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DEPARTMENT OF ARCHAEOLOGY

DIMITRIOS VLACHOS

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Abstract

Recent theoretical and methodological developments in pottery studies have altered the way archaeologists handle and interpret prehistoric pottery. The technology and use of pottery, and the symbolic and social meaning of pots, are considered as anthropological phenomena, the products of human action. Excavations at Late Neolithic Makriyalos offered the opportunity to explore several aspects of Neolithic society in Greece from a new perspective. This thesis explores the ceramic assemblage of the second phase of Makriyalos. The study is structured around the concept of the ceramic *chaîne opératoire* in an attempt to move beyond the traditional concern with typology and chronology and towards an approach that foregrounds the producers and consumers of ceramics. Ceramics are studied in terms of their production, use, function, and discard and, as far as the available data permit, in terms of the spatial distribution and social contexts in which these activities took place.

The choices made by potters at successive stages of ceramic production show that pottery from Makriyalos II exhibits a level of complexity and diversification in terms of ware, ceramic paste, surface finishing and firing conditions, directly linked, on the one hand, to practical considerations and, on the other hand, to cultural and social distinctions or contexts of use, consumption and discard. Spatial and contextual differences in a series of variables related to the ceramic material suggest differences in the intra-site organisation of space, some of which may plausibly be interpreted in terms of an opposition between smaller (perhaps 'household') and larger ('inter-household') scales of social activity.

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1. Introduction

The subject of this thesis is the investigation of the ceramic assemblage of the second phase of the Late Neolithic settlement of Makriyalos. The occupation of the writer with the study of ceramics, and in particular the ceramics of Makriyalos, started almost twelve years ago when one of the directors of the excavation, M. Pappa, offered me temporary work recording part of the ceramic material. After this, my participation in detailed recording of the Makriyalos I ceramic assemblage increased my desire to deal with ceramics as a means to investigate complex aspects of Neolithic life.

The production, use and discard of pottery in the Neolithic are of great importance for understanding social, technological and symbolic aspects of prehistoric communities and, therefore, the complex relationships between producers and consumers of pottery or among consumers. It is the choices that prehistoric potters and consumers made that are of interest in this study, from the acquisition of raw material to the construction of vessels, their use and function and, finally, discard. Excavations at the flat-extended settlement of Makriyalos II offered the opportunity, rare in Greek archaeology, to explore all this on a large scale, thanks to the very extensive nature of the excavations at the settlement.

The second chapter of this thesis explores the theoretical and methodological background of pottery studies. Fragmentation between function and use as well as between stylistic and typological approaches is discussed in order to draw the theoretical and methodological framework of this research.

The third chapter sketches out the chronological framework of the Neolithic period in Greece, the research history and current status of pottery studies, and explores the different interpretations offered to account for the recognition of two different types of settlements, tells and flat-extended settlements.

In the fourth chapter, information is given on the Makriyalos settlement and excavation together with some data on stratigraphy, finds and spatial organisation as described by excavators.

The purpose of the fifth chapter is to present and describe general information on the making of ceramic pots with insights from ethnography, experiment and archaeometry.

Aims, methodology, limitations and problems of this research are the subject of the sixth chapter, as well as analytical information on the sampling and recording strategy.

Analysis of data on generic variables for the whole assemblage and variation in fabrics, wares and firing conditions in relation to vessel shape are the objectives of the next two chapters, seven and eight, respectively.

Analysis and interpretation of the spatial distribution of the Makriyalos II pottery assemblage was one of the important issues in this research and is discussed thoroughly in chapter nine. In the final tenth chapter, a discussion is offered of the results of this research.

2. Theory and method in pottery studies

In the theoretical milieu of the archaeological discipline, and also within the social sciences, one of the most significant changes to the way we examine past societies has been the recognition of the active role that material culture plays in the construction and reproduction of social relations and cultural values (Bourdieu 1977; Appadurai 1986; Hodder 1986; Miller 1987). Pottery tends to be both abundant and well preserved in excavations. The making and using of pottery also contributes to the production and reproduction of society and its vital mechanisms and social structures through the transmission and, sometimes, imitation of the structures of daily practices (Bourdieu 1990).

Pottery studies have long been a major focus of archaeological researchers in order to reconstruct the culture histories of the past. Through the 20th century, four phases of ceramic research may be distinguished. The first phase, dominated by profound concern for the definition of cultural groups and the reconstruction of their historical evolution, focused on typological description of ceramic artefacts (Montelius 1904; Ford 1953, 1954; Spaulding 1954, 1960). This phase treated 'cultures' as equivalent to peoples, and attributed change in material culture to 'migration' of people (van der Leeuw 1984: 710).

The second phase of pottery studies in archaeology, which took centre stage in the late 1960's and early 1970's, was connected to the 'processual' approach of the 'New Archaeology'. In 1965, L. Binford suggested that variation in the form and decoration of pottery was functionally related to the degree of craft specialisation, and tried to understand and explain various economic, social and ideological processes of the past, suggesting a law-like link between pottery and the organisation of production and use. In these analyses, sometimes referred to as 'ceramic sociology' (Hill 1970; Longacre 1970), the questions now asked changed from 'When?' and 'Where?' to 'How?' and 'Why?', in an attempt to make archaeology more anthropological and in recognition that the same people could make pots differently under different

conditions (van der Leeuw and Pritchard 1984; van der Leeuw 1984; Stark 1998; Skibo 1999).

Although the 'processual' approach to pottery studies has not ceased to play an important role, in the early 1980's the growing reaction to the materialism of 'processual' archaeology led to the development of a new school of thought, 'post-processual' archaeology, marked by an increasing preoccupation with symbols. In this sense, many 'post-processual' ethnoarchaeologists showed that in traditional societies the makers and users of material culture, and pottery in particular, blur the boundaries between technology, function, and style (Longacre 1981; Stark 1995).

In contrast with the 'processual' way of thinking, 'post-processual' archaeologists believe that the individual who makes and uses the pots and the context of their use are not independent of one another, but can only be understood in relation to each other (van der Leeuw 1984: 716). The notion of choice(s) of prehistoric potters was now a central concern and, according to the 'post-processual' way of thinking, these choices were dependent on the potter's perceptions and thoughts (Hodder 1982). Even if early 'post-processual' thought was critical of generalisations, it did not deny the need for generalisations as a basis for interpretation, but rather emphasised that these must concern more than functional relationships between pottery, the organisation of production, and social complexity. The generalisations must be concerned with the way artefacts are structurally related to other aspects of life and are meaningfully involved in social strategies.

Thus, for 'post-processual' archaeologists, pottery has multiple meanings and the uncovering of these meanings was the objective of various ceramic studies during the 1980's and 1990's. On the one hand, ethnoarchaeological studies attempted to relate pottery shape and decoration to other symbolic aspects of the world-view of the makers of these pots (e.g., Miller 1981). On the other hand, archaeological studies, like that of Hodder (1982), tried to uncover structuring principles from the decoration of ancient pots on a purely symbolic, contextual and situation-specific basis, using an inductive approach, unlike the deductive approach favoured by 'processual' archaeology.

The fourth phase of ceramic studies may be regarded as a fusion of processual and 'post-processual' thinking. It is characterised by abandonment of the sharp distinction, drawn by early 'post-processualists', between social/symbolic meaning and practical considerations of use, technology and the physical properties and mechanical behaviour of raw materials, and thus returns to ideas and theories which were first presented by Binford in the 1960's. It is now widely accepted (Pfaffenberger 1988, 1992; Lemonnier 1992, 1993; Ingold 1990; Dietler and Herbich 1994; Stark 1998) that an integrated analysis and interpretation of pottery assemblages should see the concepts of use and symbolism as elements that coexist in every object/artefact.

2. 1 The 'fragmentation' of material (...and pottery) studies:
the concept of style

It is useful to examine the false fragmentation of material studies, and by extension of pottery studies, into the three different research issues of style, technology and function/use. This segmentation began in the 'processual' period and was further developed by 'post-processual' thinking. Lewis Binford in 1965 first distinguished the primary and secondary function of pottery vessels, contrasting the technology and shape of a pot from its style (Binford 1965: 200). Since then, the concept of style has occupied many archaeologists. One of the major developments in Anglo-American archaeological thought of the 1970's on material culture can be summed up in two phrases: "style has function" (Wobst 1977) and "technology has style" (Lechtman 1977).

Style has widely been examined separately from the function and technology of the pot, however, and often interpreted as something added deliberately, at an extra cost in time and labour, as a means of 'information exchange' of coded symbolic messages between different human groups, particularly between different 'ethnic' groups (Wobst 1977: 326-330). Thus, style was interpreted as an 'adjunct form', as something that has secondary significance, as a means of communicating information and, in particular, of communicating social boundaries between people from different

communities or 'ethnic' groups (Chapman 1981: 132). Style was considered as a residue of social actions, a view that led to the equivalence of style with decoration (Plog 1980; Pollock 1983; Hegmon 1992).

This perception of style as a passive residue, and as directly related to the decoration of ceramics, was not invented by 'processual' archaeological thought. Childe (1929) used style to define certain groups of people and classify them as different 'cultures'. It was the processual 'school', however, which used stylistic patterns as reflections of social organisation and social structure or as markers of negotiated social relationships, such as post-marital residence patterns and kinship structures (Deetz 1965; Longacre 1970). Unfortunately, there is little ethnographic support for such a relationship (Allen and Richardson 1971; Stanislawski and Stanislawski 1978).

The truth is that style is difficult to define. Style is not simply found in the external aspects of objects, like the decoration on the surface of the pots. This simplistic, narrow and static definition of style by 'processual' archaeology, and its divorce from function/use and technology as a kind of a residue, posed both theoretical and methodological problems. It means that style is totally independent of function/use and technology and has to be sought only in those attributes of material objects that have no relation to the manufacturing process or to utilitarian aspects. Furthermore, this conception of style and its direct relation to the decoration of the vessels had negative effects on the way we understand past societies.

Ethnographic studies and examples, like that of Dietler and Herbich (1994: 460) among the Luo in Kenya and of Gosselain (1992) at Bafia in Cameroon, have shown that ceramic style has little or no symbolic meaning for its users in terms of direct or indirect connection with the expression of their 'ethnic' identity. The relationship between ceramic style and 'ethnic' identity is widely dependent on the social context of the production and circulation of ceramic vessels.

A rather different view of material style, based on the perception of style as a means of communicating information, is that suggested by Wiessner (1984, 1989).

She tried to disassociate the study of style from the simplistic equation with decoration and from the identification of social boundaries between 'ethnic' groups, stressing that style transmits information about relative identity, not only between groups but also between individuals. She introduced two new senses of style, the 'emblemic' and the 'assertive'. The term 'emblemic' refers to the role of style in the separation of the social world into groups, while the term 'assertive' corresponds to meanings that are related to individuals and are a matter of personal expression (Dietler and Herbich 1998: 242).

This approach thus introduced the active role of the individual as opposed to the group, in transmitting and communicating style. Wiessner's study, however, was based on her ethnographic study of the San, where she could observe social behaviour directly, in the living population. To infer the role of style in communicative behaviour in past societies, however, is rather difficult: on the one hand, it is difficult to select which part of the archaeological record may have served such a role; and on the other hand, it is not easy to identify this communicative behaviour only through the material patterning of the archaeological data.

'Post-processual' archaeology explored alternative interpretations of style to the communication function proposed by the 'processual' school. This approach understands material culture and style as containing and transferring symbolic messages (Hodder 1982, 1986; Shanks and Tilley 1987). In an attempt to extract this meaning from material culture, the latter was considered as a kind of text, with style needing to be 'read' in order to decode and understand the messages hidden in the archaeological data. Criticism of this approach focused on the fact that decoration was once again the main interpretative target, and that material culture and style were examined only from a symbolic perspective, disregarding function/use and technology.

Style should be seen, therefore, not as a by-product of cultural traits or habits, as a social residue, but as the product of purposeful human actions (Dietler and Herbich 1998: 236). Moreover, several ethnoarchaeological studies have suggested that style should not be associated only with the decoration of the pot, but should be

examined in relation to other physical attributes of the pot and always in full association with function/use and technology (Sackett 1990; Dietler and Herbich 1994).

Hegmon (1998: 265) suggests that style should not be identified archaeologically as variation that cannot be explained according to functional criteria and this variation then assumed to be culturally significant. On the contrary, style should be examined as a way of doing things, but this definition is also very broad and abstract. Dietler and Herbich (1998: 236) move a step further and distinguish two senses of style: an abstract and broad sense, similar to that of Hegmon, refers to characteristic ways of 'doing things', called *style of action*; and a second more specific sense, the *material style*, where the recognition of different styles on material objects is the result of certain ways of 'doing things', for example techniques of production or modes of distribution. Consequently, style might be present and active whenever and wherever there is a choice between equally viable options (Sackett 1990) and, therefore, style could reside in every manufacturing process. Inevitably, style has to be seen as a multidimensional, complex phenomenon, as a marker of different cultural processes.

2. 2 Technological problematic

Following Shepard (1976), ceramic technology was long regarded in purely material terms related to physical properties, the mechanical behaviour of raw materials, and the application of manufacturing techniques (e.g., Maniatis and Tite 1981). The term *Archaeometry* was introduced to describe the branch of archaeological science which included petrography, trace element analysis, and the study of firing procedures (e.g., van der Leeuw 1976; Rye 1981; Rice 1987). The underlying interpretative framework of these archaeometric procedures was strongly normative, static and historical, following the typological-descriptive approach, and did not integrate the whole process of human action from the selection of raw materials to the finished product and its use (Knappett 1997: 17).

During the 1980's and 1990's, anthropologists, such as Ingold (1988, 1990) and Lemonnier (1986), and sociologists, such as Law (1991) and Latour (1991, 1996), tried to change this static and normative view of technology and emphasised how technologies can be seen not only as a material expression of society, but also as cultural choices which depend as much on the social, economic and ideological setting as on any functional criteria. Archaeologists, like van der Leeuw (1993), Schiffer and Skibo (1987, 1997), and Stark (1998), followed this change in studies of technology, but there are also differences in approach to technology. On the one hand, the 'cultural' approach considers technology as mainly a product of social expression (e.g., Lemonnier 1993) while, on the other hand, the 'behavioural' approach stresses the importance of 'natural and physical constraints in the process of decision-making' (e.g., Schiffer and Skibo 1997). This dichotomy, however, is false:

> 'There is a fundamental distinction between things and techniques, between object and process. Both things and techniques are embedded in and conditioned by social relations and cultural practice... The mediating process between things and society, and the key to understanding their reciprocal relationship, is techniques. It is only by studying techniques, with the full range of social and physico-technical constraints to which they respond, that we can arrive to an understanding of the social forces and relations that condition material culture' (Dietler and Herbich 1998: 235-236).

> 'the final goal of technological studies is not to describe microscale prehistoric *activities*, but to understand microscale social process' (Dobres and Hoffman 1994: 213, emphasis in original)

The notion of human 'choice (s)' was key to this new way of thinking about technology. This does not exactly match the 'post-processual' view, in which the symbolic and the abstract had the primary role. Rather, it starts from the principle that the material world, and technology in particular, enables many forms of interaction between people and materials, and that there is a great degree of creativity and flexibility in how people achieve their material ends (Sillar and Tite 2000: 3). In the

case of pottery, the production and 'life cycle' of every ceramic vessel involves a series of 'choices', initially by the potter and subsequently by its 'owners', regarding raw materials, tools, energy sources, and manufacturing techniques, the form and conditions of use, exchange and discard. It is no exaggeration, therefore, to say that every single pot is a unique artefact resulting from a series of choices between alternatives, either technological or utilitarian.

In order to understand and interpret such 'choices', not in a linear way but contextually, we have to see them not as independent 'choices', but as embedded in a framework of steps of a vessel's 'life', that is of the 'chaîne opératoire'. The production of the material style and techniques is understood as a series of interrelated operational choices and not as a static, instantaneous phenomenon (Leroi-Gourhan 1964, 1965; Cresswell 1972, 1976; Lemonnier 1992, 1993). Two obvious questions arise. Who makes these 'technological or utilitarian choices? And are these 'choices' conscious or unconscious, meaning do we have to assume that the potter or user has conscious control over the physical and social constraints on the production and use of pottery? As Sillar and Tite (2000) have proposed, the 'choice' suggests some agency. But agency by or referring to whom? Do individuals make these 'choices'? It is well known, even if the main target of archaeological research is the individual and the ways s/he acted in past societies, that:

> 'archaeologists are rarely able to identify a specific individual who is responsible; rather we are looking at how a particular group or even a whole society adopted one technique where others could have been used' (Sillar and Tite 2000: 9).

People live in particular conditions, environmental, social or economic, and may act, either independently or as active members of a living family, group or society. Being members of these organized entities, they understand the world in relation to their background and they develop 'dispositions' to act in a certain way, and this happens through the influence of the structures of material conditions (Dietler and Herbich 1998: 246). It is what Bourdieu (1977, 1990) has described as the *habitus*, which is the mediating factor between material style, techniques and use and

is never static, but a dynamic phenomenon combining both historical products and agency. In this framework, people form and constitute their knowledge and understand what is socially and technically acceptable for their material ends.

Various ethnoarchaeological observations suggest that potters, although having a wide range of alternative ways of building a pot, follow a traditional and socially acceptable way of doing so. This is not, however, invariably the case, because the choices of an individual potter may be strongly innovative and dynamic, resulting in important changes to existing material practices, technological traditions and style. Conversely, social or cultural choices originating from the wider society and aiming at the social reproduction of the community tend to support stability, continuity and conservatism. This is what Giddens (1984) has described as the dynamic relationship between social structures and the active agency of the knowing subject. Individual agency, therefore, when innovative, may be used to explain short-term changes in artefact design and techniques. It follows that individual agency should also be considered a dynamic factor in longer-term processes and in changes in the social reproduction of the community.

2. 3 Use-oriented theories

The function and use of material culture has always been of interest in archaeology, even if neglected in comparison to studies of style and technology. While the use of pottery links the ceramic vessel with a particular action by the owner or user, function is a broader concept that refers to all the incorporated properties of the pot comprehended in the framework of its cultural role within a particular community or region. In this respect, understanding of how pottery was used is significant for various reasons. It may shed light on diet and trade, on the identification of social complexity and social change. Furthermore, the use of pottery for specific reasons and in particular contexts directly influences the life cycle and lifespan of pottery and so gives rise to different, context-specific archaeological assemblages.

The current interest in pottery utilisation is not something new or revolutionary in ceramic analysis. It can be traced back to 'ceramic ecology', the theoretical and methodological background of which was established by Matson (1965: 202-217) and developed by others, including Arnold (1975, 1985) and Kolb (1976, 1989).

The work of Anna Shepard (1976) on the physical properties of pottery can be linked directly to these approaches, but Braun's contribution (1983) changed the orientation of pottery studies, advocating that archaeologists should handle 'pots as tools'; details of the pots, which were normally recorded, could supply useful information to researchers on how and why the potter manufactured a vessel for a particular use. Renfrew (1972) associated the use of a ceramic vessel with the needs of the society and he linked the manufacture and use of Bronze Age Aegean pottery, like the sauce-boat and the jug, with basic products of Mediterranean polyculture, such as wine and olive oil. Many other researchers, such as Rice (1987) and Sinopoli (1991), also had the objective of tracing the use of pottery in terms of technical attributes.

Criticism of these theoretical and methodological constructions stemmed not only from archaeologists, but also from anthropologists, and centred on the fact that the use of pottery varies between different societies and cannot be explained in terms of global laws. It has been suggested that this variation can be better understood only in association with various other factors, social, symbolic, ideological, economical and political, and always in specific contexts (Hourmouziadis 1980, 1981; Kotsakis 1983; Miller 1985; van der Leeuw *et al.* 1991). Pottery, in addition to use as cooking vessels, storage containers and vessels associated with other needs, may serve to transmit information about producers, owners or users. The description of Strange (1989: 26) about the possible symbolic use of a pot is representative:

> 'It may mean that I, as the ancient owner of this vessel, belong to *this* group, and believe *these* things, that I have *this* level of wealth, and *this* much status. I am also of a specific sex, and perform *these* labors

> defined by my sex, and this vessel correlates with *this* sex and *these* labors.'

It is, therefore, evident that the study of pottery cannot be limited to environmental and biological or physical constraints. Pots are indeed tools, as Braun (1983) has advocated, but they can also be signs and symbols (Kingery 1996: 3). Consequently, the study of pottery has to be interdisciplinary and the manipulation and use of hard- and soft-science techniques and approaches must be contextual and site-specific.

Researchers such as Bronitsky (1989) and Rice (1996: 138-148) have focused on technical attributes related to design and functional characteristics of ceramic vessels to trace use and have treated these attributes as the end-products of people making engineer-like decisions separated from their social and cultural background (O' Brien *et al.* 1994). By contrast, others like Gosselain and Smith (1995) have preferred to pay more attention to non-utilitarian, symbolic or cultural performance aspects of ceramic vessels, the ceramic meaning, and have described the technical properties of pots as 'side effects' (Gosselain and Smith 1995: 158). Both approaches are incomplete, because, as discussed above, pots cannot be interpreted and explained in terms of either techno-functional performance or symbolic and cultural issues alone.

To conclude, ceramic studies must cover a broad band of constraints and factors from the simple typological and technological aspects to the more complicated and contextual social and symbolic meaning of ceramic vessels.

3. The Neolithic period in Greece: the chronological framework and current state of research

The study of the Neolithic period in Greece was founded on the pioneering work of Christos Tsountas in Thessaly from 1899 to 1906. His results were published in the well-known work *'Ai proistorikai akropoleis Diminiou kai Sesklou'* (1908). Following this work, Wace and Thompson published in *'Prehistoric Thessaly'* (1912) their research on the same area. Research expanded to other parts of Greece during the following years, including Heurtley's work on prehistoric Macedonia (1939).

Refinement of the chronological framework was the main focus of German and Greek archaeologists, led by Vladimir Milojčič and Demitrios Theocharis during the 1950's and 1960's in Thessaly. With the expansion of Neolithic research to other parts of the country and with the advent of calibrated C_{14} dating, a fourfold periodisation of the Neolithic can now be recognized across most of mainland Greece: Early Neolithic (7000/6500-5800 cal BC); Middle Neolithic (5800-5300 cal BC); Late Neolithic (5300-4500 cal BC); and Final Neolithic (4500-3200 cal BC) (Andreou *et al.* 1996).

The Late Neolithic period in mainland northern Greece, especially Thessaly, is divided into two subphases, the early Late Neolithic and the later Late Neolithic, on the basis of the appearance of certain ceramic wares and decorative styles. The early Late Neolithic is characterised by the widespread black burnished ware, usually with thin white painted decoration, and polychrome motifs, which are fair chronological indicators for distinguishing between Middle Neolithic and early Late Neolithic. The later Late Neolithic is characterised by painted and incised decoration such as the painted brown-on-cream and black-on-red, and incised 'classical Dimini' and 'Otzaki' styles. In southern Greece, the two subphases can also be distinguished, but less clearly (Andreou *et al.* 1996).

The vast majority of Early Neolithic sites are open settlements, sometimes closely spaced and with habitation often continuing on the same spot for several centuries or even millennia - long enough to form obvious settlement mounds or

'tells'. The inhabitants built both mud-brick rectangular structures, with stone foundations, and free-standing post-frame houses, in each case perhaps accommodating some form of family as the basic residential unit. The houses were grouped in compact, small permanent villages of ca. 0.5-1.0 ha which arguably housed no more than a few hundred inhabitants each (Andreou *et al.* 1996; Treuil *et al.* 1989).

The distribution of early sites is heavily concentrated in east-central Greece, in particular Thessaly, while in western Greece, the north-east and south-east mainland, and the smaller islands known settlements were, until recently, either absent or rare before the later Neolithic or Early Bronze Age (Andreou *et al.* 1996; Cherry 1981, 1990). Recent discoveries of Early and Middle Neolithic sites in five different parts of western Macedonia, however, strongly suggest that the present picture of early settlements may be unreliable (Andreou *et al.* 1996: 573). The excavation of an Early Neolithic site at Korinos-Revenia in Pieria is particularly significant (Besios and Adaktylou 2006) as it fills in a blank space on the map of Early Neolithic settlement. The discovery of another site at nearby Kato Aigiannis, buried under 8 metres of recent alluvium (Pappa 1999: 877), underlines the danger of taking the distribution of known sites at face value.

Early Neolithic settlement patterns are best known from Thessaly, due to a long history of extensive survey (French 1972; Halstead 1984; Gallis 1992). Nearly 120 sites are known from Eastern Thessaly alone and the number of Middle Neolithic sites is almost the same. Most settlements were open and caves were not widely used.

Early farmers grew cereals and pulses, which are more or less evenly represented among surviving crop seeds, while sheep predominate among the domestic animals. For this initial stage, small-scale intensive farming, described by Halstead (1989, 30) as 'horticultural', has been suggested. Shortages must frequently have afflicted individual households and, from time to time, whole villages or groups of villages. In such circumstances, isolated households are only viable in the short term (Sahlins 1974). In this respect, we may interpret the location at Early and Middle Neolithic Sesklo and Achilleion of hearths and cooking equipment outdoors in the

open, perhaps shared, yards between buildings as an arrangement inviting the sharing at least of cooked food between neighbours, while elaborately decorated fine pottery, suitable for serving and consuming food, may have reinforced the cultural value of hospitality (Halstead 1994: 206-207, 1999: 80). And, as we noted above, long-lived tell settlements clearly imply mutual help among neighbours in times of need and peaceful coexistence between neighbouring villages (Halstead 1989: 34). It has been argued that fine craft goods served as 'social storage tokens' (O' Shea 1981) in exchanges of food between less closely related households and this in turn clearly implies a network of exchangeable materials.

During the Final Neolithic, the total number of sites in Thessaly decreases and there is a concentration of population into fewer settlements (Halstead 1984, 1989). The islands of the Aegean, however, show a different picture and 'in contrast with the picture some two decades ago, when the Early Bronze Age appeared to be the key period, the Neolithic is now decisively emerging as the major period of initial island colonization in many areas of the Aegean, with neolithic material reported on over two-thirds of those islands for which adequate data exist' (Broodbank 1999: 19). The same may be true in parts of the southern mainland (Johnson 1996).

Later Late Neolithic crop assemblages are not obviously different than in preceding periods, although an increased scale of production might be inferred very cautiously from large storage vessels. In the faunal record, the predominance of sheep now declines and a more balanced representation of goats, pigs and cattle is apparent (Halstead 1989). Wild animals are also more commonly represented in the later Late Neolithic, and this might be explained in terms of the occupation of marginal areas and a consequent pressure on the acquisition of resources, or on growing availability of game as a result of widespread clearance by farmers (Halstead 1999: 84).

These widespread changes during the Late Neolithic period are paralleled by the privatisation and segmentation of several aspects of life, especially the division of whole villages with walls or ditches, e.g. the six concentric perimeter walls enclosing four main courtyard areas at Late Neolithic Dimini (Hourmouziadis 1979a) or ditch Gamma at Makriyalos I which probably subdivided the settlement. A number of

different interpretations have been proposed for the function and use of these ditches and stone fortifications all around Greece and Europe. In Greece, the best known example comes from Sesklo, where the demarcation wall of the tell separates Sesklo A and B, meaning the tell from the flat-extended part of the settlement (Kotsakis 1999). Apart from Sesklo, walls separating or defining parts of the settlement are not uncommon in Thessaly and are reported from FN Pefkakia (Weisshaar 1989), while ditches have been reported from a number of Late Neolithic sites, e.g., Arapi Magoula (Hauptmann and Milojcic 1969) and Argissa Magula (Milojcic 1956: 160-163). A wall of MN date was also reported from Hatzimissiotiki Magoula by Grundmann (1937) and LN retaining terraces have been excavated at Otzaki Magoula by Milojčič (1983: 28). In addition, ditches that ran through the settlements are evident at Ayia Sofia Magoula (Milojčič *et al.* 1976), Achilleion (Gimbutas, Winn and Shimabuku 1989) and even Otzaki Magoula, all tell sites. In Macedonia, there are a few examples of these kinds of structures at the sites of Yiannitsa B (Chrysostomou 1997: 138) and Nea Nikomedia (Pyke 1996: 51-52), but the evidence is inadequate for further discussion.

Furthermore, the installation of cooking facilities indoors or outdoors in restricted areas implies a growing tendency to isolation of certain groups of inhabitants from other villagers. The suggested Early and Middle Neolithic hospitality changed to a Late Neolithic emphasis on privacy. By the Final Neolithic and Early Bronze Age, the isolation of the family household was complete with the building of internal 'kitchen extensions' (e.g. Early Bronze Age Sitagroi [Renfrew 1970]) or the enclosing of the house within a walled courtyard (e.g. Early Bronze Age Argissa [Milojčič 1972: pl. E2]).

Another significant architectural change that might be related to a more 'complex' social structure within Late Neolithic communities is the appearance of large central buildings, called 'megara', in settlements, such as Dimini (Hourmouziadis 1979a), Sesklo (Tsountas 1908) and Magoula Visviki (Benecke 1942), although the 'megaron' at Magoula Visviki is not oriented like those at Sesklo and Dimini. A building with similar internal arrangement at Makriyalos (Pappa and

Besios 1999: 185) lacks the central location of these Thessalian examples. These buildings consisted of two rooms with a porch and that at Sesklo covered an area of approximately 100 sq.m, with a rectangular hearth in the larger room and semi-circular raised platforms lined with vertical slabs in the two smaller rooms.

Various changes occurred in the material culture of the Late Neolithic: sharp regional differences emerge, both in strategies for procuring lithic raw materials and in methods of flaking, and tools were not only made for use, but also for exchange (Perlès and Vitelli 1999: 97). Melian obsidian reached western and central Macedonia, but in far smaller quantities than in Thessaly and mostly as finished pieces. By contrast, in Southern Greece, the proportion of obsidian increased, but the level of craftsmanship varied greatly. The high numbers of stone and clay spools and of loom weights might indicate growing importance of weaving, while the, admittedly sparse, metal ornaments and tools mark a strong difference with previous periods (Zachos 2007). The large numbers of objects made from *Spondylus* shell are among the 'rare' goods found throughout Greece, from Sitagroi and Dikili Tash in northern Greece to Dimini further south.

As far as 'ritual' objects are concerned, Bailey (2000: 229) regards claims of increased production and use of anthropomorphic figurines during the Late Neolithic period as difficult to assess. Figurines were found in domestic contexts, but their quality is poorer than in the Early and Middle Neolithic (Demoule and Perlès 1993: 397). The most striking example of ritual behaviour comes from Platia Magoula Zarkou: a foundation offering beneath the floor of a house consisted of a clay model of an unroofed house with eight human figurines inside, comprising four children and two pairs of older people, perhaps representing three generations of one family (Gallis 1985).

In southern Greece and the islands, the Final Neolithic period is marked by an increase in the overall number of sites, although most are small in size. Following the trend from the previous period, many caves were inhabited for the first time (Demoule and Perlès 1993: 399). In northern Greece, and Thessaly in particular, the number of sites decreased sharply and those still inhabited grew substantially in size,

implying greater nucleation, and perhaps social complexity, both at the intra- and inter-site level (Andreou *et al.* 1996). Evidence from settlements, such as Pevkakia (Schachermayer 1976) in Thessaly, further supports this view. In eastern Macedonia there is greater continuity and expansion at many of the well established tells, but this pattern is followed by a decline in the later part of the period.

The material culture of this period has many similarities with the Late Neolithic, but a decline in craftsmanship has been observed in pottery and lithic production (Demoule and Perlès 1993). Human clay figurines with a stone head in the shape of a truncated cone were common artefacts in Thessaly. Rare and prestigious artefacts of gold, silver and copper were found at sites like Sitagroi III, Dikili Tash, Kitsos, Zas Cave and Tharounia (Davis 1992; McGeehan-Liritzis 1983; Zachos 1990).

While a number of regional contrasts and temporal trends have been suggested within the Neolithic of mainland Greece, it is important to stress two acute limitations of existing data: first, most excavations since the beginning of the 20th century have been on a very restricted *horizontal* scale; secondly, most publications of artefactual assemblages have been highly selective (and unsystematically so) in terms of both specimens and variables. These two limitations are products of the primary focus of research until the late 20th century on chronological rather than social questions.

3. 1 Flat-extended settlements

The bulk of the evidence for intra-site settlement organisation in this period of Greek prehistory is derived from the major excavations at Sesklo and Dimini in Thessaly, early in the 20th century, and the recent extensive investigation of Makriyalos which is the focus of this dissertation. Only a few years ago, Neolithic settlements in Northern Greece were synonymous with tells. Settlements were considered to be mounds of small extent with varying but clearly visible height (Kotsakis 1999: 66). In particular, almost all of the sites in Thessaly were densely inhabited and long-lived villages, forming tells of restricted extent.

The site of Vasilika in Macedonia was the first to be identified as an extended settlement morphologically different from tells. A site with similar characteristics was identified at Thermi B and C, near Vasilika. In addition, two sites were identified by the intensive survey project in the Langadas basin of central Macedonia: the striking feature of one of these sites is its exceptionally large area, probably reaching 50 ha (Andreou and Kotsakis 1994). The excavations at the Neolithic site of Makriyalos, however, have supplied the most useful and detailed evidence of the flat-extended settlements, well known in other regions of the Balkans and Europe.

The main characteristics of these settlements are considered to be horizontally shifting occupation, interspersed with largely empty spaces, perhaps cultivated land and fields (Andreou *et al.* 1996: 578), and their significant extent that sometimes exceeds 50 ha, in contrast to the tells, which rarely exceed 2 ha. The thickness of deposit is very modest and, unlike tell settlements, these sites rarely form a perceptible rise in the landscape. This distinction was probably perceptible in the past too, since tells stood several meters above the surface and had a limited and well-defined boundary (Kotsakis 1999: 68) and their height may have had a symbolic sense, meaning that tells (and the habit of rebuilding houses on the same spot) represent a claim to property, so that tells and flat-extended sites differ ideologically. Sherratt describes the tells as 'habitation monuments' (Sherratt 1997: 22). It is very interesting that at Sesklo the distinction between tell and flat-extended site is repeated within the same settlement, Sesklo A and B (Kotsakis 1999).

It has been suggested that this pattern of spatial organisation also reflects a different social and economic model, with agricultural and stock breeding practices that facilitated the intensive cultivation of land in the direct vicinity of the household. One of these flat-extended sites in the Langadas basin, near Thessaloniki, is adjacent to heavy, intractable water-retentive soils. The proposed proximity of the cultivated fields to the household perhaps reflects the need for more intensive cultivation of the land, but at the same time increased investment in labour. This model of cultivation may be described as horticultural, with the manure of the animals and household residues discarded in the fields in order to increase the fertility of the soil and overall

production as well. The horticultural model proposed by Halstead for tell settlements differs in the sense that the fields and animals would not have been scattered between the houses, but arranged around the village.

It is often assumed that the density of occupation on tell sites is high and that this is another difference between tell and flat extended settlements, where the houses are not closely spaced. The density of occupation at tell settlements, however, can be lower than in densely occupied parts of the extended sites. Thus, the equations 'tell sites = dense occupation' and 'extended sites = scattered occupation' may also be false, because they are based on evidence from small trenches (Kotsakis 1999). Furthermore, sedentism and longevity of occupation are not exclusively related to tell sites, as pointed out by Tringham and Krstic (1990).

3. 2 Neolithic pottery studies in Greece

A key development of the Neolithic period was the adoption of ceramic pyrotechnology. Although the necessary technology had probably been available for millennia, it was only in the mid-seventh millennium BC that it was fully exploited. This new technique was used to build a wide range of ceramic vessels to address several needs of early farmers. Early pottery has been studied from only a few sites in Greece, the majority in the Peloponnese and Thessaly (Vitelli 1989, 1993, 1999a, 1999b; Kotsakis 1983; Gardner 1978; Jones 1986; Maniatis and Tite 1981; Schneider *et al.* 1991; Wijnen 1993). As a result of the lack of synthetic studies of Early Neolithic pottery in Greece, most information comes from Vitelli's work in southern Greece with the obvious danger that this may not be representative of other regions.

During the Early Neolithic, firing was at a low temperature on an open fire, around 650°C to 900°C, in an oxidising atmosphere (Vitelli 1991; Maniatis and Tite 1981). Pots were probably in direct contact with the fuel, resulting in frequent 'clouding' and, according to Vitelli (1989), single pots were fired each time. Potters used simple methods and techniques, like coils and slabs, but these were labour-intensive and overall production was arguably low, perhaps as few as 12-13 pots per

year total at Franchthi (Vitelli 1993: 210), while Wijnen suggests an even lower figure of 5 pots per year for sites in Thessaly (Wijnen 1993: 324). The observed 'simplicity' of the methods of building pots resulted in simple - and sometimes irregular - shapes, mostly convex bowls with rounded or more rarely flat bases, and small-sized vessels.

Perlès and Vitelli argue that pottery was locally produced at almost all sites and that various local materials were exploited (Perlès and Vitelli 1999: 98). Conversely, there is firm petrographic evidence from Early Neolithic Knossos in Crete that some fabrics were non-local (Tomkins and Day 2001: 259). Later in the Early Neolithic, regional stylistic differences might indicate developed networks of exchange, but the distributions of different styles overlap and there is limited evidence for sharp regional boundaries (Halstead 1984: 4.3.2).

An aspect of pottery manufacture and production that has concerned researchers is whether it was a technique widely known among the inhabitants of a village or whether knowledge was restricted to a few people. Vitelli (1999a) has proposed, although her quantification method makes several questionable assumptions, that there were more potters than necessary for the scale of production, but too few to represent household production for domestic needs. In her study of pottery production and use at Franchthi Cave, she argues for at least five different clay recipes, with a minimum number of four potters working in the Early Neolithic period at the cave. These different wares were uniformly distributed within the site. She furthers suggests that the first potters were women shamans and that their pots were a by-product of the performance of rituals involving ceramic production (Vitelli 1999a: 185). This might in turn explain the suggested limited scale of production of pots, and the implied restricted access to knowledge of production, as the manufacture of a pot was a complicated procedure that presupposed high-level knowledge and experience, which only the shaman could acquire and, ultimately, control.

Another interesting issue is that of the function and use of early ceramic vessels. Evidence from various assemblages throughout Greece and the Balkans does not indicate the use of pots for cooking, since there are no signs of charring or spalling on the pots that could show repeated use on fire (Björk 1995; Skibo 1992,

110; Vitelli 1989). Moreover, archaeometric and technological analyses show that Early Neolithic pots had a low resistance to 'thermal shock', and this makes them inappropriate for use on fire (Björk 1995: 80-81). This, in turn, may explain the presence at neolithic villages in Greece of a wide variety of cooking facilities, such as hearths, ovens and fire-pits (Demoule and Perlès 1993: 377). Similarly, early pots do not seem to have functioned as bulk storage containers, because of their limited capacity and relative rarity in the assemblage (Björk 1995; Pyke and Yiouni 1996; Vitelli 1999a: 188). In conclusion, it has been argued that no domestic, 'utilitarian' use can be securely documented and other explanations have to be explored, like the ritual or ceremonial use of pots (Björk 1995: 128-132; Theocharis 1973: 40; Vitelli 1999a: 190-191).

