DEPOSITION AND DISLOCATION OF POTTERY AS SURFACE ASSEMBLAGES IN SEMI ARID REGIONS

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AYLİN TUNÇER

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Approval of the Graduate School of Social Sciences

Prof. Dr. Sencer Ayata
Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science.

Prof. Dr. Numan Tuna
Head of Program

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.

Assoc. Prof. Dr. Murat Güvenç
Supervisor

Examining Committee Members

Assoc. Prof. Dr. Murat Güvenç (METU, CP)

Prof. Dr. Numan Tuna (METU, SA)

Assoc. Prof. Dr. D. Burcu Erciyas (METU, SA)

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

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ABSTRACT

DEPOSITION AND DISLOCATION
OF
PLOUGH-SOIL ASSEMBLAGES
IN SEMI-ARID REGIONS

Tunçer, Aylin

M.Sc. Settlement Archaeology Graduate Program

Supervisor: Assoc. Prof. Dr. Murat Güvenç

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This thesis aims to discuss the archaeological concerns about how surveys can provide data that is meaningful to construct spatial patterning and its intricacies for inferences through altering processes diversified as cultural and natural processes. Along with that there is also a second concern dealing with the application of these theoretical issues to practical basis. It consists both methodological limits and also limits governed by the legislation of the particular area according to the aim of the study. A particular space, semi-arid climate, is selected for comparing the amount of attrition and accretion caused by natural factors, to be able to apply the studies to Anatolian geography. However applications from around the world are frequently discussed here, these are mainly the case studies bringing methodological scheme for the appropriate data collection.

Keywords: Survey, spatial patterning, cultural processes, natural processes, semi-arid climate, attrition, accretion.

ÖZ

YARI KURAK BÖLGELERDE TARIM TOPRAĞINDA YÜZEY MALZEMESİNİN BİR ARAYA TOPLANMASI VE YER DEĞİŞTİRMESİ

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Bu tezin amacı, yüzey araştırmalarının mekansal biçimlenme ve onun çıkarımlarıyla ilgili ayrıntılarının, kültürel ve doğal oluşumlar diye ayrılan değişim süreci yoluyla oluşturmada nasıl anlamlı veriler sağlayabileceği hakkında, arkeolojik ilgi konularını tartışmaktır. Bununla beraber ikinci sorun ise bu teorik konuların uygulamaya aktarımıdır. Bu çalışmanın amacına yönelik olarak belirtilen bölgede, hem metodolojik limitler hem de kanunlar tarafından çizilen sınırları içermektedir. Özel bir alan olarak yarı-kurak iklim, Anadolu coğrafyasındaki çalışmalara uygulayabilmek için doğal faktörlerin doğurduğu aşınma ve birikme miktarını karşılaştırmak için seçilmiştir. Ne var ki dünyanın farklı ülkelerinden uygulamalar burada pek çok kez tartışılmaktadır, bunlar daha çok uygun veri toplamak için metodolojik çerçeve sağlayan özel çalışmalardır.

Anahtar Kelimeler: Yüzey araştırması, mekansal biçimlenme, kültürel süreçler, doğal süreçler, yarı-kurak iklim, aşınma, birikme.

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ABBREVIATIONS

CE	Council of Europe
ICCROM	International Centre for the Study of Preservation and Restoration of Cultural Property
ICOMOS	International Council of Monuments and Sites
MAP	Mediterranean Action Plan
OAS	Organisation of American States
PAP	Priority Actions Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Education, Science and Cultural Organization

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CHAPTER I

INTRODUCTION AND PROBLEM FORMATION

This study overviews new archaeological survey strategies and the interpretation of data recovered from such studies. It intends to examine of the governmental control and the contribution of intensive queries. Although there is a large amount of intensive surveys aiming to seek ancient settlement patterns, the lack of such studies and the lack of understanding in surveying as a prerequisite for cultural heritage management, prohibits the new management procedures used for handling regional heritage registration and documentation. This would enable historians by combining survey assets on economy, population, social and political organisation, to create more discussions concerning settlement patterns through archaeological data,

This study covers subjects like testing erosion in semi-arid areas, but it doesn't cover experimenting a specific region to idenfy natural and cultural processes. Rather, I selected to make a general overview of the theoretical thought on these processes and handling it in surface surveys. This thesis also excludes the legislative aspect of surveying in Turkey, instead that I aim to take up the impact of international laws on Turkish decision. I would like to suggest surface surveying as a good and effective method for documenting archaeological heritage items in semi-arid countries, such as Turkey.

My first concern during this study was to investigate the representation of settlement types in archaeological surveys, i.e. agricultural lands; refuse areas; temporary camps and semi-permanent camps for hunting, butchering, harvesting, pasturing, trading; routes; mining, production and ritual areas; military camps and structures for defence through surface detection.

My second concern was the taphonomic processes arteficial deposits go through to become a dead assemblage and how it can be controlled using a specific surveying technique. Here only surface surveying is considered, to monitor only the surface processes and their management by using surface assemblages. Delimitation of surface clusters to sherd clusters is as a result of their abundance in surveys, compared to stone objects, rarity of metal objects regarding their response to aerobic conditions and recuration and unreliability to organic bone finds that can only be interpreted within a context.

It is important to consider riverine processes changing geomorphology rapidly through cutting and alluvial accumulation (Kirkby *et al.* 1976: 229), especially in the Mediterranean area. These factors are so important considering survey data, which leaves us only with a sample of surface clusters. The effort of gathering data should be considered under these circumstances, because considering the time and budget spent on surveys, there should be a knowledge of geomorphology not to be lost in the tresholds by applying wrong methodology.

Archaeological survey is a research technique to investigate a specific area for a specific purpose on human impact. It is achieved through identifying the function of sites from artefact scatters. The knowledge of natural and cultural processes helps us to distinguish the amount of wear settlements pass through. They are the two causes for alteration of surface material through time. Therefore strategies, apart from the period and type of sites the team intends to discover, depend both on the geological, geomorphological, climatical, sedimentological, floral and faunal characteristics of the region (Boismier 1991: 11) and the effects of construction and cultivation activities (Schofield 1991: 3).

The archaeological record is an incomplete set of artefact scatters obtained by ground recovery and statistical inference, which constricts the spatial analysis within a site. The role of surface scatters in archaeological surveys to define settlement patterns, particularly in semi-arid regions and the role it plays on heritage management through bringing efficiency in storing data will be the main issue the thesis aims to achieve.

Aerial photographs aid us in designing our research orientation. There is limited possibility of seeing subsurface architectural features, however in older plates as northern Europe, the flat landsurface produces good results from cropmarks provided by aerial photographs, in our country the results are relatively low regarding the rough geomorphology, concealing some of the sub-surface obstrusions covered by shadows caused by the mountains and valleys.

Relation of surface and subsurface archaeology became important both in regional and site surveys seeking the answer for “how much sampling represents the subsurface?”. It is a fact that erosional factors and soil clusters affect the artefact distribution a great deal (Tuna 1994:624) together with the agricultural activities. However some of these studies, i.e. augering, shovel test pitting, and post-hole testing, are not allowed to be proceeded during surface surveys in Turkey, because they are considered as excavating.

This study can be supplemented with other archaeological investigation for a thorough research. One of this studies are sub-surface testing. Sub-surface testing is both useful to cross check of obstrusion in the region and also it is a way to control alluvial fills and other low visibility areas where there is thick vegetation growth. Regarding the undertaking of time and money investment, sub-surface testing has to be in lesser ratio than the surveyed grids.

One other way of cross checks is done by regional excavations. Regional excavations are important for the criteria of settlement organisation, that is the arrangement of living quarters and dating regional pottery, which is usually the only tool to date surface assamblages. If there is a way to identify fabrics according to periods, that is to say that if certain firing techniques and clays are preferred for specific perids, it is important to make a fabric classification to use for survey material.

A further research technique is geophysical investigations. Geophysical investigations are only meaningful when an earlier survey or excavation study agreeing on the high possibility of buried living space. Using these techniques new avenues in the world of archaeology appeared. They bring a newer perspective on where to excavate and develop broader questions for excavation. Geomagnetic susceptibility on the other hand provides information pertaining to chemical composition to determine special activity areas as middens, sheepfolds and ditches. Therefore acts as a supplementary technique to surface surveying.

The problem of associating fossil records, in other words surface scatters, with space was roused first in 1960s (Binford 1964:136). "Probability sampling" is a statistical approach introduced to archaeology for handling the fossil record to locate sites (Binford 1964: 140,151). By using statistical strategies in defining pattern, archaeologists can more securely mention the settlement patterning, and issues like population, periodical ratio of sites and general estimates like site sizes, densities and types throughout the survey region. Because they are then dealing with a particular proportion of land that supports such deductions.

Yet surveying is a developing technique trying to bring theoretical discussions to measurable terms and criteria. There is a continuous development in surveying techniques and tools. The reason for this is the possibility to generate a fuller picture about the complete settlements using these technique, answering queries for settlement patterning.

To sum up I intended to explain the effectiveness of surface surveying in archaeological heritage management by means of registration and documenting the condition of buildings and sites. There is a growing interest in documenting archaeological sites throughout Europe and handling the land surface data by dividing them under the responsibility of regions or counties. Such an attempt helps researchers focus on well set objectives and provides a better reconnaissance to organise the study on a clearer set of questions.

The chapters are set according to the organisation of hypotheses. They are arranged in a way to set the technique and its development first. Then defining and setting the problems of natural and cultural processes. Then defining the methodology to identify these processes in archaeological record and last area of study is the application of this study in Turkey.

The first chapter gives a review of development of surveying and general trends used as surveying methodology from 16th century onwards.

The second chapter explains natural processes and their effects on surface survey data. It intends both to explain factors of attrition and accretion requiring different strategies for the archaeologist to make a meaningful assessment.

The third chapter sets man made activities influencing survey data. Human activities are one reason in the altering of archaeological data. It is given under two sets: Formation of archaeological record and post-depositional factors of resettlement and ploughing.

The fourth chapter identifies the methods relevant for archaeological surveying, including aspects of naming human activity spaces, statistical sampling and how visibility affects the data.

In the conclusion provides an overview on operation of surveys in Turkey. There is a growing interest on defining the site boundaries and the amount of destruction caused by natural and cultural processes. The research of the processes are a result of the query of archaeology to determine the measurement of sites for spatial calculations. On the other hand, it intends to explain the reflections of government control over surface surveying.

CHAPTER II

LITERATURE REVIEW

Archaeological research tries to explain human behaviour through material evidence and spatial organisation of human activities in settlements (Banning 2002: 7) and off-site areas such as hunter-gatherer camps, kill sites, rubbish disposal areas, irrigation channels reflect socio-economic aspects of human – environment interaction (Banning 2002: 11). Surface survey gives us idea about the prehistoric use of landscapes, settlement hierarchy, human behaviour (Banning 2002: 1) and provide quasi-statistical data, from the sample of artefacts. This data consists of samples of surviving historical surface material belonging, made of abraded pieces of non-dated sherds, that can even be modern, hence problematic. In counting, same sherd might be broken and becomes two sherds or many.

Archaeologists should be aware of the character of the data used in statistical analyses, the effects of earlier formations should be considered and meaningfully related with the outcoming data (Tuna 1994: 623). Modern recording techniques fully rely on these factors. This requires knowledge of statistical techniques according to the needed situation, which recently can be provided by text books full of examples for situations that can be faced during an archaeological expedition.[1]

Surveys begin in 16-17th centuries with researchers like Leland and Camden as excavation prospection , a method to discover sites (Orton 2000: 68). Surface surveying was based on reconnaissance studies to previously acknowledged places. In 18th century there was an attempt to relocate ruined Central American cities and in Europe there were visits to spots led by guides

[1] See Orton 1980, Shennan 1997, Hodder *et al.*1976

and porters (Banning 2002: 2). This was the initiation to survey query, still used to register sites and monuments announced to city museums. In 1920s the methodology is defined by W. C. Clark in his guideline for amateur prehistoric lithic collectors where an arable land is chosen for study, and a systematic search is taken to identify high density clusters (Banning 2002: 3).

Spatial patterning became a concern after O. G. S. Crawford detected cropmarks during the flights in the First World War draw the attention in Northeast Europe to landscape archaeology (Collins *et al.* 2003: 5). Europe is very adventageous for such studies, because it lies on an old plate and high amount of flat lands making cropmarks easily noticed. Landscape archaeology studies the interaction between human and environment focusing on farms, villages, burial monuments and ancient field walls and ditches (Banning 2002: 4, 13). Alfred Kidder, one of the leading American anthropologists, used these methods in his survey of nine river drainages in Southwest America (Collins *et al.* 2003: 5).

Systematic surveys especially took the advantage of mechanical agriculture replacing old ox-ploughs after 2nd World War. The soil is cut deeper and therefore obstrusion of material above the ground becomes easier. South Etruria Survey (J. Ward – Perkins) an early investigation, considered changes in character in pottery assemblages and density distribution of off-site material through time to gather data about hunter-gatherer activities (Stoddart *et al.* 1991: 142). The survey were considered every scatter as sites and the attempt to define population level (Keay *et al.* 1991: 129). This of course is a major weakness. Because activity areas are not confined to sites and population assessments are directly dependent on the number of sherds. Contributions of attribute characteristics of activity areas now help us better to understand the nature of activities taking place in a specific area.

The idea of covering a region to understand settlement patterns brought new aspects to the methodology and interpretation, Virú Valley survey (Willey 1953) in Peru constitutes an early example for such surveys. The quest of estimation of settlement densities and numbers rose with the search of settlement patterns (Renfrew *et al.* 1991: 28) trying to provide analysis of settlement patterning, subsistence, population and density with temporal, functional, ecological and social questions (Banning 2002: 5). Consequently a fuller picture of distribution maps were possible to draw and pulled the attention of archaeology to the formation processes rather than art historical concerns.

The problem of associating fossil records, in other words surface scatters, with space was raised first in 1960's (Binford 1964:136). "Probability sampling" is a statistical approach introduced to archaeology for handling the fossil record to locate sites so as to represent culture development and change in settlements (Binford 1964: 140,151). However the sampling was a tool to cover larger plots just by surveying a low percentage of spot sites (Binford 1964: 154) and provide representative deductions from a region (Orton 2000: 68).

Post-processual view sees site as the basic survey unit that bounds the activity area and that according to D. L. Clarke it is the beginning of the 'loss of innocence' in archaeology. Richard Bradley suggests that it corresponds to a 'loss of nerve' in TAG group. Some of these methodologies and theories have their own validity in post-processual thought. 'Good survey requires a flexibility of mind and a willingness to solve new problems as they rise', therefore the strategy is not only a recipe to apply to each study, rather a strategy to be taken according to the character of the yielding data (Millet 2000b: 92). Also the postprocessual archaeology is interested in mindscapes "trying to see surveyed landscapes through the eyes of past occupants" (Bintliff 2000c: 8) by the outsider concept "understanding of the longer-term development paths to that inner world of "mentalités" (Bintliff 2000c: 7).

This was a clearcut change in understanding and identifying spatial organisation of human activities. Actually this was a gradual change rather than an abrupt one. Its phases are the observation of traces for settlement units with aerial photographs and the maturity of theoretical discussions and followed finally by the application of statistical strategies to measure formulations of surface assemblages to allow new studies.

There is a great change in location and collection techniques in the last three decades. The type of surveying is very important to set depending on the type of question asked, and the way the data is going to be analysed. There are two types of surface survey, depending on the area to be covered and the quantity of reconnaissance provided by previous studies and archaeological literature. These are extensive and intensive surveys. A region is first surveyed for locations with an extensive survey and later intensive survey is followed to cover spatial patterning.

All New Wave surveys require extensive fieldwalking, recording off-site material as well as onsite; periodical phasing of materials on site to access fluctuating site sizes (Bintliff 2000c: 3). On the other hand a branch evolved from theoretical developments helped archaeologists to formulate their interpretation through social and economic systems. Behavioural signs left by humans can be related to activity patterns. Hence the emergence of necessary terms "on-site, off-site and non-site scatters" are borrowed from anthropological surveys (Keay *et al.* 1991: 129), which can be related to ploughing, manuring, ditch digging or habitation spaces. This concern grew in two directions: The first focus was on whole landscape using aerial photographs, not individual sites to get a picture of social and economic context. The second, focused on site formation processes, ploughzone scatters and its relation to subsurface (Keay *et al.* 1991: 130).

Extensive surveys cover large sampling areas, stratified according to geomorphological characteristics and divided into broad transects with systematically fixed sampling points (Van de Velde 2001: 30). These are landscape based, rather than site based surveys along with geophysical and geochemical prospections in gridded analytical treatment of artefact quantification for disposal pattens and their survival rate and other patterns occurring on the phough-zone are the recent concerns (Bintliff *et al.* 2000b: 1). It is especially a good technique, where soil visibility is very low, and where sampling points can be cleared from all sorts of vegetation (Van de Velde 2001: 34).

Minnesota Messenia Expedition in 1972 (McDonald and Rapp) depended on grab and judgement sampling. It is a pioneer extensive survey in new wave era, in which reconnaissance was based on visiting the informed spots by jeep and stratification of the region surveyed with geomorphological concerns (Alcock

2000: 1). This study was concerned with archaeological heritage management, sophistication in data collection, strategical landscape zoning and settlement studies. It, first of all aims, conservation and non-destructive method encouragement (Bintliff *et al.* 2000b: 1).

Extensive survey may present some biases which are taken up in intensive surveys from concentrating on some regions related to the stratification of the land into ecological zones. This causes arteficial knowledge barriers in the design as the obstruction due to visibility or geographical obstrusive elements.

1975 onwards intensive surveys take place. One other concern with the new scope intensive surveys is the 'insider' approach, the phenomenological perspective of ancient mentalités dialogic with the 'outsider' behavioural approach through the landscape. This is to model 'community areas' or 'Siedlungskammern' through the landscape in different period as a part of landscape analysis. This way a fuller spatial analysis of archaeological data is achieved (Bintliff *et al.* 2000b: 2).

