much

[11] The existence of horizontal fractures is noticeably more common in larger vessels than in smaller ones. This may be because smaller vessels are much less likely to suffer from the problem of sagging and may have been built up more quickly.
[12] The tendency for large vessels to sag was also a problem for potters on the Greek mainland: Vitelli notes that in order to prevent sagging, some large 'coarse urf' vessels at EN Franchthi were formed in two halves which were later joined (Vitelli 1993a:183-4).

longer coil was used which was then wound round several times (cf. Blandino 1984:46).

Experimental work also suggested that the amount of time allowed between different stages of coil-building could vary only within certain limits: too soon and the vessel would sag, too long and the join between new plastic clay and old leather-hard clay would be extremely weak with the added danger of cracking between the two sections due to different degrees of shrinkage. These observations serve to emphasise how coil-building is 'essentially rhythmical', involving a feel for both time and material (Blandino 1984: 49, 63): it is crucial that the potter knows the feel of the clay so as to know when to stop to allow the work to harden (Blandino 1984:54).

During experimentation with coil building it was noticed that while a coil was being created, either by rolling or pinching in the hand, it tended to pick up any additional material with which it might come into contact. This tendency might help explain the regular presence of small amounts of organic material in most fabrics; such organic material may have become accidentally incorporated into the coil as it was being rolled. If so this might suggest that pottery production took place in a location where loose organic material was also present.

10.3.2 Bases

Macroscopic study of fracture lines and sherd breaks in and around bases suggests the existence of two main forming methods, which seem to correlate with the two most frequent types of base. Rounded bases were created using coils coiled round in a spiral (see Plate 47); in this way large round-based vessels were created entirely by coil-building. Parallels may be drawn between this method of construction and basketry techniques, where a coil of reeds is twisted together and then a vessel is built from this coil by tying each coil on to the next (see Section 13.4.1). Rounded bases are never well preserved or easy to identify since they usually fracture close to the base of the vessel and look similar to body sherds. In contrast flat-bases are more distinctive, usually fracture at a higher point above the base and, moreover, show no evidence for coil-building. The characteristic higher fracture for flat-bases and the absence of coil joins suggest that flat-based vessels began life as pinch-pots, which were subsequently built up with coils[13].

Attempts to replicate this method of forming strongly suggest that the construction of flat-based vessels, particularly large ones, was considerably helped by the use of a portable flat surface (see Plates 49-50), which helped keep the base flat and allowed the part-finished vessel to be easily moved around without putting stresses on the unfired vessel (see similar comments by Vitelli 1984:119). In the experiments a round flat wooden board was used, but other materials would equally suffice and it is tempting to connect this activity with the stone 'pot lids', which first appear in stratum VII (Evans 1964:231). Comparison of the diameters of these 'lids' with vessel rim and base diameters suggests that the majority of these could not have served as the lids for ceramic vessels, but could well have been stands of some sort.

10.3.3 Handles

Macroscopic study suggests that during ENIa-b strap handles are added flat against the wall of a vessel. Little attempt seems to have been made to 'key' either the surface of the vessel or the area of the handle to be attached prior to the application of the handle. A similarly weak attachment method was also used for wishbone handles. These handles consistently fracture in half at the tip of the handle as well as at each of the two joints with the vessel rim, which suggests that they were formed from two short coils of clay, joined at the tip of the handle that were then added to the rims of vessels together with the final rim coil.

10.3.4 Secondary Forming Techniques?

Large thick-walled vessels, once formed and roughly smoothed, are usually burnished and although this burnish is usually of high quality, the surface

[13] Thick-walled flat-bases are rare in EN (see Chapter 9) and suggest that most large thick-walled vessels were probably formed with coil-built bases, although the rare occurrence of some thick-walled flat-bases suggests that this need not always be the case.

which is created usually remains uneven. In contrast, thinner walled vessels with polished surfaces usually have extremely smooth surfaces; indeed this distinction between coarse burnished and smooth polished effectively facilitates the clear macroscopic separation of these two types of finish. It would appear, therefore that polished vessels were subject to a secondary forming technique, which served to create a very smooth surface prior to polishing. In general such secondary forming or finishing techniques are crucial to the final quality of the polished surface and experimental work suggests that they may required much more time than the actual initial construction of the vessel (Vitelli 1984:121). These secondary forming techniques probably to a large extent comprised techniques of smoothing, scraping and carving[14], which served to create a very smooth vessel surface (cf. Vitelli 1984:120-1; Blandino 1984:57-9). Such a technique would have allowed vessels to be created which, although large in diameter, could have walls as thin as 5mm.

In one or two cases, however, petrographic examination has resulted in the identification of thin clay layers (0.2mm to 0.9mm) on the exterior surface of polished vessels (i.e. Fabrics 1b, 2a, 28). Such layers may result from the process of smoothing the vessel or alternatively my have been created through the application of a thin layer of clay to the vessel. In most cases the clay used appears to be compatible with the composition of the rest of the body, although sometimes with fewer large non-plastics. This added clay may have been more plastic than would be used for normal construction in order to facilitate the creation of a very smooth surface.

10.3.5 ENIc/ENII Technological Changes in Forming Methods

During ENIc/ENII a new method of coil joining can be identified in some fabrics (i.e. Fabrics 1b, 1d, 1e, 1f, 2a, 2b, 5a), while other fabrics show no change. In the new method each coil, once applied is then pinched up around the diameter of the vessel, prior to receiving the next coil (see Plates 49, 51). Experiments with coil joins showed that this considerably improves the success

[14] Techniques, such as carving, smoothing and polishing may be paralleled in the manufacture

and overall strength of the join. From ENIc this method of coil-joining becomes standard amongst those fabrics which are consistently the most frequently represented at Knossos (i.e. Fabrics 1b, 1d, 1e, 2a, 2b, 5a). A similar type of coil join can be seen on a coil-built base from MN Sesklo (Papathanassopoulos 1996:245 no.75).

ENIc-II also sees the introduction of a new method of strap-handle attachment (e.g. Fabric 1b): some strap handles are now formed with a plug at their point of attachment to the vessel body and this plug is then located in a specially-created socket on the vessel (see Plate 51). It is striking that in both method and chronology the appearance of the technique of plug-attachment at Knossos closely parallels similar developments in handle attachment in the Elmali Plain in south-west Anatolia (see Eslick 1992:78, 81). During LN-MC (Anatolia) vessels are coil-built with handles applied flat against the wall of the vessel (Eslick 1992:81). Eslick notes that plug-attachment first appears during the course of MC and becomes common during LC (1992:78; cf. Duru 1996:142-4). Anatolian MC/LC dates approximately to the end of the sixth and the first half of the fifth millennia BC making it broadly contemporary with Cretan ENIc/ENII (see Appendices I, IV). This parallel between Knossos and south-west Anatolia is made all the more striking because the development of plug-attachment in south-west Anatolia is closely associated with the appearance of a new handle form - the strap handle - which previously had been almost entirely confined to Crete (see Appendix I). These developments may therefore be a sign of some sort of connection between Crete and this region.

10.3.6 Knowledge, Skill and Learning

The forming methods, which characterise EN ceramic production, comprise a simple but very effective set of techniques, which could be used to create a variety of basic shapes. This effectiveness was most obvious during experimental attempts at pot construction using these techniques. Previous attempts at forming, owing perhaps to my general lack of practical experience in

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of wooden containers (see Chapter 13).

potting, had not led to any significant successes, however as soon as I began my own replication experiments, which sought to put into practice the main sequence of forming techniques identified for EN Knossos, I was immediately successful in producing some of the larger and more complex EN forms (e.g. large diameter thin-walled high carinated bowls with offset rim; see Plates 49-50). This success can, I think, be put down to having a clear idea of firstly which ceramic form I was constructing and secondly which sequence of techniques I should use.

These experiences have encouraged me to view EN forming methods as comprising a highly effective and practical set of techniques. It was suggested in Chapter 7 that most variation in form could be achieved through the manipulation of a restricted group of dimensions of variability (rim, base, handle, location of curve/carination, size). For example most bowl types are simple variations on the curved open bowl and such distinctions are easily created during coil forming through variations in the angle and orientation of coils added. In addition the distinction between bowl types with or without an offset rim is easily achieved through the addition of an offset rim using the final coil. And so, although openness and accessibility to technology, may be as much in the perception of 'ease' as in the practical ease with which a technology is learnt, one might nevertheless conclude that the basic EN forming technology had at least the potential to be easily and relatively quickly learnt through observation of and participation in vessel forming. In this respect it does not resemble the sort of technology of exclusion, where the knowledge and skills required for pottery production are deliberately complex so as to enforce and protect a distinction between potter and non-potter. Open access to knowledge and techniques is also implied by the close similarities in forming techniques (and forms) exhibited between fabrics, which are most likely to have been produced at Knossos (e.g. Fabrics 1a-i, 2a-e) and fabrics which were produced at some considerable distance (e.g. Fabric 12, Mirabello Bay, c.70km).

10.4 Finishing Methods

EN vessels, once formed, could be subjected to a variety of finishing methods (see Chapter 7). However, in most fabrics during ENIa-b vessels may be separated into two categories of surface finish, namely burnish and polish. Within these two basic coarse/fine categories of finish vessels could be subject to additional forms of decoration such as incised or plastic decoration. Burnishing and polishing are time-consuming activities, comprising probably the longest single stage during ceramic production (Vitelli 1995:59). Even the most coarsely burnished vessel probably required a long period of effort, with the finely smoothed and polished vessels, found in almost every fabric represented at Knossos, requiring even greater amounts of time.

10.4.1 Burnished Vessels

This finish is most often reserved for large thick-walled vessels. These were usually roughly smoothed during construction and then burnished using a smooth hard material, such as a rounded pebble, bone or shell (see Plate 52), producing a dull slightly uneven burnished surface. Microscopic study (petrographic, SEM) of surface structure suggests that burnishing often resulted in a highly compacted surface. Interiors and exteriors could be finished in this way, but usually more care was taken with the exterior. In some fabrics, the exterior or interior might be scribble burnished (e.g. Fabrics 2b, 6, 8) or scraped (e.g. Fabrics 19, 35) (see Plate 53). The colour of these burnished surfaces varies from buff or red to dark brown or grey, depending on firing atmosphere and/or the degree to which fabrics are calcareous. Frequently colour may vary across a single surface.

Burnished vessels in Fabric 4 are particularly worthy of mention because microscopic analysis of their surfaces (petrographic, SEM) reveals that they have been covered with a calcareous slip prior to burnishing (see Chapters 6, 8; see Plate 54). This practice later (ENIc-II) also becomes a feature of Fabrics 1d and 1e. Compositional analysis of Fabric 4 indicates that this fabric is low to non-calcareous (see Chapter 8). In this way the addition of a calcareous slip to a non-calcareous body seems to have been a deliberate attempt to create a light-coloured surface. Certainly, without such a treatment burnished vessels in Fabric 4 would have tended to fire to a red or dark brown. The shape of these vessels is difficult to determine exactly owing to their fragmentary nature, however surviving diagnostic fragments suggest that these vessels were hole-mouth (straight-sided) jars with coil-built bases and strap handles (see Appendix VI). The reasons for the special surface treatment are far from clear. However it must be noted these vessels almost always show signs of burning on their *interior* along with traces of burnt residues, which suggest a possible use as indirect-heat cooking pots (see Section 13.3.1). As the deliberate use of slip would suggest, colour seems to have formed a particularly important part of this type vessel: there are fragments of vessels in other fabrics, which exhibit similar traces of burning on their interior, and which are also grey burnished with coil-built rounded bases and strap handles (cf. Fabrics 6, 8, 12, 21).

10.4.2 Polished Vessels

This type of finish is most often found on smaller thinner-walled vessels, however occasionally large thick-walled vessels were also given this type of finish. As described above, such vessels appear to have been treated to a secondary forming stage, which involved careful preparation (smoothing) of the vessel surface prior to polishing. This smoothing stage probably involved scraping, carving and perhaps on rare occasions the addition of a thin layer of clay to the vessel surface. Indeed the very smoothness of the polish depends to a large extent on how well-formed and smoothed such vessels were prior to polishing. Macroscopic examination of surfaces under a hand lens (x10) identified very fine striations in the surfaces of some polished vessels, suggesting that polishing was achieved using a fine soft material, such as leather (cf. Vitelli 1984:122).

In her study of EN fine ware from Knossos Furness contends that "none of the sherds is slipped, although in some cases the effect of burnishing was to cover the vessel with a hard coating of a different colour, which sometimes flakes off and has the appearance of a slip" (1953:110). However, microscopic study (petrographic, SEM) has indicated that many vessels were slipped[15]. (see Plates 27, 39) Aside from vessels in Fabric 4, which are slipped and burnished, the use of slips is almost always confined to the production of polished vessels. In some fabrics high quality slips are used which comprise a fine *non-calcareous*, illite-rich surface layer have been applied over a *calcareous* body., while in others the surface comprises a slip probably made from the same clay as the body. A particularly unusual surface treatment is found in Fabric 28, where the surface is coated not with a non-calcareous slip, but with a clay of different composition.

In a number of cases the use of slips seems to represent a deliberate attempt to manipulate vessel colour. This is particularly striking in polished vessels in Fabrics 1a-i and 19, where a non-calcareous slip is applied over a highly calcareous body in order to ensure a dark polished surface with the final colour varying from red to black according to firing atmosphere (see Plate 31). Without this slip these vessels would fire buff to grey. Sometimes fine brushmarks are visible on the surface of vessels in Fabrics 1b, 1d and 1e (see below on Painting/Brushing). Other polished vessels in these fabrics which have light surfaces provide evidence for the use also of calcareous slip. In these fabrics the use of slips seems to be largely confined to polished vessels.

However, polished vessels need not always involve the use of slips: for example polished vessels in Fabrics 5a and 12, consistently exhibit a high quality finish (see Plates 32, 34) but show no evidence (macroscopic, petrographic, SEM) for the use of slips and it would seem that their smooth polished surfaces were created simply through careful surface preparation and polishing. In others fabrics, such as Fabric 8, slips (illitic) may be used on the surface of burnished and polished vessels alike (see Plate 39). In this way, although the general range of surface finishes appears small, with most vessels being burnished or polished, macroscopic and microscopic examination of surfaces reveals that these finishes were achieved in a variety of ways.

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[15] The use of slips is also attested on the earliest pottery from northern (Wijnen 1993) and southern

A variety of tools were probably used for burnishing and polishing, such as shells (Evans 1964:231; Shackleton 1968:264), pebbles (Evans 1964:231, 1968:271), wood, bone, leather and even sherds: re-examination of pottery disks first identified by Evans (stratum VII-IV; Evans 1964:235), along with the discovery of previously unidentified examples in contexts from strata V-IV indicates that a large number of the unpierced examples are worn in a way consistent with their use as burnishers. Both shells and pebbles seem to have been collected ready-worn, probably from a beach environment (Reese 1987:207). Worn shells and pebbles both appear from stratum VI (Evans 1964:231). Generally, there appears to have been a marked preference for dark blue polished pebbles (limestone?), particularly during ENIc/ENII (see Plate 52).

10.4.3 Plastic Decoration

This involves the application of plastic cordons or pellets of clay to the vessel body. In the case of barbotine decoration a clay layer was applied to an area of the vessel surface, out of which the decoration could be modelled (e.g. Fabrics 1d, 1e, 5a). The most common forms of ENI plastic decoration are the U-shaped cordon or rounded pellets applied either in a row on or below the rim or singly on the body of vessels; both of these types are frequently found on large diameter deep burnished bowls or jars (e.g. Fabrics 1a, 1d,1e, 2a/b, 5a-8, 15, 18). More unusual and sometimes unique forms of plastic decoration are found in Fabrics 5a, 10, 11, 23, 24, 26, 28, 30 and 34.

10.4.4 Scribble Burnish

This technique is basically a less complete form of burnishing, where the interior or exterior surface of a vessel is rubbed with a hard object, such as a pebble, leaving a scribble or criss-cross design (cf. Plate 53). During ENI this method was used most often on large vessels (bowls and jars), especially on the interior (cf. Fabrics 1d, 2a/b, 6, 8). During ENIc/ENII it becomes more common as a

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Greece (Phelps 1975:74, 126).

finish on large vessels in Fabrics 1e, 2a/b, 6, 8 and 12 as well as more rarely on finer vessels in Fabrics 1b and 1e.

10.4.5 Incised/Pointillé Decoration

This technique, usually confined to polished vessels, involves incision (pre-firing) of the vessel surface, normally in conjunction with very careful dotting or pointillé (e.g. Fabrics 1d, 2a/b, 2e, 5a, 6, 8, 11). Often a white paste is present in the incised design. However, as has also been noted in connection with the similarly decorated EN figurines from Knossos, it is not always clear whether this white-filling is always intentional, since it may equally have been produced through burial in the 'kouskouras' layers which are such a feature of the Knossos Neolithic deposit (Ucko 1968:310). Unfortunately, although analysis was conducted by Dr André Rosenfield at the Institute of Archaeology (London) both on the white-filled incision of a broken sherd and on the white 'kouskouras' material on the surface of another sherd, the results proved inconclusive (Ucko 1968:310 n.1): the white incrustation in the incision was found to be indistinguishable from the white matter on the surface of the pottery. Nevertheless, the rare occasions, in which red ochre filling is used, demonstrate that filling was added to accentuate this form of decoration and it therefore remains likely that at least some of the white infilling is deliberate.

A variety of designs were employed during EN, although most frequently in ENI this took the form of incised triangles or linear shapes filled with dots (e.g. Fabrics 2a/b, 5a, 6, 11) or incised 'ladder' or 'lattice' patterns (e.g. Fabrics 2a/b, 5a). In ENII incised geometric patterns, such as chevron, lattice, ladder, slashed line, branch predominate (e.g. Fabrics 1d, 1e, 1f, 2a/b, 5a). More unusual or even unique forms of incised decoration (without pointillé) are found in Fabrics 27, 28 and 34[16].

Incised/pointillé decoration is restricted to relatively few forms. The majority of examples in Fabrics 2a/b and 5a (c.90% of incised decoration in ENI) are confined to flat-based mugs or dishes. Although undecorated examples of

[16] For detail of designs and their relationship to fabric see Appendix VII.

these forms exist, they are very much in the minority. It would seem therefore that there exists a close relationship here between form and finish, which hints at a special significance for this type of vessel (see Section 13.3.4). A similar situation seems to have also existed for the rare incised/pointillé 'trays' in Fabrics 2a/b and 6. Within other, less well-represented fabrics this form of decoration is similarly confined to unusual forms: for example, in Fabric 6 this is found on an unusual type of bowl, while in Fabric 11 it appears on pedestalled bowls/stands (see Appendix VII).

In addition to ceramic vessels, this type of decoration also occurs on 'shuttles'[17], figurines and a fragment of an unidentifiable clay model. In addition an unusual mace in a "uniform dark stone, much less heavy than that of other examples" has pointillé-type decoration (Evans 1964:231, fig. 52.13, pl. 55.4 no.6). With the exception of the mace, all these examples are ceramic. Where possible[18], the fabric of each of these was examined and the majority of instances in ENIa-b proved to be in Fabrics 1a, 1d and 2a/b, while during ENIc-II all examples were in Fabrics 1e and 1f.

While the meanings which lay behind this type of decoration are lost, significant patterning in its application does occur, which will be explored further in Section 13.3.4. Here, it suffices to say that incised/pointillé decoration on a number of figurines seem to represent actual forms of body decoration, such as tattooing. By this token, incised/pointillé decoration may be viewed in terms of the tattooing of a ceramic vessel. Certainly the technique of very careful regular application of incised lines and dots seen, for example, on flat-based vessels in Fabrics 2a/b and 5a would be consistent with actual tattooing. Furthermore, microscopic examination of incision/pointillé on vessels in Fabrics 2a/b and 5a suggests that they were incised using a fine pointed tool. The tip of this tool

[17] NB Evans regards the only 'shuttle' fragment from an ENI level (stratum V) as being of dubious context (Evans 1964:233). However, in view of the close associations between ENIc (stratum V) and ENII (stratum IV), there seems little reason to disassociate this shuttle fragment from stratum V.

[18] Unfortunately, study access was not granted to the 35 figurines excavated by J.D. Evans between 1957-60, currently stored in the Herakleion Museum. Thus all technological comments regarding figurines are restricted to those examples, excavated between 1969-70, stored in the Stratigraphical Museum, Knossos.

appears to be rounded, possibly through use, and was c.0.2-0.3mm in diameter. This would be consistent with a bone or wooden pin. Suitable bone pins occur in 'considerable numbers' throughout the Knossos sequence (Evans 1964:1964:236; plate 60.1, plate 61). It is perhaps worth noting that Hood drew a similar conclusion regarding the possible use of bone tools to produce the incised/pointillé decoration from Emporio (Hood 1981).

10.4.6 Grooved

This technique, closely related to incision, involves the use of a wide tool, which is sufficiently blunt to produce wide grooves rather than sharp incised lines. This form of decoration is confined to a single dark polished sherd in Fabric 14.

10.4.7 Punched

This technique involved the use of a narrow rectangular shaped tool to punch individual vertical or diagonal incisions, usually in a sequence running just below the rim or in one instance in combination to produce a V shape running around the carination of a large straight-sided hole-mouth jar. This very rare technique is confined to Fabrics 8 and 9 and is mostly restricted to ENIa, although a single example of punched decoration using a small V-shaped punch comes from ENII.

10.4.8 Wiped/Scored

With this technique the vessel surface was wiped or scored roughly with some sort of rough material leaving locally parallel striations. This technique is confined to Fabrics 1d, 2a/b, 5a and 8.

10.4.9 Combed

Here the surface of the vessel was scraped horizontally with some sort of fine-grooved tool, such as the surface of a shell, producing fine regular horizontal ridges. This very rare finish is only found on two sherds, both in Fabric 29.

10.4.10 Ripple Burnish

This involved the creation of a parallel series of wide vertical grooves, running around the rim or upper register of vessels, which had already been finely polished. The tool used was probably the same sort of rounded instrument, such as a beach pebble. Ripple burnishing begins in stratum VI (Fabrics 5a, 6, 8, 11) and is a relatively infrequent feature of ENIc and ENII (cf. Fabrics 1d, 1e, 1f, 5a, 6, 8, 10, 12).

10.4.11 Painted/Brushed Decoration

Painted vessels are extremely rare in the EN Knossos sequence and stratigraphically restricted to strata VII-IV (see Plate 55). Most examples occur in rare or unique fabrics (e.g. Fabrics 17, 25, 32, 34): a single example of bichrome (red and white painted on orange) comes from stratum VI (Fabric 32); a single example of dark-on-dark dribbled decoration is attested in stratum VI (Fabric 17); dark-on-dark diagonal lines decorate the rim of a vessel in Fabric 34 (stratum VII); dark-on-light painted crosshatching decorates the exterior of a heavily reduced vessel in Fabric 25. Finally a single dark-on-light painted sherd, in an unknown and unfortunately unsampled fabric comes from an ENII context.

In addition to these rare or unique examples, rare examples of red/dark brown-on-light painted sherds are also known in Fabrics 1d and 1e. These are mostly confined to stratum V, although isolated examples can be found in stratum VI and stratum IV. Although the material is fragmentary, designs appear to be simple and are usually confined to isolated brush-marks or dribbles of paint (98/98, Fabric 1d). In one example (97/121, Fabric 1e) the interior surface of a bowl has divided into dark and light zones, while the exterior has been lightly brushed with a dark paint to create a smeary dark and light brushed finish. Only on sample 98/79 (Fabric 1e) can a more complex dark-on-light dotted design be identified. A related and more frequent type of painted decoration is a brushed finish, similar to that described above for the exterior of sample 97/121, where a white or buff exterior is lightly brushed with a dark firing (red to black) paint.

This brushed finish seems to have been created using a fine brush, perhaps similar to that used to apply the calcareous and non-calcareous slips used on polished vessels in these fabrics (i.e. Fabrics 1d, 1e) (see Section 10.4.2). Further investigation of the nature of the paints or slips used, although important, was unfortunately beyond the limits of the current research programme. However it is likely that the dark paint/slip used for the examples of painting and brushing in Fabrics 1d and 1e was identical to that used to create the dark firing polished finish in Fabrics 1a-i (see Section 10.4.2).

10.4.12 ENIc/ENII Technological Changes in Finishing Methods

During ENIc-II most fabrics see no obvious change in methods of finishing. However in Fabrics 1a-i there is a significant increase in the range of finishing methods identifiable. During ENIa-b vessels were either burnished or polished with some also receiving incised or plastic decoration. ENIc-II sees the maintenance of these techniques of finishing alongside a new range of finishes not previously found in Fabrics 1a-i: red scribble-burnished, brushed, painted, ripple burnished, white slipped/burnished. In addition there is significant increase in the occurrence of incision and in the range of motifs rendered (see Chapter 7; Appendix VII; Washburn 1983). On the basis of Washburn's original study, Broodbank has argued that the "transition from ENI-II is marked by an almost complete discontinuity in designs, a major widening of the repertoire, and a commensurate increase in the number of 'symmetry structures' determining how designs are multiplied to generate patterning on the vessel" (Broodbank 1992:55; Washburn 1983:146 fig.9.5). Whitelaw has noted that "ENI saw a broadly balanced distribution of decoration amongst plastic (27%), pointillé (30%) and incised (43%) options, and ENII saw a massive contraction onto incised wares (86%)" (Whitelaw 1992:230).

In general these new techniques of finishing seem to represent more efficient (time and labour) ways of finishing a vessel. For example the increase in 'symmetry structures' means that incised designs can be reproduced across a vessel more quickly. In addition, the more labour-intensive method of incised/pointillé decoration declines in favour of simple incision (cf. Whitelaw 1992:230). Likewise the increase in scribble burnish and the introduction of white slipping and dribble painted and brushed decoration would also seem to represent less labour-intensive methods of giving a vessel a distinctive finish.

10.5 Firing Methods

10.5.1 Previous Studies

Previous studies of Neolithic firing methods have not made use of microscopic analysis (petrology, SEM), but have instead been confined to macroscopic observation of firing effects. For example, firing circles have been identified on the exterior of Urf round-bottomed vessels from EN Franchthi, which closely resembled firing circles re-produced by 'stacking' vessels during experimental firings (Vitelli 1993a:150, 199). Although, this suggests the existence of multiple-vessel firings during the Greek EN, it does not demonstrate that firing was necessarily fast or in an open environment. The only previous discussion of EN firing practices at Knossos is relatively brief and impressionistic (Furness 1953:103). On the basis of macroscopic observation Furness suggested that:

- the majority of EN sherds from Knossos were competently fired, but at relatively low temperatures;
- sometimes firing atmosphere varied across the same surface;
- sometimes there were differences in oxidation and reduction between the interior and exterior of vessels, with grading visible in the sherd break;
- sometimes both surfaces remained light with a dark core - the so-called 'sandwich effect'.

Furness' observations, namely, the low temperature of the firing and the presence of a mixed oxidising-reducing atmosphere, particularly across a single ceramic surface, provide some hints about firing environment. However these inferences remain unsubstantiated. In addition, Furness' observations of variation in firing atmosphere hints at greater variety in firing behaviour. Since Furness considered all EN vessels to be the result of a single production technology, one must presume that she felt this heterogeneity to be explicable in terms of the variability in temperature and atmosphere present in a bonfire firing and/or in a sort of randomness in practice to be expected at such an early stage in ceramic 'evolution'.

10.5.2 Direct Evidence of Firing Environment?

No direct and unequivocal evidence for the environment in which EN vessels were fired was ever identified during any excavation of Neolithic Knossos[19]. There does exist, however, plentiful evidence for pyrotechnology in general: most common are ash-filled hollows (stratum X onwards), occasionally stone-lined, which, to judge by their association with animal bone and their location in house floors, were probably used for cooking (Evans 1964:140, 153, 155). In addition to these, in stratum VIII the bases of two clay structures, possibly ovens, were found in the centre of house D (Evans 1964:136, 148, fig. 10, pl. 31.1). All of these fire-installations are small: the majority of the ash-filled hollows are no larger than 0.25-0.5m in diameter, with the largest example coming from stratum X measuring 1.2m, while the 'ovens' vary in size from 0.5 to 1.0m. Since most ceramic vessels are large in diameter (0.2-0.6m diam.), the small size of these features strongly suggests that they were not used for the firing of pots.

10.5.3 Exploring Variation in Firing

Macroscopic and microscopic examination, both petrographic and SEM, has allowed EN firing technologies to be investigated in more detail. Broadly speaking the picture of heterogeneity suggested by various macroscopic studies has been confirmed. Judging by their softness in hand-specimen, some vessels appear to have been low-fired, although none were so low-fired as to disintegrate

[19] Nor, perhaps, should one expect to find such evidence. As Vitelli has argued, if the firing environment was open (e.g. bonfire), it unlikely that it would leave any permanent trace of its existence (1993a:207-8).

during contact with water during cleaning. Other vessels appear to have been so highly fired and so severely reduced that they have become slightly distorted (e.g. 98/55, Fabric 8)[20]. Examination of fabrics in thin-section suggests that both temperature and atmosphere varied within fabric groups: where sufficient samples permit comparison it is possible to identify a range in the degree of optical activity of the clay micromass as well as range in colour from light to dark.

In general macroscopic study produced no clear correlations between fabric and firing effects (e.g. surface colour, hardness etc.). Perhaps the only exception to this is the relatively rare occurrence in sherd breaks of the so-called 'sandwich effect', where a dark core is sandwiched between a lighter outer layer. This phenomenon seems to be a particular feature of a number of rare or unique fabrics (i.e. Fabrics 28, 31, 33, 34). It is possible that this feature may arise from the employment of a set of firing practices which differs from those used to fire the majority of vessels at EN Knossos, which lack evidence for a 'sandwich effect'. Petrographic study of Fabrics 28, 31, 33 and 34 indicate a general absence of organic material, which may suggest that the 'sandwich effect' here is the result not of an incomplete combustion of organic matter but rather of a late and probably short-lived oxidation stage during firing. The general rarity with which this sort of firing horizon occurs in more frequently-occurring fabrics may suggest that its frequent occurrence in these rarer fabrics is significant. In this context it is perhaps worth noting that a similar type of sandwich effect is a frequent feature of broadly contemporary (LN-EC/MC Anatolia) ceramic assemblages in south-west and western Anatolia (see Chapter 7; Appendices I, IV; French 1965:18; Meriç 1993:146; Eslick 1980:8-9; 1992:81).

Examination of vitrification structures in selected samples under an SEM allows a more accurate characterisation of firing behaviour including an

[20] Previously, the presence of over-fired vessels in Neolithic assemblages has been used as an indicator of local provenance because it has been assumed that such vessels were unlikely to have been deemed worthy of exchange (e.g. Vitelli 1993a:150, 208). However, as sample 98/55 and others demonstrate, over-fired vessels in non-local fabrics, despite their apparent faults, were nevertheless probably exchanged and put to a similar pattern of usage as other vessels.

estimation of maximum firing temperature. Figure 8.1 depicts the maximum estimated firing temperature range per sample. This graph confirms the general impression gained from macroscopic examination and petrology, that EN vessels were fired to a variety of temperatures. Interestingly (*contra* Furness) not all vessels were low-fired with some indicating temperatures exceeding 1000°C. When this firing behaviour is broken down by fabric, it would appear that there is nor clear correlation between firing range and fabric (see Chapter 8). This is perhaps not so surprising since within a bonfire (or for that matter a kiln), the temperature may vary considerably over both space and time (see Figure 5.2; Gosselain 1992).

10.5.4 Characterising the Firing Environment

As previously argued (see Section 5.3.5) inferences of firing method and firing environment can proceed from a detailed understanding of the main variables which govern the effects of firing on a clay vessel, namely temperature, physical/chemical properties of the clay, firing atmosphere and time.

10.5.4.1 Calcite Alteration

Several samples, which contain large calcareous (limestone) inclusions (i.e. Fabrics 1d, 1e, 2a/b, 7, 21), when examined in thin-section proved to contain evidence for secondary calcite alteration largely in the form of micritic clots, which exhibit only a relict primary grain texture (see Chapters 6, 8; cf. Plates 19-20). Under normal (kiln) firing conditions (mixed oxidising/reducing atmosphere, slow heating rate, long soaking time), limestone begins to decompose at temperatures exceeding c.800/850°C in a process, which unless arrested or ameliorated will ultimately result in the structural failure of the vessel.

All samples, which exhibit secondary calcite alteration in thin-section, proved upon SEM examination to have been fired beyond c.800/850°C. This inevitably prompts the question of why these vessels show no signs of failure, since if they had been fired under normal (kiln) conditions they should have

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Such instances should serve to caution us against the transposition of modern value judgements disintegrated. Since there was no evidence for the addition of salt (see Chapter 8) nor, in these examples, for the use of lower firing temperatures, the possibility remains that reducing atmosphere and/or a shorter firing time acted to prevent limestone decomposition. Since a reducing atmosphere only delays limestone decomposition for about 50°C, the survival of limestone in those samples fired beyond c.900°C (i.e. samples of Fabrics 1d, 1e, 7, 21) would seem to indicate that firing was fast (see Chapter 8). Additional support for fast-firing is provided by the observation that the majority of the altered calcite visible in thin-section (e.g. Fabrics 1d, 1e, 2a-e, 7, 21) still exhibits a relict primary grain texture, which would seem to suggest that the firing conditions under which calcite alteration took place did not persist long enough for complete alteration to take place.

10.5.4.2 Non-Homogenous Firing and Localised Reduction

For a small group of samples, representing Fabrics 1d, 1e, 5a, 6, 8 and 30, study (SEM) and comparison of clay microstructure in different areas of a sherd break indicated that the microstructure was not homogenously fired throughout the sample. This was perhaps most severe in sample 97/121 (Fabric 1e), where an initially vitrified exterior (c.800°C) grades into a fully vitrified interior (c.1050°C) (see Plates 35-7). Other samples exhibit a vitrification gradient between centre and edges (e.g. 97/1, 97/9, 97/21, 97/84, 98/90). This seems to correspond to the presence of severe localised reduction in the centre (grey core; fine bloating pores (SEM)) and oxidised or mixed oxidised/reduced edges (cf. the 'sandwich effect'). This gradient in vitrification effectively means that there was an uneven distribution of heat within the ceramic body and/or a very localised reducing atmosphere. Such an uneven distribution is most likely to occur consistently when firing is fast and/or the firing environment unpredictable (atmosphere, temperature range). In the case of sample 97/121 (Fabric 1e) the most likely explanation for the steep vitrification gradient between exterior and interior is that during firing the interior of the vessel (deep bowl) was in contact with the fuel.

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into ancient contexts, where notions of value may have been quite different.

This would therefore suggest that firing took place in an open environment, such as a bonfire.