In the Thessalian sequence, Early Neolithic ceramics are simple and decoration is scarce. The Frühkeramikum phase of early pottery is characterised by simple, open shapes and monochrome ceramics with low bases and lugs instead of handles. Their firing is often non-uniform. In the next phase, the Proto-Sesklo, shapes are more complicated and closed vessels appear. The decoration of these ceramics consists mainly of geometric motifs and compact triangles under the lip, painted in red or brown on a light background. At the end of the Early Neolithic, the Pre-Sesklo phase, monochrome pottery again dominates, while painted vessels decrease sharply. Impressed wares appear during this phase, but their distribution is uneven.

The Middle Neolithic is marked by striking developments and innovations in ceramic production. The firing temperatures increase now above 800°C and there is evidence for multiple pots being fired at once (Maniatis and Tite 1981). In some parts of Greece, at least in the south, a common recipe for the clay body, the well-known Urfirnis pottery, was shared among potters at all sites (Demoule and Perlès 1993: 381).

Prehistoric potters were now skilled manipulators of technology, innovative, and willing to take risks as evidenced by the building of large vessels and vessels with very difficult shapes, like sharply carinated bowls and collared jars. At Franchthi, the overall quantity of pottery produced appears to increase, but is still small. Coarse

wares with a number of large non-plastics, suggesting cooking pots, are first present late in the Middle Neolithic in small quantities, as are a few potential storage jars. However, the majority of wares, almost 90% of production, can still be characterised as 'fine wares' (Perlès and Vitelli 1999: 98).

The main bulk of pottery consists of monochrome vessels, but a greater number of decorated ceramics occurs and this contributes to strong regional stylistic differences evident in this period. Apart from Urfirnis pottery, pattern burnished and pattern painted ceramics are characteristic of the Peloponnese (Cullen 1985; Vitelli 1993).

Following the significant changes during the Middle Neolithic, the beginning of the Late Neolithic period shows an 'explosion' of many new decorative styles and especially of painted decoration. During this period the variability of motifs and of decorative techniques increased considerably. The beginning of the Late Neolithic is marked by the widespread appearance and circulation of polished black burnished and brown-on-brown 'matt-painted' ceramics (Demoule and Perlès 1993: 381).

Stylistic regions are of varied extent in the early Late Neolithic. Most of the new 'wares' and decorative styles, e.g., Grey on Grey and local 'matt painted' wares in the Peloponnese, were produced in quite limited areas and some, like the black burnished and various polychrome wares of Thessaly and, later, some matt painted vessels, have very widespread distributions in almost all regions of the Aegean. An issue, which is still obscure, is whether these widely distributed styles are locally produced at each site, and so represent a shared style, which implies social or kinship relations, or derive from a limited source of production, and so represent an extended exchange network (Perlès and Vitelli 1999: 98).

The most common shapes of the early Late Neolithic are different from those of the Middle Neolithic and are dominated by open carinated bowls, jars, jugs and larger vessels, like pithoi, which are built in several different sections. This implies the introduction and adoption of new techniques by the potters, as is also indicated by the highly elaborated surface treatment of certain ceramics, like the black Larissa

ware. Generally, however, the level of technical skill of potters varies considerably, both within and among wares and both within and among regions.

The later Late Neolithic period is clearly identifiable, at least in the northern part of Greece, by styles such as the 'Classical' Dimini in Thessaly and by the Dikili Tash group in Macedonia. The typical shape of 'Classical' Dimini pottery is the deep open bowl with highly standardised painted and incised decoration. The painted vessels include polychrome jars, open and closed shapes with black paint on a red or reddish background (red-on-black), open bowls with brown-on-cream patterns and ceramics painted with brown-on-brown motifs. Spiral, meander and chequer motifs are the most common, on both the inside and outside of the pot. Incised patterns are more or less similar to painted motifs, but the most common motif consists of groups of two to four vertical lines intersected by one or two horizontal lines. It has been suggested that this motif has its origin in weaving (Gallis 1996: 122).

These painted motifs were achieved with the use of a new manganese-based pigment, which required advanced knowledge by the potters and new firing techniques and kilns (Renfrew 1973; Vitelli 1993). The use of this new pigment involved an exotic material, perhaps of restricted availability. In Macedonia, the typical painted vessels are linked with the ceramic tradition of Bulgaria and the potters used a graphite-based pigment for their decorative motifs.

In contrast to the early Late Neolithic, the later Late Neolithic in the northern part of Greece is characterised by very large cultural regions and fewer local styles. On the other hand, in the Peloponnese, the scale of stylistic distributions in production appears to drop dramatically, but this localising trend demands further examination. An interesting aspect of the Late Neolithic, which has its roots in the Middle Neolithic, is the increase of coarse and cooking wares to 30-40% of production in both northern and southern Greece, reflecting the growing use of pottery in the domestic sphere (Perlès and Vitelli 1999: 99).

Finally, in the Final Neolithic, pottery production, use and consumption was affected by significant changes in other aspects of social and economic life. The

decrease in site numbers and nucleation into larger settlements, are paralleled in ceramics with the formation of very large stylistic provinces, like the Aegina-Attica-Kephala group, which covered central and southern Greece (Demoule and Perlès 1993: 398). Decoration, dominated by crusting, is increasingly scarce and impoverished, while coarse wares dominated the assemblages - up to 95-100% at some sites. These coarse wares exhibit great variability in composition, shape and level of skill (Perlès and Vitelli 1999: 99). Open dishes, jars, and large pithoi were the most common shapes of the Final Neolithic period.

Even if a great deal of work has been done over the past thirty years, more and more data are coming to light every day concerning neolithic Greece, albeit poorly studied and interpreted as is the bulk of data from excavations throughout Greece, and new questions, added to the old ones, need reliable and meaningful answers in the light of new developments in ceramic technology and use (Pappa *et al.* 2004; Urem-Kotsou and Kotsakis 2007). This study on the Makriyalos II pottery assemblage will attempt to tackle these new and old questions using these new developments in pottery studies.

4. The Makriyalos excavation in Pieria, northern Greece

In 1992, the 16th Ephorate of Prehistoric and Classical Antiquities conducted rescue excavations in Pieria, in Northern Greece, on the occasion of the construction of a new railway and the extension of the main Athens-Salonika motorway. Among threatened archaeological sites that cover the period from the Late Neolithic to the Late Roman Period, a major excavation started at a Late Neolithic site, near the modern village of Makriyalos, approximately 2 km inland from the modern coast (fig. 4.1). The site covers approximately 50 ha, based on surface finds and on geophysical survey (Tsokas et al. 1997: 130-136); 6 ha were intensively investigated during 1993-1995, in one of the largest salvage efforts in the history of Greek archaeology (Pappa and Besios 1999: 177). The excavation of the site offered valuable information about the hitherto relatively unknown character of 'flat-extended' sites in the Greek Neolithic.

4. 1 The Environment of Pieria

The region of Pieria is situated in the southern part of the administrative unit of Macedonia. The natural boundaries with the two adjacent regions, of Thessaloniki in Macedonia (to the north), and Larissa in Thessaly (to the south) are, respectively, the river Aliakmon and Mt. Olympus. To the east, the region is bounded by the Gulf of Thessaloniki and to the west by the heights of Mt. Olympus and Mt. Titaros. Lowland Pieria is comprised of rolling hills and a discontinuous coastal plain. The main route between north and south has always passed through Pieria (Pappa and Besios 1999: 179) and its coastal area.

4. 2 History of Archaeological Research in the Pieria Region

Until recent years, research into the Neolithic period in the region of Pieria had yielded sparse evidence (Grammenos 1991) and there had been no intensive or systematic investigation on either the intra-site or the inter-site level. The number of

known Neolithic sites in Pieria is very small, probably due to unsystematic research, to lack of intensive survey, and to the burial of sites by alluvial depositions from the four major rivers of the area. The six Neolithic sites reported in the literature cover the period from the end of the Early Neolithic to the Late Neolithic. Three of these sites are in the vicinity of Makriyalos.

The site of Paliambela is situated in a hilly area and the settlement itself is founded on a natural, gentle hill (Vlachos 2000: 15). The extent of the site surpasses 12 ha. and habitation spans the greater part of the Neolithic period, based on surface pottery finds, dated from the end of the Early Neolithic to the end of the Late Neolithic (Classical Dimini phase). Geophysical inspection, coring and intensive survey of the site have been conducted, followed by extensive excavation that confirmed the dating of the settlement and brought to light massive stone structures and ditches, possible parts of a system of boundary features (Kotsakis and Halstead 2004).

The site of Sfendami is also situated in the hilly area of Pieria and, according to surface finds, habitation started at the end of the Neolithic period. At the site of Sevasti, limited excavations revealed very thin deposits, about 20-30 cm thick, from occupation of the site during the Late Neolithic period (Pappa 1999: 875). The site of Kato Aigiannis, near Katerini, confirmed previous suspicions that most Neolithic habitation evidence is now under later deposits. The site is now buried 8 metres below the modern surface, and its discovery was accidental. The form and decoration of sherds are similar to those of the Early Neolithic period in Thessaly (Pappa 1999: 877).

4. 3 Excavation at Makriyalos

Until 1970 the site of Makriyalos was unnoticed and came to the attention of the Archaeological Service only after the construction of the motorway, which destroyed about 6 ha of the settlement. In 1992 trial trenches explored the site and during 1993-1995 a huge salvage effort uncovered approximately 6 ha of the

settlement (Pappa and Besios 1999: 179). Today, the excavated part is wholly destroyed. The excavation revealed, according to pottery finds, two principal occupation phases, Makriyalos I and II, dated respectively to the early and late Late Neolithic (fig. 4.2). The pottery of Makriyalos II has close relations in decorative motifs with pottery assemblages from Thessaly, of the so-called 'classical' Dimini style.

These two occupation episodes appear on opposite slopes of the hill. Only a few sherds of Makriyalos II were found in deposits of Makriyalos I, leading to the conclusion that Makriyalos I was completely abandoned before the establishment of Makriyalos II. During Makriyalos I the entire settlement was encircled by two curved, parallel ditches, A and B, both systematically investigated by excavation. A third, ditch Gamma, was revealed and excavated inside the settlement. Ditch A took two distinctive forms. In an early phase, a chain of large, deep pits was dug, occasionally up to 3.5 m in depth and up to 4.5 m in width; from time to time, pits were renewed, always on the same line. Subsequently, in a second phase, a V-shaped ditch was dug on the line of these pits. The inner fill of these pits of ditch A was composed of refuse from the settlement, including human bone and large quantities of stone and other artefacts. The quantity of finds inside the fill varied, according to the origin of the refuse. In some stretches of the ditch, a mudbrick wall was constructed, always on the outer edge of the ditch. The form of ditch B is similar to the later phase of ditch A, that is again a V-shaped linear feature, but shallower and narrower. The quantity of finds in ditch B is poor, and the fill consists largely of soil collapsing from its sides. No clear function was identified for ditch Gamma, but the proposal that it served as a partition within the area enclosed by the other ditches is possible. Within the enclosure, groups of large and small pits may have served as sources for building materials and as the 'basements' of semi-subterranean houses respectively.

The extent of Makriyalos II is smaller than that of Makriyalos I. In this occupation phase, ditches were also present, but their character is difficult to establish, because they largely lie outside the excavated area. At the intra-site level, occupation is denser than in the previous phase, focused on sectors H and Θ of the

excavated area, with no empty spaces between dwellings. The excavators tentatively distinguished two architectural subphases: an earlier subphase of pit dwellings and a later subphase of apsidal structures (Pappa and Besios 1999: 183-185).

The subterranean or semi-subterranean dwellings of the **earlier subphase** are again pit-huts, as in Makriyalos I, usually of a diameter up to 5 m and encircled by postholes (fig. 4.3). One of these subterranean dwellings, Pit 24, is the only pit that presents a clearly stratified fill (fig. 4.4). This pit is unusual in its depth, its diameter, the entrance identified by the excavators and the discovery of three holes marking the position of storage pots on the floor, 2m below the present surface. The sherds of these storage pots were found in the floor deposit together with imprints of the bases of such vessels. The excavators suggest that the bottom of the pit could have been used as a cellar. Hearths and ovens were situated outside the houses in small clusters of three or four, while a number of pits around the dwellings were recognised as storage pits, refuse pits and possible working areas (Pappa and Besios 1999: 185).

The structures of the ***later subphase*** are of a rectangular-apsidal form, all with the same N-S orientation, with the apsidal end towards the south. One of them was 15 m in length and had two rooms, divided by an inner wall (fig. 4.5). The amount and type of finds in the excavation of Makriyalos II are different from those of Makriyalos I. The majority of the chipped stone assemblage comes from Makriyalos II (Skourtopoulou 1997), there are more animal bones in Makriyalos I, although there are more bone tools in Makriyalos II (Isaakidou 2003). The pottery assemblage of Makriyalos I is bigger than that of Makriyalos II. Anthropomorphic and zoomorphic clay figurines and a variety of other kinds of clay objects, including stamps, spindle whorls and loom weights, were abundant throughout the excavation. An assemblage of 65 metal objects, including cylindrical beads, pins, awls, wire, a chisel, and a number of unidentified objects, is among the earliest in Greece (Pappa and Besios 1999: 188-189). In addition, the excavation of Makriyalos II deposits yielded a considerable number of stone figurines, mainly of white marble and of a very schematic form.

An infant cremation burial in a small urn was also found within the settled area, while several other inhumations in pits were placed outside the main settlement area. An Early Bronze Age extramural cemetery which has been discovered in close proximity to the Makriyalos II settlement and included ten articulated inhumations, together with some Roman remains inside the settlement, might explain the limited appearance of Bronze Age and Roman sherds found in the excavation.

Finally, the preliminary study of the faunal and floral assemblages indicates no striking differences between the flat-extended settlement of Makriyalos and tell settlements in terms of composition and exploitation of plants and animals (Valamoti 1999: 136; Collins and Halstead 1999: 139), although one Makriyalos I pit (Pit 212) has yielded an exceptionally large accumulation of faunal and ceramic debris from consumption of food and perhaps drink (Pappa *et al.* 2004).

The excavation at Makriyalos II offers a series of advantages for the study not only of ceramic and other data, because of the large-scale horizontal excavation, the relatively clear contextual definition, the large size of the artefactual and bioarchaeological assemblages and their relatively systematic retrieval and archiving. In these respects, the Makriyalos assemblages are rare in the archaeology of the Greek Neolithic.

5. Making pots: insights from ethnography, experiment and archaeometry

Before presenting the procedures adopted for sampling and recording the Makriyalos II ceramic assemblage, it is necessary to consider some of the practical steps involved in making pots and the ways in which manufacturing methods interact with the fabric, appearance and utility of vessels. This chapter draws on the results of a range of ethnographic, experimental and archaeometric studies which have shaped the methodology adopted here and thus, ultimately, the interpretations offered.

5. 1 General description and classification of surface treatments

After selection of the fabric and method of building of the pot and before decoration (if relevant) and firing, vessels undergo surface treatment and finishing. The time and effort spent in surface treatment and finishing varies, and according to Rice (1987: 138) two basic techniques can be distinguished, smoothing and burnishing; polishing and roughening of the surfaces of pots may also be recognised as intentional choices by potters.

Roughening of the vessel surfaces is not usually recognised as a finishing technique, and Rice (1987: 138) classified this as a surface patterning process. Roughening of vessels is strongly embedded in the intentions of potters, however, and is often related to specific uses of vessels, as for example in cooking where roughening may improve heat transfer and thus decrease cooking time.

For Rice (1987: 138), smoothing is the procedure by which the surface of vessels is made more regular than results from simple building and secondary formation processes. Vessels are smoothed while the surface is slightly wet (where the surface has completely dried, it can be rewetted). A soft tool, such as cloth, leather, a bunch of leaves or sometimes the potter's hand accomplishes smoothing. The resulting surface has a matt rather than lustrous finish, as the clay particles are not aligned and compact, and any lustre is due to natural properties of the clay and not to

the action of smoothing itself. Traces of smoothing are shallow and parallel to each other with rounded edges.

Burnishing is achieved by rubbing vessel surfaces with a hard and smooth object such as a pebble, bone, horn or antler. In contrast to smoothing, fine clay particles follow the same orientation and have a high degree of compaction, creating a more lustrous surface. Burnishing creates narrow parallel linear and oblong facets, the distribution of which reveals the degree of coverage and, therefore, the time and care expended by the potter.

The degree of lustre in burnished vessels depends also on the moisture of the surface at the time of treatment. If the surface is relatively moist, a vessel will be less lustrous and the traces of burnishing more visible; where the degree of lustre is high and uniform and the characteristic parallel facets are absent, the surface will have been worked when relatively dry, as well as with increased care. In such cases, the surface treatment may be categorised as polishing rather than burnishing or smoothing. Rice again (1987) classifies polishing as a form of surface patterning rather than a discrete process of surface treatment. Polishing represents a deliberate choice of potters, however, both to finish surfaces with particular care and to do so at the appropriate time in terms of clay moisture, and so might be regarded as a discrete and meaningful category.

5. 2 The firing process

Once surface treatment has been completed and any decoration applied, the last step is firing. This process involves firing at elevated temperatures with the aim of gradually removing water from the clay and permanently altering the crystalline structure of the clay minerals, resulting in ceramics (Rice 1987: 80). It was these properties of clay that made possible and widely desirable the broad use of ceramics by people.

Firing, however, is not easy, and particularly so in prehistoric societies. As a process that caused permanent alterations to clay minerals, care and control were needed in construction and firing to prevent breakage of ceramics. For Rice (1987: 80), firing involves three primary variables - duration, temperature and atmosphere - and all three variables should be considered when studying ceramic technology to reconstruct past firing processes (Gosselain 1992). These three variables apply to every firing process, whether in a kiln or on an open fire (or bonfire), but with different and variable potential for control. Kilns are re-usable constructions in which the fuel is separated from the ceramic products. A re-usable installation for an open fire may also be achieved by digging a pit, but the fuel is then in direct contact with the ceramic products. In some ethnographic examples, large potsherds were used to separate fuel from pots in open fires (Rice 1987: 154).

5. 2. 1 Open firing

At Makriyalos II and for the majority of Neolithic settlements in Greece, firing probably took place without a kiln in an open fire, with or without the presence of a pit. Only a few uncertain examples of kilns have been identified in the Late and Final Neolithic, and open firing is thought to have been the norm (Demoule and Perlès 1993). Ethnographic analogies suggest that pots are likely to have been placed on the ground or on a bed of fuel, while quantities of fuel were placed around and on top of the pottery, and more fuel perhaps added during firing. Fuels used may have been wood, brush, animal dung, and agricultural by-products. The scale of firing may have varied from a single pot to tens of vessels, carefully stacked.

Firing in an open fire has a variable duration, ranging from 15-20 minutes to several hours (7-8 hours) in ethnographic examples (Rice 1987: 153-154, Rye 1981: 96-98, Gosselain 1992). Pots may be removed immediately or allowed to cool inside the ashes. The temperatures in open firing range between 600 and 850°C and rise very rapidly. In general, heat is very difficult to control in open firings, as the fire consumes the fuel very rapidly, resulting in a short firing, unless more fuel is added.

Maximum temperatures, the time needed to reach them and their duration are directly related to the kind and quantity of fuel used and to their size and position in the fire. Big pieces of wood burn more slowly than small pieces, soft woods burn quicker but create lower temperatures than hard woods, and different kinds of fuels in different locations in an open fire result in different firing conditions. The short duration of firing, combined with the rapid rise in temperature and direct contact with fuel, cause many problems for ceramic production. Windy conditions are also a serious problem for the bonfire method, as sudden gusts of wind may stoke fires to undesirable temperatures. In addition, firing losses are likely to be higher in rainy than in dry conditions. Characteristic fireclouds on the surface of pots are one of the least significant problems caused by these poorly controlled conditions of firing. More important problems range from over- and underfired ceramic vessels to the cracking and breaking of pot(s).

Despite these disadvantages, non-industrial potters used, and in fact still use, open fires to make pottery, for several reasons. Firstly, this is an economical solution to making pottery, as an open fire is less time-consuming than a kiln to make and maintain. Secondly, open fires are mainly used to make low-fired coarse storage and cooking pottery, where thermal shock is mediated by the use of coarse textures (this is not true for Neolithic Greece where fine wares are abundant). And thirdly, potters may exercise more control on conditions of firing in open fires than is often assumed. This control may be achieved by preheating the pots or by lighting the upper layer of the fuel first, as most of the heat from the fuel is diffused to the atmosphere leaving a limited amount of heat to reach and pre-heat the pots..

5. 2. 2 Firing behaviour

The physical and chemical characteristics of clay are subject to widespread alteration during firing as a result of the temperature, duration, and atmosphere of the whole process. Adjustment, regulation and control of these variables are critical to the final result, the ceramic vessel. The term 'atmosphere of firing' refers to the presence of gases, particularly oxygen, during the firing and cooling process. The term

'oxidising atmosphere' refers to unobstructed circulation of free air and abundant quantities of oxygen, which bind with clay minerals. By contrast, when air does not circulate freely and oxygen is lacking, other gases derived from the fuel or from the clay material itself (e.g., carbon dioxide and sulfur dioxide) prevail, and the atmosphere is characterised as reducing (Rice 1987: 81).

Potters face a lot of problems in controlling these three parameters and in achieving the desired atmosphere when using an open fire or bonfire, due to variable weather conditions and irregularities in fuel combustion, as they are in direct contact with the pots and affect them in various ways. Consequently, firing atmosphere in an open fire or bonfire is almost never completely stable or controllable, and fluctuations occur. These fluctuations in the firing atmosphere impact on several properties of the ceramic vessels, particularly colour and hardness, but also affect porosity and shrinkage. In addition, firing atmosphere is directly related to temperature, and one set of conditions might apply while the temperature is rising or sustained at the desired level, and different conditions might occur (or be selected) during cooling, if adequate quantities of fresh air are allowed to circulate and *vice versa*.

Thus, in an open fire, the atmosphere is never completely oxidising nor completely reducing and is usually best described as incompletely oxidising, reflected in chromatic fluctuations on both the interior and exterior surfaces of ceramic vessels. Prehistoric potters achieved a fully reducing atmosphere, however, under certain well-controlled conditions. In some cases, a fully oxidising atmosphere could also be attained in open fires using temporary constructions, such as a stone ventilator joint, to set pots and fuel appropriately and so to supply increased quantities of air, and to some degree control the atmosphere (Rye 1981: 98).

The most important parameter in obtaining the desired firing atmosphere (oxidising or reducing) is the spacing of pots so as to allow or prevent the circulation of free air. If an oxidising atmosphere is desired, potters can separate pots in several ways, such as by putting small pots inside bigger ones or placing stones and broken sherds around unfired vessels.

Even if the primary goal of most studies in the 1980's and early 1990's was the determination of the temperature of firing - usually its highest level - a series of other alterations during firing is also important to explore, such as the duration of maximum temperature and the atmosphere at that temperature. Some physical and chemical reactions are completed at low temperature, but in a reducing atmosphere, while others need higher temperature and an oxidising atmosphere (Rice 1987: 81-82). Similarly, the duration of the desired maximum temperature is also very significant, as many reactions are only completed if the required temperature is maintained for a specific period of time. In open fires or bonfires, where the duration of firing is usually short and heat somewhat uncontrollable, maximum temperatures are achieved very rapidly, but the beginning of the cooling process is also quick. Consequently, many reactions in ceramic vessels remain uncompleted.

5. 2. 3 Alterations in clay and non-clay components during firing and their contribution to the final result

Water, organic materials, lime, quartz, broken shells, mica and other components occur in clay material (e.g., at Makriyalos II) and are all subject to severe alterations in chemical and physical structure during firing.

i) water

When heating starts and the temperature is still low (between 200 and 300°C), the drying process initiated under the sun and before firing is completed with the absorption of water from the surface of clay particles or from the pores. If the clay contains large quantities of water or if the water is removed too fast, the vessel may crack or, in the worst case, explode (Rice 1987: 87). The total absorption of chemically combined water is achieved when the temperature rises above 400°C and is usually completed around 600°C, depending on the type of clay mineral. When water is totally evaporated and there is loss of weight and shrinkage in total mass, the process of transformation of clay to ceramic is at its peak.

ii) organic materials

When the temperature rises above 200°C, organic materials, which are present in variable quantities in almost all clays, also start to oxidise. Organic materials consist mainly of plant remains, such as spikelet residues and roots. Even if large quantities of organic materials, i.e. carbon, are burned out of the clay or oxidised as CO and CO_2 when the temperature is around 200°C, the total quantity of carbon is only eliminated when the temperature is above 600°C (usually when it reaches 750°C), and the atmosphere must be fully oxidising, that is free oxygen is needed. The removal of carbon again causes loss of weight and shrinkage of the clay body.

The time needed fully to eliminate carbon from clay is affected by several factors: duration and temperature of firing, the amount of carbon included in the clay mineral, the quantity of oxygen in the atmosphere, the type of clay mineral itself, and its fineness. When the firing is short and does not reach high temperatures (above 600°C) and/or there are large amounts of carbon in the clay and/or there is not enough circulation of free air, the carbon is not fully eliminated from the clay. In addition, some clay minerals (e.g., smectites) retain significant amounts of organic material in their structure even if adequately fired. Finally, coarse-textured clays release carbon more easily (sometimes at low temperatures) than fine clays, due to increased porosity that allows carbon to move to the surfaces of the vessel and so to be burned out (Rice 1987: 88).

iii) quartz

Generally, most ceramics contain variable quantities of quartz or silica inclusions, either as a natural component (silica is an abundant natural mineral on earth) or as an addition to the clay body. Two types of silica are of interest to potters: macrocrystalline (quartz and quartz sand) and cryptocrystalline (mostly flint, but also chert, jasper, etc.). Quartz or quartz sand, which are the types of silica most frequently found in ceramics, affect significantly the structural properties of the clay body, that is

its shrinkage, porosity and strength, but this function is influenced by particle size and type of crystallinity (quartz-sand or flint). The effect of heating on quartz is minimal when the temperature is low. Three inversions occur in quartz at 573, 867-79 and 1250°C. The first inversion, a structural change, takes place rather rapidly at around 573°, associated with an expansion of quartz grains in the clay, but its effects are minimal, as it coincides with the removal of large amounts of water resulting in shrinkage of the clay body. The other two inversions occur at higher temperatures and are not so rapid, but take place less frequently in open fires, where the maximum temperature rarely exceeds 900°C. The role of quartz in ceramics is twofold: it prevents undesirable properties (e.g., by reducing shrinkage in firing); and it promotes desirable properties (e.g., increased strength of ceramic). Several studies have shown that the quantity and particle size of quartz are decisive factors in achieving these goals (Rice 1987: 95-96).

iv) calcium

Another important and very common mineral component in pottery is calcium, which is found in various forms of calcium carbonate (calcite, limestone, shells, etc.) and, as in the case of quartz, may be either naturally present in the clay paste or added deliberately by potters.

Calcium carbonate is characterised by a very special property that affects its use and value for ceramics: it decomposes at about 870°C (that is at temperatures which it is possible to attain in open fires), forming lime and carbon dioxide gas. The exact temperature at which calcium carbonate starts to decompose is a matter of argument, because there are several cases where this reaction occurs at about 650-750°C, probably as a result of differences in duration of firing and atmosphere (Rice 1987: 98).

It is not during firing that the effects of lime are observed, however, but in the cooling process. A major problem is that lime absorbs atmospheric moisture and forms quicklime, at the same time releasing heat. These two reactions are associated

with volume expansion, which stresses the surrounding clay body causing cracking and spalling (lime popping). The bigger the lime particles, the more the strength of the clay body is reduced, in extreme cases leading to total failure and crumbling of the clay body (Rice 1987: 98).

Potters are highly aware of these negative effects of lime and use several solutions if lime particles in the clay body are small (achieved by using fine clays or a pounded paste), and so lessen the risk of damage. The addition of salt (Rye 1981) and the wetting of pots immediately after firing, while they are still hot, can prevent crumbling or spalling (Rice 1987: 98). Other alternatives are firing in a reducing atmosphere, or in an oxidising atmosphere at a temperature either below 700-750°C or above 1000°C, usually in a kiln: with firing in a reducing atmosphere or at temperatures below 700-750°C, the decomposition of lime is avoided, while at temperatures above 1000°C rehydration does not occur (Rice 1987: 98).

v) mica

Mica is very common in pottery, being the most frequent inclusion in the fabric. For this reason, it is almost certain that potters did not deliberately add mica unless the particle sizes and quantities are large. When mica is found in large quantities in pottery, it is most likely that the pottery was made from a micaceous clay or tempered with crushed micaceous rock rather than being tempered with mica alone (Rice 1987: 410; Shepard 1976: 162).

vi) feldspar

Feldspar is the most abundant mineral on earth, averaging 39% of surface rock-forming minerals. The term feldspar refers to a large family of silicate rocks, and occurs primarily in granites and pegmatites, usually together with mica, constituting the primary parent materials of clay minerals. The presence of feldspar in natural clays is testified in small amounts, as a result of incomplete weathering (Rice 1987:

35, 96). The role of feldspar in ceramics will not be further examined in this study, however, because the identification of feldspar was not possible in macroscopic examination of the Makriyalos II pottery assemblage.

vii) other rare inclusions and impurities

A series of other inclusions and impurities, such as carbonates, salts, sulphates, and sulphides, volatise during firing between 500 and 800°C, further contributing to weight loss and shrinkage. No further examination of these inclusions and impurities will follow, because a microscopic analysis would be necessary for their identification.

5. 2. 4 Estimating firing conditions in pottery

Within the limitations and scope of the present study, an attempt was made to identify the firing conditions of the pottery assemblage from Makriyalos II. The secure reconstruction of firing conditions requires the application of several laboratory methods, such as refiring tests, thin sectioning and observation with polarising microscope and/or SEM. Unfortunately, only macroscopic examination of the Makriyalos II pottery assemblage was possible. This macroscopic examination could examine two factors: colour of surface or core or both, and hardness of surface. The definition of hardness is difficult, because it is often related to other variables, such as surface treatment and presence of inclusions.

Another feature possibly indicating firing conditions, especially temperature, is burnishing. Preservation of burnishing on the surface of vessels indirectly implies firing at temperatures below 900-950°C, while possible vitrification at higher temperatures may alter the microstructure of the surface and thus obscures burnishing. Such temperatures are difficult to obtain in an open fire or bonfire, however, which is widely assumed to have been the norm in Late Neolithic Greece.

Consequently, only colour of surfaces and/or cores will be used to examine firing conditions of Makriyalos II sherds. This offers only a general assessment of firing conditions, with no precise estimates of time, temperature, or atmosphere of firing, and refiring tests would be necessary for increased accuracy. Under these constraints, the validity of observations on firing conditions of Makriyalos II pottery is limited.

a) what constitutes colour of a sherd?

Colour is a basic element in ceramic description and classification. Variation in colour is often attributed to cultural, temporal or technological variables. The validity of observations of colour variation depends on a series of factors affecting colour in pottery fragments (Rice 1987: 331). These factors fall into two broad categories: those related to the manufacture and firing of pottery; and those which are related to use and post-depositional processes. For example, during their use life, cooking vessels may be exposed to smoke, soot, and charring, so that carbon is deposited on surfaces; storage vessels may accumulate surface residues, such as salt, that alters their colour; and accidental burning in a house fire may oxidise pots or deposit carbon. Post-depositional alterations may also occur, for example by erosion or absorption of various components during burial (Rice 1987: 345; Shepard 1976: 103).

The most significant factors affecting colour are related to the preparation and firing of the clay, that is the composition of the clay body (size, amount and distribution of inclusions and impurities) and firing conditions. As noted above, clays contain a wide variety of inclusions and impurities, of which organic materials and iron compounds in particular directly affect the colour of a ceramic. Their influence on colour is related to the kind, amount and distribution of iron compounds and organic materials in the clay. If clay is completely free of these two classes of impurities, it will usually be white when unfired and white or cream when fired, but such clays are very rare (Rice 1987: 333). Firing conditions also influence the effect of these impurities on colour. Generally, in open fires where temperatures are

relatively low (between 800 and 900°C), colours of natural clays are limited to white, black, orange-red and red or shades such as grey, cream, yellowish and brown. Other colours, such as pure yellow, blue and green are very difficult to achieve at low temperatures and usually require high temperatures and special additives.

i) <u>organic materials</u>

The presence of organic materials turns clay, when fired, into grey, black, or dark brown, depending on the amount of organic material present. When the temperature starts to rise, organic material, that is carbon, begins to char and oxidise. The time needed for carbon to oxidise fully is related to temperature, the amount of organic material, and the type and fineness of clay. In a fully oxidising atmosphere, carbon is fully eliminated at relatively high temperatures combined with a slow rise in temperature, but this is rather difficult to achieve on an open fire or a bonfire with significant fluctuations in temperature and atmosphere.

The amount of organic materials in the fabric of ceramics is usually estimated by examining a broken section. Large amounts of organic material usually result in a dark core, whether a thin grey strip or a very black band occupying most of the wall section. The presence or absence of a dark core reflects large amounts of organic matter and/or the deposition of carbonaceous material during firing. Four types of core resulting from the presence of organic material may be distinguished:

a) a dark core in the centre of the section with light-coloured patches on both sides of the ceramic surface; this could be the result of organic material that was not completely removed because of factors such as the duration, temperature and atmosphere of firing. When the dark core has diffuse margins with light patches, this means that the cooling of the ceramic was normal, while sharp margins are the result of rapid cooling in the air.

b) a light core in the centre of the section with dark-coloured patches on both sides of the ceramic surface; especially when associated with a black surface, this could be

the result of smudging, in which potters using an open fire cover the surfaces of ceramics with a dense layer of fine organic matter, such as sawdust, manure or fat, so that no oxygen reaches the pots and carbon is deposited on the surface and in the pores (Rice 1987: 335).

c) no dark or light core present, but the section is equally divided into patches of dark and light colours; this feature is usually associated with a black exterior surface, probably as a result of smudging, and a lighter (red-brown) interior surface, where no smudging is evident and an oxidising atmosphere prevailed.

d) a 'double core'; a dark core with sharp margins is found in the centre of the section bordered by light (red-brown) patches that do not reach the surfaces, while sharply defined light and dark patches are also evident near both surfaces. This probably means that the pot was cooled rapidly in air, fired one more in a reducing atmosphere and again cooled rapidly in air (Rye 1981, fig. 104).

ii) <u>iron compounds</u>

The colour of raw clay containing iron and fired in an oxidising atmosphere will vary between red and brown-red. If, however, the iron is partly oxidised or fired in a reducing atmosphere, the surface of the vessel will have a grey, black or grey-black and dark-brown colour. Thus, grey-black, dark-brown, grey and black colours on pottery surfaces could be the result of the presence of organic materials, iron compounds, or both. Consequently, it is rather difficult to say whether these colours on a ceramic are associated with iron or organic materials.

In low-fired ceramics, however, iron is the major determinant of colour. Moreover, full oxidation of iron can be obtained right after total elimination of organic materials, while red colours, as a result of iron compounds in clay material, are visible at temperatures around 900°C and, of course, when adequate amounts of oxygen are present (Rice 1987: 334-336).

Quantity of iron compounds is also significant for the colouring of ceramic vessels. When there are no other factors involved, a quantity of iron compounds of 1% will contribute a yellowish colour, a quantity of 1.5-3% will give a light brown or orange colour, and quantities of 3% and more, a red colour (Shepard 1976: 150). Quantity of iron compounds is important, but equally important is their distribution in the clay, which in turn is directly related to the fineness of the clay. In the case of a fine clay, its surface area is greater and finer-particled iron is required to cover this area (Rice 1987: 335).

Iron compounds in the form of thick granules, such as magnetite, pyrite or other iron-rich minerals, will not affect the overall colour of a ceramic vessel in the same way as finer iron compounds evenly distributed will do, though the total quantity of iron compounds is the same in both cases. Other impacts of iron compounds on the colour of ceramics occur at higher temperatures (above 1000°C) and will not be examined here, as it is very difficult to reach such temperatures in an open fire.

iii) <u>other inclusions and impurities affecting colour of ceramics</u>

It is not only organic materials and iron compounds that have a significant effect on colouring of ceramic vessels, and may help in estimating firing conditions. Lime when found in large quantities may also contribute to the colour of pots. As described above (see 5.2.3.iv), calcium carbonate is transformed to lime (CaO), absorbing moisture from the environment, at relatively high temperatures, about 800°C and above. This results in scaling of the surface and the creation of characteristic craters, which reflect firing at temperatures above 800°C. On the contrary, no evidence of such characteristics in lime-rich clays probably implies firing at lower temperatures than 800°C.

Various others inclusions and impurities such as manganese, magnetite, sulphides, sulphates, etc., can be used as paints (in the case of manganese and

magnetite) or may contribute to forming a slip on the surface of the vessel (in the case of sulphides and sulphates).

6. Aims of this Research Project

In the excavation of Late Neolithic Makriyalos, among other abundant finds, pottery was the most common. Ca 50 tons of pottery were found during the excavation of the site, the majority from Makriyalos I deposits as a result of the larger scale of excavation of this phase. Study of Makriyalos I pottery has investigated a variety of aspects of the ceramic assemblage such as the spatial distribution of pottery on the site, its use, style and technology, using methods including petrography, residue analysis, firing and re-firing experiments (Urem-Kotsou 2006). The study of production and consumption of the phase II pottery within Makriyalos and the exchange of this material over long distances was the focus of a PhD dissertation in the University of Sheffield by Elli Hitsiou (2003). This latter research was carried out on two spatial levels: firstly, intra-site study of the deposits within Makriyalos; and, secondly, inter-site comparison with the spatially disparate, contemporary pottery assemblages from Dimini in Thessaly, and Agrosykia and Giannitsa B in Macedonia. The pottery was studied macroscopically, to sort the material by shape, decoration and fabric, and microscopically by means of thin section petrography, to obtain information on technological aspects and provenance (Hitsiou 2003).

The present study has several objectives. Firstly, this study will try to trace the social and functional role of the Makriyalos II pottery in terms of use, and sometimes abuse, the distribution of pottery related to or defining particular activity areas, and the discard of the ceramic assemblage. Secondly, using available information from other classes of material, this study will attempt to test, and perhaps refute or revise, the preliminary phasing of Makriyalos II into two subphases, the subphase of pit dwellings and the subphase of apsidal structures. The manufacture, use, distribution and discard of pottery in prehistoric societies are integrally bound up with complex relations between humans. It is the investigation of these complex relations and interactions between pots and people on the one hand, and between people, on the other hand, that is the ultimate aim of this study.