Extensive surveys for site recovery are followed by intensive surveys by first recording entire land surface material in the surveyed zone and the character or the debris, and computer aid to analyse surface material as GIS and multivariate analyses (Bintliff *et al.* 2000b: 2). Intensive surveys started in late 1970s in Greece (Jerry van Andel, Curtis Runnels, 1987), where the entire landsurface was close-order fieldwalked to define site sizes and types. Intensive systematic surveys begin and bring together the quantification of off-site and low density scatters. Boeotia survey introduced clickers for counting sherds, but this way all assemblage was counted not considering their dates. Hvar survey followed a total collection, where all artefacts were bagged. Although such quantification is not common, yet Gallant's recommendation on regional visibility and density is widely used throughout surveys. In Hvar all artefacts are quantified and weighed from 10 X 10 m grids from surface and subsurface. The concern on how much area covered by surveyors, Hvar covered less than a km in one season, whereas the speed of surveyors differ according to the intensity of the survey (Fentress 2000: 44).

The information also contributes to analyses on settlement hierarchy and land utilisation. The specialists were not adequate in all periods, therefore periods out of focus were either represented with a few sherds, usually not dated correctly. This is also still true for almost half of the pottery in medium size specialists surveys (see the section on sampling). There is a pitfall also considering periods that pottery was not used as much as other periods to be underrepresented.

However the lack of new wave surveys along with the novelty in methodology and interpretive essence by the provided survey data are:

1) The omission or inadequate nature of data on periods apart from the focus,
2) Contemporaneity relying on broad phases of several hundred years' length,
3) The neglection of vestigial sites, obscured sites and sites that appear episodically on surface,
4) Inability to represent scatters with occupational phases for small frequency periods,
5) Social and economic inference across entire landscape is limited,
6) No interpretation on phenomenological perspective (Bintliff 2000c: 3).

Together with the data on size, density, wear of artefacts; archaeologists are also interested in the context of artefacts. There has been a shift from locating sites to defining settlement patterns through time and also locating archaeological landscapes. Landscape archaeology is a complex field of investigation applied to unique, colossal, stratified studies equal to urban archaeology. Landscape archaeology is composed of all applications, methodologies and technics of surface archaeology. These technics are (Cambi 2000: 72):

1) aerial photogrammetry and remote sensing,
2) geographical prospection,
3) paleoclimatical research,
4) drilling and shovel tests,
5) all types and intensive recognition (Cambi 2000: 73).

Novelties following mechanical agriculture have brought the methodology to a refinement, where 10 or 15 m² grids are used as units of analysis. It becomes extremely intensive using geophysical techniques we can even trace the outlines of the subsurface structures (Collins 2003: 63-94). Besides using magnetic susceptibility (Collins 2003: 94) archaeologists can firmly identify middens and habitation areas, which can together lessen the amount of destruction stemming from excavations.

Site boundaries are important for settlement patterns, and the theoretical framework is therefore an initial act for determining techniques for surveying. Practical implication only develops under the enlightment of spatial analysis techniques, to see their availability considering natural and cultural processes. Experimentation and computer simulations are techniques to set the practical implication from these studies.

CHAPTER III

NATURAL PROCESSES

Wind, flood and rain erosion; alluviation; horizontal ploughing; burrowing animals; plant root and vertical movement of artefacts are post-depositional events affecting data after abandonment (see fig. 1). The initial debris mound sits on a slope of 30º and accumulation first starts with in the building. As walls are eroded a movement starts from inside to outside (Kirkby *et al.* 1976: 231). They influence the survival rate in response to natural factors, which may cause swifter deteriotation than other conditions. Vertical movement is the cause for obrstrusion of pottery on the surface as a result of biological turbation, freeze and thaw action, as a response of cyclic expansion and contraction of clay (Schiffer 1987: 280).

Natural processes are first diversified into two broad groups the subractive (slope gradient, time, climate, vegetation) and additive erosion (aeolian, colluvial and alluvial sedimentation). Apart from additive and subtractive processes others processes also cause vertical displacements. But if all these patterning can be distinguished analytically, the management of these problems can be a matter of issue (Boismier 1991: 15). The density and slope gradient help to calculate through "uni", "bi" and "multivariate" combinations a pattern and its erosional or depositional attributes (Boismier 1991: 18).

Geomorphology is an important factor acting on exposing and screening prehistoric material. Preservation and discovery of sites depend upon configuration of exposure of preserved fossilised landforms on the correct stratigraphic level. Sand dunes redeposit artefacts and alluvial fans conceal them but leaving swathe cuttings for their obstrusion. Erosion has been studied both in the field and in the laboratory conditions (Mallone 2000: 100). Results confirm Kirkby's.

All these intensive surveys suffer from biasing factors as geomorphology, fieldworker's recognition and weather conditions. However it is not always to account for all these biases in measuring site size. Topographical constraints are helpful to limit site sizes. They are usually registered by a few sherds (Mallone 2000: 101). In Calabria sherd size was to assess non depositional processes, just like in Polesine, where they used for determining surface rubbish pits.

Geomorphological problems brought strategies to be integrated with excavation. In Kephala survey, it is overcome by observations of surface and subsurface material. At San Marco Survey, it is followed by excavation, where large size pottery distribution in excavations occur in dispersal position in the upper ploughsoil. Alto-Medio Polesine – Basso Veronese Project (Fabbrica dei Soci) was concerned on by combining aerial photos, stratigraphy, sediments and phosphate level analyses. Also remote sensing techniques (resistivity, magnetometer, and ground penetrating radar) can be used to understand subsurface processes (Mallone 2000: 101).

Two processes; displacement and attrition (decomposition of sherds) are discussed. Abrasion is a general problem faced in the surveys. The information on the abradability is important to see the duration of taphonomy and the character of the material. Decoration, finishing and form have impacts on abradability. In Riu Mannu Survey, texture and fabric were the main focus in analysis. Better fired, artefacts are more probably survive in ploughsoil (van Dommelen 2000: 27). Agricultural practices like terracing, setting dry wall around the field or removal of large artefacts like tiles and amphora bodies (spietramento) should also be considered. Collection strategies and visibility as well as occurrence and preservation of pottery are important (van Dommelen 2000: 28).

Attritional processes result from fluvial and aeolian abrasion (Schiffer 1987: 273), patination caused by sand-blasting, erosion and chemical reactions (Schiffer 1987: 274). The post-depositional accretion are as a result of caliche, accretional desert varnish and accumulation of lichens (Schiffer 1987: 278) that brings analysis under laboratory conditions.

"Attrition"is a process which act destructively upon artefacts. It can not only alter the total quantity of sherds which survive, but the composition of an assemblage as a whole.

"Displacement processes" involve the physical movement of artefacts within the ploughsoil. It can also alter the composition of surface scatters if acting unevenly in exposing certain materials or parts of an assemblage. Attrition and displacement blur and destroy characteristics of the assemblage. The impact of attrition is studied in the Laboratory of Traditional Technology in the University of Arizona to understand the nature and breakdown rates of pottery. This study showed three important processes in ploughsoil as impact, abrasion and frost wedging (Taylor 2000: 19).

Abrasion leads to deformation and removal of material on the surface through mechanical contact, scraping, sliding and striking action of an abrader. In ploughsoil, the factors are soil particles, other objects within the soil and the surfaces of tilling equipment. The affect of abrasion does not alter the object so much, however the damage on the surface makes them undatable. When considering a site within its lithology, microclimate and agricultural regime the study becomes more plausible. Abrasion resistance or abradibility also depends on the strength, size, shape, porosity, temper, cracks and voids, shape and surface of the ceramic. Among these firing temperature and duration has a greater impact on hardness (Taylor 2000: 19). Marked convexities as rims, edges, handles and corners are more easily abraded. Surface treatment is also a factor affecting the amount of abrasion. Reasons for abrasion are agricultural machinery, freeze-and-thaw action and trampling on site. Four factors cause break down: The impact strength, frequency of impacts, the compaction, or hardness of the substrata in which the sherd lies and the strength (impact resistance) of the ceramic itself. No measurement on stress from agricultural machinery or frequency (Taylor 2000: 20).

Artefact size is important to consider in natural transformations, because the process may cause reduction in size and sort certain to be exposed on surface (Schiffer 1987: 267) Animal turbation also cause size sorting by bringing small size artefacts up when burrowing (Schiffer 1987: 269). Seasonal freeze and thaw cycles and swelling and shrinking of clay also helps exposure on the surface (Schiffer 1987: 269).

Frost action is the least known cause of attrition. Frost wedging caused by frozen porewater causes this, sometimes together with hydraulic pressure caused by flow ahead of the advancing ice. The factors affecting that are: firing temperature, pottery permeability and soil moisture. Freeze-thaw cycle is tested on laboratory in mid-west U.S. Pottery with 950°C firing and above are not affected after 10 severe freeze-thaw actions (Taylor 2000: 21). Unfired pottery is highly permeable, open pores, as organic and volatiles disappear porosity increases up to 800°C, later shrinkage and vitrification eliminates pores. Burnishing and slip coating although reduce permeability, may cause surface exfoliation from the core. Inorganic temper although good in highly fired sherds, the changes in expansion and contraction may cause crack especially in low fired sherds. Type of soil is also important in freeze-thaw action, vegetation and snow prevent freezing and porosity of soil, size of grains, thickness affect the velocity of freezing (Taylor 2000: 22). In practice the availability of water had great importance. The surface is not good for water reservation. Only fine grained, close to surface sherds, get sufficient and nuanced temperature differences. It has greater effect. Therefore porous sherds are affected by freeze-thaw and ploughing actions a great deal (Taylor 2000:23).

Upward mixing is due to geomorphic and cultural accumulation. It adds new strata to sites and the interaction with earlier levels through cultural and natural processes cause upward mixing. Wet-dry cycles affect vertical movement in the upper 50 cm of the soil and the freeze-thaw causes coarse material. To assume polygonal pattern, whereas periglacial processes cause parallel stripes. Small random disturbances cause coarse material diffuse in all directions. But this is rather a slow displacement compared to erosion (Kirkby *et al.* 1976: 241).

Using geological and topographical information, he divided the survey area into ecological zones. 3 level variation is sought: between collection units within each zone, between zones, between region; to see the location for settlements and industrial activity, and their associated assemblage.

Natural processes are also important in identifying stratification in surveying units. Contributions from geography is used when looking for patterns so as to identify evitable areas. Water, lithic source areas, timber, pasture and arable land are among these opportunities. Chisholm considered two sets of relationships. The first is in its land: Provisions of the area as arable and grazing land, water, fuel and building material and stability of the area for human settlement: Defence, bewaring flood and natural shelter can be considered under this issue. He quantified each in terms of cost to community water in 1 km proximity 10 units of cost, building material in 1 km proximity 1/10 units of cost. Sometimes unsuitable places are also inhabited. The second concerned the relation with outside world. We can again include defence, proximity to trade routes, urban centres, harbours, barren mining areas, military controlling spots can be considered under this issue.

Roberts has made a similar consideration of the factors deciding on the suitability for occupation. He diversified the concerns for finding occupation areas as intrinsic site qualities (desirable) and extrinsic site qualities (advantageous). Drainage (soil infiltration, slope), shelter and aspect (south-facing, wind direction) are the main concerns defining the needs required in a settlement. There is also the "land-cunning concept" consisting of factors humans in different periods. It is kind of "Zeit-Geist"which becomes desirable as a result of competition. Ecological factors are important to specify activity (Schofield 1991f: 118).

3.1. Weathering

Weathering is disintegration and decomposition of (Cooke *et al.* 1990: 317) an exposed rock on surface by physical agencies as sun, wind, frost and thaw (Cornwall 1958: 76) and chemical infiltration (Butzer 1982: 76). Different types of materials have different characteristics of weathering and this way it is possible to make suggestions about the nature and depth of the deposit. This especially occurs if there is a change in its condition from the present environment (Cooke *et al.* 1990: 316). This factor mobilizes material from one place to another. Continuation of this process is resulted by an alteration called regolith with is the loose and partially decomposed rock covering 90% of earth's surface and other unconsolidated materials (Butzer 1982: 35). The speed of weathering is controlled by three variables:

1) Lithosphere is the nature of parent rock, which covers its lithology, structure, crystal structure and assemblage of the parent rock
2) Biota is plant and chemical assemblage
3) Climatic conditions are athmosphere, hydrosphere and local factors as topography, drainage and watertable (Cooke *et al.* 1990: 318).

Disintegration is caused by mineral alteration through physical factors and decomposition is a chemical action. Dry, cold weathers cause freeze-thaw cycle by the freezing and melting activities of water in pores and fractures. Dry, hot weathers on the other hand causes the evaporation of water and as it continues rising dissolves or oxidates acids (Herz 1998: 39). Rainwater containing athmospheric gases as nitric acid attacking minerals as potassium, calcium and sodium salts in rocks mostly leaving silica and silicates, iron oxides and other heavy minerals (Cornwall 1958: 77). Temperature and precipitation are the most important variables, but their amount of effectiveness in wathering depends on mean seasonal values and their amount of diversities among these values. Hot and wet weather trigger chemical weathering and high temperature diversities trigger mechanical weathering (Cooke *et al.* 1990: 319). The 9% increase during frost causes a 125 kg/cm^2 pressure during the change of state in water is then followed by thaw action (Butzer 1982: 36).

The disintegration of bedrock forms the regolith, which involves unconsolidated materials of lithic origin called sediments and soils the mixture of sediments and decaying organic material (Herz 1998: 37). Semi-arid climates provide conditions for easy erodability (French 2003: 34) regarding the availability of both physical and chemical disintegration throughout the year.

Also the same freezing and warming causes movement from bedrock upwards as a result of expansion and loosening movement of surface soil as it freezes (Butzer 1982: 38). In this issue the frequency of frosts in a year is more important than the mean annual temperature (Cooke *et al.* 1990: 319).

Understanding the nature of this movement can help archaeologists to trace patterns of movement, and enlighten their strategies to search for archaeological remains of human activity.

In tropical semiarid climates evaporation exceeds precipitation. Rainfall is low, and the temperature is high and seasonal. Organic content low. Physical weathering, salt weathering, granular disintegration is dominant in driest areas. Thermal effects possible. Low organic input relative to decomposition. Slight leaching produces 2 : 1 clays and $CaCO_3$ accumulation

Sediments may occur in springs, caves, stream valleys, coastlines, slopes, dune fields, sheets of windborne dust or volcanic ash. Packages several different levels, one specific lenticular records is called facies (Butzer 1982: 44). Sediments are transported, deposited and subsequently altered as post deposition. This can also transport artefacts. Artefacts found where they were last used is called "primary context" and if removed it is called "post secondary context" (Rapp *et al*. 1998: 18).

Events as erosion, sedimentation and soil formation are observed by sampling and matrices are formed for the entire site, correlation of these links to the regional lithostratigraphy and dated relatively (Butzer 1982: 69). In necessity also absolute dating can be provided from samples. Paleoenvironmental assessment by hydrological and sedimentational patterns, palynological and archaeozoological data are documented as an assemblage (Butzer 1982: 71).

Sediments in site formation are grouped under three headings:

1) Physiogenic processes relate to erosion, transfer and deposition within the site.
2) Biogenic processes are caused by domesticated and hunted animals, rodents, earthworms, snails, insects in a settlement; wasps, owls, bats, porcupines, hyenas, felids and bears in a cave.
3) Anthropogenic processes relate to biological materials, items derived from cultural objects, human alteration of geomorphic processes as minerals in soil. The impact of their process may be swift (Butzer 1982: 77).

How severe is erosion? Monitoring of these events for the past is rather difficult. The landscape is shaped by complex dynamic system of closely integrated processes, nature of colluvium and artefacts is the only data. Sediments sometimes involve stratified artefacts, which points to prehistoric erosion. Molluscs, soil micromorphology, granulometry and chemistry studies result that land clearance followed by cultivation took place in the area. Therefore downlands are mostly anthropogenic landscapes composed of man-made soils.

The landsurface is mostly eroded. To reconstruct the past landscapes aerial photos were placed in GIS and they were used with other techniques to observe geology, pedology, landscape position. In Catena soil profile was reflected through changing topography. Rock weathering and lichen chronology was used to observe Holocene erosion and deposition. Geobotany reflects the soil structure, soil chemistry, hydrology and micro climate. Anthropogenic – the exploitation and the response (Given *et al.* 1999: 25).

Off-site collection as well as on site collection is gathered. Although information on landscape is scarce, landscape processes and human processes occur together. For cultivation, rendzinas of Upton and Icknield soils from chalklands are preferred. Carsten series provides proargillic brown earth on Tertiary cappings of Clay-with-Flints, which are thick soils. Erosion causes soil loss from fields and double sowing is a new trend brought after that. There are however works of archaeologists as well as geomorphologists. Boardman's study is on erosion of the Sussex downs artefact distribution and redistribution are examined under this approach. Organic content, structure, fabric and water contents are taken up as determinants of erosion. And if the amount of clay is lower than 35%, it increases the probability of erosion. Medium-coarse silt of 100-130 μ are found to be more easily erodible (Allen 1991: 41).

3.2. Effects of Water

Specific gravity or density is a factor affecting movement of artefact by hydraulic force and air and sort them on gravity and density criteria (Schiffer 1987: 269). Water transport (see fig. 2, 3) causes decrease in assemblage, round edge and uniform abrasion on the sherds (Schiffer 1987: 266). Sedimentary particles erode and are deposited on artefacts is related to the velocity of the running water (Schiffer 1987: 268).

Rain-drop erosion is caused by the detachment of soil particles by splashing and run-off erosion is the transportation of soil with flowing (Cooke *et al.* 1990: 80). Soil erosion by water is mostly effective in steeper slopes with finer grained soils (Cooke *et al.* 1990: 83). Rain-drop erosion causes 90% of erosion on agricultural fields (Cooke *et al.* 1990: 84). Run-off erosion occurs as rain infiltrates the soil. It is at first rapid rain packing finer grained soils, then it becomes slower even leading to the saturation of soil and moves the soil with flow (Cooke *et al.* 1990: 88). Surface slope, surface length, vegetation and roughness are the factors affecting erosion through water (Cooke *et al.* 1990: 94-95).