10.5.4.3 Conclusions

It would seem that under certain circumstances it is possible to infer firing practices from firing effects. The above discussions of calcite alteration and non-homogenous firing both suggest that firing was fast (at least for those samples discussed). It has been suggested that there exists an inverse relationship between speed of heating and the separation of vessel and fuel (Gosselain 1992:246): a fast heating-rate is therefore a general indication that vessels were fired in contact with fuel, that is in an open firing environment. In this way the identification of a fast heating rate may also imply firing in an open environment and *vice versa*. If so, then it would appear that some, if not all, vessels in Fabrics 1d, 1e, 2a-e, 5a, 6, 7, 8, 21, 30 were fast fired in an open environment. The nature of the firing environment for the remaining fabrics unfortunately cannot be determined with the same confidence. However, it should be stressed that these remaining fabrics exhibit no obvious differences from those samples, for which firing environment is more certain. Moreover, an important feature common to almost all fabrics studied is the consistent presence in thin-section of burnt, partially burnt and even unburnt organic material. The survival of sometimes large amounts of organic material would certainly be consistent with an environment where the heating rate was too quick and/or the soaking time too short to ensure complete combustion of organic matter.

The stresses which fast-firing place on the ceramic body are high. If the heating-rate is very quick and the vessel a little damp then rapid shrinkage and thermal stress are likely to cause a failure in the ceramic body. As a result of these stresses vessels fired in open firings usually suffer from a higher breakage rate than vessels which have been kiln-fired (cf. P. Arnold 1991:56, kiln c.21%, open c.31.5%). Much of this stress may be alleviated by use of the type of coarse fabric that is such a consistent feature of EN ceramics. The frequent presence of large non-plastics produces a body which dries more quickly and which has a low rate of thermal expansion . In addition to this, and largely as a result of the forming methods used, voids are fairly frequent and often large and these contribute to the general resistance (toughness) of these fabrics to thermal stress (Kilikoglou et al. 1998).

10.5.5 Possible ENIc/ENII Technological Changes in Firing Methods?

During ENIc-ENII there are hints of possible changes in firing methods for vessels produced in Fabrics 1b and 1e. Macroscopically this can be seen in the consistent production for the first time of buff burnished and buff polished and dark polished wares which exhibit little or no variation in colour across their surfaces (cf. also similar comments of Furness (1953:117) and Manteli (1993a:61)). At the same time there is a disappearance in these fabrics of heavily vitrified (over-fired) vessels. These features may indicate that there was now greater control over firing atmosphere. Unfortunately, however, further investigation of this possibility would require the analysis (SEM) of more samples of these fabrics and must therefore await further study.

Manteli has argued that "in LN, right from stratum II (LNI Knossos) onwards, the effects of firing improvements are strongly felt. Firing is hard and regular, is done at a higher temperature and in better controlled firing conditions than before and produces a brick red core right through and more uniform surface colouring" (Manteli 1993a:61). Although she preferred to see these improvements in firing as occurring within an existing pit-firing technology, the recent discovery at Knossos (near the South House) of a kiln in association with LN levels (Tomlinson 1994-5:61) would seem to indicate that by this period at least some ceramic vessels were being kiln-fired.

Conclusions

All previous studies of EN ceramics at Knossos have consistently emphasised their stylistic homogeneity (Mackenzie 1903:158-9; Furness 1953:95; Evans 1964:194; Manteli 1993:42; Evans 1994:8). This has encouraged an interpretation of EN ceramic technology, which views it as equally homogenous (single fabric, single source): all previous studies have viewed ceramic production as being almost entirely local to the site, with little or no evidence for imports (Evans 1968:273-6; Vagnetti & Belli 1978:126; Broodbank 1992:47-9; Vagnetti 1996:30; Manteli 1996:132). None of these previous studies went further to investigate technological and mineralogical homogeneity in a systematic fashion.

However, as the results of these new analyses have shown, such a characterisation can no longer be supported. Combined macroscopic and microscopic (petrology, SEM) study of fabric, form, finish and firing has demonstrated the presence at EN Knossos of not one ceramic technology but many. Consideration of fabric reflects a wide variety of approaches to paste preparation: different fabrics evidence the use of single or multiple clay sources (clay mixing), which vary from calcareous to non-calcareous. Choice of temper shows a similar variety: in addition to a variety of crushed rock tempers, there are also examples of the use of grog, sand and vegetal temper. It should be stressed that such a variety in fabric is quite normal for a Neolithic site: all sites, whose ceramic assemblages have been subject to fabric studies have indicated a similar diversity in fabric (see Chapter 2).

What is perhaps more significant, however, is that this diversity in fabric *cannot* be explained purely in terms of production local to Knossos. Study of the mineralogy of different fabrics indicates the exploitation of a wide variety of raw material sources. While the most frequently occurring fabrics are also those, which are most compatible with a local provenance (marls, limestone; i.e. Fabrics 1a-i, 2a-e), there are others whose nearest possible sources lie within north-central Crete but beyond the local (<c.5km) area of Knossos. These fabrics are dominated by rocks such as calcimudstone and schist/phyllite (Fabric 5a), altered igneous rocks (Fabric 6), phyllite (e.g. Fabric 8) or serpentinite (Fabric 10). Still others must have origins at some considerable distance from Knossos although these occur much more infrequently: for example Fabric 12 (granodiorite) has a likely source in the Mirabello Bay area and also closely matches Neolithic comparanda from that area (Kavousi). Perhaps most significantly, a small number of fabrics, such as Fabric 31 (biotite mica) or Fabric 35 (blueschist) are most likely to originate from off the island.

It has been concluded from this that such diversity in the source of the raw materials of ceramic production must in many cases reflect a diversity in production locations. Comparative ethnography indicates that there exists a close link between the resident location of groups of potters and the raw materials which they use for pottery production. In this way, diversity in raw material sources or diversity in production locations is therefore likely to mean the existence of different EN settlements located within and beyond Crete. Such a conclusion has a number of significant wider consequences. Firstly, it would imply that intensive/extensive surveys have consistently failed to detect early (Aceramic - EN) settlement on Crete, as well as possibly in other parts of the southern Aegean. Secondly and regarding early ceramics within the Aegean in general, it would suggest the possibility that previous identifications of fabric diversity with Neolithic ceramic assemblages may have seriously underestimated the nature, dynamics and complexity of ceramic production and consumption, the importance of ceramics as exchange items and even the extent of exchange itself.

Although the apparent range of EN surface treatments was narrow, microscopic examination of vessel surfaces reveals that such finishes were achieved in a variety of ways. This variability in some instances corresponds to fabric groupings: for example polished vessels in Fabrics 5a and 12 were not slipped, while those in Fabrics 1a-i were. In this way, by measuring variation in finish and finishing methods against fabric one can discover more subtle differences, which would also seem to have some meaning in terms of provenance.

In contrast to the subtle differences in techniques of finishing between fabrics, study of forming methods suggested that vessels produced in different fabrics were generally formed in the same way. Vessels were mostly coil-built, probably in stages, although flat-based vessels probably began as pinch-pots which were then built up with coils. However, it should be stressed that the results of the studies of finishing and forming methods cannot be directly compared, since it was not possible to reconstruct the sequence of forming methods used for each vessel with the same level of resolution. In most cases finishing methods had removed all direct evidence for forming and even when limited evidence could be found this required the study of a large sample of sherds. This inevitably confined the study to only the most frequently occurring fabrics. Thus, although it would seem that the same basic forming sequence was used for all the most frequently occurring fabrics, it is not possible to be certain whether there were also more subtle differences in gesture or technique. Moreover, the degree to which the rarer fabrics differ from this basic sequence remains unclear: certainly in one or two cases (e.g. Fabric 24) one could argue for more obvious differences in technique.

The same could also be said of the evidence for firing methods. Study of clay microstructure (SEM) suggests that there exists a great variety of firing temperatures within and between fabrics from those clay bodies that are not vitrified (<750-800°C) to others which have an estimated firing temperature of over 1000°C. By combining petrographic and SEM data it proved possible to make inferences regarding the likely firing environment. In a number of cases study of secondary calcite alteration or non-homogeneity in firing both led to the conclusion that firing was likely to have been fast with contact between vessel and fuel. This would indicate firing in an open environment, such as a bonfire or pit. Unfortunately however, as with forming methods, the resolution at which one can reconstruct the sequence of actions which went into firing a vessel cannot match the clarity with which one can identify subtly different surface treatments. Thus the degree to which the firing methods may have differed subtly or markedly between fabrics cannot be assessed.

During ENIc/ENII (strata V-IV), the majority of fabrics appear to continue largely without any apparent changes in ceramic technology. However, in Fabrics 1a-i and 2a-e, whose origin is likely to lie within the local area of Knossos, a series of parallel technological changes take place:

Paste Preparation: ENIc-II sees the gradual disappearance of coarser limestone tempered fabrics (i.e. Fabrics 1a, 1d) and the simultaneous appearance of finer crushed limestone fabric (i.e. Fabrics 1b, 1e, 1f, 2c). By the end of ENII these finer fabrics dominate the ceramic assemblage.

Forming Methods: during ENIc/ENII a new method of coil joining can be identified in Fabrics 1b, 1d, 1e, 1f, 2a and 2b (cf. also Fabric 5a). Each coil is now pinched up around the diameter of the vessel, prior to the addition of the next coil. This period also sees the introduction of a new method of strap-handle attachment (e.g. Fabric 1b), where the join between strap handle and body is strengthened by the use of a plug and socket. This approximately parallels the introduction of plug-attached strap handles in south-west Anatolia.

Finishing Methods: during ENIc-II there is a significant increase in the range of finishing methods identifiable in Fabrics 1a-i. New methods appearing at this time in these fabrics are red scribble-burnished, brushed, painted, ripple burnished and white slipped/burnished. This period also sees a significant increase in the occurrence of incision and in the range of motifs rendered, with a concomitant decrease in the popularity of incised/pointillé. A striking feature of the new surface finishes introduced at this time is the speed and ease with which they can be used to finish a vessel and as such represent a gain in efficiency over previous ENIa-b more labour intensive finishing methods, such as polishing or incised/pointillé.

Firing Methods (?): during ENIc-ENII there are unconfirmed hints of possible changes in firing methods for vessels produced in Fabrics 1a-i. Macroscopically this can be seen in the consistent production for the first time of buff burnished and buff polished and dark polished wares which exhibit little or no variation in colour across their surfaces (Furness 1953:117; Manteli 1993a:61). At the same time there is a disappearance in these fabrics of over-fired vessels. These features may indicate that there was now greater control over firing atmosphere, although this would require further investigation using SEM.

When viewed in isolation the reason for these changes remains unclear. Certainly most, if not all, could be viewed as representing improvements or gains in efficiency (time, labour) over the pre-existing ENIa-b ceramic technology. However, it should be stressed that the need for such improvement is *not* self-evident, nor is progress sufficient explanation in itself: existing ENIa-b ceramic technology had proved adequate for many generations of previous potters, why should these innovations occur now? Furthermore the simple argument of self-evidential 'progress' does not explain why in many cases (e.g. Fabrics 1d, 2a/b) the ENIa-b ceramic technology continues to be employed alongside these new technology. Combined macroscopic and microscopic study indicates that these technological changes are largely restricted to the finer fabrics introduced during ENIc (i.e. Fabrics 1b, 1e, 1f, 2c). Although in one case (i.e. Fabric 1b) one of these finer fabrics completely replaces an earlier coarser version (Fabric 1a), in other instances the coarser versions continue to be made during ENIc-II. In future chapters, these technological changes will be considered in the light of evidence for developments in other areas (exchange, consumption, architecture) during this period (see Chapters 11-13).

CHAPTER ELEVEN

THE ORGANISATION OF EARLY CERAMIC PRODUCTION

11.1 Ceramic Variation and its Interpretation

11.1.1 Previous Studies of Neolithic Ceramics

Under the model most consistently applied to Neolithic pottery production, the household is viewed as the principal organisational unit of production (see Section 2.3). Pottery production takes place in individual households, which although largely independent, nevertheless together comprise some sort of wider association (i.e. a community). Household ceramic production is understood to be largely geared towards supplying the needs of the household, although ceramic vessels may have circulated at a local level between households. Some finer vessels may have been exchanged beyond the community, however these are likely to have amounted to a tiny fraction of overall production output.

As a result of the influence of this model, most ceramic studies have explained observable variation in fabric, form and finish purely in terms of local production by one or more groups of potters: For example, the five main recurring fabrics[1] at Franchthi are considered to reflect local production by five different households (see Section 2.3.1; Vitelli 1993a:208, 207-10). Unfortunately, such an apparently straightforward interpretation of ceramic variation is not easy to substantiate with much depending on the *demonstration* that each fabric was locally produced (TLP). In reality the evidence in favour of TLP is never so incontrovertible, yet somehow it is always the TLP interpretation that receives prominence. For example, in the Franchthi publication the evidence in favour of TLP is described cautiously in terms of its possibility or probability

[1] These different fabrics were found to correlate with different techniques of forming and finishing, which prompted Vitelli to conclude that each fabric corresponded to a different tradition of production or in other words that there were different potters working within different traditions (Vitelli 1995:60). Such an interpretation conveniently matches an outcome predicted by the conventional model of Neolithic ceramic production organisation: i.e. a number of local production units (households), which show distinctive differences (independence) and which together account for almost all the ceramic vessels consumed at the site (minimal exchange of ceramic vessels between different settlements).

(see Vitelli 1993a:208). However, in later articles Vitelli allows herself to be more categorical: for example,

> "All the wares [i.e. fabrics], with the possible exception of one, were made from local materials" (1995:60).

In view of these later categorical statements as well as their uncritical incorporation into recent general discussions of Greek Early Neolithic ceramic production (e.g. Demoule & Perlès 1993:377-82; Kalogirou 1997:12-13; but cf. Day 1995a), it is worth re-examining the arguments in favour of TLP at Franchthi in more detail[2].

In her discussions of provenance Vitelli often relies on a combination of indirect evidence and (modern) assumptions regarding ancient attitudes to distance and mobility (e.g. Vitelli 1989:19) manifest, for example, in a reluctance to countenance the transport of large vessels over long distances (Vitelli 1993a:209). This may be illustrated with reference to her discussion of 'Andesite ware', a fabric which occurs regularly at Franchthi but in such low frequencies as to suggest 'at first glance' non-local production (Vitelli 1993a:208). The possibility of non-local production would seem to further increase since petrographic study of a sample of this fabric identified the island of Aegina[3] as the source of this andesite (Vitelli 1993a:111). Vitelli, however, does not seriously consider the possibility of production elsewhere (Aegina?), but prefers to argue that local potters at Franchthi were crushing up millstones of Aeginetan andesite. Such an interpretation, however, fails to take account of the absence of any andesite flakes from Franchthi, which might indicate primary or secondary working of andesite (Perlès 1992:130). It is clear that the onus of proof in this case lies with anyone seeking to identify such vessels or fabrics as non-local. In this way the full weight of the prevailing model acts as a conceptual boundary undermining the legitimacy of alternative interpretations (see Section 2.3.1), even

[2] It should be stressed that the prominence devoted here to the work of Vitelli is simply because hers is by far the most detailed and honest discussion of early Aegean ceramic production. Issues of provenance feature as strongly in other more prosaic discussions (e.g. Jones 1986; Yiouni 1995; 1996a; see Chapter 2).

[3] If it was produced on Aegina, this would be the earliest indication of settlement on this island. In view of its proximity to the mainland, EN settlement is by no means unlikely (see Broodbank 1999).

in cases, such as 'Andesite Ware', where a more balanced assessment would suggest a non-local provenance[4].

Issues of provenance and interpretation can also be raised concerning 'Lime ware', which is consistently the most frequent fabric at Franchthi. Vitelli notes that "visually similar Lime ware occurs at other roughly contemporary southern Greek sites, including Lerna, Nemea and Corinth" and later that "the raw materials are certainly available in the vicinity of Lerna, and, indeed, almost everywhere in southern Greece" (Vitelli 1993a:208). Vitelli then goes on to acknowledge the possibility that a tradition of making ceramics from calcareous clays and some form of limestone was shared between several sites in the vicinity of Franchthi. In this way, the 'Lime Ware' at Franchthi although macroscopically similar, may have had different sources. Possible support for this is provided by the results of the analysis of selected samples of 'Lime Ware' (OES, petrology), which identified the presence of "visually different, but chemically similar forms of calcium carbonate" (Vitelli 1993a:208). This could suggest that there was some diversity of fabric within the broad macroscopic category of 'Lime Ware'. However, despite this possible evidence in favour of significant variation within the category of 'Lime Ware', Vitelli chose instead to emphasise with some finality, although without further supporting evidence, that it was "likely that most, if not all, Lime ware... was produced *within a few kilometres* of the site" (Vitelli 1993a:208 my italics).

It is ironic that if the macroscopic and microscopic methods of analysis and characterisation used on the Franchthi material had been combined more successfully, then they could have offered a means of actually testing the validity of local and non-local hypotheses (see Chapter 5)[5]. Petrological analysis facilitates study not just of large non-plastics, but also of the relationship between those non-plastics (often temper) and the clay which hosts them. Thus, if potters were acquiring local or non-local rock tempers and adding them to local clays, as

[4] Similar arguments may also be proposed against local production of 'White Ware' (see Section 7.6.4 for provenance work conducted on 'White Ware').
[5] Unfortunately Vitelli experienced problems in combining macroscopic and microscopic methods of analysis, prompting her ultimately to reject them (see Chapter 5).

Vitelli suggests for 'Andesite Ware', then this would be clear in thin section: clay would be compatible with a local provenance and would most likely not have a close mineralogical relationship with the rock temper, unless perhaps by accident. Likewise petrology should be able to identify whether production was more likely to be occurring at other locations in different parts of the landscape, the products of which arrived at Franchthi through exchange: clay would be more likely to be incompatible with a local provenance and would most probably relate more closely in terms of mineralogy to temper. Further exploration of the issue of fabric diversity and provenance is impossible in the context of EN (Greek) Franchthi; although it should be stressed that a careful reading of the published data would suggest that the issue of provenance currently remains unresolved.

11.1.2 The Interpretation of Ceramic Variation at Early Neolithic Knossos

A comparison of the main features of ceramic variation at EN (Greek) Franchthi and EN Knossos reveals a number of striking parallels, which suggest the possibility of direct comparison between these two assemblages (see Figure 11.1).

EN Franchthi	EN Knossos
fabrics consistently reproduced over long periods (c.700-1000 years[6])	most fabrics consistently reproduced over long periods (e.g. c.1000 years)
rare fabrics which testify to the exploitation of non-local raw materials e.g. Andesite Ware	rare fabrics which testify to the exploitation of non-local raw materials e.g. Fabric 12, Fabric 35
vessels in each fabric share similar shapes and sizes	vessels in each fabric share similar shapes and sizes
different forming techniques per fabric	some fabrics share forming techniques, others are unique
different finishing techniques per fabric	some fabrics share finishing techniques, others are unique

Figure 11.1 Key Features of Early Ceramic Technologies at Franchthi and Knossos.

[6] Vitelli notes that C14 dates for the EN period at Franchthi range from 6680 - 5640BC (Vitelli 1995:60). However Demoule & Perlès prefer a period of c.700 years for the EN period in Greece (1993:366).

Similar parallels, however, cannot be found in the way this variation is interpreted. Detailed petrographic study of the different fabrics represented at Knossos suggests that the relationship between fabric and provenance is far from as straightforward as has been argued for Franchthi (see Chapters 6, 7, 10; Appendix V). The situation at Knossos may be summarised as follows:

(1) Some fabrics clearly testify to the exploitation of raw material sources, which cannot be local to Knossos (<5km). Some of these can be shown to lie at some considerable distance in Crete (e.g. Fabric 12, Mirabello Bay, c.70km) or beyond the island (e.g. Fabrics 31, 35); all are either unique or occur at Knossos in extremely small quantities (<0.15%). These are considered to be of non-local provenance.

(2) Other fabrics, similarly testify to the exploitation of raw material sources, which cannot be immediately local to Knossos (<5km), but which are nevertheless likely to originate within the general area of north-central Crete. Some of these occur in very small quantities (<1%), although Fabrics 5a, 6 and 8 consistently occur more frequently (c.10-20%). These fabrics are also considered to be not immediately local to Knossos.

(3) A smaller and closely inter-related group of fabrics are compatible with a provenance in an area immediately local to Knossos. Together these fabrics comprise the largest single group throughout the EN period (c.45-85%) (e.g. Fabrics 1a-i, 2a-e).

From this it would seem that fabric diversity *does* in many cases reflect a diversity of origin and as such has no direct relevance *per se* to the discussion of ceramic production organisation at Knossos. An analogy might be drawn between these fabrics and the rarer fabrics at Franchthi, such as 'Andesite Ware' or 'White Ware', which contain raw materials whose sources are demonstrably not local to Franchthi.

Clearly, however, this is not the whole story: fabric diversity, as the third group of related local fabrics demonstrates, can also exist at a local level. Petrological study of Fabrics 1a-i and 2a-e would suggest that they are closely related (see Section 11.2.1; Chapter 6). The differences that enable each of these fabrics to be separated are mainly textural, but also find expression in the use of different forms of limestone and in the case of Fabrics 2a-e the exploitation of different clays.

How might this be interpreted? One way of thinking about this is to view this diversity at a larger scale. During the course of analysis I have always sought to characterise variation at the lowest possible level. However one could choose to see Fabrics 1a-i more simply as three groups: coarse limestone (Fabrics 1a, 1d, 1g, 1h), finely crushed limestone (1b, 1e, 1f) and coarse limestone and grog (Fabric 1i). Fabrics 2a-e could also be seen in this way: coarse limestone (Fabrics 2a, 2b, 2d), finely crushed limestone (2c) and coarse limestone and grog (Fabric 2e). In this way the variety apparent in Fabrics 1a-i and 2a-e can be reduced to three main paste recipes, which also have some sort of chronological meaning: during ENIa-b the most frequent is the coarse limestone group, with the coarse limestone and grog group a rarer variant; however during ENIc-II, when technological changes are apparent in paste preparation, these two coarse limestone groups are joined and in some instances (Fabric 1a) replaced by a finely crushed calcite group.

Therefore ceramic variation amongst local fabrics at Knossos operates at two levels. At one level Fabrics 1a-i and 2a-e testify to the local existence during ENI-II of usually only one or two basic paste recipes at any one time. However, the consistent maintenance of very subtle textural and technological (raw material selection, clay processing, form, finish) between these different fabrics (see Section 10.2.1), would seem to reflect another lower level of variation. If Fabrics 1a-i and 2a-e reflect ceramic production at Knossos, then such low level variation could reflect the actions of two or three different producing groups within the Knossos community (i.e. Fabrics 1a-c, Fabrics 1d-i, Fabrics 2a-e). Certainly the consistency with which these subtle textural and technological differences are reproduced must in most instances reflect some sort of consistency of action. For example, the consistent selection of particular forms of limestone without, it should be said, significant overlap would seem to suggest that these fabrics were not the product of any sort of random variation in the form or source of limestone temper used. Instead it would seem more likely that firstly there was some sort of consistency in the selection of different forms of limestone and secondly that this consistency parallels subtle differences in form and finish. Obviously one cannot seriously imagine that EN potters acted as geologists in their raw material selection, however one possible explanation for this patterning might be the consistent exploitation of different local limestone sources.

And so, as this discussion would suggest, the interpretation of variation in Neolithic ceramic assemblages is by no means as straightforward as previous studies have assumed. A large proportion of the variation in fabric identified in the EN assemblage from Knossos is explicable not in terms of variation amongst local producing groups, but as the products of other, non-local production locations. Such fabrics therefore have little bearing on the question of the organisation of local production at Knossos. It has been argued that a smaller group of fabrics (Fabrics 1a-i, 2a-e) are compatible with a provenance local to Knossos and it is this smaller group of fabrics within the EN ceramic assemblage at Knossos, which is most likely to have relevance to questions regarding the local organisation of production.

Although this discussion has undermined the validity of Vitelli's interpretation of ceramic variation at EN Franchthi upon which she subsequently based her identification of restricted household production, this does not mean that such a form of production did not exist. That said however, preoccupation with the household as the principle unit of social organisation should not be allowed to obscure the validity of other possible forms of organisation, particularly forms of organisation operating beyond the individual household (see Section 4.4). Thus study of early ceramic production organisation should explore all options including the conventional model of household production.

11.2 Early Ceramic Specialisation?

The conventional definition of household ceramic production in the Aegean, that is household production largely for household consumption, is generally characterised as non-specialised since it fails to accord with even the most basic modes of specialisation. For example, Costin's much-quoted discussion of craft specialisation has offered an eight-part typology, which for lower levels of specialisation offers a choice of the following (Costin 1991:8):

(1) *Individual Specialisation*: independent individuals/households producing for unrestricted local consumption;

(2) *Dispersed Workshop*: larger workshops producing for unrestricted local consumption;

(3) *Community Specialisation*: independent individual or household based production units, aggregated within a single community, producing for unrestricted regional consumption;

(4) *Nucleated Workshops*: larger workshops aggregated within a single community, producing for unrestricted regional consumption.

None of these definitions would seem to cover a scenario of household production for household consumption (Costin 1986:328; cf. Perlès & Vitelli 1999:96; see Chapters 2, 4).

The absence of any form of specialisation from early Aegean ceramic production has recently been challenged by Vitelli, who has argued that within the EN-MN (Greek) community at Franchthi, ceramic production was restricted to five different households and may already have been in the hands of individual female specialists, who were also healers or diviners (shamans) (see Section 2.3.2; Vitelli 1993a:216-7; Vitelli 1995; Perlès & Vitelli 1999:98, 102). This characterisation of ceramic production would fit Costin's most basic category of individual specialisation: that is independent individuals or households producing for unrestricted local consumption (Costin 1991:8).

Although this identification of early ceramic specialisation has in general achieved a wide acceptance (e.g. Demoule & Perlès 1993:377-82; Kalogirou 1997:12-13; but see Perlès 1999:101), the methodology used is open to dispute and cannot be considered to be a reasonable means through which to make an identification of specialisation (see Section 2.3.2). Furthermore, discussion of the interpretation of ceramic variation at Franchthi (see Section 11.1) has undermined much of the basic premises upon which this identification is based. Vitelli argued that EN ceramic production at Franchthi was specialised because of an 'overproduction' of pots: that is, a low-level of ceramic use (c.12-13 pots/year) could nevertheless support five different local groups of potters (each producing in a different fabric). Such an interpretation, however, relies on all five fabrics being locally produced, an assumption which does not at present appear to be justified (see Section 11.1).

11.3 Why is Specialisation No Longer Special?

Even if one sets issues of correct methodology and interpretation aside, there still remains the more fundamental question of what specialisation might mean in the context of the earlier Neolithic Aegean and what we might gain by identifying it in this context. In general, anthropological and archaeological studies of craft specialisation have focused on craft production in what has been termed 'complex societies', that is societies which are characterised by permanent social hierarchies and marked social, political and economic inequalities (e.g. Brumfiel & Earle 1987; Costin 1991; Sinopoli 1988; Stark 1985). Indeed it was long thought that craft specialisation could *only* be found in complex societies: for example in studies of prehistoric Crete this was manifest in a marked reluctance to admit the possibility that specialised ceramic production and social ranking might pre-date the appearance of the palaces in the MBA (e.g. Cherry 1983:33-4) or else the EBA period (e.g. Branigan 1983:23-32). Such studies tended to view craft production during the EBA and the LN very much in the same terms as has been suggested for the earlier Neolithic, namely household production for household consumption. In this way both the Neolithic and EBA periods were viewed as long periods which saw little change in production organisation.

More recently, this assessment of LN and EBA ceramic production in the Aegean has been questioned. For example, detailed macroscopic and microscopic analysis of EBA ceramic material from a large number of sites around Crete, including Knossos has argued for the existence of different regionally located ceramic specialists (Wilson & Day 1994; Day et al. 1997). Furthermore preliminary study of LN ceramics from Knossos has indicated the possibility that some form of ceramic specialisation might have been existence before the end of the Neolithic (Day et al. 1997:287). In this way Vitelli's hypothesis of EN ceramic specialisation must be seen very much within the context of this reassessment of the origins of specialisation in the Aegean. Other scholars have sought to identify specialisation in the EN in the production of obsidian tools and shell beads (Perlès 1992; Miller 1996:30). Some have even gone so far as to suggest that "'specialists' have always existed" (Perlès & Vitelli 1999:96).

Largely, in response to Vitelli's thesis of specialisation at EN Franchthi, Day, Wilson and Kiriatzi have questioned whether there was "ever a period in the Aegean when pottery production was not specialised" (Day et al. 1997:287). However, if one is to push specialisation back into the Palaeolithic (cf. Perlès & Vitelli 1999:96) and thus make specialisation simply an attendant feature of craft production[7], then inevitably one must question the utility of the term: what is it that makes specialisation special? Since the concept of specialisation, as originally formulated, implies a relative state and not an absolute one (Costin 1991:2), it cannot exist purely in isolation: if one form of production is characterised as specialised, then this would imply the existence of others which were not[8]. One proposed solution to this problem is to view specialisation as a continuum of 'degrees of specialisation', varying from low to high (Brumfiel & Earle 1987:5; cf. Day et al. 1997). However, this dodges the crucial issue of whether specialisation is really a constitutive element of all forms of production or whether forms of production ever existed for which it is an inappropriate or even an irrelevant term. Is specialisation always a matter of degree or are there situations where specialisation is entirely absent?

In her study Costin defined craft specialisation as:

[7] e.g. Miller (1996:30) "specialization, then, should be viewed as one common mode of the organization of production".

[8] Costin (1991:3) talks of the characteristics of specialised production which mark it out from production which is non-specialised; elsewhere (1991:12) she talks of the evolution of independent specialisation, thus implying the existence of non-specialised production.

"a differentiated, regularized, permanent, and perhaps institutionalized production system in which producers depend on extra-household exchange relationships at least in part for their livelihood, and consumers depend on them for acquisition of goods they do not produce themselves" (Costin 1991:4).

Specialisation can therefore be recast as the existence of differentiation or separation between producers and consumers, hence subsequent statements made by Costin such as:

"whenever there are fewer producers than consumers of a particular good, we recognise specialized production" (Costin 1991:43).

This latter statement, when taken on its own, encompasses an enormous range of production behaviours. Indeed under this latter formulation the only instance where specialisation could be said not to operate would be where producers produce all that they need for their own personal consumption and never rely on the products of others. Such a situation has arguably never been a feature of human societies and is certainly a theoretical and practical impossibility under the DMP, that is the conventional model for Neolithic production organisation (Sahlins 1974:101; see Chapter 4). Unfortunately, however, it is this very all-encompassing statement by Costin, which has been used as a definition of specialisation in several discussions of early Neolithic specialisation (e.g. Miller 1996:30; Perlès & Vitelli 1999:96). The failure of these studies to quote Costin's full definition is a serious error and may, as will be seen, compromise their subsequent identifications of early specialisation.

Such an all-encompassing statement also leaves it unclear as to what level one should pursue specialisation? If, as Costin's full definition suggests (1991:4), specialisation is all about differentiation, then at what scale should one seek to study it: the individual, the household, the community or the region? Vitelli's model of EN-MN ceramic specialisation locates specialisation at the level of the individual (female shamans?) and appears to situate these individual specialist potters within households. This formulation of specialisation is, however, highly problematic, since it is usual in definitions of specialisation to exclude household divisions of labour by age or sex (Costin 1991:4). To pursue specialisation at this level is generally considered inappropriate, since, as Sahlins emphasises, the effect of the pooling of goods and services within the household is to abolish "the differentiation of the parts in favour of the coherence of the whole" (Sahlins 1974:94; see also Sections 2.1.4, 4.2). For example, household-based ceramic production usually involves not just the single actions of one individual, but rather the co-operative efforts of other household members, such as children or the elderly, who often remain invisible in modern ethnographic studies of production (see Section 2.1.4; Wright 1991:198-9; Miller 1985:77, 110; Barley 1994:61-6). In this way, it would seem that any search for specialisation within the household would be unproductive and would merely debase the currency of the term.

In Chapter 4 it was suggested that during the earlier Neolithic (EN-MN Greek), communities, although perhaps notionally composed of individual household units, may have placed a greater emphasis on relationships conducted at a supra-household level. Such communities may have been characterised in their acts of consumption by ideals of sharing (Halstead 1995:16-19). Egalitarian ideals may have also been reflected in shared collective acts of production and an absence of direct household storage and therefore ownership of produce (Chapter 4). It was also argued that within such a socio-economic scenario the household may not act as the primary unit of social organisation and may not therefore be the principle unit of production and consumption. Instead one should perhaps look to larger social groupings which transcend individual households.

And so, where might one legitimately seek specialisation within such a formulation? If specialisation is primarily about differentiation then how or where might one locate specialisation within egalitarianist communities? If communities, although notionally composed of households, largely organise acts of production and consumption at a higher communal level, then it would seem to make little sense to seek specialisation within these higher supra-household groupings. And so, as with household-based societies where the seeking of specialisation within the internal divisions of the household is widely considered to be inappropriate (Costin 1991:4), so perhaps a similar approach to specialisation in 'communal' societies might also be misguided. To reformulate Sahlins' original proposition regarding internal differentiation within the household (1974:94), the effect of the *communal* pooling of goods and services within larger egalitarianist groups might also be to abolish the differentiation of the parts in favour of the coherence of the whole. In this way the level at which specialisation can legitimately be sought emerges as something that is context-specific since it depends on how and at what scale specific societies principally organise themselves.

And so, if one is to retain specialisation as a useful analytical term, rather than seeking simply to broaden its chronological sweep (e.g. Miller 1996:30; Perlès & Vitelli 1999:96), one must recognise and embrace the potential problems surrounding its application to production in egalitarian communities. Recognising this is not an exercise in defeatism so much as the acknowledgement of something potentially fundamental and different about how earlier Neolithic communities might have organised themselves. Furthermore, this formulation of specialisation rescues it from becoming a meaningless term and instead restores its focus to situations where its perspective on aspects of differentiation, whether political, social or economic, provides a means of identifying and understanding where important social/power relationships and differences are negotiated.

For these reasons I would prefer Costin's main definition of specialisation, putting special weight on her adjectives, 'differentiated', 'regularised', 'permanent', 'institutionalised', noting also the explicit nature of the relationship between producer and consumer, where "producers depend on extra-household exchange relationships..., and consumers depend on them for acquisition of goods they do not produce themselves" (Costin 1991:4). Here the term 'depend' requires explicit comment. A natural relationship of dependence has always existed between producers and consumers; namely that there have always been people who consume products which they themselves did not produce. In the most simple circumstances production itself is oriented primarily towards securing livelihood and not towards the production of surplus product for exchange (Sahlins 1974:82-6; see Chapter 4). Thus the relationship of dependence associated with specialised production should exceed this basic level. As Costin has stressed:

"The characteristics that distinguish it [specialisation] from nonspecialized production - generally or the Domestic Mode of Production... - are the amount of time spent in the activity; the proportion of subsistence obtained from the activity; the presence of a recognised title, name or office for the person or activity; and the payment in money or in kind for the products of the specialist" (Costin 1991:3).