This study has several advantages. First of all, the Makriyalos I and Makriyalos II assemblages are the richest undisturbed pottery groups for the Greek

Late Neolithic (Pappa and Besios 1999: 187). Secondly, the excavation covered a great part of the original extent of the site, affording the opportunity - rare in Greek archaeology - to study the Late Neolithic pottery in spatial context.

The spatial organisation of Neolithic settlements is scarcely known, apart from Sesklo and Dimini – both tell sites and both excavated a century ago. Makriyalos offers the opportunity to explore the reflexive relationship between activity areas and pottery and also to investigate the contrasting social use of space on tell and flat-extended settlements.

6. 1 Methodology

6. 1. 1 Sampling strategy

Given the time available, the aims of the research, the large size of the pottery assemblage and the possibility of future additional investigation of the material under study, a sampling strategy was necessary. The aim of sampling is to achieve reliable inferences about a target population, in this case the pottery assemblage of Makriyalos II, from a subset of that population. Samples may be selected in a variety of different ways. Random sampling is the most unbiased way and allows the structuring and evaluation of archaeological inferences about the entire population, that is to say estimation of population parameters from sample statistics and testing of hypotheses about populations on the basis of the sample. Three different random sampling procedures may be distinguished: simple random sampling, stratified random sampling and clustered random sampling (Mueller 1975; Drennan 1996).

Simple random sampling means the selection of the sample randomly from a table of random numbers with no further presuppositions. In the case of stratified random sampling, pre-existing knowledge of some specific characteristics of the target population contributes to the selection of the sample. For example, the target population of an archaeological survey might be all sites in a region. Previous observations of an association between prehistoric sites and specific environmental factors might be grounds for the selection of a bigger random sample of regions featuring these environmental factors, but a smaller sample of other areas. The

existence of clustered random sampling technique is widely questioned (Mueller 1975), and therefore will not occupy us. Non-random systematic sampling has also attracted interest in archaeology, but it tends to be biased, with limited potential for archaeological inferences about the entire target population.

In order to understand and interpret the social and functional role of pottery, the pottery assemblage must be analysed in terms of particular contexts of habitation episodes as revealed by excavation. Thus, our sample will be random, in order to reduce bias, but will be stratified, regarding of course the results of the excavation and the questions raised concerning certain spaces, areas or assemblages.

The selection of a sample of the Makriyalos II pottery assemblage was affected by a number of factors. The methodology of excavation at Makriyalos was based on the 'excavation unit', a more or less arbitrary unit variously corresponding to a single small feature, a single layer within a feature, an arbitrary 'spit' within a feature or layer, or a 'spit' within part of a trench, depending on the experience of the excavator and the clarity of the stratigraphy. Consequently, the excavation unit was the basis of the ceramic sampling strategy.

The excavation of Makriyalos II revealed a wealth of architectural and other features and, as noted above, a strict simple random sampling procedure might overlook or underrepresent pottery groups from certain architectural features of great importance. Excavation units were selected for analysis on the following criteria. First, excavation units thought to be disturbed by post-depositional erosion, etc., were excluded. Secondly, a representative sample was chosen of feature types, based on excavation information, for each part of the phase II settlement. Thirdly, the most informative layers from each feature were selected. To this end, a pilot project was conducted for two months to compare the basal and upper levels of selected pits. The aim of this study was to determine whether the basal layers of pits display greater functional variability in ceramics than the upper levels, which were potentially derived from later infilling, and whether there is a systematic difference between basal and upper levels in the quality of ceramic preservation. Fourthly, after initial rapid 'scanning' to gain an overall picture of the assemblage, areas between pits were

sampled in order to see the relationship between pottery from the pits/other features, and from the spaces between them. The quantity of pottery selected for this last exercise was very small and did not exceed one plastic box (ca. 20 kg). Fifthly, the subsample selected on these stratified and judgmental criteria was further reduced by random sampling to achieve a realistic total subsample for analysis.

Given the time limits of a three-year Ph.D., the total time available for recording the pottery assemblage of Makriyalos II was eighteen months. Previous experience of recording the pottery assemblage from Makriyalos I led to the decision that this time period was adequate to record and analyze a sample of ca. 80-100 boxes, from a total of ca. 400 boxes.

Of the six excavation sectors, five were selected for sampling: B, Δ, H, Θ, I. The sixth sector, Ξ, was not selected for sampling, because its layers contained a mixture of material from both Makriyalos I and II, greatly complicating interpretation. Sectors H and Θ were thoroughly and very carefully sampled under the procedures outlined above, as most features were found in these two sectors. Sector I received a lot of attention during the excavation, but the pottery gathered was small in quantity and almost completely abraded. Therefore, it was decided to take only a small sample from this area and to 'scan' the rest of the pottery very quickly to see if there was anything of interest. The result of this 'scanning' was not significant and the area received no further attention.

Sectors B and Δ were at the eastern edge of the excavated area, limiting the potential for an adequate and detailed archaeological investigation. Sector B is located on the edge of the habitation area of Makriyalos II, while sector Δ is far from it. In addition, some of the features, like a pit in sector B that yielded a striking quantity of incised pottery, were excavated before the establishment of the excavation grid and, therefore, were not investigated systematically. The same is true for sector Δ, where a few pits had a small amount of pottery, with the majority of this material belonging to the 'classical Dimini' category. Consequently, the value of these two sectors for study of the Makriyalos II pottery was restricted. Finally, a pit in the south-eastern part of the excavated area, outside the habitation area, which yielded pottery dated to the later

Late Neolithic, was again excavated unsystematically and was excluded from the sampling procedure.

On the basis of these considerations, the sample selected from the Makriyalos II pottery assemblage was 473 excavation units that covered the entire settlement and almost all features. Besides these selected units, some additional units were added to the sample because they contained distinctive potsherds, collected separately during excavation.

Regarding the total amount of pottery selected for analysis, the distinction between sample fraction and sample size, an issue that has received a lot of discussion in the literature, is important. For example, a sample fraction of 20% is small, when the target population is 50 sherds of pottery, while a sample fraction of 5% is adequate when the target population consists of 500,000 sherds. These units selected for the present study included 50,826 sherds, representing a sample large enough for statistical analysis and archaeological inferences about the target population of the Makriyalos II pottery assemblage.

6. 1. 2 Recording the assemblage, stage I: recording of all sherds in selected excavation units

The recording of the sherds took place in two stages. In the initial stage the following variables were recorded for each selected excavation unit: macroscopic assessment of the surface treatment, fabric and part of vessel of each sherd; attribution of each sherd to an open, closed or unknown shape; the total number and total weight of each of the preceding categories; the degree of post-depositional abrasion and the relative dimensions of the sherds; the number of individual sherds derived from the same pot; and, finally, the context-related information from the unit in order to understand the way pots were broken and dispersed.

Surface treatment refers to all the procedures evident on a pot-sherd other than method(s) of construction and secondary forming processes, like coiling or slabbing, beating, cutting or scraping. Rice (1987: 136-138) and Rye (1981: 84-88) consider

these secondary processes as subsidiary actions which are responsible for the final result, but do not dramatically or decisively alter the shape or dimensions of the vessel.

In this preliminary stage of recording, for sherds with well preserved surfaces, a distinction was drawn between decorated and undecorated sherds, as decorated sherds received more treatment and, consequently, their production demanded greater investment of time by the potter, than undecorated sherds. The undecorated sherds were further divided into polished, burnished and rough. The polished, burnished and rough groups were again subdivided in terms of both their type of surface treatment and firing environment (oxidising or reducing atmosphere; even or uneven firing), into **Black-burnished**, **Black-polished** and **Black-rough**; **Brown-burnished**, **Brown-polished** and **Brown-rough**; **Red-burnished**, **Red-polished** and **Red-rough**; **Burnished** or **Polished covered with red plaster**, **Burnished** or **Polished** or **Rough with clouds** (reflecting an anomaly in the firing process or accidental clouding from subsequent contact with the fuel); **Burnished-whitish**, a rare category with a whitish plaster covering the surface of the pot and a distinctive clay recipe; three categories of undecorated sherds which could be classified as either polished or burnished (with a strong preference for polished treatment), that is **Black-topped, Red-topped** and **Red plaster on a reducing surface** (the last being a rare category recorded separately in order to understand how and when the red plaster was applied to the reducing surface). In addition, a few sherds of **Bronze Age** and **Historical** date were identified (fig. 6.1).

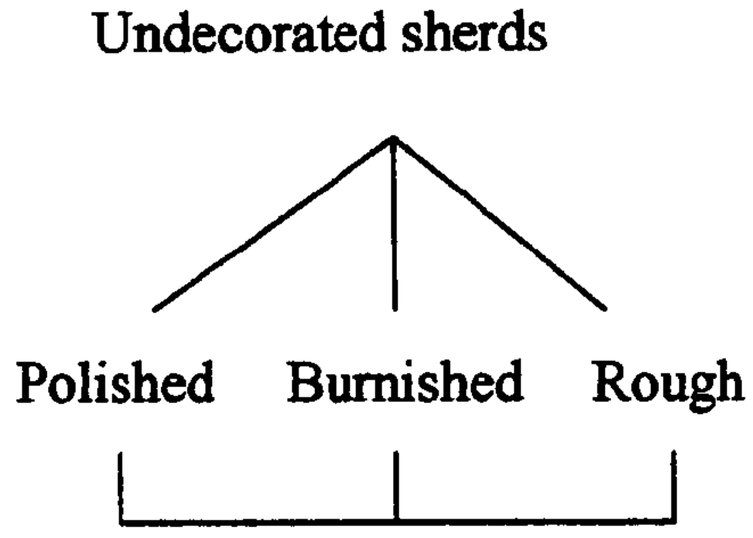

Figure 6.1

The second general category, decorated sherds, includes not only painted sherds, but also sherds that have evidence of additive or subtractive processes or modifications of their surface condition other than simple polishing or burnishing. In this category were recorded **Impressed** sherds, **Pattern-burnished** sherds, sherds with **Plastic decoration, Incised** sherds, **Channelled** sherds, **Painted** and **Incised 'classical Dimini'** sherds, **Black-polished** and **Red-polished** sherds that reveal a **yellowish paint** in the lower part of the pot in various decorative motifs, **Barbotine** sherds, sherds **Decorated with a shine** and, finally, **Other painted** sherds, that were impossible to place in one of the above sub-categories and too rare to justify creation of a separate sub-category.

The sub-category of **Painted 'classical Dimini'** sherds was further divided into four categories: sherds with the characteristic **Brown-on-Cream** painted decoration; sherds with **Brown-on-brown** painted decoration; sherds with **Black-on-Red** painted decoration; and sherds with **polychrome** decoration. The sub-category of **Incised 'classical Dimini'** was divided into two categories: **simple incised 'classical Dimini'** sherds and **incised sherds with broad painted bands** (fig. 6.2).

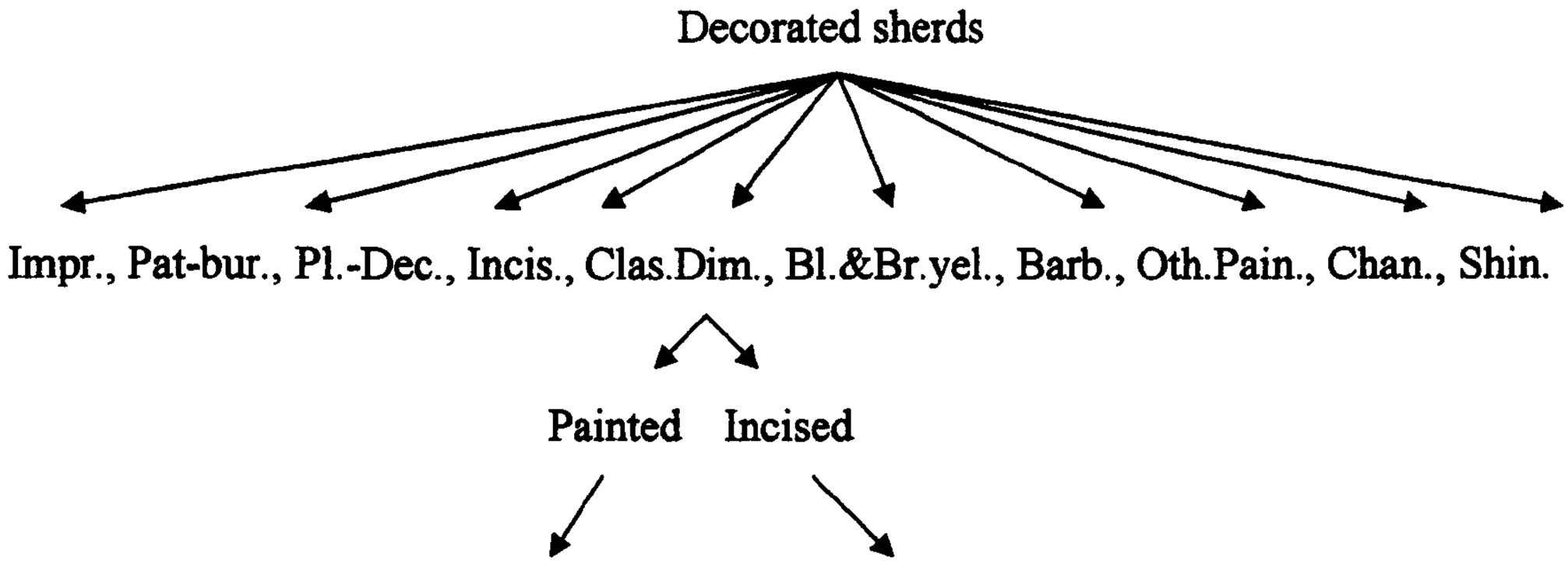

Figure 6.2

A third general category of surface treatment includes sherds that are undiagnosed for various reasons, such as post-depositional abrasion, post-depositional encrustation or small size. Finally, for all sherds, the presence or absence was recorded of broken shell inclusions to examine the possibility that these inclusions were related to the use of pots for cooking.

The macroscopic analysis of the fabric of each sherd was limited at this initial stage to the quantity of inclusions evident in section. In almost all cases, a small part of the potsherd was broken in order to facilitate examination of the section of the ceramic and to ensure secure conclusions about the texture of the fabric. The separation of sherds into **Fine, Medium** and **Coarse,** according to the quantity of inclusions, followed Mathew *et al.* (1991). Sherds with less than 5% of inclusions were defined as **Fine**, those with 5-20% as **Medium** and those with more than 20% as **Coarse**. The total weight of each category for each fabric, namely **Fine**, **Medium** and **Coarse**, was recorded. All the sherds from each of these categories were weighed in order to explore the relationship between the weight and number of fragments.

As regards the part of vessel represented by each sherd, four main categories were distinguished: body, rim, base and handle; each of these was sub-divided by shape of vessel - open, closed or unknown. Carinated sherds were recorded together with the bodies.

The degree of post-depositional abrasion was measured in terms of the proportion of the surviving surface area preserved sufficiently to give adequate and safe information about the sherd or pot. This variable was recorded in increments of 10 on a scale from 0 (surface entirely preserved) to 100 (surface wholly obscured). The dimension of the sherds was recorded as: small, medium or large, to provide a rough measure of the fragmentation of each contextual group of sherds. Sherds were not measured, as this would have been prohibitively time-consuming. Instead sherds were classified as small, medium or large relative to the size of vessel from which they were derived; the bigger the pot, the larger the sherds assigned to each size category. The size of vessel was of course difficult to determine for most sherds, but usually some estimate of size was possible and it was often possible to refine such estimates by taking account of information on shape, surface treatment and fabric; e.g. a black-polished sherd belonging to a bowl is easily identifiable and the dimensions of such bowls are fairly well known. Finally, the average fragment size class for each unit was estimated.

The number of sherds derived from the same vessel was recorded as follows: actual/physical joins from the same unit; actual/physical joins between units; judgmental joins, within or between units, of sherds that, on the basis of such characteristics as fabric, shape, colour, decoration, etc., very probably belonged to the same pot. Unfortunately, there was limited time and space to search very thoroughly for joins either for every sherd or between many large units, each weighing up to 67 kg. As a result, joins between units were usually limited to the small units; joins between bigger units were made only if a particularly distinctive sherd recalled another from a different unit. Consequently, this variable must be interpreted with due caution.

Finally, in this initial stage a series of other information was of interest, that is information not necessary directly related to the pottery, but associated with the excavation unit, and consequently context-related. For example, the presence of burnt clay fragments, such as floor fragments, was recorded at this point.

6. 1. 3 Recording the assemblage, stage 2: detailed recording of selected sherds

In the second stage of recording, all rims, handles, bases, carinated bodies, profiles and decorated sherds of each selected excavation unit were sorted out and recorded in more detail. The focus of the analysis here was not only the individual sherd, but also the pot this represented. Detailed recording was organised under five headings. Almost all variables in the recording sheet contained an **Unknown** cell, for sherds where the information was not available for reasons such as the small dimensions of the sherd or its abrasion.

First, general information was recorded on: the category of pot represented in terms of surface treatment and firing environment; the part of the pot represented (rim, handle, body, base, carina or complete profile); the weight of the sherd or pot, and the number of sherds represented (if there was more than one sherd from the same pot). Colour was recorded in terms of Munsell value, but this will be interpreted with caution as values were taken using different books and under variable lighting for reasons beyond the control of the writer.

Secondly, information was recorded on the construction of the pot or sherd, and on technological attributes, but not on building techniques. Macroscopic information on the quantity and type of inclusions was recorded to explore the way different fabrics were employed for different kinds of vessel, in other words to trace the intentions or 'choices' of pot-makers for constructing and using pots. Ten general types of inclusions were distinguished: flakes of pottery or clay (0), mica (1), quartz (2), shell (3), limestone (4), sand (5), schist (6), organic materials, such as chaff (7), unrecognised stone (8) and gravel (9). It is almost certain that finer distinctions could be made, but not with the naked eye. The PhD dissertation of Elli Hitsiou (2003) is a detailed and thorough study of petrography and construction of Makriyalos II ceramics.

To explore the firing environment, evidence was recorded for oxidising, reducing or mixed atmosphere and the location of such evidence on the inner or outer surface of the sherd. For sherds exhibiting 'clouding', a distinction was made between 'clouds' caused during firing, usually having a more or less black colour on a single

part of vessel, and those due to repeated use of the pot on a fire and, therefore, unrelated to firing environment, usually representing multiple tones of grey and black all over the pot or a great part of it. Similar evidence was recorded for the core of the sherds, to shed light on the way the pot was fired, the duration of exposure to fire and the speed of cooling of the pot and what this might mean for the final result. The basic core types were: oxidised, reduced, mixed and half-oxidised/half-reduced. The core in the section of sherds is not always uniform. So, these basic types were further distinguished as: uniform, two-coloured reduced, two-coloured oxidised, half-oxidised/half-reduced, three-coloured and multi-coloured.

The detailed description of surface treatment was undertaken with the objective of understanding why particular surface treatments and wares were used for different vessels and uses, either as tableware or as cooking vessels. Often there is no clear distinction between secondary forming processes and surface treatments. When a pot is constructed with the coil or slab technique, it is very difficult to distinguish between trimming, scraping or smoothing used to remove wasteful residues of clay or to join different parts, and deliberate attempts to alter the appearance of the pot, by burnishing, polishing, roughening or pasting a film of red plaster on the surface, but not as decoration.

This study attempts to identify and interpret only those examples of surface polishing, burnishing or roughening which result from the purposeful actions of potters. Low or medium coverage and sleekness of surface were attributed to burnishing, while high coverage and sleekness were attributed to polishing. A few sherds with high coverage and medium sleekness were attributed to burnishing.

Thirdly, evidence was recorded for vessel shape and dimensions, and for the percentage of the circumference represented. Details of vessel types and, also, of the types of rims, handles and bases will be given in Chapter 7. As regards the dimensions of sherds, in the assemblage as a whole the majority of sherds covered an area of between 2 by 2 and 10 by 10 cm. As a result, four size categories were created to study and analyse the fragmentation of various ceramic categories:

i. < 2cm x 2cm

ii. ≥ 2cm x 2cm and < 5cm x 5cm

iii. ≥ 5cm x 5cm and < 10cm x 10cm

iv. ≥ 10cm x 10cm

Fourthly, information was recorded on the degree and location of post-depositional damage to the sherd to further understanding of both the post-depositional history of the pot and how this has affected the evidence surviving today. Post-depositional damage and abrasion was measured on a three-point scale: high, medium and low, based on the percentage of the surface and decoration preserved, as well as the appearance of the sherd (e.g. worn edges), as in the first stage of recording.

Fifthly, a more detailed record was made of decorative motifs to investigate possible spatial differences in the distribution of various styles. All the decorated categories described above were distinguished in this section, but the impressed category was subdivided again into **Impressed** and **Dotted**. This was necessary in order to differentiate between decoration with the finger and with a tool that makes small dots on the vessel surface, a distinction that was difficult to make at the first, general, stage of recording.

This second stage of recording thus provided information on the use and function of individual pots or sherds, although divorced from the context of associated material that plays an important role in the final interpretation. In the final stage of analysis and study of the Makriyalos II pottery assemblage, the resulting data set will be explored with SPSS and Excel packages; contextual and spatial analysis will then be conducted using a GIS (Geographical Information System) programme.

7. Analysis of the data

7. 1 Quantitative overview of the data

In the first place, it is useful to give some general quantitative data on the sample of Makriyalos II pottery selected for analysis and interpretation. From the total of almost 400 boxes of pottery uncovered in the excavation, 90 boxes (22.5%) were selected for recording and analysis. These boxes contained 473 excavation units, covering five excavation areas: B, Δ, H, Θ and I. In addition, 103 feature sherds from other excavation units, selected during the excavation because they helped to understand the repertoire of shapes and decorative motifs of Makriyalos II, were included in the sample for study.

The sample of 473 excavation units yielded 50,723 sherds, each of which was carefully examined for the initial phase of recording of the variables described in chapter *6.1.2*. The total weight of these 50,723 sherds was 1,340,890 kg (mean sherd weight 26.4 g), while the extra 103 sherds weighed 22,035 kg. The material from the 473 units comprised 17,575 coarse sherds (34.6% of the total sample by number) weighing 509,835 kg (38.0% of the total sample by weight), 23,556 medium sherds (46.4%) weighing 674,210 kg (50.3%) and 9,592 fine sherds (18.9%) weighing 156,845 kg (11.7%). The 103 extra sherds comprised 30 coarse sherds weighing 8,919 kg, 39 medium sherds weighing 6,979 kg and 34 fine sherds weighing 6,137 kg.

From the total of 50,826 sherds, nearly one fifth or 9,337 sherds, were selected for detailed study and analysis. These sherds belonged to 8,123 cases, as some sherds were parts of the same pot. The total weight of these sherds was 377,739 kg (mean sherd weight 40.5 g). This selected material comprised: 2,486 coarse sherds (26.6% of the selected sample by number), representing 1,960 cases and weighing 140,416 kg (37.2% of the selected sample by weight); 3,140 medium sherds (33.6%), representing 2,884 cases and weighing 154,903 kg (41.0%); and 3,711 fine sherds (39.7%), representing 3,279 cases and weighing 82,420 kg (21.8%).

As expected, given the criteria for selecting material for detailed study, selected sherds tend to be much larger than those in the assemblage as a whole and include much higher percentages (by weight and sherd count) of fine ware. Nonetheless, coarse, medium and fine wares are each well represented in both the whole and selected assemblages.

7. 2 Quantifying surface treatment

The 50,723 sherds sampled for initial recording can be divided into the following categories on the basis of surface treatment:

i) polished undecorated sherds number 3,586 sherds or 7.1% of the total (table 7.1). More than half of these polished sherds exhibit a reduced firing environment and belong to the black-polished category; there is an almost equal representation of two other polished categories: polished with clouds and polished with red plaster. A significant number of sherds display an oxidising atmosphere and were classified as brown-polished or red-polished sherds.

ii) burnished undecorated sherds are a big component of the Makriyalos II pottery assemblage, comprising 14,511 sherds or 28.6% of the total (table 7.1). The distribution of these burnished sherds among different firing environments and different conditions of use is dominated by black-burnished, brown-burnished and burnished with clouds. Red-burnished, burnished with red plaster and burnished-whitish are all rare (each<0.1%).

iii) black-topped are fairly common, while red-topped sherds and red plaster on a reducing surface are rare (each<0.1%) (table 7.1).

iv) the rough undecorated category includes 3,005 sherds or 5.9% of the total (table 7.1), dominated by brown-rough sherds fired in an oxidising atmosphere. Black-rough sherds, like the black-burnished category, are present

in small numbers. As with burnished sherds, rough sherds with clouding make up about one sixth of this category.

v) decorated sherds make up 3,016 or 6.0% of the total (table 7.1). Of the various decorative categories: the red-on-black 'classical Dimini' group comprises 1,664 sherds or 55.2% of the total; two other painted 'classical Dimini' categories, the brown-on-cream and brown-on-brown, contribute 239 or 7.9% of the total and 246 or 8.2% of the total sherds respectively, while the third, polychrome 'classical Dimini', is represented by 37 sherds or 1.2%; in addition, there are 40 or 1.3% incised 'classical Dimini' sherds and 42 or 1.4% incised and painted with broad band.

Other forms of incised decoration occur on 249 sherds, while impressed decoration is present on 128 potsherds, plastic decoration on 114 sherds, and channelled decoration on 20 sherds. Other forms of painted decoration (155 sherds), black-polished with yellowish decoration (51 sherds), pattern-burnished decoration (10 sherds), barbotin (13 sherds) and red-polished with yellowish or whitish decoration (8 sherds) make up the remainder of this category.

vi) a few sherds (141 sherds or 0.3%) in the sample of Makriyalos II pottery have been classified as post-Neolithic, with the majority dated to the Roman period (table 7.1).

vii) half of the sample (51%) comprises sherds impossible to classify as one of the above categories in terms of surface treatment and decoration.

7. 3 Quantitative distribution of characteristic sherds

8,123 characteristic cases (9,337 sherds) separated for further analysis present a wide variety of surface treatments (decorated and undecorated), firing environments and, sometimes, conditions of use:

i) the characteristic sherds, selected because they were particularly informative, could all be classified in terms of firing environment, but still only 61.3% could be assigned to one of the surface treatment categories distinguished previously (table 7.2).

ii) among the latter, decorated sherds (table 7.2) are naturally more frequent in the characteristic sample (25.4%, as opposed to 6% in the larger sample), and among decorated sherds 'classical' Dimini makes up a bigger proportion (71%, as opposed to 4.4% in the larger sample).

iii) some less distinctive categories are less frequent in the characteristic sample (table 7.2).

7. 4 Sherd dimensions and fragmentation

This section, and the following section on the post-depositional abrasion of Makriyalos II sherds, perhaps belong at a later stage of analysis, in terms of the *chaîne opératoire* of ceramics. High degrees of fragmentation and post-depositional abrasion, however, have dramatically influenced the precision and reliability of the observations made on the assemblage, and so must be considered first.

Fragmentation of Makriyalos II sherds is high and this is true for both the total of recorded sherds and the characteristic sherds. This is reflected in the high proportion - almost 95% - of medium- and small-sized sherds found in the sample (tables 7.3 and 7.4). In addition, the number of whole pots is small - only 34 whole vessels have been found - while the rest of the sherds represent small or large fragments of pots that are in turn of varying complete size.

A more detailed and informative picture emerges when the characteristic sherds are examined by the shape that they represent (table 7.5). Size of sherds from Makriyalos II is highly related to function and use of vessels, as well as to the way they were constructed (e.g. if they have thick walls and the kind of the fabric used), and their spatial context of deposition. Of course, method of recording has affected

this variable, because smaller fragments of decorated vessels were retained while coarse vessels were only kept where big pieces were found with information on vessel shape.

Tableware pottery, such as various kinds of bowls including 'classical Dimini' bowls, breaks more easily and the size of sherds found is small, as most such vessels have been constructed using a fine clay body and their walls are thin. By contrast, other categories of vessels, such as cooking and storage vessels, present lower fragmentation due to thicker walls and medium or coarse fabrics that give increased toughness to this kind of ceramics. Details on fragmentation for various shapes will be given below (see Chapter 8). Moreover, some units - especially in part of sector H and in pit 24 - have relatively high proportions of large sherds, while others present very fragmented and broken vessels. Detailed information on spatial differences of sherd fragmentation will be given below (see Chapter 9). At this point it suffices to note that vessel fragmentation is heavy and pervasive and, as a result, limits the potential for an integrated analysis of the ceramic assemblage. On a more positive note, the modal sherd size tends to correlate with overall vessel size: for example, miniature vessels and cups are dominated by the 5 x 5 size category, cooking vessels by 10 x 10 and pithos vessels alone are dominated by sherds in the largest size category. Small sherds from small vessels may provide a similar amount of information on overall shape, decoration, etc. as large sherds from large vessels.

7. 5 Post-depositional abrasion of Makriyalos II pottery assemblage

Post-depositional abrasion of sherds in Makriyalos II is substantial and, as shown in table 7.6, the majority of units (about 80%) present a post-depositional abrasion that exceeds 60% and reaches up to 100%, meaning that a great part of the initial information of the sherds has been lost. Regarding characteristic sherds, degree of post-depositional abrasion, like fragmentation, is related to the shape, fabric and even surface treatment of vessels. In general, coarse and medium ware sherds exhibit more severe post-depositional abrasion (almost 70% with high degree) than fine sherds in which high degree of abrasion reaches around 50% and medium and low

degrees of abrasion are common (table 7.7). Fine tableware exhibits the lowest degrees of post-depositional abrasion, probably because the labour invested by potters, from careful selection of raw materials to extended polishing and firing, served to enhance the preservation of valuable information from these vessels (see Chapter 8).

A factor that has strongly affected presentation of surfaces in the ceramic assemblage of Makriyalos II is location in space. Low levels of abrasion were found in part of sector H and in pit 24 (table 7.8, blue colour), where larger vessel fragments occurred, and some units in pit 24 (table 7.8, red colour) have the lowest degree of abrasion. The lower fragmentation and abrasion of material in these two areas may be attributed to the greater thickness of deposits, which perhaps protected the lower layers, especially from post-depositional disturbance. Other Makriyalos II deposits, including closed features (i.e. pits) are very shallow, resulting in the 'washing out' of sherds and increased abrasion.

7. 6 From the bottom up: prehistoric potters, clays, fire and pots

In the past, archaeologists have often regarded the choices made by potters, from the selection and preparation of fabrics and raw materials to the finishing, firing and decoration of ceramic vessels, in normative terms, resulting in the classification of prehistoric pots into rigid typologies. It is now accepted that these choices were often highly variable, because they responded to a range of social, economic and symbolic constraints in different times and places.

In what follows, an attempt will be made to reverse this process so that, instead of treating the pots from Makriyalos II as inviting analysis and interpretation under some pre-existing typology, the different steps applied by the potters will be followed. In other words, the vessels will be broken down into their primary components and the choices of potters will be traced, from the preparation of raw materials and use of different clay recipes to surface treatment, and from the firing of vessels in various environments to decoration before or after firing.

Each step will not be examined in isolation, because every choice by potters could demand alterations in subsequent stages of the building, forming or firing procedure. This is evident, for example, in the use of a clay recipe full of broken shells, that imposes limitations on surface treatment, because it is extremely difficult to achieve a very fine surface treatment with this particular fabric. This attempt begins with a simple description of the different steps and choices made in the process of making pots, followed by more detailed analysis of combinations and interactions of these choices. The only part of the process not examined is that of the building of the vessel, as this is thoroughly discussed elsewhere (Hitsiou 2003).

7. 7 Types of inclusions, fabrics and wares

a) general observations and terminology

The term clay body or clay paste, that will be widely used in this study, refers to the final clay mass that potters used to build clay products, which are permanently transformed by firing into ceramics. The clay body or clay paste included several materials, inclusions or minerals mixed with water. The clay body or clay paste, after the firing and transformation of clay to ceramics, is called a fabric, and refers to all characteristics, micro- or macroscopic, of the components, the structure and presentation of the ceramic material, except its surface treatment (Kotsakis 1983: 107; Rice 1987: 476).

Macroscopic examination of sections of Makriyalos II sherds resulted in the following six general observations regarding types of inclusions and the composition of fabrics:

1. Ten types of inclusions were identified: mica, quartz, schist, limestone, broken shells, sand, gravel, unidentified small stones, very small pottery fragments or clay pieces and organic materials or, to be more accurate, imprints of decayed organic materials (mostly cereal chaff).

2. Almost all sherds contained mica as a macroscopically visible inclusion. Where mica is absent from a fabric, this will be noted in the text; otherwise mica inclusions are the norm.

3. In most of the cases where broken shell inclusions are apparent in coarse fabric sherds, shells are very numerous and often make up about half of the total mass of the potsherd, sometimes giving the impression that it is impossible to see in section anything but broken shells. There is much debate about the composition of clay including broken shells, as to whether there was a clay source naturally contained broken shells or whether the broken shells were added deliberately by the potter (Rice 1987). Although not directly of interest to this study, it may be noted that generally there are such natural sources of clay which could be used by the prehistoric potter to build ceramic vessels, but it is also evident that some pots contained very small quantities of broken shells, perhaps implying an abstraction process by the potter to achieve the final result.

4. As regards sand inclusions, the predominant mineral of sand in clays is quartz, but other kinds of 'sand' are possible, including the admixture of many minerals. Sand components are very small, however, and so are extremely difficult to recognise without the help of a microscope. Therefore in the present study, sand inclusions refer to a particle-size category (less than 1 mm) and not to a specific mineral, and will be considered as part of the same fabric together with quartz. This decision has some degree of risk, but was taken because most sand inclusions are indeed small particles of quartz and it would be misleading to create two different fabric groups, that may largely represent the same thing.

5. Apart from mica, quartz, broken shell, limestone and sand, the remaining categories of inclusions are represented rarely in the sample: schist, imprints of decayed organic materials and unidentified stones are each represented in ca 0.3% of cases; gravel and tiny flakes of pottery or clay pieces in less than 0.1%. It is very difficult to determine whether the rarer inclusions were added deliberately by potters or occurred inside the original clay source in very small quantities. Only in the case of organic residues is it certain that the inclusions were added on purpose

by the potter. Where these rarer inclusions repeatedly occur in widely used fabrics or are associated with a particular shape or function of pot, this will be mentioned in the text; otherwise they are considered as 'noise' and not discussed further.

b) fabrics of Makriyalos II sherds

After thorough macroscopic examination of Makriyalos II sherds, eight (8) major fabrics were identified (table 7.9), while a series of other combinations of inclusions are very rare:

i) a mica fabric, of very pure clay, makes up one third of the sample. In a few cases, no mica was identified, but the defining feature of this fabric is the lack of other types of inclusion (F1).

ii) a broken shell fabric, where the primary and unique inclusion of the ceramic was broken shell in various quantities. This fabric makes up 21% of the sample (F2).

iii) a limestone fabric, where limestone was the basic and unique inclusion in the clay body (F3).

iv) a fabric which includes broken shell and quartz-sand inclusions in various quantities. The predominance of broken shells is obvious in coarse wares, while in medium wares the two kinds of inclusions are often more equally represented and it is difficult to determine which predominates (F4).

v) a fabric with quartz-sand and limestone in varying quantities, but with a preference for quartz-sand inclusions in the majority of cases (F5).

vi) a fabric with broken shell and limestone inclusions in various quantities. The predominance of broken shells is again obvious in coarse wares, while in medium wares the two kinds of inclusions are sometimes evenly represented (F6).

vii) a quartz-sand fabric, with large particles of quartz being the basic ingredient in the majority of cases. The quartz-sand fabric makes up 18.9% of the sample (F7).

viii) a fabric with broken shell, quartz-sand and limestone inclusions in various quantities. The predominance of broken shells is again obvious in coarse wares, while in medium wares there is sometimes an equal representation of the three kinds of inclusions (F8).

These different fabrics are represented in varying frequencies in the three broad ware groupings of coarse, medium and fine.

c) coarse wares

Coarse sherds comprise 17,605 pieces or 34.6% of the total Makriyalos II sample. Of these, characteristic bodies, rims, handles and bases make up 1,960 cases, representing 2,486 sherds or 24.1% of the characteristic sample. Broken shell is the most common type of inclusion in coarse wares, represented by 1,683 cases or 85.9% of the total (table 7.10). The majority of these (1,058 cases or 54.0% of the total) belong to F2, with only two types of inclusions, mica and broken shell. In 58 cases or 2.9% of the total, shell appears to be the only type of inclusion, but the large quantity of broken shell may have obscured the presence of mica.

A significant number of cases have broken shell in combination with other types of inclusions. In particular, F4, in which broken shells are combined with mica and quartz-sand inclusions, is represented by 407 cases or 20.7% of the total, while an additional 13 or 0.7% of the total cases do not have mica and F6, in which broken shells are combined with mica, quartz-sand and limestone inclusions, is represented by 91 cases or 4.6% of the total. In addition, 51 cases or 2.6% of the total also have limestone inclusions, with 5 additional cases (0.3%) having no mica (F8). Other wares, which have broken shell in combination with other kinds of inclusions, are relatively rare.

In the present analysis of Makriyalos II pottery, almost all coarse wares with broken shell inclusions will be grouped under the general category of *broken shell-based ware*. This is because, in the vast majority of cases (more than 95% of the total), broken shells are the major ingredient in the ware; other kinds of inclusions, whether part of the natural clay source or deliberately added by the prehistoric potters, are found in small quantities.

Apart from those with shell inclusions, almost no other coarse ware fabric exceeds 1% of the total coarse sample. Only two coarse wares deserve to be mentioned, that is F5, with a combination of mica, quartz-sand and limestone: represented by 79 cases (4% of the total, with an extra case (0.1%) with no mica inclusions) and F7 (182 cases or 9.3% of the total), these fabrics occur more frequently in medium ware sherds.

d) medium wares

Medium ware sherds comprise 23,595 or 46.4% of the total Makriyalos II sample, but this category includes a high proportion of uncharacteristic body sherds. As a result, medium ware ceramics are only the second largest component of the sample of characteristic sherds, comprising 2,884 cases or 3,140 sherds (35.5%) of the total characteristic sample. In contrast with the coarse wares, medium sherds include a more balanced representation of fabric types (table 7.10). Characteristic sherds with broken shell inclusions comprise only 942 cases or 32.7% of the medium ware total. Of these, sherds that have broken shell inclusions in combination with mica (the dominant coarse ware F2 fabric) comprise only 549 cases or 19.0% of the total (an additional 6 cases do not have mica inclusions). In addition, broken shell occurs more frequently in combination with other kinds of inclusions: the mica-quartz-sand-broken shell fabric (F4) is represented by 306 cases or 10.6% of the total and the mica-limestone-broken shell fabric (F6) by 66 cases or 2.3% of the total.