Riverine processes involve valleys and floodplains of autogenic and allogenic formations. Autogenic process is the infilling of storage sites, where as allogenic process is the influence of climate in deposition (French 2003: 25). Sediment availability and flood history are factors influencing the sediment deposition rate. High amount of flood and run-off are usually associated with change in land-use or other anthropogenic factors (French 2003: 26). Alluvial fans are typical for arid and semi-arid environments with high elevation variation, mostly consisting of sedimentary deposition and a low amount of stream channel deposits, resulted from cut-and-fill deposits (Rapp *et al.* 1998: 55). On slopes it may cause mass wasting if the gravity is high (Rapp *et al.* 1998: 55). In such climates valleys erode artefacts and redeposit or bury by sorting them (Rapp *et al.* 1998: 56).

Hydraulic energy is an important component of lake deposits, sorting sediments according to their size, as high-energy coarse material accumulating on the margins, whereas fine material near the centre (Rapp *et al.* 1998: 57). Therefore artefacts, sorted by erosion, transport and deposition are more likely to occur in the coarse material zone, which is the margins (Rapp *et al.* 1998: 57).

Brown forest soil in this manner better with more porosity and organic material. On valley bottoms, gravel and head deposits exist. Fine material erosion occurs under gravitational conditions. Rain splash, hillwash, soil creep, tillage, burrowing animals and hoofed animals are among these erosional factors. Rain splash occurs when water flows overland as a result of exceeding infiltration. Sheetwash, rilling and gullying are all caused by this effect (Allen 1991: 43).

Sheetwash acts suspending fine material sheet and coarser particle like soil aggregates move downslope. Chalk is also more mobile than flint in such a case. Channels don't occur in such a case. Rilling is a more powerful movement creating channels. Here soil type, slope, velocity and depth of water are important factors. This action from 3cm deep channels create fans and movement of coarser material (6-14 mm deep) occur on the fans. Events of higher energy occur less frequently larger rills are 17 cm deep and may exceed to a length of 150 m and 89 tonnes may be removed. These fans cause fans of 0.26 tonnes. Here up to 20 cm diameter stones may occur. Finer chalk and flint may move 500 m and silt and clay about 1 km (Allen 1991: 44).

Gullies are permanent or semi-permanent rills, usually stripping all soil into channels of 0.5 m depth and more than 200 m in length. Gullying may occur as low as 4′ slope and sheet wash down to 2′ slope. The loosening factor of tillage effects fields more in this process. Under these circumstances ploughzone artefacts will be affected, sites may be denuded, or deposition may preserve sites (Allen 1991: 44).

Sheetwash and small rills do not cause significant artefact displacement. However a regular regime will decrease soil cover and cause stoniness (stones per unit of soil). In such a case 3 cm erosion will be 3 cm additive for the receptive area. The 250 artefact for 1 m^3 will be 167 per 1 m^3. As soil accumulates, the density of artefacts will decrease only after 3 cm dislocation density will fall to 2.50 and 1.67 respectively (Allen 1991: 45).

However sometimes different geomorphological coexistence may hide extend of the site as deep sterile hill wash. Therefore part of the surroundings should also be included in the conservation zone (Barford 2000: 79).

In case of fluvial movements flat surface flint move downslope. 873 flints in

2X45 m on 11´ slope 87% of the material is found in the first 10 m downslope, and 94% of the blades are found after 2 small storms. After 4 years 80% of 60 flints caught in the 2^{nd} trap 50 m below, and will be blanketed by finer wash. In case of severe rilling and gullying the movement of thin layer from the plough-soil may cause severe re-deposition problems, the cover by finer material at the base. If the fan material is not buried and in plough-zone and may face with rilling. For this evidence erosion and artefact occurrence, fieldwork data required to make a sound assessment (Allen 1991: 47).

3.3. Effects of Wind

Especially in desert environments wind is the main process destructing and abrading artefacts (Rapp *et al.* 1998: 54). Aeolian processes (see fig. 4) mostly take place when the ground surface is denuded (Cooke *et al.* 1990: 239). Therefore arid and semi-arid regions are mostly subject to such processes, but desertification is the main areas subduing wind processes as well as fine grained soils (Cooke *et al.* 1990: 239). Wind has a movement similar to fluids and the moving particles called grain ballistic is effective on moving and abrading other particles (Briggs *et al.* 1997: 292) The abrasion is caused especially by the ballistic quartz particles (Briggs *et al.* 1997: 294).

When wind force is higher than the gravity of particles, it moves them by saltation and as velocity of wind increases it may even cause surface creep or suspension (Cooke *et al.* 1990: 240). Suspension in air takes longer as the sediment gets finer (French 2003: 28). Aeolian processes are active abrading soil into loess or aeolian dust (Briggs *et al.* 1997: 292). Wind also sorts artefacts according to size and removes or deposits clay, silt and sand-sized particles according to its velocity (Schiffer 1987: 269).

Deflation is the transportation and later deposition of sediments elsewhere (Briggs *et al.* 1997: 293). Wind depleting artefacts from sealed layers and deposit as lag or pavement accumulation in a process leading to post deposition (Butzer 1982: 110). Therefore in aeolian processes it is possible to find archaeological deposits found unrelated to the context and sorted according to their sizes.

3.4. Biological Turbation

Trampling and burrowing of animals are faunal turbations. Burrowing of rodents, insects and earthworms cause vertical movement and disappearance of layers. Root action is another biological factor called floral turbation. Root action moves artefacts by pushing in the direction of root growth (Rapp *et al.* 1998: 83). Especially in dry climates termites and plants contribute bioturbation (Butzer 1982: 113). The biological factors may counteract burying artefacts as well as mixing strata and sorting material. This occurs as the animals deposit earth for nests and burrows and by leafmould under thick vegetation (Banning 2002: 73).

3.5. Effects of Slope

Properties of the material and external factors like the increasing stress on the slope are the causes for slope failure (Cooke *et al.* 1990: 112). Dry movements occur when ground heave is supported by hydration, ice formation or rain splash either as creep or, if velocity high, as solifluction (Briggs *et al.* 1997: 228). Rock falls start with cracks and develops with vegetation growth and rain. When the support from the base is lower than the gravity rock fall occurs (Cooke *et al.* 1990: 109). Frost-wedging on loose material, is a more powerful process called toppling. Translational slides are the downward movement of material on a planar slope. Cohesion of material influences the movement, which makes clays less easily transported than sand. However clays are more susceptible to mudflows (Cooke *et al.* 1990: 111).

Mass movement occurs with freeze-thaw as downslope creep and with rain moving saturated soil as a viscous flow (Cooke *et al.* 1990: 118). When considering sediments and soils, shear strength decreases wth water pressure and transforms the sediment into a viscous fluid (Briggs *et al.* 1997: 225). High rainfall, alignment of the strata, lack of vegetation are all favourable conditions for mass movement (Cooke *et al.* 1990: 121). The equilibrium of stability depends on shear strength, shear stress and slope angle (Briggs *et al.* 1997: 222). When the equilibrium is lost then the action begins. Rapid ice melt (Cooke *et al.* 1990: 106) and human influence on the environment, like dam construction, road building, urban expansion and forest clearance, cause such imbalance (Cooke *et al.* 1990: 107).

In Albegna survey a villa and a city are surveyed through 5 X 5 m grids and 20 X 4 m transects tile densities plan of the villa, when erosion moved lighter objects down, heavier material as tiles remain, rest of the destructed material accumulated in the valley. Tile density then becomes post depositional mostly, heavier material moves further downslope than the lighter ones. The longer occupation leaves heavier density. Cultivation causes large stone clearance piles (selective sorting). Chemical analysis on the other hand is a more reliable evidence. Because in places like central Italy the remnants of mudbrick only produce a heap of 1 m higher than the surroundings and not much else regarding the material. Ploughing and erosion processes may lower the mound (Fentress 2000: 49).

Colluvial studies assume according to Taylor and Godwin's comment that: Hillwash cause colluvial deposits then erosion at Pitstone (Buckinghamshire-Evans 1966), Brook (Kent-Kerney 1964), Pegwell Bay (Kent-Kerney 1965, Weir 1971). They are more anthropogenic (Bell 1983, Allen 1988) rather than natural or climatic. Bronze Age gravel fan at Ashcombe bottom is a result of rilling of arable land. A severe storm can cause 17 cm fine sediments (Allen 1991: 49).

Sedimentation is highly variable in dry valleys as Kiln Combe (Sussex) 3 m hillwash on dipslope, Strawberry Hill (Wiltshire). 3.3 m post-glacial hillwash on minor scarp slope, Ashcombe Bottom 1.2 m colluvium and Bourne Valley (Eastbourne) 1.2 m colluvium in an extremely broad valley. The exceptional valleys without colluvium are Seven Sisters (Sussex) and Stonehenge Bottom (Bell and Richards). Drift geology, soil naps and fieldwork suggest 16% colluvium, 3% colluvium obscured by alluvium in the five valleys. There is an increase in sherd frequency by depth, which indicates rapid burial. The pottery is weathered and reduced in size. There 73% is found in right layer and 27% in colluvium. The ploughsoil contain only 1%. The excavations were not able to gather more than 0.0007% of the valley surface. It is important to reconstruct specific activities and archaeological landscape (Allen 1991: 51). Beaker activity in the downland – Trying to reconstruct off-site landscape evolution. Bourne Valley – IA sherds, Kiln Combe. Beaker occupation and medieval farmstead 40 cm beneath. Ashcombe Bottom – Beaker scatters, Strawberry Hill – LBA below 2.1 m. In Sussex 28 Beaker cemeteries on chalk uplands. North Bersted on the coastal plain two earthworks take place on the cliff edges the ditch of larger earthwork holds has a primary fill of Beaker pottery – on the valley occupation not exposed to hill wash – Belle Tout, however the Late Beaker assemblages at Kiln Combe and Ashcombe Bottom are well buried. Only one Beaker sherd from the colluvium at Holy Well Coombe (Kent) revealed an extensive Beaker occupation. The valley bottom chosen by Beaker people led archaeologists a different strategy for surveying. Apart from fluvial deposition, downslope movement by gravitational forces play an important role (Allen 1991: 53).

3.6. Effects of Climate

Climatical query has been one of the concerns on natural processes affecting the formation of archaeological deposits.

Climatic variances are:

1) Glacials are places with no biota, ice sheets and large ice caps.
2) Periglacials are places where aeolian processes occur and these are soil-frost environments with waterlogged soils. Tundra and alpine meadows and seasonal human food plants grow with herbivore and high animal populations are found.
3) Humid temperate climates are places with extensive waterlogged and flat plains. Pleistocene glaciation may exist, deciduous coniferous mixed forests, seasonal human food plants, moderate herbivorous and smaller mammals, medium fluvial processes take place.
4) Semi-arid/Sub-humid climates are places with extensive fluvial processes.

Pleistocene loess, mod-stable soil and aeolian activity take place. There are waste grasslands with cold season dormancy and large herbivores.

5) Arid climates are places with sporadical fluvial processes, low soil and high aeolian activity. Deserts and subdeserts take place with low food plans and low biomass.
6) Semi-arid/Sub-humid tropical climates are savannas with dry season dormancy. There is high productivity, seasonal and perennial food plants and high biomass.
7) Humid-tropical climates are rainforests and evergreen woodlands. There is very high abundant food plants, large herbivores but low biomass, especially small mammals (Butzer 1982: 64).

Mediterranean climate covers partly Europe, North Africa, the Levant and the Mediterranean Islands, and besides it consists western subtropic coasts between lattitudes 30º - 40º as California, Chile, South Africa and Southwestern and Southern Australia. The climate itself has hot, dry summers with local winds and mild, wet winters (Briggs *et al.* 1997: 462). The collapsing high pressure cell in Late October and Early November and subtropical high pressure and westerly jet stream move south to Sahara and cause precipitation in winter (Briggs *et al.* 1997: 463). April to October soil moisture gets very low (Briggs *et al.* 1997: 464). In moist winters there is a high amount of soil formation by chemical disintegration (Briggs *et al.* 1997: 465). Mediterranean climate soils and vegetation are favourable conditions for desertification such as agricultural adaptations followed by farmers and urban and residential development (Briggs *et al.* 1997:477).

Anatolia has sparse vegetation with semi-arid climate. Two factors sweeping mounds are given as rate of erosion and amount of soil remaining from decomposted mudbrick walls and the density of sherds in the mudbrick (Tuna 1994:625).

Natural and cultural processes in semi-arid areas bring rapid erosion reducing mounds within 500 to 2,000 years. It is also important to consider riverine processes changing geomorphology rapidly through cutting and alluvial accumulation (Kirkby *et al.* 1976: 229).

Denudation causes both loss of soil and physical and chemical weathering of chalk, erosion has removed 70 cm chalk since 4th millennium BC. The low discovery of Neolithic and EBA sites depend on the factor that they chose valley bottoms for easier communication, sheltered location and suitable habitable terrain, where colluvium veils the recovery (Allen 1991: 53) hack of fieldwork, nature and quality of fieldwork, destruction of evidence (ploughing, industry, development) or evidence not available by surface examination will be left blank and therefore may lead surveyors develop new strategies. The use of taphonomic stories allow a better reconnaissance for field evaluation (Allen 1991: 54).

North Eastern Greece is the space the research is undertaken (Davidson 1976b: 255). 18 Neolithic and Bronze Age sites were located. The effects of river and new settlement activities (Davidson 1976b: 257) and alluvial accumulation observed. Sitagroi tell limestone lowland incised by river Argitis field 5.5 m alluvium and one edge with terra rossa (Davidson 1976b: 258).

Natural processes are ongoing activities altering archaeological data continuously. Therefore there is a need for a geomorphologist, at least to make the necessary study on the geomorphological map to decide on alluvial and colluvial fills to save time while doing survey to avoid unnecessary places to be surveyed.

CHAPTER IV

CULTURAL PROCESSES

A single artefact passes through many processes from the time it was utilised till it becomes a dead assemblage. The record it produces is fossilised material remnants of cultural and behavioural activities of past societies altered either through cultural transforms (C-transforms) or natural transforms (N-transforms) of mostly refuse materials that are considered as outputs of human activity (McKee 1999: 35). The artefact becomes meaningful and processes become assessable as we consider the object in its context with variables regarding the assemblage's density, size, and functional/typological characteristics, along with the amount of attrition/accretion on objects and the particular object, and the history of the locus they were preserved.

Cultural processes stem from human activity (Schiffer 1987: 47). They are the primary cause for arteficial accumulation, and ongoing processes under most conditions. These processes are formed by patterns of refuse disposal, maintenance of habitation area, production and social activity quarters; processes of post-deposition, reuse and abandonment (Alexander 1999: 79). In this chapter cultural processes are defined on a basis of gradual expansion from short-term activities to accumulating long-term activities.

The artefact groups are first of all taken up as archaeological records and C-tansforms is the sole answer to that (Ault *et al.* 1999: 47). The nature of anthropogenic activity can be brought about by assessments mentioned above; i.e. context and frequency and size of artefacts in their distribution, which is an issue brought by New Archaeology (Allison 1999: 15, Ault *et al.* 1999: 43). In such a treatment the criteria is to reveal depositional history, and once we eliminate the natural processes we are head to head with the behavioural product, the inference of the habitational span, which is until then possible to be interpreted on economical, sociological aspects and the response to the governing geography can be assessed.

The factors humans bring can be grouped under the headings settlement density, re-use, destruction brought by reuse and ploughing. The chance of representation of strata lower than 5 m on the surface is lower than 1% and collection from a depth of 5 cm is a better way to raise the probability of finding earlier artefacts (Tuna 1994: 627).

The limits in collection of ceramics is the quantity depends on cultural activity, erosion, plough soil transfers may distort past activity loci, soil accumulation may bury artefacts, past and present agricultural practices and current field surface may distort collection. Chronological resolution is limited to pottery. Pottery is relatively a perishable item according to its firing technique. Poorly fired prehistoric pottery can survive only limited ploughing episodes and therefore could only be retrieved if buried deeper and exposed recently, therefore more difficult to trace in a regular account. Middle Eneolithic, Middle Bronze Age and Migration period are therefore quite low in survey recovery. Therefore functional attribution of space is difficult for prehistoric periods; such as field, production areas, communication zones, but limited to residential activities (Kuna 2000: 33).

The archaeological problem is sought through using ethnoarchaeological studies that gives us idea about the behavioural activity in a two dimensional aspect, one is object as a signifier of human behaviour, the other is the human behaviour as a signifier of object. The operation is repeated by observing human behaviour as a response to geographical entity by examining a contemporary society with similar geographical and climatological conditions. However archaeology has to deal with a complex problem of the total processes that act on deposits. Deposits can be a combination of more than one deposit, or may be dispersed to various occupation spaces or may upwarp into temporally different assemblages (Schiffer 1987: 266). Therefore multiple query should be a part of the archaeological search to understand the processes operating on the deposits.

Medieval pottery however stays well and reliable for manuring scatters in villages. Settlement pits change the value of prehistoric pottery recovered from other survey units. Duration of settlement and intensity of production are responsible for the amount recovered. The protection of surface data on the landscape are conditioned as long-term destruction as slow and gradual by ploughing, decay and burial, medium-term crop rotation and soil treatment in decates and short-term freeze-and-thaw processes and current agricultural practices and ground cover (see fig. 5). Long-ter changes can only be controlled if cultication history is known. Medium-term crop rotation is the factor distorting scatters most. Deep ploughing every 4-8 years preceeding root plants reveals prehistoric sherds but wear out the next season (Kuna 2000: 34). The relation between crop type and density of pottery is not known. The sherds on the surface remain localised between deep ploughing episodes. The ploughing as a result of erosion causes the plough go deeper in a slow gradual process and bring more artefacts to the surface. Weathered and good visibility fields are appropriate for surveying.

There are types of processes that need to be considered here to understand the states in formation of archaeological assemblage, in other words how these artefacts turn into fossilised data through human activity. The ethnoarchaeological testing on the other hand does not aim a specific time point in household behaviour, but by assessing these behaviour, explain pattern of use and behaviour in an accumulating manner (Ault *et al.* 1999: 50-51). However the interpretation of archaeological data through ethnographical observation still has its limitations, only answering few questions and yet needs a careful examination to use an appropriate model for the proposed situation or chain of events (Deboer 1983: 32).