Specialised production, as described here, is suggestive of production *specifically* for exchange. Indeed it is largely for this reason that specialisation has been understood as denoting "a measure of economic intensification" (Day et al. 1997:287). It remains to be demonstrated whether such a form of economic intensification, characterised by production for exchange, is an inappropriate characterisation of the earliest Neolithic forms of ceramic production.

11.4 Characterising the Organisation of Ceramic Production at ENIa-b Knossos

It has recently been recognised that current typologies of craft specialisation, particularly when applied to Neolithic production, often seem to obscure much more than they reveal (Perlès & Vitelli 1999:99-100). This is largely because typological models of social organisation exist at a higher level of generalisation and thus always suffer from an in-built insensitivity to the specific characteristics of individual case scenarios (see Section 4.1). Regarding typological models of production in particular, Costin has argued in favour of a move beyond typologies of specialisation to a detailed analysis of production organisation, through the consideration of four main parameters (Costin 1991:8-18):

(1) *Context* of production (affiliation of producers; control of production; demand);

(2) Relative regional *concentration* of production facilities (unequal/equal distribution of producers through the landscape; local/regional location of markets; availability of transport);

(3) *Scale* of production units (size of production unit; constitution of production unit; efficiency);

(4) *Intensity* of production (part-time or full-time).

Clearly production must not be studied in isolation, but must be placed in its specific context which must always include an awareness of aspects of distribution and consumption (cf. Day et al. 1997:275).

In this section the organisation of ENI-II ceramic production will be assessed diachronically using these four parameters. It should be stressed that discussion will always seek to focus on local ceramic production at Knossos, since not only is this the only site for which contextual information exists, but also because combined macroscopic, microscopic and quantitative analyses have allowed a group of fabrics to be isolated (i.e. Fabrics 1a-i, 2a-e), whose production in the immediate locality (<5km) of Knossos seems assured.

11.4.1 The Context of Ceramic Production (ENIa-b)

The context of production refers specifically to the position that producers and their production activities occupy within wider social, political and economic networks. Thus in the context of specialisation, Costin discusses whether certain producers might have been affiliated to other social groups (e.g. elites) or otherwise independent. Affiliated specialists[9] often produce a different range of products (luxury, prestige, wealth goods) from independent specialists (daily, 'utilitarian') (Costin 1991:11). However, at EN Knossos no such a distinctions could be observed, even where different producing groups could be shown to be producing in separate locations (e.g. Fabric 12 produced in the Mirabello Bay and Fabrics 1a-i produced locally to Knossos). Rather, in all cases where a fabric is sufficiently well-represented it is clear that a range of forms and finishes were made, which were highly similar or identical to those made in other fabrics. Therefore, during ENIa-b, there is no obvious distinction in the types of products made so as to suggest the existence of different types of ceramic producers, whether of different affiliation or of different status.

And so, if different ceramic producers during ENIa-b largely produced a similar or identical range of products, what might this tell us about their status or

[9] Admittedly discussion of affiliated specialists is somewhat irrelevant to earlier Neolithic communities, since by definition there can be no affiliated specialists in egalitarian societies

their social context? Was ceramic production at Knossos, to use Vitelli's model for EN Franchthi, restricted to certain individual specialists, who may have been specifically gendered (female) and who may have enjoyed a special status (shamans?)? If production was restricted to high status individuals, one might plausibly expect to find evidence to suggest that producers were deliberately trying to mark themselves out as different from others. For example, during EMI-II on Crete, a period for which the existence of ceramic specialists has been plausibly argued (Day et al. 1997), ceramic technologies are extremely diverse, with choice of raw materials being made according to the shape, size and decorative technique of the vessel to be produced (Wilson & Day 1999:38; 2000:57; Whitelaw et al. 1997) and with different surface finishes being achieved using a variety of finishing and firing methods (Day & Wilson 1994). Several of the wares analysed, although indicating different combinations of raw materials and exhibiting quite different finishing methods, seem to originate from the same area (Wilson & Day 1999:38-40; 2000:57); in some cases these areas correspond to different regions within Crete (e.g. Mesara). Here one could argue that specialist producers were consciously seeking to differentiate themselves by the adoption of complicated techniques of production which serve to exclude the participation of non-specialists and by the visual marking of their products as different by the use of distinctive forms and finishes. In the very least these technological features suggest the existence of a "sophisticated way of conceiving of and producing ceramics" (Wilson & Day 2000:57).

The situation for ENIa-b ceramic production could not be more different. Here choice of raw materials does not appear to have been based on considerations of form, size or finish. Instead each fabric demonstrates a comparable range of forms and finishes. Although there are obvious differences in the types of raw materials used, the type of fabric produced is almost always the same (coarse, tempered). Study of forming methods concluded that, although some form types had different forming sequences from others, within each fabric specific vessel types seem to have had the same basic forming sequence.

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which lack elites (Costin 1991:12). However, the comparison serves to emphasise how earlier

Moreover, after experimental replication work it was observed that these forming techniques and sequences were simple to operationalise and presumably therefore equally simple to learn.

The striking feature of these different fabric groups is, therefore, the absence of profound differences in the basic ceramic technology used. Although subtle differences in form and finish can sometime exist, in most cases it is quite impossible to tell the products in one fabric, from those in another. This low level of external differentiation would seem to suggest that different EN producers did not prioritise the marking out of differences between each other. In this way ENIa-b ceramic technology could not be described as a closed technology of exclusion, but rather an open or shared one of incorporation.

The temporal context of EN ceramic production is also important. In most instances, different fabrics (and those forms and finishes specific to them) seem to have been re-produced consistently without significant change over an extremely long period of time (c.1000-1300 years). In previous studies of EN ceramics, this stability in methods of forming and finishing has been glossed as a 'conservative' feature of EN ceramic production. However, within more recent ceramic studies, such a lack of innovation has come to be understood as a dynamic process in its own right (see van der Leeuw & Torrence 1989). If one seeks to reconstruct past behaviour as arising from the deliberate actions of knowledgeable actors, then the successive recreation of the same vessel types using the same series of techniques over many centuries might be re-cast as a *deliberate* attempt to maintain continuity between the past and the present.

It is commonplace amongst pre-modern societies of the ethnographic present to find very different attitudes to the past, where time itself is viewed as not purely successive and potentially looking both forward and back (see Section 3.3.1; Shanks & Tilley 1987:125ff). In such societies production (and consumption) may be seen as a deliberate act of recreation, which links present with past via the reproduction of past knowledge and techniques, and which situates the producer in a timeless state which is at once past, present and future.

Neolithic ceramic production differs from later Bonze Age scenarios.

In this way acts of production and the objects produced are the means by which traditional knowledge is reproduced. In this way acts of production contain an important ceremonial aspect in the way they transform and create by enacting the 'nature of cosmic reality'. They may therefore reflect a desire to emphasise common memory, ancestry or ownership. It has recently been suggested, within the context of the social dynamics of Neolithic house destruction, that the "struggle for social and material continuity might have been a leading mobilizing force in creating and maintaining social practices and beliefs in the Neolithic society" (Stevanovic 1997:334).

And so, within such societies it is through acts of production - or rather the individuals behind them - that traditional or doxic forms of knowledge are maintained. However, individuals and households alone do not constitute stable mechanisms for the transfer of knowledge over countless generations. During ENIa-b Knossos, like EN-MN (Greek) Franchthi, was a small[10] community probably containing relatively few households. As Sahlins remarked, individual households are in the long-term extremely unstable (Sahlins 1974; see Chapter 4) and may suffer from an array of potential destabilising factors, such as periodic fluctuations in labour availability or uncertainty in food supply caused by fluctuations in climate (Halstead 1999:89). This inherent weakness is usually partly offset by a variety of strategies, which usually rely on the cultivation of ties beyond the household within the wider community (Halstead 1989). In this way over very long periods individuals, families, lineages and households will all come and go. It is therefore difficult to see how any of these *alone* could constitute a stable mechanism for the long-term transfer of knowledge, as evidenced in EN ceramic production. Rather it makes better sense, particularly within communities as small as that at Knossos and when acts of production were infrequent or seasonal (see Section 11.4.4), to see the community as a whole or at least a very large proportion of it as the reservoir or custodian of this knowledge. It is therefore the existence of this knowledge at a communal-level that provides the stable mechanism for its continued maintenance. As Childe long ago remarked:

> "The neolithic crafts have been presented as household industries. Yet the craft traditions are not individual, but collective traditions. The experience and wisdom of all community members are constantly being pooled. In a modern African village the housewife does not retire into seclusion in order to build up and fire her pots. All of the women of the village work together, chatting and comparing notes; they even help one another. The occupation is public; its rules are the result of communal experience... [The pots] bear the stamp of a strong collective tradition rather than of individuality" (Childe 1981:87-8, reprint of 1956 edition).

And so, if the knowledge required for ceramic production was restricted to a few individual specialists, as argued by Vitelli, then it is difficult to see how sets of production practices could have survived *intact* and *unaltered* over such a long period of time, when they depended for their survival on such a narrow restricted line of inheritance. ENIa-b production is therefore unlikely to be *restricted* in the way Vitelli argues, but was most likely *shared* amongst producers working within a single community.

It has been suggested (see Section 11.1.2) that local production at Knossos in Fabrics 1a-i, 2a-e could be interpreted at one level as embodying two or three paste recipes, which at a lower level may represent two or three producing groups (i.e. Fabrics 1a-c, Fabrics 1d-i, Fabrics 2a-e). These groupings have a significant temporal dimension: during ENIa only Fabrics 1a and 2a/b[11] are found at Knossos[12], suggesting the possibility that the earliest phase of ceramic production at Knossos may have been characterised by only one or two fabrics and by inference one or two producing groups. Since we have no idea of social organisation at Knossos during this period it is difficult to see how this patterning could translate into different social groupings. However, if - for the sake of argument - one assumes a DMP scenario of individual households, perhaps composed of 5-6 members, then ENIa Knossos with a population of 30-60 (see Appendix II) is likely to consist of 5-10 households. If ceramic production was taking place in each household, then one might expect to see

[10] Maximum population at the end of ENIa was c.60 and at the end of ENIb c.300 (see Appendix II).

[11] Fabrics 2a-e were produced using a low to non-calcareous quartz-rich clay, which is different from the two calcareous clays used to produce Fabrics 1a-i (see Appendix V). NB If Fabric 2a/b was produced at another location very close to Knossos, then this would leave only one main local fabric (Fabric 1a) at Knossos during ENIa.

[12] Fabric 1d only appears during ENIb and Fabrics 1b-c, 1e, 1f, 1g and 2c during ENIc-II (see Figures 9.3-4).

between 5-10 different production groupings. However, during ENIa there is petrographic evidence for only one or two.

This of course relies on the ascription of past significance to present-day petrographic groupings and should therefore be treated with some caution. However, at the risk of speculating further, one might note that when the petrographic evidence for one or two production groupings is taken together with the evidence in favour of a shared communal basis for the knowledge and techniques of ceramic production, very low levels of production (see Section 11.4.3) and a lack of differentiation on the part of producers, then a coherent picture emerges for the earliest phase of ceramic production at Knossos. Rather than being restricted to one or two households, it seems on balance more likely that the earliest ceramic production (ENIa) took place at a supra-household or communal level involving the co-operative effort of a large proportion of the community. It remains open as to what sort of social formation this might represent.

11.4.2 The Concentration of Ceramic Production (ENIa-b)

Concentration refers to the geographic organisation of ceramic production and the spatial relationship between producers and consumers. For example it has been noted that independent specialists often evolve under conditions of unequal resource distribution (Costin 1991:12). However, as has been argued (see Section 10.2.5), such a scenario could not be said to characterise ENIa-b ceramic production. ENIa-b ceramic technology did not place a heavy demand on clay and temper suitability and perhaps as a result the ENIa-b assemblage at Knossos testifies to the exploitation of a wide variety of raw materials. In many cases this exploitation suggests the production of ceramic vessels in a variety of landscape locations, which has been interpreted as having taken place at settlements. If correct this interpretation suggests that suitable clays and tempers were available within the immediate area of most EN settlements. For example at Knossos local Fabrics 1a-i were created using one or two calcareous clays, which were then tempered with limestone, all of which are compatible with a local provenance. During ENIa-b therefore the evidence is consistent with ceramic production taking place in most if not all open settlements, even ones as small at ENIa Knossos (0.25-0.3 ha.). This suggests that the spatial relationship between producers and consumers was close. This is more than likely since production and consumption on such a small scale suggests that the producers must also have been the main consumers. Consideration of the circulation of ceramics (see Chapter 12) also supports this, with 45-85% of the ceramics consumed at EN Knossos being locally-produced and most of the remaining 15-55% probably produced within the immediate vicinity.

11.4.3 The Scale of Ceramic Production (ENIa-b)

Costin has observed that specialist producers, above all independent specialists, are usually heavily influenced by profit or efficiency motives (i.e. production for exchange) (1991:11-12, 15-16). Indeed independent specialists generally rely for their existence on the sort of large general demand for their products that would result from dense population, regional political integration and/or the availability of cheap transportation (Costin 1991:11-12). However, notions of profit or efficiency seem to have little relevance in the context of ENIa-b ceramic production:

- rough estimates of the level of ceramic consumption at ENIa-b Knossos suggest that demand for ceramic vessels was low, perhaps as low as c.25 vessels per year during ENIa and c.789 during ENIb (see Chapter 9);
- notions of functional efficiency do not seem to have been a feature of ENIa-b paste preparation: there is little or no evidence to suggest that the performance characteristics of a vessel influenced choice and combination of raw materials (see Section 10.2.5);
- although essentially the same series of forms are reproduced this does not represent any sort of gain in efficiency via standardisation[13], since the forming

[13] Standardisation has been used to infer specialisation in complex societies, however it is as well to bear in mind that standardisation is equally possible in less complex societies: for example potters are

and finishing procedure for each vessel, especially fine polished vessels, was extremely time-consuming (see Section 10.4). In this respect ENIa-b production is extremely inefficient since it produces small quantities in a labour-intensive production sequence.

Production at this scale and at this sort of level of efficiency could not be considered to be overproduction or production for exchange; rather ENIa-b ceramic production could be characterised as production for livelihood. This characteristic of ENI production is well-illustrated if one considers the important role played by ceramic vessels in acts of exchange (see Chapter 12). If ceramic production were specialised then one would expect to see the role played by ceramics in exchange translating into significant increases in production. During ENIa-b, ceramic production was production for use or livelihood and in the exchange of ceramic vessels it was not quantity (or rather the power of access to vessels in large quantities) which was important but rather quality. Vessels were exchanged because of specific qualities, of which one seems to an association with distant sources (see Chapter 12). Since in many cases the origin of a vessel was masked or at least rendered ambiguous by its form and finish (cf. large style zones), this quality of the vessel must have always to some extent been provided or at least supported by oral information (see Chapter 12). Such a scenario helps to explain the underproduction of ceramics, despite their clear role in exchange: one cannot mass-produce pot biographies, they can only be acquired through time and circumstance. It is therefore interesting that significant increases in output only take place in ENIc-II at the same time as the role played by ceramic vessels in non-local exchanges seems to have been diminished (see below; Chapter 12).

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quite capable of producing surprisingly uniform vessels without production regulations and administrative overseers (Hodder 1981:231-2; Welbourn 1985). It should also be stressed that standardisation as a concept has no meaning unless a clearly more variable type of ceramic exists with which to establish its existence; it is therefore a relative state and not an absolute one.

11.4.4 The Intensity of Ceramic Production (ENIa-b)

If one assumes that the level of consumption also reflects the level of production output (see Section 9.4.5), then during ENIa-b ceramic production had an extremely low output, too low to suggest anything other than part-time, seasonal production[14]. During ENIc-II output would appear to rise significantly, admitting the possibility that production could have been a full-time or at least year-round activity (see below). In contrast, ceramic production during ENIa-b would seem to be characterised by an extremely low intensity. This is particularly clear during ENIa, where the entire yearly output, if in the region of c.25 vessels, could be accommodated within one large open firing. Such a low intensity would be extremely hard to accommodate within conventional definitions of specialisation.

11.5 Changes in the Organisation of Ceramic Production at Knossos (ENIc-ENII)

11.5.1 Changes in Scale and Intensity

During ENIa-b the main local fabrics (Fabrics 1a-i, 2a-e) together comprise c.45% of the Knossos assemblage, however during ENIc-II this figure rises to c.85%. At the same time as this increase in the proportion of local fabrics represented, the estimated number of vessels in circulation also sees a significant increase from c.789 in ENIb to c.8750 in ENIc (see Section 9.4.4). Although ENIc probably also sees a significant increase in population, even when some allowance is made for this (see Figure 9.8), this still amounts to an approximate ten-fold increase in the quantities of ceramic vessels in circulation. As emphasised in Chapter 9, considerable caution must be exercised in the use of these estimates, however although the quantities are surely incorrect the quantitative increase in ceramic consumption over ENIa-b must in some way be real.

[14] Indirect support for a low level of production is provided by the general absence from ENIa levels of tools that could be connected with ceramic production: e.g. sherd burnishers are only found from stratum VII (ENIb), while suitably worn pebbles and shells are found only from stratum VI. While one can never be sure whether differential patterning of artefact distribution between Neolithic strata at Knossos is an accident of sample size (see Whitelaw 1992), the complete absence of potential ceramic production tools below stratum VII remains striking.

Furthermore, some support for the high number of vessels estimated for ENIc is provided by the estimate for ENII which is approximately equivalent.

These striking increases in consumption imply a significant increase in local production output during ENIc-II, which in turn suggests an increase in the intensity of ceramic production. An increase in intensity would also be supported by the evidence for the development and introduction of less labour-intensive finishing methods at this time (see Section 10.4.12). Other technological changes in paste preparation and forming could be interpreted in terms of improvements or gains in efficiency (see Chapter 10). These changes occur alongside an apparent decrease in the degree to which ceramic vessels were moving between other communities and Knossos (see Chapter 12). When taken together all these changes might indicate that the role of ceramic vessels in consumption had changed, with less importance attached to qualities, such as distant origins, and more importance assigned to quantity and availability (see Chapter 13). During this period ceramic vessels may have been used more frequently and the development of new types of finish may signify the creation of new vessel categories. Together these may suggest that ceramic vessels also began to take on new roles.

11.5.2 Changes in Context: The Architectural/Ideological Isolation of the Household (ENIc-II)

During ENIc-II the settlement at Knossos went through a series of important quantitative and qualitative changes. During this period it would appear that the estimated occupied area of the settlement doubled to c.2.5-3.0ha (see Appendix II). This relatively sudden increase in size suggests an increase in population, possibly in the same order. However the ENIc-II period does not just represent a quantitative change in settlement size, but also a qualitative change in house design and construction. ENIa-b structures are generally characterised by thin irregular often insubstantial walls which although exhibiting a general orientation are never truly parallel to each other (cf. Evans 1964:figs. 7, 9-11). Such structures usually exhibit many phases of alteration, addition and abandonment (see Appendix I). During ENI the space of the household is not delimited or clearly marked, inside space flows into outside space and different structures merge with one another.

In contrast, ENII structures are much more substantially constructed (Evans 1994:11; cf. Evans 1964:fig. 15; 1994:figs. 5-6) with much thicker walls, which have clear inner and outer faces and which are invariably parallel or at right angles to each other. In addition during ENII the stone foundation for the pisé superstructure now becomes much more substantial reaching a height of c.1.0m (Evans 1994:11). Houses now stand more apart and there now appears to be a marked distinction between inside and outside space, emphasised by straight well-built walls and narrow entrances. Moreover Evans has noted that some of the ENII structures "might have had small enclosed yards attached" (Evans 1994:14). In addition ENII houses seem to be more complex consisting of an assortment of small and large rooms. Thus, in terms of the quality of their construction and the regularity and complexity of their design, ENII structures more closely resemble the large well-built complexes of rooms characteristic of MN and LN than anything that might have preceded them.

It is within the context of this new isolation and elaboration of the household dwelling that one might understand the appearance for the first time in the Cretan Neolithic of what appear to be house models (see Plate 61). These objects first appear in ENII and continue at least as far as LN (Furness 1953). All examples studied proved to be in local fabrics (Fabrics 1d, 1e, 1f). Previously, fragments of these objects have been considered to derive from rectangular 'legged receptacles', however study of an unpublished semi-complete example from the 1968-1970 excavations suggests that they should be considered to somehow represent built structures. One might note in particular the niche to the side of the large opening, the side windows/doors and details of roofing. Furthermore, like these 'models' ENII built structures are rectilinear and single-storeyed (no evidence for staircases). If this interpretation of these models is correct it would suggest that the architectural isolation of the household may also have had an ideological dimension. Neolithic house models also occur on the Greek mainland and it has been suggested that these may "represent, among other things, an emphasis on the productive unit and its members" (Andreou et al. 1996:558).

When these features are taken together they seem to suggest a growing self-consciousness on the part of the household. Similar (and chronologically parallel) changes in the spatial organisation of LN (Greek) households have been interpreted as signifying a change from an ideology of sharing to an ideology of hoarding (cf. Halstead 1995; see Chapter 4). In Chapter 4 it was suggested that this period may actually see the emergence of the household as *the* primary social and economic unit and a concomitant decline in the importance of supra-household groupings. At Knossos the reasons why this change came about during ENIc-II are largely hidden, however it is perhaps significant that by the end of the preceding period (ENIb), Knossos had already probably reached the upper limits for Neolithic settlement (i.e. c.1.0-1.5ha with a population of 150-300), as defined by Halstead (1989:70; c.1.5ha, 300 people). It is generally accepted that once communities reach a population of more than c.300 it becomes harder/impossible for them to function on a face-to-face basis (see references in Broodbank 1992). If so then this would have further weakened the ability of the community to act as one, something which would have had severe consequences for any ideology of sharing or communal action.

11.5.3 The Organisation of Ceramic Production During ENI-II

In the context of ENIa-b it has been argued that one of the main factors promoting stability and continuity in production was the communal context in which ceramic production probably took place: production was visible and public with the production act probably being seen in terms of an active recreation of the past, carrying forward communal ideals, values and categories into the future. Such values and categories are likely to have been considered doxic or beyond dispute. Within such a context opportunities for innovation were probably very restricted and possibly actively discouraged.

The apparent emergence during ENII of the household as a distinct architectural and symbolic entity and the weakening of any ideology promoting communal action, which such an emergence might represent, is likely to have had an effect on the way ceramic production was organised. In this way such a restructuring of values (and society?) might provide a context within which the ENIc-II changes in production might be situated. For example, if the context of production moved from being public to private, or from the communal to the household, then the influence of communally-held values, particularly social controls inhibiting innovation, is likely to be weakened, precisely because they were no longer being reproduced in a communal environment. In this way the timing of these technological changes in production could reflect a wider shift in emphasis from the communal to the private. This must, however, remain merely plausible conjecture. The increases in scale, intensity and efficiency of ENIc-II ceramic production certainly suggest that changes took place and it remains theoretically possible that ceramic production at this time took on a new restricted, differentiated and thus specialised character. Ultimately, however, the degree to which these changes may or may not imply changes in organisation remains unclear.

Conclusions

In this chapter it has been argued that previous attempts to characterise earlier Neolithic ceramic production as specialised can be challenged theoretically, methodologically and in the overly simplistic way they interpret ceramic variation. These studies have generally not sought to understand specialisation nor how it relates, among other things, to how we conceive the relationship between producers and consumers under the DMP. Often there also seems to be confusion between the consumption by non-producers of items produced *for livelihood* and the consumption by non-producers of products produced specifically *for exchange*; only in the latter case need specialisation be implied. In Chapters 4-5 it was argued that with the great detail available from the integration of various categories of ceramic data (macroscopic and microscopic) one need no longer occupy oneself with self-serving assessments of where the EN situation accords with or differs from different generalised types of production organisation. Rather, as this discussion of ceramic variation has demonstrated there is sufficient detail available to allow one to move beyond typology and to explore the subtleties and potential uniqueness of the way ceramic production was organised during the earlier Neolithic[15].

Although the ceramic data from ENIa-b Knossos exhibit a degree of variation which is comparable to that found at EN-MN Franchthi, at Knossos macroscopic and microscopic study indicated that a large proportion of this variation could not be correlated with local production and thus could not be used to demonstrate that local ceramic production was restricted and in the hands of individual or household specialists. Instead a considerable proportion of the ceramic variation identified maps out, not as production by different producing groups within a single site, but as production across the wider landscape at a much larger spatial scale: during ENIa-b pottery was produced at a number of different and probably settled locations around Crete.

Detailed contextual study of EN ceramic variation at Knossos, suggested that during ENIa and possibly during ENIb ceramic production was non-specialised and organised at a higher communal level than the individual household. Producers seem to have operated as a group with their primary affiliation being to the community. Production itself was probably regulated by the group but operated within powerful notions of suitability and fitness, which may have been shared with other communities. Production units were small, as would befit small communities, and probably comprised a proportion of the total population of the community. Demand was relatively low and production, although highly labour-intensive, was probably seasonal and part-time. Ceramic technology itself seems to have been simple but highly-effective[16] both in the way it was easily learnt and in the quality of its product.

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[15] cf. similar comments made in reference to the study of EBA specialisation (Day, Wilson & Kiriatzi 1997:276).

[16] cf. Perlès (1992:148): EN (Greek) ceramic technology was "local, limited and technologically simple".

These conclusions bear comparison with a recent study of EN[17] (Greek) shell bead production at Franchthi (Miller 1996; Perlès & Vitelli 1999:104-5). Previously thought to represent the remains of a specialised workshop (e.g. Perlès 1992; Demoule & Perlès 1993), detailed re-analysis and experimental replication suggested that production was characterised by high labour input, low overall output and, a low skill requirement (Miller 1996). It is striking how many of the features of EN bead production at Franchthi recall those identified in ENIa-b ceramic production at Knossos: high labour input, low output, relatively low skill requirement, low efficiency, with the high labour investment hinting at the high value of both beads and pots. Regarding EN shell bead production at Franchthi it has been suggested that the enormous labour investment involved in making one necklace could indicate that production of bead necklaces was "a collective undertaking by some portion of the Franchthi community" (Perlès & Vitelli 1999:104-5). This form of organisation parallels that suggested here for ENIa-b ceramic production at Knossos.

In this way ceramic production may have been one of the mechanisms active during the earlier Neolithic which affirmed the importance of the community over that of individual households. ENIa-b ceramic production was shown to exhibit striking stability and continuity. This was interpreted as something that was *actively* created. During ENIa-b communal acts of production may have served to maintain existing social values and categories through their reproduction in material objects and specifically to promote them as ancestral values reflecting an idealised socio-economic scenario of egalitarianism, where all individuals or households work together as equals. Ceramic production may therefore have functioned like other co-operative acts of production, such as sowing and harvesting, in promoting group cohesion and defining group identity. The seasonal nature of early ceramic production may furthermore suggest the

[17] Miller (1996:10-11, 23) notes that none of this material was found in primary deposits, although there was a clear association with EN material in contexts dating to the early seventh millennium. Thus this material spans not just the EN, as Miller suggest, but could date back into the Aceramic.

possibility that ceramic production, like harvesting and sowing, may have played a significant part in the ritual calendar.

Within this context any attempt to privilege specific individuals as specialists seems to out of place and perhaps even anachronistic. Desire to isolate significant individuals within the earlier Neolithic may have more to do with our modern obsession with individuality, than any ancient reality (Thomas 1990). Certainly there is no overt signalling of individual identity in ceramic production during this period: form and finish remain remarkably constant, with the same limited set of designs consistently reproduced over dimensions of time and space, which transcend the individual. Under such circumstances it is therefore difficult to find a place for Vitelli's individual specialists[18]; rather it is possible that within communities of the earlier Neolithic, such as ENIa-b Knossos, individuality was suppressed in favour of corporate solidarity, as would be expected in an egalitarianist society. Within such a scenario the community or a large proportion of it may have somehow functioned as the 'household of all', making the pursuit of specialisation at an inter-household level as meaningless as its pursuit within the household along lines of age or gender.

If acts of ceramic production expressed in some way a communal ideology of sharing and equality, then presumably the vessels produced belonged in some way to all. Consequently after production, the initial distribution of vessels was most probably not controlled by a restricted group of producers, seeking recompense for their investment of time and labour and with a sense of personal ownership engendered by having been responsible for their production. Instead access to vessels after the completion of firing may have been determined by individual or household status within the community and/or age and gender. Alternatively the very low quantities of vessels in circulation during ENIa may indicate that individual households did not directly own their own sets of vessels and instead that ceramic vessels were instead the property of the community and

[18] Here it is perhaps worth noting that in Rice's typology of specialisation individual specialists occupy her fourth category and imply a specific social and economic scenario which does not resemble that of ENIa-b.

were perhaps centrally stored ready for use only on special occasions (see Chapter 13).

The relevance and utility of the term specialisation in an EN context really only begins when more obvious changes in production occur during ENIc-II, which allow comparison with the situation described for ENIa-b. Specialisation is, after all, "a relative state, not an absolute one" (Costin 1991:2). These changes could only be identified in fabrics, which mineralogy and frequency would suggest were locally produced at Knossos. However, since the ENIc-II period sees a sharp drop in the proportion of non-local fabrics represented at Knossos, with such a small sample it is impossible to be certain that parallel changes did not take place at other production locations outside Knossos. At the same time as these technological changes take place, there are also significant increases in the scale of ceramic consumption and by implication ceramic production, which would indicate a significant increase in output and intensity over the previous phase (ENIb). Such an increase in intensity provides a context within which to understand some of the technological changes, such as the introduction of more efficient (time, labour) techniques of forming and finishing.

It was suggested that these changes could not be properly understood without an appreciation of the possible social changes taking place during this period. Qualitative and quantitative changes in architecture and the appearance of symbolic representations of built structures may suggest the emergence of the household as a distinct architectural and symbolic entity and thus a weakening of any ideology promoting the rights of the community over that of the household. If during ENIa-b ceramic production was concerned with the reproduction of communally-held values with powerful social restrictions on change, then the fact that a wide series of technological changes could take place during ENIc-II suggests that the values which communal acts of ceramic production reproduced were no longer considered to be beyond dispute, but rather had become open to doubt, manipulation and innovation. It was suggested that one way that this might have been achieved was if ceramic production moved from being a public activity to being a private one. A possible parallel at ENII Knossos for such a move could be the enclosing of previously open public areas between houses to create private yards or enclosures attached to individual houses. This development has near contemporary parallels (LNI Greek = ENIc-II) on the Greek mainland and seems to have reflected a move in the shared consumption of food from public to private (see Halstead 1995; see Appendix I).

It is possible, therefore that ceramic production during ENIc-II moved from being a communal activity to being a household activity. These changes in technology, scale and intensity may indicate that ceramic production took place more frequently and was conducted with more efficiency. Although this could still be explained if ceramic production remained an unrestricted practice, it is equally possible that the ENIc-II period sees the very beginnings of some sort of (household?) specialisation in ceramic production. In view of this possibility it is instructive to compare ENIc-II ceramic production with what comes later. Broodbank has argued that the succeeding MN phase is "characterised by a permanent contraction in the number of types of open shape in use, and the overwhelming popularity of a single carinated bowl form", moreover the period also sees an increased restriction in the range of design types represented, a restriction which only increases during LN (Broodbank 1992:54-5)[19]. These observations led him to draw a "contrast between "ENII diversity and MN high-volume uniformity" (Broodbank 1992:65). These statements are at least partly corroborated by my own preliminary observations of changes in ripple burnish between ENII and MN: during ENII (and ENIb-c) ripple-burnish is characterised by well polished surfaces and deep wide carefully applied ripples; however during MN it is characterised by less well-polished surfaces and shallow thin ripples. The latter development would seem to represent a quicker and more efficient method of applying such a finish. Regarding the LN phase Manteli has argued that the development of an 'open style' of design syntax, an increase in pattern-burnishing and the abandonment of 'time-consuming' forms of decoration, such as ripple or 'dense style' incised/pointillé, should be understood as a sign that 'mass production forces' have taken over (Manteli 1993a:69; cf. Manteli & Evely

1995:5). In addition by LN at least some ceramic vessels were now being kiln-fired (see above). These features would seem to confirm the likelihood that LN ceramic production at Knossos was specialised in some way (Day et al. 1997:287).

These observations of MN-LN ceramic production, although not backed up by more detailed technological and mineralogical analyses at least suggest a coherent picture. It would appear that the series of changes which characterise ENIc-II ceramic production represent the beginnings of a process whereby ceramic production became increasingly more efficient in terms of time and effort. If ENIc-II represent the beginnings of some sort of specialisation, then it would appear that ceramic specialisation continued to be a feature of ceramic production in later phases of the Neolithic at Knossos, although quite what form this specialisation took remains impossible to determine without further study. Vitelli has argued that during the later Neolithic ceramic production in Greece actually became a non-specialised craft activity (Vitelli 1993b:252). However, these preliminary observations regarding later Neolithic phases of ceramic production at Knossos would seem to support those of Kalogirou, who has argued (*contra* Vitelli) that Greek LN and FN ceramic vessels required as much skill and labour investment as earlier EN-MN vessels and as such cannot be used as evidence for non-specialised production (Kalogirou 1997).

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[19] Whitelaw, however, has argued that the drop in the range of MN designs may be a result of smaller sample size (1992:230).

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CHAPTER TWELVE

THE CIRCULATION OF CERAMIC VESSELS DURING THE EARLY NEOLITHIC

12.1 The Cretan/Knossian Isolation Hypothesis

"While a few earlier pottery imports may be hidden in the mass of material from the site [Knossos], their incidence cannot but be negligible" (Broodbank 1992:48).