The most numerous medium ware group is the mica-quartz-sand fabric (F7) with 1,105 cases or 38.4%. Also interesting, but not so abundant, is the medium mica-

limestone fabric (F3), represented by 349 cases or 12.1% of the total and associated with particular vessel shapes (see Chapter 8). Also partly associated with these shapes, is the mica-quartz-sand-limestone fabric (F5) with 476 cases or 16.5% of the total. The remaining medium ware groups are rare (less than 1% of the total).

e) fine wares

Fine ware sherds comprise only 9,626 (19%) of the total Makriyalos II sample, but are the largest component of the characteristic sherds with 3,279 cases or 3,711 sherds (40.4% of the total characteristic sample). This contrast may reflect 2 factors: on the one hand, because fine sherds broke up more easily than the medium and coarse ware sherds and, thus, the occurrence in the sample of fragmented fine rims, bases and handles is bigger; and many fine sherds, although representing body sherds, have some kind of decoration and so were selected for analysis in the characteristic sample. This study emphasises the fabric differences rather than selective study.

The fine ware group is heavily dominated by F1 (2747 cases or 83.8%), a very pure clay with no inclusions other than mica, which rarely exceeds 1 or 2% of the total mass of the potsherd (table 7.10). In addition, 53 cases (1.5% of the total) had no visible inclusions, not even mica. As noted above, this might be because the quantity of mica is too small to be detected macroscopically, but almost all of these cases are from elaborate 'classical Dimini' vessels, suggesting that the absence of mica may be real (see also Chapter 8).

Also represented among the fine category is the mica-quartz-sand fabric group (F7) with 262 cases or 7.9% of the total, and the mica-limestone mixture (F3) with 141 cases or 4.3% of the total; the latter occurs mostly with particular shapes, as discussed in Chapter 8. Surprisingly, a few fine sherds (38 cases or 1.2% of the total) exhibit the mica-broken shell fabric (F2). The small quantity of broken shells, rarely exceeding 1-2% of the clay, perhaps indicates that broken shell was sometimes added by the potters and not always derived from a natural clay source ready for use, as it

would be very time-consuming for the potter to remove most of the shell from the original clay for use in constructing a fine pot.

7. 8 Surface treatment of Makriyalos II vessels

Three of the surface treatment techniques discussed above (see chapter 5.1) were distinguished in analysis of the Makriyalos II pottery assemblage: roughening, burnishing and polishing. Given time constraints that allowed only macroscopic investigation of sherds, smoothing, which is not easily identified and can be confused with burnishing, was not distinguished as a separate category. All sherds, that had a matt or low- to medium- lustrous surface and presented parallel linear striations or facets of variable form and depth with low and medium coverage, were classified as the result of burnishing rather than smoothing.

A few cases, in which medium coverage is associated with a high degree of lustre and *vice versa*, are characterised as burnished, because polishing refers here to both high coverage and high degree of lustre, as a result of very carefully executed surface finishing. Finally, roughening refers to sherds with no sign of surface burnishing or polishing, meaning a deliberate absence of surface treatment by potters.

7. 8. 1 Distribution of different types of surface treatment and factors influencing surface treatment

Of 8123 'characteristic' specimens, post-depositional abrasion was too severe in 2,679 cases for surface treatment to be identifiable (table 7.11), although burnishing/polishing was in most cases considered more likely than roughening. A total of 5,220 cases (88.5%) with burnished or polished surfaces and 678 cases (11.5%) that received roughening were identified. Of the former category, 3,214 cases (61.6%) are burnished and/or polished on both interior and exterior surfaces (table 7.11), 1,645 cases (31.5%) on only the exterior of the vessel (312 of these cases have a rough interior) and 361 cases (6.9%) on only the interior surface.

In several cases (6.1% of interior surfaces and 10% of exterior surfaces), burnishing or polishing was identified or suspected on part of the vessel, but the degree of post-depositional abrasion made it almost impossible to determine degree of coverage and, so, to classify these as either burnished or polished. As a result, they were classified as unidentified. Burnishing/polishing was thus observed more frequently on exterior than interior surfaces. Since there is no obvious reason why post-depositional processes should have affected these two surfaces differentially, it seems that potters burnished exterior surfaces more frequently (and/or more intensively). The much higher frequency of rough interior than exterior surfaces (table 7.11) points in the same direction. That this contrast is at least partly utilitarian is suggested by a group of material that contradicts the overall pattern. Of cases burnished/polished only on the interior surface, nearly one third are from a particular type of cooking vessel with a rough exterior and burnished or polished interior.

Although roughened surfaces are relatively scarce, they are documented in coarse, medium and fine wares and in almost all fabrics. At first sight, there is a strong relationship between surface treatment (burnishing/polishing vs rough) and type of ware. Only half of the medium ware sherds and less than half of the coarse ware sherds have a burnished or polished surface in contrast with fine ware sherds, almost 90% of which are characterised as burnished or polished. This contrast, however, is partly an artefact of post-depositional abrasion. These 2,679 abraded cases (the majority of which resembles burnished/polished rather than rough) are mostly (and disproportionately so) coarse and medium rather than fine ware sherds (table 7.11). As a result of abrasion, therefore, the frequency of burnishing and polishing is underestimated for the medium and especially coarse ware sherds. In the case of pots with a high or medium quantity of inclusions, such as broken shells or big pieces of limestone, careful surface treatment is of course more difficult, but not impossible, as we will see in the case of cooking pots.

If we go a step further and distinguish polishing (2,548 cases on the exterior of vessels) from burnishing (1,498 cases on the exterior), we recognise a clear preference of potters for polishing fine vessels, usually tableware, on the exterior (table 7.12).

Fine ware vessels in F1 fabric, in particular, but also many in F7 fabric and to a lesser extent in F3 fabric received polishing (table 7.13). Of course, this does not mean that fine pots, or F1 fine pots, were always polished as almost 6% of cases with F1 fabric received burnishing rather than polishing and this is true for all other fabric types. To strengthen the above observation, the picture for the interior of fine vessels is different. Fine vessels with F1 fabric received polishing in the majority of cases, but almost 26% received burnishing not polishing, and for all other fabric types burnishing was preferred by potters (table 7.13). Polishing in medium ware sherds is limited and in coarse ware sherds almost completely absent. Polishing is less frequent than burnishing in all medium ware fabrics (but most common in Fabric 7) and is less frequent on the interior than exterior in all medium ware fabrics (table 7.14).

As regards methods of burnishing or polishing, horizontal traces were found in the majority of cases on both sides of the ceramic. Vertical traces of burnishing/polishing were also found, but in a much smaller number of cases, while diagonal traces were identified in a very few cases. There is a clear preference for horizontal burnishing/polishing on both interior and exterior and on all kind of pots, but vertical burnishing/polishing was largely restricted to exterior surfaces (table 7.15).

7. 9 Estimating firing conditions in the Makriyalos II pottery assemblage

7. 9. 1 Measuring colour

Colour was recorded for the Makriyalos II pottery assemblage using a Munsell colour chart, that standardises colour specification and organises this information in terms of three primary variables: hue, intensity and saturation. Colour was measured only for exterior surfaces, as lack of time precluded examination and recording also of the interior surface and/or the core. In an attempt to limit the negative effects of this decision, differenes between exterior and interior surface colour were noted, if possible.

As noted above (see chapter 6.1.3 for methodology of recording), there were some uncontrollable difficulties in measuring colour of vessels, which have limited the degree of standardisation achieved. First, the quality of light was not always the same and variations in colour readings may have resulted. Moreover, different Munsell colour charts were used during recording and significant differences in chroma values were noted between the two Munsell guides used most frequently, probably because of the long-term use of one of them. Unfortunately, this problem was not appreciated until recording was far advanced so that the only solution practicable was to take note of the problem and to treat the observations recorded with due caution.

7. 9. 2 Estimating firing conditions from colour

Low numbers for value and chroma measurements provide a general indication of the amount of free carbon present in sherds. This information is incomplete, because it says nothing about whether carbon was originally present or deposited during firing, but a dark grey or black colour indicates that oxidation was incomplete. Incomplete indication, in turn, might be due to firing atmosphere (insufficient oxygen) or a short duration and/or low temperatures of firing (Rice 1987: 343). By contrast higher values and chroma measurements may indicate increased oxidation and/or less initial organic matter. In the Makriyalos II assemblage, four categories were adopted to describe firing environment: oxidising, reduced, mixed and unknown. As shown in Table 7.16, an oxidising atmosphere was confirmed for the majority of the assemblage (79.2%), while most of the remaining cases were fired in a reduced atmosphere (17.4%) and only a few in a mixed environment (3.2%).

7. 9. 3 Types of cores

Observations on surface colour may be combined with observations on core type and kind to shed light on fluctuations in firing atmosphere, relative duration and

temperature, and character of the cooling process. The relationship between these variables and ware/fabric is dicussed in Chapter 8.

In general, six types of cores were distinguished in the pottery assemblage from Makriyalos II (table 7.16):

a) oxidising cores

b) sharply oxidising cores

c) reduced cores

d) sharply reduced cores

e) mixed cores

f) cores divided equally, and usually sharply, between a reduced and an oxidising section

Each of these types of cores was further subdivided according to whether the core was uniform or displayed a variety of chromatic zones (table 7.16):

for oxidised cores

i) homochromatic core and surface.

ii) two-coloured oxidising core.

iii) oxidising core and grey/black surface.

iv) oxidising core in the centre of the section with dark patches of the same colours on both sides of the ceramic surface. The oxidising core may have diffuse or sharp margins depending on conditions in the cooling process. In the Makriyalos II assemblage, cores with sharp margins are always associated with type [b] (sharply oxidising) cores.

v) oxidising core in the centre of the section with dark patches of two different colours on both sides. This implies one colour on one side and a second colour on the second side.

vi) oxidising core in the centre of the section with dark patches of more than two different colours on both sides. This implies more than one colour on one side and more than one colour on the second side.

for reduced cores

i) homochromatic core and surface.

ii) two-coloured reduced core.

iii) reduced core and light surface.

iv) reduced core in the centre of the section with light patches of the same colour on both sides of the ceramic surface. The reduced core may have either diffuse or sharp margins, depending on conditions in the cooling process. In the Makriyalos II assemblage, cores with sharp margins are always associated with type [d] (sharply reduced) cores.

v) reduced core in the centre of the section with dark or light patches of two different colours on both sides. This implies one colour on one side and a second colour on the second side.

vi) reduced core in the centre of the section with dark or light patches of more than two different colours on both sides. This implies more than one colour on one side and more than one colour on the second side.

for mixed cores

i) no central oxidising or reduced core, but even distribution of oxidising and reduced patches in the section.

ii) no central oxidising or reduced core, but uneven distribution of oxidising and reduced patches in the section.

iii) no central oxidising or reduced core, but three coloured dark or light patches in various combinations.

iv) no central oxidising or reduced core, but multiple coloured (>3) dark or light patches in various combinations.

for equally divided cores

i) no central oxidising or reduced core. The section is equally comprised of dark and light patches, frequently with sharp margins. Usually, dark grey or black colours are located on the exterior and lighter colours on the interior of vessels.

What do these core types tell us about how vessels were made?

Homochromatic core and surface

Homochromatic cores and surfaces indicate that the atmosphere was uniform during the whole process of firing. Conditions of firing can be further distinguished by the colour of core and surface:

i) clear and intense red colours indicate full or strongly oxidising conditions of firing at temperatures about 800-900°C, or lower if limited quantities of organic material were originally present; unfortunately, the quantity of organic matter originally present is difficult to determine.

ii) light brown colours reflect fully or partly oxidising firing conditions and perhaps a short duration of firing. Quantity of organic materials is again unknown. For a more accurate picture of the firing conditions, refiring tests are necessary.

iii) brown colours indicate incompletely to moderately oxidising firing conditions. Iron compounds are either fully oxidised, if present in quantities too low to give brighter colours, or partly oxidised, if present in larger quantities. Refiring tests are also necessary to determine better the firing conditions.

iv) white or whitish colours are associated with clay lacking both iron and organic residues or with pure caolinite (china clay). Firing conditions are uncertain, as oxidising or mixed conditions may be applied and refiring tests in oxidation should be undertaken.

v) light grey colours indicate incomplete oxidation of possible iron compounds and/or limited presence of organic materials that were not sufficiently fired to be oxidised. An incomplete reducing atmosphere is usually involved.

vi) dark grey or black colours indicate a reducing atmosphere of variable duration. The temperature may be either low or high, but the quantity of organic materials in the clay body is high. Smudging, that is deposition of carbon on surfaces during or at the end of firing, or any other technique such as burying some part of the ceramic vessel in the soil, cannot be excluded.

Chromatic unevenness between core and surface

Generally, presence of grey-black colours in the core and lighter colours on the surface or *vice versa* indicate a variety of different things which can be summarised as follows:

i) dark grey or black core and lighter colours on the surface. This combination reflects presence of organic materials, which were not fully oxidised, as a result of their presence in large quantities in the clay body and/or of firing in an oxidising atmosphere of too short duration to burn out all the organic matter from the clay.

ii) light core and dark grey or black colours on the surface. This combination indicates that firing conditions were incompletely or moderately oxidising in a great part of the firing process, while a fully reduced atmosphere dominated or deposition of carbon took place during the final stage of firing and/or during the cooling process.

iii) dark grey or black core with light coloured patches on both sides of the core, and light coloured surfaces. This combination may reflect the presence again of organic materials which were not fully oxidised, as a result of their large quantities in the clay body and/or of firing in an insufficiently oxidising atmosphere or for too short duration to burn out all the organic matter from the clay.

Alternatively, firing conditions were more or less reduced, but incompletely or moderately oxidising conditions applied during the final stage of firing or during the cooling process. When the dark grey or black core has sharp margins, the ceramic was cooled rapidly in the air.

iv) light core with dark grey or black patches on both sides of the core, and dark grey or black surfaces. This combination indicates again that firing conditions were incompletely or moderately oxidising in a great part of the firing process, while a fully reduced atmosphere dominated or deposition of carbon took place during the final stage of firing and/or during the cooling process, but affected the colour of the core less than in case (ii) above. When the light core has sharp margins, the ceramic was cooled rapidly in the air.

v) no core evident, but cross section divided evenly between dark and light patches, usually with sharp margins. This feature can be explained by the application of different firing atmospheres to the exterior and interior surfaces. In particular, deliberate or accidental deposition of carbon only on the exterior surface may cause a reduced atmosphere on this part of the vessel, while oxidising conditions dominate on the interior.

Colour variation in the core

Presence of a variety of different colours in the core is an indication of alterations in the conditions of firing. Relative determination of the firing atmosphere can be completed on the basis of colours evident on the surface (either light or dark grey-black colours), but refiring tests are also needed.

7. 10 Decoration

In this section the various types of decoration and decorative motifs will be described. To alter the appearance of vessels, prehistoric potters used a wide range of different types of decoration. First, as Rye (1981: 90-95) has noted, a distinction can be drawn between additive (e.g., plastic and painted decoration) techniques and subtractive (e.g., incised decoration) techniques. Secondly, Rice (1987: 144-152) distinguishes between decorative techniques that change the surface of a vessel by applying some kind of instrument, as with incised, impressed, channelled and pattern-burnished decoration, and those that involve adding to the surface, such as painted and plastic decoration.

Six main decoration types occur in the Makriyalos II pottery assemblage: a) painted, b) plastic, c) pattern burnished, d) incised, e) impressed and, finally, f) channelled. These types of decoration are found both alone and in combination, e.g. painted and impressed decoration are found together, as are plastic and incised patterns. Three further types of decoration were distinguished in recording, but are treated here within the six main groups: i) punctuated decoration, may be classified as either incised or impressed decoration, ii) barbotin decoration may be characterised as a form of impressed decoration, and iii) crusted painted decoration, found on some incised sherds, may be described as an incised or painted design. In the vast majority of cases, decoration is found on the exterior surface of vessels.

7. 10. 1 Types of decoration and decorative motifs

The decorative motifs encountered in different types of decoration at Makriyalos II are as follows:

a) painted decoration

Painted decoration involves the adding of colour(s) to the surface of the vessel using different kinds of slips and in various designs and motifs. The painted designs and motifs encountered are:

i) wave-like decoration, usually of a yellowish colour.

ii) simple lines forming no particular designs, usually of a red or reddish colour, but also brown or whitish.

iii) parallel and/or intersecting lines of various colours, mostly red.

iv) rhombus designs of various colours, mostly red.

v) spirals of various colours, mostly red.

vi) crusted decoration.

vii) 'classical Dimini' decoration, which is further subdivided according to the decorative motifs and colours used:

1) <u>polychrome decoration (mostly trichrome with black lines to a yellowish or whitish paint on a red ground), forming geometric designs and found on certain 'classical Dimini' jars</u>.

2) <u>black-on-red decoration in the following motifs</u>:

on the exterior surface

a) parallel lines and rhombus designs

b) net designs

c) curved and parallel lines together with spirals

d) parallel and/or intersecting lines

e) crooked lines

on the interior surface

a) all the above motifs

b) parallel lines and flame-like patterns

3) <u>brown-on-cream decoration in the following motifs</u>:

on the exterior surface

a) parallel lines and intersecting lines and chequer-board designs

b) lines inside boxes and chequer-board designs

c) crooked lines

d) lines and spirals

e) lines and net designs

on the interior surface

a) all the above

b) flame-like patterns

4) <u>brown-on-brown decoration in the following designs and motifs</u>:

on the exterior surface

a) parallel and intersecting lines and chequer-board designs

b) lines inside boxes and chequer-board designs

c) lines and flame-like patterns

d) lines and net designs

e) lines and spirals

f) crooked lines

on the interior surface

a) all the above motifs

b) plastic decoration

Another additive technique is plastic decoration, whereby small pieces of clay, usually small pellets, are affixed to the surface of the vessel. The following types of plastic decoration are found at Makriyalos II:

i) one or two breast-like apophyses

ii) oblong apophysis

iii) oblong brow-like apophysis

iv) striations

v) button-like apophysis

vi) strings with or without impressions

vii) nail-like apophysis

viii) series of very small apophyses

ix) various anthropomorphic designs

x) various beak-like apophyses

c) pattern-burnished decoration

Pattern-burnished decoration usually resulted from very carefully wiping the surface of the vessel to bring up the finest parts of the paste which were then used to draw simple linear designs. The pattern-burnished designs of Makriyalos II are the following:

i) intersecting lines

ii) diagonal lines

iii) crooked lines

iv) net designs

v) spirals

vi) wave-like designs

d) incised decoration

In this subtractive technique, lines are cut into the surface of the vessels with various pointed tools (perhaps small wooden sticks, bone and stone tools, etc.). In several cases, incised designs were filled with coloured paste (crusted decoration). The incised designs and motifs present at Makriyalos II are the following:

i) parallel curved lines

ii) simple lines

iii) crooked lines

iv) intersecting lines

v) parallel lines

vi) rhombus designs

vii) triangle designs

viii) 'classical Dimini' incised patterns

ix) parallel and intersecting lines with broad coloured lines between them

x) curved, intersecting and parallel lines on trays

xi) mixed designs

xii) punctuated

xiii) punctuated (1 consecutive line)

xiv) punctuated (2 parallel lines)

xv) crusted decoration

e) impressed decoration

Impressed decoration refers to the technique of creating small hollows in the surface of the pot using various kinds and means of pressure, usually with the fingers and rarely with tools. The kinds of impressed decoration observed on potsherds of Makriyalos II are:

i) punctuated

ii) punctuated (1 consecutive line)

iii) punctuated (2 parallel lines)

iv) finger marks under the rim

v) simple impressions

vi) impressions on the rim

vii) pinched

viii) barbotin.

f) channelled decoration

As with impressed decoration, channelled decoration involves displacement of ceramic material, but in the latter case displacement is continuous and affects a large part of the vessel in various designs. At Makriyalos II, these designs are:

i) curved channels

ii) horizontal channels

iii) vertical channels

iv) crooked channels

v) diagonal channels

7. 11 Ceramic vessels at Makriyalos II: rims, handles and bases

The Makriyalos II vessels exhibit a range of different types of rims, bases and handles. This variability is considered in the first instance separately from the associated vessel forms.

a) types of rims

i) simple vertical rim

ii) everted rim

iii) in-turned rim

iv) broad rim

v) broad and everted rim

vi) broad and inclined rim

vii) everted and swollen rim

viii) rim swollen in the outer part

ix) very thin rim

x) 'classical Dimini' type

xi) zoomorphic rim

xii) T-shape rim

xiii) lid

b) types of bases

i) flat base

ii) slightly convex flat base

iii) obtrusive flat base

iv) convex base

v) simple elevated base

vi) conical elevated base

vii) unknown elevated base

viii) ring-like base

ix) elevated-simple leg

x) small leg

xi) *trapeza* leg

xii) pointed base

xiii) tripod base

c) types of handles

1) <u>handles in form of an apophysis</u>

i) simple apophysis

ii) horizontally perforated apophysis

iii) vertically perforated apophysis

iv) repeatedly perforated apophysis

v) simple breast-like handle

vi) double breast-like handle

vii) breast-like handle with apophysis

viii) impressed breast-like handle

ix) tongue-like handle

x) button-like handle

xi) beak-like handle

xii) hanger-like handle

xiii) double hanger-like handle

xiv) oblong apophysis

xv) oblong and broad apophysis

xvi) broad apophysis

xvii) double broad apophysis

xviii) apophysis on the rim

xix) double apophysis on the rim

xx) apophysis on the rim with vertical perforation

xxi) apophysis on the rim with horizontal perforation

xxii) horn-like apophysis on the rim ('classical Dimini')

2) Zoomorphic handles

i) various forms

3) Anthropomorphic handles

i) various forms

4) Cylindrical handles

i) horizontal cylindrical handle

ii) vertical cylindrical handle

iii) small horizontal cylindrical handle

iv) small vertical cylindrical handle

v) 'unfinished' cylindrical handle

vi) cylindrical handle with apophysis at base

vii) small horizontal cylindrical handle and small vertical unfinished cylindrical handle

5) Banded handles

i) horizontal banded handle

ii) vertical banded handle

iii) small horizontal banded handle

iv) small vertical banded handle

v) banded handle with straight sides

vi) banded handle with apophysis at base

6) Petaloid handles

7) Pipette-like handles

8) Complex handles

i) various combinations of different kinds of handles.

7. 12 Summary

Analysis of the assemblage is complicated by fragmentation and abrasion, both of which seem related to ware, but nonetheless some clear trends are evident. Coarse and medium ware sherds exhibit more severe post-depositional abrasion than fine sherds. Tableware pottery, such as 'Classical Dimini', presents a high degree of fragmentation compared with medium and coarse ware pottery suitable for cooking and storage.

A variety of fabrics are used, including some with overlapping characteristics, but the three commonest fabrics are clearly favoured for coarse (F2), medium (F7, F5) and fine (F1) wares, while F4 and F6 are used for coarse and medium and F3 for medium and fine pots.

Surface treatment is often more intensive on external than internal surfaces and again is clearly related to ware, so deliberate strategies of selection of raw material and manufacturing process are evident. In addition, the assemblage exhibits a wide range of firing conditions, decorative treatments, rim and handle forms, the interrelationship between which is the subject of the next chapter.

8. Shaping the past: technological attributions of the Makriyalos II vessels

In this chapter, we go a step further and explore variation in fabrics, wares and firing conditions in relation to vessel shape to understand why the prehistoric potter chose to use and apply specific features of clay for particular pots. In other words, we will trace patterns of repetitive utilisation of specific manufacturing variables (fabric, ware and firing) for different categories of shapes intended to meet different needs and desires in the social and economic life of the prehistoric society of Makriyalos II.

In contrast with traditional typology, a different way of grouping ceramic vessels may be more relevant to the Makriyalos II pottery assemblage. This would be based on a more general grouping of vessels' characteristics, rather than arbitrarily creating a new type every time a previously unknown feature was encountered. Following this decision, drawings and photos in the end of this study are limited to characteristic examples of pottery vessels, as attention was payed to the way pots were constructed and used and not to their typological categorisation (figs. 8.1 and 8.2). As was noted above, people - prehistoric or contemporary - make pottery to satisfy a variety of needs, from simple everyday needs such as storage and cooking, to more complex and arbitrary requirements such as aesthetic expression. When ceramic vessels are constructed for use on fire and for the preparation of food, e.g. in the case of cooking pots, the choices of potters are directed to preparation of a clay body with specific internal and external features (such as porosity and composition of fabric). These features affect resistance to heavy physical stress and durability and so are reflected in the final form of the vessel and its fabric.

Conversely, vessels designed for lighter uses, such as storage, serving or display, needed to be constructed to other specifications, although some vessels may have had multiple uses, e.g. carrying water and preparing food and eating it, and all these different aspects must be considered together with the context of discovery (Rice 1987: 209). It is easier, however, to identify a vessel designed for heavy duty over a fire than any vessel designed for lighter use (Björk 1995: 8).

With these guidelines, in the following analysis, all 8123 characteristic cases from the Makriyalos II sample will be examined in terms of vessel shape and manufacturing variables, initially out of spatial context, even if for the majority of cases it is not certain what kind of vessel they represent. As a result, sherds of unknown shape or assignable only to open or closed shape will be referred to as *cases* and not *vessels or pots*, because it is impossible to speak with certainty about particular vessel forms. By contrast, specimens identified to a particular shape and perhaps individual pot will be referred to as vessels or pots.

Where a shape definition was clearly and meaningfully established, this characterisation has a great degree of certainty and in most cases concerns rims and whole profiles. In several occasions, bases and handles were attributed to specific shapes, but only when this was very secure, and only when it was absolutely certain that they were not associated with other sherds and, of course, were not connected or matched to a rim. For the remaining sherds, classification into various shapes is more or less subjective and, therefore, must be interpreted with great caution. 'Classical Dimini' sherds pose the additional problem that high fragmentation makes very difficult the identification of different sherds belonging to the same vessel.

a) Specimens of unknown shape (table 8.1)

The majority of the pottery assemblage from Makriyalos II could not be attributed to a particular vessel shape, whether because of the small size of sherds, post-depositional abrasion, the part of the pot represented or a combination of these factors. As regards what part of the pot is represented, it is often very difficult to infer the shape of the vessel from a single handle or a base, and even in the case of rims there are a lot of cases where the small dimension of the rim or post-depositional abrasion or both factors make identification of shape extremely difficult such that these rims had to be classified as of unknown shape. A series of different rim types is present in this category (rims cover almost one third of the total number of cases), from the simple vertical rim, which is found in very significant numbers, to zoomorphic rims. Handles make up another third of the unknown shape category,

with cylindrical and banded handles usually used by the potters. Bases make up only 20% of the unknown shape category, with flat bases being the most common type, but a significant number (30.4%) are of the ring-base type with a height of more than 3 cm.

i) Composition and use of fabrics

From the total of 8,123 cases, almost half (3,546 cases or 43.7%) could not be recognised and assigned to a certain shape. The coarse ware unrecognised cases are 1,218 (34.4%) representing 1,366 sherds, the medium ware cases are 1,750 (49.4%) representing 1,829 sherds and the fine ware unrecognised cases are 578 or 16.2% of the total, representing 656 sherds. These differences between ware types are the product of several factors: vessel size, with coarse ware tending to be larger than fine; fabric, with coarse ware tending to be less fragile than fine; elaboration of shape and surface treatment, with coarse ware tending to carry fewer diagnostic features than fine; and, related to the last factor, selection of 'characteristic' sherds for detailed study, with more fine ware being chosen than coarse.

As regards coarse ware of unknown shape from Makriyalos II, we observe a preference for broken shell inclusions in the recipes used. The broken shells were widely and, sometimes, exclusively used as the basic ingredient for the coarse pottery assemblage of Makriyalos II. From Table 8.1, it is evident that broken shells (F2) are the only inclusion in more than half the cases. Furthermore, broken shell is the basic and most abundant ingredient in almost all the other cases, where it is found together with other kinds of inclusions. Thus, the predominance of this specific inclusion for constructing coarse pottery in Makriyalos II is obvious.

The rest of the coarse ware cases show little variation in composition of fabrics. The quartz-sand fabric (F7) occurs in a significant number of cases (10%), while the quartz-sand-limestone fabric (F5) can be observed in 47 cases (3.9%) in various combinations (a few times along with other inclusions). Consequently, the

composition of coarse fabrics among cases of unknown shape is fairly typical of the coarse ware material as a whole (see fig. 7.1 and table 7.10).

The medium ware unrecognised cases show a variety of different recipes used by the prehistoric potters. The dominant fabric is that of quartz-sand (F7). The broken shell recipe (F2) is apparent in many cases (17.6%), while broken shells occur together with other kinds of inclusions (F4, F6 and F8) in an additional 14.9% of the total. Of these cases with broken shell inclusions mixed with other ingredients, the vast majority has a specific recipe containing also quartz-sand.

A widely used recipe for constructing medium ware pottery at Makriyalos II is that containing limestone. As we will discuss elsewhere, this recipe using exclusively limestone inclusions (F3) was strongly related to closed-shape vessels and, in particular, two specific shapes addressing discrete needs and demands. Limestone was also used in a number of other cases together with other kinds of inclusions, like the quartz-sand-limestone fabric. Again, the representation of fabrics among medium ware material of unknown shape is fairly typical of medium ware as a whole (see fig. 7.1 and table 7.10).

For the building of fine pottery, the prehistoric potters attempted to find or prepare very pure clay. In the pottery assemblage of Makriyalos II, this attempt is reflected in the 70.9% where only mica is evident in the fabric of the sherds (F1). Small quantities of quartz and sand (F7) can be traced in 13.7% of cases, while limestone is found in small quantities (F3) in 10.1%. In a few cases, the presence of limestone is related with possible, but not certain, closed-shape vessels. As with coarse and medium ware, fabric distribution among fine ware cases of unknown shape is again typical of fine ware as a whole (see fig. 7.1 and table 7.10).

ii) Decoration

Painted, incised, punctuated, plastic, pattern burnished, impressed, channelled and barbotin decorative designs have been located on the interior and external

surfaces of unrecognised cases. Painted motifs were applied to decorate mostly the external surfaces of vessels, but also interior surfaces received some attention from potters. Except for the cases where 'classical Dimini' decoration is evident, the most frequent designs were linear patterns of unknown character and light red colour.

Incised decoration is widely used and is usually located on the exterior of the vessels (only one case has incised decoration on the interior surface), and linear designs alone or in various combinations were common, such as simple lines, crooked, parallel and intersecting lines. In addition, several parallel and intersecting lines with broad coloured lines between them can be classified as 'classical Dimini' motifs. Impressed decoration is again located on the external surface of pots and punctuated designs were common together with nail marks and impressions just below the rim.

Plastic decoration was also favoured by prehistoric potters to alter the external surface of vessels. The most frequent type of plastic decoration used was the breast-like apophysis, while other plastic additions were less usual. Channelled and pattern-burnished decoration is rare and no particular preference for specific designs is evident. Overall, the decoration patterns are fairly typical of those observed in the assemblage as a whole.

b. Specimens assignable only to open or closed shapes

<u>i) Storage vessels of unknown shape (table 8.2)</u>

This category includes vessels that seem to have served long- or short-term storage needs for foodstuffs or liquids. The use of these vessels is inferred from the large dimensions and wall thickness they exhibit, in contrast with the ceramics conventionally identified as tableware (though some of the former could have been used for the serving of liquids), and from their fabric. The latter was constituted in such a way as to be highly durable and also of low porosity, favouring the preservation of liquids and dry foodstuffs. Although classified as storage vessels,

these vessels cannot be identified as either open or closed shapes. The total number of these storage pots is 510, represented by 557 sherds.

Their rim diameter varies between 12 and 44 cm, with the vast majority of sufficiently preserved rims ranging between 16 and 28 cm. The most frequent type of rim used was the simple vertical rim. In a significant number of storage vessels broad rims were identified, while a variety of other types of rims was used. Among a wide variety of types of handles, there is a clear preference for banded and cylindrical handles, while handles in an apophysis form were not so popular. The overwhelming majority of these storage vessels have a simple flat base.

i) Composition and use of fabrics

The proportions of different coarse ware fabrics exhibit significant differences from the whole assemblage discussed in Chapter 7. On the one hand, only 38.1% of this type of vessel (171 cases represented by 193 sherds) contains broken shells as the basic ingredient in the recipe (F2), a much lower proportion than that observed for all coarse ware pottery. On the other hand, the number of vessels that have broken shells in combination with either quartz-sand and/or limestone is 129 cases or 75.6% of the total, very close to the overall figure for coarse pots. This evident preference for limestone and quartz-sand in the fabric decreases the porosity and, as has previously been noted, improves storage. The representation of other fabrics is limited, with the quartz-sand fabric (F7) used in a number of storage vessels, and the quartz-sand-limestone (F5) in 18 cases (10.6%).

As regards medium ware storage vessels of unknown shape, the 303 cases (323 sherds) show a relative variety of fabrics. Only a quarter of these vessels contain large quantities of broken shells and only half of these cases contain only broken shells (F2), while many vessels used broken shells together with other kinds of inclusions. As with their coarse ware equivalents, these medium ware storage vessels were commonly made of a quartz-sand recipe (F7 - 95 cases or 31.9%), a pure limestone fabric (F3 - 43 cases or 14.4%) and a limestone with quartz-sand fabric (F5

- an additional 85 vessels or 28.5%). Looking at the medium ware as a whole the picture is more or less the same.

Of the fine ware storage vessels of unknown shape, half (36 cases) do not have any inclusions in their sections (F1) and half are made up of the same range of recipes as in the medium ware counterparts: 11 vessels with a quartz-sand fabric (F7), 3 with a limestone fabric (F3), 4 with small quantities of broken shells (F2), and one vessel with a combination of quartz, broken shell and limestone (F8). In this case, lower predominance of F1 than in fine ware overall, is presumably related to the large size of potsherds.

ii) Firing environment

The overwhelming majority of these storage vessels exhibit brown-red colours in various tones (but not very dark brown), indicating a more or less oxidising firing environment. Light brown surfaces are mostly associated with homochromatic brown cores (290 out of 457 vessels), indicating a fully oxidising firing environment. The remaining cases are associated with grey cores with or without diffused margins, multicoloured cores or cores with no dominant colour, indicating a more or less oxidising firing environment with varying quantities of organic materials within the clay. The remaining storage vessels have grey or black surfaces, but only a few of these present a homochromatic reduced core indicating a fully reduced firing environment, while six cases have a more or less expanded oxidising core with diffuse margins. This probably indicates that firing conditions were incompletely or moderately oxidising for much of the firing process, while a fully reduced atmosphere dominated or deposition of carbon took place during the final stage of firing and/or during the cooling process. Thus, firing conditions for these vessels seem relatively selective (oxidising firing), probably associated with the fabrics used to achieve low porosity.

iii) Surface treatment and conditions of preservation and fragmentation

The degree of post-depositional abrasion is higher on the interior surfaces of storage pots, while the exterior surface presents more cases with a medium degree of abrasion. Most of the sherds are small to medium sized (366 cases or 71.8% belong to the third size category). Burnishing was very common in surface treatment of storage vessels: in 210 cases where the surface was well enough preserved for such examination, traces of burnishing were evident, and this may tentatively be taken as representative of the remaining vessels where the surface was too abraded to preserve any such traces. Moreover, in a number of vessels traces of burnishing were also verified on the interior of the pot. The degree of coverage and lustre is usually medium on both the interior and exterior surfaces, and in most cases the traces of burnishing follow a horizontal direction. The high frequency of burnishing, the evidence of burnishing on interior as well as exterior surfaces, and the higher degree of abrasion on interior surfaces together suggest that storage vessels were partly intended to hold liquids and that at least some of these liquids had corrosive properties.

iv) Decoration

Only six vessels have traces of decoration on the exterior surface, and these are of the impressed type. All six cases exhibit finger marks around the rim area, either on the rim (5 vessels) or right under it (one pot).

<u>ii) Cooking vessels of unknown shape (table 8.3)</u>

As in the case of storage vessels, cooking pots of unknown shape cannot be classified with certainty as open or closed shapes, although the former is considered more likely. The total number of such cooking pots in the Makriyalos II sample is 50 vessels.

Their rim diameter varies between 12 and 23 cm, but their height is difficult to calculate, because of the fragmented state of the evidence. One or two such vessels have a height of 35-40 cm, but the presence of shorter and smaller cooking pots

cannot be excluded. Rims are of the simple vertical form and the body of the pot is curved and ends in a flat or slightly convex flat base. Handles, where present, were mostly breast-like or oblong apophyses on the body or rim, but banded and cylindrical handles also occur in a few cases.

i) Composition and use of fabrics

There are 26 coarse cooking pots in the Makriyalos II sample, represented by 29 sherds. Twenty two pots have fabrics rich in broken shells, alone (F2) in half of the cases or with quartz-sand and limestone quartz-sand and limestone inclusions (F4, F6 and F8), something that conforms to the overall picture from the coarse ware. Of 19 medium-ware cooking pots (19 sherds), almost half contain only broken shell (F2) and five vessels have broken shell with quartz inclusions (F4). Two cooking pots have a quartz-sand mixture (F7) and two a limestone fabric (F3). Surprisingly, in terms of fabric, the medium ware vessels seem more typical of coarse than medium ware, presumably reflecting their intended use as cooking pots.

Four fine ware vessels (6 sherds) have shapes resembling those of the coarse and medium ware 'cooking pots' and also preserve traces of repeated use on fire, but their function as cooking vessels is questionable. Three of them have only mica (F1), and one contains also a small quantity of limestone (F3). A similar picture emerges from the identification of cooking vessels among decorated wares in the Makriyalos I assemblage (Urem-Kotsou 2006)

ii) Firing environment

Due to repeated use of cooking pots on fire, resulting in clouded surfaces, it is difficult to recognise with security the original firing environment of the vessel. At Makriyalos II, 30 out of 50 cooking pots exhibit clouds on the exterior surface of the pot. Light brown and brown colours dominate the surfaces together with grey clouds, but in several cases a grey core with diffused margins was found along with red or

brown bands on both sides, possibly resulting from a fully or incomplete oxidising environment during firing.

In some cases, an oxidising or reducing atmosphere is securely demonstrated by homochromatic grey or brown cores associated with grey-black or brown colours on the exterior surfaces with no or little sign of clouding. Most vessels, however, were apparently fired in a more or less oxidising environment and clouding resulted from repeated use of these vessels on fire.

iii) Surface treatment and conditions of preservation and fragmentation

In terms of preservation, most of these cooking pots exhibit a high degree of post-depositional abrasion, but are represented by rather large sherds compared with other shapes. The latter observation is consistent with the overall impression from the non-characteristic bodies of cooking pots. The exterior surfaces of cooking pots are usually burnished and only one vessel has a rough surface, but the degree of coverage and of lustre is modest in the majority of cases. The interior surface of cooking pots received less attention from potters and, judging from the few cases where the interior surface is preserved, burnished and rough surfaces are evenly represented. Usually, traces of burnishing have a horizontal direction, but vertical traces are also found.

iv) Decoration

No sign of decoration was found on any of the cooking pots of unknown shape, but some, as in the case of open shape cooking vessels, may have had impressed or plastic decoration.