4.1. Nature of Activities in Settlements

Consideration of household characteristics is a new approach in understanding the behaviour hidden behind the accumulation of archaeological data (Allison 1999: 5). This processual implication is a result of social theory brought up to the practice to enlighten consumption, privacy, gender, symbolism, household series (Allison 1999: 15-16). In one particular space that leave behavioural traces from one or more unit of individuals, where quantity of units diversify temporally. This one particular space that consists several household series is called the archaeological unit of analysis (Alexander 1999: 81).

The relationship between material culture, which leads to spatial clusters of dwellings and structures, and social organisation, units of social integration (Alexander 1999: 80) and the behavioural processes themselves are necessary for archaeological studies (Allison 1999: 1). The query for formation and change in household data, behavioural pattern, can be achieved through models provided by middle range theory (Deboer 1983: 30), which is the appropriate ethnoarchaeological comparative data, and by which there will be a query format to understand the pattern of discard (McKee 1999: 40).

The appropriateness of ethnoarchaeological comparison requires temporal, cultural and spatial considerations in associating behavioural activities (Allison 1999: 2-3). This is an issue sometimes mistreated by anthropologically trained archaeologists, considering local people as endogenous people, who in some cases may have come to the area by migrations, and may have the traits of another geography other than their present. However the inference should aim to answer specific questions regarding the adaptation to geographical conditions, which should also be an important factor to be considered in Anatolia. The fact that many locations are occupied by previously nomadic communities should be a limiting factor in how to set the criteria for a better understanding of the interaction of man and his environment (personal communication with Ass. Prof. Y. S. Erdal).

There are studies closely linked to the subject at Çatalhöyük, both are on specific problems like refuse deposition (Matthews 1998) and the comparison of utilisation of living spaces in Çatalhöyük and Zuni Pueblos (Steele 2001). However the first concentrating on the refuse deposition concerning microstratigraphical materials of organic origin, the second insignificant artefact that can only be extracted through excavation. In these circumstances it is true to say that Anatolia lacks the relevant study for household study concerning cycle of artefacts, and in this specific query, sherds.

The processes creating house floor assemblages is the integral activity sum of the life span of the space (LaMotta *et al.* 1999: 19). The processes are either caused by accretion, which is the deposition inside the living space (LaMotta *et al.* 1999: 20), or depletion either by removal or deposition outside the living space (McKee 1999: 35). These are changes in the households which differ in proportion relatively (Alexander 1999: 81), but yet being possible to diversify according to functions. Both the consideration of the domestic structure, the settlement and other anthropogenic spaces; the depositional account is the only significant concern related to the surface assemblages.

Within the habitation units we encounter food processing, preparation, consumption; sleeping; manufacture and maintenance of artefacts; maintenance of the living space; activities concerning cultural traits and rituals, which create the primary deposits at activity related locations either through discard or loss (LaMotta *et al.* 1999: 21, Deboer 1983: 22-23, Schiffer 1987: 58). However keeping in mind of the maintenance activities as an ongoing process, periodical cleaning accumulates these deposits either when they are bulky or endangering habitation (LaMotta *et al.* 1999: 21). This leaves us with two possible primary deposits within the living quarter: Abandonment deposits, and loss integrated in the floor assemblage as microartefacts, which are more likely to appear in loose floor materials (LaMotta *et al.* 1999: 21). These floor assemblages are called residual primary refuse (Ault *et al.* 1999: 55). Therefore the significance of habitation units is only limited to structural elements and the chance of post abandonment deposition and curation activity during abandonment. Primary deposits can only be derived through excavation and microstratigraphy. That leaves us only with structural elements like roof tiles or traces of stones from walls. In cases of mudbricks, sherds may be already be an inclusion for mudbrick production (Tuna 1994: 625).

Secondary deposition is the significant context resulted by main depletion behaviour into a separate space (LaMotta *et al.* 1999: 21), which has a high possibility to be recovered in surface scatters if these places are habitual discard areas. The ratio of primary refuse to secondary refuse decreases as the settlement becomes highly populated and intensity of occupation rises (Schiffer 1987: 59). The secondary residual refuse is quite close to primary residual refuse, intruding refuse material from an earlier period, possibly as a remnant of a third depositional account (Ault *et al.* 1999).

Provisional deposition is the cached items either for the idea of repairing for use in the primary function or another use for future in modified or unmodified form (LaMotta *et al.* 1999: 21, McKee 1999: 36). However the quantity of these items should be also low and not traceable through surface surveys. Clutter refuse is primarily kept for this deposition, which is the broken items of value, that are more difficult to replace (Schiffer 1987: 66). Modification is an important process in the recycling of objects, especially ceramic sherds are used for variety of purposes in this issue, i.e. architectural elements, spindle whorls, lids (McKee 1999: 37, Schiffer 1987: 70). This can be observed through changes in artefact size and modifications on them, termed as Frison Effect (Schiffer 1987: 268).

Tertiary deposits are the redeposited refuse subjected to extramural secondary deposition with small or heavy attrition taphonomy as a result of trampling, which are likely to occur in this phase (LaMotta *et al.* 1999: 25). Their depletion is as a result of scavenging, collecting, turbation, decay, recreational pillaging, activities with archaeological concerns (LaMotta *et al.* 1999: 25) and also mixed depletion together with midden accumulation to use as fodder for the agricultural maintenance. The occurrence of tertiary deposits are due to clearing some still-in-use spaces when there is still an ongoing activity in the settlement or as a ritual behaviour (Montgomery 1996: 161).

One contribution from ethnoarchaeological studies is that, there is more information of refuse deposition as secondary and mostly tertiary refuse is mostly around the settlement. The accumulation in Taroundant, Morocco, the rubbish disposal appears around the walls for 300 m. (Fentress 2000: 46) and this material is more consistent of pottery, rather than tiles in a proportion of 79 sherds to 3 tiles (Fentress 2000: 47). However manuring activity, which also occurs around the sites as off-site distribution, and also called the background noise, which has long been considered the main cause for accumulation around the sites, continue still to be utilised in Greece. Manuring occurs, but not necessarily along with cultural refuse, and in rural areas, mostly in gardens have been the place for manuring activity (Fentress 2000: 46).

One ethnoarchaeological study from a semi-arid region is the Mesoamerican house assemblage analysis from a selection of mid-eighteenth – mid-nineteenth century settlements to analyse spatial relationship between dwellings, extramural areas, middens and relevant assemblages representing them (Alexander 1999: 79). The study shows some aspects about the integration of ethnoarchaeological study in surface surveys, and also shows the distinction that there is always at least 200 m. between the refuse deposits and burial areas.

The extensive survey initiation consisted of description, functional and stylistic characterisation of features, estimation of site size; ecological setting and location of water resources. Consequently scale maps are produced to diversify them into archaeological categories (Alexander 1999: 86).

The following intensive survey consists of stratified sampling of 3 X 3 m^2 by scraping the surface soil, priorly cleared from vegetation and screening through one-eighth inch mesh to get a full covering of the sampling units (Alexander 1999: 87). This revealed concentration around the foundations of the dwellings as large frequency, large size sherds related to the erosion of floors and floor fills (Alexander 1999: 88). There was also a great influence of the topography regarding the amount of slope, exposed bedrock, regional strategy playing the important role to cope up with settlement patterning and turbation was another variable affecting exposure (Alexander 1999: 89).

The 250 years following occupation still is easy to entangle with, where it was possible to detect the post-depositional noise without much alteration by other factors and questions like population and topography management were possible to assess from duration of household series, the size of household assemblage and non-local items, size of gardens and amount of supplementary structures (Alexander 1999: 92).

Yet this study is a short-term answer to an archaeological concern. Muddling through archaeological evidence, we come across with long-term patterns obscuring the behavioural impact of the process (Alexander 1999: 94).

This is a case that can be handled to understand the process, supplemented by ethnoarchaeological study and may be simulated by computer applications to get a fuller idea about its aspect in the long run.

Reduction in size and sorting of size is a factor resulted partly by cleaning and refuse disposal activity (Schiffer 1987: 267), but natural factors can also cause such distinction patterns (Schiffer 1987: 266). Curate behaviour and *de facto* refuse may also show size determined characteristics as large items with high replaceability to stay as *de facto* refuse and small items with high cost as curated (Schiffer 1987: 268).

What we deal with during excavations and surveys is derived data, going through the processes of utilisation, abandonment and post-abandonment (LaMotta *et al.* 1999: 19). The inquiry is related to archaeological surveys to be able to understand the nature of deposits created as a result of activities as part of daily tasks. This study can not give the information itself for spatial patterning of artefact distributions, but only is the initial step in formation process. Along with its underived state, only in a partial way can this study aid surveys, because the main data used for surveys is ceramic sherds, and they only become meaningful inferences as they are found in quantity. Hence the concern of the archaeological concern is not the household itself, but setllement patterns which take place in dwellings, compounds and house lots (Alexander 1999: 81).

4.2. Abandonment of Settlements

Abandonment process is the final stage of the life span of a structure, which is important to consider in understanding surface scatters. Since considering 'Pompeii Premise' as an extreme situation, where we see past human behaviour in action. This situation occurred as a result of burial under volcanic ash and kept the settlement in its life state. "The real Pompeii Premise is that archaeologists can treat house floor assemblages at any site as if they were Pompeii-like systemic inventories" (Lightfoot 1996: 165). However the data to be sought in surface surveys should not be the remnants of habitation behaviour, instead it is mostly the taphonomy of abandonment state.

Abandonment suggests a catastrophe, political change, migration or environmental crisis occuring in archaeological records as curation and caching artefacts and structures, cessation of deposition activity (Cameron 1996: 3, 5). All settlements explored as archaeological sites have at least one or more period of abandonment. In most cases they are not resulted as sudden processes. Abandonment happens in a period of preparation if it was not caused by a catastrophe. Behavioural stages in abandonment are preabandonment, abandonment and postabandonment; and in scale they are diversified as intra-site and regional abandonment (Cameron 1996: 4).

Intra-site abandonment is the cessation of activity in one particular activity space while vicinities are still in use, which is usually followed by scavenging and reuse of post-abandonment activities (Cameron 1996: 5-6). Scavenging relates to unplanned rescue of usable items, i.e. artefacts and structural elements in post-abandonment phase as opposed to provisional items (McKee 1999: 38). Using these abandoned areas as playgrounds, storage areas and ritual spaces causes additional finds as primary refuses of loss or breakage, or a deliberate bulky *de facto* assemblage, pointing one particular activity. Abandonment assemblage enrichment is the continuation of deposition even after abandonment as a result of ritual practices in form of offerings (LaMotta *et al.* 1999: 23). This brings unexpected accumulation of which can be misinterpreted as provisional and *de facto* artefacts and it should be a factor requiring notice by careful contextual control (LaMotta *et al.* 1999:24, Cameron 1996: 5).

Relative Room Abandonment Measure is a method of calculation achieved through comparison of quantification of whole floor pots and fill sherds in a particular living space and the aim of using this method for Pueblo sites is to observe processes of abandonment when an ongoing habitation exist in the vicinity (Montgomery 1996: 157). Curation from the spot to another room still occupied, scavenging for usable items, utilisation for secondary refuse deposition, and the last occupied room without signs of scavenging and secondary refuse and accordingly the *de facto* refuse in early abandoned rooms were scanty and in late abandoned rooms were plenty (Montgomery 1996: 158).

In this study, elimination of non-relevant assemblages as slope wash materials, collapsed walls and reoccupation on the room fill were more easily perceived as a result of ceramic assemblage analysis with the above given criteria (Montgomery 1996: 160). These processes go along with ritual practices as burning the site after abandonment and gathering sherds into habitation spaces from the middens (Montgomery 1996: 161). The study provides useful insights pertaining to the temporal sequence of abandonment by using ceramic assemblages, however in multistratigraphical sites and the sites subjected to long term natural processes the data can be obstructed (Montgomery 1996: 162).

Regional abandonment points out to permanent or periodic abandonment of settlements (Cameron 1996: 4). The artefacts are organised in this final stage depending on the cause of abandonment. So the length of abandonment, that is, the causes provide, plays an important role on the type of processing it leads. The artefact condition (active-good, worn; passive-broken) and manufacture type (expedient/primary use, improvised/secondary use, craft and industrial) are an other type concern in the curation and caching behaviour, providing decisive consideration how to treat the artefact (Tomka 1996: 15).

In cases of rapid abandonment structures can be left under construction, and in planned abandonment artefacts are cached or prepared for storage (Cameron 1996: 4). It usually occurs as a result of catastrophic abandonment and the dwellers are limited to a very short time to leave the habitation area (McKee 1999: 38). *De facto* refuse deposition is the abandonment of cultural material (e.g. tools, facilities, structures) in usable condition (LaMotta *et al.*: 22, Cameron 1996: 3, Deboer 1983: 26) outdoors (Tomka 1996: 15).

In regular cases abandonment is a gradual process The patterns of assemblages in regional abandonments are site furniture and curation (Cameron 1996: 4). Site furniture is any item that are left in the abandoned area (Tomka 1996: 15, Graham 1996: 31) , diversified as active and passive according to their state of functioning (Tomka 1996: 14). Curate behaviour relates to the transferring of artefacts in good condition from the old location to the new domestic habitation areas with economical concerns given the priority regarding the artefact's replaceability, transport costs and also the conditions of abandonment (LaMotta *et al.* 1999: 22, Cameron 1996: 3). The amount of curation rises as abandonment time prolonged (Tomka 1996: 16). This is achieved through delayed curation behaviour, as undecidious visits to the site in the post-abandonment phase (Tomka 1996: 21). The function of tool assemblage and intrasite abandonment extends the delayed curation behaviour (Tomka 1996: 23).

Periodic or seasonal abandonment of settlements rely on the fact of subsistence activities (Binford 1973: 242). It mostly occurs in mobile hunter-gatherer, transhumant groups, semi-sedentary groups and exceptionally some sedentary groups depending on the diversity of seasonal or periodical activity areas (Cameron 1996: 5). Artefact assemblages in such settlements consist of site furniture assemblages and curate assemblages more organised in removal and deposition (Cameron 1996: 5).

Punctuated abandonment is a well organised removal process, with intervals of return history (Graham 1996: 25). Seasonality is again the key answer to this behaviour as well (Graham 1996: 27). This behaviour follows a continual recycle of household assemblage, leaving behind the abandonment assemblage which consists of functional tools particular to that area of activity, food preparation assemblages and structural elements (Graham 1996: 31-32). These items hold together valuable intransportable ones, which are curated in case of permanent abandonment and mainly consisting a discard activity (Graham 1996: 34-35, 37).

Mobile camp abandonment in Khutse Game Reserve, Botswana represents single episode sites of a couple of months to a couple of years concentrating around the villages (Kent 1996: 54). Duration of camps are directly proportional to the find frequency, i.e. short term camps reveal less artefacts and less maintenance activities and construction (Kent 1996: 55). The type of settlement provides strategical avenues for archaeological studies depending on the low object and high bone recovery in abandoned sites, peripheral areas contain more bone and object due to scavenging, regarding the limited subsistence ethnicity does not affect the finds, but the population does (Kent 1996: 58).

The application of regional settlement behaviour at an archaeological issue appears in the study of late Copper Age (3,000-2,000 B.C.) west-central lowlands of Portugal relying on the hypothesis that central abandonment was caused as a result of social problems caused by environmental inferiority, which is relevant to peripheral abandonment as well (Lillios 1996: 110).

The Copper Age was based on intensive farming and herding (Lillios 1996: 112), along with that the socio-political organisation was related to the proximity to exploitation of raw materials (Lillios 1996: 113). Whereas the transition between Copper Age and Bronze Age is related to the factors of socio-economic and sociocultural change, shifts in settlement pattern; previously attached to the climatic change to arid sub-boreal phase (Lillios 1996: 114). Although there were signs for environmental stagnation, it appears together with anthropogenic botanical increase (Lillios 1996: 115).

The observed changes between periods in settlements are; a change from clustered to dispersed settlements in centres and continuation of dispersed settlements in peripheries, fortified settlements on hilltops to lowland and hilltop unfortified settlements in centres and hilltop walled settlements to hilltop unwalled settlements in peripheries, and decrease in export materials in both centres and peripheries (Lillios 1996: 116). This is explained by fission in shifting agricultural communities as long-term abandonment, shift from clustered to dispersed settlements and decline in size and range of settlements (Lillios 1996: 116). It gives an insight for the use of centre and periphery system with the use of multivariate factors (Lillios 1996: 118) with an even emphasis given to archaeological data and methodological application, where the main governing cause appears to be the shift in agricultural strategy through this change.

The application of abandonment behaviour to surface survey assemblages is sometimes quite a hopeless possibility, because finding household material in daily function areas is remote, yet it is a part of formation processes and plays a role in characterising intra-site spatial accumulation of depositions (Tomka *et* *al.* 1996: 191). Although the study envisages particular issues, while the research should be a combination of local factors, socio-economical factors and other behavioural possibilities and when integrating it into larger cultural and theoretical issues this process should be considered with consequent processes, not in isolation (Tomka *et al.* 1996: 193).

4.3. Taphonomy and Dead Assemblage

Taphonomy (see fig. 6) relates to socio-cultural laws covering the burial process of objects. It also helps us to understand in what assemblages pots are discarded (Orton 2000: 47). Discarded material can be systematic or arbitrary, same can be supposed for the life of the object. We can come across with complete objects like coins; broken objects with traces of taphonomy like pottery, recycled like glass, metal; broken parts with different history like bone (Orton 2000: 48). Taphonomic stages: Life assemblage, death assemblage, deposited assemblage, fossil assemblage and sample assemblage. But quantification is rather difficult (Orton 2000: 53). This aspect is important to be considered to make a correlation between the sample and target population (Orton 2000: 48).