"In no system is everything so singular as to preclude even the hint of exchange... such a construction of the world -... as totally heterogeneous... - would be humanly and culturally impossible" (Kopytoff 1986:70)

"Whether stemming from economic need or social strategy, ...the use of objects and materials from distant sources seems to be an integral part of human behaviour which can be traced back at least as far as the Middle Palaeolithic" (Scarre 1993:3)

It has become commonplace in studies of southern Aegean in the seventh, sixth and even fifth millennia BC to find Knossos and Crete described in terms of isolation and not interaction. Thus Sampson in his study of the Neolithic of the Dodecanese and its relationship to other regions of the southern Aegean, emphasised that Crete was culturally isolated during the Greek EN and MN periods (Sampson 1984:239; cf. Rackham & Moody 1996:2). Likewise Manteli has argued that Crete was isolated until the LN-FN period, when there is evidence for a much closer relationship with the Aegean (Manteli 1993a:158-168). Broodbank has gone even further in down-dating the period of earliest interaction arguing that "until the 4th millennium (the FN period), it is intrinsically quite probable that Crete constituted a largely self-contained world" (1992:48, 47-8). Vagnetti has similarly highlighted the FN period as the phase in which Crete joins the wider Aegean and has pointed to parallels (baking pans/cheese-pots) between Nerokourou in West Crete and the Alepotrypa Cave (Peloponnese), the Attic-Kephala culture at Emporio VII-VI, the Ayio Gala Cave, Tigani (Samos) and other sites in the Dodecanese (Leros, Yiali, Kastro, Kalythies, Koumelo, Aspri Petra, Vathy) (Vagnetti 1996:34-6)[1].

[1] Many of these parallels (e.g. Emporio VII-VI), Ayo Gala, Tigani etc.) date to LN, thus appearing to undermine the significance of any synchronism with Nerokourou. However, it seems likely that Nerokourou dates earlier than FN: the presence of wishbone handles (absent from latest LN/FN deposits at Knossos) strongly suggests an LN date for at least some of the

An integral part of the isolation hypothesis is the common view that during the earlier Neolithic it was not so much Crete that was isolated as Knossos itself (cf. Evans 1968:273-6; 1971:114; Vagnetti & Belli 1978:126; Cherry 1985:24,27; Broodbank 1992:47-9; Vagnetti 1996:30; Manteli 1996:132; Rackham & Moody 1996:97; Manning 1999:470). Most recently Manning has argued that

> "Whilst no comprehensive survey will ever be possible, it nonetheless appears likely that Knossos was the only large, significant settlement on Crete during the entire Neolithic period... Indeed there were very few other settlements until the LN-Final Neolithic (FN), when a number of small sites appeared around the island" (Manning 1999:469).

Manning also considers that, if one ignores the circulation of Melian obsidian, "there is almost no (cultural) evidence of contact between Knossos - or anywhere on Crete - and the rest of the Aegean (or beyond) until the FN period" (1999:470).

Naturally the conclusions reached in previous studies of EN ceramics at Knossos have played an important part in the formation of these ideas. The statements of a whole series of scholars regarding the overall homogeneity of the EN sequence at Knossos have left little room for the development of alternative hypotheses (cf. Mackenzie 1903:158-9; Furness 1953:95, 103, n.16; Evans 1964:194; Manteli 1993a:42; Evans 1994:8). In addition the failure to identify or publish other EN sequences from around the island has also prevented further insight (see Appendix I). Compounding all this is the general failure amongst scholars working on material from around the southern Aegean to include Crete in their thinking or even in their references (e.g. Perlès 1992; see Appendix I). Such factors have conspired to make Knossos' isolation as much intellectual as practical.

By now, however, it should be clear that the homogeneity view of the EN Knossos assemblage cannot be sustained any longer. In Chapters 6-7 a considerable degree of variation in fabric, form and finish was identified and significant correlations between fabric, form and finish were noted. In Chapter 10

Nerokourou material (see Appendix I). This gives new significance to the parallels and suggests that Cretan-Aegean interaction cannot be confined purely to the FN period, but must date back at least to the Greek LN (see also Appendix I).

it was argued that a large proportion of this variation/correlation can only be accounted for if production was taking place at different locations around Crete. It has also been demonstrated that contrary to previous estimations Aceramic and ENIa Knossos remained too small to be demographically self-sufficient, thus further implying the existence of other undiscovered Aceramic and EN settlements (see Appendix II). In this way it becomes clear that Knossos, far from existing in isolation, must have been and indeed was interacting with other settlements. In this chapter an attempt will be made to characterise the nature of this interaction and to trace its development over time. Discussion will focus primarily upon the circulation of ceramic vessels, however reference will also be made to the circulation of other goods in order that a more holistic picture of EN exchange might be built up. Finally, previous attempts to model earlier Neolithic Aegean exchange will be assessed in the light of this new data.

12.2 Understanding the Circulation of EN Ceramic Vessels

In this thesis ceramic provenance has been approached from several angles. Firstly petrographic study can at times lead to the identification of the raw materials employed with specific areas in the landscape (e.g. Fabric 12 Mirabello Bay) and even in less favourable circumstances petrology at least allows source areas to be characterised in terms of basic geology. Secondly, macroscopic study has allowed fabrics to also be characterised in terms of their features of form and finish. These features can be compared with material from other sequences in Crete and the southern Aegean in order to assess degrees of similarity and difference. Thirdly when the frequency in which fabrics, forms and finishes occur is calculated, it becomes possible to identify not only particular fabrics, forms and finishes which are common, but also those which are rare or unique. All these data have been presented in detail in previous chapters; in particular, assessments of likely provenance, some of which are used below, can be found in Chapters 6-7 and Appendix V. In this section through a combination of these three different perspectives on provenance, an attempt will be made to establish the approximate scale, distance and directions in which ceramic vessels circulated in the various phases of EN (see Appendix I).

12.2.1 Scale and Distance

The frequency (per 1000 sherds) with which the main fabrics occur in the different EN strata at Knossos is presented in Figure 12.1.

	Fabrics 1-4	**Fabric 5a**	**Fabric 6**	**Fabric 8**	**Total Rare (<15/1000)**
IX	441.4	103.3	232.5	119.9	102.9
VIII	401.0	160.8	171.8	119.1	147.3
VII	442.5	101.8	197.6	91.7	166.4
VI	497.6	186.8	118.7	86.6	110.3
V	851.9	71.3	27.8	33.3	15.7
IV	873.0	27.9	5.6	25.4	69.1

Figure 12.1 Frequency (/1000sherds) of Most Common Fabrics (Strata IX-IV)

Fabrics 1-4 are frequently represented fabrics which petrological analysis suggests would be most consistent with an origin in the area immediately local (<5km) to Knossos. Petrological study of Fabrics 5a, 6 and 8 concluded that these were inconsistent with an origin within this immediate area, but could have originated within the general area of Knossos (Herakleion basin). The clear mineralogical links between Fabric 6 and the most common EMII cooking pot wares from Knossos may seem to confirm this. The remaining rare fabrics combined together account for only a small proportion of the total assemblage in each stratum. These are never more frequent than c.15/1000 sherds, with frequencies of less than 1/1000 being common. This rare group comprises around 25 fabrics in total over the whole EN sequence.

In Chapter 7 it was demonstrated that several of the rarest fabrics have unusual forms and/or finishes which find no parallel within the more frequently represented fabrics. On the basis of similarities with published sequences from various parts of the southern Aegean and/or an incompatibility with Cretan geology, this group of fabrics was tentatively interpreted as off-island. In contrast the majority of this rare group of fabrics present features of form and finish which are so closely comparable with Fabrics 1-6, 8 as to make a Cretan provenance hard to doubt. Amongst these fabrics is Fabric 12, for which petrological analysis has indicated a provenance in the Mirabello Bay, east Crete. This would suggest that certainly in this case, the rarity with which this fabric occurs at Knossos is directly related to the distance from its place of manufacture (c.70km.). This in turn suggests that other fabrics in this rare group of 'Cretan' fabrics, which remain unsourced might also originate on Crete but at a greater distance from Knossos than Fabrics 1-4 or 5a, 6 and 8.

	Fabric 10	Fabric 12	Fabric 14	Fabric 24	Fabric 28
IX	0	3.7	12.9	0	7.4
VIII	0.3	0.3	0.9	15.8	1.2
VII	1.1	0.3	0.3	4.2	1.9
VI	0.7	0	0.3	0.3	0
V	1.0	2.6	0	0.3	0
IV	1.3	5.5	0	0.2	0

Figure 12.2 Frequency (/1000sherds) of Fabrics 10, 12, 14, 24 and 28 (Strata IX-IV)

A number of considerations suggest that this distance need not always have been as great as that indicated by Fabric 12. Close mineralogical links are apparent between Fabric 14 and one of the cooking pot fabrics at EMII Knossos, a link which may indicate a provenance somewhere within the Herakleion Basin. Likewise, the closest source for the serpentinite in Fabric 10 is to be found in the foothills of Mount Ida, at the far west edge of the Herakleion Basin. Figure 12.2 records the frequency with which these fabrics occur at Knossos during EN. Although consistently represented, it is striking that Fabrics 10 and 14 occur as rarely as Fabric 12 (Mirabello Bay) and others which may be off-island (Fabrics 24, 28). And so, if either of these two fabrics do indeed have a provenance in the Herakleion Basin, then this would suggest that there was a very significant fall-off in the frequency with which fabrics occur at Knossos after only a relatively short distance from source.

If this interpretation of frequency and provenance is correct, then it would seem to indicate that vessels from more distant areas of the Herakleion Basin and other regions of Crete, such as the Mirabello Bay, are as rare at Knossos as those vessels, which are likely to have come from off the island. If so, then it would seem that ceramic vessels circulated most intensely and were most likely to be consumed and discarded at sites close to their location of production. The other important implication is that on the rare occasions when a vessel was exchanged beyond this zone, distance from source was no longer a factor and such vessels could potentially circulate over great distances.

The changing circulation of ceramics can also be expressed in terms of fabric diversity. By dividing the total number of fabrics within a single stratum (see Figures 9.3-4) by the total number of sherds in that stratum and then multiplying by one thousand one can produce a measure of the range of fabrics in each stratum (see Figures 12.3-4).

Stratum	Fabrics/1000 sherds
IX	31.37
VIII	7.00
VII	5.28
VI	3.84
V	4.99
IV	1.39

Figure 12.3 Fabric Diversity Per Stratum

This measure reflects very well the surprising range of fabrics present in stratum IX despite its relatively small size (total 542 sherds). Since only Fabrics 1a-i, 2a-e in stratum IX are likely to be local to Knossos, this suggests that the very first phase of ceramics saw a particularly intense circulation of ceramic vessels. In contrast for stratum IV (ENII) Figures 12.3-4 suggest a decline in fabric diversity. This would seem to suggest a decrease in the circulation of ceramics; an impression only reinforced by the knowledge that almost half of the different fabrics represented in stratum IV are actually variants of local Fabrics 1-4 (i.e. 1b, 1d, 1e, 1f, 2a/b, 2c, 3, 4).

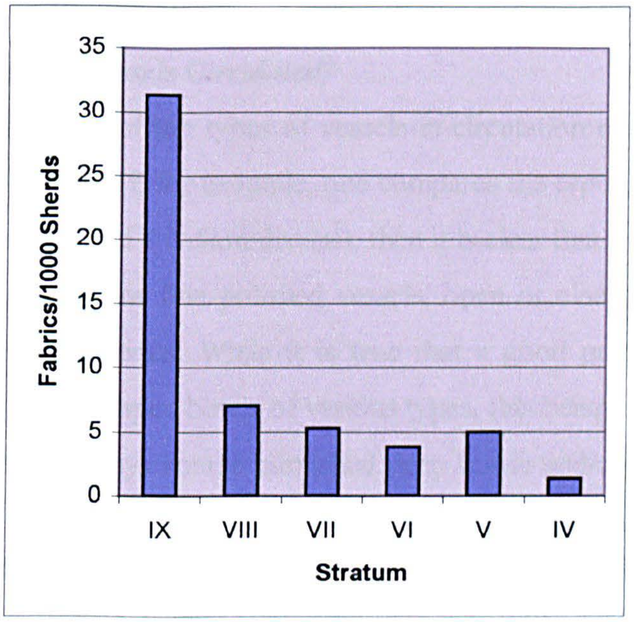

Figure 12.4 Fabric Diversity Per 1000 Sherds Per Stratum

12.2.2 Temporal Changes in Circulation (ENI-II)

A comparison of the frequency with which Fabrics 1-4, 5a, 6, 8 recur in different strata (Figure 12.1) indicates a high degree of consistency between strata IX-VI and again between strata V-IV. This chronological distinction, taken in conjunction with the basic conclusions reached above, suggests the existence of two chronologically distinct patterns of circulation during the course of EN:

(1) Consistently during ENIa-b ceramic vessels circulated widely between sites, which probably lay within the vicinity of Knossos, perhaps within the Herakleion basin. This circulation may have reached a peak in stratum IX. During ENIa-b at Knossos vessels, produced in the immediate area (<5km) account for under half of the total assemblage, vessels produced in Fabrics 5a, 6 and 8 comprise between c.11-23% each, leaving less than 10% of the assemblage from possibly more distant sources.

(2) In ENIc there is a significant change to this pattern of circulation. During ENIc-II at Knossos vessels produced in the immediate area (<5km) now consistently account for over 85% of the assemblage, vessels produced in Fabrics 5a, 6 and 8 only comprise between c.2-7% each, leaving only c.1.5% of the assemblage possibly from more distant sources.

12.2.3 What Types of Vessels Circulated?

Careful scrutiny of the types of vessels in circulation reveals little in the way of clear patterning. If, for example, one compares the types of vessels which occur in Fabrics 5a, 6 and 8 (>5km distant), then it is clear that a variety of vessel types, coarse burnished or fine polished vessels, open or closed, are present at Knossos in non-local fabrics. While it is true that a good proportion of these vessels are fine polished open bowls of various types, this being especially true of Fabric 5a, there are always coarse burnished deep bowls and/or collared/necked jars present in reasonable quantities. This variety is also apparent in rarer fabrics. Thus although Fabric 12 (Mirabello Bay) is most often present in different types of very fine dark polished open bowl, there are also coarse burnished vessels, one of which (stratum VIII) is round-based and has been burnt on the interior (see Chapter 13 on cooking pots). Likely off-island vessels are variously coarse (cf. coarse burnished hole-mouth jar in Fabric 24 (98/43, 98/44), coarse burnished red-slipped tubular-lugged vessel in Fabric 28 (97/36)) or fine (cf. shallow bowl in Fabric 31 (97/101), painted vessels in Fabrics 25, 32 and 34).

This is a surprising but very important conclusion, since previously it has been thought that only decorated/fine pottery was likely to circulate during this period (Halstead 1999:80). Rather the evidence from Knossos suggests that a wide variety of different vessels could circulate, indeed as wide a variety of forms and finishes as is found in local fabrics (Fabrics 1a-i, 2a-e). In the next chapter the ways in which some of these vessels might have been consumed are discussed in detail. Here it suffices to note that fine polished open bowls are very likely to have been used for serving and display, while the collared or necked jars with flared or normal strap handles would have made containers suitable for both liquids and solid foods as well as other items. Such containers could have served equally well for storage or transport and it seems likely that they served both purposes (see Chapter 13). In this way the movement of ceramic vessels, in at least some cases, probably also testifies to the movement of other commodities which comprised the contents of these vessels. The implication of this variety[2] in the types of vessels in circulation is that models of exchange which emphasise the importance of distinguishing between fine and coarse vessels or luxury and utilitarian vessels may be imposing a *fixed* 'modern' set of value categories upon vessels which seem to have been subject to differing and varying valuations in the past (see below).

12.2.4 Direction of Movement and Technology of Transport

The direction in which vessels circulated is almost impossible to assess with any confidence, since only one site within this network of contacts was sampled (Knossos) and the exact location of almost all other sites is unknown. However, it is possible to make some tentative suggestions regarding broader patterns of circulation. The distribution of known and possible EN sites consistently suggests a focus along the northern coast of Crete, from at least as far east as the Mirabello Bay and possibly extending west from Knossos towards Chania (see Appendix I). If this picture is correct it would seem to imply that some movement between settlements, certainly any that required a large distance to be covered, was predominantly east-west and maritime based. In their modelling of the maritime colonisation of Crete, Broodbank and Strasser suggest that "hide-boats or logboats... [were] the most likely form of transport... given the constraints of an early Neolithic tool kit" (Broodbank & Strasser 1991:241), while elsewhere the use of simple reed boats has been proposed (Cherry 1985:21). In each of these cases it is likely that such vessels were employed in short-range maritime movement, that is movement which hugged coastlines and hopped to visible nearby islands, and which in any one day could only cover a relatively short distance (cf. Cherry 1985:21-2; Broodbank & Strasser 1991:241). Thus, the likely presence at Knossos of a few vessels originating in southern Greece and south-west Anatolia suggests that this east-west axis of maritime

[2] If one considers the range of vessels represented by the possible Cretan imports identified in sequences around the southern Aegean, one inevitably finds that all of these are decorated in some way (slashed cordons, incised/pointillé, barbotine). However, this pattern results from the

movement ultimately extended further west and north via the island of Cythera to the Greek mainland and east and north via the islands of Kasos, Karpathos and Rhodes to Anatolia (see below for further discussion).

12.3 The Circulation of Other Goods?

The ways in which exchange systems of the Neolithic Aegean have been variously approached, have recently been subject to careful reappraisal (see Perlès 1992:117-9). Perlès identifies three different perspectives and methodologies, which are characterised here as follows:

(1) *Socially Simplistic*: although tools, raw materials, ornaments and prestige goods are considered to have some value in social relations, little or no attention is paid to possible differences in production, quantities in circulation, use value, regional distribution. Such an approach tends to produce "only one form of Neolithic exchange, one socioeconomic basis for the circulation of goods, one distribution network" (Perlès 1992:117).

(2) *'Joining the Dots'*: socio-economic forms of production and technical function of the goods are ignored in favour of a simple analysis of their distribution at a regional level. No distinction is made between different productive and consumptive forms of an object, such as obsidian cores, debitage, blades and scrapers. Instead these are all subsumed into a single artefact category. Such an approach ignores the extent to which different stages in the life of an object (production, distribution, consumption) all inform upon each other (see Chapters 3-5).

(3) *Single Artefact Biographies*: largely in response to criticism of approaches (1) and (2) some studies have considered the production and distribution of a single category of raw material or finished item (e.g. obsidian). However how these raw materials or finished goods interact with other related goods or materials is ignored.

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impossibility of recognising undecorated vessels in these sequences on the basis of style alone and cannot therefore be used to argue for the exchange of only decorated vessels.

Clearly an understanding of Neolithic exchange systems is predicated upon diachronic study of all commodities in circulation and, most crucially, how different objects or commodities were articulated in practice. Unfortunately, however, study of the latter is currently inhibited by the lack of contextual information regarding the relationship between different types of object or commodity, whether in acts of production, consumption or exchange (see Chapter 9). This restricts study of the circulation of ceramics and other goods to the comparison of individual summaries (see below), which give useful details of the circulation of specific categories of material in comparison to ceramics, but which, it must be stressed, do not provide a means of entering into the different contextual relationships, which must have existed between ceramics and other materials.

12.3.1 Chipped Stone

Obsidian is the clearest example of a resource which must be procured from a long distance. It has been argued that the main source for the obsidian at Knossos was Melos (Cann & Renfrew 1964). However this was based on a small sample (n=5) and in a separate larger sample, analysed at Bradford University by Dr. A. Aspinall, two pieces from ENI and one from ENII proved to be from the island of Yiali, off the south-west Anatolian coast (Cann & Renfrew 1964:239; Evans 1994:5 n.10). The unexpected discovery of the presence of Yiali obsidian raises the possibility that more might exist in the assemblage than originally thought. Obsidian was by far and away the main form of chipped stone in use in Aceramic and EN Knossos and was occasionally retouched (Evans 1964:142, 146, 150, 155, 157). Obsidian is most common at Knossos in ENI levels and amongst these there are peaks in numbers in strata IX, VIII and later in stratum V (mostly small flakes) (Evans 1964:233). In addition small quantities of chert are found throughout the deposit, which were occasionally retouched.

Another form of chipped stone are the schist 'pot lids', which occur from stratum VII (Evans 1964:231). In many cases these are in fact too small to have served as lids, at least for ceramic vessels, but could have served as pot stands (see Chapter 10). The nearest sources of schist occur at some distance to Knossos and unless the raw materials were procured directly by the community at Knossos, these items are likely to be non-local products. The nearest schist sources are on the north flanks of Ida, on the western side of the Herakleion Basin and possibly around Iouktas (see Appendix III).

12.3.2 Ground Stone

Stone axes occur from the Aceramic onwards, while stone 'maces' occur from stratum VI (Evans 1964:229-31). These have been classified on the basis of their raw material (see Warren 1968) and it has been generally assumed that all have a Cretan raw material source, although this has never been examined analytically. A striking feature of the axes and maces in ENI levels at Knossos is that scarcely any are made from limestone, the most suitable local rock to Knossos: there is a single limestone mace from stratum VI and an axe from stratum IV (Warren 1968:240-1). Thus it would seem that during Aceramic-ENI exotic materials from non-local sources, such as 'greenstone', chlorite and serpentinite of various colours, were deliberately sought, all seemingly favoured more for their appearance than their performance characteristics (Warren 1968:239-40; Evans 1968:270). The nearest sources of serpentinite and chlorite lie in the foothills of mount Ida around Gonies (Warren 1968:239 n.2). Figures 12.5-6 depict variation in raw material sources per stratum.

The axes from Knossos are currently being subject to a detailed re-study by Dr. T Strasser. Preliminary results from this study indicate that three pieces[3], previously considered to be haematite are now identified as emery (T. Strasser pers. comm.). Since Aegean sources of emery are confined to the Cyclades and coastal Anatolia (Izmir), this important discovery indicates the exploitation of off-island stone sources from the Aceramic and compliments the evidence for the use of obsidian from the islands of Melos and Yiali. Evans states that stone querns and mortars, known from the very earliest phase of ENI, are generally

[3] i.e. one from stratum X (Aceramic), one from stratum IX (ENIa) and one from stratum IV (ENII) (T. Strasser pers. comm.)

made from "volcanic rocks, grits and sometimes limestones" (Evans 1964:231). Currently there is no known source for such volcanic rocks on the island and certainly if such volcanic mortars were found in Bronze Age strata an off-island provenance would be immediately presumed. It is also perhaps worth mentioning in this context the unpublished marble bowl from an Aceramic level in sounding X (Evans 1970b) as well as the two marble figurines from stratum VIII (Evans 1964:237-8). Two pieces of marble from Neolithic contexts at Knossos, thought to resemble figurine marble, were analysed by S.E. Ellis of the Department of Mineralogy (British Museum): although one was identified as a granular limestone unlike any known Cycladic marbles, the other proved to be an onyx-marble, the sources of which are uncommon (Ucko 1968:321 n.1). Unfortunately neither stone could be linked to a specific source.

12.3.3 Shells and Other Ornaments

Numerous marine molluscs occur throughout the EN deposit at Knossos (Evans 1964:238). By far the majority were collected worn and empty from the beach and thus were not a food resource (Reese 1987). This suggests another function: some appear to have been used as burnishing tools, others have been pierced, presumably to be worn (Shackleton 1968:264-6). Although explicable in terms of direct procurement, their presence could also be accounted for by their circulation as exchange items, perhaps in the form of ornaments. In addition to this probable use of shells there are variety of bone, clay and stone beads and pendants, all of which seem to have been used as forms of body ornament (Evans 1964:237).

12.3.4 Colouring Materials

Lumps of red and yellow ochre are known from stratum X, stratum V and stratum IV, while a small piece of malachite and two pieces of azurite come from stratum IX (Evans 1964:238).

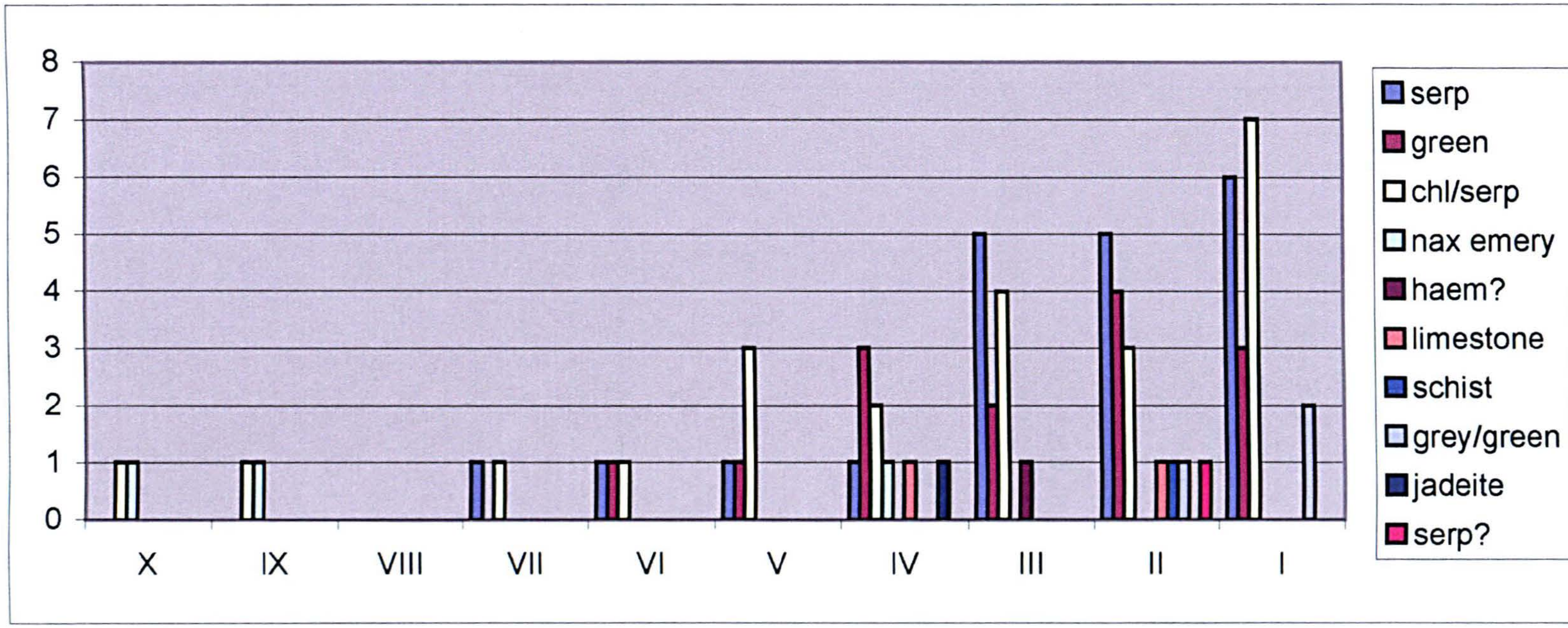

Figure 12.5 Variation in Raw Material Sources of Stone Axes Per Stratum

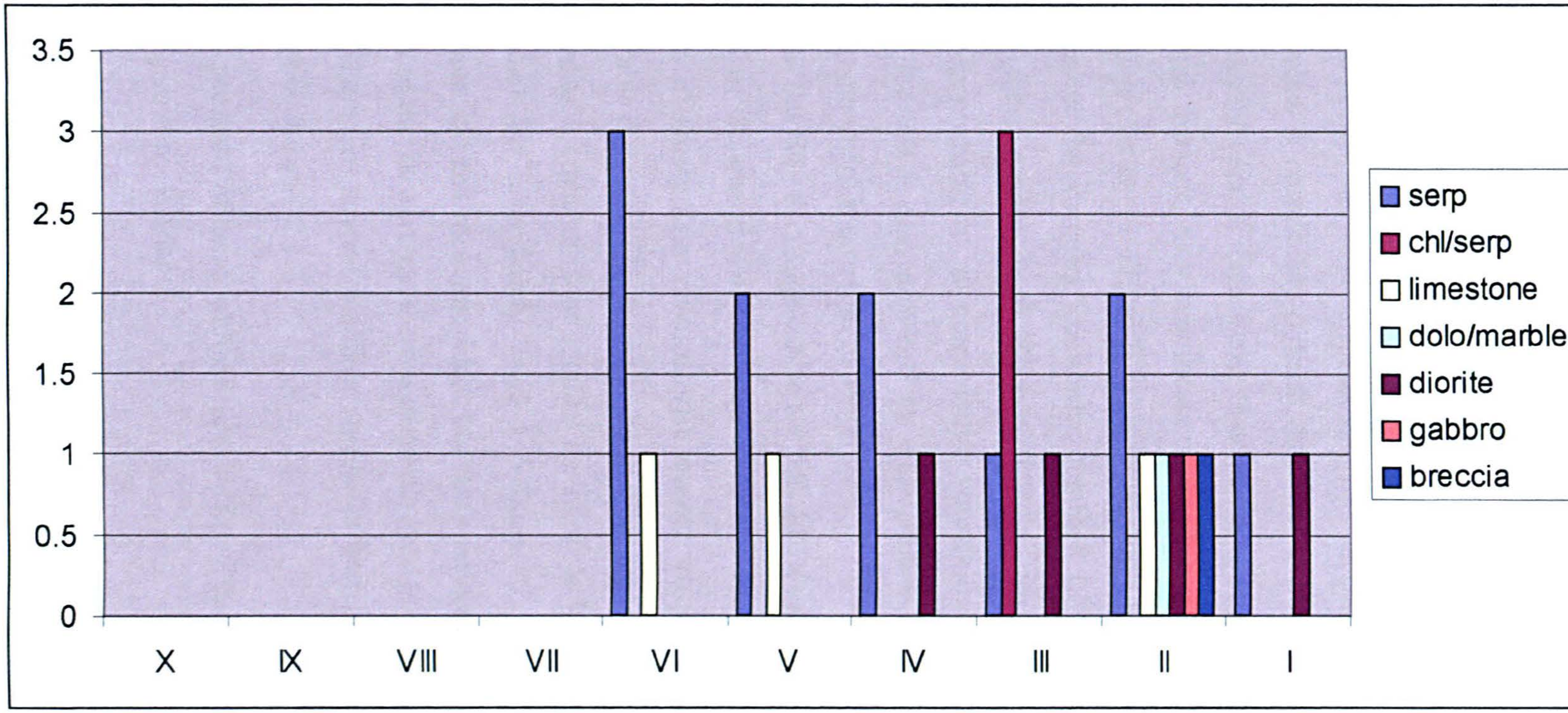

Figure 12.6 Variation in Raw Material Sources of Stone Maces Per Stratum

12.3.5 Conclusions

In advance of further study it is perhaps dangerous to speculate on the possible circulation of these various items. Nevertheless, the demonstration of the early circulation of ceramics between Knossos and sites unknown only emphasises the likelihood that other goods were also exchanged. Discriminating archaeologically between hypotheses of exchange and those of direct procurement is notoriously difficult, however if non-local items are present in small quantities and if these items represent a variety of sources, many of which lie at some distance, then hypotheses of exchange provide the most economical explanation (Perlès 1992:116-7). This explanation is reinforced when one takes into account the complex knowledge required to find, extract, transport and produce these various items. Such context-specific knowledge is not likely to have been available to all communities equally over time and space. Indirect support for this is also provided by ethnographic studies, which suggest that direct procurement is rare (Perlès 1992:116).

In this way exchange can be the only likely explanation for the presence at Knossos of the majority of the items discussed above. Melian or Yiali obsidian and axes of emery have raw material sources which lie off Crete and at some considerable distance. This may also be true for the volcanic stone mortars. Other more common types of stone artefact are likely to have a provenance on Crete, but cannot be immediately local (<5-8km) to Knossos (e.g. greenstone, serpentinite and chlorite axes; schist 'pot lids'). Indeed during ENI it is not clear if any axes or maces were made from materials local to Knossos.

There are several parallels here with patterns of circulation suggested above for ceramics:

(1) Rare presence of items with a source from off the island (e.g. obsidian, emery tools, volcanic mortars).

(2) More frequent presence of items whose source is probably closer but not local to Knossos (greenstone, serpentinite, chlorite axes, schist 'pot lids'). It is very tempting to compare the consistent presence at Knossos of fabrics dominated variously by 'greenstone' (Fabric 6), serpentinite (Fabric 10),

chlorite (Fabric 13) and phyllite (e.g. Fabric 8), with the frequent presence of items made in these materials. Although further speculation is impossible in advance of further analysis, it remains at least possible that the production of axes, 'potlids' and ceramic vessels alike took place in communities located near the sources of these various raw materials.

(3) Most of these goods are consistent with an origin within the Herakleion basin, however the presence of emery, Melian obsidian and Yiali obsidian suggests a pattern of circulation, which ultimately complements that suggested above for ceramics. If the limits of maritime technology made large journeys over large stretches of open sea unlikely or infrequent, then the most likely way for these exotic items to reach Knossos from the Cyclades was for them to travel either westwards to the southern Peloponnese, then via Cythera to west Crete and then east along the north coast to Knossos, or alternatively eastwards and southwards via Yiali, Rhodes, Kasos and Karpathos to east Crete and then west along the north coast.

(4) However, unlike ceramics, which exhibit a different pattern of circulation in ENIc/II, stone axes and maces show no change. Most examples are still from sources not immediately local to Knossos, although there are now a few examples which could now be local. Indeed the diversity of sources represented seems to reach a peak in ENII (n=7).

There is therefore nothing in these data to suggest that ceramic vessels during ENIa-b circulated in significantly different ways to other goods. However that is not to say that the actual ways in which the circulation of ceramic vessels was articulated need necessarily have been the same as other goods. Indeed the data are currently insufficient to allow any exploration of how the circulation of ceramics articulated with the circulation of other goods (see also below). Rather, this comparison simply shows that during ENIa-b there are no obvious differences in the way ceramics, ground stone tools, chipped stone or body ornaments circulated. The first clear indications of any divergent patterns come in

ENIc/II, where an apparent decline in the presence of non-local ceramic vessels is not matched by a similar decline in ground stone tools.

12.4 A Reassessment of Current Models for Neolithic Exchange

12.4.1 Different Artefact Trajectories? Different Mechanisms of Exchange?

This apparent basic similarity in the patterns of early circulation of ceramic vessels, stone axes and obsidian stands in contradiction to the conclusions reached by a recent detailed study of exchange in the Neolithic Aegean (see Perlès 1992), which compared the production, circulation and consumption of three different artefact types, namely ground/chipped stone, fineware ceramics and ornaments/rare goods (seals, vases, figurines) (see 1992:table 3). This study concluded that these different artefact types were produced, valued and consumed in fixed and very different ways. Regarding exchange it was argued that each artefact type circulated within one of three different forms of exchange, namely utilitarian, social and prestige (Perlès 1992; Demoule & Perlès 1993:384).

Certainly there do seem to be clear differences in the ways in which these different artefact types were produced (cf. obsidian with ceramics), part of which can be seen to be a function of the differential spatial distribution of raw material sources for each artefact type: some sources are ubiquitous (e.g. ceramics), others more discrete (e.g. stone axes) with some confined to single sources (e.g. Melian obsidian, Aeginetan andesite, Ionian honey-flint). Increasing spatial discreteness inevitably means that not all communities will have equal access to particular raw material sources. This suggests that certain communities are likely to focus or specialise in the exploitation of those sources, which are not ubiquitous. Thus, for example, Perlès notes that Greek EN-MN sites generally exploited local resources of chipped stone on a small-scale using a 'mediocre' and probably local production technology, but at the same time had access to 'high quality' honey-flint and jasper blades which were never produced locally (1992:128). These quality implements were most likely manufactured by specific communities specialising in their production and then circulated through exchange. The production of obsidian implements, which such communities also had access to, in many respects represents a case apart since there is evidence to suggest that it was not simply blades that were being exchanged, but rather that specialised production took place locally at each site and may have been in the hands of itinerant specialists (Perlès 1992:128).