<u>iii) Miniature pots (table 8.4)</u>

This category contains sherds that represent parts of miniature pots of uncertain shape. Height rarely exceeds 7 cm, information on rim diameter and types

of handles is lacking, and the type of bases used varies while their diameter ranges between 2 and 7 cm.

i) Composition and use of fabrics

The fabrics used for coarse miniature vessels (3 cases represented by 3 sherds) are characterised by the presence of broken shells in two cases (F2) and the quartz-sand fabric in the third (F7). In the medium ware vessels (15 cases represented by 16 sherds), the variety of fabrics increases. Broken shells occur alone only once (F2), and in combination with other inclusions twice. The quartz-sand fabric (F7) is found in 7 vessels, the quartz-sand-limestone recipe (F5) in 3 cases, and the rest of the pots contained a limestone fabric. The fine ware miniature pots (6 cases represented by 6 sherds) are typical of fine ware vessels: five were made of very pure clay (F1), while one had a small quantity of limestone (F3). In fact, fabrics of miniature pots are fairly typical of coarse, medium and also fine examples of bigger vessels.

ii) Firing environment

Light brown colours are predominant, with oxidising homochromatic cores. A few grey-black cores with diffuse margins and brown-red patches on either side possibly indicate an incomplete oxidising environment during firing.

iii) Surface treatment and conditions of preservation and fragmentation

The degree of post-depositional abrasion is high in almost all cases and the size of sherds rarely exceeds the second size category. There is no secure evidence on surface treatment of miniature vessels at Makriyalos II, but their small size limits the potential for burnishing and examples from other settlements mostly exhibit rough interior and exterior surfaces.

iv) Decoration

Decoration is very rare in miniature vessels. Only one vessel has an incised pattern with parallel lines.

iv) Unrecognised open shape vessels (table 8.5)

Open vessels of otherwise unknown shape make up a significant proportion of the Makriyalos II pottery assemblage. Vessels or sherds were classified as open on two criteria:

i) in the rare cases where the maximum diameter of the vessel was that of the rim.

ii) on the basis that the better the treatment of the interior surface, the more likely a vessel is to be open. This criterion is of course dangerous as a well treated interior surface often belongs to a closed shape and, in particular, it is relatively easy to apply careful treatment to the rim area, leaving the rest of the interior untreated.

As regards parts of the pot represented, half of the cases are rims and the distribution of different types of rims is similar to that described for the assemblage as a whole, with the simple vertical rim common. Potters also applied apophysis like handles to these open vessels.

i) Composition and use of fabrics

The total number of open vessels of unknown shape is 1051 (1152 sherds), distributed unevenly between the three major ware categories (coarse, medium, fine): 144 coarse ware vessels are represented by 145 sherds, 335 medium vessels by 347 sherds, and 572 fine vessels by 660 sherds.

Coarse ware fabrics are dominated by broken shell, either as the only inclusion (F2 - 68.1%), or in combination with other inclusions (21%). Other fabrics are scarce. By contrast medium ware vessels were made of a range of fabrics. Broken shells occur alone in 30.2% of cases (F2) and together with other inclusions in a further 9.3%. More than one third of the sample is made of the quartz-sand fabric (F7). The difference is that in the cases where broken shells were found together with other inclusions, it is not certain whether the broken shells were the basis for the recipe (with other inclusions either added deliberately in small quantities or occurring by chance) or *vice versa*. Limestone also occurs both alone and with other types of inclusions; the quartz-sand-limestone fabric (F5) makes up 10.2% of the sample. Among the fine ware cases, a pure clay predominated and only mica inclusions were identified in the majority of cases (F1). In 15% of cases, the quartz-sand recipe (F7) was used, while a few cases contained limestone inclusions or very small amounts of broken shell. Overall, fabrics of unrecognised open shape vessels are fairly typical of the whole assemblage.

ii) Decoration

Almost all types of decoration occur on these open shape vessels and sometimes a combination of different decorative techniques was applied. Painted designs have been found on both surfaces, with a preference for decorating external surfaces. Incised patterns were also widely used on both surfaces, and the majority of cases concern tray-like vessels with curved, intersecting and parallel incised lines, where the shape is not identifiable.

Impressed decoration includes punctuated designs, nail marks and simple impressions. In addition, plastic decoration is well represented, mostly by breast-like apophyses, while channelled and pattern-burnished decoration are identified in a small number of cases.

v) Closed vessels of unknown shape (table 8.6)

This category is defined by two criteria: a) if the maximum diameter of the vessel is larger than that of the rim, b) on the basis that the worse the treatment of the interior surface, the more likely it is that the vessel had a closed shape. Closed vessels of unknown shape are not so frequent in Makriyalos II (236 vessels represented by 243 sherds) as open shapes.

A significant number of rims were found, and the simple vertical rim was again widely used, but everted and broad rims were also identified in significant numbers, possibly indicating the presence of a lid, ceramic or other. Banded and cylindrical handles were used in the majority of these closed shape vessels, and handles of apophysis-like type were identified in the remaining cases. Few bases were attributed to this category, but simple flat bases predominate.

i) Composition and use of fabrics

These closed shape vessels include 43 coarse ware cases, represented by 43 sherds, 82 medium ware cases represented by 85 sherds and 111 fine ware cases represented by 115 sherds. The majority of coarse vessels again have fabrics with broken shell (alone in 22 cases and with other inclusions in 14 cases). The quartz-sand fabric (F7) is present in a few cases. The picture is again totally different for medium ware. Some contain broken shells alone or with other inclusions. A great number of cases contain the quartz-sand fabric group (F7). The limestone fabric (F3) makes up 12.4% and the limestone-quartz-sand fabric (F5) 15.8% of the sample. Evidently quartz, sand and limestone inclusions in various combinations were preferred for making medium-ware closed-shape vessels. Finally, for fine ware, the use of fine clay was again the norm, as 83.8% of the cases contained only mica inclusions (F1). Of the remainder, quartz-sand fabric makes up 10.8%, limestone fabric occurs in a few cases and one sherd contained a small quantity of broken shells. Again, fabric composition in this type of vessel is more or less typical of the pottery assemblage as a whole.

ii) Decoration

Painted and incised patterns (72 and 17 cases respectively) were usually identified on closed shapes, always on the exterior of vessels. 'Classical Dimini' decoration was the only type of painted design evident, probably indicating the presence of 'classical Dimini' jars. 'Classical Dimini' patterns predominate among incised cases (11 cases, of the characteristic hole-mouth jar).

c) Specimens identifiable to particular shapes

Open shape vessels

1. Cups (table 8.7)

This category of vessels with its small rim diameter (up to 12 cm) and its limited height (up to 10 cm), which were probably used for drinking or serving liquids, shows a relative homogeneity in construction. A primary characteristic of this type of vessels is that the diameter is always larger than the height of the pot. In almost all pots the rim has the simple vertical form. Half of the vessels have a flat or slightly convex flat base, but a significant number are associated with a convex base. Handles were difficult to identify in the majority of cups, either because of their absence or due to post-depositional factors, but single handles were probably not rare, while the existence of two handles was difficult to establish. In the few pots where a handle was evident (17 cups), a wide variety of cylindrical and apophysis-like handles were used.

i) Composition and use of fabrics

The Makriyalos II assemblage includes 72 cups, with a preference for medium over fine and coarse wares. Of 8 coarse ware vessels (represented by 10 sherds), 6 contain broken shell: 3 pots used F2, two F4, two F5 and one F8 fabrics. For medium ware cups (44 vessels represented by 51 sherds), the picture is again completely different and fairly typical of medium wares. Broken shell fabrics make up only one

third of the sample, while quartz-sand fabric (F7) accounts for 43% and limestone with sand or quartz inclusions (F5) for a further 14%. Finally, of 20 fine ware cups represented by 30 sherds, the pure and fine F1 makes up half of the sample, while the rest of the cases exhibit a range of fabrics, as is the norm for fine fabrics overall.

ii) Firing environment

As regards firing environment, the majority of cups display dark brown or brown colours and only 15 vessels were fired in a pure reduced atmosphere and exhibit grey or black colours. Most of the cups are associated either with a homochromatic oxidising core (18 cases), indicating a fully oxidising firing environment, or a homochromatic reduced core (17 cases), of which almost half have a grey-black surface, showing a reduced firing environment. The remaining homochromatic reduced cores are associated with light surfaces reflecting the presence of organic materials which were not fully burnt off, because of their abundance in the clay body and/or because the oxidising atmosphere was too short in duration.

A grey core with diffused margins and oxidising edges on both sides (29 cases), associated with brown-red surfaces, may be attributed to two possible causes: firstly, the presence of organic materials which were not fully burnt off, because of their abundance in the clay body and/or because the oxidising atmosphere was too short in duration; or, secondly, firing conditions that were incompletely oxidising. All these observations are to some degree problematic because of extensive clouding on almost half of the cups, which might be due to the original firing environment (mixed environment or contact with fuel) or, more surprisingly, to the use of cups on fire during their life cycle, a utilitarian aspect that contradicts the widely accepted view that cups were used only in serving or display.

iii) Surface treatment and conditions of preservation and fragmentation

The preservation of cups is not very good and the degree of post-depositional abrasion varies between high and medium. Only six vessels have a low degree of abrasion (8.2%), while the fragmentation of cups is low to medium. In the next chapter we will try to explore the depositional and post-depositional factors that affected these vessels. The external surface of the well-preserved cups is usually burnished, but rough surfaces are evident in a significant number of vessels and this is strange given the characterisation of this category as 'tableware'. The same is not true for the internal surfaces, where rough surfaces are dominant, indicating a limited concern by potters and consumers with cup interiors. Even in the case of cups with a burnished external surface, however, the degree of burnishing is usually not high and, even when the degree of burnishing is high, the lustre is low. Burnishing on external surfaces is mostly (7 cups out of 12) vertical, but horizontal burnishing is also attested, exclusively so on internal surfaces. External burnishing traces have a limited width (2-3 mm), implying the use of a pointed tool.

iv) Decoration

Only four vessels present some kind of decoration, that is two incised cups, one impressed and one punctuated. Furthermore, two cups have traces of a red slip on the surface, but it is not certain if this is a kind of decoration. All the decorated cups were burnished beforehand.

2. Footed cups (table 8.8)

This category includes cups with almost the same characteristics as simple cups, but with the addition of a foot. The footed cups have a diameter of 7-13 cm and a height around 15 cm, including also the foot; otherwise their height is similar to that of the simple unfooted cups. Usually, they have a simple vertical rim, in one cup a cylindrical vertical handle is evident, and they rest on a small foot (missing in three cases).

i) Composition and use of fabrics

Footed cups are only seven (represented by 33 sherds), including two coarse, two medium and three fine ware cups (29 sherds in total). As far as can be judged from such a small sample, the breakdown by fabric is similat to that for unfooted cups. Broken shell fabrics were used for the coarse ware footed cups and the quartz-sand recipe (F7) for the medium footed cups. Of the three fine ware footed cups, one contains limestone inclusions (F3), one mica (F1) and one quartz and limestone (F5).

ii) Firing environment

Dark brown colours are evident in more than half of the vessels, while grey or mixed colours are present in the rest of the cases. Only one brown-coloured footed cup exhibits a homochromatic brown core, indicating a fully oxidising firing environment, while the remaining vessels have grey cores with diffuse margins and light patches on both sides.

Identification of the firing environment is difficult, because four out of seven footed cups have external clouding, and five out of seven have traces of internal clouding. The presence of external clouding might indicate mixed firing conditions or subsequent use of the cup on fire, if drinking pots were also used to warm up liquids, but presence of internal clouding cups makes this interpretation highly doubtful, at least for footed cups.

iii) Surface treatment and conditions of preservation and fragmentation

The degree of post-depositional abrasion of footed cups is low to medium, and the dimensions of the fragments preserved compared to total vessel size are relatively high, that is 5 examples are of the third size category and one of the fourth. Most of the footed cups have a rough exterior associated with rough or burnished interiors, while the same is true for burnished footed cups. The degree of burnishing and lustre

is difficult to define due to the limited number of burnished footed cups that have clear traces of burnishing.

iv) Decoration

As in the case of simple cups, decoration is very rare, and restricted to one vessel with plastic decoration (a breast-like apophysis).

3. Bowls (table 8.9)

Open bowls are well represented in the Makriyalos II pottery assemblage. They are tableware vessels with a diameter of 11-42 cm (the majority having a rim diameter of 18-28 cm), and height of 12-22 cm. Simple vertical rims (sometimes with very thin walls) were applied to most bowls, while various forms of apophysis-like handles are found. Open bowls have a flat base with a diameter of 6-11cm or, in a very few cases, a flat, but smoothly convex base.

i) Composition and use of fabrics

Most of the open bowls are fine ware vessels (83%), with smaller numbers of medium (13%) and coarse vessels (5%). Of 20 coarse ware vessels (21 sherds), 12 are made of the broken shell fabric (F2) and five more have broken shell with other inclusions, as in coarse ware overall. The remaining three vessels have a mica-quartz-limestone fabric (F5). The 56 medium ware open bowls are represented by 67 sherds and exhibit a variety of different fabrics. Broken shells are found alone in 15 vessels (F2) and with other inclusions in a further six cases (F4, F6 and F8). Mica-quartz-sand fabric (F7) is commonest (21 cases or 38%), while the limestone fabric (F3) is found in 6 vessels. Again the fabric distribution is more or less typical of medium wares. Of the 364 fine ware bowls represented by 387 sherds, 85% were made of the very pure clay (F1), including 307 vessels with only mica and two with no visible inclusions. A

mica-quartz-sand fabric (F7) was used for 36 fine bowls, while all other fabrics are relatively rare, a common picture in fine wares.

ii) Firing environment

For one third of the open bowls, an oxidising firing environment is evidenced by light brown-red colours, while a reducing atmosphere is indicated for the rest of the bowls by grey-black colours. In several cases, grey-black colours on the exterior surfaces are associated with light colours on the interior of the vessel. This might be the result of smudging the exterior of the pot or covering it with some material (e.g., fat, carbon) to prevent oxidation of the exterior surface. These vessels have half oxidising and half reducing cores in equal proportions.

Homochromatic cores, either brown-red or grey-black, occur in both environments, but in different proportions. The ratio of homochromatic brown-red to grey-black cores is 2:1 in light brown-red bowls, but 1:11 in grey-black bowls. This contrast might result from more carefully and controlled firing conditions in the case of black-burnished or black-polished bowls and/or from increased amounts of organic materials in the recipe of the latter.

In addition, dark grey-black cores, with light patches on either side, are found. Where this combination is associated with light coloured surfaces, it indicates increased quantities of organic matter and/or variable oxidising conditions. When associated with grey-black surfaces, it suggests alterations in firing conditions, but refiring tests are needed for detailed understanding of such cores.

iii) Surface treatment and conditions of preservation and fragmentation

Overall, bowls are well preserved and medium degree of post-depositional abrasion is evident in most cases (ca 60%). A significant proportion of bowls was found in an extremely good condition (around 17-19%) and a similar proportion (around 20%) was highly weathered. Finally, fragmentation was striking, as the

dimension of most potsherds was very small (72.7% belong to the second size category) due to composition of fabrics.

Only two bowls have a rough surface and the vast majority (422 vessels) received some kind of surface treatment, burnishing or polishing. Of these 422 cases, four fifths were polished rather than burnished on their external surface, while only half were polished on the interior surface. Traces of surface treatment are usually visible only when burnishing is evident. Burnishing traces are visible in 86 cases located on the interior of the bowls where polishing was least frequent and horizontal burnishing is predominant.

iv) Decoration

Only 17 simple open bowls have some kind of decoration: 8 with painted, 5 with plastic, 1 with channelled, 1 with impressed, and 2 with pattern-burnished decoration.

Painted bowls are dominated by 'classical Dimini' decoration (7 vessels, including 6 with decoration on both interior and exterior surfaces) in various motifs. Breast-like apophyses are the commonest form of plastic decoration. Impressed and channelled decoration are represented by nail marks and linear designs respectively and, finally, pattern-burnished bowls have spiral designs on the interior and zig-zag lines on the exterior of the vessel.

4. Carinated bowls (table 8.10)

A second category of open bowls is distinguished from the simple open bowls by the presence of a carination. This second category seems to be less numerous than the simple bowls, but this may be misleading because, during recording, many carinated fragments (mostly black-polished and black-topped, but also from other categories) could not be attributed with certainty to carinated bowls and so were not recorded as such.

i) Composition and use of fabrics

There is no coarse ware among the carinated open bowls, while only nine cases (represented by 12 sherds) are of medium ware. Most of the latter have a F3 recipe, while the rest of the cases have a quartz-sand based recipe (F7), representing a contrast with other medium wares. Finally, there are 69 fine ware vessels (represented by 101 sherds), of which 80% have no inclusions in their fabric (F1), while the quartz-sand based mixture (F7) accounts for a further 15%, fairly typical of fine wares overall.

ii) Firing environment

Carinated bowls exhibit similar firing conditions to simple bowls. Reduced conditions prevail, with dark grey-black exterior and interior surfaces and homochromatic reduced cores or reduced cores accompanied by light patches on either side, or half reduced – half oxidising cores with grey-black exterior and light interior surface. Cores with either diffuse or sharp margins were recognised, suggesting a different cooling process. Light coloured exterior surfaces are also found in several cases, but mostly associated with dark grey-black cores (homochromatic or with light patches), and less frequently with homochromatic light cores.

iii) Surface treatment and conditions of preservation and fragmentation

Overall, the degree of post-depositional abrasion is lower on the exterior surfaces of carinated bowls (30% high abrasion, 58% medium abrasion) than on the interior surfaces (41% high abrasion, 47% medium abrasion). The fragmentation of carinated bowls is high, perhaps because the fine clay used in their manufacture and their thin walls led to low durability.

Carinated bowls were usually polished on the exterior surface (80%) and burnished (43%) or polished (33%) on the interior surface. The interior surface thus attracted less attention, although the quality of treatment was still good. It is in carinated bowls with less polished surfaces, that traces of burnishing can be observed, and they always have a horizontal direction.

iv) Decoration

Decoration in carinated bowls, as in simple bowls, is not very frequent. A significant number of carinated bowls (14 vessels) exhibit some kind of decoration, but this is probably an underestimate due to abrasion. Plastic decoration in the form of breast-like apophyses is the most frequent design, while other kinds of decoration encountered are impressed motifs (one vessel with nail marks), painted designs (two pots with simple re-coloured lines, one on the interior and one on the exterior surface), and incised patterns (two vessels with parallel lines).

5. Carinated-like bowls (table 8.11)

This category includes vessels that resemble open carinated bowls, but are distinguished by the form of the carination and by the recurrent decorative motifs: two parallel rows of impressed dots (punctuated decoration) on the upper part of the pot and the painted wavelike pale yellow decoration on the lower part, just below the carination to the base of the vessel. Painted decoration (dark brown or black), in a wavelike design, is also evident on the interior of the vessels in the majority of cases.

The rim diameter of carinated-like bowls varies between 14 and 30 cm, and the most frequent form of rim was the simple vertical rim. Only one type of handle has been observed, the horizontally perforated apophysis-like handle, always near the carina. The only base recognised is the simple flat base, of diameter between 6 and 13 cm.

i) Composition and use of fabrics

The vast majority of the 222 carinated-like bowls have a fine ware recipe (216 cases represented by 255 sherds), while only 6 cases (12 sherds) have a medium ware mixture, where the quantity of inclusions is only slightly above the arbitrary 5% upper limit for fine pottery. For the overwhelming majority of fine carinated-like bowls, the recipe used was extremely pure (F1) and contained no inclusions (4 bowls) or only mica (199 bowls). The remaining carinated-like bowls contained only a small number of quartz-sand and limestone inclusions. The choice of a single pure clay fabric to build this fine decorated pottery raises the possibility that this pottery had a particular value in Makriyalos II society.

ii) Firing environment

Carinated-like bowls were fired in a reduced atmosphere (grey and black colours dominate the interior and exterior surfaces), sometimes with increased oxygen supply reflected on the interior surface or the lower part of the pot. Thus, homochromatic grey and black cores are the norm, while a number of vessels have grey cores with diffuse margins and brown coloured patches on either side, indicating again a limited supply of oxygen at some point in the firing process, but the overall firing environment was reduced.

iii) Surface treatment and conditions of preservation and fragmentation

Mostly medium and low degrees of post-depositional abrasion have been noted on this type of vessel, on both interior and exterior surfaces. Polishing rather than burnishing could be the reason for this, but it could be also associated to depositional factors, investigated in the next chapter. As with other fine tableware, fragmentation is high. Burnishing occurs on 95% of interior and almost all exterior surfaces. The extent and degree of burnishing is higher on exterior surfaces, 85% of which were classified as polished, compared with 28% of interior surfaces. In the

limited number of cases where traces of surface treatment are visible (33 cases, including only 9 external surfaces), horizontal burnishing is dominant.

iv) Decoration

As noted above, punctuated decoration (two lines of dots) on the upper part of the pot, above the carination, and painted decoration on both the interior and exterior are distinctive features of carinated-like bowls. Other kinds of decoration are very rare and limited to some plastic decoration designs (breast-like apophysis).

6. Hemispheric bowls (table 8.12)

Hemispheric bowls are characterised mainly by their hemispheric body. They have simple vertical rims and their diameter varies between 11 and 24 cm. Apophysis-like handles (vertical perforated breast-like and oblong apophyses) were used in the majority of cases recognised, while flat or convex bases of small diameter were favoured. Unfortunately, only 14 hemispheric open bowls were recognised in the Makriyalos II pottery assemblage and the information recovered is somewhat questionable.

i) Composition and use of fabrics

No coarse ware hemispheric bowls were found in the sample. The seven medium ware hemispheric bowls (8 sherds) were made in a variety of fabrics. Of the seven identifiable fine vessels (8 sherds), six contained only mica inclusions (F1).

ii) Firing environment

Light brown-red colours are visible on the surfaces indicating a more or less oxidising firing environment. Homochromatic brown-red cores are evident in 6 cases, verifying the rich presence of oxygen in the firing process. Of two cases with

homochromatic grey cores, one is from a black surfaced vessel (reduced atmosphere) and the other from a brown-red coloured surface, indicating a more or less oxidising atmosphere.

iii) Surface treatment and conditions of preservation and fragmentation

Conditions of preservation are not very good: most vessels displayed medium to high post-depositional abrasion and fragmentation was fairly high. All hemispheric bowls exhibit surface treatment in the form of various traces of burnishing or polishing on their surfaces, internal and external. As regards internal surfaces, the degree of coverage and lustre is medium in the majority (almost two thirds) of cases, indicating a preference for burnishing rather than polishing, in contrast with external surfaces, where a more balanced picture emerges. Traces of burnishing, when they are visible on either the interior or exterior of the vessel, show a horizontal direction.

iv) Decoration

Five hemispheric bowls have painted decoration, all of the 'classical Dimini' style. Three have this type of decoration on both surfaces (black-on-red, brown-on-cream and brown-on-brown motifs respectively), while in the remaining two vessels painted designs are visible only on the exterior surface (both of the brown-on-cream style), probably because of the small dimension of the sherds.

7. 'Classical Dimini' Bowls (table 8.13)

The well-known form of 'classical Dimini' bowls is highly standardised in terms of shape, manufacturing conditions and decoration. The shape is almost the same as that of the simple open bowls, but is distinguished by the dimension of the (flat) base and the regularity in the diameter of the rim.

Beginning from a straight simple vertical rim, the bowls narrow very rapidly from a wide rim (diameter 26-30 cm, usually 28 cm) to a small flat base (ca 6-10 cm, but usually 8 cm). The most commonly used handle, was the vertically perforated apophysis-like handle or horn-like apophysis near the rim, while other types (e.g., breast-like apophysis, cylindrical and banded handles) occur very rarely.

The 'classical Dimini' bowls are a large and interesting, but also problematic group of ceramics, because the fabrics used and high fragmentation make it very difficult to estimate securely the number of pots represented (see also discussion at the beginning of this chapter).

i) Composition and use of fabrics

The estimated total of 'classical Dimini' bowls is 1147, of which only 18 cases (represented by 65 sherds) have a medium ware, while the remaining 98% were made with a very fine ware (F1), a striking difference with other tableware vessels. The quantity of inclusions in medium 'classical Dimini' open bowls rarely exceeds 10%, with the quartz-sand fabric (F7) used for 13 vessels and the quartz-sand-limestone fabric (F5) for five vessels. The fine 'classical Dimini' open bowls were overwhelmingly (98%) made with a very fine and pure clay with only mica inclusions (F1 - in 25 cases, not even mica inclusions were identified). A few cases have a very small quantity of inclusions other than mica (quartz-sand, broken shell and limestone).

ii) Firing environment

A purely oxidising firing environment is attested for 'classical Dimini' bowls, one of the very few major shape categories in the Makriyalos II assemblage with all oxidising firing, as red and light red colours (usually 2.5 YR Munsell) are found on both surfaces, which usually have also a red slip. Homochromatic red and light brown cores are present in many vessels, while homochromatic grey-black cores can be observed in limited numbers. A majority of cases have grey-black cores with red-

brown patches on either side. Of these latter vessels, about a third have grey-black cores with diffuse margins, implying gradual cooling, and two thirds have grey-black cores with sharp margins, indicating rapid cooling.

iii) Surface treatment and conditions of preservation and fragmentation

Most 'classical Dimini' open bowls exhibited a high (68%) or medium (28%) degree of post-depositional abrasion, and fragmentation was mostly severe, perhaps due to the type of fabric. In a number of cases (6.7%) the degree of abrasion on the interior surface was high and it was not possible to recognise the type of painted decoration used, but black-on-red designs are probable for the majority of these unrecognised cases. On the exterior surface, only 7 cases were difficult to identify.

'Classical Dimini' bowls received a lot of attention from potters in terms not only of purity of clay, but also of quality of surface treatment. Almost all 'classical Dimini' bowls have polished interior (96%) and exterior (97%) surfaces, with the rare cases of rough surface restricted to the interior.

Here the combination of polished surface, high abrasion and fine fabric indicates that surface treatment and fabric do not alone determine variable abrasion, but that other factors such as context of deposition and, perhaps, use also played a crucial role in the final result. Higher abrasion of interior than exterior surfaces in some cases presumably reflect the use of these vessels, given that both surfaces were equally well polished.

iv) Decoration

On both interior and exterior surfaces, black-on-red painted decoration was more frequent than brown-on-cream which was more frequent than brown-on-brown, while polychrome decoration was extremely rare. Which patterns were preferred with the predominant black-on-red decoration is unclear, because of the high degree of abrasion.

In brown-on-cream decoration, the most common patterns were parallel and intersecting lines on both interior and exterior surfaces, lines inside boxes, chequer patterns on external surfaces, and spirals on interior surfaces. Brown-on-brown designs were also obscured by abrasion and fragmentation, but certainly included linear motifs on the upper part of vessels, near the rim.

8. Fruitstands (table 8.14)

Fruitstands are very shallow open bowls, with a long stand as their base. Fruitstands are a very common shape in 'classical Dimini' strata in Thessaly and exhibit the characteristic decoration of this type of pottery (see Chapter 7). Fruitstands are not common in the Makriyalos II assemblage (only 39 vessels have been recognised).

Like their Thessalian counterparts, the 'classical Dimini' fruitstands from Makriyalos II have a more or less quadrangular shape rising up at the corners, and a diameter of 20 to 34 cm (usually around 28 cm). Apophysis-like handles have been identified (breast-like and oblong types) and stands have a diameter of 6 to 13 cm (mostly around 6 and 8 cm).

i) Composition and use of fabrics

The coarse ware fruitstands (7 cases represented by 11 sherds) include 5 with broken shell fabrics (F2) and two with the quartz-sand-limestone fabric (F5). The eight medium vessels include the quartz-sand-limestone fabric (F5) and the quartz-sand fabric (F7), but none with broken shells. In the majority of fine ware fruitstands (24 cases, represented by 25 sherds), only mica inclusions (F1) were identified, while four cases had a limestone fabric (F3), one quartz (F7) and one broken shell (F2). In terms of fabric types, all three wares are fairly typical of the assemblage overall.

ii) Firing environment

The most interesting feature of fruitstands is not the firing environment, which is always oxidising like the 'Classical Dimini' bowls (all vessels have light brown-red colours on their interior and exterior surfaces), but the type of core. Homochromatic oxidised cores are evident in 6 vessels and one pot exhibits a grey-black core, but a significant number of vessels have grey-black cores with brown-red patches on either side. Of these vessels, ten have very sharp margins between grey-black and brown-red colours, suggesting rapid cooling.

iii) Surface treatment and conditions of preservation and fragmentation

The degree of post-depositional abrasion is again higher on the interior surface of fruitstands, but the sample is too small to place great weight on this contrast. Medium sized sherds (of the third size category) were found in the majority of cases. All interior and most exterior surfaces of fruitstands were polished. On fruitstands with'classical Dimini' decoration, this extensive polishing had the effect of coating both surfaces with a red slip upon which decoration was painted. Traces of burnishing on interior surfaces have a horizontal direction.

iv) Decoration

Various decorative designs are visible on both surfaces of vessels. 'Classical Dimini' painted decoration is by far the most common (on both surfaces of 14 vessels and on the exterior of six more), with the majority - 17 cases - having black-on-red (mostly unrecognised patterns) or brown-on-brown designs. Incised and plastic decoration is less frequent.

9. *Trapezes* (table 8.15)

The *trapeza* is a three- or four-footed, rectangular open vessel with vertical sides. A significant number of trapezes were found during the excavation of Makriyalos II, but many were found outside the areas sampled for this study. It is

diffcult to determine the diameter of trapezes as they have a rectangular shape. Rims are usually of simple vertical form, and handles are rare. Dimensions are unclear because too few specimens were found and most of these were isolated legs.

i) Composition and use of fabrics

The 44 trapezes included in the database comprise 9 coarse, 27 medium and 8 fine ware examples. The coarse *trapezes* are in a range of fabrics, with or without broken shells. For medium ware *trapezes*, a quartz-sand recipe (F7) was clearly preferred, while a limestone-quartz-sand fabric (F5) was also popular. For fine *trapezes*, a very fine and pure clay (F1) was again preferred. Again all wares are typical of the whole assemblage in terms of fabrics.

ii) Firing environment

Light brown or brown-red colours dominate on the surfaces of *trapezes* (31 cases) and, furthermore, are associated with homochromatic oxidised brown cores in almost half of the cases. In a number of *trapezes*, brown-red exteriors are associated with homochromatic grey cores or grey cores with diffused margins and light patches on either side. In a few *trapezes*, grey or black surfaces occur together with homochromatic grey cores, indicating a fully reduced firing environment. The presence of clouding in a significant number of vessels (17 cases or 38%) again undermines the reliability and precision of these observations.

iii) Surface treatment and conditions of preservation and fragmentation

Post-depositional abrasion is high in most *trapezes* (27 cases) and surviving fragments are small (of the first size category). Most *trapezes* were burnished or polished only on the exterior surface. In seven out of eight pots with traces of burnishing, this has a vertical direction.

iv) Decoration

Perhaps consistent with the suggested use of *trapezes* as ritual offering vessels, decoration is attested on almost half of the trapezes from Makriyalos II (20 vessels), and might have been more frequent if preservation was better and fragmentation lower. *Trapezes* were exclusively decorated with incised linear or curved motifs.

10. Cooking pots

i. Dish-like vessels ('platter' style) (table 8.16)

'Platter' style pots are represented in the Makriyalos II assemblage by 121 vessels. These are very shallow, dish-like pots with a very large rim diameter (> 40 cm) and a very smooth and open carination near the rim; they end in a smooth convex base, sometimes giving the false impression that there is no base at all. The presence of extensive clouding on the exterior (and interior) surfaces, indicating repeated use on fire, suggests use as cooking pots to satisfy various needs of everyday diet.

i) Composition and use of fabrics

Most of the 'platter' style vessels display a coarse ware recipe, while medium and fine forms are very few. A striking feature of the coarse pots is the predominance of broken shell fabrics. From a total of 114 cases (represented by 154 sherds), 57 vessels (50%) display the broken shell recipe (F2) and a further 47 (41%) contain broken shell with other inclusions (F4, F6 and F8). In the majority of these 104 cooking pots, the quantity of broken shells is enormous, giving the impression that the clay mass is only a subsidiary ingredient of the mixture. Almost all the remaining vessels contain a quartz-sand mixture (F7). Only five cooking pots (5 sherds) display a medium ware recipe, and four of them contain broken shell (F2 and F4). Finally, the only cooking pot with a fine ware again contains broken shells (F4).

The preference of potters for this distinctive recipe, with broken shell, can be understood in terms of the need for strength, toughness and thermal shock resistance in the face of rapid changes in temperature that these vessels experienced.

ii) Firing environment

As in the case of deep cooking pots, 'platter' vessels present mostly brown colours in various tones on the interior and exterior surfaces. Evidence for firing conditions also matches that described above for deep cooking pots, indicating again a more or less oxidising environment.

iii) Surface treatment and conditions of preservation and fragmentation

The degree of post-depositional abrasion is mostly medium or high and fragmentation is also severe. The most interesting feature of dish-like 'platter' vessels is the way their interior and exterior surfaces have been treated. Leaving aside surfaces too abraded for diagnosis, all exterior surfaces are rough and all interior surfaces well burnished, probably in order to sustain thermal shock on the exterior and to prevent absorbing of food or liquids by the interior walls during cooking. The extent and degree of burnishing is usually medium and, where traces of burnishing survive, these are overwhelmingly horizontal.

iv) Decoration

Only one 'platter' style vessel is decorated, with impressions on the rim. The lack of decoration is not uncommon in these vessels for preparing and cooking foodstuffs. This, together with the rough surfaces they have, made the use of some types of decoration almost impossible and worthless, but other kinds of decoration, such as impressed and incised patterns, could have been used.

ii. Other cooking vessels (table 8.17)

An equally widely represented category is open cooking pots with a rim diameter of 16-38 cm and a height of 15-35 cm. Their rims are of the simple vertical form and the curved body of the pot ends in a flat or slightly convex flat base. Handles usually took the form of breast-like or oblong apophyses on the body or rim, but banded and cylindrical handles also occur in limited cases. These vessels almost always have on their surface traces of repeated use on fire.

i) Composition and use of fabrics

Most of these vessels are in coarse ware (76%) and a further 22% in medium ware. Of 120 coarse vessels (represented by 264 sherds), most contain an abundance of broken shell, either alone (F2 - 62%) or with other inclusions (F4, F6 and F8 - 33%). Similarly, most of the 35 medium vessels (37 sherds) contain abundant broken shells, either alone (F2 - 49%) or with other inclusions (F4 and F6 - 20%). Of the remaining medium cooking pots, eight vessels have the quartz-sand fabric (F7) and three the limestone-quartz-sand fabric (F5). Finally, of the two fine-ware cooking pots (3 sherds), one was made of a very pure clay (F1) and one of a mica-quartz-broken shell fabric (F4). As in dish-like 'platter' vessels, a clear preference for shell fabric is again demonstrated.

ii) Firing environment

As regards firing condition, open cooking pots exhibit similar patterns and problems to these of unknown shape (see above, p.99). Light or dark brown colours dominate almost all exterior surfaces, together with either homochromatic brown and grey cores or grey cores that have diffuse margins and brown patches on either side reaching the exterior surfaces. Clouding is evident in 103 vessels on the exterior surface, and in 59 on the interior, consistent with culinary use but making identification of the original firing environment extremely difficult.

iii) Surface treatment and conditions of preservation and fragmentation

Post-depositional abrasion is fairly high, but fragmentation modest. Among cooking vessels of unknown shape, burnished surfaces were much more common than rough surfaces and the latter were largely restricted to vessel interiors (see above, p.100). By contrast, among open cooking vessels, burnished surfaces are little more than twice as frequent as rough surfaces on both exteriors and interiors of vessels. Rough interiors are more frequently associated with burnished exteriors, than the reverse, but burnishing tends to be both more extensive and more intensive on interior surfaces, indicating probably differentiation in the cooking vessels used for different types of cooking, e.g., of liquid or solid foodstuffs. Where the direction of burnishing is visible (mostly on vessel interiors), this is predominantly horizontal.

iv) Decoration

Decoration of these cooking pots is limited to plastic designs, such as breast-like and oblong apophyses, found in various parts of only 8 vessels.

11. Braziers

The brazier, a vessel intended for use on fire, is considered to have become a ritual vessel during the Late Neolithic period. Braziers are rare in Neolithic Greece and only four were found in the Makriyalos II assemblage. In shape, they resemble large rectangular legs where the rim, the base and handles are incorporated in a compact way.

i) Composition and use of fabrics

There are three medium ware braziers and one fine. The fine brazier has no traces of inclusions other than mica (F1), while the three medium braziers include one broken shell (F2), one limestone (F3) and one quartz-sand-broken shell fabric (F4).

ii) Firing environment

All four braziers exhibit light red-brown colours associated with homochromatic red-brown (3 pots) or mixed-colour cores, indicating a more or less oxidising firing environment.

iii) Surface treatment and conditions of preservation and fragmentation

The degree of both post-depositional abrasion and fragmentation of the braziers is high. Two braziers have burnished surfaces and the other two are too abraded for secure diagnosis. The extent, degree and direction of burnishing are unclear.

iv) Decoration

Elsewhere, braziers are decorated. In Makriyalos II, only one brazier is decorated, with an incised pattern, probably because of the high degree of abrasion and the small dimensions of the potsherds.

12. Strainers

Strainers are not a very frequent find in the sample from Makriyalos II (11 vessels), and they are always very fragmentary and weathered. Their shape is unknown, because no complete examples were found, but it may have been similar to that of the open bowls with a flat base. Simple vertical rims were used with a diameter ranging between 15 and 22 cm, while the diameter of the flat bases varies between 5

and 9 cm. No handles were recognised, but their absence is not verified for all strainers.

i) Composition and use of fabrics

There is a balanced representation of coarse, medium and fine ware strainers. Four coarse strainers (6 sherds) include two with the broken shell recipe (F2), one with broken shell and limestone (F6), and one with quartz and limestone (F5). The four medium strainers (22 sherds) include three with a limestone recipe (F3) and one with quartz (F7). Of the three fine strainers, two have only mica (F1), and one has limestone (F3).

ii) Firing environment

Strainers have light brown-red interior and exterior surfaces, associated with homochromatic brown-red cores or grey cores with diffuse margins and brown-red patches at either side, indicating a more or less oxidising firing environment.

iii) Surface treatment and conditions of preservation and fragmentation

Because of the small number of strainer sherds and the high degree of abrasion and fragmentation, surface treatment is unclear.

iv) Decoration

No traces of decoration were found on any of the Makriyalos II strainers.

13. Spoons

Only two ceramic spoons were found in the Makriyalos II pottery assemblage.

i) Composition and use of fabrics

One fine spoon has very pure clay (F1) and one medium spoon has a broken shell-limestone fabric (F6).

ii) Firing environment

Both spoons were fired in an oxidising environment, as testified by light brown-red surfaces and the homochromatic brown-red cores.

iii) Surface treatment and conditions of preservation and fragmentation

Both spoons exhibit medium degree of post-depositional abrasion and are represented by fragments of the third size category. Both spoons exhibit a burnished surface and the coverage and lustre are medium in the single spoon with a well-preserved surface.

iv) Decoration

No decoration was found on either of the spoons.