Post-abandonment stage is the period that has also additive and subtractive type of formation. Mostly the utility of the abandoned spaces stems from refuse deposits of varying depth, quantity and assemblage occuring as secondary or tertiary deposits, structural collapse and the negligible amount of primary refuse that is mostly integrated in the floor matrix (LaMotta *et al.* 1999: 24). This stage can also be considered as the first taphonomic stage, where a definite end to the utility of the objects is drawn.

The locations for refuses are an important aspect to deal with these assemblages of different genre in archaeological contexts. Primary refuses appear mostly in refurbishing locations or more evidentially at workshops (Schiffer 1987: 59), where an accumulation occurs as a result of ongoing activity of discard within the activity area as opposed to “shlepping”, term for large amounts of waste material transported as secondary refuse (Schiffer 1987: 69). The locations of use can only contain residual primary refuse as microartefacts in floor deposits (Schiffer 1987: 62-63). One other type of primary refuse, is the more significant *in transit refuse*, which is the refuse left on the paths adjacent to non-occupational spaces (Schiffer 1987: 64).

Secondary refuses and tertiary refuses on the other hand occur as a result of maintenance activity to keep occupation area free of debris, which is only characteristic to particular space of accumulation (Schiffer 1987: 59), as midden, landfill, abandoned structure or cemetery (LaMotta *et al.* 1999: 21). Besides they become habitational areas where collective disposal is concentrated (Schiffer 1987: 62). These are the most important type of refuses that provides us a significant amount that can be interpreted as survey material.

The ethnoarchaeological observation presents that daily sweeping of the clear area causes a pattern of low weight and small size artefacts, as opposed to the high weight, large size artefacts in the garden area (Alexander 1999: 84). The accumulation around the dwelling area is mostly related to the distance from the activity, the more closer to the dwelling area, the larger the frequency and the size of the objects become; such as the vicinity of the door (in transit refuse), garden's edge adjacent to the dwelling and walking area adjacent to the dwelling, however this information is blurred with the intervention complex structures, large populations to distinguish from long household series (Alexander 1999: 88).

The consideration of erosion and colluvium is very important to see the percentage preserved on the surface and if it is originally located there. However implication of taphonomy is crucial to deduce such information (Schofield 1991c: 27). Scatters are results of landscape formation. Therefore landscape formation should be the first concern (Schofield 1991c: 28).

The dead assemblage becomes only meaningful as archaeological samples, and the sample is directly related to the tresholds of visibility or obstructiveness (Deboer 1983: 25). As from now we can assume that reconstruction through sample material is impossible, but only informative about the human behavioural patterns (Deboer 1983: 27). Apart from the deposition and dislocation episodes, wear is another important element of formation processes appearing in the context as accretional (additive substances accumulating during life time, crustation accumulating as a fossil) and attritional wear (subtractive processes as a result of removal during its function, or deterioration through natural processes and ploughing activity) (Schiffer 1987: 48).

Yet in this process all three types of refuse considered fossils, and episodes regarding the dislocation during occupation phase are influenced by natural processes. They have been explained in previous sections to integrate them to the mode of formation they belong to. The processes including all episodes after utilisation of artefacts are taphonomical processes. Taphonomy is the process in formation of archaeological assemblage, or dead assemblage subjected to natural and cultural processes (Deboer 1983: 20).

Discard pattern is formulised through a couple of considerations. The pathway model provides performance activity through the number of uses per life time as indirectly proportional to the amount of artefact wear during use (Schiffer 1987: 50-51). And basic discard equation is a wider consideration of discard of a specific item in the settlement as proportionate to systemic number of the item in use during activity and indirectly proportionate to uselife of the item (Schiffer 1987: 53). These calculations require an ethnographical study to test artefacts according to their uselife and number in occupation in one episode. This can only be presumed as fraction of long periods, where the number of items can not be other than sample assemblage providing only indefinite inference, because lifespan of artefact forms is very large considering with the uselife of one particular artefact.

The factor influencing the quantity of dead assemblage is the use frequency, life span of the object and replacement cost (Deboer 1983: 29, Schiffer 1987: 48). One item may vary in quantity to the neighbouring site relying on the trade activity. Life span of an object may be different due to its endurance to the particular activity and if replacement cost is high, it may be used in a repaired state. However time to time they may appear in a secondary cultural context through secondary use, i.e. improvised use with a different function (Tomka 1996: 15).

One taphonomic characteristic of the artefact is the amount of attrition. Whole vessels are likely to appear in burials, caches, ritual deposits and floor deposits. It is more likely that whole pots are kept for a particular purpose other than refuse. Only in ancient Greek bothroi we see the practice of depositing whole pots in pits within the sacred land, aiming to create space in treasury for new offerings. The use-wear analysis informs us if it functioned or its modified function (Schiffer 1987: 271). Intrasite deposits are only considerable related to the intensity of the occupation, which tends to expose secondary and tertiary refuse, and in some respect *de facto* refuse can be of significance if the curated artefact ratio is low, but they are mostly considered as negligible clusters (Schiffer 1987: 281).

4.4. Cumulative Cultural Processes

Through time an environmentally favourable area witnesses various long or short-term human activities. POSI (places of special interest) aims to give information about the activity took place in an area by considering the diversities in types of assemblages as lithic scatters, dense pottery scatters, slags (Given *et al.* 1999: 24), dense tiles, ratio of coarse and finewares, dark cultural soil, daub (Stoddart *et al.* 1991: 142). By such a study archaeologists aim to diversify individual activities. However in most cases activities intersect each other.

Eastern Mediterranean (Turkey, Balkans, Egypt) and Middle East (Mesopotamia, Afghanistan and the Indus basin) are the areas the accumulation of cultural processes provide arteficial mounds (Davidson 1976b: 255). These mounds are long-term settlements built on top of the leveled ruins belonging to previous periods. Natural and cultural processes in semi-arid areas bring rapid erosion reducing mounds within 500 to 2,000 years (Kirkby *et al.* 1976: 229).

Understanding the formation of dead assemblage from a house is important to be considered to understand the dynamics behind the höyüks, which are flat topped mounds distinguished easily within the surrounding geography (Davidson 1976: 262).

In house mounds the house first begins to disintegrate as a simple central mound or two peaks spaced 3 m from eachother or as a broad mound with a sharp edge (Kirkby *et al.* 1976: 238). Later they form an elyptical mound. The clay used for brick, especially in Mexico and Iran are mixed with sherds and reused and as they collapse. This explains one aspect of the dense sherd concentrations in settlements. The artefacts move and form alluvial and cultural accumulations, breaking down and transported in its geographical context (Kirkby *et al.* 1976: 230). In the beginning they move up, above the structure., later dislocated and decrease in density (Kirkby *et al.* 1976: 239).

In case of tell formation, a continuous destruction process and levelling takes place before reuse occurs. This deposit is quite similar to alluvional deposition. They are not faced with erosion as does the isolate house model (Kirkby *et al.* 1976: 244). Sherd concentration decline is related to the mound height rather than the process of reuse. The levels lower than 5 m are expected to be found lower than 1% of their original concentration. Therefore the survey technique should be careful enough to miss that below 1% sherd. The condition of the ground on different days is also a great importance. And considering the upper 5 cm of surface soil increases the possibility to find more sherds (Kirkby *et al.* 1976: 246).

Taphonomy of cumulative cultural processes are usually what we come across with in a survey. The recovery of sherds help us to understand the activity areas of past humans, but these are just patterns of mostly multi-period scatters with various densities. Archaeologists attempted to define these patterns as:

1) Uniform distribution: It provides equal probability of yielding artefacts but with mean artefact differing on site and off-site in case of clustering variance would be higher than the mean. Negative binomial distribution and poisson distribution can be used to model such distributions (Banning 2002: 14).
2) Bulls-eye or Fried-egg model: In a continuous distribution of background noise on modern surface or plough-zone concentrations are associated with human activity relying on site formation processes (Banning 2002: 15).

Peaks of artefact density are surrounded by gradual fall off by distance (Banning 2002: 16). There has been sophistication in the definition of the pattern through time. Kintigh suggests a hemispherical distribution rather than the uniform distribution decreasing linearly. A sinusoidal distribution is used for defining highly localised activities with mean coordinates centered at the anomalous distribution. But bimodal and sinusoidal distributions reach a peak and decrease gradually whereas in settlements there is a uniform pattern on site and as we reach the edges of the site there is an abrupt decrease reaching again a uniform off-site distribution. Contagious distribution includes binomial and Neyman type A distributions are used for randomly distributed Poisson process of one cluster, or doubly stochastic poisson distribution involving randomly placed clusters (Banning 2002: 17).

3) Palimpsest model: Site doesn't consider a particular activity, but rather cumulative distributions of activities of differing times overlapping over eachother (Banning 2002: 18) (see fig. 7).
4) Off-site or Intersite model: Other than settlements, where there are discrete spots for activities as dwelling, working, worshipping, interacting quarters but other activities take place other than the settlements like agriculture, pastoralism, waste disposal, processing raw material which can relate to such patterning outside the locations (Banning 2002: 19).
5) Distributional or non-site model: The model argues that densities are accumulation of gradual repeated discard activity although not satisfactory to represent a settlement but preferred habitats, represented with the analytical units (Banning 2002: 20).
6) The place model: The model was formed to avoid adhering activity to settlement rather than any possible activity (Banning 2002: 20). The consequent overlapping of camps, resource extracting locations, tool maintenance and other site formation processes forms sites (Banning 2002: 21).
7) The paleolandscape model: It is a geoarchaeological model combining landscape and subsurface information. The probability of representation on

the surface relies on the changing landsurface (Banning 2002: 22).

The refinement in the attempts to model density patterns help surveyors to better interprete the data collected. Because only a fraction of the outlying artefacts are collected and set in a statistical frame although these models are produced from patterns of activity. Here the post depositional processes (erosion, colluviation, alluviation) are ignored. Technique; skills; visibility due to colour, vegetation, angle of the sun (Hayes 1991: 81); patterns of scatter, all affect the data and add some bias. Besides all these artefacts are not a complete population, and their surviving rate is unknown. In case of low frequency intensification may help gathering sufficient data, but this reduces the area surveyed, and conceal the patterning.

The human behaviour have four depositional aspects:

1) Rubbish disposal: In communal deposits, most domestic refuse (pottery mostly where it was used or produced, high concentration of artefacts, bones and other domestic disposals) take place at the immediate vicinity of settlements. It forms the majority of debris accounted as sites,
2) Manuring: At least from 1st century AD onwards midden and manure-stack material used as humus for intensive arable land short in distance. These are usually attributed to low density extensive scatters of abraded sherds around the sites,
3) Burials: They are usually omitted and difficult in terms of coincidence, isolated sherds from a couple of whole pots either from a funerary practice or a hoard,
4) Miscellaneous breakages: Lost or broken in transit or during daily outdoor activity. In pastures it is only possible to coincide a couple of sherds in intensive surveys, contrasting totally with arable lands (Hayes 1991: 82).

4.5. Other Anthropogenic Factors

Trampling of sherds by human, animal and machine interference (Schiffer 1987: 268) cause decrease in assemblage, chipped edge (Schiffer 1987: 266) and sandy substrates sort exposed artefact by size and ploughing activity shows both characteristics together (Schiffer 1987: 268). The effect of trampling is explained by 'treating event'. A 60 kg person moving on an archaeological mound can turn 100 4-8 cm sherd into 2000 sherds. This action causes 'surface lowering' in the centre. Near the periphery there is no addition to the present sherds. One person walking all over the mound every century is equivalent to 10 people walk every year (Kirkby *et al.* 1976: 237). There is also a great chance that movement of large objects by getting kicked or thrown down by animals and people (Allen 1991: 53).

Pottery collection is a field technique and interpretation for population, density, settlement and location relies on the counting of these sherds. Rather than simply relying on erosional and agricultural activities, all kinds of human activity should be considered for changing the statistical significance of artefact densities and archaeologists are a part of the process (Schofield 1991d: 79).

Public vandalism by collecting unsystematic data for recreation damages the data, but rate unknown. Diagnostics and retouched artefacts will decrease or be extinct. In such a case the use of dated unsystematic surveys + frequency of the remaining again contingency table analyses, difference of proportions and graphic scaling techniques can be used (Boismier 1991: 19).

It is sometimes different endogenous practices rather than modern mechanical ploughing and drifting soil (Gaffney *et al*. 1991: 76) that helps understanding the surface replacement.

In Hvar survey archaeological material was mostly collected upon the clearance cairns and field walls. The process of depositing large materials around the field walls is common in the Mediterranean, strategies for such surveys are common in Southern-semi-arid US, Northwest temperate Europe. 50% of the material is assumed to be near the walls (Gaffney *et al*. 1991: 77).

Terracing is one artificial interference to nature known in the

Mediterranean from Bronze Age onwards, when poorly maintained, enhances erosion, from then it encourages dispersal of ceramics downslope. Clearance and remanagement may deposit them in field walls as in Hvar Project (Mallone 2000: 100).

4.6. Ploughing

Only 1980s onwards traction of horse-drawn ploughing is replaced by machinery. Intensive agriculture brings ancient settlements to life. If specific activities can be distinguished, we can get rid of the word "site" (Clark *et al.* 1991: 103). From then on some sites are not represented on the ploughsoil either because they lay deeper undisturbed or their representation on surface either absent as they are unploughed or by low material that escaped the eyes (Barford 2000: 84) that is excluded from conservation zones.

New agricultural techniques bring more questions for surface surveying than last 50 years mixing again and again the subsurface-surface assemblages. Analytical surface survey is continuous data spreaded over the landscape giving preliminary information not applicable for theoretical interpretation. Experimentation is required for various sampling schemes for an optimal methodology, in the best season. So representative data considering the time span, size of units, intensity, time and labour costs, the knowledge of specialists are all influencing factors. This sort of data is only a thin fraction, therefore all data should be analysed in significance. Past settlement behaviour and plough-zone taphonomy act on the assemblage and "background noise" should be considered to interprete properly. Mathematical data synthesis allows such low numbers be evaluated. Understanding processes transforming archaeological remains in the plough-zone though experimenting and finally coming up with formulae and simulations to measure survival of certain types will be the next step in interpretation of surface data (Kuna 2000: 42).

However the taphonomic transforms only become significant for survey materials as they become cumulative. Post-depositional damage like trampling activity causes attrition on artefacts (Schiffer 1987: 272). One other cumulative cultural process is vertical selection of artefacts as a result of ploughing activity, and the dragging effect causes horizontal deplacement (Schiffer 1987: 280-281).

Breaks occur depending on sherd's microstructure, where impact resistance is greater than impact strength. And after a significant number of events (ploughing episodes) an unimodal distribution forms around the spot where impact resistance equals impact strength. In case the impact strength is so high, then again if impact damage stabilises gradual sherd size lowering curve forms a 'Poisson Distribution' (Taylor 2000: 20). And later the sherd size becomes so small like 10 mm. That it becomes a part of the soil matrix.

Five factors are considered as a distinction between behavioural and agricultural patterning in agricultural ploughing: Horizontal/vertical displacement, class frequency changes, condition and conservation of assemblages, destruction of layers and features. Horizontal displacement relies mostly on the slope, size and equipment type. Mouldboard ploughs have the largest effect (Boismier 1991: 17). Size affects the displacement of larger (<4 cm) objects to higher soil levels and smaller objects to lower levels by the ploughing activity. This continues till it reaches an equilibrium and by that time >4 cm sherds are more evenly distributed in the lower soil level. It first becomes a sample of total population, later a sample of ploughed zone. In total it is no more than 10% of total population. Large artefacts will of course be overrepresented. Implement weight, object size, frequency of ploughing affect damages of ploughing. Loosening of soil and increase in organisms help chemical processes. Therefore more durable objects have more probability to be found. Original behaviour patterning and their analytical diversification are questions and via distribution of size classes, direction of ploughing, preservation contingency table analysis, bivariate and multivariatecorrelation and graphi scaling techniques can aid to reach behavioural patterning (Boismier 1991: 18).

The plough action does not affect the horizontal movement of the objects, but the vertical movement of larger objects (Tuna 1994:628). In vertical movement the cause of displacement – mouldboard plough – larger objects are pushed down in the ploughing and in cultivation an S-spring-tine cultivator is used. In 3rd year much of the material still laid packed in the subsoil. As a result we may conclude that the material will remain consistent in subsoil to an extent. After the fluctuation in the beginning, the exposure and remainder settled (representation below ca. 3.5%). Ploughing brings high number of material compared to other agricultural equipments (Clark *et al*. 1991: 100). However displacement is more concerned with cultivation, not ploughing in flint. Without ploughing only one flake and two pebbles out of 430-565 visible on the surface.

In vertical movement, coarsewares are the first to travel to the surface. Destruction of different types of material relies on the firing of the objects (Bowden *et al*. 1991: 109). Lithics remain mostly on the surface and more pottery survive stratified deposits. Ceramic building materials have a different pattern, they are pretty immobile contrasting smaller artefacts, however topsoil representation higher than surface and stratified deposits. Strong correlation coefficient provided in regression analysis between survey and subsurface ceramic building materials. This variation illustrates differential destruction of different materials (Bowden *et al*. 1991: 111). Stripping even 5 cm of the plough-zone increases the representation a great deal.

Cultivation rather than ploughing causes horizontal displacement (Taylor 2000:23). Usually ploughing distributes sherds evenly, however in case of a slope, only ploughing made parallel to the slope, therefore displacement in the direction of ploughing and erosion only factors to affect (Taylor 2000: 24).

Tillage, geomorphology and biogenic activity cause displacement. Experimentation on these are shown to be inconclusive and unreliable, methodology limited. Normal agricultural activity cause alternating direction movement. But as the sherd number changes as cultivation depth and attrition changes. No constant number to be called target population. In cultivation different effects are caused by harrowing, disking, mouldboard ploughing and subsoiling (Taylor 2000:23).

The depth rises with heavy soil. Mouldboards dig usually 300-350 mm and tine cultivators 250-300 mm. Instead of the drag effect of chisel and tine plough, subsoilers and panbursters create fistures and shake the soil for drainage and aeration, and reach a depth between 350-700 mm. Composition of remains of durable depositional assemblages, form close to the modern surface (Taylor 2000: 17). Soil type and drainage are decisive factors influencing soil erosion, ploughing depth and necessity for subsoiling. Subsoilers and panbursters cause fissures in soil rather than pulling material to the ploughzone. In the ploughzone artefact is faced with continual displacement in soil matrix and more deteriorated (Taylor 2000: 18).