The general situation with chipped stone and other rare artefacts is contrasted with that of ceramic vessels, which Perlès argues were "simple" in their requirements on knowledge and skill and "always a primarily local production"; moreover "non-local ceramics were very rare in the Early and Middle Neolithic" since production was located in villages which were geographically evenly distributed (1992:128, 133; Demoule & Perlès 1993:383). This characterisation of early Greek ceramic production and consumption has been subject to a detailed critique by Vitelli (1993b), who disagrees with Perlès' characterisation in many areas: ceramic technology cannot be dismissed as simple or unskilled and as lacking stylistic investment or even social importance nor can the consumption of vessels be considered to be high.

Particularly problematic is Perlès' characterisation of the quantities of various artefact types in circulation. She argues that chipped and ground stone circulated in large quantities, while ceramics and 'rare goods' circulated in low quantities. However, as noted by Vitelli, there seems to be a contradiction between Perlès' assumption that large quantities of chipped stone were in circulation and statements elsewhere to the effect that the quantity of obsidian at one site in any one phase was small enough to represent the output of a single day's output by a specialist (Vitelli 1993b:24; Perlès 1992:136). Circulation in large quantities is also difficult to accept for stone axes. Perlès quotes the total number of stone axes at Franchthi as evidence for this and contrasts the rarer incidence of andesite millstones (10-30% of grindstones in the Argolid) (1992:141). However this produces a false contrast since no meaningful comparison is possible between the total quantities of a general artefact type and the specific output of a single source/production location within a general artefact type. Furthermore it is difficult to see how the 128 axes at Franchthi, deposited during a period of more than 2500 years - i.e. c.1 axe every 20 years - correspond to large quantities in circulation! Likewise concerning shell bead manufacture at Franchthi Perlès optimistically concludes from production waste that output was high. However more recent detailed study has shown that output was very low and the evidence from other sites suggests that the quantity of shell bead necklaces in circulation was low (Miller 1996). Stone vases also seem to have circulated in very small quantities (Perlès 1992:142) and at least one community (Nea Makri) may have been specialising in their production (Phelps 1975:114). Thus if one breaks down the quantities of specific artefact in circulation within each general artefact type (i.e. particular types of stone axe, mortar, chipped stone), the differences between these different categories dissolve.

When compared to the evidence from Knossos for the same period, Perlès' assessment of the low circulation of Greek EN-MN ceramics (1992:145) also seems problematic. As Figure 12.1 demonstrates, during ENIa-b (Greek EN-MN) local fabrics (1a-i, 2a-e) account for less than half of the ceramics consumed at Knossos. It has also been argued (see Chapters 6-7) that a small number of vessels originated in areas at least 250km from Knossos, which far exceeds the maximum noted by Perlès of 70km (1992:146). Thus although Perlès (1992:143) contrasts the high level of pottery consumption with the low level for 'rare goods', these data from Knossos show that within the broad category of pottery there are vessels which are as rare and thus consumed in equal quantities as 'rare goods'. In addition at Knossos it is not simply finely finished vessels which seem to travel. Rather both coarse (burnished) and fine (polished, incised) vessels circulate to such an extent as to suggest that the ubiquity of sources and production locations did not act to constrain circulation in the way that Perlès suggests they might have done. This latter point reveals something important, namely that the extent to which ceramic vessels circulated during ENIa-b contradicts the simple economic argument from necessity and availability and suggests rather that this pattern is significantly social in origin: ceramic vessels circulated widely despite the fact that functionally-equivalent locally-made versions were available (see below).

Difficulties are also encountered when one considers Perlès' identification of three different contexts in which chipped/ground stone, ceramics and 'rare goods' were exchanged and consumed, namely utilitarian, social and prestige (see Perlès 1992:143-4, 148-9, 152-3; see discussion in Chapter 3). Thus axes and chipped stone are considered to be 'utilitarian', that is they are items which are purely functional and have a low stylistic input. These are contrasted with 'rare goods' and pottery which are non-utilitarian, that is not purely functional and therefore social. 'Rare goods' are considered to be in a special category of prestige items. Pottery qualifies as non-utilitarian because during Greek EN-MN it is not a tool for cooking, is finely finished and fragile (Perlès 1992:143-4). The validity of these distinctions is open to serious question and is actually very difficult to justify. In Chapter 3 it was argued that *all* action is social action, that *all* material culture is profoundly social and that *all* functional categories are effectively social constructs. In reality it is impossible or even ridiculous to assume that the circulation and consumption of stone axes was in any way less social or less prestigious than the circulation and consumption of ceramic vessels or other rarer items. Thus this distinction drawn by Perlès is false and confusing. Nor does it even make sense when applied to the available data: although Perlès notes the 'handsome' exotic stone axes from the 'communal' building at EN Nea Nikomedeia as exceptions to her distinction (1992:143), there are many others. For example almost all the stone axes from Aceramic-ENIb Knossos are significant for the exotic nature of their raw materials, a feature which cannot be simply explained in purely economic or functional terms. As a result the distinction drawn (Perlès 1992:144) between exogenous utilitarian products, exogenous non-utilitarian and local non-utilitarian dissolves. In this way the three different exchange systems (utilitarian, social, prestige) or categories of circulation and consumption, which Perlès 'identifies' (1992:153), appear to be a modern imposition and may have little or no relevance to any past scenario.

And so if one incorporates these criticisms and substitutes a characterisation of ceramic production, circulation and consumption based on data from Knossos for the one preferred by Perlès, then ceramic vessels exhibit a much closer similarity to other artefact types (see Figure 12.7).

	Ground/Chipped Stone	**Ceramic Vessels**	**Ornaments /Rare Goods**
origin of artefacts	mostly non-local, some local	local and non-local	mostly non-local
quantities consumed	medium to low according to category	medium to very low according to fabric	very low
use context	social/ritual	social/ritual	social/ritual
quantities in circulation	medium to low according to category	medium to very low depending on distance from source	very low
maximal distances	350km	c.250km+?	unknown, but long
fall-off patterns	'reciprocal'	'reciprocal'	unknown
Inter-/intra-site distribution	present in all sites & households	present in all sites & households	present in some sites & some households

Figure 12.7 Comparison of the Consumption and Circulation of the Main Artefact Types during Greek EN-MN (a modification[4] of Perlès 1992 (tables 2-3) substituting ceramic data from Knossos)

Indeed, if one sets aside the basic differences in the distribution of constituent raw materials and in the various production sequences[5], there seem to be no significant differences in circulation and consumption for ceramics, ground/chipped stone or ornaments/rare goods. It is important to be clear that (*contra* Perlès 1992:149) the recognition of these basic similarities in the circulation and consumption of these three artefact types is neither 'socially simplistic' (see above) nor a reductive attempt to create a single form of exchange, a single socio-economic basis for the circulation of goods or a single

[4] This table uses Perlès' assessments for each category, apart from ceramics and where she refers specifically to obsidian. Figure 12.7 ignores the data for the circulation of obsidian since this does appear on current evidence to be a special case. Figure 12.7 also ignores evidence for differences in production and raw material location. For the use-context of chipped/ground stone the broader definition social is preferred to 'utilitarian' since it is impossible to justify the distinction of utility as having any relevance to how such artefacts were perceived in the past (see Chapter 3). Also the fall-off pattern for rare goods is considered 'unknown', rather than the vague 'prestige goods', since, as Perlès herself indicates (1992:tables 2-3), the distances over which such vessels circulated is unknown.
[5] In the conclusions to Chapter 11 it was suggested that even these differences may not have been as significant as has previously been claimed (e.g. Perlès 1992; Perlès & Vitelli 1999).

distribution network. Rather, this recognition of similarities simply represents a more faithful characterisation of the data currently available. It remains possible that if the resolution of our data was better, it might prove possible to see subtle differences in the circulation, valuation and social classification of different objects, however what must be stressed is that at present there is nothing in the available data and certainly nothing in Perlès' analysis to demonstrate the existence of such differences. Certainly the general nature of the criteria in Figure 12.7 and the wide variation exhibited by each artefact type within each criterion do not preclude a very real variety in the potential trajectories along which individual objects, whether stone axes, ceramic vessels or 'rare goods', could travel.

And so, if one sets aside obsidian, one cannot, at least not for Crete, argue that different artefact types, with differentially distributed raw material sources and different production sequences, *necessarily* circulated in different ways prior to the Greek LN or Cretan ENIc (see below). Furthermore, at present the three mechanisms which Perlès has described have no basis in the available data. Recognition of this, however, need not engender further expressions of our ignorance of the 'socio-economic basis' for the networks in which objects circulate (cf. Perlès 1992:116), but rather provides the basis for a more subtle and contextually sensitive characterisation of the circulation of ceramic vessels during the Neolithic. In the following section, as a preliminary to later discussion, several mechanisms, which have previously featured in analyses of Neolithic exchange, will be discussed in connection with the data from Knossos.

12.4.2 Identifying and Understanding Modes of Neolithic Exchange: Down-the-Line versus Middleman Exchange?

In an early article on the circulation of raw materials in the Neolithic Aegean and their correlation with modes of exchange, Renfrew argued that all early movement could most easily be accounted for by a model of reciprocal 'down-the-line' exchange, where artefacts travel over distance by passing from hand to hand and from community to community, without the assistance of full-time specialist 'middlemen' traders (Renfrew 1973:185). This interpretation was considered to be the best means of explaining patterns of distribution which indicated a rapid fall-off in frequency with distance from source.

More recently, Perlès has argued that the specific fall-off curve of frequency versus distance from source for the Melian obsidian found at EN-MN sites in Greece is not so rapid and may indicate the existence of middleman traders (1992:146, 151). She identifies a very gradual fall-off rate over a very wide area which includes sites in northern and southern Greece together with a very sudden drop-off outside this zone, which is held to correspond to an expected drop-off "beyond the traders' zone of action" (Perlès 1992:146). It is unfortunate, however, that this assessment is based on 'impressions' and could not be quantified or demonstrated in absolute terms. Furthermore, elsewhere Perlès argues that obsidian blades are "never really plentiful... and particularly not at sites outside the direct procurement area", a statement which would suggest that the quantities of obsidian at sites are too low to construct a meaningful fall-off curve. These considerations inevitably take something away from the conclusions reached.

The middleman hypothesis can also be questioned in more general terms on the grounds of the usual relationship between producers, middlemen and consumers. The role which middlemen play in socio-economic systems has recently come under closer scrutiny and it is now recognised that middlemen play an important role in translating the external demands of consumers back to local producers with the end result being a reorganisation of that production gearing it more to the external market (see Kopytoff 1986:88-9; Appadurai 1986:33, 42ff). As noted by Nicklin, "the appearance of middlemen tend to signal the extension and growth of modern market economies" (Nicklin 1971:12). Thus with the presence of middlemen one is likely to see changes in the organisation of production and increases in output; i.e. one would expect to find 'production for exchange' (see Chapter 4). However, in situations where there are no specialist middlemen, local producers are unlikely to have knowledge of external markets and are unlikely to re-organise their production accordingly; i.e. production is 'for use' or 'livelihood'.

As demonstrated in Chapter 11, ENIa-b ceramic production on Crete does not appear to have been oriented towards high output or to have been re-organised towards production for exchange or to satisfy the needs of distant consumers. Rather as a 'production for use' ceramic production seems to have been sparing of labour demands and not motivated by considerations of economic efficiency (seasonal, low output; see Chapter 11, also Chapter 4). This even seems to have been the case elsewhere in the Aegean for the production of valuables perhaps by communities specialising in their manufacture: at EN Franchthi shell-bead manufacture was labour-intensive and the output very low, showing no signs of having been organised primarily for exchange (see Chapter 11). Thus, although one could argue that such products of community specialisation should be considered 'commodities by destination' (Appadurai 1986:16), in the sense that they exceeded the immediate consumption requirements within their location of manufacture and would most likely be exchanged, one cannot characterise this as production for exchange in the conventional sense.

In this way the singular lack of any impact of external demand on local production in the earlier Neolithic of Crete and the Aegean, that is the absence of 'production for exchange', constitutes a strong argument against the existence of middlemen traders in any conventional sense. It therefore seems unlikely that earlier Neolithic exchange, at least on Crete, was ever in the hands of full-time specialists and more likely that it was based on forms of reciprocity, as Renfrew originally suggested (see below).

A more fundamental problem with these approaches (Renfrew 1973; Perlès 1992) is that both assume that different artefact distribution patterns will always correlate with specific modes of exchange. This assumption has been the basis for most reconstructions of past exchange systems over the last two decades, however it is now clear that "a number of quite different agencies might have been responsible for the same types of patterning" (see discussion in Bradley

& Edmonds 1993:5-11). Highly similar fall-off curves can be generated by a variety of different processes, interactions and contexts. A further problem with such approaches is that they often assume that the supposed identification of a mode of exchange from spatial distribution of artefacts is all the explanation required for that exchange system. Thus the majority have tended to emphasise the frequency or the scale of consumption and circulation, rather than the character and context of artefact use and deposition (Bradley & Edmonds 1993:11). As emphasised in Chapter 4, the use of typological models to identify past forms of social organisation is always to some extent reductive and ahistorical since it assumes that it is worthwhile and useful to generalise about past behaviours, in this case viewing the circulation of artefacts as somehow pre-destined by the mode within which they were circulating. As argued in Chapters 3-4, a more sensitive approach is to be preferred, which views the circulation of objects in terms of the different social contexts through which they pass and the different social relationships and values such objects help to create (Bradley & Edmonds 1993:11-12).

12.4.3 Exogamy?

The application by Halstead of the DMP model to early farming communities in Greece, represents a significant advance in our understanding of those factors which might encourage the creation and maintenance, through reciprocal exchanges, of social relationships within and between communities (see Chapter 4). Early Greek farming communities were relatively small and in all but the largest examples cannot have been demographically self-sufficient. Likewise later Neolithic island communities must have relied on networks of social contacts to ensure their viability (Cherry 1985:24). For example Knossos from its Aceramic beginnings to the end of ENIa seems never to have exceeded 0.5ha in size with a population of well below 100 (see Appendix II). Thus exogamy must have been one factor which promoted exchanges between communities. However, as Halstead has noted for northern Greece (1999:78-9), the size of the interaction zones, as suggested by ceramic stylistic similarities between settlements, are far larger than would be necessary for simple demographic viability. This statement also seems to hold true for ENIa-b Knossos: ceramic vessels highly similar or nearly identical to ones produced in the immediate locale of Knossos were being made at a number of locations around the Herakleion Basin and as far away as the Bay of Mirabello (c.75km). If however, instead of zones of stylistic similarity, one considers only those fabrics, which occur most frequently at Knossos in this phase (Fabrics 1a-i, 2a-e, 5a, 6, 8), then a much smaller zone of intense interaction is suggested. Although speculative, one could tentatively suggest that Fabrics 5a, 6 and 8 might correspond to between one and three other settlements with which Knossos was most frequently exchanging. If so and if these settlements were of a similar size as Knossos then this would suggest a maximum breeding population of c.250 at the end of ENIa and c.1200 by the end of ENIb (see Appendix II). Halstead has suggested a figure of around 500 as a stable, viable breeding population (1999:79). Thus, if there is any validity in this admittedly very speculative reconstruction then it would suggest that this zone of intense local interaction between a relatively small number of settlements could relate more closely to the scale of interaction expected between local intermarrying populations.

12.4.4 Risk-Management?

Halstead has also suggested that the need to off-set the risk of individual household failure constitutes another factor encouraging the maintenance of links beyond the household and perhaps beyond the community: By maintaining such links individual households could call upon outside assistance at times of subsistence failure or during periods of labour shortage (see Chapter 4). In this way households are likely to compete with each other to establish links with stronger households outside the community. Certainly the need to manage risk may be embedded within a number of motives behind the cultivation of wider social ties, however it is hard to see it as a primary motivating force. Sahlins' powerful characterisation of small-scale pre-modern societies as non-economising and essentially optimistic (even over-optimistic) about their abilities to provide for their own subsistence (see Chapter 4) suggests that risk-management, although a seemingly obvious necessity, need not have been at the very forefront of their decision-making.

12.4.5 Conclusions: Social Fields and Special Journeys?

The ceramic data from Knossos strongly suggest that the majority of exchanges can be accounted for in terms of interaction between a number of communities within a relatively small radius around Knossos, probably within the Herakleion basin. This area is defined here as a *social field* (see Welsch & Terrell 1998:50-4). Thus most ceramic vessels appear to have been produced, exchanged and consumed within this immediate area. During ENIa-b the level of interaction between communities within this field was high, with vessels made outside the immediate area of Knossos (>5km) accounting for around half the ceramic assemblage. During ENIc-II, the level of interaction beyond the immediate area of Knossos dropped considerably to c.15%.

The rare presence of vessels originally produced at some greater distance from Knossos and the existence of very large style zones can be explained in two ways:

(1) *Overlapping Social Fields*: the social field described above surrounds Knossos, however each community within Knossos' field will have their own social field which may include other communities not so well represented at Knossos. Social fields therefore overlap spatially and together create an interlocking web of contacts, which in extent will always transcend those of any individual community within it. In this way vessels from distant sources may travel in different directions from community to community, from field to field, until their deposition sometimes at a great distance from their place of origin. This mechanism requires that one assumes that ceramic vessels circulated (and re-circulated) consistently as commodities and were not subject to inalienability (Chapter 3; see below).

In this way analyses of 'Down-the-Line' exchange only work because social boundaries blur and overlap. Unfortunately, the impression one usually gains from such analyses is not that objects could have unpredictable biographies, but rather that the circulation of particular categories of artefact was unidirectional and predictable with objects moving steadily away from their source becoming less and less frequent in site assemblages as they move. That this is not the best characterisation of how ceramic vessels actually may have circulated is indicated by the frequency data from Knossos, which strongly suggest that once ceramic vessels move outside the social field surrounding their place of manufacture, they do not move in groups, which steadily decline in size as they move further away, but rather in such small quantities (<1/1000sherds) as to suggest their movement as individual vessels. At this point there is no frequency curve, but rather a steady base-line of frequency for all rare vessels (cf. Figure 12.2). Once outside their initial social fields the ultimate deposition point of such vessels actually seems to be *unpredictable* and could range from the next community to communities in other regions of the island or even beyond. Nor need the circulation of such vessels be in any way unidirectional, rather it is safer to admit the possibility that such circulation involved movement in all directions.

(2) *Special Journeys*: although the model of overlapping social fields theoretically could account for the rare presence of ceramic vessels originating at some considerable distance from Knossos, there are good reasons to think that in addition to frequent interaction probably over relatively short distances, there must also have been rarer occasions when single journeys were made over considerably larger distances.

The existence of such journeys is above all implied by the presence at Knossos of ceramic vessels and other goods, which must have an origin off the island. Thus the presence from the Aceramic of obsidian from Melos and Yiali and stone tools of emery and from ENIa ceramic vessels with likely origins in southern Greece and south-west Anatolia/east Aegean, indicates that longer journeys were made beyond Crete. Even if one assumes the minimal[6] view, that

[6] In support of minimal penetration of regions beyond Crete it is perhaps worth noting that likely off-island vessels are represented by a very small number of fabrics, several of which improbably, considering their very distant origin, recur (e.g. Fabrics 24, 26, 28, 32). This may suggest that contacts with regions off-island were not extensive and even restricted to specific areas within those

such journeys took place between communities located at the far east and west ends of Crete and communities on the very tips of Greece or Anatolia, this nevertheless requires long journeys crossing island chains (i.e. Cythera, Kasos, Karpathos), which at present during Aceramic-ENIb (c.7000-5100BC) appear to have been uninhabited (Broodbank 1999:31-4). Such journeys were probably not frequent, but nevertheless were regularly made to judge by the presence of off-island material throughout the EN deposit (ceramic vessels, obsidian, emery). Furthermore, once the existence of such special journeys has been established, then it becomes quite possible, if not likely, that such journeys were also made within Crete between different communities in different social fields or even in different regions.

The possibility of such special longer journeys having taken place during ENIa-b can be approached from another direction. The principal problem with assuming that all non-local items at Knossos are explicable in terms of a sequence of exchanges within overlapping social fields is the general association noted in ethnographic studies between gift-giving and the 'inalienability' of the gift given (see Chapter 3; Thomas 1991:14-22). Although the exact nature of the exchange relationships, which lie behind the ENIa-b circulation of ceramic vessels, remains obscure, if, as seems likely, these exchanges generally served to create, reproduce and manipulate social relations (e.g. marriage rights, settling disputes etc.) between individuals and groups, who were already socially close, then it is highly probable that they frequently equated to some form of gift exchange. If so, then the 'gift' of a ceramic vessel is likely on many occasions to have rendered it inalienable: the on-going significance of the gift lies in the way it always contains an association with the original producer/owner and thus continues to testify to the continued existence of the social relationship between giver and receiver, which its original exchange rendered in material form. If forms of 'gift exchange' were the principal forms of local exchange during the earlier Neolithic then the

regions. The recurrence of some fabrics over the course of EN may indicate that these contacts were maintained over a long period of time. Halstead has argued (1989:75) that distant partnerships are inherently stable because of their inevitable redundancy at some times. However it is equally possible degree to which objects re-circulated after initial exchange from their production locale may have been quite restricted. However, in those exchanges where there was greater social distance between the two parties, such as those conducted outside the immediate social field, where giver and receiver are unlikely to be close kin, it is possible that exchanged objects did not have the same connotations and associations and may therefore have had a less restricted commodity candidacy.

Within forms of exchange which rendered the object inalienable and in the absence of third parties (i.e. middlemen traders), for whom such vessels might have been exchange commodities more than gifts, it is hard to see how vessels could have passed at a local level through many hands prior to their arrival at Knossos. Also questionable is the extent to which ceramic vessels could have passed through many hands and remained unbroken or undiverted. Finally, as noted above once vessels travel beyond the immediate social field surrounding their location of manufacture, there is not so much as a declining frequency curve, but a frequency base-line, which suggests that vessels did not move from community to community in groups which decreased in size as distance from source increased (e.g. 'Down-the-line' exchange), but as *single* vessels.

All of these features combined therefore favour the existence of special longer journeys of acquisition. One might also note in passing that the regular occurrence of special longer journeys between settlements in different regions of Crete might also be the best way to explain the continued maintenance of large zones of stylistic similarity during this period (ENIa-b). These special journeys would have taken individuals far from their home communities and must have required considerable skill, have entailed high risks and have taken considerable amounts of time. Clearly therefore such journeys required considerable effort, knowledge and skill and as such must have been a source of prestige (cf. Helms 1993).

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that knowledge of specific maritime routes off Crete to distant regions, passed on from generation to generation, led successive generations of travellers to the same distant locations.

12.5 Luxury/Ordinary Goods, Diversion and the Differential Creation of Value

And so it may be suggested that two basic types of movement contributed to the circulation of ceramic vessels and other goods between communities during ENIa-b. Firstly and primarily intensive interaction at a local scale, and secondly more distant special journeys beyond the local environment. A broad parallel for the co-existence of these two types of movement is provided by the kula system, where grander (high prestige) inter-island exchange is contrasted with more intimate regular and problematic intra-island exchanges (Appadurai 1986:20). In the kula system such longer distance exchanges represent deliberate efforts to transcend the more humble flow of things. In other words, such long journeys serve to divert objects from their usual paths (Appadurai 1986:28-9), i.e. local circulation in intensive local interactions, and thereby serve to create special value in the object and special prestige on the traveller. If this comparison has any meaning it would seem to suggest the possibility that one of the motivations behind such special journeys during ENIa-b, was the strategic diversion of objects from their usual patterns of circulation in order to create special value and thereby social prestige.

In Chapter 3 it was argued that value is not a fixed attribute of each object, but rather that is created and recreated through acts of exchange. Thus objects may gain or lose value depending on their context and specifically on how they are perceived. Here it is perhaps worth noting again the distinction drawn by Appadurai between how early complex and less complex societies differentially create distinctions between luxury and ordinary goods. In early complex societies the links between luxury and ordinary goods mostly involve the production process, with luxury goods usually having more complex production sequences. However in less complex societies the connection between luxury and other goods involves "not the ripples of a complex set of production milieux and forms but critically, the domains of exchange and consumption" (Appadurai 1986:39; see Chapter 3). Likewise Sahlins has argued that since producers in less complex societies always retain some sort of control over their economic means, social competition tends to be played out in the arenas of consumption and exchange (Sahlins 1974:94; see Chapter 4).

Several converging lines of archaeological evidence suggest that during ENIa-b ceramic vessels and other objects did not have fixed values based on the rarity of their raw materials and/or the complexity of their production sequences (*contra* Perlès 1992; see discussion above), but rather were subject to changing estimations of value constructed through acts of exchange and consumption.

(1) *No clear correlation between distance from source and 'quality' of vessel*: thus, although many of the non-local vessels in the ENI assemblage at Knossos are well-formed finely polished open bowls of various types and would thus qualify broadly as 'fineware', the presence also of coarsely burnished open and closed vessels, some of them from very distant sources (see above) makes it clear that it was not simply the most finely-produced vessels which circulated. The circulation of coarsely finished vessels makes sense if such vessels had gained in value through exchange, travelling far from their source precisely because their social value had transcended their original use-value.

(2) *Redundancy of form and function*: all non-local vessels at Knossos have direct formal and functional equivalents amongst vessels produced locally. This redundancy in form and function is only emphasised further by the very strong similarity in form and finish exhibited between vessels produced locally (<5km) to Knossos (Fabrics 1a-i, 2a-e), vessels produced nearby (Fabrics 5a, 6, 8) and vessels produced, either at the opposite end (c.75km) of the island (Fabric 12) or perhaps at the edge of the Herakleion Basin (Fabric 10). This conclusion directly contradicts Perlès' claim that during the Neolithic the degree of stylistic marking/variation corresponds to the scale of exchange: high stylistic variety, high level of exchange (Perlès 1992:140). Such similarities or redundancies in form emphasise how the circulation of vessels cannot be explained either in simple economic terms through their special functional capabilities or in their obvious distinctive characteristics. Regarding this latter point it should be stressed that on many occasions it is impossible to discern provenance simply by looking at vessel form or finish. This invisibility of origin suggests that

knowledge of a vessel origins could only be transferred between owners through oral transmission. This invisibility may even suggest that origins were not as important as other associations in a vessel's life history, such as individuals or events. Certainly such invisibility allows the narrator/owner of such vessels room for a degree of manipulation of fact and fiction in the creation and recreation of individual vessel biographies.

(3) *Drilled mend-holes*[7]: during macroscopic study the incidence of mend-holes per fabric and form was recorded, the results of which are presented in Figures 12.8 and 12.9. Out of the total number of mend holes recorded for ENIa-b, almost 75% were in non-local fabrics. The high frequency with which mend holes correlate with non-local fabrics is much greater than the rate at which these fabrics occur (cf. c.75% of mend-holes, only c.50% of assemblage; see Figure 12.1). However, during ENIc-II the frequency with which mend-holes occur in non-local fabrics falls to less than 20% with now over 80% of mend holes being in local Fabrics 1a-i, 2a-e. Here the frequency of mend-holes seems to relate closely to the frequency in which fabrics occur (cf. c.80% of mend-holes in local Fabrics 1a-i, 2a-e, local Fabrics 1a-i, 2a-e comprise c.85% of the assemblage; see Figure 12.1).

It seems likely that the occurrence of mend holes should direct us towards those vessels for which greater effort has been taken to ensure their curation (see Plate 56). Moreover it seems reasonable to suppose that this extra effort in some way provides an index of relative value. One noticeable feature of mend holes is that with perhaps only one or two exceptions in the whole EN sequence they are found on fine polished bowls/jars. This would seem to illustrate a general if unsurprising point, that fine polished vessels were more highly valued than ones which were more coarsely burnished. Also worth stressing is the especially high frequency with which mend-holes occur in non-local fabrics at Knossos during ENIa-b. This would seem to suggest that during this period greater efforts were

[7] Drilled mend-holes have been noted as a feature of a number of other Neolithic ceramic assemblages, such as EN-MN Franchthi (cf. Vitelli 1993a:40 n.1, 150, 211 n.11) and LN-MC Ayio Gala and Emporio (Hood 1981:20).

taken to curate vessels in these fabrics, than in local Fabrics 1a-i, 2a-e and that this greater effort might correspond in some way to the greater value attached to these more exotic vessels.

Phase	Context	Fabric	Ware	Comments
ENIa	VIII	5a	fine	curved open bowl; near rim
ENIa	VIII	5a	fine	curved open bowl; near rim
ENIa	VIII	1/2	fine	open bowl; body
ENIa	VIII	6	fine	near rim
ENIa	VIII	6	fine	body
ENIa	VIII	1/2	fine	open jar; near rim
ENIa	VIII	6	fine	near rim
ENIa	VIII	10	fine	body
ENIa	VIII	10	fine	body
ENIa	VIII	10	fine	body
ENIb	ENIb	8	fine	collared jar near rim
ENIb	ENIb	8	fine	collared jar body
ENIb	VII	1/2	fine	near rim
ENIb	VII	1/2	fine	near rim
ENIb	VII	10	fine	body
ENIb	VII	6	fine	near rim
ENIb	VII	10	fine	near rim
ENIb	VII	6	fine	near rim
ENIb	VI	5a	fine	curved open bowl; near rim
ENIb	VI	5a	fine	curved open bowl; near rim
ENIb	VI	1/2	fine	thin-walled body
ENIb	VI	1/2	fine	near rim
ENIb	VI	5a	fine	thin-walled body
ENIb	VI	5a	fine	vertical carinated bowl; near rim
ENIb	VI	5a	fine	vertical carinated bowl; near rim
ENIb	VI	5a	fine	vertical carinated bowl; near rim
ENIb	VI	8	fine	bowl with offset rim; near rim
ENIb	VI	8	fine	body
ENIb	VI	6	?	body
ENIb	VI	6	?	body
ENIb	VI	1/2	?	body
ENIb	VI	1/2	fine	bowl with offset rim
ENIb	VI	1/2	fine	body

Figure 12.8 Incidence of Drilled Mend Holes Per Fabric, Form and Finish (ENIa-b)

Phase	Context	Fabric	Ware	Comments
ENIc	V	5a	coarse	thick-walled body
ENIc	V	1/2	fine	curved open bowl; near rim
ENIc	V	1b	?	curved open bowl; near rim
ENIc	V	1b	?	curved open bowl; near rim
ENIc	V	1b	?	curved open bowl; near rim
ENIc	V	1d	fine	carinated bowl with offset rim
ENIc	V	1d	fine	carinated bowl with offset rim
ENIc	V	5a	fine	body
ENIc	V	5a	fine	body
ENIc	V	1b	fine	body
ENIc	V	1b	fine	body
ENIc	V	1b	fine	carinated bowl with offset rim
ENIc	V	1b	fine	carinated bowl with offset rim
ENIc	V	1b	fine	flared rim bowl; near rim
ENIc	V	2a/b	fine	deep bowl; near rim
ENIc	V	1b	fine	body
ENIc	V	2a/b	fine	body
ENIc	V	1e	fine	curved bowl with offset rim; near rim
ENII	IV	5a	fine	near rim
ENII	IV	1e	fine	near rim
ENII	IV	1e	fine	near rim
ENII	IV	1e	fine	body
ENII	IV	1d	coarse	body
ENII	IV	1e	fine	body
ENII	IV	1e	fine	body
ENII	IV	1e	fine	body
ENII	IV	1e	fine	body
ENII	IV	1e	fine	curved bowl with offset rim; near rim
ENII	IV	1e	fine	curved bowl with offset rim; near rim
ENII	IV	1e	coarse	body
ENII	IV	1e	coarse	body
ENII	IV	1f	fine	body
ENII	IV	1f	fine	body
ENII	IV	1f	fine	body
ENII	IV	1f	fine	curved bowl with offset rim; near rim
ENII	IV	1f	fine	body
ENII	IV	1f	fine	body
ENII	IV	1f	fine	body
ENII	IV	5a	fine	curved jar with offset rim; near rim
ENII	IV	8	fine	body
ENII	IV	8	coarse	thick-walled body
ENII	IV	34	fine	body

Figure 12.9 Incidence of Drilled Mend Holes Per Fabric, Form and Finish (ENIc-II)

(4) *Similar patterns of circulation for other artefact types*: a final indication that production sequences were probably not responsible for the value attached to artefacts is indirectly provided by the general similarities (*contra* Perlès 1992; see

above) which seem to exist between the circulation and consumption of ceramic vessels and other goods during ENIa-b (see Figure 12.7 and discussion above). These similarities exist despite the different production sequences of these objects and despite the differential distribution of the raw materials required.

When these four converging lines of evidence are combined they strongly suggest that different ceramic vessels were valued in different ways in different places and at different times. They indicate a higher valuation for fine polished vessels than for coarse burnished ones, but also for ENIa-b suggest that fine polished vessels, which had travelled some distance from their source, were more highly valued than their local equivalents. It would also appear, however, that both coarse and fine vessels circulated. In addition the small number of ENIa-b mended vessels in immediately local fabrics (1a-i, 2a-e) also serves to emphasise that such vessels could also have particular social value. When combined these features suggest very strongly that the value of ceramic vessels was not fixed or absolute, but very much contingent, subject to variation and intimately related to the contexts in which these vessels were exchanged and consumed. In other words quantitative and qualitative differences in the consumption or valuation of different goods must have been dependant on context and *not* on the very different requirements necessary for their production (cf. Chapters 3-4). One of the ways in which the value of exotic vessels may have been curated and displayed was through the oral narration of vessel biographies (stories surrounding acquisition, associated individuals, events, places). In this way the life history of an object may have been *essential* and not incidental to its value (cf. Appadurai 1986:23ff.).

And so it should be clear that the distinction between luxury and ordinary goods at ENIa-b Knossos was not hard or fast, but was subject to varying contextual definitions, whether created by exchanges over short distances or by special acts of procurement over longer distances, which served to divert objects from their normal paths of circulation. Thus although all forms of exchange create value, these valuations may vary within and between these different forms. For example, it seems reasonable to argue that special value and special prestige accompanied objects brought back from special longer journeys. Comparative ethnographic, historical and archaeological study well illustrates the political and ideological symbolism associated with the procurement of valuable resources from distant or outside locales and their role in the negotiation of power, status and identity (see Helms 1993, especially pp.210-7). In this way the exchange and consumption of certain ceramic vessels may have taken place within what have been termed 'tournaments of value' (Appadurai 1986:21ff.; see Chapter 3). Such 'tournaments of value' are not driven by economic necessity but rather by the desire to negotiate status and establish reputation.