14. Storage vessels with large rim diameter (table 8.18)

This shape group includes large ceramic vessels, probably used as storage containers. Only the rims and handles have been identified from these vessels. They are of open shape and display two distinctive features: the large rim diameter, of 40-45 cm; and the almost vertical walls, at least as documented by the rims found. Rims were mostly of the simple vertical type, while broad and thickened rims are also present. Identified handles are breast-like apophyses on the body or rim. The rarity

and high degree of post-depositional abrasion of these distinctive vessels limits the conclusions that can be drawn about them.

i) Composition and use of fabrics

Of four coarse ware examples of these storage pots (7 sherds), three have broken shell fabrics (F2 and F4). Among 16 medium storage pots (represented by 18 sherds), these broken-shells fabric are rare and there is a preference for quartz-sand (F7), quartz-sand-limestone (F5) and limestone (F3) fabrics. Two fine ware storage pots (2 sherds) both have very pure clay (F1).

ii) Firing environment

The majority of vessels have light brown-red interior and exterior surfaces, and only three pots have dark grey or black surfaces. A fully oxidising firing environment is testified also by the homochromatic brown-red cores associated with these light colours in 10 vessels and by double coloured oxidised cores in a further four vessels. The remaining vessels exhibit more diverse and perhaps more complex firing histories.

iii) Surface treatment and conditions of preservation and fragmentation

As noted above, the degree of post-depositional abrasion is extremely high and fragmentation fairly high. All nine vessels with sufficiently well preserved surfaces were burnished to a medium or low degree, and burnishing traces were horizontal.

iv) Decoration

Two storage vessels exhibit some kind of decoration, one a plastic button-like apophysis and the other an incised design filled with white paste.

15. Other storage vessels (table 8.19)

The ceramic vessels classified in this group have been identified as open storage containers and open pithoid pots. Simple vertical rims have a medium to large diameter (20-50 cm, usually between 20 and 32 cm). Cylindrical and apophysis-like handles have been identified, but no bases.

i) Composition and use of fabrics

Five coarse open storage pots (represented by 7 sherds) are made of fabrics with broken shells, either alone (F2) or in combination with other inclusions (F4 and F6). Seven medium ware open shape storage vessels (8 sherds) were made of a variety of fabrics containing broken shells (F2), quartz-sand (F7), limestone (F3), and quartz-sand-limestone (F5). Of the two fine open storage pots (2 sherds), one has a limestone fabric (F3) and the other no inclusions (F1).

ii) Firing environment

Light brown-red colours are predominant in all vessels, on both interior and exterior surfaces, and are associated with homochromatic red-brown cores (7 vessels) or with grey-black cores that have diffuse margins and red-brown patches on either side (three vessels) or with mixed cores (four vessels), indicating a more or less oxidising firing environment.

iii) Surface treatment and conditions of preservation and fragmentation

Post-depositional abrasion is variable and fragmentation medium to high. All open shape storage vessels received some degree of surface treatment and there are no rough examples. Medium coverage and lustre are most common, while most traces of burnishing are horizontal.

iv) Decoration

No traces of decoration have been identified on open shape storage vessels.

Closed shape vessels

1. Jugs (table 8.20)

Jugs are closed shape vessels with a small rim diameter (6 to 16 cm), spherical body and medium to high neck, with 1-3 handles (vertical or, rarely, horizontal). A common type of jug at Makriyalos II has a simple vertical or in some cases everted rim of small diameter (usually not exceeding 10 cm), a medium-to-small sized cylindrical neck and a spherical, egg- or pear-shaped body, an almost flat or slightly convex flat base, and two vertical cylindrical handles attached at the rim and the neck or body of the vessel. The Makriyalos II sample includes 58 jugs (represented by 90 sherds) and they are found in almost all sampled areas. Jugs were probably used for storing and transferring liquids and so needed to be made with low porosity.

i) Composition and use of fabrics

The jugs include 17 in coarse ware (represented by 24 sherds), 32 in medium ware (36 sherds) and nine in fine ware (30 sherds). Most of the coarse jugs contain broken shell, either alone (F2 - 53%) or together with other inclusions (F4 and F6 - 24%). The remaining examples are of the quartz-sand (F7), limestone (F3) and quartz-sand-limestone (F5) fabrics. As with other storage containers, broken shell fabrics are less common among medium jugs, for which quartz-sand (F7), quartz-sand-limestone (F5) and limestone (F3) fabrics are preferred. Fine ware jugs are made with limestone and/or quartz-sand inclusions (F3, F5 and F7 - 5 vessels) or the very fine clay (F1 - 4 vessels).

ii) Firing environment

Most jugs have light brown or red surfaces, indicating a more or less oxidising firing environment. These colours are usually associated with homochromatic oxidised cores, reflecting fully oxidising conditions, but a few grey cores with diffuse margins and lighter patches on either side may indicate either incompletely oxidising conditions or organic materials that were not fully oxidised, because they were present in large quantities or because the oxidising atmosphere was of insufficient duration.

iii) Surface treatment and conditions of preservation and fragmentation

Abrasion is usually high on both interior and exterior surfaces. In addition, the fragmentation of jugs from Makriyalos II is again medium to high, and the dimensions of most sherds range between the second and third size category. All Makriyalos II jugs are burnished on the exterior of the vessel, while the interior was usually rough. The rough interior surfaces may result in part from the closed shape of the vessel (i.e., burnishing would have been difficult) and partly from the use of the jugs, as the well-worked external surfaces would not have allowed liquids to leak out of the vessels. Well-preserved traces of burnishing are usually vertical on the neck and horizontal on the body.

iv) Decoration

As at other sites, jugs are usually undecorated. The exceptions usually have incised (simple linear or zig-zag designs) or impressed (finger marks) and rarely plastic (breast-like apophysis) or pattern-burnished decoration.

2. Jars (table 8.21)

Makriyalos II jars are closed vessels with a very short neck and a spherical or globular body. Most have simple vertical rims (70%), but everted rims are also quite

common (25%). Rim diameter varied between 6 and 16 cm. Most handles were banded or cylindrical, while the few bases assigned to jars included flat and convex types.

i) Composition and use of fabrics

The total number of jars identified is 146, of which 25 (represented by 51 sherds) are of coarse ware, 64 cases (76 sherds) of medium ware and 57 cases (96 sherds) of fine ware. Most coarse jars include broken shell, either alone (F2 - 60%) or with other inclusions (F4 and F6 - 32%). The medium ware jars are made of a wide variety of different recipes, including the quartz-sand fabric (F7 - 38%), quartz-sand-limestone fabric (F5 - 17%) and limestone fabric (F3 - 11%), as well as broken shell fabrics (F2, F4 and F6 - 31%) and two cases with only mica inclusions (F1). The vast majority of fine jars (81%) are made of the fine clay (F1).

ii) Firing environment

The overwhelming predominance of light brown-red over dark brown and grey-black colours implies mostly oxidising rather than reduced firing conditions. Nearly half of the light-coloured jars have homochromatic light-coloured cores, indicating thoroughly oxidising firing conditions and/or the presence of limited organic matter. Homochromatic grey-black cores, associated with dark grey-black surfaces and indicating a fully reduced atmosphere or smudging of the vessel's surface, were rare.

Light brown-red surfaces are also associated with grey-black cores in various forms: a) homochromatic cores indicate incompletely burnt off organic materials, due to their abundance in the clay body and/or to firing in an oxidising atmosphere of short duration; b) dark grey or black cores with light patches on either side indicate either the same firing conditions as in (a) or more or less reduced conditions, but with an oxidising atmosphere during the final stage of firing or during cooling; c) dark grey

or black cores separated by sharp margins from lighter patches indicate ceramics cooled rapidly in the air.

iii) Surface treatment and conditions of preservation and fragmentation

Abrasion is higher on the interior than exterior of jars, while fragmentation is again high. As a closed shape almost all jars (96%) have burnished exteriors and most (77%) have rough interiors. Burnishing is less extensive and less intensive on interior than exterior surfaces, whether because the former received less attention or because they were harder to work. Traces of burnishing are horizontal on the interior and mainly vertical on the exterior of vessels.

iv) Decoration

'Classical Dimini' polychrome decoration has been identified on 23 vessels, of which three have polychrome designs on both interior and exterior surfaces. Black-on-red decoration is attested in six cases. Apart from painted designs, incised patterns were also used, among which 'classical Dimini' motifs again predominate, while other types of incised decoration are very rare. Finally, impressed design decoration occurs in one case.

3. Hole-mouth jars (table 8.22)

These vessels have a very distinctive shape with a flat base, a somewhat carinated body that narrows towards the top without a neck, and an everted rim that seems to have been added after the building of the body. The diameter of the rim is slightly wider than the top of the body and judging from finds elsewhere in Greece, should be around 14 cm. Two vertical banded and thin handles were applied very close to the surface of hole-mouth jars and 'classical Dimini' incised decoration was present in three cases.

i) Composition and use of fabrics

Only five hole-mouth jars have been recognised at Makriyalos II, so any observations are of limited reliability. One coarse and two medium jars are made of the limestone and quartz fabric (F5), a third medium jar contains broken shell (F2) and the single fine jar contains mica inclusions only (F1).

ii) Firing environment

Hole-mouth jars have either light or dark surfaces and a variety of cores, suggesting a more or less oxidising or mixed firing environment.

iii) Surface treatment and conditions of preservation and fragmentation

Abrasion of hole-mouth jars is variable and fragmentation moderate. Four interiors are rough and the fifth is burnished, while all four preserved exterior surfaces are burnished. The closed shape of the vessel may again have made burnishing of the interior difficult.

iv) Decoration

As noted above, the characteristic 'classical Dimini' incised decoration is applied elsewhere to hole-mouth jars, and was identified on three vessels in the Makriyalos II assemblage.

4. 'Classical Dimini' jugs (table 8.23)

A very distinctive type of pottery is the 'classical Dimini' jug with a strongly inclined and everted rim, a medium to short and narrow neck, a small cylindrical or banded handle and, usually, a flat base. Unfortunately, no bases were recognised at

Makriyalos II. The rim diameter of 'classical Dimini' jugs is not small as in the case of other closed-shape vessels, but varies around 15 cm.

i) Composition and use of fabrics

The 'classical Dimini' jugs in the Makriyalos II assemblage include four medium and 38 fine ware vessels. Three of the four medium jugs are made of the limestone-quartz-sand fabric (F5) and the fourth of the limestone fabric (F3). The fine 'classical Dimini' jugs (38 vessels represented by 38 sherds) were mostly made of very fine clays (F1 – 92%).

ii) Firing environment

Firing conditions resemble those described above for 'classical Dimini' bowls: an oxidising environment with abundant organic materials and/or variable supply of oxygen suggested by grey-black cores with diffuse or, usually, sharp margins (the latter indicating rapid cooling) and red-brown patches on either side.

iii) Surface treatment and conditions of preservation and fragmentation

Abrasion is rather heavier on the exterior than interior of 'classical Dimini' jugs from Makriyalos II, perhaps because the narrow aperture of these vessels protected the interior from scraping during use. Fragmentation of 'classical Dimini' jugs is medium, as the majority of sherds have a size ranging in the third size category.

Presumably because of the constraints imposed by the closed shape, the interiors of 'classical Dimini' jugs were left rough (the minority of burnished cases in Table 39 refers to the more accessible rim). Conversely, no exterior surfaces were untreated and most (81%) were polished. Traces of burnishing, where evident, are horizontal on the interior and mostly vertical on the exterior.

iv) Decoration

Decoration of 'classical Dimini' jugs is dominated by painted patterns, especially black-on-red decoration followed by brown-on-brown, while brown-on-cream and polychrome are rare. The motifs depicted in the predominant black-on-red style are obscured by abrasion and fragmentation.

5. Pithoi and pithoid pots (table 8.24)

Pithoi and pithoid pots are by far the most thick-walled and among the largest vessels in the Makriyalos II assemblage. Their shape is mostly oval, ending in a narrow base. Their height may tentatively be estimated at 50-70 cm, while their rim diameter reaches 40 cm. A wide range of different rims occur, from the simple vertical type to broad and everted rims. Cylindrical and banded handles were used, usually with a vertical orientation. Small flat and pointed bases have been found with a diameter around 7 cm (one base has a diameter of 14 cm, but may not belong to a pithos).

i) The composition and use of fabrics

There are 10 coarse ware vessels (represented by 131 sherds), 12 medium ware (17 sherds) and one fine ware. The coarse and medium vessels are made in a range of fabrics, including broken shell (F2), broken shell with quartz and limestone (F4, F6), and various combination of quartz, sand and limestone without shell (F3, F5). The single fine ware vessel also contains quartz and limestone.

ii) Firing environment

An oxidising firing environment is attested for all pithoi and pithoid vessels from Makriyalos II, both by light brown-red surfaces and by the predominance of homochromatic red-brown cores (90%).

iii) Surface treatment and conditions of preservation and fragmentation

Abrasion of both internal and external surfaces is fairly high, but fragmentation is modest, reflecting the durability of these thick-walled vessels. The external surfaces of pithoi and pithoid vessels are always smooth, but in most cases they are not intensively burnished and the degree of coverage and lustre is frequently low. As with other closed vessels, the less accessible interior surfaces are usually rough, but some are slightly burnished or wiped. The few traces of burnishing are horizontal.

iv) Decoration

Decoration of pithoi is very rare at other settlements in Greece, and is unknown at Makriyalos II.

6. Storage vessels (table 8.25)

This category includes vessels that seem to have served for long- or short-term storage of dry foodstuffs or liquids. The use of these vessels is inferred from their large dimensions and wall thickness (although some could have been used for serving liquids), and from their fabric which was constituted in such a way as to be highly durable and of low porosity and so favourable to the preservation of liquids and dry foodstuffs.

Their rim diameter varies between 16 and 22 cm, and the most frequent type of rim was the simple vertical form. There is a clear preference for the use of banded and cylindrical handles. Only two bases were found, both of simple flat type.

i) Composition and use of fabrics

These vessels include three in coarse ware (6 sherds), seven in medium ware (7 sherds) and two in fine ware. Among the coarse vessels the broken shell fabric (F2) was used in two cases and the quartz-sand fabric (F7) in the third case. The medium vessels include two of broken shell fabric (F2), two with broken shell and sand (F4), and three with a limestone-quartz-sand recipe (F5). Both fine vessels were constructed with a fine recipe (F1).

ii) Firing environment

All surfaces are brown or light brown-red, associated with various cores, of which the most common is homochromatic red-brown (oxidised). These vessels were thus apparently fired in a more or less oxidising environment.

iii) Surface treatment and conditions of preservation and fragmentation

The degree of post-depositional abrasion is medium in most vessels, primarily on the exterior, while the fragmentation is high (mainly sherds from the third size category). Higher abrasion of the interior than exterior surface may be due to treatment of these vessels during their use life (storage of liquids or scraping for cleaning perhaps), but again the sample is very small. External surfaces were all burnished to some degree, whereas internal surfaces were left rough or burnished with equal frequency and, in the latter case, were burnished less carefully than the exterior. Nevertheless, it is clear that the large size of these vessels allowed potters some access to the interior. A contrast between horizontal burnishing on the interior and either horizontal or vertical burnishing on the exterior is consistent with the very different access to the two surfaces, but is based on a very small sample.

iv) Decoration

Plastic decoration, a breast like apophysis, has been found on only one of these closed shape storage vessels.

8. 1 Discussion

The Makriyalos II ceramic assemblage is very diverse, comprising a range of different shapes with diverse probable uses. The most common vessel shapes for each of the major functional categories are: a) for tableware - simple open bowls, carinated and carinated-like bowls and simple cups; b) for serving, storing and transferring liquids - closed-shape jugs and jars; c) for long-term storage - pithoi and other small storage pots; and, finally, d) for cooking pots - open shapes usually with vertical or breast-like handles and dish-like 'platter' style. Each broad functional category and, to varying degrees, each vessel shape exhibits variability in terms of ware, fabric, firing and surface treatment, and this surely justifies the decision adopted here to present ceramic variability 'bottom upwards', in terms of the *chaîne opératoire* of production, rather than in terms of a traditional typology of idealized forms. Nonetheless, the assemblage exhibits considerable patterning in terms of more or less clear correlations between functional category/shape and other production variables, and also between these and fragmentation or abrasion that might reflect differences in use or discard history.

A first technological observation concerns the composition of the clay recipe used for manufacturing different kinds of pottery vessels. The striking majority of shapes securely recognised from coarse ware represent cooking pots and storage vessels. Storage vessels need to be strong and durable, while cooking vessels must in addition be resilient to heat, perhaps including direct exposure to fire. Desirable properties of such vessels, therefore, are strength, toughness, porosity, permeability and thermal shock resistance, which are in turn affected by variables such as wall thickness and the kind, concentration and average size of inclusions within the fabric. At Makriyalos II, broken shells were found in the fabric (whether as part of the natural clay source or deliberately added) of more than 95% of such vessels. Coarse wares full of broken shells were mostly used in cooking vessels, especially the dish-

like 'platter style', arguably reflecting the need for strength, toughness and thermal shock resistance in the face of rapid changes in temperature. Other kinds of inclusions were also found in varied quantities, especially in storage vessels, perhaps relecting the need for such vessels to be relatively impermeable.

Medium ware sherds represent a variety of different vessel shapes and different fabric groups. Cooking, storage and serving vessels and also plain and decorated tableware were made using a medium ware recipe. Storage vessels were usually made of quartz tempered fabric, but other inclusions were also used, such as limestone and sometimes even broken shells. A particular category of vessels, jugs used for storing, transferring and serving liquids, was made of the quartz-sand-limestone fabric in various combinations to decrease the porosity of walls and enhance waterproofing. Broken shells were used in some storage vessels, in cooking pots and in limited quantities in some other shapes, but quartz, sand and limestone inclusions were predominant among medium ware vessels at Makriyalos II.

Fine ware, mainly of very pure clay, was primarily used as tableware, that is for serving or displaying food and drink or for limited other practical purposes. Like coarse ware, fine ware is dominated by one fabric group. This fabric has mica inclusions only in very small quantities and its ubiquity suggests that it was not deliberately added unless particle sizes and quantities are large. When mica was found in large quantities, pottery was probably made from a micaceous clay or tempered with crushed micaceous rock rather than being tempered with mica alone. Other fine fabrics are relatively scarce (F3 and F7), and the quantity of inclusions is perhaps too low to suggest deliberate addition to achieve specific properties in the finished vessel. The mica-limestone recipe (F3), however, seems to be favoured for some specific shapes, such as jugs which needed low porosity for short- or long-term storing and transporting of liquids. In a small number of cases, the mica-broken shell fabric was used for fine ware (F2), but the quantity of broken shells is very small, rarely exceeding 1-2% of the clay mass. This suggests that broken shell inclusions were added by potters and were not simply derived from a shell-rich natural clay source, since removal of most broken shell for fine fabrics would have been very time-

consuming. Only if this clay source (including broken shells) had some special properties favoured by the potter, would such effort be plausible. Finally, a number of fine sherds do not have any inclusions at all (not even mica inclusions could be identified with the naked eye). Almost all of these cases are 'classical Dimini' sherds, from very fine and elaborate fine vessels.

In the case of firing conditions, diversity is encountered in most shape categories. A purely oxidising firing environment is characteristic of 'classical Dimini' bowls, fruitstands, jars and jugs, however, while a reducing atmosphere is usual in open bowls and carinated bowls. The different firing conditions of these two groups of tableware created a clear contrast in physical appearance and this in turn presumably signalled some socially important distinction in the context or meaning of their use. The majority of storage vessels exhibit a more or less oxidising firing environment. Finally, for cooking pots, repeated use on fire resulted in clouded surfaces, that made it hard to recognise positively the original firing environment, although an oxidising firing environment was probably the norm. Extensive clouding was also observed on almost half of the cups, which might be explained in terms of either original firing environment (mixed environment or contact with fuel) or use of cups on fire during their life cycle. The latter explanation would contradict accepted views on the use of cups only for serving or displaying and, at least in the case of footed cups, is rendered unlikely by the presence of internal clouding.

Burnishing was very common in storage vessels and probably suggests intended use to hold liquids, while internal abrasion (see below) suggests that some of these liquids may have been acidic. More particularly, in closed-shape storage vessels, external surfaces were all burnished to some degree, whereas internal surfaces were left rough or burnished with equal frequency. As noted above, the large size of these vessels allowed potters some access to the interior. In cooking pots overall, exterior surfaces are usually burnished and the interior surface received less attention from potters. By contrast, among open cooking vessels the picture is different and burnished surfaces are less frequent, while rough surfaces are commoner on both exteriors and interiors of vessels. Burnishing tends to be both more extensive and

more intensive on interior surfaces, indicating probable differentiation between cooking vessels used for different types of cooking. In addition, in the dish-like 'platter' style vessels, exterior surfaces are always rough and interiors well burnished, probably to sustain thermal shock on the exterior and to prevent absorbing of food or liquids by the interior walls during cooking.

Cups are usually burnished, but roughening was not rare. This is unexpected, given that this category is characterised as 'tableware', but coupled with the observation of fire clouding perhaps hints at a utilitarian aspect including exposure to fire. The same is not true for internal surfaces, where rough surfaces are dominant, indicating a limited concern by potters. In addition, most footed cups have a rough exterior associated with rough or burnished interior, while the same is true for burnished footed cups.

The vast majority of bowls received some kind of surface treatment, burnishing or polishing, and polishing rather than burnishing was favoured on their external surface, while only half were polished on the interior surface. The same is true for carinated bowls but the interior surfaces attracted less attention, although the quality of treatment was still good. 'Classical Dimini' vessels, as high class objects (judging from highly selective fabric and firing conditions), received a lot of attention from potters in terms of surface treatment. Almost all 'classical Dimini' vessels have polished interiors and exteriors. As noted above, the combination of polished surface, high abrasion, context of deposition and fine fabric played a crucial role resulting the quality of preservation of this category.

Finally, all Makriyalos II jugs are burnished on the exterior of the vessel, while the interior was usually rough, probably due to the closed shape of the vessel and partly from the use of the jugs, as the well-worked external surfaces would not have allowed liquids to leak out of the vessels.

Abrasion and fragmentation patterns also differ between shape categories. Among storage pots, abrasion is higher on the interior surfaces, while the exterior surfaces are usually better preserved. Higher abrasion of the interior than exterior

surface is unlikely to be due to post-depositional history and may be explained more plausibly in terms of treatment of these vessels during their use life (storage of liquids or scraping for cleaning perhaps). Fragmentation in storage pots is high, although some big sherds were found. Most cooking pots exhibit a high degree of abrasion, but are represented by rather large sherds compared with other shapes and this perhaps suggests that abrasion may be due to use rather than post-depositional conditions. In contrast with other cooking vessels, fragmentation is severe in the dish-like 'platter' vessels - probably due to thickness of walls. The latter observation is consistent with the overall impression from the non-characteristic body sherds of cooking pots.

The surface preservation of cups is not very good and fragmentation is also relatively high. Conversely, the degree of post-depositional abrasion of footed cups is lower and the dimensions of the fragments preserved compared to total vessel size are relatively large, a contrast that needs investigation in the next chapter on spatial analysis. Overall, bowls are well preserved and a significant number of bowls was found in an extremely good condition, but fragmentation was extremely high, perhaps due to composition of fabrics. In carinated and carinated-like bowls, abrasion is lower on the exterior than interior surfaces, but could be due to post-depositional history because of the better finishing treatment of the exterior surface. The fragmentation of carinated bowls and carinated-like bowls is high, perhaps because the fine clay used in their manufacture and their thin walls led to low durability. Finally, most 'classical Dimini' vessels exhibited high degree of post-depositional abrasion and fragmentation was mostly severe - again perhaps due to the type of fabric. The following chapter explores some of these associations, and especially those that may relate to depositional history, in terms of spatial and contextual distribution.

9. Spatial distribution of the Makriyalos II pottery assemblage

9. 1 Spatial distribution of Makriyalos II sherds: the designation of space, methods, general problems and limitations

9. 1. 1 The designation of space

An attempt to analyse and interpret the distribution of the Makriyalos II pottery assemblage in space was one of the important issues posed at the beginning of this study. Most of the Makriyalos II features identified during excavation are pits, and these seem to have been the primary 'architectural' means by which prehistoric people organised their social life in space on this site. Pits were sampled from all areas of the excavated part of the settlement, while some areas between pits were also sampled, as were other 'negative ' features such as the ditch and some contexts associated with above-ground constructions.

As mentioned above (see Chapter 6), not all pits from Makriyalos II were selected for analysis, nor was the sample from selected pits always the same. All the selected pits in sectors H, Θ and I were sampled in their entirety, with two exceptions. First, approximately 75-80% of the fill of the big Pit 24 was sampled, with the units comprising the excavation baulks excluded for reasons of excavation methodology. Nonetheless, the quantity of pottery excavated from this feature was very large, amounting to almost 15 boxes or approximately 200 kg of pottery. Secondly, a pit in sector Θ, that formed the 'apsidal' end of one of the two 'apsidal' buildings (fig. 9.1), was sampled only from the part that belonged to excavation square Θ0024, because the rest of the pit was excavated with different recovery protocols in a trial trench at the beginning of the rescue project.

The subterranean dwelling, Pit 24, is the only pit at Makriyalos II that presented stratigraphic differences during excavation (fig. 9.1). This pit is unusual in its depth, its diameter, the entrance identified by the excavators and the discovery of three holes marking the position of storage pots on the floor, 2m below the present surface. The sherds of these storage pots were found in the floor deposit. The

excavators suggest that the bottom of the pit could have been used as a cellar. All the other pits and architectural features (hearths, ovens, ditches, apsidal buildings) from the settlement had mostly medium to small amounts of pottery and it was decided to study a 100% sample of their content to gain a better picture of the deposits and, ultimately, to understand their character.

Study was also restricted to a sample of the material recovered in excavation sector Eta (H), on the northern edge of the settlement, where the excavators had noted an exceptional abundance of ceramics (fig. 9.1). This area, although only one tenth of the excavated Makriyalos II habitation area, yielded nearly one quarter of the total pottery assemblage for this phase. The excavators describe this ceramic-rich area in sector Eta as a 'borrow pit' and have suggested that this was subsequently filled with pottery eroded from the slope above the pit (Pappa and Besios 1999, 188). In support of this interpretation, the stratigraphy in this area shows a series of deposits of, sometimes, very distinctive pottery separated by thin layers of soil. Beneath these deposits, were discovered some pits with small amounts of pottery and a few traces of minor ditches.

Sampling in this area was random and the quantity selected for analysis was determined by two interrelated factors: first, the amount of time available for recording a sufficient quantity of the material from other areas of Makriyalos II to provide reliable conclusions about the pottery and organisation of the settlement; and, secondly, bearing in mind the large quantities of pottery from this area, the amount of pottery needed to give a representative picture of the character of this area of the site. The fraction of the pottery selected for sampling was approximately 20-25%, an amount adequate to give valuable and significant information about the pottery, and the character and use of this particular area.

Finally, areas between pits were sampled at the beginning of the study and recording to a limited extent, after first gaining a fair picture of the character of the pottery from these areas by rapidly 'scanning' the rest of the material. This sampling technique was conducted in order to see if there is a relationship between pottery from the pits and other features, and the spaces between them. The quantity of pottery

selected for this purpose was very small and did not exceed one plastic storage box (ca. 20 kg).

9. 1. 2 Methods

Spatial analysis of the Makriyalos II pottery assemblage could have been carried out in either of two ways: a) the traditional analysis using a database and the transfer of results to a map of the settlement either manually or electronically; and b) using a GIS programme (Geographical Information System) which provides all the means for a detailed and thorough spatial analysis. Both alternatives had advantages and disadvantages, but previous experience of GIS analysis (Vlachos 2001) made this the most appropriate means of achieving the goals of this research. The GIS programme used was ArcView version 3.2.

9. 1. 3 Problems and limitations

Unfortunately, as in the case of many other questions related to the pottery assemblage from Makriyalos II, spatial analysis was neither easy nor unproblematic, and several difficulties were encountered. One of the significant problems inherent to the pottery assemblage of Makriyalos II is the high degree of fragmentation, which made very difficult the secure identification and recording of ceramic joins that would lead to the recognition of many whole vessels.

Another important limitation on analysis and interpretation of the distribution in space of Makriyalos II pottery is that study of most other classes of artefact and ecofact is still ongoing or publicly available in only preliminary form.

Thus, it was decided that, at this stage, the spatial distribution of pottery would of necessity be analysed in isolation from other archaeological materials. Inevitably, this severely restricts the scope for testing any interpretations based solely on ceramic evidence.

9. 2 Spatial distribution of Makriyalos II sherds: generic variables

In the initial stage of recording, all the sherds of each selected excavation unit were recorded in terms of the following variables: surface treatment and fabric; part of vessel represented; open, closed or unknown shape; total number and total weight of each of these categories; degree of post-depositional abrasion and relative dimension of the sherds; archaeological context; and, finally, the number of sherds derived from the same pot in order to understand the way pots were broken and dispersed.

In spatial analysis of pottery from Makriyalos II, some of this information will not occupy us for various reasons. The spatial distribution of the various categories of surface treatment is not of interest, because surface treatment is not usually closely related to shape of vessel, making any spatial patterning in this variable difficult to interpret. The same is true for the part of vessel each sherd represents, as no information on shape was recorded during this phase of recording and the distribution of characteristic parts of pots (rims, handles and bases) will be analysed more systematically below to observe and understand patterns of breakage.

In addition, information on joins between sherds or on sherds that seemed to be parts of the same vessel in the same unit or between units was very sparse and, mainly, insufficient for extracting reliable conclusions, and so these data were not used in the analysis of spatial distribution of sherds at Makriyalos II.

Finally, although the excavator's identification and interpretation of different contextual features will be used to guide spatial analysis of the pottery, it must be remembered that it is the character of these features that we want to explore, using associated pottery as evidence.

9. 2. 1 Quantitative distribution of the pottery assemblage, conditions of preservation and fragmentation

The distribution of pottery is strikingly uneven in terms of both number (fig. 9.2) and weight of sherds (fig. 9.3). Nearly half of the sampled sherds come from the

ceramic-rich area in sector H (23,090 sherds out of 50,723 or 45.5%) which yielded more than a quarter of the total amount of pottery from Makriyalos II. The same is true for total weight, with sherds from this area accounting for 594.6 kg out of 1,340.89 kg or 44.3%.

At first sight, the close similarity between number and weight measures for this area (45.5% and 44.3%) suggests that the degree of fragmentation (treating the ratio of sherd number to weight as a measure of sherd size) is the same as in the rest of the settlement. It would follow that the large quantity of sherds yielded by this area is unlikely to be due to taphonomic process(es) (see discussion above), unless the sherds are derived from whole vessels of a very different size from those represented in the rest of the settlement.

In practice, this picture of fragmentation in the sector E borrow pit may be misleading for two reasons. First, this context contained large numbers of mostly small 'classical Dimini' potsherds that tend to exaggerate the overall level of fragmentation. Conversely, large pieces of pottery have been found in significant numbers and observations during recording suggest that fragmentation is limited compared to all other Makriyalos II contexts. Secondly, there are differences in sherd size and degree of fragmentation between individual excavation squares within this ceramic-rich area.

In the blue square (fig. 9.4, H0421), mean sherd weight is medium to small (26.7 gr.), and the same is true for the yellow area (fig. 9.4, H0433). A different picture is presented by the other two areas, red (fig. 9.4, H0441) and green (fig. 9.4, H0531). In the red area, the mean size of sherds is smaller (21.2 gr.) than the settlement average, while in the green area the mean size (39.1 gr.) is bigger than in any other part of this area. A similar picture to the green area (H0531) is presented by pits in the lower levels of the blue area. One of these pits, pit 625, reveals very modest fragmentation (mean weight of 37.5 gr. per sherd), and is one of two contexts where the dimension of sherds was recorded as big, while the preservation of the assemblage is also good and abrasion reaches only 40% of the surface of sherds. In addition, the

quantity of pottery in this pit is large compared to most pits across the settlement (ca. 35 kg).

In principle, these spatial differences in *mean* fragmentation might be an artefact of averaging very different results from individual excavation units. For example, a context comprising four units might include two units with small fragments of pottery and two with big pieces, resulting in an average fragment size for the context of 'medium' that would be unrepresentative of all four units. During recording, however, the nature and dimensions of pottery were noted for every single excavation unit. In the case of the area under discussion, the mean fragment sizes quoted are not an artefact of averaging contrasting materials from constituent excavation units. The differences in fragmentation between larger sub-divisions of the ceramic-rich area in sector H are not illusory, however, nor are they methodological artefacts. Leaving aside the reasons for these differences, they do imply that the huge volume of pottery in this area is not simply a taphonomic artefact (e.g., exaggeration of sherd weights by good preservation or of sherd numbers by fragmentation), but reflects spatial patterning in human pre-depositional activity or discard practices.

Turning to the central part of the excavated area, Pit 24 also yielded very significant quantities of pottery, approximately 6,000 sherds were studied (from a total number of perhaps 8,000), with a weight surpassing 160 kg. The relative dimension of sherds is medium to high (27 gr. per sherd) and observations during recording confirm that medium-sized pieces dominate the pottery assemblage from this particular pit.

Other architectural features and contexts that yielded significant quantities of ceramics were (fig. 9.5):

a) pit 32 in the eastern part of the settlement, with ca. 1,100 sherds weighing approximately 20 kg. This pit contained a hearth and the composition of the pottery may help clarify its function, as a housing structure or a cooking facility.

b) pit 78, also in the eastern part of the site, with approximately 1,000 sherds weighing 14 kg.

c) pit 40 in the eastern part of the settlement, with approximately 1,000 sherds and the strikingly high weight of ca. 34 kg.

d) a cluster of pits (cluster 1) with no clear limits in the central part of Makriyalos II yielded ca. 900 sherds weighing approximately 20 kg.

e) pit 125, an architectural feature in the eastern part of the settlement, with a medium number of sherds (ca. 600) amounting to a large weight of pottery (ca. 17 kg).

f) pit 552, in the central part of the excavated area and very close to a pit that contained structures identified by the excavators as hearths (Pappa and Besios 2001), contained ca. 600 potsherds weighing 18.3 kg.

g) in another cluster of pits very close to the pit containing the hearths, pit 559 yielded ca. 600 sherds weighing approximately 11.5 kg.

h) pit 14 in the central part of the excavated area, where the habitation is denser than the eastern part, contained the medium quantity of 560 sherds weighing approximately 11 kg.

i) another cluster of pits (cluster 2) in the central part, very close to the cluster of pits with hearths, yielded more hearths, one of which contained approximately 560 sherds weighing ca. 14 kg.

j) pit 413, in the central part of the excavated area and again very close to the pits containing the hearths (see also pits 552 and 559), yielded a medium concentration of pottery (ca. 500 sherds, 12.5 kg).

k) pit 414, in the central part of the excavated settlement, together with pit 554 is part of the big pit that formed the 'apsidal' end of one of the 'apsidal' buildings. The quantity of pottery is medium (ca. 530 sherds, approximately 10 kg).

l) an area in the central part of Makriyalos II, where a big feature was found with no clear limits, produced a medium quantity of pottery (approximately 520 sherds, weighing 14 kg).

m) a pit in the denser part of the settlement, which formed the 'apsidal' end of a second 'apsidal' building. The quantity of pottery is medium (ca. 500 sherds weighing approximately 14 kg), but this is from only half of the original pit. The other half was excavated in a trial trench at the beginning of the excavation and its material was not selected for analysis for methodological reasons (different excavation methods).

These concentrations of pottery are of interest for two reasons: first, they provide samples large enough for detailed analysis; secondly, they suggest spatial contexts where discard and perhaps use of ceramics was intensive, although intensity of discard should ideally be explored by standardising raw counts and weights of pottery against volume of deposit (information on which is incomplete) or duration of deposition (unknown). For the second of these reasons, areas and contexts that yielded low concentrations of ceramics are also significant in an effort to analyse the spatial distribution and spatial organisation of pottery discard. There are nearly 20 pits where the quantity of pottery is very low (≤50 sherds, ≤1.5 kg) and the number of ceramic vessels represented is rather low. The majority of these pits, that is 15 out of nearly 20 pits, are located in the central part of the excavated area of Makriyalos II, though this may be because sampling for the present study focussed on this area where habitation was densest and distinctive architectural features offered good potential for contextual differentiation. Interestingly, most of these pits with small quantities of pottery present a high degree of fragmentation, making the identification of sherd properties (shape, decoration, etc.) very difficult.

All other sampled areas had varying quantities of pottery that rarely surpass 400 sherds or 10 kg. More particularly, concentrations of pottery near constructions, such as hearths and ovens, present very small quantities of sherds, that rarely reaches 150 sherds or 5 kg.

As regards degree of abrasion, the sector H 'borrow' pit presented some of the best preserved Makriyalos II potsherds, while the rest of the pottery from this area had a very low degree of abrasion (fig. 9.6), implying low levels of weathering or other post-depositional destruction. As well as enhancing the potential of this material for detailed analysis and interpretation, this low level of abrasion implies that the ceramic assemblage in this area accumulated rapidly and that the large volumes of material recovered are not simply an artefact of unusually long-term deposition.

As mentioned above, the excavators have suggested that this area was subsequently filled with pottery eroded from the slope above the pit (Pappa and Besios 1999, 188). If the overlying material had been deposited by erosion, however, relatively intense abrasion and fragmentation of sherds might be expected, whereas in fact the pottery is mostly well preserved and the size of sherds is large compared to other areas of the settlement. Thus, other possible explanations should be examined for the use of this specific area and the associated deposition of very large quantities of pottery. Some other interesting information cited below will help to this end.

Another area with exceptional preservation of sherds is Pit 24, where the degree of abrasion is strikingly low (ca. 32% of sherd surface area, one of the lowest measurements at Makriyalos II, fig. 9.6), especially in the lower levels, where the preservation of sherds is in some cases extremely good, with abrasion of only 10-20% of the total surface area. Discussion on this aspect below will try to explore the reasons for this 'abnormality' compared to the picture from the whole assemblage and from other contexts.

Well preserved sherds were also found in the two apsidal buildings and especially in the pits that form the 'apsidal' part. In particular, the large pit marking the 'apsidal' end of the building in sector Θ contains some of the finest and best-preserved pottery found.

Other areas where the degree of abrasion was low enough to enable detailed study of the pottery were (fig. 9.5):

a) a large pit that contained two constructions identified by the excavators as hearths. The degree of abrasion ranges between 30 and 40%, although the quantity of pottery is small in absolute terms (ca. 5.5 kg).

b) two adjacent pits, 25 and 25a, which might be parts of a single feature. These two pits were located about 3 m from the subterranean dwelling pit 24. The degree of post-depositional abrasion is approximately 40-45%. Interestingly, although pit 25 was nearly three times as big as pit 25a, it yielded only 53 medium-sized sherds, while the smaller pit 25a had a significantly larger concentration of pottery (181 potsherds with a weight of 6 kg).

c) pit 31 in the eastern part of the settlement, near the ditch, where a modest quantity of medium- to small-sized sherds (448 sherds, ca. 11 kg) is associated with abrasion ranging between 50% and 60%.