Lateral or horizontal movement on ploughsoil has variables as time, climate, pedology and topographical setting. Between 20 and 30 years the displacement is between 20cm and 10 m, whereas in two years after an episode of six or more ploughing the displacement is somewhere between 1.18-1.74 m (Clark *et al*. 1991: 93). In a downslope plot after an episode of three years (9 or more ploughing) the displacement reaches up to 5 m. Other agricultural activities serve mostly breaking the large clods into a level soil. Rocking motion causes displacement, but variation is caused by intensity and soil type. Arid-light soils exhibit less artefact movement, middle latitude-heavier soils on the other hand exhibit more artefact movement. The drag factor of the plough quickens the process. Experiments won't apply to a different region, relying on the differences indicated above. Intrasite patterning occurs lowland Britain despite long intensive agricultural activity. The surface-subsurface equation can be drawn even if subsoil is disturbed some characteristics may help us relating artefacts together like burning (Clark *et al*. 1991: 94). Sampling will be affected by the visibility and activity on soil will also lower the sample.

Both regional and site surveys seek the question of "how much does sampling represent the subsurface?". Dunnel discussed surface finds-1990: "Artefact size and lateral displacement under tillage: Comments on the Odell and Cowan Experiment", American Antiuqity 55(3), 592-94. "disputed by unreliability especially machining of unstratified surface deposits in site evaluations." Regular ploughing homogenises the surface finds and total ploughzone correlation and ploughzone and target population will be considered (Orton 2000: 57). It is more convenient to consider ploughzone as a population, in considering subsurface remains it may be absent or it may be partially present like shallow features (Orton 2000: 58).

Building materials are related to superficial activity (collapse or destruction) if they are high in frequency. They are the first to be affected by post-depositional activity. If uniform post-depositional activity persists, top-soil will start to gain building material and the correlation between surface and subsurface data will increase. Pottery deposition is different in character. Cleaning and disposal activity is important in accumulation of the material, as tessellated floor, together with manure, as inclusion for mudbrick. In PP17, Boeotia, tiles on top of buildings, ceramics have no intersection. Pottery supposedly from pits in the farmyard. Only considering pottery, while excavation may lead astray (Bowden *et al*. 1991: 112).

As ploughing is added as a factor soil profile will rise. If 15 cm is considered as ploughzone, 3 cm erosion on the receptor area will increase to 18 cm and not be processed as plough soil, and will be 17% of the upper density. As the process continues vertical dispersal and burial will occur hand in hand. In a low energy erosion frequency will increase on top and decrease on the valley bottom. A more powerful rill can move artefacts. Gravity of prehistoric pottery (1.93), flint (2.61) and chalk (2.17) are respectively important for this process. Chalk is likely to move in a small rilling and break into round shapes and roll more easily. However although pottery has less gravity, its platy shape resists rilling, only move on overland flows (Allen 1991: 45).

Good quality data provided by the development of field methodologies. British Theoretical Archaeological Group (TAG) conferences between 1982-86 discussed surface survey techniques. It seems that ethnographic data for human behaviour's role in surface processes will be a great aid. One other interest is defining sites according to their roles. Sedentery habitation sites are not the case in all sites. "Living" is not the only activity on sites opposed to archaeologists before 1980s, the activity can only be assessed through incorporating survey results within the general archaeological data. TAG stated that the fragmentary nature of survey data is a problem. 15 cm ploughsoil is the borderline between residuality and reliability (Bowden *et al*. 1991: 107). Here I would like to present how agricultural fields are treated:

Group 1 - Models for simple mixed farming

Model 1 (A): Individual infield, individual outfield: In early farming communities and pioneer settlements, where low hierarchy or non, small settlement units on good arable land. Extensive agriculture rather than intensive. Small concentration of pottery and domestic debris. The diffused pottery small in size and more abraded – off-site, with patches of empty land reserved for pasture. In such a subsistence oriented system, pottery is expected to be mainly local or scarce. Erosion, burial by hill wash or alluviation may also cause such spurious patterns (Hayes 1991: 83).

Model 1 (B): Individual infield, communal outfield: Settlements brought together with adjacent large arable land and pastures. Higher total productivity, have a share for social purposes together with individual again a pioneer or non-market economy system. Sherds and settlement debris more closely spaced than 1(A) surrounding low level scatter and nearby a blank area for pasture, usually on sandy or loomy soil. The original pattern, again can be changed partially due to erosional and depositional processes.

Model 1 (C): Complex infield, distant outfield: Intensive pastoral production, relying on their seasonality and intensive care close to the settlements for supplementary fodder in winter and nursing periods. Therefore pastures can be further apart from the cultivated land, however stables and pens are situated just outside the settlement and a couple of sherd accumulated there will be replaced with dung and domestic refuse in the arable land. There, sherds should be more (Hayes 1991: 85).

Group 2 – Models for specialised farming

Model 2 (A): Specialised arable: Bulk transport of agricultural product. Arable land close to processing and market area. One would expect low density scatter consisting regular arrangement of sites. This time abundant and varied pottery including non-local wares. There should be access to pastoral zone.

Model 2 (B): Specialised pastoral: Activity closely associated to an urban centre like large-scale horticulture. The main specialisation is animal husbandry and transportation to longer distances is possible. In places unsuitable for agriculture, or in need of such a specialisation in market economy it occurs (Hayes 1991: 89). An exchange centre and complexes in loose clusters, but empty between these no non-site material. However post-depositional processes may cause such a formation. We expect high non-local pottery and possible arable land outside the settlement.

Group 3 – Models for complexed and mixed farming

Model 3 (A): Triadic Integration: Communal open fields, ordinary pastures and intensive pastoral lands integrated around one settlement. Herd or flock size is limited to the amount stocked for winter (Hayes 1991: 90). Such a territory will be autonomous being supplemented with an exchange market. Such places are in junction of various ecological zones. Abundant sherds on the arable land.

Model 3 (B): Expansion onto marginal land: It is formed by adding new agricultural land from the pastures, by means of new less dense sherd scatters, sometimes even increased to a three-field system (Hayes 1991: 91).

The attempts to identify the effects of ploughing start with the observational phase of 1960s. There the concerns were density related with non-cultural soil depth, horizontal movement can bring new secondary deposits, there is down slope movement tendency (Orton 2000: 58), horizontal displacement assessed through distance between parts of one individual find, rainfall, agricultural activity affects the data frequency, individual sampling procedure, manuring from middens adds extra material, tillage taphonomy, frequency of different periods should not be compared (Orton 2000:60).

The experimental phase in 1970s were more concerned with visibility and its representation of the ploughzone, sampling process , vertical and horizontal displacement, amount of breakage by by cultivation activity (Orton 2000: 60).

Verhoeven experimented with 1000 tiles buried 20 mm below visibility and observed 5-6% variation in 2 years 2 m. The displacement, downslope displacement are considered. Downslope ploughing applied and low breakage observed, but the duration was insufficient (Orton 2000: 61).

Ammerman experimented with 1000 chipped stones buried 0.10-0.15 m below the surface in a 15 X 15 m field (Orton 2000: 61). 5.6% yearly vaariation of displacement is calculated. Obstrusion was highest in spring and autumn. Larger artefacts were more frequent. Displacement in one season was one metre, in two seasons is two metre. Displacement is affected by the direction of the plough, object size and displacement are not related (Orton 2000: 62).

Odell and Cowan used computer simulations for aging such experiments. The displacement of artefacts depends on material, size and burial context. Such aging experiments are a good way to get the sense of a cumulative observation (Orton 2000: 62), which reflect the character of the data in a more real presentation.

Van de Velde experimented the destruction of bones, have a half-life of 700, and pottery of 1,500 years. Ploughing causes horizontal movement and large scale patterning smearing of large objects. If the general pattern is good structured , it can still be recognised so long after (Orton 2000: 62).

Boismier discusses portable artefacts, how they reach surface and how they create a pattern (Orton 2000: 62). He observed the relation between patterns and parent population, the surface distribution through tillage, possibility to trace of intrasite patterning and to distinguish it from large-scale patterning. Therefore as well as the patterning of assemblages and their composition on surface also affected by the intensivity of tillage and slope and also affect the surface finds and their character. And he came to a conclusion. Abundant categories are easier to draw conclusions from, in rare categories the conclusion is less related due sampling effects, dispersion doesn't depend on size and it tends to accumulate and if there is a slope, more tendency to be biased, small scale patterns disappear quickly, and through time patterning increase in size and decrease in density and two adjacent patterns may merge. The problem in this study is the negligence if tillage is a regular process or not, to recognise if equilibrium can be reached on surface material (Orton 2000: 63).

Clark experimented the behaviour of lithics on ploughsoil in a three seasons' work at Salisbury where he defined geology, topography and soil type and type and intensity of agriculture (Clark *et al*. 1991: 95). He came up with two hypotheses 90% will be in the ploughsoil. 0.3 to 2.79% will be on the surface. 9 zones within the trench represent different artefact types to 20 cm depth.

Horizontal displacement was limited. Lateral displacement in the 1st year was with a mean displacement for flakes was 1.04 and nodules were 0.87 m consistently to the left of the plough (Clark *et al*. 1991: 96). In the 2nd year the mean displacement for flakes was 1.90 m and nodules were 1.83 m and 3rd year mean displacementfor flakes was 1.23 m and nodules was 0. 51 m.

Human activities have the same importance of altering the archaeological record as natural factors. The main reason for this is the reoccupation of favourable spaces over and over. Ploughing activity lead archaeologists to do many experiments. And abandonment process introduced us to a new terminology concerning all the activities taking place during the evacuation of a site.

CHAPTER V

ASSESSMENT

Archaeological data assessment requires a site surveying of previously set transects according to a statistical consideration. Quantification of surface material is later printed on the transects on the map. Definition of sites according to the type of activities is therefore a later decision to be made according to the size, density and character of activity areas. The main idea is to create a database informative about the studies to be undertaken in the same region. Here I tried to explain the processes of archaeological investigation phases:

5.1. Survey Methodology

Survey will never be a chronologically refined mode of investigation. The precision provided by excavations datewise, in surveys is provided by the supply centres and their marketing, site size, site function and life styles (Alcock 2000: 2). Research strategies usually stay implicit, but all involving sampling and designed to solve specific problem sequenced to form productive and efficient (Millet 2000b: 92) results. Also traditions and scale of study bring us to data that can not be systematised together. Visibility is either recorded with repect to the distribution, or correcting variation according to the visibility factor by using filters (Millet 2000b: 93). Data accessibility is the most important factor after the work finishes. Messenia survey and Pylos Project have put their data on the Web. For pottery, both reconnaissance of leading pottery and their social meanings are important (Alcock 2000: 3).

Standardisation can be achieved in archaeology, but before hand all surveyors should use standardised field organisation, and methodology, data handling , analysis and reportage. Within the past decade there are many books on survey methodology, recording and interfacing of the data into complex databases, retrospects and new surveys will be the critics on methodology. There is a clear-cut distinction between intensive and extensive surveying. However the difference in methodology does not allow archaeologists to compare data easily. Although people talk about standardisation in methodology, this is not achieved yet (Mattingly 2000: 5).

Transect walking may inform us about large sites with numerous artefacts, but may be uninformant about highly localised and rare distributions. And once recognising a classical rural farmsite, microtopography would help identifying vestigial earthwork features and geophysical survey helps identifying the subterranean anomalies and geochemical studies analysing the accumulation of phosphate, which is mostly the encircling outskirts and the putative ditch, trace element lead in abnormally high concentration in the central area and geophysical and surface survey are matching apart alignment. In geophysical survey showed that the orientation of the building is different (Bintliff 2000c: 7).

For field evaluation the first research should be the revision of previous studies in the region, and if sufficient it may not require a survey but desk-based assessment (Orton 2000: 116). Objectives should clarify the need to do a survey by means of gaps in period, significance of settlement patterning, or cultural significance. Population to be sampled in a site is limited by the boundaries of the site. Data to be collected should follow extensive and non-invasive for general and for the areas of interes with intensive invasive methods (Orton 2000: 117).

Redman comes with an idea that can statistically be inferred through a multi-stage. Multi-stage research design starts with a preliminary investigation or reconnaissance survey to refine research questions then gather the data according to the problems and design providing desired datasets (Banning 2002: 24). First sites are picked up, next they are subsampled. This way characterisation and specification within a site is achieved. Environmentally this sort of projects occur as a part of legislational view of surveys, regional projects, small scale projects, small scale surveys as part of regional research design after the discovery of sites (Orton 2000: 69). In a purposive research design previous stage is decisive on what to focus on next (Banning 2002: 25).

Research proposal is on the other hand a combination of problems and the approach to solve it to find funding. The prior review of the literature and geographical information it will be possible to set fieldwork into some methodology. And the sorts of patterning expected to be found should match with the methodology. Research design is the path followed to set questions and to solve them. It requires a general understanding of physical properties of the land, the studies taken in the region and also the limitations of the extent of the study can be set. The framework of the data analysis, sample size and fraction and unit size and shape became clear (Boismier 1991: 12).

Surface sampling is the technique of data collection in surveys, but their application is just by employing techniques used by other surveys. Problem orientation and research design is a medium come up by a general review of the area and to see which methodology is appropriate to follow. However employing methodologies from other studies may not match the character of the data and lead missing many clues that are related to solve specific problems of the present study. Another problem is to fit the fieldwork to the research design. They mostly depend on budget, equipment and work schedule and time (Boismier 1991: 11).

Pottery became a tool to identify different sorts of human activity. Site formation processes, artefact displacement, ploughing, artefact taphonomy, as well as quantitative methods (Shennan, SJ, 1985, Experiments in the collection and analysis of archaeological survey data: The East Hampshire Survey, Sheffield University Press) become considered facts. Geographical concerns and taphonomy of landscape is however less studied. Bias comes mostly from the geomorphological processes, that is the obstrusion and post-depositional activities (Allen 1991: 39). That is logical considering the types of artefacts and their conditions expected according to the function of the site we are investigating as a whole. But if we consider the small percentage inspected, it becomes more difficult to make an assessment by its own. There is also the up-lift factor by natural and agricultural processes which mixes different contexts and combined with horizontal movement a more confusing picture develops. However knowing the present velocity of material transport and using computer simulations, one may get an idea of the pattern of movement and it may provide an insight for the archaeologist at a certain level. Nevertheless it may set a border of confidence in our interpretation.

There are lots of biases involved because human factor is processing , tendency to pick bright colours, visibility and light. Most of the pottery (especially coarse) remain undated. Other than pottery, lithics, tile, slag, metal, non-local stone and glass are also collected. Tile and pottery ratios are important to decide between site/off-site distributions. Quantification is done to measure density. Grab samples are good to get datable information (Mattingly 2000: 9).

Field is usually implemented as unit in tract collection. The tract is then divided into traverses (stints) or transect corridors paced by one line walker. 5 m spacing increases the intensity, 15-25 m spacing for covering large plots and 10 m a more secure way not to miss out changes if inexperienced archaeologists are involved. Tracts can be arranged according to the modern field shapes or the whole site may be taken and divided into traverses. Therefore usage of GIS becomes difficult for the precision of defining field boundaries. IDRISI and GRASS are more suitable programs for entering survey data in their raster-based application. It is easier to locate on a map and locate differences in land-use and vegetation. (Mattingly 2000: 8).

Trial trenches are informative about the site especially for drawing info about the periods. The degree of significance is an archaeological decision, the type of data collection should be according to the character of the site. If little is known, probabilistic sampling is is ideal, if aerial photographs exist, machine dug trial trench informs us more about the architectural features (Orton 2000: 118).

Cochran has identified twelve stages in surveying, which are:

1) Assimilation of existing knowledge: Background information and partially experience brings some strategies and so far one can control the information brought by using different techniques (Orton 2000: 159). The studies in the region should be overviewed before the fieldwork and strategies has to be set according to natural and cultural processes to survey more prudently. GIS gives us very useful information about the mechanical processes (Orton 2000: 76) and predictive modelling can be presented to show cumulative effects of processes (Orton 2000: 77).
2) Objectives of the survey: It is to obtain information according to needs in order not to struggle with processing sampling strategy; to represent proportions and diversity (Orton 2000: 159). Together with quantification ecofacts also help us understand cultural traits like butchering marks, other food processing activities (Orton 2000: 160). The research should consist both a regional coverage and periodical concerns. SMR (Site Monument Records) and MARS (Monuments at Risk Surveys) are very different in duration, but aim total coverage (Orton 2000: 77). Sometimes objectives are more estimation oriented like the number of sites due to their size, type, period, function; environment and site distribution, network (Orton 2000: 79).
3) Population to be sampled: Setting boundaries to the excavation area is not always difficult. Usually cut features and dark and ashy deposits are the challenge for plant remains, recently instead of this selective sampling (Orton 2000: 160). Blanket sampling is preferred for its meaningful status by means of statistics. Volume/population is therefore a better consideration rather than assemblage/population. If a cluster sample is already considered, then a subsample is of course is of importance (Orton 2000: 161). Before sampling the site should be defined. It is done through archaeological , topographical, administrative and arbitrary means. Archaeological boundaries vary from one year to another, whereas topographical boundaries are well defined spaces. Administrative boundaries are usually related to then orientation of the project which consists re-occupation of various places and their ancient

network or the focus as urban archaeology or SMR (Orton 2000: 79). Arbitrary boundaries depend mostly on systematic survey units. Third dimension is necessary when visibility and obstrusiveness are low. Multi-stage sampling consists of subsurface sampling after surface surveying. Sometimes it is not actually possible to survey some parts because of urban or forested areas and difficult land owners. But it changes the sampling and adds partial bias to the study (Orton 2000: 80).