Finally although strictly outside the range of this study mention should be made of the implications of this interpretation of circulation in ENIa-b for our understanding of the preceding Aceramic period. The circulation of objects far from their original source noted for ENIa-b suggests the possibility that a similarly high level of circulation might characterise the Aceramic. Certainly the presence of an emery stone axe in stratum X, a marble bowl in sounding X (Evans 1970b) and Melian obsidian would be pointers in this direction. In addition, macroscopic study of the small amount of other chipped stone in stratum X suggests the exploitation of a number of sources (T. Strasser pers. comm.). The consistently small size of the settlement at Knossos during this long phase also indicates the necessity of contacts with other settlements (see Appendix II). Finally, the arrival of ceramic technology and the adoption of several forms which have contemporary parallels in other regions of the Aegean (see Chapters 7, 13; Appendix I) may also constitute an argument in favour of contacts between communities on Crete with those outside the island, which might be analogous to those described above for ENIa-b.

12.6 The Circulation of Goods (ENIa-b): A Stable Universe of Commodities?

Although much of this discussion of exchange and circulation has been about widening the scope of previous approaches to Neolithic exchange, it should not be forgotten that the actual range of material goods in circulation, although apparently numerous, is, in comparison for example with the Aegean

Early Bronze Age, relatively small (cf. beads and body ornaments, marble figurines, stone axes, maces, schist 'potlids', mortars, querns, chipped stone (obsidian, chert etc.), colorants, as well as invisible items such as perhaps food, wooden objects, basketry, people). This range of potential commodities seems to have remained stable, that is it does not appear to have been consistently extended to include other artefact types (see also Section 13.2.4). In Crete during ENIa-b different settlements around the island were producing ceramic vessels with strong similarities in form and finish so that in general the wide circulation of ceramics at this time rarely meant the arrival of new and very different foreign forms. Likewise although stone axes of a variety of non-local sources were consumed at Knossos during this period, the frequency with which three or four main sources recur and the similarity in form between these different sources again suggests stability and an emphasis on continuity.

This limit, both to the range of material categories in circulation and to the amount of variation within each material category, suggests that material categories may have been formalised (see also Chapter 13) with the types of exchangeable objects might have been restricted to a limited set of formal categories. Comparative ethnographic studies of consumption and exchange have noted that in pre-modern small-scale societies there tends to be only very limited room for manoeuvre in the 'tug-of-war' between the economic tendency to commoditisation and the inclination of all societies to restrict commoditisation to a 'stable universe of commodities'; that is to put a limit to the numbers and types of commodities in circulation (Appadurai 1986:17). This restriction of equivalences and exchange to a 'stable universe of commodities' often acts to protect and reproduce status systems (Appadurai 1986:25); in such systems luxury or valuable goods play the role of tokens through which status is conventionally reproduced. In contrast, where the universe of commodities is ever-changing, status systems rely on the strategic control of taste.

And so the circulation of ceramic vessels during ENIa-b may be understood in terms of exchange within a stable universe of commodities. Although individual vessels were potentially subject to a variety of valuations, the majority are likely to have circulated within a relatively small social field surrounding their place of manufacture. Within this zone it is likely that such items may have circulated within a more restricted system of equivalences. Recognition of the stability of this local system in turn allows the significance of the rare appearance of more exotic items to be more clearly understood. At one level the ground stone tools of emery or ceramic vessels with origins in distant communities, such as the Mirabello Bay in East Crete or regions outside Crete, fit perfectly within existing material categories at Knossos and are thus 'acceptable', however on another level the distance over which they have travelled, the biographies they have acquired and perhaps the extent and difficulty of the special journeys undertaken to acquire them make them rare, exotic, valuable and above all powerful objects. Thus while most exchanges existed within a universe of commodities, whose very stability and acceptability was something which was actively maintained in each act of exchange through adherence to a particular set of social values, the apparent desire to acquire and consume more powerful versions of these socially acceptable material categories suggests the possible existence within communities like ENIa-b Knossos of social competition - within certain limits - by individuals and/or households in pursuit of status and reputation (see Chapter 13).

12.7 Understanding Changes in Circulation During ENIc-ENII

During ENIc and ENII significant changes in the circulation of ceramic vessels are apparent, with a serious increase in the consumption of products from the immediate area of Knossos (<5km) and a concomitant sharp decrease in the presence of non-local items (see above). This decrease in non-local ceramic vessels is not matched by a similar decrease in the presence of non-local ground stone axes and maces. This situation contrasts with the preceding ENIa-b phase and suggests that significant changes in the circulation and exchange of ceramic vessels may have taken place.

12.7.1 Ceramic Regionality?

During approximately the same period (ENIc/ENII = LNI; see Appendix I) the Greek mainland sees the development of greater ceramic regionality (Perlès 1992:139-40). In Thessaly this proliferation in regional styles seems to correspond in some cases to specific production centres specialising in certain ceramic products and it has been argued that at this time there were actually *more* ceramic vessels in circulation (Perlès 1992:139-40), a scenario which stands in direct contradiction to ENIc/II Knossos, where evidence for changes in production at this time (see Chapters 10-11) suggest that ceramic production took place on a greater scale but in conjunction with an overall decline in the quantities of ceramic vessels in circulation.

At present the Cretan data are simply too sparse to be able to argue seriously for a parallel development of ceramic regionality on Crete. Not only does Knossos remain the only certain site for this phase, preventing any further comparison, but also the serious decrease in the representation of non-local fabrics at Knossos during this period means that very little can be said about ceramic production elsewhere in the island at this time. However, as far as Knossos is concerned, the decrease in the presence of non-local vessels would seem to suggest that changes in mobility may have taken place during this period.

12.7.2 Evidence for Wider Contacts

Decrease in the circulation of ceramic vessels within the area of Knossos and the implication that patterns of mobility were much less extensive than before seems to contradict the widespread evidence (noted Appendix I) for an increase in wider links between Knossos, the Cyclades and the eastern Aegean, which first appear in ENIc and from ENII are strong. For example one might compare the series of close links which synchronise ENII Knossos with Emporio VIII and to a lesser extent Saliagos (Washburn 1983; see Appendix I). These can be understood within a wider LN context of increased links between different regions bordering the Aegean and new settlements on Aegean islands (see Broodbank 1999). For example Eslick has noted (1980; 1992) that from MC south-west Anatolia changes in orientation away from the east and towards the Aegean. It is no accident that the first signs of increased contacts (c.5300BC) probably coincide with the establishment of many permanent settlements in the Cyclades and other Aegean islands, which seem to have been inter-linked by exchange networks (Broodbank 1999:37). Sampson has noted that from the beginning of the Greek LN common ceramic traits unite the islands, with for example 'White-on-Dark Ware' common to Emporio, Ayio Gala on Chios, Tigani on Samos, Vathy on Kalymnos, Rhodes, Saliagos (Sampson 1984:239) as well as Naxos and Thera. However in addition to these shared traits it has been argued that there is a degree of regionality. Thus Sampson isolates four regions within the LN Aegean (North-East Aegean, Dodecanese/Samos/SE Aegean, Attic-Kephala-Euboea Culture/Cyclades and North-West Aegean) (1984:245, fig.6).

It has been tentatively suggested (Appendix I) that communities on Crete may have played a more active role in this phase of island colonisation than previously thought. On the basis of a series of shared ceramic features between new communities on islands in the east and south-east Aegean and contemporary communities on Crete, features which have a long history on Crete and are *not* found in other regional sequences (i.e. flared strap, flap and wishbone handles, triangular 'ears' on the rim, plastic cordon decoration, pellet/knob decoration and incised/pointillé decoration), one could argue that at least some of these new communities are likely to have had a Cretan origin or at least a very close relationship with the island.

This evidence for a greater level of movement and activity within the island Aegean during the ENIc/II period on Crete and the likely active role of Cretan groups in this process makes it hard to see how this decline in the presence of non-local vessels at Knossos could be explained in terms of the sudden isolation of Crete or Knossos from the exchange networks of ENIa-b. Rather the evidence for new contacts and new settlements would be likely to promote greater access and more intense circulation leading one to expect to see an *increase* in exchange during this period: one could argue that the ENII peak in the diversity of stone sources represented in stone axes and maces reflects this.

12.7.3 Conclusions

These considerations therefore suggest that the actual and very real decline in the circulation of non-local ceramic vessels at Knossos during ENIc-II was not due to any lack of access to non-local goods or to an inability to make long journeys of acquisition, but instead suggests that these changes were due to more fundamental and significantly social developments. If Knossos can be considered typical, then it would seem that for whatever reasons ENIc/ENII communities on Crete no longer placed such a value on the acquisition of exotic ceramic vessels. In view of the rapid growth in the size of Knossos at this time and a probable concomitant increase in population, one could argue that this reflects a decrease in the demographic necessity of exogamy: certainly it seems likely that Knossos at this point finally reaches a point at which it is as least theoretically demographically self-sufficient (population c.500; see Appendix II). However, this observation does not explain why these changes should occur at this point and not earlier or later. Nor does simple population growth explain why the incidence of ceramic vessels with more distant sources decreases so dramatically during ENIc/II.

Further explanation of these changes must inevitably remain speculative. If, as argued above, the presence during ENIa-b of relatively large numbers of non-local vessels, sometimes with very distant sources, can be best explained through their acquisition on special long journeys, then the steep decline in ENIc/II might imply a decrease (or even cessation) in the number of special longer journeys being made during this period. A decrease in the incidence of such journeys, which during ENIa-b may have been causally related to the maintenance of large style zones, may have similarly contributed to the emergence of sharper regional differences in ENIc/II. In addition, one could argue that the expansion in the range and variety of ceramic products produced locally during ENIc-II (see Chapters 10-11) might have somehow addressed the drop in variety left by the sharp decrease in the incidence of non-local vessels. It is perhaps significant that all these changes suggest that the probable role and value of exotic ceramic vessels in social competition had changed with new mechanisms serving in the ongoing negotiation of power and identity.

Conclusions

And so to return to the long-held theories of ceramic isolation for Knossos and Crete which preface this Chapter, it is now possible to say with some confidence that non-local vessels comprise a notable proportion of the EN assemblage at Knossos, particularly during ENIa-b, and that the significance/value of these vessels was probably great. The tautology in the equation of distance and value has been noted in a number of studies of Neolithic exchange (e.g. Féblot-Augustins & Perlès 1991 cited by Gamble 1993:36-7):

> "by travelling far an exchange item is automatically transformed from being mundane to being special... But where does this transition in value occur, the passage from local to exotic, and why and how do the distances vary?" (Gamble 1993:36-7).

Clearly Gamble finds this difficult to answer, concluding that the mechanisms and significance of exchange remain obscure until the Neolithic. However if one views value as constructed through acts of exchange and subject to variation (Appadurai 1986; Kopytoff 1986; see Chapter 3) then one can see this dilemma in a new light. Distant objects by virtue of their rarity, their unusual biographies and their intimate association with 'outside' have value and power (Helms 1993). Such objects were acquired through exchanges, which create a social relationship between giver and receiver. Such objects objectify those relationships, but significantly, since they are objects which have a use, their consumption provides their owner with the opportunity and cue for narratives surrounding their acquisition. Such narratives allow the owner/teller to benefit on more than one occasion from prestige associated with the ability to make journeys outside the realm of the familiar (Helms 1993). In this way it is above all through the public consumption of such exotic objects that their owners are able to gain the prestige and status associated with the conduct of longer journeys of acquisition (see Chapter 13).

In this way the importance of exchange was great, particularly within ENIa-b communities, as well as possibly earlier in the Aceramic. On one level the circulation of goods testifies to the existence of close social relationships (kinship? friendship? exogamy?) between the community at Knossos and its immediate neighbours, relationships which may have minimised conflict and contributed to the apparent stability of EN Cretan communities (cf. similar comments of Perlès 1992:121 for Thessaly). However at a different level the acquisition and display ('tournaments of value') of particularly valuable ceramic vessels and other goods may have been one of the few legitimate ways in which individuals and households could negotiate status and power.

This new view of the circulation of goods in Crete during the Aceramic and EN also places previous attempts to understand the initial colonisation of Crete in a new light. Thus Broodbank and Strasser's innovative attempt to model this colonisation now emerges as an over-simplification of what was a much longer process. The settlement of Crete probably took place as an intensification of earlier movement and exploration and was a single, if important phase within a process of circulation of individuals, ideas and objects, which continued well after the first colonisation (before 7000BC) and can be traced in various forms throughout the Cretan EN. Within this much broader perspective, modelling long-distance movement purely in terms of colonisation represents too narrow a view of mobility.

CHAPTER THIRTEEN

THE CONSUMPTION OF CERAMIC VESSELS DURING THE EARLY NEOLITHIC

As with production and circulation, study of the choices, values and strategies which lie behind EN consumption, in the absence of direct observation or oral testimony, must rely instead on study of the material itself. In Chapter 9 the difficulty of isolating temporally and spatially restricted consumption contexts in the EN sequence at Knossos was acknowledged and discussed. Study of consumption was seen to be largely restricted to analysing direct evidence for choice at a broader spatial (communal) and temporal scale (i.e. a single ceramic phase). There is therefore no way of studying the different consumption choices made by individual households or other social groupings within the community. However, these restrictions upon the resolution of our direct data for acts of consumption, do not prevent consumption being approached from another angle. Since material action tends to be habitual or unconscious and since, even at this habitual level, material action reproduces social values, relations and strategies, detailed structured study of the material objects themselves - particularly those, like pottery, with a wide variety of potential uses, forms and finishes - can provide a rich source of information about the very values, relations and strategies which lie at the heart of consumption studies (Chapter 3; Miller 1985:11-12, 67, 191-3). Material acts of production create and recreate material categories, which embody elements of the social order of the world within which they are created (see Chapter 3). Since the gap between producers and consumers in small-scale societies, such as those of Early Neolithic Crete, is unlikely to have been very large, the categories created during production may have had a close relationship to the social classifications in which such vessels were *consumed* (see Chapters 3-4). Furthermore, different material categories may have acted as frames or cues for different forms of activity (Chapter 3).

Therefore, the discussion of EN consumption in this chapter will begin with an analysis of the range of material categories in the Knossos EN ceramic sequence. This will involve careful assessment of the extent to which the material categories recognised during archaeological study have any relevance to social classifications of the past. This sort of approach largely focuses on the primary or intended function of these categories. This inevitably ignores the extent to which material categories may be employed in a variety of tasks, which they were not initially intended to perform, and this limitation to the analysis is explicitly acknowledged here. In the second half of this chapter discussion of EN ceramic consumption will proceed from the direct analysis of ceramic material, via other forms of archaeological evidence to a more general contextual analysis of the changing ways in which ceramic consumption was bound up within the flow of activities, which constituted social life at Knossos (and probably at other settlements on Crete) during the seventh and sixth millennia BC.

13.1 Identifying Early Neolithic Material Categories

The new typology of forms, presented in Chapter 7, like the previous typologies of Furness and Evans, is based on the selection of specific dimensions of variability as significant, namely rim, shoulder, handle, base, decoration. That this may have also been the means by which ancient material categories were distinguished is suggested by:

(1) A consistent association between particular form-types and particular finishes: for example incised pointillé decoration during ENIa-b is almost entirely restricted to polished flat-based mugs and plastic cordon decoration is almost entirely confined to large burnished deep or slightly incurved bowls; during ENII incised chevron decoration is almost entirely confined to carinated/curved bowls with offset rim, rim strap handle and concave base in Fabrics 1e-f.

(2) A consistent association between particular form-types/finishes and particular forms of use-alteration: for example a number of incised pointillé flat-based mugs on their interiors have a white concretion, which is not found on any other vessel; likewise burnt interiors only occur in conjunction with grey burnished round-bottomed vessels.

(3) The detailed comparison conducted in Chapter 7 between the most common vessel forms from Knossos and vessel forms from south-west Anatolia and the Peloponnese revealed many general similarities in form, but importantly noted that the most significant differences consistently occurred amongst a limited group of variables, namely rims, handles, bases and forms of decoration. This would seem to suggest that at least some of the dimensions of variability selected by archaeologists, might well correspond to those employed in the creation and recognition of different EN material categories in the past.

Taken together these points seem to suggest that modern archaeological types may bear some relation to the categories in which ceramic vessels were consumed during the Early Neolithic and that one might go some way to identifying ancient material categories through the isolation of significant associations between form, finish and use-alteration. In the next section some of these associations will be discussed in greater detail.

13.2 Material Categories and Dimensions of Variability: Exploring Associations Between Form, Finish and Function

13.2.1 Surface Finish and Colour

During ENIa-b perhaps the most fundamental pair of associations within any single fabric group is the correspondence between burnishing and large open thick-walled vessels and that between polishing and smaller open thinner-walled vessels with flat bases. Thus rounded bases are almost always burnished and not polished, while most flat bases are polished rather than burnished. There is also a clear association between plastic cordon decoration, large open bowls and burnishing and between incised pointillé decoration, flat-based steep-sided vessels and polishing. It must be stressed that, although these associations hold for the majority of cases, there are overlaps between the two main categories: for example occasionally there are fine thin-walled small bowls which are coarsely finished; more intriguing are the numbers of collared jars with flared strap handles and flat-bases that are polished, since this is the only truly closed shape to be finely finished in this way. In general, however, this basic distinction holds.

In some fabrics (e.g. Fabrics 1a-i, 2a-e, 6) there appears to be a clear distinction in production between burnished vessels which generally lack slip layers and polished vessels which received slip layers (see Chapters 6, 8, 10). This would appear to suggest that a distinction between burnished and polished vessels also existed in the mind of producer. Since more effort seems to have been spent on creating a high quality polished surface, one might infer that polished vessels represented the more valued category of vessel.

The significance of this distinction is obviously difficult to assess with any certainty. During ENIa-b the coarse-fine distinction is visually very obvious and it seems possible that it corresponded to a fairly basic distinction in consumption. In his study of the consumption of categories within a modern Indian village, Miller, although concluding that variation in form did not necessarily equate to variation in function, did note the existence of a clear relationship between finish and function[1]: thus painted red pots were all associated with the function of carrying water, while cooking pots were always given a black finish (Miller 1985:162). This was very much a relationship based on convention and was not dictated by any sort of efficiency gains. Miller also noted that this distinction based on finish also had some relationship to distribution: red-painted pottery was associated with a local variation of the *jajmani* system, a formal mode with fixed principles and expectations centred around two festivals; in contrast black pottery was sold on the market system of supply and demand (see Miller 1985:162-3).

This example suggests that basic differences in finish and colour might correspond to basic differences in intended function. Regarding the potential significance of the EN coarse-fine distinction, we might let ourselves be guided by the strong association noted above between round bases and burnishing and between flat-bases and polishing. It has been noted that round bottomed vessels sit better on uneven ground, while flat-based vessels only make sense if used on a

[1] The important relationship between the colour of specific vessels and their function/social significance has been widely noted (cf. Vitelli 1995:61; Kaplan & Levine 1981:876-78; Rice 1987:331-2).

flat surface, such as a table (Sherratt 1991)[2]. This would suggest that one possible meaning for the coarse-fine distinction, is that it marked a difference between those vessels specifically intended for use on a table (tableware) and those vessels which were not. If the identification of polishing with tableware holds, then the large number of polished collared jars with flared strap handles and flat-bases, would then be explicable in terms of their intended primary function as a type of tableware (see below). In Chapter 12 it was shown that it was almost always polished vessels, which were subject to mending attempts (see Figures 12.9-10). This was interpreted as indicating that polished vessels were consistently more highly valued than more coarsely burnished vessels. This interpretation in conjunction with the greater effort put into producing polished vessels (see Chapter 10) would be entirely consistent with polished vessels being a form of tableware.

The ENIa-b coarse-fine distinction is by no means the only meaningful association between form, finish and function. For example all examples of a type of round-based deep bowl, which to judge by use alteration (see below) had been used as a type of cooking pot, are in a grey or white burnish. The significance of colour here is further supported by the discovery that in some fabrics (e.g. Fabric 4) this colour was deliberately achieved through the application of a calcareous slip on a non-calcareous body (see Chapters 6, 8, 10). The deliberate use of different slips to control the colour of vessels can also be seen in Fabrics 1a and 1d where there are frequent examples of the use of a non-calcareous slip over a calcareous body to ensure that the resulting vessel had a dark surface (red-brown-black) (see Chapter 10). This practice is almost entirely confined to polished vessels and suggests that dark polished vessels were considered particularly appropriate (see below). And so, while the reasons why a grey/white colour should have been important for cooking vessels or why a dark surface should have been sought for polished vessels might remain unclear, the

[2] The existence of tables of some sort during EN seems difficult to doubt. In Chapter 7 it was suggested that incised ceramic 'trays' might actually have functioned as models of tables.

significance of the association of colour and function in these examples seems clear.

During ENIc-ENII, all of the ENIa-b associations between colour, surface finish, form and function continue. However this period also sees an extension to the range of finishes possible within particular fabrics (see Appendix VII). During ENIa-b variation in finish in almost all fabrics consisted of burnished, polished, burnished and plastic decoration or polished with incised decoration. However during the latter part of ENIb (stratum VI) and above all during ENIc-ENII the range of finishes found in particular fabrics increases. During stratum VI (late ENIb) barbotine decoration appears in Fabrics 1d and 5a, while ripple decoration makes its earliest appearance in Fabrics 8 and 11. During ENIc rippled, dark-on-light painted, red-scribble burnished and brushed decoration appear in Fabrics 1c and 1d. In addition there are new forms of incised decoration and new motifs appearing in Fabrics 1b, 1c, 1d, 1e, and 2a/b. And so, if colour and surface finish during ENIa-b might mark off different material categories, perhaps relating to different types of activity, the extension to the range of surface finishes during late ENIb and ENIc-ENII might indicate an extension to the range of activities or perhaps the types of occasion during which ceramic vessels might be used. This possibility will be subject to further evaluation below.

13.2.2 Simple Rims and Offset Rims

Another basic dimension of variability is that marked by the presence or absence of offset rims. As noted in Chapter 7, vessel-types with offset rims essentially share the same range of basic forms as those with simple rims and, in this way, offset rims serve no greater purpose than to extend the range of form types. The majority of vessels with offset rim are thin-walled and polished, although there are occasional exceptions to this rule. In this way, the addition of an offset rim in most cases creates a separate group of vessels within the category of polished vessels. The possible reasons for this separation remain obscure. Since the range and size of forms with offset rims are essentially the same as those without offset rims, there is no obvious functional difference between these vessels. One might speculate along the lines of the use of these two groups of vessels in different consumption activities, on different occasions or perhaps as containers for different items (liquids and solids?). However, this remains simply speculation and it as well to remember the *caveat*, noted by Miller in his Dangwara example, that variation in form need not necessarily correspond to any variation in function (Miller 1985:162).

13.2.3 A Recurring Series of Vessel Types: Redundancy of Form?

In each of those fabrics, which are well-represented in the EN sequence at Knossos (i.e. Fabrics 1a-e, 2a-d, 5, 6, 8), there are a range of forms, which consistently recur (see Appendix VII). These form-types are listed in Figure 13.1. In addition to these recurring shapes there are also more unusual shapes, which are shared only amongst some fabrics: e.g. flared cup (Fabrics 1b, 1d, 5a, 10), flat-based mug (Fabrics 1b, 1d, 2a/b, 5a, 23), 'tray' (Fabrics 2a/b, 6).

Simple Rim	Offset Rim
deep bowl	deep bowl
curved bowl	curved bowl
carinated bowl	carinated bowl
shallow bowl	shallow bowl
hole-mouth bowl/jar	incurved jar
's' profile jar	collared jar
flared bowl	

Figure 13.1 Forms Which Consistently Recur in the Most Frequently Occurring EN Fabrics at Knossos.

From a purely functional perspective, it is striking how many of these forms are essentially interchangeable with one another (see Appendix VI). In most cases the dimensions of variability which mark off each type as different need not necessarily affect how that particular type performs. Indeed the range of shapes presented in Figure 13.1 could be replaced with perhaps three forms (shallow open bowl, deep open bowl, collared jar). In this way one might characterise the basic EN shape repertoire as exhibiting redundancy of form (see Chapter 3). This redundancy of form only increases if one takes into account the likely existence of containers in perishable materials (see below). Thus, it is concluded that notions of functional efficiency play little part in the detailed explanation of variation in form (cf. similar comments of Miller 1985:67; cf. Chapter 3).

In view of the distinction made between burnished vessels and polished vessels, it is worth noting that vessels which are only burnished are made in a much more restricted range of shapes, than vessels which are polished. The majority of burnished vessels are deep or incurved bowls or collared jars, although other forms do occur more infrequently in the burnished category. In contrast polished vessels frequently occur in a much wider range of forms: i.e. curved bowls, shallow bowls, flat-based vessels, curved bowls with offset rim, deep bowls with offset rim, carinated bowls with offset rim, collared jars with flared strap handles. Thus the nexus of formal ceramic variation is in polished vessels. If the identification of polished vessels with table ware (see above) has any substance, then this would seem to indicate that the greatest demand for different vessel forms was in activities closely associated with the consumption of food. This conclusion finds an echo in a statement made by Broodbank (1992:53) to the effect that any identifiable stylistic change in EN ceramics at Knossos was heavily concentrated amongst open shapes (eating, drinking and serving), while closed (storage) vessels show little variation and decoration. Certainly if the connection between polished vessels and tableware is correct, it becomes easier to explain this greater variation, since the consumption of food is very likely to have been, at least on some occasions, a very public arena of consumption (see Sections 4.2-3).

13.2.4 Formal versus Informal Categories of Form

As outlined in Chapter 3, variation in systems of material categories may be characterised as either informal, where the variety of forms or finishes within a single producing group is very high and where typologies are very extensive and difficult to subsume into a simple order, or formal, where the variety of forms or finishes is low and where typologies are simple with low variation and are often remarkably consistent between sites (Miller 1985:199-200). If each distinct

ENIa-b fabric were to represent a producing group, then the total range of forms produced by each group can be calculated. Figure 13.1 lists 13 basic recurring forms, which, even if one adds 2 or 3 more unusual form types, still only amounts to around 16 form types. This figure might, for example, be contrasted with the 51 different material categories based on form noted by Miller for just one group of potters in India (1985:39). This might suggest that the range of ENIa-b forms within each fabric was relatively low. In Chapter 7 it was suggested that the variation which can be observed in the range of EN forms can be understood to be very simple to generate through the differential combination of a limited range of basic forming sequences. In this way the ENIa-b range of material categories may be understood as simple. Finally, as noted above, this simple range of forms and this limited range of finishes are repeated in a large number of fabrics, many of which must correspond to producing groups in different locations outside Knossos (see Chapters 6, 7, 10).

When taken together these various features suggest that the ENIa-b system of material categories should, using Miller's definition, be characterised as formal; that is one where the variety of forms or finishes is low and where typologies are simple and remarkably consistent between sites. Since pottery is not reproduced either by itself or by abstract structures, but by the active intervention of human agency (see Chapter 3), recognition of the high degree of formal order exhibited by ENIa-b material categories carries implications for how such vessels might have been consumed. In Chapter 3 it was argued that one of the ways in which material categories work is as a frame or cue for further action. Thus if categories of vessel acted as frames for action, then in the case of a formal system of material categories, such as that suggested for ENIa-b, it seems likely that the ways in which these vessel categories were consumed may have been equally highly formalised. The production of a similar, simple range of forms at different ENIa-b settlements (see Chapter 10; cf. Plates 32-4, 57-8), therefore, would seem to testify to a widely-shared set of formalised ideas about how ceramic vessels should be consumed.

Here it is worth emphasising how stable ENIa-b material culture was (see also Section 12.6). A crude way of appreciating the rate of ceramic change is through a comparison of the estimated duration of definable ceramic phases, since the ability to separate different strata using ceramics depends entirely on the degree and speed at which ceramics change over time (see Figure 13.2). Even with the new sub-phasing of ENI proposed in Appendix I, individual ceramic phases still remain long in duration (c.600-700 years) until late in the ENI sequence, after which point the observable pace of ceramic change increases to a faster rate (c.200-250 years). Clearly EN ceramics, particularly ENIa-b ceramics, exhibit a very slow rate of change.

Phase	Estimated Duration
Aceramic	c.600 years
ENIa	c.600 years
ENIb	c.700 years
ENIc	c.200 years
ENII/MN	c.400 years
LNI	c.250 years
LNII	c.250 years

Figure 13.2 Estimated Duration of Neolithic Ceramic Phases (Based on Appendix I).

In this way it should be clear that ENIa-b material culture is not in a constant state of flux but rather suggests the reproduction of a 'stable universe' of material categories and social values (see also Chapter 12). Indeed, the very slow rate of change observable in ENIa-b ceramics, suggests that the social context within which material categories were being reproduced was an inherently stable one. In order to bring out the full implications of this, one might contrast this situation with one where ceramic change is necessarily more rapid, such as, for example, where there is a defined social hierarchy and where processes of emulation are taking place[3]. Here ceramic change is necessarily more rapid because objects and/or practices may become symbolic of persons or groups within such a hierarchy, perhaps even as markers of status. In such a scenario if an individual or

[3] Here one should see especially Miller's discussion of the effects of social hierarchies and attendant processes of emulation on the rate at which ceramics change (1985:185-196).

group should wish to raise their status within the hierarchy, they might elect to adopt some of the objects and/or practices associated with the higher status (emulation). In turn if the higher individual or group wishes to maintain the previous contrast, they must either prevent this or promote new objects/practices as symbols to maintain this distinction. Such a dynamic inevitably leads to a more rapid rate of change in material culture.

The contrast between this situation and the scenario described for ENIa-b ceramic consumption could not be stronger and it hints at the absence of a permanent clearly-defined social hierarchy. It also provides further support for the idea that the consumption (and production) of ceramics vessels was highly regulated and subject to formal rules or social values, which actively promoted the maintenance of specific forms and, presumably, the practices which went with them. This sort of non-innovation should be understood to be equally as dynamic as any situation where innovations are taking place (see Chapter 3). Furthermore, as argued in Chapter 3, it is just such rules or systems of social values, which render power to symbolic capital. Through socially-generated restrictions on consumption (and exchange) (e.g. taboos), formalised systems of social values act to control and direct symbolic activity towards specific activities and specific material categories and away from others. It should be stressed that although such rules direct activity, they also allow limited room for manoeuvre and negotiation, where individuals and groups can compete for status, even within a society which lacks a defined social hierarchy and which may uphold an ideal of egalitarianism. It was suggested above that the nexus of formal variation in ENIa-b ceramics occurs amongst categories of polished vessel, for which a primary function as tableware was tentatively suggested. If correct this might suggest that the consumption of food in ceramic vessels was one of the few areas where, subject to certain rules, individuals or groups might compete for status (see below).

During ENIc-ENII there is a clear increase in the rate of ceramic change. This period also sees a slight increase in the range of forms produced in each fabric group: for example, while almost all the basic recurring ENIa-b forms continue, there are new forms such as the various types of carinated bowl (carinated, shallow carinated, flared carinated). As noted above, this period also sees an extension in certain fabrics to the range of surface finishes used. In terms of formal or informal categories of form, this would seem to suggest a certain loosening of ENIa-b formal categories to include new forms. The continuation of almost all ENIa-b material categories would seem to suggest that, whatever functions pottery vessels performed during ENIa-b, these functions continued to be fulfilled. However the creation of new categories of finish and the introduction of new forms might also indicate that there was also some sort of extension to the ways in which ceramic vessels and previously been consumed (see below).

13.3 How were EN Ceramic Vessels Consumed? Material Categories in Action

The important role played by early ceramic vessels in the preparation and consumption of food has long been recognised (see Chapter 2; Rice 1999:29-37). Regarding the Knossos EN sequence in particular several scholars have drawn attention to a primary focus on vessels suitable for the serving and display of food, with other shapes being considered more suitable for storage than cooking (Evans 1964:196; Broodbank 1992:53). Restudy of the EN material with particular attention paid to evidence for use-alteration has allowed the validity of these statements to be re-assessed.

13.3.1 Cooking

As emphasised by previous scholars, there is no evidence at EN Knossos for the direct use of ceramic vessels over a fire. Despite careful examination no sherds could be identified with soot marks on their *exterior*. However, it was found that there was always a small number of sherds with clear traces of burning/sooting and even burnt sediment on their *interior* surface, particularly around the interior of the base (cf. Plate 54). Usually this burnt concretion was observed to have penetrated the body of these vessels, leaving a dark stain in the sherd break. Vessels are generally white or grey burnished, although unburnished organic-tempered vessels are also found (Fabric 15), and in every identifiable instance have rounded coil-built bases (see Section 10.2.5). The form of the upper portion of these vessels is less easy to reconstruct with confidence, since these vessels are always highly fragmented (cf. Plate 45). However surviving fragments suggest a hole-mouth jar or deep bowl, probably with strap handles attached around half way down the body (see Appendix VI). The consistently large diameter of these vessels suggests that these were not used for individual food consumption but rather contained food to be shared between a number of individuals. Such vessels were identified in Fabrics 1d, 1e, 1i, 4, 8, 12 and 15. It should be stressed that, with the possible exception of Fabric 15, none of these fabrics represent functionally-specific cooking pot fabrics: rather the same fabrics were used to make the full range of EN shapes (see Section 10.2.5). Since none of these vessels preserve any evidence of burning on their exterior surfaces, yet demonstrate clear evidence for the application of heat to their contents, it seems likely that they testify to the use of a method of indirect heating, such as the addition of pre-heated stones (pot boilers)[4].

Evidence for indirect forms of cooking can also be found at other early Neolithic Aegean sites. In Aceramic levels at Argissa (Thessaly) Weinberg notes the discovery of "large quantities of river pebbles which had been subjected to repeated heat and are believed to have been heating stones used in cooking" (1970:568). From the same site there is also no evidence for the use of stone cooking vessels nor were there any signs of burning on two thick-walled vessels of unbaked clay (Weinberg 1970:569). Thus these heat-treated pebbles must have been used in some vessel made from a perishable material, such as basket or wood. For EN-MN Franchthi Vitelli notes a similar lack of evidence for sooting/burning on the exterior of vessels (direct heating), but notes that occasionally there are sherds which "preserve sooty deposits, but always on the *interiors* of vessels" (Vitelli 1993a:214, my italics; see also 1993a:213-5). It is only late in MN when the first evidence occurs for the possible direct use of vessels over a fire (Vitelli 1989:24). Vitelli has concluded from this that ceramic

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[4] Examples of the use of forms of indirect-heat cooking can be found in the ethnographic literature (see references in Brown 1989:206-7; cf. Sassaman 1995:225).

vessels were not used for cooking during this period (1989:24-5; 1993a:214-5). However it would be more accurate to say that although ceramic vessels were not used in direct-heat cooking, there is evidence to suggest that certain vessels may have been used for indirect-heat cooking.