In other areas of the settlement and contexts (pits, hearths and other architectural features), the degree of abrasion is usually high, exceeding 80% in almost half of the cases, and in some instances reaches 100%. Such high levels of abrasion make the surface of the sherd almost completely uninformative, sometimes to the point that even the part of the pot represented could not be recognised. Of more positive interest is the apparent contrast between, on the one hand, many contexts containing small quantities of heavily fragmented and abraded pottery and, on the other hand, a few contexts with large volumes of less fragmented and abraded material. The implication is that much of the Makriyalos II ceramic assemblage is derived from discrete episodes of deliberate, mass discard followed by relatively rapid burial, rather than from accidental breakage, piecemeal discard and prolonged surface exposure.

9. 3 Shell-based fabrics at Makriyalos II

The frequent use of fabrics including shell at Makriyalos II, and the more or less clear association of such fabrics with particular shapes and types of ceramic vessel, was discussed above. A question not yet addressed is whether shell fabrics were used throughout the Makriyalos II settlement or were restricted to certain areas.

To recap some basic quantitative data, 46.9% of the total of 50,723 recorded sherds included broken shells. The proportion was very high in coarse ware sherds (90.3%), more modest in medium ware sherds (33.6%) and rare in fine sherds (<0.1% or only 8 sherds, some on the margins of classification as medium ware sherds).

Contextually, shell fabrics are almost ubiquitous across the Makriyalos II settlement (fig. 9.7), being absent from only seven excavation units, two of which yielded only 22 and 14 sherds each, including no coarse sherds (where broken shell is commonest). The remaining five excavation units without shell fabrics include four pits and a concentration of ceramics, all from the same 4 m by 4 m area (fig. 9.8, yellow dots).

The distribution of broken shell based fabric at Makriyalos II is most consistent for coarse sherds and much less so for medium ware sherds. In areas with large concentrations of coarse sherds, such as the 'borrow' pit in sector H, the use of broken shell based fabric was widespread and all the sampled units contained more than 90% of coarse sherds with broken shells. A possible explanation for this is given below (see 9. 4i). The same is true for other areas, such as pit 24, pit 125 and other architectural features (fig. 9.9). In some contexts, the proportion of broken shell based coarse sherds is lower and an attempt is made below to relate this variability to the types of ceramic vessels associated with particular contexts.

Differences in the distribution of broken shell based fabric are greater among medium wear sherds. The proportion of broken shell based fabrics varies between contexts from almost 60% to only 2% of sherds (fig. 9.10, red dots). In the so-called 'borrow' pit, the distribution of broken shell based fabric is unequal even in adjacent

pits or contexts. As in the case of coarse ware sherds, these differences have to be examined in relation to the shapes of pots found in different areas to understand the use and/or depositional history of vessels and contexts.

The distribution of broken shells in fine sherds will not be examined as such sherds are very scarce and the level of shell inclusions is very low.

9. 4 Spatial distribution of characteristic sherds from Makriyalos II

The characteristic sherds provide more detailed information and hence offer greater opportunities for interpreting the spatial distribution both of individual types and of associations between types. The variables that were selected for spatial analysis are:

a) vessel shape. Vessel shape is known for less than half of characteristic sherds, however, as these include not only parts of pots diagnostic of shape, but also isolated handles or bases and decorated sherds. In addition, sherd dimensions and post-depositional abrasion obscure vessel shape in many cases.

b) sherd dimension and post-depositional abrasion were explored in two stages. First, each variable was examined in isolation to explore patterns of breakage/fragmentation and abrasion in space. Moreover, abrasion of sherds was examined for both interiors and exteriors of vessels, to see if there are differences in this respect between contexts. Secondly, these variables were explored in association to explore their interaction in different Makiyalos II contexts.

c) fabrics, in terms not only of quantity of inclusions, but also of quality and type of inclusions, to identify possible contextual variation in use of different recipes. More particularly, as noted above, the distribution of broken-shell fabrics will be explored in relation to both different vessel shapes and different contexts.

As in previous stages of spatial analysis, existing knowledge of architectural features revealed during excavation (pits, ditches, etc.) will guide contextual analysis of the pottery assemblage, but may also be re-evaluated in light of new insights from analysis of the ceramic material.

i) spatial distribution of shapes

Analysis of the spatial distribution of vessel shapes at Makriyalos II is complicated by the high proportion of cases of unknown shape and by the fact that different shapes vary greatly in their ease of recognition. For these reasons, secure shape identifications must be taken together with other observations made during recording in order to gain a more reliable and meaningful understanding of the Makriyalos II pottery assemblage.

The majority of pits contained small quantities of pottery and shared a common, but limited 'repertoire' of ceramic vessels. This 'repertoire' includes a small number of impressed and incised tableware vessels, such as carinated bowls, while other tableware pottery, such as a few bowls and cups, is undecorated and could be related to the consumption of food or liquids. Pottery for storage needs, like pithoi and small storage vessels, and for the transfer or serving of liquids, like jars and jugs, was predominant. This 'repertoire' could reflect the presence of small individual households, where almost all the spectrum of everyday needs was served by particular vessels. And we say almost, because cooking vessels found in the pits were limited to the shallow dish-like vessels, the 'platters', which are more appropriate for heating and cooking small quantities of food and then eating them directly from the vessel, than for cooking for many people, as for example in inter-household feasting. More cooking vessels were recognised in areas near hearths, but the proportion is still low compared to the number of cooking vessels found elsewhere. A pit in the eastern part of the settlement yielded remarkable quantities of incised pottery, but it was excavated in a trial trench and so its spatial relationship to other pits remains unclear (fig. 9.5).

Some distinctive contexts deserve more detailed examination. The subterranean dwelling, pit 24, is the only pit that presents stratigraphic differences and has yielded significant numbers of most, if not all, of the shape categories found at Makriyalos II, including cooking, serving, eating and storage vessels. The excavators interpret the bottom of the pit as a cellar, as suggested by the big storage vessels found there, but the pottery in the pit exhibits other stratigraphic differences. 'Classical Dimini' pottery is dominant in the upper layers along with other tableware pottery and many big storage pots, as well as cooking vessels ('platters' and simple cooking pots). In the lower levels, the amount of 'Classical Dimini' and tableware pottery decreases and other decorative motifs are present, albeit in small quantities, while the frequency of storage pots increases, suggesting more subtle changes in activity in and near the pit than a distinction between 'use-life=storage' and 'abandonment=consumption'.

In the central part of the settlement, the internal organization of the apsidal buildings, including one or two separate rooms and an apsidal end with many fragments of storage pots, reflects a different perception of the use of space from that of the simple pit dwellings. Inside the rooms, however, post-depositional abrasion and fragmentation are high and differences from the pit dwellings in ceramic composition are minimal, something that possibly reflects the existence of a bigger family rather than a fundamentally different social unit or social activity. Only the pit(s) that formed the apsidal end show a special use, with a large quantity of storage vessels implying that the apsidal part functioned as a storage space.

The boundary ditch in the southern part of the excavated area has yielded a very small quantity of pottery. The fill of this ditch contained sherds attributed to small storage pots with an almost complete absence of tableware or decorated pottery, except for some incised pots, as in the case of most pits in the habitation area. It seems that the pits that constituted the ditch filled with material exposed for a long time before incorporation in the ditch or in some cases with refuse discarded from the settlement itself or both, because the material is very abraded and the potsherds do not seem to be parts of the same vessels, but pieces of different ones.

One of the most interesting features exposed during excavation of Makriyalos II is the ceramic-rich area in sector Eta. The stratigraphy in this area shows in certain places a series of deposits of, sometimes, very distinctive pottery that are separated by thin layers of soil. Beneath these deposits, were discovered pits with small amounts of pottery and a few traces of minor ditches. The pottery assemblage from this area contained almost all the repertoire of shapes described in Chapter 8. Tableware in this area is overwhelmingly of 'Classical Dimini' type, 90% of which is found here. Shallow flat-based bowls and straight-sided open bowls are dominant and decorated with the characteristic 'Classical Dimini' motifs, as are the fruit-stands and 'classical Dimini' jugs. Some incised jars are also present, but pottery with different decorative motifs is scarce, as is undecorated tableware like cups or bowls, which are scarce relative to the large quantities of pottery found. Furthermore, numerous cooking vessels and pots with clear traces of fire were recognised and a very large number of storage pots were found in this particular area.

If we accept the view of deliberate deposition rather than erosion down-slope in that part of the settlement (see discussion immediately below), community activity could be reflected in this concentration of pottery. This community activity (i.e. feasting) took place either in this part of the settlement, followed by *in situ* abandonment of remains, or elsewhere, followed by removal to this area, ritual dumping and covering with soil. In sum, the large volumes of pottery discarded, the high proportions of *decorated* tableware and the striking concentration of Classical Dimini decorated wares together identify this area as the focus of social activity of both large scale and great importance, involving the mobilization of stored produce, cooking and consumption of this produce and formal discard of the ceramic vessels involved. In the case of the Classical Dimini tablewares, formal discard perhaps involved particularly intensive breakage. As with other major concentrations of pottery at Makriyalos II, this area yielded a range of cooking vessel shapes, in contrast with the emphasis on shallow dish-like 'platters' in smaller concentrations. One obvious reading of this contrast is that major episodes of commensality may have been marked out not only by their large scale, but also by a more diversified cuisine than 'everyday' or 'domestic' acts of consumption.

ii) patterns of post-depositional abrasion and fragmentation

a) <u>post-depositional abrasion</u>

Patterns of post-depositional abrasion in Makriyalos II characteristic sherds are more or less the same as those described above for the pottery assemblage as a whole. Post-depositional abrasion is very significant in the majority of contexts throughout the settlement of Makriyalos II, but there are some contexts where abrasion is less or the preservation of sherds very good.

The large 'borrow' pit in sector H, which includes pits or contexts with large quantities of sherds, presents a mixed picture in terms of post-depositional abrasion of pottery: in some contexts, pottery with medium or low abrasion occurs in equal numbers to highly abraded sherds; and in other contexts, higher degrees of abrasion are clearly prevalent. Thin films of soil were observed during excavation between different layers of pottery concentrations and these may have protected the underlying pottery from abrasion, as the 'borrow' pit is located at the edge of the slope of the low hill where the settlement was founded. This does not mean that the pottery was transported down-slope by rainwater, but thin films of soil transported and deposited in the borrow pit protected some groups of sherds while others were subjected to abrasion (see discussion above). Whatever the precise mechanisms involved, these thin layers and the variable degree of preservation suggest that the concentration of pottery in this area was the result of several successive acts, rather than a single massive episode, of deposition.

Another pit with well-preserved sherds is pit 24, in which almost two thirds of the pottery is very well preserved (medium and low abrasion), and sherds with very low abrasion are as frequent as those with high abrasion. The fact that this pit is very deep with a clear stratigraphic sequence, and also that it is located at the top of the hill, precluding the accumulation of material abraded during down-slope erosion, might have contributed to this picture.

Moreover, the large pit with two constructions identified by the excavators as hearths has equal numbers of sherds with medium and high abrasion. Pit 25a is another example where preservation of pottery is good. Finally, well preserved pottery was also found in the two apsidal buildings, and especially in the pits that form the 'apsidal' part. In particular, the large pit marking the apsidal end of one of these buildings, in sector Θ, produced some of the finest and best-preserved pottery in significant quantities.

b) <u>sherd dimension and fragmentation</u>

Dimensions and fragmentation of characteristic sherds again present a similar picture to that described for the total assemblage from Makriyalos II. In the sector H 'borrow' pit, in the blue square (fig. 9.4, H0421), small sherds prevail: 70% are of 2 by 2 cm or 5 by 5 cm size, and only 30% are bigger. The small sherds represent only small fractions of the majority of shapes recognised at Makriyalos II, apart from cups and some small whole mouth jars, but these shapes are infrequent in the pottery assemblage as a whole. This trend could be explained by the increased presence of 'Classical Dimini' sherds that break up more easily due to fabric type.

The red area (fig. 9.4, H0441) reveals a similar picture to that of the blue square, while the green square (fig. 9.4, H0531) has a higher percentage of medium sherds (38%) higher. Big sherds are scarce (2%) and much fewer than in the overall assemblage (see p. 149-151), suggesting that most big sherds belonged to non-characteristic body sherds. It should be recalled again that the picture from the 'borrow' pit is highly biased by the large number of 'classical Dimini' potsherds with high degree of fragmentation. Otherwise, as discussed above, observations during recording suggested that fragmentation in this area is limited in comparison with other areas inside the settlement.

In pit 24 in sector Θ, where the quantity of pottery is large, sherd dimensions are again large, indicating limited fragmentation of pottery reflecting taphonomic conditions and better positioning of the pit in the settlement that prevented erosion. In

this pit, sherds with dimensions exceeding 10 by 10 cm are more frequent than in any other context. Another pit in the eastern part of the settlement, pit 40, also presents big and medium sized sherds, but high post-depositional abrasion (more than 70% of sherds are completely abraded) limiting the information that could be obtained.

Some other features and contexts have relatively large characteristic sherds, but the majority present (mainly) medium to small sized characteristic sherds. Overall, therefore, the fragmentation of ceramic vessels can be characterised as high and usually limited the insights that could be gained from the ceramic assemblage. Three contexts present a diversified picture that could be, at least in two of them that are 'borrow pit' and pit 24, explained in terms of use and function during the life of the settlement. These limitations have to be borne in mind in attempts at interpretation of the ceramic assemblage.

iii) distribution of fabric groups

For reasons mentioned above (Chapter 7), there is no need to discuss the distribution of the mica fabric (F1). As regards the limestone fabric (F3), the largest concentrations are observed in the 'borrow' pit in sector H where huge amounts of pottery were found. In terms of *relative* frequency, however, F3 vessels are found uniformly throughout the settlement (fig. 9.11, red dots) with a very limited presence testified in the 'borrow' pit.

Similarly, the combined mica-quartz-limestone-sand fabric 5 occurs mainly in the habitation area (fig. 9.12, red dots); in the sector H 'borrow' pit, F5 is abundant in absolute terms, but again extremely scarce relative to other fabrics, perhaps due to the high proportion of F1 'Classical Dimini' sherds. The same is true of fabric 7 (mica-quartz-sand) (fig. 9.13, red dots).

An interesting picture emerges when one looks at the spatial distribution of another inclusion, broken shell. As discussed above, this inclusion is found either alone or in combination with other inclusions (quartz, lime, etc.) in Makriyalos II

fabrics. The spatial distribution of broken shell fabric is highly related to the use of the vessel, but also to a series of other activities, including discard. Broken shell was used primarily for making cooking vessels and some storage pots and so the spatial distribution of these fabrics should match the distributions of particular vessel shapes.

Figs. 9.14 and 9.15 show that the presence of this broken shell fabric is limited in the simple pits in the central part of sector H and in the majority of pits in sector Θ, that could be characterised as residential pits, and is associated mainly with 'platter' style vessels; it is more abundant in the areas where hearths and ovens were recognised by the excavators and is here found in cooking vessels. Some pits have larger quantities of this inclusion, but the proportion of vessels found is also bigger than in smaller and unstratified pits, as in the case of pit 24, where broken shells are found mainly in storage vessels and cooking pots, and pit 125. Furthermore, broken shell fabrics were found in significant numbers in the pits that formed the apsidal end of the apsidal buildings, although mainly in storage vessels. In sector I and particularly in the pits that formed the ditch, the broken shell based fabric is extremely scarce, perhaps because of the range of shapes and the origin of the material found in these pits. Apart from these contexts, very large proportions of broken shell based fabric were found in the 'borrow' pit in sector H, reflecting the abundance of both cooking and storage vessels.

9. 5 Summary

The relative proportions of cooking, storage and tablewares vary in space, partly perhaps reflecting functional differentiation in use of space, e.g. concentration of storage vessels in base of pit 24 with holes to accommodate storage vessels and in pit marking apsidal end of the apsidal building; or of cooking pots near hearths. Interpretation of this is not easy, but occurrence of storage vessels in large-scale consumption debris may imply that such produce was stored FOR these consumption events, a different practice comparing to Late Bronze Age where breaking and dumping drinking vessels took place but not breaking of storage vessels too. Clearer

differences relate to particular types of vessels. Shallow platters 'dish like' were found in small 'domestic' contexts versus more diverse cooking vessels in ceramic dumps. In addition, concentration of 'Classical Dimini' vessels in 'borrow' pit in sector H and the contrast in fragmentation between this category and other 'tableware' pottery could imply a deliberate breakage of this kind of pottery.

Spatial variation in the distribution of fabrics could be attributed to variation in broad vessel types like the shell-tempered fabrics related to, mainly, cooking vessels, but also to storage vessels. Finally, sample size, fragmentation and abrasion vary considerably in space, complicating the task of exploring spatial variation in ceramic discard and consumption. Nonetheless, small samples are often associated with high fragmentation and abrasion and large samples with the reverse. This suggests that much of the assemblage is derived from some very large episodes of ceramic consumption and deliberate discard (leading to favourable preservation). Smaller worse-preserved contexts may reflect accidental breakage and piecemeal discard without deliberate subsurface disposal.

10. Discussion: the Makriyalos II pottery assemblage and human societies in Late Neolithic Greece

The results of analysis of the Makriyalos II pottery assemblage can be considered on two levels: intra-site and inter-site. First, on an intra-site level, variability in the ceramic material and the association of this variability with the architectural contexts found during excavation are explored as a source of insight into the role of pottery in the life of the prehistoric inhabitants of Makriyalos II. Secondly, this material and possible contextual associations are compared with other related materials and settlements from the Greek Late Neolithic to explore patterns of similarity, difference and interaction on an inter-site level.

As already discussed, in recent years pottery studies in archaeology have moved beyond the traditional dichotomy between technology-use and social-symbolic (van der Leeuw and Pritchard 1984; Stark 1998). The functionalist view of pottery as connected to the storage of foodstuffs and the establishment of sedentism, and thus as a by-product of the introduction of farming, has been widely questioned. Ceramics are now viewed in a more integrated way, and not only as a component of the 'Neolithic package', a view strengthened by growing evidence that the adoption of pottery followed the beginning of agriculture in some cases, including at least parts of Greece, but preceded it in China, Japan and Southeastern Russia (Zhang Chi 2002; Nishida 2002; Kusmin 2002).

The technology and use of pottery, and the symbolic and social meaning carried by pots, are now regarded from a more anthropological perspective as related to everyday practices, beginning with the manufacture and production of a pot, including its various uses, and ending in its discard (Lemonnier 1993; Skibo 1999). Of course, people are the main participants in these actions. They understand and even change the social meaning of pottery through time, organising the production of a pot not only to meet basic biological needs, but also to represent certain perceptions of dietary traditions or to effect change in these traditions .

Understanding of the Greek Neolithic is still dominated by the results of excavations in the early 20th century at Sesklo and Dimini (Tsountas 1908), in Thessaly. Apart from these two sites, adequate published information is scarce for settlements of this period and the same is true for pottery. Indeed, one of the major problems of Greek Neolithic studies is the restricted extent of later 20th century excavation programmes, mostly by German and Greek groups and, as a result, the limited potential for reliable archaeological inferences. Furthermore, most sites in Thessaly are tell-villages that were densely inhabited, long-lived and restricted in extent, and so not representative of the newly recognised category of flat-extended settlements.

Until recently the chronological framework for the Greek Neolithic and the culture histories of different regions within Greece were based on typological differences between pottery groups, analysed at an inter-site level and treating date as the only significant source of variability at an intra-site level (Milojčič 1958; Milojčič et al. 1976; Hauptmann 1981). This framework now seems fragile and the mere observation and description of typological differences inadequate. Makriyalos offered the opportunity to investigate intra-site spatial variability in archaeological material on a large scale and, thereby, to explore human activity within an early farming community with a high degree of confidence.

10. 1 Intra-site analysis

In order to examine the role and function of pottery found at Makriyalos II, a combined method was used that included two approaches, one technological and the other more archaeological. Each approach had significant weight in the final result, albeit in different proportions. Although this may sound a dichotomous approach, in that it separates technological attributes from archaeological ones, this was essentially a methodological distinction. In practice, the study and final results concerning the Makriyalos II pottery assemblage were completely integrated and based strongly on both approaches, such that each either complemented or contradicted the

interpretations yielded by the other. In both cases, the results of the two approaches are integrated.

The technological attributes of pottery were significant in our study for three reasons: first, to recognise the way pots were manufactured, that is if they were made for light or heavy duty, to be used in different ways and in different contexts; secondly, to determine the impact of firing on clay properties, clay recipes, and ultimately ceramic vessels; and thirdly, to explore their behaviour under an extreme condition of use, that is over fire. Archaeological considerations included the morphology of pottery, meaning the shape, and the archaeological context of its retrieval, trying to sketch out the use and function of various vessels in various environments, economic, social, or symbolic.

Ceramic technology at Makriyalos II was the focus of another more detailed study (Hitsiou 2003), but *macroscopic* study of technological attributes formed a significant part of the present study and identified considerable variability in the fabric, firing conditions and surface treatment of ceramics and established important associations between these variables and vessel shape.

The archaeological approach focused on two basic issues: the shape of ceramic vessels and the context of their retrieval; the post-depositional history of pots (abrasion, fragmentation), with both 'negative' implications for the preservation of shape, decoration, etc., and 'positive' implications for the ways in which different ceramic deposits were formed.

10. 1. 1 Technological considerations: choices versus 'norms'?

As discussed above (see Chapter 7) the strategy adopted for this study was to present ceramic variability 'bottom upwards', in terms of the *chaîne opératoire* of production, rather than in terms of a traditional typology of idealized forms. This decision was in large part vindicated as the analysis of the assemblage showed that each broad functional category exhibits variability in terms of ware, fabric, firing and

surface treatment. Furthermore, considerable patterning was found among variables which are associated not only to shape, but to other production variables, and also between these and fragmentation or abrasion that could say something interesting about the use and discard history of ceramic vessels.

To make different kinds of pottery vessels for their various needs, prehistoric potters at Makriyalos II followed a diversified, but clearly patterned strategy of manipulating their clay recipes. Cooking pots and storage vessels had to be strong and durable and/or heat-proof, and so needed a more or less coarse ware recipe (medium ware cooking vessels used a variety of clay recipes), a decision that affected other variables such as wall thickness and the kind, concentration and average size of inclusions within the fabric. The recipe that met all these demands at Makriyalos II was the broken shells based fabric (whether as part of the natural clay source or deliberately added) and potters favoured this for construction of cooking vessels, especially the dish-like 'platter style'. In coarse and medium ware storage vessels, choices in clay recipe were more varied and other kinds of inclusions and fabrics were also found, perhaps in order to ensure relative impermeability.

Deliberate and active choices were not limited to clay recipe, but were also made in firing. The majority of storage vessels exhibit a more or less oxidising firing environment and the same was probably the norm for cooking vessels even if repeated use on fire resulted in clouded surfaces, that made it hard to recognise positively the original firing environment. Burnishing was also a field of diversification associated with use and/or construction technique. Storage vessels exhibited burnishing probably in order to hold liquids, while increased internal abrasion suggests that some of these liquids may have been acidic. Diversification was also noticed among storage vessels shapes, with closed-shape vessels exhibiting rough interior surfaces, perhaps due to limited access. Burnishing in cooking pots is again associated with use and function and tends to be more extensive and more intensive on interior surfaces, indicating probable differentiation between cooking vessels used for different types of cooking, as in the case of the dish-like 'platter' style vessels, where thermal shock resistance

and prevention of the absorbing of food or liquids by the interior walls during cooking played a crucial role in the choices of potters.

For plain and decorated tableware for serving or displaying food and drink, medium and fine ware recipes were used. Quartz, sand and limestone inclusions were favoured by the potters among medium ware tablewares at Makriyalos II and very pure clay, usually containing only mica inclusions, was primarily used in fine vessels. As in the case of coarse ware vessels, the demands and needs of consumers, the Neolithic inhabitants of Makriyalos II, led potters to particular choices. A particular category of vessels, medium ware jugs used for short- or long-term storing, transferring and serving of liquids, was made of the quartz-sand-limestone fabric to decrease the porosity of walls and enhance waterproofing, while the mica-limestone recipe (F3) seems to be the choice for fine jugs associated with well-worked external surfaces that would not have allowed liquids to leak out of the vessels. Fine ware vessels in the F2 fabric shed interesting light on the question of whether potters added or removed broken shells. The quantity of broken shells is very small and this probably suggests that broken shell inclusions were added by potters and were not simply derived from a shell-rich natural clay source, since removal of most broken shell for fine fabrics would have been very time-consuming. Finally, a number of fine sherds (all of 'Classical Dimini' vessels) do not have any inclusions at all, consistent with the very fine and elaborate nature of these vessels.

Neolithic potters at Makriyalos II also made choices between different firing conditions for tableware. 'Classical Dimini' vessels exhibit a purely oxidising firing environment, while a reducing atmosphere is usual in open bowls and carinated and carinated-like bowls. This contrast in physical appearance probably signalled some social or contextual meaning related to their use. Furthermore, extensive clouding observed on almost half of the cups, if not a result of original firing environment (mixed environment or contact with fuel), may indicate the use of cups on fire during their life cycle, contradicting the widely accepted view of their use only for serving or displaying. Also perhaps counter to expectations is the burnishing of cups. Burnishing was the norm for these vessels, but rough surfaces were not uncommon, suggesting a

utilitarian aspect in addition to exposure to fire. Interestingly, rough surfaces are dominant on the interiors of cups, indicating that potters were less concerned with the appearance of the internal surface, seen only by the person using the cup, than of the external surface visible to onlookers. This obviously highlights the social rather than simply utilitarian role of the vessel.

Burnishing or polishing? Potters at Makriyalos II favoured polishing rather than burnishing on the external surface of bowls, while the interior attracted less (but by no means little) attention. In the case of carinated and carinated-like bowls, the interior surfaces again attracted less attention, although the quality of treatment was still good. 'Classical Dimini' vessels, by contrast, are characterised by extensive polishing on both surfaces, and this choice coupled with highly selective fabric and firing conditions again marks the high status of this kind of pottery at both inter- and intra-site levels. Careful finishing of both interiors and exteriors of 'Classical Dimini' bowls is matched by careful decoration of both surfaces, suggesting that these vessels were intended to be admired more closely than other bowls. This may imply that individuals using them enjoyed (or were thus accorded) particularly high status. In light of indications that these vessels were long-distance 'imports' (below), we might also imagine the handing round for collective evaluation and admiration of particularly prestigious gifts.

10. 1. 2 Archaeological considerations: choices again, but where and how?

Any attempt to infer the function or use of the various contexts exposed by excavation from the 'repertoire' of associated ceramic vessels faces a series of limitations outlined above (Chapter 9). Nonetheless, some valuable insights can be gained for some contexts by tracing the choices, not only of potters, but also of the consumers of the ceramic products.

Distribution of pottery across space at Makriyalos II showed that the majority of the excavated pits shared a common, but limited 'repertoire' of ceramic vessels, most of which (cooking and storage vessels, tableware other than the smallest cups)

were excessively large for the likely needs of a single individual, but too small to cater for a social group larger than a small (e.g., nuclear or stem family) household. Based on the pottery found in the pits, these 'households' could not support all aspects of social life inside the community, as for example cooking for larger social groups or inter-household feasting. And cooking seemed to have played a crucial role in social bonding between inhabitants of Makriyalos II.

The preparation, cooking and consumption of foodstuffs and drinking of liquids are often equated for the Neolithic in Greece with the ceramic vessels used for these purposes. The lack of written and iconographic sources (available only from the Bronze Age and particularly the late Bronze Age) makes very difficult the identification and interpretation of these habits, that are related to many, if not all, aspects of social, economic and symbolic life. Knowledge of the processes and relations linked with food and drink habits is critical to understanding social relations between people, prehistoric, historic or contemporary.

For the Neolithic, archaeozoological and archaeobotanical studies provide useful evidence on palaeodiet, as do studies of human skeletal material. Analyses of organic residues in ceramic vessels are beginning to supplement our understanding of diet (e.g., by providing evidence of consumption of milk products), while also shedding valuable light on Neolithic foodways (Urem-Kotsou 2006). Organic residue data are a very recent, and still quite scarce, addition to our knowledge, leaving macroscopic analysis of pottery as the main source of information on Neolithic drinking and eating habits and also on the complexity of the social relationships mediated through commensality.

In the later Late Neolithic, coarse wares and pottery shapes that could be related to cooking, and pottery with traces of repeated use on fire, make up a large proportion of ceramic assemblages (perhaps 30%), and this has been suggested to reflect increasing use of pottery in the domestic sphere (Perlès and Vitelli 1999: 98). According to Vitelli, this increase in the quantity of cooking pots found at most sites throughout Greece might also suggest that the mystique and magic of pottery had diminished by the Late Neolithic (Vitelli 1999a: 198). Moreover, the intensification in

use of pottery for cooking might suggest the introduction of new ways of preparing food, which consequently altered the food habits of Late Neolithic societies (Hansen 2000).

At Late Neolithic Makriyalos II, these dramatic changes in cooking and food habits observed elsewhere in Greece may be reflected in the preparation of food in particular areas. Overall, very few sherds could be associated with cooking and in most cases they were situated near cooking facilities, such as hearths. Both inside and outside the pits, sherds that could be assigned to cooking vessels or that seemed to have traces of repeated use on fire are almost absent and the few exceptions belong to fragmentary 'dish-like' vessels, implying that much activity associated with preparation and cooking of foodstuffs and liquids took place elsewhere. Given that the 'missing' cooking vessels attest to more diversified cuisine and, in some cases, were large enough to cater for more than the small social group implied by the shallow 'dish-like' platters, this might reflect preparation away from pits for inter-household commensality. On the other hand, the small size of cups and some undecorated shallow bowls indicates individualized *consumption* associated with the pits but also with other 'inter-household' contexts.

This dual pattern of collective production and individual consumption, also seen in phase I at Makriyalos (Pappa et al. 2004; Urem-Kotsou and Kotsakis 2007) might suggest that relations between inhabitants were negotiated in everyday life through food. It has been previously been argued that the consumption of food and drink, and of tableware, played such a role in negotiating social relations in Neolithic Greece, particularly between different 'household' groups (Halstead 1995, Andreou *et al.*, 1996). Makriyalos II offers the opportunity to explore this role in the rather different social context of a site dominated architecturally by small pit dwellings, suitable for housing only restricted numbers of people.

Where did neolithic inhabitants of Makriyalos II choose to display and negotiate these relations? In the sector H 'borrow pit', numerous cooking vessels and pots with clear traces of fire were recognised and almost all of these have fabrics rich in shell inclusions. A very large number of storage pots were found in this particular

area. Thus it seems clear that this area was the location of a distinctive type of social/community activity or at least discard. The almost complete absence of decorated pottery and particularly of 'Classical Dimini' pottery elsewhere in the settlement and the quantity of this pottery in this 'borrow pit,' together with the abundance in this pit of pottery related to cooking and storage, suggests that this distinctive group of material should be interpreted in terms of patterns of social/community activity or discard rather than chronological variation.

Diversification in use of space and patterns of consumption by the Neolithic inhabitants of Makriyalos II is not limited to the 'borrow' pit. The subterranean dwelling, pit 24, contained significant numbers of most, if not all, of the shape categories typical of the Makriyalos II 'repertoire', while the basal level of the pit yielded, among other shapes, big storage vessels. More particularly, the upper layers exhibit a significant quantity of 'Classical Dimini' pottery along with other tableware and many big storage pots, as well as cooking vessels ('platters' and simple cooking pots), while in the lower levels the amount of 'Classical Dimini' and tableware pottery decreases and other decorative motifs are present, albeit in small quantities. Thus the apparent shift in use from storage and habitation to 'abandonment' and discard was accompanied by changes in both the relative frequencies of different functional categories (storage, cooking and consumption vessels) and in the type of tableware and hence, presumably, in the social contexts of consumption.

A larger 'household (e.g., perhaps an extended family), rather than a fundamentally different social unit or social activity, may be manifested in the central part of the settlement, and particularly in the internal organization of the apsidal buildings. The existence of separate rooms reflects a different perception of the use of space from that of the simple pit dwellings, and the apsidal end with many fragments of storage pots is of obvious relevance to ongoing debate as to the extent to which storage was under household (e.g., Halstead 1995; 1999) or collective (Tomkins 2004) control in the Greek Neolithic. The provision for storage in the subterranean dwelling pit 24, however, warns against reading diachronic change into the evidence

from Makriyalos II. Moreover, the composition of the ceramic 'repertoire' is more or less the same in the apsidal house and pit dwellings.

10. 2 The macro-scale level

10. 2. 1 'Classical Dimini' pottery at Makriyalos: where from and what for?

As discussed above, the production characteristics and contextual distribution of the so-called 'Classical Dimini' pottery style (Dimini brown-on-cream, Otzaki black-on-red, polychrome decoration and incised patterns) at Makriyalos II are particularly distinctive and interesting. Almost 90% of this type of pottery comes from the ceramic-rich area in sector Eta on the northern edge of the settlement, discussed above, and ca 8% from pit 24, which was recognised by the excavators as a clear example of a subterranean dwelling. In addition, one pit outside the ditch produced a significant amount of this kind of pottery, but otherwise only a few sherds were found inside and outside the remaining pits.

A first, obvious question is whether the 'classical Dimini' pottery at Makriyalos II is a result of local production or was imported from elsewhere through networks of exchange, as in the case of Melian obsidian? According to Hitsiou (2003), based on petrological examination, the origin of this type of pottery is clearly Thessalian. She suggests that 'classical Dimini' pottery at Makriyalos was imported directly from the 'source' settlement of Dimini, as the clay recipe found at Makriyalos shares the same characteristics as those found at Dimini.

Our contribution to the resolution of this question is limited to the observation that decorative motifs and designs on 'classical Dimini' pottery at Makriyalos II, as well as other properties (e.g., standardised rim diameter and overall dimensions), are clearly similar to those found at Dimini. The view that these vessels were imported from Dimini is strengthened by the fact that one or two other vessels found at Makriyalos II look like unsuccessful attempts to imitate typical 'classical Dimini' pots, but these vessels differ in quality of clay and fabric, as well as decoration. More

particularly, the colour of clay is clearly different from that observed on all other such vessels (reflecting their medium ware fabric, containing large quantities of limestone). Furthermore, decorative motifs and designs on these 'imitation' vessels exhibit linear models distinctively different from those found on all other 'classical Dimini' pots.

The second question is the reasons for the distribution of 'classical Dimini' pottery and the conditions and perceptions of its appearance so far to the north of Dimini in southern Thessaly. As was the case with Middle Neolithic Urfirnis pottery in southern Greece, certain Late Neolithic wares were found over very large geographical areas, including 'Classical Dimini' pottery, distribution of which reaches Albania, but seems uneven given its absence at Mandalo and Dispilio in Western Macedonia. As shown above (Chapter 8), both the quantity and quality of this particular ceramic category are high at Makriyalos II.

How was Classical Dimini pottery distributed and perceived outside southern Thessaly? In the case of Melian obsidian, it has been suggested that skilled craftsmen travelled around mainland Greece and worked obsidian in settlements far from the source (Perlès 1990). The distribution of 'classical Dimini' pottery seems to have been totally different. First, it will have been very difficult for craftsmen or traders to carry large quantities of raw material from clay sources near Dimini. Secondly, there was no practical need to acquire fine pottery from distant places, as every settlement had the knowledge and means to produce such vessels. Other inessential objects were also exchanged over long distances in the Late Neolithic, such as 'Spondylus' and metal ornaments (Demoule and Perlès 1993: 395-396, 403; Andreou *et al.* 1996: 544-545).

According to Vitelli (1999: 197-198), the acquisition of fine pottery from distant sources, together with a significant increase in the percentage of cooking pots observed during this period (see above), may indicate that manufacture and use of locally produced pottery was now commonplace on Late Neolithic settlements, reducing the value of pottery as a prestige item. Other means of obtaining prestige goods were thus needed, such as long-distance exchange of pottery. These changes in the acquisition of pottery from distant sources affected the relations between

producers and consumers of pottery. The direct relationship between consumer and producer was now lost and the assigning of any value or function (social, symbolic, etc.) to pottery was in the hands of the consumer and not of the producer, leading to a dramatic decline in the role of the potter in determining social choices and consequently a diminution of the social power of locally produced pottery (Vitelli 1999: 197-198). These alterations in the role and function of pottery intensified during the Final Neolithic, when painted pottery decreased significantly on settlements throughout Greece (except in Macedonia). At the same time, cooking and coarse vessels increased substantially implying a more practical use of pottery in everyday life, although FN pottery retained symbolic and ritual meaning, as reflected in its use in graves.

Vitelli's work has proved extremely influential in moving the traditional emphasis on Neolithic ceramic typology and chronology to active interest in the human producers and consumers of Neolithic pottery. Her model is somewhat impressionistic, however, and based on first-hand experience of pottery from the southern Greek mainland – in large part from the cave site of Franchthi, which may be very atypical of open-air settlements. Moreover, contrary to her model, it is now established that fine pottery was already moving long distances in the Early Neolithic period (Tomkins and Day 2001: 259-260) and, while the range and volume of ceramic vessels produced does seem to increase significantly over the course of the Neolithic (e.g., Tomkins 2007), the basis for her minimal assessment of Early Neolithic ceramic output has been effectively criticised (Youni 2004).

Intriguingly, Makriyalos II lacks the variety of 'wares' and decoration evident elsewhere in Macedonia, as at Servia (Ridley and Wardle 1979: 213-217) or Giannitsa B (Chrysostomou 1996: 165), where 'Classical Dimini' pottery is only part of the decorated pottery assemblage and co-exist with other decorative motifs and patterns. Decorated pottery at Makriyalos II is dominated by the 'Classical Dimini' styles and only a few other decorative styles occur in limited numbers, such as the incised carinated bowls and some other painted, incised and impressed pots. This 'anomaly' is plainly not due to small sample size in the case of Makriyalos II. The possibility

that it might reflect detailed differences in chronology between Makriyalos II, Servia and Giannitsa B cannot as yet be ruled out, given the scarcity of vertical stratigraphy at Makriyalos. The large horizontal scale of excavation at Makriyalos II, however, and the resulting relative clarity of contextual definition, allows us to explore the interface between the inter- and intra-site scales of analysis. In the sector H 'borrow pit', the major concentration of 'Classical Dimini' fine table ware is associated with an abundance of storage and cooking vessels, suggesting a close linkage between the consumption of these exotic vessels and the mobilization and consumption of local surplus. While the details of these occasions of conspicuous consumption elude us, the implied link between inter-regional contacts and local strategies of mobilization is of considerable importance for our understanding of Neolithic society in Greece.