4) Data to be collected: Quantification of different types and their characteristics determine the strategies required for an appropriate method. Apart from broken data, the large amount of missing data is involved in an archaeological dataset, where refitting acts with importance (Orton 2000: 161). Unit of analysis is one main concern in collecting strategy. The site or assemblage or artefact? Boeotia survey set units of pottery distribution to separate site/off-site. Defining site is sometimes arbitrary and more an archaeological decision. But either to categorise or to select or to record data in situ (Orton 2000: 81) depends on the spatial accuracy. Collection damages the archaeological record, causes time and money loss and yet it is subjective. Total collection helps using information about rare categories as periodical activities and especially for prehistoric sites such an evaluation is helpful (Orton 2000: 83).
5) Degree of precision required: The margin of error provides reliability for the interpretation. Inadequate data will just be spending time (Orton 2000: 163). If hypothesis testing exists, the degree of precision can be much easily calculated. But when testing hypotheses the probability of missing a site in accordance with the sampling strategy and intensivity of the survey and also the precision to follow the methodology should all be counted. To be able to do this we should have the criteria of categorisation of statistical models and also considering anomalies through the distribution within the units (Orton 2000: 84).
6) Method of measurement: Weighing, counting, counting using EVE (estimated vessel equivalent) or MNV (minimum number of vessels) are the best fit in this problem. If there is a load of work, it should certainly aid

interpreting, but only if applicable measuring system is used (Orton 2000: 163). It should be well understood by the pedestrians and entry to the database should be easy (Orton 2000: 85).

7) The frame: It considers spatial units (Orton 2000: 163), and sampling technique. Bias in sampling is inescapable, but samples of same intensity can be compared according to their assemblages. However condition of sample units may not be equal. A more fragmented unit (Orton 2000: 165) will be less informative. But this can also be noted (Orton 2000: 166). Surveying quadrats are expensive but easier to define before the survey. Transects however can even take natural lines (Orton 2000: 86). The border lines taken may diminish the next year but GPS is a good solution used for precision in tract borders (Orton 2000: 87).
8) Selection of the sample: Subsampling from cluster samples does not aim a population, sampling is not random. Nance approaches this problem considering a unit as a population (Orton 2000: 166). The third dimension is a trivial part. The level may be misleading (Orton 2000: 167). If sample is small it may be difficult and misleading to draw conclusions, if it is large, it is a waste of time and money to process (Orton 2000:92). All this struggle is to prepare samples to represent a sampling unit adeuqately. Adaptive sampling regards the difficulties according to topographical structure omitting low percent probable sites (Orton 2000: 93). One site is estimated for each run and the correlation made between the estimated and actual sites (Orton 2000: 94).
9) The pre-test: To develop procedures a couple of pilot sample units should be quantified to adjust sample size and sampling strategy (Orton 2000: 168). It may answer questions like variability either spatial or other means, cost of fieldwalking, test-pit, screening, locating sample points, transporting, and recording system (Orton 2000: 99).
10) Organisation of the fieldwork: Previous works give us idea about the planning, sampling, processing, storing and expenses (Orton 2000: 168). Location, size, duration, funding are all important factors in organisation. Random sampling or the sampling technique to be followed should be

learned well (Orton 2000: 99).

11) Summary and analysis of the data: In cluster samples ratio estimation is the first step to analyse (Orton 2000: 168). X^2-test is used to calculate binomial distribution and standard deviation informs us about the similarity of sampling units, have same ratio. Effective size (or pseudo-total in pottery) is a measurement of ratio estimates to calculate homogeneity or variability. Factual and estimate means, standard deviations and totals should be calculated. Nearest neighbour analysis may require reconnaissance of all quadrats, due to edge effect or some may be part of two units. It may cause problems (Orton 2000: 99) of counting a site twice (Orton 2000: 100).

12) Information gained for future surveys: Density, variability, types of features can be useful for comparing future sites (Orton 2000: 169). Differentiation of site/non-site is yet an archaeological criteria and seeks significance which is dependent on the context it consists. But it can be changed through time. The aim should be to understand original population from unit samples (Orton 2000: 100).

Methodology follows these procedures to achieve a database informative about the regional aspect of activity arrangement. This information is aimed to consist type of settlements, spatial organisation, arrangement of work spaces and regional production, and may also consist information on economy, population, trade and periodical changes.

5.2. Site

Region requires both topographical and cultural recognition (Orton 2000:67). Site is high density of artefacts (Orton 2000: 68). Term site relies on the "culture-history" (typological) paradigm and it is a definition in field surveying as spatial unit for artefact scatters. However the surrounding empty areas are usually a smooth decline caused by erosion and other factors. And in these studies small scatters or individual artefacts, large low density scatters, scatters of atypical artefacts or ecofacts are omitted. They miss out both non-residential areas with low finds. Sites usually have phases of different periods (Kuna 2000: 31), lots of information is lost during sampling and also quantification is problematic. "Siteless" survey by measuring densities in the landscape is however analytical and their comparison and correspondance in small units (Kuna 2000: 32).

The hypotheses brought for defining a site are :

1) high density does not necessarily represent occupation (Schofield 1991a:).
2) Artefacts represent various activities and sometimes a combination of few (Schofield 1991a: 1).

Limits of a site, esp. in a larger survey difficult. The case in which site and non-site and non-site together, it is possible to make a statistical sampling of the population. Surface/ subsurface collection, recognition of features, detecting soil colour changes, chemical changes (phosphate) good ways to understand the limits as well. Population or proportion of particular object assessed through archaeologically significant difference, at a 95% confidence level 10% precision can be assessed. This can be tested on cluster sampling (Orton 2000: 128). They can be grouped as feature/non-feature units, where binominal formulae can be used and they give proportion roughly as well (Orton 2000: 129).

Mattingly approaches the problem through comparison between the targets and understanding of surveyors from assemblages, i.e. surface and subsurface sampling and assemblages and excavation sampling and assemblages. The overall sampling strategy depends on budget and available labour. Collection may cause a problem in storage. There is a new tendency to conduct siteless surveys. Data collection from background noises is later analysed and rather than calling them sites there is a new tendency to call activity areas as Abnormal Density Above Background Scatter (ADABS) and there are attempts to form a new surveying taxonomy. Standard sized control collection in ADABS circular collection in 5 m^2 or cross- shaped transects starting from the centre (Mattingly 2000: 6). In multi-period sites sub-scatters may be detected as discrete scatters. It is usually cost-effective to collect diagnostics as grab samples and mostly dating relies on these sherds. Recording off-site scatters, the use of land and change during time can be traced analysing pottery (Mattingly 2000: 7).

Proportion of different artefacts and dispersion changes in off-site locations help considering a different taxonomy and provides more control over the data. Region is first divided into ecological zones representative for whole region (Keay *et al.* 1991: 137).

POSI (places of special interest) as lithic scatters, dense pottery scatters, water mill, smelting furnace and SIA (special interest areas) showing horizontal expansion and more variable in the type of material are also new terminologies used by surveys that are helpful identifying the function of the activity areas. Other uses of terminology for settlement patterning are sites (peaks in density) and settlements (sherds, tiles and architectural remains) (Given *et al.* 1999: 24).

The types of surveys according to their sampling concerns are divided into three:

1) Prospection (selective surveying) aims to find archaeological materials (Banning 2002: 27). It grew as a result of search and rescue operations after the Second World War in Europe. There was a great struggle to rehabilitate and identify monuments together with city maps and constitutions. High probability spots were considered for research (Banning 2002: 29).
2) Predictive (statistical model) aims to estimate populations from the densities (Banning 2002: 27). Testing predictive models require sampling design. Therefore spatial units are considered as the subset of the universe and estimation of parameters are considered as population of the universe (Banning 2002: 30). However while doing this time is an important variable requiring consideration all population can not be simply considered as one cluster (Banning 2002: 31). Such a consideration of population has its pitfalls dating with pottery dating sites may be founded while others disappear and seasonal sites will increase the population. One other aim is to set the relation between environmental zones and exploitation (Banning 2002: 32). In such surveys specific artefacts distributions can be used to see economic interaction. Diversity in artefacts can be set to see hierarchical setting of settlements over the survey universe (Banning 2002: 33).
3) Structural survey aims to identify spatial patterning, arrangement of services and catchment and nearest neighbours (Banning 2002: 28). A large sampling

area is required to identify settlement patterning regarding Hodder and Orton and rather than random sampling a contiguous part of the area is necessary to survey to identify settlement lattices, roads and apply Central Place Theory (Banning 2002: 34).

Sites are all sorts of activity places defined by field archaeologists in different ways as ADABS and POSI. The different prospection techniques provide different rate of precision related to the developments in surveying. The more sensitive prospection techniques get, the research precision increases. As intensive surveys start, field archaeologists become aware of the relation between the similarities between type of activities and scatters.

5.3. Sampling

There occurred problems conceiving sampling as site sampling and artefact sampling. Simple and systematic sampling, experimental resampling then shifted to more definitive approaches. Obstrusiveness and visibility are two factors affecting the data. Some argued that total coverage is essential and others that sampling is dehumanising (Orton 2000: 70). In regional surveys, total coverage is related to the space between pedestrians and sampling size, intensivity should remain in such studies. STP (shovel test-pit) is a technique for visibility-poor lands, a 0.5 m^2 area gives 0.1 to 0.001% of the total. Sub-surface probing, augering and divoting other techniques and the aim is to find artefacts, features, middens (anthropic soil horizon), chemical and instrumental anomalies (Orton 2000: 71). Geophysical prospection is more efficient on known sites, but as their speed rose, they are even used in regional surveys now (Orton 2000: 72). The aim goes from estimation to hypothesis testing. The probabilistic sampling of Binford soon followed British implementation of the technique (Orton 2000: 73).

Therefore a mosaic of good visibility sites should be the first to encounter. The completion of maps can be compensated by simulations considering visibility and observed patterning. Since conmplete recovery is impossible, thinking natural selection and man-made sampling together. All spatial techniques like Thiessen polygons, rank-size rule and nearest neighbour analysis rely on complete distributions. So visibility should be considered regionally on different geographic contexts (Terrenato 2000b: 25). GIS becoming common in surveys to process quantitative data on a density map, but it is rather used for topographical accuracy.

The factors affecting the data assemblage are the geomorphological and pedological character of the archaeological site, natural and cultural processes and their duration, conditions and methods under which the research has taken place, "chance" (Tuna 1994: 623).

Systematic sampling is useful, although running the risk of coinciding the regular pattern, hypotheticly (Orton 2000: 133). Adaptive sampling has more bias in it and it increases standard deviation and not as efficient as random sampling. On the other hand sampling size is small and it is not restricted by a certain number of sample units (Orton 2000: 135). Selective sampling induces biased and distorted population estimates (Boismier 1991: 20).

Sherd quantification and weighing are very time consuming processes and very much related to the intensivity of the survey. If off-site coverage is as important as in site, then such a collection will become meaningful. Later the processing phase small collections become difficult to assess a statistical result. Recording format for pottery is important to use effectively for quantification (Orton 2000: 56). The diversity of ploughsoil assemblage from excavation material are: They are unstratified, they are faced with an ongoing destructive sorting (even relative to the sherd fabric), direct comparison between surface and subsurface material is problematic. Quantification, dating and a technique to use assemblages in maps. There are doubts about population measurements relying on survey data. Large scale and long term economies can be set through using this data (Millet 2000a: 53).

They all have intrincacies though in quantification:

1) Counts – level of fragmentation varies according to their wall thickness and firing

2) Weighing – different fabrics and fors give different percentages of a whole pot

2) EVE (estimated vessel equivalent) and MNV (minimum number of vessels) – highly worned and fragmented rims and bases are difficult to come up with a circumference proportion. The correlation of count and weighing seem to produce meaningful inferences (Millet 2000a: 55).

The character of the background noise is sometimes confusing. The overall picture gives an idea, however soundings are important to understand the character of the scatter. In intensive surveys, it is possible to trace changing density through time (Mattingly 2000: 11). The patterns formed by density maps should be well analysed and explained if resulted from modern land use or visibility or natural processes. The quantification should serve a good planned statistical analysis. Multipliers are used to get a full effect of the survey. However a full collection is required for such a calculation (Mattingly 2000: 12). One other treshold is caused by the lack of diagnostics in some periods raising identifiable diagnostics of another period (Mattingly 2000: 13).

Technology and surface treatments can be chronologically attributable diagnosis (Kuna 2000: 35), in case decoration and shape are the diagnostic features then probability of dating for surveys reduces. That is also a reason for dating some Medieval and prehistoric phases. High fragmentation is a problem erasing form, treatment and last technology from the sherd and cause underrepresentation of some periods (Kuna 2000: 36). Chronological distinction on sherds survive only for short as they are represented by surface treatment and form and these diagnostic sherds can be very low in number. Distinctiveness of pottery varies highly therefore abrasion effects dating if fabric can not be set chronologically. Complex production systems are helpful this way. Greece and Anatolia has sophistication and elaboration in pottery through time therefore easier to distinguish chronologically. As they are less fired prehistoric pottery is less resistant to degradation, below 900° C and between Moh’s scale 3 and 5 and high porosity of 30% and higher (Mallone 2000: 96).

Pottery is relatively a perishable item according to its firing technique. Poorly fired prehistoric pottery can survive only limited ploughing episodes and therefore only retrieved if buried deeper and exposed recently, therefore more difficult to trace in a regular account. Middle Eneolithic, Middle Bronze Age and Migration period are therefore quite low in survey recovery. Therefore functional attribution of space is difficult for prehistoric periods; such as field, production areas, communication zones, but limited to residential activities (Kuna 2000: 33).

Qualitative characteristics of the artefacts are informative about the attribution of sites with the function. Categories of material according to functional distinction as sanctuaries, cemeteries. Kiln sites are informative about urban and rural production and distribution of specific coarsewares (Hayes 2000: 105) and even second sheets are arranged so. In case of no pottery available, sites remain undated as in Dark Age and Middle Age (Hayes 2000: 106).

About dating regional production is problematic to be expected to be set chronologically from excavations by the aid of contemporary datable items, this is usually a high expectation. But pottery chronologies are not precise (Millet 2000: 54). And the amount of undated pottery biases the data (Millet 2000a: 55). Excavations can at this point be helpful by reanalysing and quantifying diagnostic pottery with fabric treatments and fabric diagnosis can be used deduced from excavations to identify a broad chronology based on fabric characteristics. In Eastern Mediterranean the high proportion of coarsewares on surveys depend on the fact that depositional processes, low portability and in situ reuse causes this proportion. Baker tested them according to size effect hypothesis large and potentially reusable artefacts survive on the surface (Mallone 2000: 98). This selective excavations should also consist detailed survey of kiln sites and kiln dumps. If archaeologists are mostly locally based dates will be better identified (Hayes 2000: 107).

In Mediterrenean surveys, population is studied through units taken as cemeteries, huts, farms and villages from Bronze Age onwards. The use of off-site scatters is actually to fix the site boundary. In Middle Ages there are almost no sherds in Britain and very little in Italy due to wooden vessel usage. Therefore density itself is not reliable, this is true also for Saxon sites and quantification is meaningless. So other than pottery remains of organic material like bone or charcoal, dolia, querns and slags, building material as worked stone, foreign stone, mortared stone, mortar tesserae, floor tile, burnt daub, dark patches of earth (phosphate and trace elements?), patches of subsoils (cemetery), light clayey soils (dissolved pisé walls) are qualitative remarks other than pottery pointing a site. Therefore regarding these facts of subjective judgement a second visit to the sites is necessary (Fentress 2000: 48).

Obsidian and other lithic finds are more frequent than pottery in most Mediterranean surveys. At Saliagos although sherds wore off obsidian still present. Situation is very similar in Melos and Kephala as well. At Paura obsidian escapes better from downslope transportation and they are two times as much as pottery. In Northern Keos lithics determined 4 Neolithic sites whereas there were only 2 diagnostic sherds. In Gubbio valley ceramics occur at sedentary core sites and flints on off-site mobile activity zones. In Nemea Valley a similar case occurs, while corrections were made regarding the friability of Neolithic sherds (Mallone 2000: 99).

The mapping of overall densities of groups according to time and space are done to define the variation through time and space. With this broad phases used for pottery, broader aspects are viewed in social and economic changes. Deviation and the mean percentage from the total survey is summarized using these assemblages (Millet 2000a: 57). Patterns can be identified small assemblages of infrequent occurrence are with limited information. The responsible factor for patterning is complex determining the variation, which should be considered also may cause the data be random (Millet 2000a: 58).

5.4. Visibility

1980s onwards visibility became an important concern. Vegetation cover, alluvial deposits and erosion cause the distortions, but they have not been considered in measurements. Cecina Valley survey is an asset on that matter.

25 km² on the coastal plain surveyed with recording visibility. There is a strong correlation of surface visibility and density of sites (10 times higher). One mistake in settlement patterns is that archaeologist assumes dealing with a complete distribution; like Nearest Neighbour Statistics, Rank-Size Analysis, Thiessen Polygons. This problem can be simulated on different visibility levels but complete distribution of sites never recorded (Terrenato 2000a: 60).

To deduce settlement pattern; border of large settlements, natural boundaries can only be possible by the full coverage survey. The limitation to that is the dispersion of material in the landscape and obstrusiveness and visibility. In such a case small box soil sampling is more suitable to get information about large, common and dense sites. Visibility depends on inflation in soil, density of ground cover, precipitation and quality of light. Traditional techniques reinforce hot spot sites, whereas using statistical methods, the ratio of site will rise up to 8 – 17 times that. Therefore probabilistic sampling is problematic, recording therefore should be tested by resampling and by "seeding" experiments (Given *et al.* 1999: 22).

There are unsuitable spots for surveying; a small spot from the region is generalised by autocorrelation. When there is low visibility and few sites it may be misleading to show a small radius in the map, rather the surrounding values become important or their value must be left blank. When calculating spatial analysis of Nearest Neighbour on the map, requires incomplete distributions, it is not possible to use modified data (Terrenato 2000a: 69). Although earlier spatial analysis was understood in a more geographical way. Employing shaded or contour maps rather than dots is more feasible for that idea. Rather than actual, the likelihood of concentrations can be shown. So the most important impact there is the consideration of incompleteness of the data (Terrenato 2000a: 70).