It is important to place these ceramic vessels used for indirect-heat cooking within the wider context of EN cooking practices. At Knossos such vessels do not in any way dominate the ceramic assemblage; in fact, although a consistent presence, they are never common. It therefore seems highly unlikely that these vessels accounted for all cooking needs, rather the opposite. Even within the restricted excavated area of EN Knossos, there is abundant evidence in each stratum, in the form of shallow pits filled with ash, bones or even 'greasy' deposits, for the use of small pits for cooking (Evans 1964: 140, 153, 155). Judging by the high frequency with which these occur these are likely to have served as the main means of cooking. This in turn suggests that the grey burnished or organic-tempered ceramic vessels used for indirect-heat cooking could only have played a restricted role in cooking and were probably not a regular daily cooking pot. Rather, it seems possible that such vessels might have been associated with the preparation of special foods or might have been used on special occasions.

Halstead has argued that the location of many cooking facilities in EN-MN (Greek) settlements in open spaces between houses suggests the existence of social pressure to share cooked food (1995:16-19; see Chapters 2-3). Although broadly in favour of such an interpretation, Andreou, Fotiadis and Kotsakis note that ash-pits have been found both inside and outside houses (1996:559). This is also the case for EN Knossos, where built structures invariably contain numerous small ash-pits cut into their occupation floors (e.g. Evans 1964:153), which would seem to indicate that some cooking was small-scale and took place indoors. At the same time, however, there is at least one instance of a much larger cooking installation located in an open(?) cobbled area to the north of house C (stratum VII) (Evans 1964:153). Apparently House C maintained both small-scale internal cooking facilities and a larger-scale open-air cooking area.

This suggests a more complex scenario than a simple sharing of all cooked food. If cooking took place both indoors as well as in more public arenas there may have been a distinction in food preparation between on the one hand the small-scale, private(?) preparation and perhaps consumption of food indoors and on the other the larger-scale, public(?) preparation and perhaps consumption of food outdoors. If so it may have been that private consumption of food was the normal practice with more communal acts of food consumption being perhaps a more ritualised form of consumption restricted both spatially to areas adjacent to but outside the household and temporally to specific occasions.

During ENII at Knossos there seems to have been a change to the spatial location of external cooking facilities. Evans notes that along with changes in the scale, techniques and design of house building, there seems also to be a tendency to enclose external yards: "remains found in [sounding] AC suggested that some structures might have had small enclosed yards attached" (Evans 1994:14).These ENII changes may find a near contemporary parallel on the Greek mainland in the LN division of previously open village settlements into separate 'courtyard groups' (Halstead 1995:17). Halstead has interpreted these changes as signifying more restricted sharing between households (1995:17-18).

And so, when the available data for earlier Neolithic cooking practices are collected together they present a surprisingly coherent picture. Before the adoption of pottery all cooking was done without the aid of ceramic containers. Although it seems likely that most cooking, at least at Knossos, was done in fire pits, the discovery of heat-treated stones at Aceramic Argissa strongly suggests that non-ceramic perishable container forms (skins? wood? basketry?) were also used for a form of indirect-heat cooking. When ceramic vessels first appear, it would seem that, far from revolutionising cooking technology, as emphasised in 'adaptionist' approaches to early ceramics (Chapter 2), these new containers actually did very little to change pre-ceramic methods of cooking. Indeed on present evidence it seems unlikely that those ceramic vessels, which were used for a form of cooking (indirect-heat), were ever used on a daily basis. Vitelli reached a similar conclusion regarding pre- and post-ceramic cooking practices at

Franchthi and suggested that the failure to use ceramic vessels as cooking pots might signify continuities in both diet and cooking practices between the Mesolithic and Neolithic (Vitelli 1989:25), continuities which may have persisted owing at least partly to the embedded social nature of culinary practices. Clearly, the supposed advantages of ceramic vessels in direct-heat cooking, so obvious to modern researchers, were not so immediately apparent to the earliest users of pottery at Knossos and at other sites in the Aegean.

13.3.2 Storage

In contrast to cooking, the use of ceramic vessels for storage does not leave unequivocal traces. If one considers the suitability of each of the various EN forms for storage, one is forced to conclude that almost all medium to deep bowls and jars of whatever form could have been used in this way if necessary. Of these, perhaps the most likely candidates are some of the jars, since some of the largest (c.15-18cm diameter) schist 'pot-lids' identified by Evans (1964:231) could have served as covers. However any large upturned bowl could have been used as the cover of another. In his study of ceramic consumption in an Indian village, Miller noted that, after a period of use, all ceramic forms were taken out of their primary functional context and used for storage (Miller 1985:71). This may also have been the case for EN Knossos, with a variety of different vessels having secondary lives as storage vessels.

Unfortunately, there is little direct indication as to what the potential contents of storage vessels might have been. All bowls forms would have been suitable for either liquids or solids, although there is a complete absence of shapes dedicated to the storage and pouring of liquids (no spouts). Perhaps the best adapted for both are the collared jars, since they have collared necks which make pouring more easy, but which also are of a sufficiently wide diameter (e.g. c.20cm) to allow easy access to the contents, whether liquid or solid (see also below on transportation). Perhaps the most likely candidate for storage is agricultural produce, although literally any loose material would have been possible.

The scale at which any agricultural produce could have been stored in ceramic vessels cannot have been very large. Figure 9.8 suggests that during ENIa and ENIb the quantities of ceramic vessels in circulation were relatively low (see Chapter 9). Also worth stressing is the small size of EN vessels, especially in comparison to later Bronze Age dedicated storage vessels. Certainly there is a very real absence of obvious dedicated storage jars (pithoi) at EN Knossos and it may well be that like mainland Greece, Crete did not see the first of such specialised storage jars until late in the Neolithic (Cullen & Keller 1990; Perlès 1992:144). In this way, one is forced to conclude with Vitelli (1989:26-7) and Yiouni (1996b:192) that at EN Knossos, as at EN (Greek) Franchthi and Nea Nikomedeia, ceramic vessels were neither large enough nor numerous enough to be able to satisfy the direct storage requirements for a single independent household for a year. This in turn suggests that we should consider the possible existence of other, perhaps communal, forms of storage during this period at Knossos. Possible evidence for such structure a might be the cache of burnt grain in association with a burnt post-hole structure located in an Aceramic level (stratum X) outside the main area of the settlement.

13.3.3 Transportation

Perhaps owing to the general reluctance in studies of Neolithic ceramics to accept the movement of anything more than a few fineware vessels between sites (see discussion in Chapter 2), the possible use of ceramic vessels for transportation has not been seriously discussed. This is unfortunate since there is a need for transport containers at both intra-site and inter-site levels, the most obvious example being the need to convey water from source to place of consumption. In this regard it is worth noting that there are a number of vessel forms are provided with large strap handles, usually large open bowls (deep bowls, curved bowls) or collared jars (see Plates 57-8). Certainly their suitability for transportation might go some way to explaining the regular occurrence at EN Knossos of such vessels, especially collared jars, in fabrics which cannot be immediately local to the site (e.g. Fabrics 5a, 6, 8, 9, 10, 11; see Plates 57-8). In this way the movement of these vessels may indicate that at times the contents of an exchanged vessel may have been the object of that exchange and not the vessel itself.

As with storage above, there is no indication of what the contents of these vessels might have been; liquids or solids are equally likely. The need to transport water could theoretically have been fulfilled by the collared jars. However, a far better candidate for a specific container for liquids is suggested by a number of clay jar stoppers from EN and later strata (e.g. Evans 1964:pl.58.3). The diameter of these clay stoppers is far too narrow (1.5-2.5cm) for even the narrowest ceramic jar and it therefore seems likely that these stoppers were sealing a container in a perishable material, perhaps a lined basket, or more likely a gourd. Whatever the material, such vessels, with their narrow neck aperture, would have been ideal for the transportation and storage of liquids.

13.3.4 Serving/Display

Most EN bowl and jar types allow easy access to the contents of the vessel and thus could have been used directly in the consumption of food and drink. Indeed one is forced to acknowledge that the majority of types comprise a range of essentially interchangeable forms whose specific significance - if actually different for each form type - is effectively lost to us. Certainly the larger deep bowls, which occur in several fabrics and which are often decorated in plastic decoration, either cordons or lumps/pellets around the area of the rim (sometimes both), with their large diameters make most sense as communal containers for food. In support of this, many of these vessels have wear marks around the base of the interior, which are suggestive of repeated scraping, perhaps by smaller bowls. Some confirmation of this is provided by wear marks on the exterior rims of smaller curved bowls (both with and without offset rims). This suggests a situation where food is shared out of a communal vessel to be consumed in one or more smaller vessels which may or may not have also been shared. Other closed vessels could also have been used as serving containers; the best candidates being the smaller polished collared jars with flared strap handles and flat bases.

Unfortunately, further exploration of how specific bowl forms were consumed is generally limited by the lack of contextual information. The only possible exception to this is a certain category of open shallow open bowl which has a flat base and steep sides (flat-based mug), which make their first appearance during ENIa and continue throughout ENI. These vessels are the most frequently decorated EN form type, although undecorated examples are also known (see Appendix VII). Indeed almost all examples of EN incised/pointillé decoration occurs in this form in Fabrics 1d, 2a/b and 5a. The only other categories of artefact, where incision and/or pointillé is also frequently found, are clay 'shuttles' and above all figurines, more specifically human figurines, since animal figurines appear not to have been decorated. In addition to figurines, a single example of incised/pointillé decoration is found on a unique, but fragmentary ceramic object (Fabric 2a/b), whose significance remains is unclear (see Evans 1964:fig.27.23). The usual technique used for figurines is that of

> "small punctured holes... either alone or in combination with incised lines running along one or both edges of the lines, covering either the whole or parts of the body. Both techniques occur in all periods..." (Ucko 1968:329-30).

This compares very closely to the use of incised/pointillé decoration on flat-based mugs.

In this way incised/pointillé decoration makes a link between flat-based vessels and human figurines. This link is further reinforced by a unique flat-based mug in Fabric 23 (97/60), which in addition to having an unusual form of incised/pointillé decoration (dots and wavy lines) also has the upper torso of a figurine moulded into and projecting above its rim (see Plate 59). Although this example remains unpublished, Evans illustrates several figurine fragments which could represent other possible examples of this practice (Evans 1964:226, fig.60.6-7). A key to the possible significance of this connection is provided by Ucko's study of the Neolithic figurines from Knossos (Ucko 1968). He concludes that much of the incision and/or pointillé decoration on figurines is used to represent anatomy, clothing or tattooing (see Plate 60): indeed around one quarter of all figurines would seem to have either clothing, tattooing or scarification of some form and in almost every case incisions are used (Ucko 1968:329).

In view of the possibility or even likelihood that tattooing was practised at Knossos during EN, it is worth drawing attention to a number of items from the EN sequence, which have previously attracted little attention in this regard. First and foremost are the bone needles, both perforated and unperforated, which were found in 'considerable numbers' (Evans 1964:236, fig. 61.11, 13, pl.60.1-2). Also worthy of mention are the small quantities of red and yellow ochre (strata X, V and IV), one piece of malachite and two of azurite (stratum IX), all of which were "almost certainly prized for their use as colouring materials" (Evans 1964:238). Finally there is the single example of what, on analogy with EBA Cycladic examples, could be a mixing palette (stratum VIII) (Evans 1964:fig.28.24). This is the only known ceramic example (Fabric 2a/b), however other versions, perhaps in wood, could have existed.

If much of the incised and/or pointillé decoration on human figurines represents tattooing, then it might be reasonable to suppose that the incised/pointillé decoration on flat-based mugs might also bear some relationship to the practice of tattooing. In addition to the connections already noted, there are other suggestions that this might have been so. Study of the application of incised/pointillé decoration strongly suggests that it was applied in a very careful manner, since the pointillé dots are not randomly applied but were deeply impressed in regular rows, always with a small gap between each one (see Section 10.4.5). Such decoration could have been applied by the same bone needles, mentioned above, which would equally have served as real tattooing needles. Moreover, after incised/pointillé decoration has been applied it would appear that a white or red paste was rubbed into each incision in order to accentuate the effect. This practice would find a neat parallel with application of colouring pigments during tattooing.

Ethnographic parallels for the objectification of values, ideas or even people in ceramic vessels abound. For example in the study of David et al. (1988)

among the Mafa and Bulahay of northern Cameroon, the decoration of pottery is understood by analogy to the decoration of the person: pots may be assimilated to persons and represent human and other spirits. A similar sort of relationship may have existed at EN Knossos between flat-based vessels, the human body and the practice of tattooing. How this relationship was articulated in practice is difficult to decipher. Flat-based vessels are usually provided with large handles, perhaps placed at opposite sides of the vessel. All flat-based vessels are small enough to have been picked up by one person. At least one flat-based vessel has incised decoration on its base (see Evans 1964:fig.27.20) - a practice not found in any other forms - and this would seem to suggest that the base was often visible, as would be the case if the vessel was held by its two handles and tipped towards the mouth. In this way, these vessels perhaps make most sense as vessels for the individual consumption of food or drink. That said however, it should be noted that several incised/pointillé decorated flat-based vessels have a white encrustation on their interiors. This does not appear to be a food residue, but rather resembles the white in-filling of the incised/pointillé decoration[5]. It therefore remains possible that this white encrustation may have had something to do with the use of these vessels in body decoration.

The very specific set of associations which surround the consumption of flat-based vessels, suggests above all that they should be considered to play a part in ritualised action, which involved both the consumption of food and/or drink and the practice of tattooing. The sort of rituals which spring most readily to mind are those which involve rites of passage of some sort during the human life-cycle. Tattooing might mark a form of personal transition, such as the acquisition of a new identity or status. This transition might also be marked by food consumption. In this way these ceramic vessels along with the body tattoos may have continued to symbolise this set of associations long after the event itself. Finally and in the context of these final conclusions it is worth noting the possible importance of gender in these practices. Ucko notes that "over one third of the female figurines are either tattooed, clothed or cicatrized... while only one

[5] This, however, was not tested by analysis.

twentieth (?) of male figures have any non-anatomical markings" (1968:330). This may indicate that tattooing and therefore the consumption of flat-based vessels might have been intimately associated with moments of transition during the female life-cycle, such as the beginning of menstruation or marriage.

Such an example provides further support for an earlier suggestion, based purely on the observation that the system of EN ceramic material categories is highly formalised, that the EN consumption of ceramic vessels may have been subject to very specific rules with perhaps specific types of vessel having specific meanings, particular sets of practices and associations and perhaps different contexts of use. In the end, however, the general lack of contextual information for specific acts of consumption means that this must remain speculation.

13.4 Diachronic Changes in the Consumption of Ceramic (and Non-Ceramic) Containers (Aceramic-ENII)

13.4.1 Aceramic

It is almost certain that during the Aceramic use was made of non-ceramic containers made from perishable materials (Evans 1968:271). It has already been argued above that during EN there is evidence in the form of clay stoppers to suggest the use of very narrow-necked non-ceramic containers (gourds?). Other evidence for the existence of non-ceramic containers is provided by evidence for interaction between ceramic and non-ceramic forms, such as when pottery mimics the form and/or finish of containers made from other materials (skeuomorphism). Skeuomorphism has been noted as a feature of early ceramics in many areas of world with a variety of other containers, usually of perishable materials, being mimicked: e.g. birch-bark bags, baskets, soapstone bowls, animal skin bags, gourds, wooden vessels, leather vessels (see Chapter 2).

Perhaps the clearest examples of skeuomorphism occur in fine dark polished bowls, particularly ENIa examples. These bowls contain several features which recall wooden vessels. Particularly striking is the consistent use made of wishbone handles, which seem to function poorly as handles for ceramic vessels. Wishbone handles are long, heavy and with such a narrow point of attachment as to render them highly susceptible to breakage (cf. Plate 32): indeed in almost every case such handles break off at their point of attachment. In wood however such a handle would be both straightforward to carve and would be much less likely to break off. Certainly such a handle would be unlikely to arise purely from a ceramic tradition. Other features of these vessels, such as pierced or unpierced ears mounted on the rim could easily have wooden prototypes. Wishbone handles and pierced ears are invariably found on the simplest bowl forms, namely curved bowls or shallow bowls, which also could easily have wooden prototypes; however even the more complicated shapes, such as curved or carinated vessels with offset rim, could have been rendered in wood. Mention is also worth making of a number of very rare or unique ceramic forms, which might have been more common in wood, such as the ceramic spoons (two examples) and the single ceramic palette (Evans 1964:fig.28.24, fig.57.15-16). The possible connection between some of the finishing techniques used for polished vessels and some of the finishing techniques used for wooden vessels (i.e. carving out, smoothing, polishing, incising) has already been noted in Chapter 10.

Further strong indications in favour of the skeuomorphism of wooden vessels is provided by a consideration of how polished vessels were finished. A significant proportion of the earliest polished ceramic vessels have a horizontal scribble burnish laid over their polished surface, which seems to have been a deliberate attempt to reproduce a polished wood grain finish (see Plate 60). Also apparently deliberate was the creation of a dark as opposed to a buff polished surface. Where non-calcareous clays were used (e.g. Fabric 2a/b, 6, 8) a dark polished surface would be the most likely natural result, however in calcareous Fabric 1a a non-calcareous slip was deliberately used apparently to ensure a dark surface (see Chapters 8, 10). Certainly all 'wood-grain' polished bowls have a dark surface, whatever their clay chemistry. And so, here the deliberate creation of a dark grained surface makes is perhaps best explained in terms of the skeuomorphism of pre-existing wooden vessels. This 'wood-grain' technique is particularly characteristic of the earliest (ENIa) dark polished vessels, however the use of non-calcareous slips on calcareous bodies to ensure a dark polished surface continues to be a feature if Fabrics 1a, 1b, 1c, 1d, 1e and 1f throughout

EN. This suggests an ongoing significance for dark polished surfaces long after the initial interaction between ceramic and wooden vessels in ENIa.

In this way it seems likely that many of the basic forms of polished bowl could have had wooden prototypes. In view of the clear links between ENI ceramic tableware and wooden prototypes it is perhaps probable that prior to the adoption of pottery wooden vessels were primarily used as tableware. And so, if at least some polished ceramic bowl forms had wooden prototypes, then this raises the question of potential prototypes for other EN ceramic forms. Wood would have been a good material out of which to make open forms of tableware: open shapes are easy to carve out and being tableware vessels need not be too large; a wooden container is naturally water-tight and can be smoothed and polished to a shine to accentuate its appearance; wood can also be incised or carved to produce relief decoration. Other forms, however, especially very closed shapes or very large vessels would have posed problems in wood.

Ceramic versions of these very closed or very large forms preserve a series of features which suggest the possibility that such forms might skeuomorph containers in a different material, most likely basketry: these ceramic vessels tend to be round-based globular shapes, sometimes with collared or extended rims and often with strap handles, more rarely with tubular loop handles (vertical or horizontal). Round bases, globular forms, collared or extended rims, strap handles and loop handles are all features found in modern ethnographic examples of basket-making. A origin in basketry might be particularly appropriate for the collared jars and their flared strap handles (thin/flat-profile), which in ceramic are common in a variety of fabrics from the very earliest pottery bearing level (stratum IX) (see Appendix VII). Such a vessel, if produced in basketry, would have been light and easily carried. Basketry would have also allowed the construction of larger vessels suitable for storage. Finally, as with wood, connections can be drawn between some techniques potentially used in basketry and techniques used the formation of ceramic vessels (e.g. a coil of reeds is twisted together and then a vessel is built from this coil by tying each coil on to the next) (see Chapter 10).

Skeuomorphs of other materials are less easy to isolate with certainty. Stone bowls are actually very rare with only a single unpublished 'worked stone bowl' coming from Aceramic levels (sounding X) (Evans 1970b:7). Indeed in general it would seem that stone bowls may themselves skeuomorph container forms in other materials: for example a stone bowl from an ENIc context (sounding XY) copies a common ceramic form (deep bowl with offset rim) (see Plate 62).

Unfortunately, because wood and basketry are perishable materials, direct evidence for containers in these materials is unlikely to ever be found. However, such containers must have existed during the Aceramic and, in view of the evidence for skeuomorphism in the earliest ceramic containers (ENIa), there is a very real likelihood that many ceramic forms had wooden or basket prototypes. Certainly there cannot have been any difficulty in terms of accessing the raw materials for such materials, since both wood and reeds must have been easy to come by. The existence of such crafts is suggested more indirectly by the use of timber in the construction of buildings and the almost certain existence of some form of sea-craft during EN (see Chapter 12), which must have involved skills in wood-working, basketry and/or sewing. Furthermore the apparent success of ENI maritime movement suggests that these crafts were reasonably well developed.

And so if an understanding of how different ceramic forms skeuomorph vessels made in different non-ceramic materials, is combined with a consideration of the various material properties of wood and basketry, a relatively coherent picture emerges for the consumption of containers during the Aceramic. It seems probable that there existed a range of non-ceramic containers made from wood, basket and perhaps gourd. Moreover, it would seem that these non-ceramic containers in the Aceramic may have potentially comprised a very similar range of forms to those found in ENIa ceramics and that these Aceramic forms may possibly have performed very similar functions to those ascribed above to EN ceramics.

13.4.2 Early Neolithic Ia-Ib

When ceramic containers first appear in ENIa they manifest themselves in such a range of distinctive forms that it has long been argued that both ceramic technology and the ceramic forms themselves must have been developed elsewhere prior to their introduction/adoption at Knossos (Evans 1964:196; 1968:271; cf. A. Evans 1921:35; see Chapter 2). Past attempts to provide an origin for this technology have generally looked east, pointing to blank areas on the Neolithic map, particularly the islands of the east Aegean or along the Aegean/Anatolian littoral. Unfortunately, however, as knowledge of the Neolithic in these areas increases, it is becoming increasingly unlikely that these areas did provide the origin for the ceramic forms of ENIa Knossos (cf. Appendix IV, Chapter 7). As was outlined in Chapter 7, although some general similarities exist between the basic forms at EN Knossos and contemporary forms on both sides of the Aegean, what is quite clear is that these distant areas also had their own distinctive range of features and moreover lack all of the most distinctive features of Cretan ENIa forms (i.e. offset rims, wishbone handles, strap handles, flared strap handles, pierced triangular ears). Nor do these areas provide parallels for the most distinctive ENIa-b finishes (i.e. incised/pointillé, incised lattice, ripple burnish, barbotine, slashed cordon decoration).

This would seem to suggest that the hypothesis of wholesale and slavish adoption of a 'foreign' technology with a 'previously developed' range of forms, whether from the Greek mainland to the east or Anatolia to the west, is no longer tenable. Rather, in view of the near certainty that non-ceramic forms existed prior to the adoption of pottery, the role played by other containers in the adoption of pottery should be given fuller consideration. Certainly the quite extensive body of evidence in favour of very real links between ceramic and non-ceramic forms makes it hard to deny that at least some of the most distinctive ceramic forms must have had non-ceramic prototypes (e.g. eared bowls, bowls with wishbone handles, strap handled bowls/jars). In this regard it is worth drawing attention to the fact that it is those very features, which so distinguish ENIa forms from LN Anatolian or EN Greek forms, (i.e. wishbone handles, strap handles, flared strap handles, pierced triangular ears) that present the clearest evidence for skeuomorphism.

If correct this would suggest a very different context for the adoption of pottery. In view of the striking similarities in the date of the first arrival of pottery containers in Greece, coastal Anatolia and Crete (see Chapter 2; Appendices I, IV) it remains likely that trans-Aegean diffusion at least of the basic idea of ceramic technology played a part in the adoption of ceramic technology. This could have taken place along existing extensive social networks, which must have existed during the Aceramic (see Chapter 12). However, what the data from Knossos suggest is that existing local non-ceramic container forms most likely had a significant influence on the forms which the first ceramic vessels took. Where this first combination of adoption and adaptation first took place on Crete is immaterial. What seems to be more important is that there was great interest in these new containers and in the new technology and that both spread rapidly through Crete, probably along existing social networks. This is perhaps the best way of explaining the presence in the earliest pottery bearing stratum (stratum IX) of a wider diversity of fabrics than any other EN level, with several of these fabrics demonstrably having come from some considerable distance (e.g. Fabric 12).

Consideration of the scale at which ceramic vessels were consumed also sheds light on the earliest phase of ceramic-use (see Figures 9.7-9; Sections 9.3-5). Although the figures presented in Chapter 9 represent a very crude estimate, they do give some indication of important differences in the scale at which ceramics were consumed during different phases of EN. For ENIa they suggest a very limited use of ceramic vessels. Regarding this low figure it is worth emphasising that the figure of c.25 vessels represents a maximum estimate, an even lower figure could be possible (see Section 9.5). Since the basic range of recurring ENIa form types was identified as numbering between 13-16 forms (see Figure 13.1), it is difficult to see how different social groups within the Knossos community could have control or own a full range of ceramic forms. This may indicate that during ENIa (and possibly ENIb) there was some sort of communal sharing of ceramic vessels between social groups, perhaps even that there was no direct ownership of vessels by individual households. Vessels could, for instance, have been kept in some sort of communal storehouse on analogy with the communal building at EN Nea Nikomedeia.

What these low figures for ENIa also emphasise, is that although the earliest ceramic vessels most likely comprised a range of forms and functions comparable to earlier Aceramic containers, they could not have entirely replaced the use of these non-ceramic vessels. Instead the low level of consumption of ceramic vessels during ENIa and to a lesser extent during ENIb testifies not only to the ongoing use of non-ceramic container forms alongside ceramic vessels, but also to a continued reliance primarily on non-ceramic containers long after the adoption of ceramic technology. The low frequency of indirect-heat ceramic cooking pots and the general unsuitability of ceramic vessels for storage on any sort of large scale (small number and small size of vessels) also suggest that both these tasks, although making use of ceramic vessels, were primarily accomplished using other means.

And so, contrary to views of early ceramics, which view the adoption of ceramic vessels in terms of potential improvements in adaptation or economic efficiency (see Section 2.1.2-3, 2.1.5), the data presented in this and other chapters strongly suggest that the adoption of ceramic containers revolutionised neither the processing/cooking of food nor the range of available storage containers nor perhaps even the serving/display of food. Instead there are strong indications that pre-ceramic forms of container consumption continued very much as they had done prior to the adoption of pottery. Moreover, what seems likely is that when ceramic technology first appeared, instead of becoming the independent evolutionary revolutionising force of 'adaptionist' hypotheses, it was required to submit to the very specific needs and values of individual Aceramic/ENIa Cretan communities. Analysis of the process of adoption very much suggests that the first ceramic containers, in both form and finish, were inspired by non-ceramic forms. In this way they did not create new categories of container or consumption, but instead had to fit into existing non-ceramic material categories.

The absence of any evidence to suggest that the earliest ceramics to revolutionise and dominate the consumption of containers re-focuses attention on the reasons for the adoption of ceramic technology and ceramic containers. A general feature of more recent studies of early ceramics around the world has been an emphasis on the likelihood that the earliest pottery had a particularly high social value (see Chapter 2). For EN (Greek) Franchthi Vitelli has argued that ceramic vessels were probably valued, possibly because "their scarcity, novelty, and perhaps function might well have made them precious" (Vitelli 1993a:39). This sort of interpretation makes particular sense in the context of EN Knossos. The wide range of forms and functions manifest in even the earliest pottery combined with the very low levels of actual ceramic consumption and the continued primary reliance on non-ceramic containers, make most sense if there was a hierarchy of value for containers in different materials, with ceramic vessels occupying the uppermost register. ENIa-b ceramic vessels would, therefore, have constituted more valuable versions of containers which also continued to be produced and consumed in other materials. In this way the consumption of ceramic vessels instead of non-ceramic vessels, might have rendered a habitual action in some way special. This in turn opens up the possibility that particular strategic use could have been made of ceramic vessels during occasions of social competition, such as communal feasting. Certainly the low level of ceramic consumption would be best explained if the consumption of ceramic vessels was valued, periodic and strategic, with particular efforts taken to maintain or extend the life of individual vessels (cf. mend-holes).

A possible further context for the use of ceramic vessels is suggested by two spatially discrete series of pit deposits, one in sounding AC dug into stratum VIII towards the end of ENIa and sometime prior to the construction of House C (stratum VII) and another dug into the top of the Aceramic deposit in sounding X, probably during ENIa (see Appendix I for details of date and sequence of construction). Both are characterised by the excavation of a large pit into the debris of an earlier occupation level, followed by the excavation of two or more smaller pits in the base of this larger pit. These smaller pits seem to have been filled soon after excavation and usually contain animal bone, ash, potsherds and less frequently figurines and/or complete ceramic vessels. The larger pits, however, appear to have been left open for some time after the sealing of the smaller pits. These pits may possibly represent some sort of ritual activity perhaps to be connected with some of the ceremonial aspects of house abandonment, such as the clearing/cleaning of occupation floors and the possible 'votive pottery pits' in the top of the destruction levels of houses, which may have been closure/foundation deposits (Evans 1968:268; 1964:48; 1994:7, 14). Certainly the deposition of figurines and complete ceramic vessels within closed temporally and spatially restricted deposits marks them out as unusual, especially if one considers that during ENIa ceramic vessels do not appear to have been consumed in large quantities. If these were ritual events then the excavation of a series of large and small pits may hint at the actions of a quite a large group of people; in addition the initial excavation of a larger pit would have provided an arena, within which ritual action centred around the smaller pits could be observed by a large group of people. However, whatever their significance, such occasions seem to have provided opportunities for the ceremonial consumption and disposal of ceramic vessels.

13.4.3 Early Neolithic Ic-II

As suggested by Figure 9.8, ENIc and ENII see a considerable increase in the scale at which ceramic vessels were consumed. Even when some attempt is made to account for increases in population (see Figure 9.9), this still represents a significant increase from ENIb by a factor of between four and nine. This period (ENIc-ENII) also sees an increase in the range of finishes and forms produced within individual fabrics, which in turn would seem to indicate a possible increase in the number of different ceramic material categories (see above). Such a rise in the overall consumption of ceramic containers suggests a concomitant sharp decline in the reliance on non-ceramic containers. Thus it is perhaps during this period that ceramic containers first begin to dominate or even replace non-ceramic container forms.

At the same time as this increase in the scale of consumption, there is also a clear increase in the rate of ceramic change (see Figure 13.2). This, in conjunction with the other changes described above, suggests that the previously stable process, whereby ENIa-b material categories were maintained, underwent change, as a result of which the system of material categories became less formalised and/or the overall range of activities, in which ceramic vessels were used, was extended to include activities or occasions where previously non-ceramic vessels had been used. If so then it would seem that ceramic consumption changed from being periodic to frequent. Thus while the ways in which ceramic vessels were consumed during ENIa-b were probably maintained (i.e. special occasions of food consumption), ENIc-ENII seems to see the use of ceramic vessels on a more frequent basis.

Conclusions

Throughout this chapter an attempt has been made to view EN ceramic vessels as firmly embedded within EN social life and social action. Analysis of EN material categories has suggested that the consumption of ceramic vessels was formalised and subject to rules. In view of Bourdieu's idea that social stability is closely related to the success with which that society reproduces its constitutive values (see Chapter 3), the consistent reproduction of the same basic system of material categories, presumably representing a system of social values, would seem to testify to a high degree of social stability during this period. This social stability is likely to have been a direct result of the formalised nature of consumption (as well as production and exchange). Consistent reproduction of the same formal material categories may be understood as a very conscious attempt to link the present with the past, by recreating elements of that past in the present. This may even amount to the collapsing of the barriers between past and present, where time is conceptualised as cyclical (Chapter 3). Social life during the Neolithic therefore emerges as something which was governed to a large extent by powerful social values which were most likely manifest in taboos, sayings and stories, whose validity must have been considered beyond contention (doxa). These values were passed on to each succeeding generation and were given practical expression in the every day acts of individuals and groups. The very fact, however, that such rules depended for their continued validity and existence on the actions of individuals underlines the possibility that at some point these specific rules or values could be contested. In general this emphasis on continuity between past and present would seem to be a feature of many Neolithic societies (e.g. Stevanovic 1997:334).

Careful consideration of the adoption of pottery found that this emphasis on continuity between past and present most likely had a strong influence on the adoption of ceramic containers. It was argued that the pre-existing system of non-ceramic material categories had a profound influence on the form and function of the earliest ceramic vessels. Rather than revolutionising this pre-existing system, ceramic vessels were forced to conform to it. In this way this system of pre-existing material categories may be characterised as formalised and as profoundly resistant to change. The earliest ceramic vessels appear to have been absorbed within it, probably as the occupants of a new, higher register of value. Their consumption during ENIa-b was most likely periodic and strategic. In this way a specific and strategic use of ceramic vessels has the potential to direct our attention towards those values, activities and occasions which were most important to the EN community at Knossos.

It has been argued that during the EN ceramic vessels were used primarily in the context of commensality, either as serving vessels or as special cooking vessels. Most vessels would also have been suitable for storage, however large-scale storage most likely took place in non-ceramic containers. Some vessels were also suggested as suitable for transportation (e.g. collared jars with flared strap handles). These could have also played a part in the context of commensality, either as serving vessels or indeed as the containers for gifts to be exchanged between different groups of people, originating either within the

Knossos community or from outside. A more specific set of associations was seen to be represented by incised/pointillé decorated flat-based vessels. These vessels may have played a role in specifically ritualised activity involving the consumption of food and perhaps other substances along with body modification (tattooing). Such ceremonies may also have been specifically gendered (female).

In almost all of these instances, the consumption of ceramic vessels seems to involve groups of people coming together, exchanging and consuming ceramic vessels, food and drink. In at least one instance, such occasions were also accompanied by the ceremonial disposal of ceramic vessels (e.g. Pits A and B, stratum VIII; see discussion above). People are likely to gather, give and receive for a variety of specific reasons: strong possibilities are occasions, such as marriage (see Appendix II for the early demographic inviability of Knossos) or death, which constitute significant stages in the human life cycle; other possibilities could include key stages in the agricultural calendar, such as harvesting, or perhaps at other stages in an unknown ritual cycle. In his study of ceramic consumption in a modern Indian village, Miller explicitly contrasts ritual and non-ritual consumption of ceramic vessels: in the former, usually life cycle and annual ceremonies, the selection of particular vessel types is fixed and selected vessels are employed in a prescribed manner, while in the latter the selection and use of vessels is much more flexible and open to differential interpretation (Miller 1985:124-132, 163). In the context of EN-MN (Greek) Franchthi, Vitelli has suggested that the consumption of ceramic vessels may have played a role in ceremonies and rituals which served to dissipate and regulate social conflicts (see Vitelli 1993a:213-9). If the consumption of ceramic vessels at Knossos during ENIa-b was similarly and specifically associated with special perhaps ritualised occasions, then this may go some way to explaining why the ENIa-b system of material categories appears to have been so formalised. If ceramic vessels operate as frames or cues for action, then the very formalised set of ENIa-b material categories would have provided knowledgeable consumers with specific information about how such vessels should be consumed. In this way during ENIa-b the periodic, public, consumption of ceramic vessels according to prescribed rules might be contrasted perhaps with the daily, private consumption of non-ceramic containers, which may have been more flexible and open to interpretation.