10. 3 Conclusion

This thesis represents a macroscopic analysis of the large ceramic assemblage from Late Neolithic Makriyalos II. The analytical approach adopted was based on the ceramic *chaîne opératoire* in the hope of moving beyond the traditional concern with typology and chronology to an improved understanding of the social actors involved in ceramic production, consumption and discard and in the social contexts in which these activities took place. Inevitably, the potential of this approach is limited by several constraints: the fragmentation, abrasion and dispersal to which the material was subjected during and since (and perhaps also before) discard; the need, for reasons of time, to restrict analysis to a sample of the recovered assemblage; the need, for reasons of time and expertise, to restrict this study to macroscopic analysis; the variable precision – inevitably – with which excavation was able to define and interpret different depositional contexts; and the fact that this is just one of several doctoral studies based on Makriyalos, each of which in isolation can reveal only part of the picture of social life at the site. On the positive side, this ceramic assemblage is large and systematically recovered, while the combination of very large-scale excavation and of a 'flat-extended' form of settlement affords a rare degree of contextual definition.

The thesis has arguably succeeded in its core aims. The *chaîne opératoire* approach has revealed a level of complexity and diversification, in the choices made by potters at successive stages of ceramic production, that would inevitably elude a traditional approach based on preconceived typologies. Much of the observed variability in ware, ceramic paste, surface finishing and firing conditions can be related directly to practical considerations, such as vessel size, need to withstand rough handling or exposure to heat, need for porous or impermeable surfaces, accessibility of surfaces for manual finishing, and so on. Much of the diversity in these same variables, however, is plainly related to a desire to signal important cultural and social distinctions as to the manner or context of use of different types. These distinctions were variously signalled through details of shape, fabric, colour, surface finish and decorative form. Distinctions between 'kitchen' and 'table' wares are not as clear-cut as is often in the case in later periods, but broad functional types can be discerned, as can different forms of cooking vessel and different forms and styles of tableware.

There are also evident spatial/contextual differences in the volume and quality of preservation of ceramics and in the presence/absence or, more usually, the relative proportions of different functional categories and different sub-categories of ceramic vessel. In most contexts, ceramics are found in modest quantities and associated with high levels of fragmentation and abrasion, while a few contexts have yielded huge volumes of material, that is often less fragmented and abraded. It has been suggested that the contents of most contexts may represent piecemeal discard of ceramics accidentally broken during use and disposed of informally, whereas the richer contexts represent deliberate episodes of mass discard following important social occasions that involved commensality. The ceramically poorer contexts tend to contain limited evidence of cooking vessels, and mostly of a single type – the shallow 'dish-like' platter, whereas richer contexts include a more diverse range. This contrast may tentatively be interpreted in terms of an opposition between small-scale consumption by 'household' units and larger-scale commensality involving greater culinary diversity. The differential spatial distribution of different categories of tableware supports the suggestion that differences of form, firing, finish and

decoration signalled contrasting social contexts of consumption. Of particular interest is the concentration of exotic 'classical Dimini' fine vessels in the sector H 'borrow pit', in association with volumes of storage and cooking vessels that imply close linkage between the maintenance of long-distance social relationships (whether direct or indirect) and the mobilisation of local surplus.

This tentative distinction between 'household' and 'inter-household' contexts of consumption and discard is reinforced in many ways by macroscopic study of the vessels themselves. The generally strong relationship between probable vessel function and external appearance attests to a set of social expectations as to how and when, and perhaps where, vessels would be used. These regularities were presumably reinforced variously both by collective participation in commensality and by observation and emulation of consumption within smaller social groups. The strongly social dimension of ceramic consumption is also very evident in the general tendency (exceptions to which are hence of great interest) to more elaborate finishing of the exterior surface, visible to onlookers, than of the interior, visible to the consumer – even in the case of open vessels where ease of access by the potter to the interior was not an issue. That the 'Classical Dimini' bowls are striking exceptions to this generalisation further underlines their high value as objects to be admired closely. As in early Late Neolithic Makriyalos I, however, emphasis on collective consumption, literally and figuratively, is counterbalanced by small fine cups and bowls that seem intended for individual consumption.

Encouragingly, this opposition between small- ('household'?) and large-scale ('collective', 'communal', 'inter-household') consumption and discard is a recurrent theme in ongoing and recently completed studies of other classes of material from Makriyalos, suggesting that there should be considerable potential for fruitful integration of these various specialist studies.

References Cited

Allen W. L. and Richardson J. B.

1971 The reconstruction of kinship from archaeological data: the concepts, the methods, and the feasibility. *American Antiquity* 36: 41-53.

Ammerman A. J. and Cavalli-Sforza L. L.

1984 *The Neolithic transition and the genetics of population in Europe.* Princeton, Princeton University Press.

Andreou S. and Kotsakis K.

1994 Prehistoric rural communities in perspective: the Langadas Survey Project. In Doukellis P.N. and Mendoni L.G., eds., *Structures rurales et societes antique*, 17-25. Paris, Les Belles Lettres.

Andreou S., Fotiadis M. and Kotsakis K.

1996 Review of Aegean Prehistory V: The Neolithic and Bronze Age of Northern Greece. *American Journal of Archaeology* 100: 537-597.

Appadurai A., ed.

1986 *The social life of things: commodities in cultural perspective.* Cambridge, Cambridge University Press.

Arnold D. E.

1975 Ceramic ecology of the Ayacucho Basin, Peru: implications for prehistory. *Current Anthropology* 16: 183-205.

1985 *Ceramic theory and cultural process.* Cambridge, Cambridge University Press.

Bailey D. W.

2000 *Balkan Prehistory.* London, Routledge.

Benecke J.

1942 Steinzeitdörfer in den Ebenen am Olymp. Ester Bericht über die Ausgrabungen des Reischsamtes für Vorgeschichte in Griechenland. *Völkisvher Beobachter* 18 februar 1942: 6.

Besios M. and Adaktylou F.

2006 Neolithikos oikismos sta 'Revenia' Korinou. *To Arkhaiologiko Ergo sti Makedonia kai Thraki* 18: 357-366.

Binford L. R.

1965 Archaeological systematics and the study of culture process. *American Antiquity* 32: 1-12.

Bintliff J.

1977 *Natural environment and human settlement in prehistoric Greece*. Oxford, British Archaeological Reports, International Series 28.

Björk C.

1995 *Early pottery in Greece: a technological and functional analysis of the evidence from Neolihic Achilleion, Thessaly*. Astroms Forlag, Jonsered.

Bourdieu P.

1977 *Outline of a theory of practice*. Cambridge, Cambridge University Press.

1990 *The logic of practice*. Cambridge, Polity Press.

Braun D. P.

1983 Pots as Tools. In J. A. Moore and A. S. Keene, eds., *Archaeological Hammers and Theories*, 107-134. New York, Academic Press.

Bronitsky G.

1989 A ceramics manifesto. In Bronitsky G., ed., *Pottery technology: ideas and approaches*, 5-11. Colorado, Boulder, Westview Press.

Broodbank C.

1999 Colonization and configuration in the insular Neolithic of the Aegean. In Halstead, P, ed., *Neolithic Society in Greece*, 15-41. Sheffield, Sheffield Studies in Aegean Archaeology.

Cauvin J.

1992 A propos de l'ouvrage de C. Renfrew: L'énigme indoeuropéenne. Le modèle oriental de la diffusion néolithique. *Topoi. Orient-Occident* (2): 91-106.

Chapman J.

1981 *The Vinča culture of South-East Europe. Studies in chronology, economy and society*. Oxford.

Cherry J. F.

1981 Pattern and process in the earliest colonization of the Mediterranean islands. *Proceedings of the Prehistoric Society* 47: 41-68.

1990 The first colonization of the Mediterranean islands: a review of recent research. *Journal of Mediterranean Archaeology* 3: 145-221.

Childe V. G.

1929 *The Danube in prehistory*. Oxford, Oxford University Press.

Chrysostomou P.

1996 I Neolithiki Katoikisi sti Voreia paraktia Zoni tou Allote Thermaikou Kolpou. *To Archaeologiko Ergo sti Makedonia kai Thraki* 10: 159-172.

1997 O neolithikos oikismos Giannitson B'. Nea anaskafika dedomena. *To Archaeologiko Ergo sti Makedonia kai Thraki* 7 (1993): 135-146.

Coleman J. E.

1977 *Keos I. Kephala, A Late Neolithic settlement and cemetery*. Princeton, American School of Classical Studies.

Collins P. and Halstead P.

1999 Faunal remains and animal exploitation at Late Neolithic Makriyalos: preliminary results. In Halstead, P, ed., *Neolithic Society in Greece*, 139-141. Sheffield, Sheffield Studies in Aegean Archaeology.

Cresswell R.

1972 Les trois sources d'une technologie nouvelle. In Thomas J. and Bernot L., eds., *Langues et techniques, nature et société II: approche ethologique, approche naturaliste*, 21-27. Paris, Klincksieck.

1976 Avant-propos. *Techniques et Culture* 1: 5-6.

Cullen T.

1985 *A measure of interaction among neolithic communities: design elements of the Greek Urfirnis pottery*. Ph.D. dissertation, Program in Classical Archaeology. University of Indiana, Bloomington.

Davis J. L.

1992 Review of Aegean Prehistory I: the islands of the Aegean. *American Journal of Archaeology* 96 (4): 699-756.

Deetz J. D. F.

1965 *The dynamics of stylistic change in Arikara ceramics*. Illinois Studies in Anthropology No. 4. Urbana, University of Illinois Press.

Demoule J.P and Perlès C.

1993 The Greek Neolithic: a New Review. *Journal of World Prehistory* 7: 355-416.

Dennell R.

1992 The origins of crop agriculture in Europe. In Wesley Cowan C. and Watson P. J., eds., *The origins of agriculture. An international perspective*, 71-100. Washington, DC, Smithsonian Institution Press.

Dietler M. and Herbich I.

1994 Habitus et réproduction sociale des techniques: l' intelligence du style en archéologie et en ethnoarchéologie. In Latour B. and Lemonnier P., eds., *De la préhistoire aux misiles balistiques: l'intelligence sociale des techniques*, 202-227. Paris, Editions la Découverte.

1998 *Habitus*, techniques, style: an integrated approach to the social understanding of material culture and boundaries. In Stark M. T., ed., *The archaeology of social boundaries*, 232-263. Washington, DC, Smithsonian Institution Press.

Dobres M.-A. and Hoffman C. R.

1994 Social agency and the dynamics of prehistoric technology. *Journal of Archaeological Method and Theory* 1 (3): 211-258.

Drennan R. D.

1996 *Statistics for archaeologists: a commonsense approach*. Plenum Press.

Ford J. A.

1953 Comment on A. C. Spaulding, 'Statistical technique for the discovery of artefact types'. *American Antiquity* 19: 390-391.

1954 On the concept of types: the type concept revisited. *American Anthropologist* 56: 42-54.

French D.

1972 *Notes on prehistoric pottery groups from Central Greece*. Ms. on file, Athens, British School of Archaeology.

Gallis K. J.

1985 A late neolithic foundation offering from Thessaly. *Antiquity* 59: 20-24.

1992 *Atlas proistorikon oikismon tis anatolikis Thessalikis pediadas*. Larisa, Etairia Istorikon Erevnon Thessalias.

1996 Pottery. Thessaly and Northern Sporades. In Papathanasopoulos G. A., ed., *Neolithikos Politismos stin Ellada*, 120-123. Athens, Mouseio Kikladikis Technis.

Gardner E. J.

1978 *The pottery technology of the Neolithic period in southeastern Europe*. Ph.D. dissertation. Los Angeles, University of California.

Giddens A.

1984 *The constitution of society*. Cambridge, Polity Press.

Gimbutas M., Winn S. and Shimabuku D., eds.

1989 *Achilleion: a neolithic settlement in Thessaly, Greece 6400-5600 BC* (Monumenta Archaeologica 14). Los Angeles, Institute of Archaeology, University of California.

Gosselain O. P.

1992 Technology and style: potters and pottery among Bafia of Cameroon. *Man* 27 (3): 559-586.

Gosselain O. P. and Smith A. L.

1995 The ceramics and society project: an ethnographic and experimental approach to technological choices. In Lindahl A. and Stilborg O., eds., *The aim of laboratory analyses of ceramics in archaeology*, 147-160. *Konferenser* 34.

Grammenos D.

1991 *Neolithikes erevnes stin Kentriki kai Anatoliki Makedonia*. Athens, Tameio Archaeologikon Poron.

Grundmann K.

1937 Magula Hadzimissiotiki: eine steinzeitliche Siedlung im Karla-See. *AM* 62: 56-69.

Halstead P.

1984 *Strategies for survival: an ecological approach to social and economic change in early farming communities of Thessaly, N. Greece*. PhD thesis, University of Cambridge.

1989 The economy has a normal surplus: economic stability and social change among early farming communities of Thessaly, Greece. In Halstead P. and O'Shea J., eds., *Bad year economics. Cultural responses to risk and uncertainty*, 68-80. Cambridge, Cambridge University Press.

1993 *Spondylus* shell ornaments from Late Neolithic Dimini, Greece: specialised manufacture or unequal accumulation? *Antiquity* 67: 603-609.

1994 The North-South divide: Regional paths to complexity in prehistoric Greece. In Mathers C. and Stoddart S., eds., *Development and Decline in the Mediterranean Bronze Age*, 195-219. Sheffield, Sheffield Archaeological Monographs 8.

1995 From sharing to hoarding: The Neolithic foundations of Aegean Bronze Age society. In Laffineur R. and Niemeier W. D., eds., *Politia, Society and State in the Aegean Bronze Age*. Aegaeum 12. Liege, Universite de Liege.

1999 Neighbours from hell? The household in Neolithic Greece. In Halstead, P, ed., *Neolithic Society in Greece*, 77-95. Sheffield, Sheffield Studies in Aegean Archaeology.

Hardin M. A.

1984 Models of decoration. In van der Leeuw S. E. and Pritchard A. C., eds., *The many dimensions of pottery: ceramics in archaeology and anthropology*, 573-614. CINGULA VII, Albert Egges van Giffen Instituut voor Prae- en Protohistoire. Amsterdam, Universiteit van Amsterdam.

Hauptmann H.

1981 *Die Deutschen Ausgrabungen auf der Otzaki-Magula in Thessalien III. Das Spate Neolithikum und das Chalkolithikum.* Bonn, Rudolf Habelt Verlag GMBH.

Hauptmann H. and Milojčič V.

1969 *Die Funde der frühen Dimini-Zeit aus der Arapi-Magula, Thessalien,* Beiträge zur ur- frühgeschichtlichen Archäologie des Mittelmeer-Kulturraumes 9. Bonn, Rudolf Habelt.

Hegmon M.

1992 Archaeological research on style. *Annual Review of Anthropology* 21: 517-536.

1998 Technology, style, and social practices: archaeological approaches. In Stark M., ed., *The archaeology of social boundaries*, 264-279. Washington, DC, Smithsonian Institution Press.

Heurtley W. A.

1939 *Prehistoric Macedonia. An archaeological reconnaissance of Greek Macedonia (West of Struma) in the Neolithic, Bronze and Early Iron Ages*. Cambridge, Cambridge University Press.

Higgs E. S. and Jarman M. R.

1969 The origins of agriculture: a reconsideration. *Antiquity* 43 (169): 31-41.

1972 The origin of animal and plant husbandry. In Higgs E. S. and Jarman M. R., eds., *Paper in economic prehistory*, 3-13. Cambridge, Cambridge University Press.

Hill J. N.

1970 *Broken K Pueblo: prehistoric social organization in the American Southwest*. Anthropological papers of the University of Arizona No.18. Tucson, University of Arizona Press.

Hitsiou E.

2003 *Production and circulation of the Late Neolithic Pottery from Makriyalos (Phase II), Macedonia, Northern Greece*. Unpublished doctoral dissertation. University of Sheffield.

Hodder I.

1982 *Symbols in action*. Cambridge, Cambridge University Press.

1986 *Reading the past: current approaches to interpretation in archaeology*. Cambridge, Cambridge University Press.

1990 *The domestication of Europe*. Oxford, Blackwell.

1992 *Theory and practice in archaeology*. London, Routledge.

Hourmouziadis G.

1971 Dio neai egkatastaseis tis archaioteras Neolithikis eis tin dytikin Thessalian. *Athens Annals of Archaeology* 4(2): 164-175.

1973 *Ta Neolithika idolia ris Thessalias*. Volos, Etairia Thessalikon Erevnon.

1979a *To Neolithiko Dimini*. Volos, Etairia Thessalikon Erevnon.

1979b Eisagogi stis ideologies tis ellinikis proistorias. *Politis* 17: 33.

1980 Eisagogi sto Neolithiko Tropo Paragogis (A' meros). *Anthropologika* 1: 118-129.

1981 Eisagogi sto Neolithiko Tropo Paragogis (B' meros). *Anthropologika* 2: 39-54.

Ingold T.

1988 Tools, minds and machines: an excursion in the philosophy of technology. *Techniques et Culture* 12: 151-176.

1990 Society, nature and the concept of technology. *Archaeological Review from Cambridge* 9 (1): 5-17.

Isaakidou V.

2003 Worked and utilised bone and antler: Practical and cultural rationales for the selection of raw materials. In Kotjabopoulou E., Hamilakis Y., Halstead P., Gamble C. and Elefanti P., eds., *Zooarchaeology in Greece. Recent Advances*, 233-238. London, British School at Athens.

Jacobsen T. W.

1981 Franchthi Cave and the beginning of settled village life in Greece. *Hesperia* 50 (4): 303-319.

Johnson M.

1996 Water, animals and agricultural Technology: a study of settlement patterns and economic change in Neolithic Southern Greece. *Oxford Journal of Archaeology* 15 (3): 267-295

Jones R. E.

1986 *Greek and Cypriot pottery: a review of scientific studies.* The British School at Athens, Fitch Laboratory Occasional Paper I.

Kingery W. D.

1996 Introduction in Kingery W. D., ed., *Learning from things: method and theory of material culture studies*, 1-15. Washington, DC, Smithsonian Institution Press.

Knappett C. J.

1997 *Ceramic production and distribution in Propalatial Crete: technological, economic, and social perspectives.* Ph.D. dissertation. University of Cambridge.

Kolb C. C.

1976 The methodology of Latin American ceramic ecology. *El Dorado: Newsletter-Bulletin on South American Anthropology* 1 (2): 44-82.

1989 *Ceramic ecology, 1988: current research on ceramic materials.* British Archaeological Reports, International Series 513, Oxford.

Kotsakis K.

1983 *Keramiki technologia kai keramiki diaforopoiisi: problimata tis graptis keramikis tis Mesis Neolithikis Epochis tou Sesklou.* Ph.D. thesis. University of Thessaloniki.

1993 *Eisagogi stin proistoriki arxaiologia.* Thessaloniki, Paradoseis Mathimaton.

1999 What tells can tell: social space and settlement in the Greek. In Halstead, P, ed., *Neolithic Society in Greece*, 66-76. Sheffield, Sheffield Studies in Aegean Archaeology.

Kotsakis K. and Halstead P.

2004 Anaskafi sta neolithika Paliampela Kolindrou. *To Arkhaiologiko Ergo sti Makedonia kai Thraki* 16 [2002], 407-15.

Kuzmin Y. V.

2002 The earliest centres of pottery origin in the Russian Far East and Siberia: review of chronology for the oldest Neolithic cultures. *Documenta Praehistorica* XXIX: 37-46.

Lambert N.

1972 Grotte d'Alepotrypa (Magne). *Bulletin de Correspondance Hellénique* 96: 845-871.

Latour B.

1991 Technology is society made durable. In Law J., ed., *A sociology of monsters: essays on power, technology and domination*, 105-131. Routledge Sociological Review Monographs 38. London.

1996 *Aramis or the love of technology*. Cambridge, MA, Harvard University Press.

Law J., ed.

1991 *A sociology of monsters: essays on power, technology and domination*. Routledge Sociological Review Monographs 38. London.

Lechtman H.

1977 Style in technology: some early thoughts. In Lechtman H. and Merrill T. S., eds., *Material culture: style organization, and dynamics of technology*, 3-20. St. Paul, MN, West Publishing Co.

Lemonnier P.

1986 The study of material culture today: toward an anthropology of technical systems. *Journal of Anthropological Archaeology* 5: 147-186.

1992 *Elements for an anthropology of technology*. Anthropological papers. Museum of Anthropology 88. Michigan, Ann Arbor.

1993 Introduction. In Lemonnier P., ed., *Technological choices: transformations in material culture since the Neolithic*, 1-35. London, Routledge.

Leroi-Gourhan A.

1964 *Le geste et la parole I: techniques et langage*. Paris, A. Michel.

1965 *Le geste et la parole II: la mémoire et les rythmes*. Paris, A. Michel.

Longacre W. A.

1970 *Archaeology as anthropology: a case study*. Anthropological papers of the University of Arizona No.17. Tucson, University of Arizona Press.

1981 Kalinga pottery: an ethnoarchaeological study. In Hodder I., Isaac G. and Hammond N., eds., *Studies in honour of David Clarke*, 49-66. Cambridge, Cambridge University Press.

Maniatis Y. and Tite M. S.

1981 Technological examination of Neolithic-Bronze Age pottery from central and southeast Europe and from the Near-East. *Journal of Archaeological Science* 8: 59-76.

Mathew A. J., Woods A. J. and Oliver C.

1991 Spots before the eyes: New comparison charts for visual percentage estimation in archaeological material. In Middleton A. and Freestone I., eds., *Recent Developments in Ceramic Petrology*, 211-263.

Matson F. R., ed.

1965 *Ceramics and Man*. New York, Viking Fund Publications in Anthropology No. 41. Wenner-Gren Foundation.

McGeehan-Liritzis V.

1983 The relationships between metalwork, copper sources and the evidence for settlement in the Greek Late Neolithic and Early Bronze Age. *Oxford Journal of Archaeology* 2 (2): 147-180.

Miller D.

1981 *Form and ideology in material categories*. Paper presented at the third TAG conference, Reading, England, December 14-16.

1985 *Artefacts as categories: a study of ceramic variability in Central India*. Cambridge, Cambridge University Press.

1987 *Material culture and mass consumption*. Oxford, Blackwell.

Milojčič V.

1956 Bericht über die Ausgrabungen auf der Gremnos-Magula bei Larissa 1956. *Archäologischer Anzeiger* 71: 160-163.

1958 *Hauptergebnisse der deutschen Ausgrabungen in Thessalien 1953-1958*. Bonn, Rudolf Habelt.

1972 Neue deutsche Ausgrabungen in Demetrias/Thessalien, 1967-72. *Jahrbuch der Heidelberger Akademie der Wissenschaften* 61-74.

1976 *Die deutschen Ausgrabungen auf Magulen um Larisa in Thessalien*, Beiträge zur ur- frühgeschichtlichen Archäologie des Mittelmeer-Kulturraumes 15 (5-6). Bonn, Rudolf Habelt.

1983 *Die deutschen Ausgrabungen auf der Otzaki-Magula in Thessalien 2: das mittlere Neolithikum. Die mittelneolithische Siedlung*, Beiträge zur ur- frühgeschichtlichen Archäologie des Mittelmeer-Kulturraumes 20. Bonn, Rudolf Habelt.

Milojčič V., Boessneck J., and Hopf M.

1962 *Die deutschen Ausgrabungen auf der Argissa_magula Thessalien, I. Das präkeramische Neolithikum sowie die Tier- und Pflanzenreste*, Beiträge zur ur- und frühgeschichtliche Archäologie des Mittelmeer-Kulturraumes 2. Bonn, Rudolf Habelt.

Milojčič V., von de Dreisch A., Enderle K., Milojčič-v.Zumbusch J. and Kilian K.

1976 *Die deutchen Ausgrabungen auf Magulen um Larisa in Thessalien, 1996: Agia Sofia-Magula, Karagyös-Magula, Bunar Baschi*, Beiträge zur ur- frühgeschichtlichen Archäologie des Mittelmeer-Kulturraumes 15. Bonn, Rudolf Habelt.

Montelius O.

1904 *Die typologische Methode*. Stockholm.

Mueller J. W.

1975 *Sampling in archaeology*. Tucson.

Nandris J.

1970 The development and relationship of the Earlier Greek Neolithic. *Man, Journal of the Royal Anthropological Institute* 5: 192-213.

Nishida M.

2002 Another Neolithic in Holocene Japan. *Documenta Praehistorica* XXIX: 21-28.

O' Brien M. J., Holland T. D., Hoard R. H. and Fox G. L.

1994 Evolutionary implications of design and performance characteristics of prehistoric pottery. *Journal of Archaeological Method and Theory* 1: 259-304.

O' Shea J.

1981 Coping with scarcity: exchange and social storage. In Sheridan A. and Bailey G., eds., *Economic archaeology: towards an integration of economic and social approaches*, 167-183. Oxford, British Archaeological Reports 596, International Series.

Pappa M.

1999 I organosi tou chorou stous neolithikous oikismous tis voreias Pierias. *Arxaia Makedonia, 6o Diethnes Simposio* 2: 873-886. Thessaloniki, Idrima Meleton Xersonisou tou Aimou.

Pappa, M. and Besios M.

1999 The Neolithic Settlement at Makriyalos, Northern Greece: Preliminary Report on the 1993-1995 Excavations. *Journal of Field Archaeology* 26: 177-195.

Pappa M., Halstead P., Kotsakis K. and Urem-Kotsou D.

2004 Evidence for large-scale feasting at Late Neolithic Makriyalos, N. Greece. In Halstead P. and Barrett J., eds., *Food, Cuisine and Society in Prehistoric Greece*, 16-44. Oxford, Oxbow.

Papathanasopoulos G. A.

1971 Archaeologika Chronika. Spilaia Dirou, 1971. *Athens Annals of Archaeology* 4 (3): 289-304.

Perlès C.

1990 L' outillage de pierre taillée néolithique en Grèce: approvisionnement et exploitation des matières premières. *Bulletin de Correspondance Hellénique* 114: 1-42.

2001 *The Early Neolithic in Greece*. Cambridge, Cambridge University Press.

Perlès C. and Vitelli K. D.

1999 Craft specialization in the Neolithic of Greece. In Halstead, P, ed., *Neolithic Society in Greece*, 96-107. Sheffield, Sheffield Studies in Aegean Archaeology.

Pfaffenberger B.

1988 Fetichised objects and human nature: towards an anthropology of technology. *Man* 23 (2): 236-252.

1992 Social anthropology of technology. *Annual Review of Anthropology* 21: 491-516.

Phelps W. W.

1975 *The neolithic pottery sequence in southern Greece*. Ph.D. thesis. London, Institute of Archaeology.

Pilali-Papasteriou A. and Papaevthimiou-Papanthimou E.

1989 Nees anaskafikes erevnes sto Mandalo D. Makedonias. *Egnatia* 1: 17-27.

Plog S.

1980 *Stylistic variation in prehistoric ceramics: design analysis in the American Southwest*. Cambridge, Cambridge University Press.

Pollock S.

1983 Style and information: an analysis of Susiana ceramics. *Journal of Anthropological Archaeology* 2: 354-390.

Pyke G.

1996 Structures and architecture. In Rodden R. J. and Wardle K. A., eds. *Nea Nikomedeia I*, 39-53. London, British School at Athens.

Pyke G. and Yiouni P.

1996 *The excavation and the ceramic assemblage*. Athens, British School at Athens (Nea Nikomedeia I. The excavation of an Early Neolithic village in northern Greece 1964-1981, Rodden J. R. and Wardle K. A., eds.) (BSA, Supplementary vol.25).

Renfrew C.

1970 The burnt house at Sitagroi. *Antiquity* 44, 131-134.

1972 *The emergence of civilization: the Cyclades and the Aegean in the third millennium BC*. London, Methuen.

1973 Trade and craft specialization. In Theocharis D. R., *Neolithic Greece*, 179-191. Athens, National Bank of Greece.

Rice P.

1987 *Pottery analysis: a sourcebook*. Chicago, University of Chicago Press.

1996 Recent ceramic analysis: 1. Function, style, and origins. *Journal of Archaeological Research* 4: 133-163.

Ridley C. and Wardle K. A.

1979 Rescue excavations at Servia 1971-1973: a Preliminary Report. *Annuals of The British School at Athens* 74: 185-230.

Rodden R. J.

1962 Excavations at the Early Neolithic site at Nea Nikomedeia, Greek Macedonia (1961 season). *Proceedings of the Prehistoric Society* 28: 267-288.

1964 Recent discoveries from prehistoric Macedonia. An interim report. *Balkan Studies* 5: 109-124.

Rye O.

1981 *Pottery technology: principles and reconstruction*. Manuals on Archaeology 4. Washington, DC, Taraxacum.

Sackett J. R.

1982 Approaches to style in lithic archaeology. *Journal of Anthropological Archaeology* 1: 59-112.

1986 Style, function, and assemblage variability: A reply to Binford. *American Antiquity* 51 (3): 628-634.

1990 Style and ethnicity in archaeology: the case for isochrestism. In Conkey M. W. and Hastorf C. A., eds., *The uses of style in archaeology*, 32-43. Cambridge, Cambridge University Press.

Sahlins M.

1974 *Stone Age economics*. London.

Schachermayer F.

1976 *Die agaische Frühzeit, I: die vormykenischen Perioden.* Vienna, Austrian Academy of Sciences.

Schiffer M. B. and Skibo M.

1987 Theory and experiment in the study of technological change. *Current Anthropology* 28 (5): 595-622.

1997 The explanation of artifact variability. *American Antiquity* 62: 27-50.

Schneider G., Knoll H., Gallis K. and Demoule J-P.

1991 Transition entre les cultures néolithiques de Sesklo et de Dimini: Recherches minéralogiques, chimiques et technologiques sur les céramiques et les argiles. *Bulletin de Correspondance Hellènique* 115 (1): 1-64.

Shanks M. and Tilley C.

1987 *Social theory and archaeology.* Albuquerque, University of New Mexico Press.

Shepard A. O.

1976 *Ceramics for the archaeologist.* Washington, DC, Carnegie Institution of Washington.

Sherratt A.

1997 *Economy and society in prehistoric Europe.* Edinburgh, Edinburgh University Press.

Sillar B. and Tite M. S.

2000 The challenge of 'technological choices' for material science approaches in archaeology. *Archaeometry* 42 (1): 2-20.

Sinopoli A. O.

1991 *Approaches to Archaeological Ceramics.* New York, Plenum Press.

Skibo J. M.

1992 *Pottery function: a use-alteration perspective.* New York, Plenum Press.

1999 Pottery and People. In Skibo, J. M. and Feinman, G. M., eds., *Pottery and People: a Dynamic Interaction*, 1-8. Foundations of Archaeological Inquiry, The University of Utah Press.

Skourtopoulou E.

1997 Oi lithotechnies apolepismenou lithou sto neolithiko Makriyalo. Ta prota stoicheia. *To Archaeologiko Ergo sti Makedonia kai Thraki* 10 (1996): 259-277.

Spaulding A. C.

1954 Reply to Ford. *American Antiquity* 19: 391-393.

1960 Statistical descriptions and comparison of artefact assemblages. In Heizer F. R. and Cook S. F., eds., *The application of quantitative methods in archaeology*, 60-92. New York.

Stanislawski M. B. and Stanislawski B. B.

1978 Hopi and Hopi-Tewa ceramic tradition networks. In Hodder I., ed., *The spatial organisation of culture*, 61-76. London, Gerald Duckworth.

Stark M. T.

1995 Economic intensification and ceramic specialization in the Philippines: a view from Kalinga. *Research in Economic Anthropology* 16: 179-226.

Stark M. T., ed.

1998 *The archaeology of social boundaries*. Washington, DC, Smithsonian Institution Press.

Strange J. F.

1989 Beyond socio-economics: some reactions to. In Blakeley J. A. and Benett W. J., eds., *Analysis and publication of ceramics*, 23-30. Oxford, British Archaeological Reports, International Series 551.

Theocharis D. R.

1973 *Neolithic Greece.* Athens, National Bank of Greece.

1980 To Neolithiko spiti. *Anthropologika* 1: 12-14.

1981 *Neolithikos Politismos*. Athens, Morfotiko Idryma Ethnikis Trapezis.

Tite M. S.

1972 *Methods of physical examination in archaeology*. New York, Academic Press.

Tomkins P.

2004 Filling in the "Neolithic Background": Social Life and Social Transformation in the Aegean Before the Bronze Age. In Barrett J. and

Halstead P., eds., *The Emergence of Civilisation Revisited*, 38-63. Oxford, Oxbow Books.

2007 Communality and competition: the social life of food and containers at Aceramic and Early Neolithic Knossos, Crete. In Renard J. and Mee Ch., eds., *Cooking up the Past*, 174-199. Oxford, Oxbow.

Tomkins P. and Day P.

2001 Production and exchange of the earliest ceramic vessels in the Aegean: a view from Early Neolithic Knossos, Crete. *Antiquity* 75: 259-60.

Treuil R., Darque P., Poursat J.-Cl. and Touchais G.

1989 *Les civilisations égéennes du Néolithique et de l' Age du Bronze*. Presses Universitaires de France.

Tringham R. and Krstic D.

1990 *Selevac: a Neolithic village in Yugoslavia* (Monumenta Archaeologica 15). Los Angeles, Institute of Archaeology, University of California.

Tsokas G., Sarris A., Pappa M., Besios M., Papazachos C., Tsourlos P. and Giannopoulos A.

1997 A large scale magnetic survey in Makriyalos (Pieria), Greece. *Archaeological Prospection* 4: 123-137.

Tsountas Ch.

1908 *Ai Proistorikai Akropoleis Diminiou kai Sesklou.* Vivliothiki Arxaiologikis Etaireias 14. Athens.

Tsuneki A.

1989 The manufacture of *Spondylus* shell objects at Neolithic Dimini, Greece. *Orient* 25: 1-21.

Urem-Kotsou D.

2006 *Neolithiki Keramiki tou Makrigialou: Diatrofikes Sunithies kai oi Koinonikes Diastasis tis Keramikis*, PhD dissertation. Department of History and Archaeology, Aristotle University of Thessalonikis.

Urem-Kotsou D. and Kotsakis K.

2007 Pottery, cuisine and community in the Neolithic of North Greece. In Renard J. and Mee Ch., eds., *Cooking up the Past*, 225-46. Oxford, Oxbow.

Valamoti S.

1999 Charred plant remains from Makriyalos: preliminary observations. In Halstead, P, ed., *Neolithic Society in Greece*, 136-138. Sheffield, Sheffield Studies in Aegean Archaeology.

van Andel T. and Runnels C.

1995 The earliest farmers in Europe. *Antiquity* 69 (264): 481-500.

van der Leeuw S. E.

1976 *Studies in the technology of ancient pottery*. Amsterdam, Organization for the Advancement of Pure Research.

1984 Dust to dust: a transformation view of the ceramic cycle. In van der Leeuw S. E. and Pritchard A. C., eds., *The many dimensions of pottery: ceramics in archaeology and anthropology*, 709-775. CINGULA VII, Albert Egges van Giffen Instituut voor Prae- en Protohistoire. Amsterdam, Universiteit van Amsterdam.

1993 Giving the potter a choice: conceptual aspects of pottery techniques. In Lemonnier P., ed., *Technological choices: transformations in material culture since the Neolithic*, 238-288. London, Routledge.

van der Leeuw S. E. and Pritchard A. C., eds.

1984 *The many dimensions of pottery: ceramics in archaeology and anthropology*. CINGULA VII, Albert Egges van Giffen Instituut voor Prae- en Protohistoire. Amsterdam, Universiteit van Amsterdam.

van der Leeuw S. E., Papousek D. A. and Coudart A.

1991 Technical traditions and unquestioned assumptions: the case of pottery in Michoacan. *Techniques et Culture* 17-18: 145-173.

Vitelli K. D.

1989 Were pots first made for foods? Doubts from Franchthi. *World Archaeology* 21: 17-29.

1991 The possible uses of plant extracts by prehistoric potters. *Paper presented at the 1991 SAA meeting*. New Orleans, Los Angeles.

1993 *Franchthi neolithic pottery, 1; classification and ceramic phases 1 and 2* (Excavations at Franchthi Cave, Fascicle 8). Indiana University Press, Bloomington.

1999a 'Looking up' at early ceramics in Greece. In Skibo J. M. and Feinman G. M., eds., *Pottery and people: a dynamic interaction*, 184-198. Foundations of Archaeological Inquiry, University of Utah Press.

1999b *Franchthi neolithic pottery, 2; the Later Neolithic ceramic phases 3 to 5* (Excavations at Franchthi Cave, Fascicle 10). Indiana University Press, Bloomington.

Vlachos D.

2000 Efarmoges GIS stin archaeologiki epifaneiaki erevna: to paradeigma ton Paliambelon Kolindrou, MA thesis. Thessaloniki.

Wace A. J. and Thompson M. S.

1912 *Prehistoric Thessaly*. New York, AMS Press.

Washburn D.

1977 *A symmetry analysis of Upper Gila area ceramic design*. Cambridge, Massachusetts, Harvard University Press.

Weinberg S. S.

1970 The Stone Age in the Aegean. *Cambridge Ancient History I, Part I*, 557-672. Cambridge, Cambridge University Press.

Weisshaar H. J.

1989 *Die deutschen Ausgrabungen auf der Pefkakia Magula in Thessalien, 1: das späte Neolithikum und das Chalkolithikum*, Beiträge zur ur-frühgeschichtlichen Archäologie des Mittelmeer-Kulturraumes 28. Bonn, Rudolf Habelt.

Wiessner P.

1984 Reconsidering the behavioral basis for style: A case study among the Kalahari San. *Journal of Anthropological Archaeology* 3: 190-234.

1989 Style and changing relations between the individual and society. In Hodder I., ed., *The meaning of things. Material culture and symbolic expression*, 56-63. London, Unwin Hyman.

Wijnen M.

1993 Early ceramics: local manufacture versus widespread distribution. In Roodenberg J., ed., Anatolia and the Balkans. *Anatolica* 19: 319-331.

Wobst H. M.

1977 Stylistic behavior and information exchange. In Cleland C. E., ed., *Papers for the Director: research essays in honor of James B. Griffin*, 317-334. Anthropological Papers No. 61. University of Michigan, Museum of Anthropology, Ann Arbor.

Yiouni P.

2004 Counting pots in Early Neolithic Greece. *Annual of the British School at Athens* 99: 1-22.

Zachos K.

1990 The Neolithic period in Naxos. In *Cycladic Culture. Naxos in the third millennium BC*, 29-38. Athens, N. P. Goulandris Foundation, Museum of Cycladic Art.

2007 The Neolithic background: a reassessment. In Day P. M., Doonan R. C. P., eds., *Metallurgy in the Early Bronze Age Aegean*, 168-206. SSAA 7.

Zhang C.

2002 The discovery of early pottery in China. *Documenta Praehistorica* XXIX: 29-35.