Study of the changing patterns of ceramic consumption raises the possibility that different social groupings are manifested in the consumption of ceramic vessels during different periods. For example during ENIa the likelihood that ceramic vessels were shared between households might suggest that some vessels might have been owned by the group and were possibly used specifically during those special occasions when collective acts of consumption took place. In contrast the increase in the level of ceramic consumption during ENIb may mark a change in the availability of ceramic vessels to individual households, with perhaps individual household 'owning' a full range of ceramic vessels. However, these still do not appear to have been numerous enough to suggest frequent (private?) use of ceramic vessels. Rather ceramic vessels may have continued to be used on specific occasions, perhaps on the more public occasions of food preparation and consumption, which might have taken place in areas adjacent to the household, such as the cobbled yard with large cooking installation to the north of House C (stratum VII). In this way ENIb ceramic consumption could have been directly linked to occasions of inter-household co-operation, competition and commensality. This form of ceramic consumption may have continued into ENIc-ENII, however this period may also see the beginnings of regular private consumption of ceramic vessels by individual households (new categories of ceramic vessel, increase in ceramic consumption). This may reflect a more prominent socio-economic role for the individual household group (cf. Chapter 11).

And so during the EN acts of commensality may have acted at several levels and at different scales. Within the household the collective consumption of food may have served to reproduce roles and status according to the internal hierarchy of the household group, while at a group level commensality may have acted to reproduce the values and practices which structured and stabilised EN communal life. Even during ENIa, when the consumption of ceramic vessels may reflect special forms of commensality at a larger group level, intra-household commensality may have taken place on a more regular (daily?) basis using non-ceramic vessels.

Public acts of consumption should not, however, be seen as simple recreations of an idealised egalitarianist social order. Even during ENIa, when ceramic consumption is suggestive of collective acts of sharing and may reflect an ideology of equality and group ownership, it is probable that people more frequently associated in smaller groups based on the household. The potential conflict between the interests of the household and the interests of the community may have been one of the ongoing dynamics in EN society, with different social mechanisms acting at different times to resolve potential disputes. Public occasions, although probably ritualised and formalised to some degree, nevertheless will have provided opportunities for individuals and groups to compete for and display status. In addition such occasions would have provided the opportunity for a potentially wide range of private transactions. In Chapter 12 the differential creation of value in ceramic vessels during ENIa-b was seen to be closely related to acts of exchange, distance from source and perhaps deliberate acts of long-distance acquisition. Particularly valuable or powerful vessels could therefore be used in a structured way to create or display status. Public occasions, such as communal feasting, would have provided the occasions and opportunity for what might be termed social 'tournaments of value', where individuals and groups might compete to display status. This could have involved both story-telling and actual consumption of ceramic vessels (see Chapter 12). In this way the consumption of ceramic vessels on such occasions may have served both to reproduce a set of social values and social categories, which lay at the very heart of EN society, but at the same time allowed individuals and groups limited manoeuvre, within those formalised systems of values and categories, for the strategic employment of material culture in the ongoing negotiation of status, affiliation and identity. Such societies would be best characterised as egalitiarianist, rather than egalitarian, since in reality they were marked by forms of informal social hierarchy, which manifest themselves in overlapping networks of alliances, commitments or debts of honour.

CHAPTER FOURTEEN

CONCLUSIONS

A central theme in this thesis has been the characterisation and interpretation of ceramic variation. At a basic level this centrality is only to be expected: one cannot investigate ceramic production, exchange or consumption without first committing oneself to the detailed characterisation of variation in fabric, form and finish. However, within the context of studies of Neolithic ceramics in the Aegean, the issue of ceramic variation has a very specific relevance. In a review of current approaches to early ceramics and early ceramic technology in the Aegean (Section 2.3), it was noted that there exists a critical divide between detailed analyses of individual site assemblages and more general syntheses of Neolithic production, consumption and exchange. While the former have emphasised the local production of ceramics and a minimalist view of ceramic exchange, the latter have stressed the important role of ceramic vessels in exchange and have implied that certain ceramic vessels moved widely if perhaps in small quantities. At present, therefore, awareness amongst some scholars that ceramic vessels should play a role in exchange is matched by an apparent inability in detailed ceramic analyses to recognise non-local ceramic vessels.

It has been argued that this conflict arose initially at least partly because of problems of methodology. Earlier studies of Neolithic ceramics in the Aegean were generally based on the observation of variation in form and finish and had the primary goal of constructing relative regional ceramic chronologies. Such studies tended to prioritise the recognition of similarities between different site assemblages over the characterisation of any local differences, thus creating a picture of stylistic homogeneity. In their conclusions regarding technology, they tended to infer a simple relationship between stylistic homogeneity and technological homogeneity (i.e. total local production; e.g. Furness 1953), although none of these went as far as to test this interpretation further. Such a picture of total local production also accorded well with then current ideas regarding the Neolithic economy, which emphasised subsistence self-sufficiency over exchange (e.g. Childe 1981). However, more recent studies *have* subjected Neolithic ceramic assemblages to detailed technological study (e.g. Vitelli 1993a; Yiouni 1995, 1996a) resulting in the identification in each case of considerable diversity in fabric. Such studies have emphasised that observation of form and finish alone may not be the best method to investigate ceramic variation.

Despite this identification of fabric diversity, however, the old idea of technological homogeneity, at least in dedicated ceramic studies, has not been subject to critique. Instead most studies continue to emphasise total or near total local production. The failure to engage with the issue of technological homogeneity is surprising and demands further consideration. The reasons for this cannot simply be methodological: for example, Vitelli's *macroscopic* study of the EN-MN ceramics from Franchthi (1993a) represents a model approach; it is only perhaps in the failure to integrate the results of this macroscopic study with the series of analyses conducted (petrographic, chemical) that this study could be said to be methodologically weak (see Section 5.6.3). One cannot therefore simply ascribe the continued emphasis on total or near total local production to an inability to characterise a Neolithic assemblage in the level of detail necessary to allow the identification of non-local ceramics. Indeed, the very possibility of re-interpreting Vitelli's original ascriptions of provenance using her original data (see Section 11.1 on 'Andesite Ware'), demonstrates that the problem in more recent studies is not so much the ability to characterise non-local material as the will to recognise it.

It has been argued that the eagerness, with which recent technological studies of ceramics have explained all forms of ceramic variation (i.e. fabric, form, finish) purely in terms of local production, may actually reflect the continued influence of the old self-sufficiency model for the Neolithic economy (see Section 2.3.1). In more general studies of the Neolithic economy there has been a subtle shift in emphasis from a focus on production, mainly of subsistence, purely for local consumption to an awareness of the important role played by exchange (see Section 2.3.1). This shift in emphasis is largely responsible for some of the more positive statements regarding ceramic exchange to be found in more general syntheses. In contrast recent technological studies of ceramics have continued either implicitly or explicitly to stress the self-sufficiency model (e.g. Vitelli 1993a:208). This model continues to act as a conceptual barrier preventing further exploration of the significance of ceramic variation in all its forms. As a result in their interpretations of provenance the onus is proof is always left to the person wishing to identify non-local products (see Section 11.1).

ENI-II Ceramic Technology at Knossos

In many respects the Early Neolithic ceramic sequence at Knossos represents an ideal opportunity to explore the critical issue of ceramic variation in Neolithic assemblages. First discovered early in the twentieth century (A. Evans 1900-1901), Neolithic ceramics at Knossos have had what might be termed a 'classic' history of interpretation: early study combined form and finish with observations of stratigraphy to construct a relative ceramic chronology (Mackenzie 1903), which has since been refined by later more detailed analyses (Furness 1953; Evans 1964). Such studies emphasised stylistic and technological homogeneity, although no dedicated technological study had previously ever been conducted. Based on this interpretation of ceramic production as almost entirely local, a dominant view has developed which sees EN Knossos as essentially isolated not only from the Aegean, but also from other settlements on Crete (see Section 12.1).

This characterisation of ceramic production and exchange, however, can no longer be sustained. Combined macroscopic and microscopic (petrology, SEM) study of fabric, form, finish and firing has demonstrated the presence at EN Knossos of considerable degree of ceramic variation (see Chapter 10). Consideration of fabric reflects a wide variety of approaches to paste preparation involving the use single or multiple clay sources (clay mixing) of a variety of types as well as a wide range of tempers (limestone, metamorphic, igneous, altered igneous, grog, sand, organic) (see Chapter 6; Appendix V). Perhaps more significantly this diversity in fabric *cannot* be explained purely in terms of local production within the immediate area (<5km) of Knossos. While the most frequently occurring fabrics are also those that are most compatible with a local provenance (marls, limestone; i.e. Fabrics 1a-i, 2a-e), there are many other fabrics, which occur less frequently, whose nearest possible sources lie within north-central Crete but beyond the immediate area (>5km) of Knossos (e.g. Fabrics 5a, 6, 8, 9, 10, 11). In addition a small group of very rare fabrics have a mineralogy that would suggest that their origins lie at some considerable distance from Knossos (e.g. Fabric 12, Mirabello Bay; Fabrics 31 and 35, probably off-island). Detailed comparative study of form and finish also suggested the possibility of an off-island provenance for rare Fabrics 24, 25 and 28, whose mineralogy is not distinctive of a specific origin.

Perhaps the most striking feature of the majority of the fabrics identified is that they present very similar features of form and finish, even in cases where production locales are widely separated. For example, vessels produced in the Mirabello Bay area of east Crete (Fabric 12) are indistinguishable in form and finish from those produced in the immediate area of Knossos (e.g. Fabrics 1a-i). When the relationship between variation in fabric, form, finish and frequency was considered in depth, it emerged that c.97.5-99.9% of the EN assemblage at Knossos could be characterised in terms of a relatively limited range of recurrent features of form and finish (see Sections 7.5-6, especially 7.6.1-2; Appendix VI). Although subtle differences can sometimes be noted between different fabrics (see Appendix VII), in general it is their similarities that are most striking. Wherever information existed for these fabrics which might indicate provenance (mineralogy, frequency), it either suggested a Cretan provenance (e.g. Fabric 12) or at least a compatibility with an origin on the island. In contrast, the remaining small group of rare or unique fabrics either share little or no parallels in form or finish with this main group or have a mineralogy that is inconsistent with an origin on Crete (see above).

The recurrent range of features of form and finish, characteristic of the main group of fabrics, was subject to detailed comparison with published assemblages from neighbouring Aegean regions. This comparison resulted in the identification of a more restricted range of features of form and finish, which lack any close parallels outside Crete and are thus considered to define Cretan Neolithic ceramic production. These distinctive features break down into three main dimensions of variability, namely rims, handles and decoration, and comprise offset rims, wishbone handles, strap handles, pierced triangular ears, incised/pointillé, incised lattice, dribble painting, ripple burnish, barbotine, incised cordon/rope decoration.

The general similarities in form and finish shared amongst most fabrics helps to explain why previous macroscopic studies of EN ceramics at Knossos have always chosen to emphasise homogeneity in form and finish. However, as microscopic analysis of fabric has shown, considerable variety may exist at a lower level. A similarly concealed diversity is suggested by the microscopic examination (petrology, SEM) of vessel surfaces (see Section 6.6; Chapter 8). This revealed that the apparently narrow range of EN surface treatments (burnished, polished, incised) could be achieved in a variety of ways. In general this study noted that surface compaction as a result of burnishing or polishing was a feature found in most fabrics. However, in some fabrics (e.g. Fabrics 5a, 12) high quality polished surfaces were produced by burnishing or polishing the smoothed vessel surface. Other fabrics (e.g. Fabric 8) testify to the application of a slip (non calcareous or calcareous) prior to polishing. Some of these slips derive from clays different in composition from the body. In the case of some calcareous fabrics (e.g. Fabrics 1a-i, 19), a non-calcareous slip has been used, apparently in order to ensure a dark (red-dark brown) polished surface on vessels, which would normally fire buff to grey.

In contrast to the subtle differences in techniques of finishing between fabrics, study of forming and firing methods suggested that vessels produced in different fabrics were generally formed and fired in the same way. However, this conclusion may to a large extent reflect an inability to characterise these stages in production at the same resolution as finishing. Vessels were mostly coil-built, probably in stages, although flat-based vessels probably began as pinch-pots that were then built up with coils. Study of firing (petrography, SEM) suggested that in most fabrics vessels were fired to a variety of temperatures, which vary from below c.750°C to beyond 1000°C (see Chapter 8). No clear patterning emerged when this variability was broken down by fabric; rather individual fabrics tend to be characterised by a range in firing temperature and firing atmosphere. In this way it was concluded that SEM-based study of firing temperature, although of proven worth in studies of Bronze Age ceramics (e.g. Kilikoglou 1994), does not represent a productive means of characterising differences in firing behaviour in Neolithic ceramics. In the majority of examples studied no inferences could be made regarding firing environment, however in a small number of cases consideration of secondary calcite alteration and/or non-homogeneity in firing both led to the conclusion that firing was likely to have been fast with contact between vessel and fuel. This would indicate firing in an open environment, such as a bonfire or pit.

In general most fabrics that are represented throughout the ENI-II sequence at Knossos exhibit no obvious evidence for changes in technology. In this way and to a very great extent ENI-II ceramic technology is characterised by stability and continuity. However, during ENIc-ENII a series of parallel technological changes take place in the local fabrics (i.e. Fabrics 1a-i, 2a-e). These comprise changes in paste preparation (more finely crushed limestone temper), forming (new method of coil joining and strap-handle attachment), finishing (introduction of new finishing methods) and possibly firing.

The Organisation of Ceramic Production (ENI-II)

In general, previous attempts to characterise the organisation of earlier Neolithic ceramic production may be criticised for the overly simplistic way in which they have chose to interpret most or all ceramic variation purely in terms of local production. For example, in her study of ceramic production at EN-MN Franchthi, Vitelli applied a very specific interpretation to ceramic variation: the five main fabrics identified were interpreted as reflecting production by five different producing groups, which probably correspond to five individual female specialists working in different households. This reconstruction relies entirely on the local production of the five different fabrics, an interpretation which has been shown to be open to doubt (see Section 11.1). It is argued that the data from Knossos are particularly instructive in this light. Although the EN ceramic assemblage from Knossos exhibits a degree of variation that is comparable to that found at EN-MN Franchthi, at Knossos macroscopic and microscopic study indicate that a large proportion of this variation cannot be correlated with local production and thus cannot not be used to demonstrate a one-to-one relationship between different fabrics and different locally producing households.

At a more fundamental level, it has been argued that the unquestioned pursuit of specialisation in the earlier Neolithic Aegean is itself open to challenge. If we seek to identify specialisation wherever we find production, then one has to question the value of the identification. Previous studies have generally not sought to understand the concept of specialisation nor how it might properly relate to the relationship between producers and consumers under the DMP. Often there appears to be confusion between the consumption by non-producers of items produced *for livelihood* and the consumption by non-producers of products produced specifically *for exchange* (see Section 4.2.2 for the definition of these terms); only in the latter case need specialisation be implied. In Chapters 4-5 it was argued that the detail available from the integration of various categories of ceramic data (macroscopic and microscopic) provides the opportunity to move beyond typologies of production and to explore the subtleties and potential uniqueness of the way ceramic production was organised during the earlier Neolithic.

During ENIa ceramic vessels seem to occur in small quantities and from the perspective of production this was taken to suggest that production was seasonal and output low. Consideration of the sequence of production and particularly the effort taken to create thin-walled smooth dark polished vessels suggests that ENIa ceramic production was labour intensive, inefficient and might therefore be characterised as 'production for livelihood'. Through a combination of arguments it was suggested that production was not in the hands of high-status individual specialists (*contra* Vitelli), but was instead most likely to be an activity which was communally-shared and non-specialised.

The stability and continuity shown by most fabrics during ENI-II would seem to suggest that there was an effective mechanism, which ensured the transfer of the knowledge and techniques of ceramic production to the next generation. This mechanism was argued to be the community itself with ceramic technology forming part of the communal reservoir of knowledge with the communal nature of ceramic production acting as an effective check on innovation. However, it was also argued that the absence of innovation may also be understood in a more active sense. Communally-shared acts of ceramic production may have deliberately chosen to emphasise continuity: by recreating past material actions and categories producers effectively situated themselves in a timeless state between past, present and future, where the community of the present joins communities of the past. Such actions reinforce group cohesion and promote a particular authorised view of group identity and cosmology. If vessels were in some sense communally produced, then they may have in some way belonged to the community. If ceramic vessels were distributed after production, then this distribution could have been according to status within the community. Within the context of collective acts of production the desire to privilege specific individuals as specialists seems to out of place and perhaps even anachronistic. Indeed it remains possible that within communities of the earlier Neolithic, such as ENIa-b Knossos, individuality was suppressed in favour of corporate solidarity, as would be expected in an egalitarianian society.

Although clays and temper suited to the requirements of EN ceramic production enjoy a wide distribution, the distribution of the raw materials for other products does not seem to have been so ubiquitous. Inevitably this means that the production of such products is necessarily more restricted. Production using resources, which are spatially restricted, characterises the production of a range of objects, such as chipped stone (obsidian, chert, schist), ground stone axes, maces, mortars and beads/necklaces.

The spatial restriction to the production of such objects has been taken to indicate that the production, distribution and consumption of these products took place within a different sphere of exchange (e.g. Perlès 1992). For example in their own comparison of the production of different types of artefact Perles and Vitelli concluded that "procurement, production, distribution and consumption did (and do) not vary independently, but together form a coherent system within each category of product" (Perles & Vitelli 1999:96; cf. Torence 1986). However in Chapter 12 it was argued that such differences in the production, circulation and consumption of different types of object were actually impossible to identify in the available data. Rather, at present it would seem that different objects produced in different locales circulated in similar ways. For example, the spatially-restricted production of shell beads at EN Franchthi is characterised by the same high labour input, low efficiency and low output as found in ENIa ceramic production. As Perlès has said, the production of shell beads at Franchthi does not resemble an "export workshop" (Perles 1992:130) and thus could not be viewed as indicating any form of economic intensification nor could it be characterised as 'production for exchange'. Instead, as has more recently been suggested, the enormous labour investment involved in making one necklace could indicate that production of bead necklaces was "a collective undertaking by some portion of the Franchthi community" (Perlès & Vitelli 1999:104-5).

Thus, although spatially-restricted forms of EN production at first seem to suggest a form of specialisation, such as community specialisation, particularly because not all consuming communities participated in the production of such products, when an example of spatially-restricted production is considered in more detail there seems to be no evidence for any difference in organisation or output. Since the difference between these two forms of production is not in their organisation so much as the source of their raw materials there seems little reason to try to enforce an analytical distinction between them. The difference should be as unimportant to us as it seems to have been in the past. Differences in raw material location are not after all good grounds for an identification of specialisation in any sort of definition.

I would argue that attempts to view the spatially-restricted production of objects as special or different (e.g. Perlès 1992:151-2) do so largely because they misconstrue the relationship between producers and consumers and the role played by exchange. The exchange of ceramic vessels, although significant in proportion to the total numbers of vessels in circulation, nevertheless seems to have operated on a small-scale, particularly in comparison to later periods. In this way exchange was more symbolic than economic since it served primarily to maintain social relationships and as a means of acquiring social status. Exchange at this scale is all about quality rather than quantity. It is inevitable that certain communities, which by virtue of geographical location or initiative have access to a specific raw material, will produce which other communities do not. However the scale of their production seems to have matched that of exchange: that is high expenditure of effort and small scale. Since there is no evidence to suggest that spatially-restricted production ever sought to maximise output, that is production for exchange, such acts of production cannot be characterised as specialised. What seems to be more important, for example in the case of shell bead production is not the production of many bead necklaces of great exchange value, but the collective nature of production itself: through such shared activities communities maintained their social values, ideologies, world-views.

Changes in the local production of ceramics at Knossos during ENIc-II, were tentatively interpreted as indicating changes in the organisation of production. In addition to the technological changes noted above, this period also appears to see a significant increase in the scale of ceramic consumption and by implication ceramic production. Such an increase in intensity provides a context within which to understand some of the technological changes, such as the introduction of more efficient (time, labour) techniques of forming and finishing. Similar near contemporary changes are apparent in shell bead production at LN Franchthi, which now becomes more intensive, more efficient with a higher output (see Miller 1996). The period of ENIc-II also sees qualitative and quantitative changes in architecture as well as the first appearance of symbolic representations of built structures (house models). These were interpreted as signalling the emergence of the household as a distinct architectural and symbolic entity and a concomitant weakening in any communal ideology that may have existed. It is considered possible that at least some ceramic production may have moved from being a public (communal) to a private activity.

The Adoption of Ceramic Containers and Ceramic Technology

Contrary to theories which emphasise the revolutionising potential of the earliest ceramic containers (see Sections 2.1.2-3), the adoption at Knossos of ceramic technology and ceramic vessels does not seem to have been accompanied by obvious social, economic or material changes. During the Aceramic it is almost certain that use was made of non-ceramic containers made from perishable materials (Evans 1968:271). Moreover, study of the form and finish of the earliest ceramic vessels from Knossos (stratum IX, ENIa), would suggest that these vessels skeuomorph in form, finish and possibly function earlier non-ceramic containers made of wood and perhaps basketry.

This suggests a very different context to the initial adoption of ceramic technology and ceramic containers. It was argued that the principle reason why the earliest pottery at Knossos manifests a 'developed' range of forms, is not because it was developed elsewhere (*contra* Evans 1964:196; 1968:271; A. Evans 1921:35), but because existing Aceramic non-ceramic material categories exercised a strong influence over the form taken by the first ceramic containers and the functions to which they were put. For example, although there is evidence to suggest that ceramic vessels were infrequently used for cooking, the technique used was indirect-heating, a technique of cooking which does not exploit the full potential of ceramic containers and which may be a continuation of pre-ceramic cooking practices. Moreover study of raw materials suggests that the functional optimisation of cooking pots was not a prime consideration in the selection of raw materials. In this far way from being revolutionising, ceramic vessels seem to have been forced to conform to this pre-existing system of material categories and material practices. Once more the emphasis would seem to be on continuity rather than change.

It would seem, therefore, that the only significant material change between the Aceramic and ENIa periods was the arrival of ceramic technology itself. ENIa deposits at Knossos are characterised by a greater diversity of fabric than any subsequent phases. It can be demonstrated that the majority of these cannot be immediately local to Knossos (<5km). In some cases, such as Fabric 12 (Mirabello Bay), it is clear that their origins lay at some considerable distance from Knossos. It would seem therefore that ceramic vessels circulated between settlements with the greatest intensity during the period when ceramic technology was first adopted. This could reflect a special interest in the products of what was then a new technology. This would also seem to testify to the existence of widespread links between settlements and through which the idea and techniques of ceramic production may have spread very quickly. This hypothesis is also supported by study of the ways in which vessels from different production locations were produced. Not only are forms and finishes remarkably similar - so similar in fact as to render the products of different production locations at times indistinguishable - but also the basic paste technology (coarse tempered fabric) and the forming methods used. This sharing of basic features of ceramic technology between production locations might suggest that ceramic technology was openly and freely exchanged between communities.

This would suggest a model for the adoption of ceramics, which envisages rapid diffusion of the idea of ceramic technology, probably along existing networks of contacts between communities in conjunction with a process of local adaptation where the new technology was used to produce container forms, which to a large extent reflected pre-existing material categories. The absence of any early attempt to intensify either the production of ceramic vessels or the exploitation of natural resources means that this scenario does not accord with that suggested by the resource intensification/competitive feasting model (see Section 2.1.5). However this need not mean that the adoption of ceramic vessels was without elements of social competition or social strategy.

The Circulation of Ceramic Vessels (ENI-II)

In many cases the exploitation of different raw material sources testifies to the existence of different production locations located outside Knossos (see Chapters 10-11). In view of the close link posited by comparative ethnographic studies between the resident location of groups of potters and the location of the raw materials that they use, this would seem to indicate the existence of different EN settlements located within and beyond Crete. This conclusion is particularly important because it indicates that Knossos, far from existing in isolation as is currently believed, was most likely interacting with different settlements. Such settlements would appear to comprise an essentially hidden prehistoric landscape, which over a century of exploration and survey has consistently failed to detect.

A study of the types of non-local vessels present at Knossos did not identify clear patterns. Indeed contrary to previous views of ceramic exchange during this period, a wide variety of vessels circulated, coarse (burnished) and fine (polished, painted), open and closed. Through a variety of arguments it was suggested that ceramic vessels were subject to changing estimations of value, which were very much context-specific. Consideration of frequency and provenance suggested that vessels from more distant areas of Crete, such as the Mirabello Bay, or perhaps even the Herakleion Basin are as rare at Knossos as those vessels, which are likely to have come from off the island. If correct, this would suggest that ceramic vessels circulated most intensely and were most likely to be consumed and discarded at sites close to their location of production. Furthermore, on the rare occasions when a vessel was exchanged beyond this zone or social field, distance from source was no longer a factor and such vessels could potentially circulate over great distances.

It was suggested that this pattern of intense local circulation could conform to an exogamy model. During ENIa-b when non-local products comprise a significant proportion of the ceramic assemblage, the community at Knossos was small (see Appendix II) and must therefore have formed part of a larger breeding population. However during ENIc-II when the proportion of non-local fabrics drops considerably the population of Knossos is estimated as being considerably larger, well within the minimum estimated figure for demographic viability (see Section 12.4.3).

Consideration of the movement of vessels over longer distances suggests that at least some of this may be best explained in terms of special journeys of acquisition. The existence of such journeys is demonstrated by the presence of items with an off-island provenance (e.g. ceramic vessels, obsidian and emery): in the very least the acquisition of these items required the crossing of long stretches of sea linked by islands which at present do not appear to have been occupied at this time. Moreover, there is no obvious reason why such journeys could not also have been made between settlements in different parts of Crete. The existence of longer journeys of acquisition during ENIa-b would also help to explain the continued maintenance of large zones of stylistic similarity.

These special journeys would have taken individuals far from their home communities and must have required considerable skill, have entailed high risks and have taken considerable amounts of time. This raises the question of the motivation for such journeys. During ENIa and ENIb at least half of the vessels consumed at Knossos are of non-local origin. This cannot be explained in terms of local scarcity: local Knossian ceramic production could quite easily have produced the low quantities of ceramic vessels required for consumption. Nor can this be explained as answering a functional deficiency: comparison of different vessel forms in different fabrics suggests that there was instead a high redundancy of form. This emphasis on non-local vessels would seems therefore to have had another motivation.

Distant objects by virtue of their rarity, their unusual biographies and their intimate association with the 'outside' may be understood as having special value and power (Helms 1993). Support for a higher valuation accorded to non-local vessels was provided by a study of mend-holes, which proved to be a particular feature of non-local vessels during ENIa-b. Distant objects acquired through exchange create a social relationship between giver and receiver. Such objects objectify those relationships, but significantly, since they are objects that have a use, their consumption provides their owner with the opportunity and cue for narratives surrounding their acquisition. Such narratives allow the owner/teller to benefit on more than one occasion from prestige associated with the ability to make journeys outside the realm of the familiar. In this way it is above all through the public consumption of such exotic objects that their owners are able to gain the prestige and status associated with the conduct of longer journeys of acquisition and the possession of exotic objects.

It has been argued that the material world of the Neolithic represented a formalised or 'stable universe of commodities'; that is the range of potential commodities was limited and does not appear to have been consistently extended to include other artefact types. The pursuit of more powerful versions of existing legitimate formalised material categories, such as the acquisition of non-local ceramic vessels, might therefore be seen as a way of competing for status, without jeopardising the system itself by introducing new commodity forms. In this way the restriction of equivalences and exchange to a 'stable universe of commodities' often acts to protect and reproduce status systems (Appadurai 1986:25) with more valuable versions of legitimate material categories acting as tokens through which status is conventionally reproduced. In this way the acquisition of non-local ceramic vessels at Knossos would seem to indicate how individuals and groups competed for status within certain social rules, since by possessing these objects individuals and groups are able to take control of existing registers of value and create new ones. In this way although the ENIa-b community at Knossos might be egalitarian in its values, in reality it may have been characterised by unstable and impermanent social hierarchies.

It is striking that despite the obvious importance of exchange, this did not lead to any restructuring of ENIa-b production in favour of the production of greater surpluses specifically for exchange (i.e. production for exchange). One of the principle reasons why this did not take place is likely to be that the reasons for the importance of ceramic vessels in exchange were qualitative and not quantitative. Non-local vessels have a higher value not because of what they are intrinsically are, but what people believe they are. These vessels acquire value because of their specific associations with people, places and journeys. It is these associations that are brought out during the narration of vessel biographies. In this way value could only be acquired the hard way, through real participation in these events: one cannot mass-produce pot biographies, they can only be acquired through time and circumstance. It is interesting in this light to note that significant increases in local ceramic output only take place in ENIc-II at the same time as the role played by ceramic vessels in non-local exchanges seems to have been diminished

The Consumption of Ceramic Vessels (ENI-II)

Consideration of the functions to which early ceramics were put suggested a wide range of tasks. There is good evidence to suggest that some types of vessel were used as cooking pots. Such vessels, however are relatively infrequent, suggesting that the majority of cooking was accomplished using other means. Storage also constitutes a likely function, however the absence of a large dedicated storage jar as well as the generally small quantities of vessels in circulation would seem to suggest that this was not a primary function of ceramic vessels. Evidence for the movement of ceramic vessels between settlements also raises the possibility that ceramic vessels served for the transportation of other commodities.

However, by far the majority of ceramic forms are suitable for the serving and display of food. Consideration of the creation of material categories suggested that surface finish might mark an important division between tableware (polished flat-based) and other vessels (burnished, round-based). The range of forms within each fabric, although still exhibiting some degree of redundancy, seems to have been relatively small (c.16 shapes) and at least during ENIa-b can be shown to have been shared between different production locations. These features characterise this system of material categories as formalised (see Chapter 13). It was suggested that this system of formalised material categories may reflect formalised ideas about how ceramic vessels should be consumed. A possible example of the formalised consumption of a particular category of vessel is provided by flat-based mugs. It was suggested that these vessels demonstrate an association with human figurines, especially female figurines, and incised/pointillé decoration and by inference the human body and the practice of tattooing. These associations may suggest that the production and consumption of these vessels was bound up with the practice of tattooing and possibly even explicitly gendered.

The low frequency with which ceramic vessels seem to occur during ENIa would appear to indicate that everyday container needs continued to be served by non-ceramic containers. The estimated quantity of ceramic vessels in circulation during ENIa would seem to be too few to allow individual groups within the community to 'own' a complete range of forms and therefore vessels may have been shared between different groups or even in some sense communally 'owned'. Since it was argued that in many cases ceramic vessels copy the forms and possibly the functions of non-ceramic vessels, it seems possible that non-ceramic and ceramic vessels could be used interchangeably. It was suggested that the principal difference between vessels in different media was probably value, with the earliest ceramic vessels occupying a new, higher register of value.

If daily container needs were largely fulfilled by non-ceramic containers, then the consumption of high-value ceramic containers is likely to have been reserved for special occasions. The deployment of ceramic vessels on these occasions is likely to have had high strategic potential. Since most ceramic forms would be suitable for the display and/or consumption of food, it was suggested that these special occasions are likely to have involved commensality. Likely occasions for communal feasting are key stages in the human life cycle (birth, coming of age, marriage, death) or in the agricultural calendar (sowing, harvesting). Arguably, however, the most important feature of such occasions of communal feasting is not so much the way they might cement communal solidarity and help define and reinforce communal identity, important though these things are, but rather the opportunities these occasions provided for the negotiation of personal and group status.

During ENIc-II there appears to have been a significant increase in vessel consumption. To some extent this increase might related to the greater availability of ceramics at this time. However it also suggests that changes had taken place in how ceramic vessels were consumed. During ENIb ceramic consumption is unlikely to have encompassed all tasks for which containers were required: the estimated quantities of ceramic vessels in circulation still appear to be too low to demonstrate the replacement of non-ceramic containers and thus ceramic vessels may still have only been used on certain occasions. This type of special use may have continued into ENIc-ENII. However this period also sees the production of new vessel finishes, which in turn may denote new categories of ceramic vessel. This creation of new vessel categories, finished using new more time-efficient surface treatments (e.g. scribble burnish, white slip) may mark out a new series of ceramic vessels which could challenge and perhaps even replace non-ceramic container forms in more daily activities. In this way the ENIc-II period may see the beginnings of more regular private consumption of ceramic vessels by individual groups within the community.

Final Comments: A Model for Production, Circulation and Consumption in the Earlier Neolithic

Although speculative, this characterisation of production, circulation and consumption may be used to produce a model to explain the relationship between acts of production, consumption and exchange during the earlier Neolithic period at Knossos (ENIa-b). Acts of production appear to be inherently stable in the way they consistently reproduce a specific set of social values and formalised social categories. They represent the universe as it is ideally conceived: that is one of shared activities, shared values, shared identity and shared cosmology. That said, however, it is important to remember that if the products of communal acts of production were distributed, their distribution is likely to have reflected differences in status and thus reflect the universe as it is actually manifest: that is one where individuals and groups compete for status and influence.

Acts of ceramic consumption, specifically acts of communal feasting, can also appear to be stable since at one level they can be viewed as legitimating the authority of the community over that of the household or individual through the reproduction of formalised communal values and categories. However at another such occasions can be seen as providing the opportunity for personal advancement through participation in what might be termed 'tournaments of value', where the process by which value is constructed in people is intertwined with the manipulation, display, exchange and ownership of high-value objects.

Exchange also seems to have taken place within a formalised and limited set of material categories. Its importance during ENIa-b, however, was great: on one level the circulation of goods testifies to the existence of close social relationships (kinship? friendship? exogamy?) between the community at Knossos and its immediate neighbours, relationships which may have minimised conflict and contributed to the apparent stability of EN Cretan communities. However at a different level the acquisition and display of particularly valuable ceramic vessels and other goods may have been one of the few legitimate ways in which different individuals and/or social groups within the community could negotiate status and compete for power. Therefore consideration of how acts of production, consumption and exchange articulate with each other would seem to suggest the existence during ENIa-b of a material and social system of values and categories that was extremely successful at reproducing itself, largely because it allowed individuals and groups only limited room to compete for status and prestige. This competition never threatened to overthrow the system precisely because the system defined the rules of engagement.

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