Shape, size and position of units influence the visibility also, and one site after ploughing episodes may cause many assemblages from one site. It should be used for interpretation by adding visibility maps and the other maps should be given with sets of boxes with dots. Smoothing is one operation in interpreting the dotted maps, visibility and site density given in accordance, with changing radius which gives this measurements instead of grids and shading is given according to the visibility and number of sites. Connections made according to the visibility of incomplete segments (Terrenato 2000a: 66).

In the last years visibility and state in archaoelogical recognition were always considered together with parametres which range in difficult situation than our capacity to retrieve archaeological sites. Ammerman and Terrenato put forward a further and articulated alaboration of the subject, unrecovery is twice because of the visibility: The relationship between visibility and expectation of retrieving site and the relationship between visibility and the possibility to provide corrected historical interpretation in the study area.

1) The archaeological visibility must be 'measured' to avoid the risk of serious misunderstanding in interpretation of site diffusion and archaeological deduction.
2) The insetion of other types of non-archaeological parametres, in archaeological visibility evaluation can yet be encessary in characteristic contexts of serious difference in the way in which surface presents.

In particularly fortunate circumstances also can tempt to reconstruct the landscapes in situations of sherd absence, that is the lack of significant extractable cultivated fieds (Cambi 2000: 72).

However raw data should remain fundamental, if more sensitive filters are invented raw data would provide better results, or low densities as a result random variation. In estimation of low densities or edges of high densities concern us by means of settlement size, thus confidence in density vary spatially and through time. Comparability is one other requirement in surface surveys to be able to reference as a database (Millet 2000b: 93).

Multicultural sites are sites with material from diverse periods do not necessarily mean a continuous settlement. The boundary and the character of material are decisive in such a scatter. It is actually three sites together if all are not continuous contextual harmony. Urban sites are historic towns interrupted by modern dwelling. Finds are therefore sealed under buildings, paved surfaces or grass areas. The archaeological unit of site becomes again unclear defined by exposures (Barford 2000: 79). Mistakes can more easily be changed if computer entry is done hand in hand. Entry should be similar to the recording sheet. Recording the limit of sites , and the subsurface representation over the surface and discussions over that are still multivariated. Even if accuracy by using 5 m² grids can be informative about the limits of sites and sudden changes, they are very time consuming. By using ground visibility surveys claim to adjust quantification but it remains to be sceptical (Mattingly 2000: 10).

Test pits may be misleading if spaced far from each other in detecting farmsteads (Kirkby *et al.* 1976: 248). The studies in population shows differences according to the erosion and agricultural activities. The chance of finding earlier material rises only if they were used by later constructions (Kirkby *et al.* 1976: 249).

5.5. Publication and Data Analysis

Publication is quite a slow process still throughout the world to make research available (Millet 2000b: 93) for academics and other excavators. Academic publication is composed of these factors. First is to present a re-evaluateable data, explanation of what was done and why; and the third is what it provides to human past and why. Even when internet publications gives out data, methodology should still be explained and conclusion discussed, or incomprehensible and historically meaningless (Millet 2000b: 94).

Regional surveys start in 1970s. The adoptation of these ready data to GIS was meticulous entering as they are highly implicit. Desktop Mapping Systems (DMS) occurred as a result of aid GIS serves. GIS gathers spatial and attribute data in a uniform environment. Boeotia survey gathers 10,000 macro-scale offsite transects and 200 detailed site surveys accompanied with micro-topographic and geophysical surveys and entry of specialist artefact reports. They on the one hand provide site distribution maps, environmental and topographic base maps, on the other hand environmental variables from satellite images. However chronological entry requires division as broad chronological phases (Gillings 2000: 109). Environmental data also involves simplified soil and geology maps. GIS is technologically determined. Like some archaeological assessments as symbolic pathways and social spaces are difficult to apply with GIS. Besides it is easier to adhere variables as slope, aspect, soil type, hydrology for locational analysis as tempting archaeological sites. But it gives emphasis to spatial analytical techniques starting from theoretical discussion and being shaped by the advance of technology (Gillings 2000: 110). This combination of environmental and frequency mapping gives rise to Thiessen polygons and site-catchment analyses one more time. When the concern is protecting and curating movements and archaeological remains with a limited budget known locations and predictive decision was the strategy, which limits to understand the space, place and landscape relation in ancient world. Before it was a map producing black box, however now it is more like Pandora's box that should be used cautiously for biases it may create. Archaeologists therefore are used to create annaliste, structuralist or phenomenological questions to be able to use GIS effectively. Because it is not neutral, but a theoretically informed approach. It should not be considered as Archaeological Knowledge System involving an Archaeological Information System (Gillings 2000: 111) as metaphorically addressed.

Cultural Rersource Management and heritage protection being the main concern, the data from Cecina Valley are combined to provide on overall country map (Terrenato 2000b: 25). These gather maps of survey, archaeological maps, cadastral maps, aerial photographs, urban archaeological maps, historical maps, raster OS and airphotos, DTM, land-use, visibility and geological maps. Anglo-Saxons are using raster programs like GRASS and IDRISI and Italians vector programs like ArcInfo and Microstation. The attempt on ancient cognitive patterns is replenished by contextual information and textual information, this way allowing the distribution data integrated into landscape phenomenology (Terrenato 2000b: 26).

POPULUS project is one attempt in Europe, through methods should be applied by first understanding the nature of the site and limits of its validity. In comparison the method of collection and inferencing. However geographical and historical variability may require different methodologies, but this may still be compared. Therefore forming a thesaurus for assemblages is a good way to start (Millet 2000b: 93). However the methodologies lack comparable measurement and a well research on the present information. POPULUS sponsored CE is such an attempt (Terrenato 2000b: 23). And with that aims, new publications are formed with distribution maos, visibility maps, site distributions and finds. The new discussions support site based surveys against the time consuming density recording. The factors influencing distribution of artefacts as long term ploughing , different ground cover, the surveyor, variabilities on different phases. Repetition of surveying in different season may help along with simulations to gain an accuracy. GPS rather than gridding helps surface density recording. The geopedological character, ground cover, susceptibility to erosion are other important factors influencing. Visibility may affect recovery ten times more than poorly visible ones. Therefore recording visibility should be the first priority (Terrenato 2000b: 24).

Archaeological surveys proceed these steps to come to a conclusion. The conclusion, when supported by other geophysical surveying techniques, confirm that the survey scatters are meaningfully confirmed as activity spaces of same attribute.

One example, a farm house from Boeotia survey (Gillings 2000: 113-115), has been a proof study for intra-site analysis (see fig. 8, 9, 10). It gathers microtopographical survey results with that of resistivity, geo-chemical surveys and trace element analysis. The alignment of resistivity survey data corresponds well to the alignment of surface pottery density, only showing diversity along the slope continuity. This unfit is certainly a result of slope erosion and can be clearly seen on the topographical map. There is also abnormally high concentrations of trace element lead circling the habitation area.

CHAPTER VI

CONCLUSION AND PRACTICAL IMPLICATION

Surveying leads to low destruction, this makes it a desirable research tool to study archaeological formation. It is used to cover large samples bringing analyses on settlement patterning and is becoming a desirable technique for organisation of databases joining national archaeological records. The implication of geomagnetic surveys to surface surveys provides us a fuller image of architectural elements and lay-out beneath the soil. Using these techniques archaeologists aim to refine strategies for excavation and decrease time, money and energy spent for the bulk of excavation.

Mechanical agriculture is the cause for the emergence of large amount of pottery fragments on the surface, mixing the upper 30 cm of the ground overly each year. We should also add the deep ploughing undertaken approximately every 4 or 8 years which increases the depth into 50 cms destroying the stratigraphy (Kuna 2000: 34). Off-site prehistoric pottery does not stay for a long time on the plough-soil, but wear out the next season (Mallone 2000: 98). Therefore there is an ongoing destruction done by mechanical agriculture diminishing prehistoric pottery evidence, which need to be handled not to lose information about the prehistoric settlement patterns.

Intra-site structure is concerned with the questions on how activity patterning can be distinguished from post-depositional patterning, if qualitative and quantitative differences reflect function and post-depositional processes, how long occupation affect density and content. Diagnostic materials, technological classes and morphological and functional classes need to be distinguished in order to be able to deal with survey analysis (Boismier 1991: 19).

In individual sites, it is possible to do intrasite investigations as investigating street alignments, position of buildings, etc. There finding edges help further recognisation and then an adjustment according to the physical characteristics of the land, or sharp breaks in topography may also give us idea about the alignment. There is a difficulty of using the measurements about intra-site patterning from surveys for excavation, it may be contrivial doing so. But by the survey it may be possible to differentiate scales of sites and get some idea about the land-use by measuring artefact discard (Wagstaff 1991: 10).

There is a need for systematising attributes for activity areas. ADABS (Abnormal Density Above Background Scatter) (Mattingly 2000: 6) is a good attempt to diversify high densities from background noise and POSI (Places of Special Interest) (Given *et al.* 1999: 24) concentrates on the activity areas, but yet there is a great need for correlating size and utility based diversification to recognise them with confidentiality. In addition ways should be sought to maintain a unified methodology for the comparability of survey results.

Cultural Heritage has the function to enlighten the past lifeways and cultural developments using material data under the constriction of analyses to assess models (Banning 2002: 184). Cultural property includes archaeological sites as part of immoveable cultural heritage (UNESCO 1999: 3). They are the values taking place under a governmental management requiring to be protected from vandalism, construction and misuse (Feilden *et al.* 1993: 65). The notion heritage requires to be protected for next generations (Banning 2002: 179) and velocity of scientific developments promote a better understanding of their functions, capacities and values with further details. Managing these values also consider the scientific work to be taken, because with excavation we destroy a contextual assemblage into fragments only joined with an excavation report. Inventorying is an important issue in environmental management and surveys are necessary for this inventory (UNESCO 1999: 75)

Cultural Heritage Management aims documenting, management and conservation of Area of Potential Effects (APE) with emphasis on economic, social and cultural aspects in United States (Banning 2002: 177). Documentation is especially necessary for preventing illegal exportation and cooperate American States to appreciate cultural property (OAS 1999: 177). Identification, rescuing and consolidation of high risk cultural heritage is important to document for its state, to see what protection needs to be taken as viewed for gradual threats (Banning 2002: 178).

Surveys function to identify condition and significance of sites, for protection and scheduling cultural heritage by regional departments (UNESCO 1999: 29) with emphasis on the periods and site densities on a regional basis (Banning 2002: 180). There is a neccessity to delimit and protect sites and areas of archaeological interest (CE 1999: 82). They are a tool for developing strategies the protection of archaeoogical heritage to prepare inventories and databases (ICOMOS 1999: 389). Surveys are also preferred for being non-intrusive non-destructive techniques, and are urged instead of excavation (ICOMOS 1999: 530). Surveys achieve this aim by "… analysis of spatial evolution to cover archaeological, historical, architectural, technical and economic data, … thorough documentation and inventorying" (UNESCO 1999: 192). European Council mandated memberstates to produce systematic national archaeological inventories of soil and subsoil investigations and prepare databases for their cultural resources (CE 1999: 351). For this reason multidisciplinary surveys were found to be necessary for heritage management (CE 1999: 377).

ICCROM (International Centre for the Study of the Preservation and the Restoration of Cultural Property), a section of UNESCO declares that a site commission is necessary for controlling the conservation and management of world heritage sites according to national administrative pattern for the member states (Feilden *et al.* 1993: 3). Therefore the recording of the database and coordination of other institutional studies emerges as a mission of regional museums.

Cultural Heritage Management in United States has led to regional surveys and in Britain to county surveys. The difference in surveying plot is caused by the governmental body responsible for cultural heritage management. Prospection and statistical surveying form the Cultural Heritage Management to be able to protect cultural values while applying development plans (Banning 2002: 196). However regulations are insufficient to set out a methodology for standardising surveys which makes comparative studies impossible (Banning

2002: 37).

Sites and Monuments Record or Monuments at Risk Surveys are ones with specific problem preferred using hypothesis testing. Mediterranean Region, on the other hand, is endowed with easily recognisable remains, but still intensive survey is necessary (Orton 2000: 74) for recording a fuller information of the regional settlement networks and socio-economic potential. Man's conception of his landscape and exploitation can be traced through this macro-scale distribution in regional surveys (Schofield 2000: 45). It is also important to identify the condition of cultural heritage and take action plans for their conservation (Allen 1991: 44).

A recent conference convened, encouraged Mediterranean countries to survey of historic settlements under the guidance of institutions and experts (UNEP/MAP/PAP 1999: 268). Regarding the developments of TÜK-SEK, there is such a request initiated in year 2000. Protection and planning in archaeological sites in Turkey were insufficient regarding economical funds, lacking the multi-disciplinary project programs, lack of a database in the local administrative systems. And the sites were regarded either as excavation areas or visiting sites, which consists of surveying zones (Madran 1991: 43).

The intensive multi-disciplinary studies taken up in case of dam constructions. Keban project constitutes the starting point of "New Wave Archaeology" in Turkish archaeology (Özdoğan 2001: 10). Similar intensive studies also cover Karakaya, Atatürk, Batman, Dicle, Aslantaş, Ilısu and Kargamış Dam Projects and Bakü–Ceyhan Pipeline Project, both invite international studies and budget for a thorough analysis (Özdoğan 2001: 110), because an emergent case for rescue always taken seriously.

Surface surveying should be informative about the periodisation and the borders of the site in case of registry. Mostly registry depends on finding an above ground structure. Therefore there are only 3000 registered archaeological sites (Tuna 2000: 40).

Surveying does not only provide information about surface scatters, but also informs us about buried multi-period sites (Tuna 2000: 40). Using geophysical techniques (electrical resistivity, magnetometry, remote sensing, etc.) qualitative and quantitative determination of a site becomes possible (Tuna 2000: 41).

Turkey has an important portion of world cultural heritage (Özdoğan 2001: 38). But the researches are very limited (Özdoğan 2001: 39). Museums are responsible for the regional archaeological inventories and documentation (Özdoğan 2001: 41). There was still no cultural inventory in Turkey since the end of the last decade, although there have been several attempts, the challenge of cultural minister stopped the actions taken (Özdoğan 2001: 42). The so called TAY Project aims to inventory studies undertaken around Turkey, but that is no more than a compilation of the existing knowledge (Özdoğan 2001: 87).

The lack of systematic documentation causes problems in estimating the rate of destruction and setting high risk protection areas. Registration is done by a council make mostly of architects and only one archaeologist, decides on it, as an archaeological site and the degree of its importance (Özdoğan 2001: 72). Archaeological surface assemblages are still disregarded as sites, but they are also necessary to be defined in order to take ay protective action (Özdoğan 2001: 88). Cultural inventory requires a multi-period surface surveying of 25 to a couple of hundreds square kilometers, intensively registered and published and entered into databases in a certain format (Özdoğan 2001: 89).

Cultural heritage inventory act is rather new in Turkey. It is made effective only after year 2000, with an aim of reporting all documents related to the inventory in a certain format indicated in the handbook, ready to be entered in the database, every January (Başgelen 2003: 3). The project was initiated in two pilot regions, Buldan (Denizli) and Suruç (Şanlıurfa) (Başgelen 2003: 9). The project is a multi-disciplinary task covering an area with archaeological, urban and rural architectural, written and oral historical, ethnographical, ethnobotanical and geological considerations (Başgelen 2003: vii). Documentation follows a single format indicating GPS coordinates, condition and rate of destruction is one of the main reasons to inventory to be able to handle the protection of national cultural heritage (Başgelen 2003: 14). This act covers archaeological sites of lesser significance, including flat habitation areas as well as mounds and monumental architectural features (Başgelen 2003: 13).

United Kingdom is a good example for the steps to be taken to develop a database induced management strategy. From 1988 onwards, English Heritage Monuments Protection Programme (MPP) started reviewing sites with different character distributed on map for understanding settlement history and patterns, documenting location, date, degree of survival, integrity of scatter, size and density (Schofield 2000: 49). These data is combined under Sites and Monuments Record (SMR) conducted by county officers (English Heritage 1995: 5) and especially keeping archaeological remains in situ. The researches were undertaken by consultants and contractors with multi-disciplinary body organising field studies under the curation of National Trust, English Heritage, county archaeology sections, National Park arhaeology sections, district/borough/town archaeology sections (Darvill *et al.* 1995: 2).

The Ministry of Culture can approve the support of General Directorate of Pious Foundations, private urban administrations, municipalities and other public institutions and foundations for protection, restoration and conservation with technical and allowance support of immovable cultural and natural heritage as well as funding and technical support from its body according to issue 11 (Kültür Bakanlığı 1999: 157). Ministry of Culture also has the sanction to prohibit building plan in case of a declaration of an area as an archaeological site according to issue 17 and all the rights to control and analyse the area according to issues 20 (Kültür Bakanlığı 1999: 159). The scientific research permits for trenching and excavation are accorded to Turkish and foreign commissions and institutes, renowned as scientifically and economically sufficient by the proposal of the Ministry of Culture and Tourism (Kültür Bakanlığı 1999: 164). General Committee of Cultural and Natural Heritage Protection and Committees of Cultural and Natural Heritage Protection in the regions assigned by the Ministry provide services for coordination between protection committees, determine the general problems occuring at the practice according to issue 51 (Kültür Bakanlığı 1999: 167).

Archaeological sites are part of archaeological protection zone which consists of immovable natural and cultural heritage and their historical surroundings and requires to investigate its natural features, social, economical and architectural aspects (Kültür Bakanlığı 1999: 154) The protection law, protecting body and the consensus of protection for Turkish Heritage was not clear since 2000 (Bademli 1997: 2). Determining the Natural and Cultural Heritage list we come across with registered objects, objects requiring protection according to laws and legislations, objects requiring protection as a result of private examinations with determined protection treatment (Bademli 1997: 4). Registration creates the problem of consensus on an object requiring protection, which in case can be decided arbitrarily or politically (Bademli 1997: 12). Ownership by private and public institutions are only important for sustaining protection. Public institutions are more advantageous for handling the power to set protection rules and urging execution of these rules (Bademli 1997: 22).

Regarding all these novelties, the initiation of systematic surface surveying will be a tool for Turkish archaeology to organise new archaeological researches.

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FIGURES

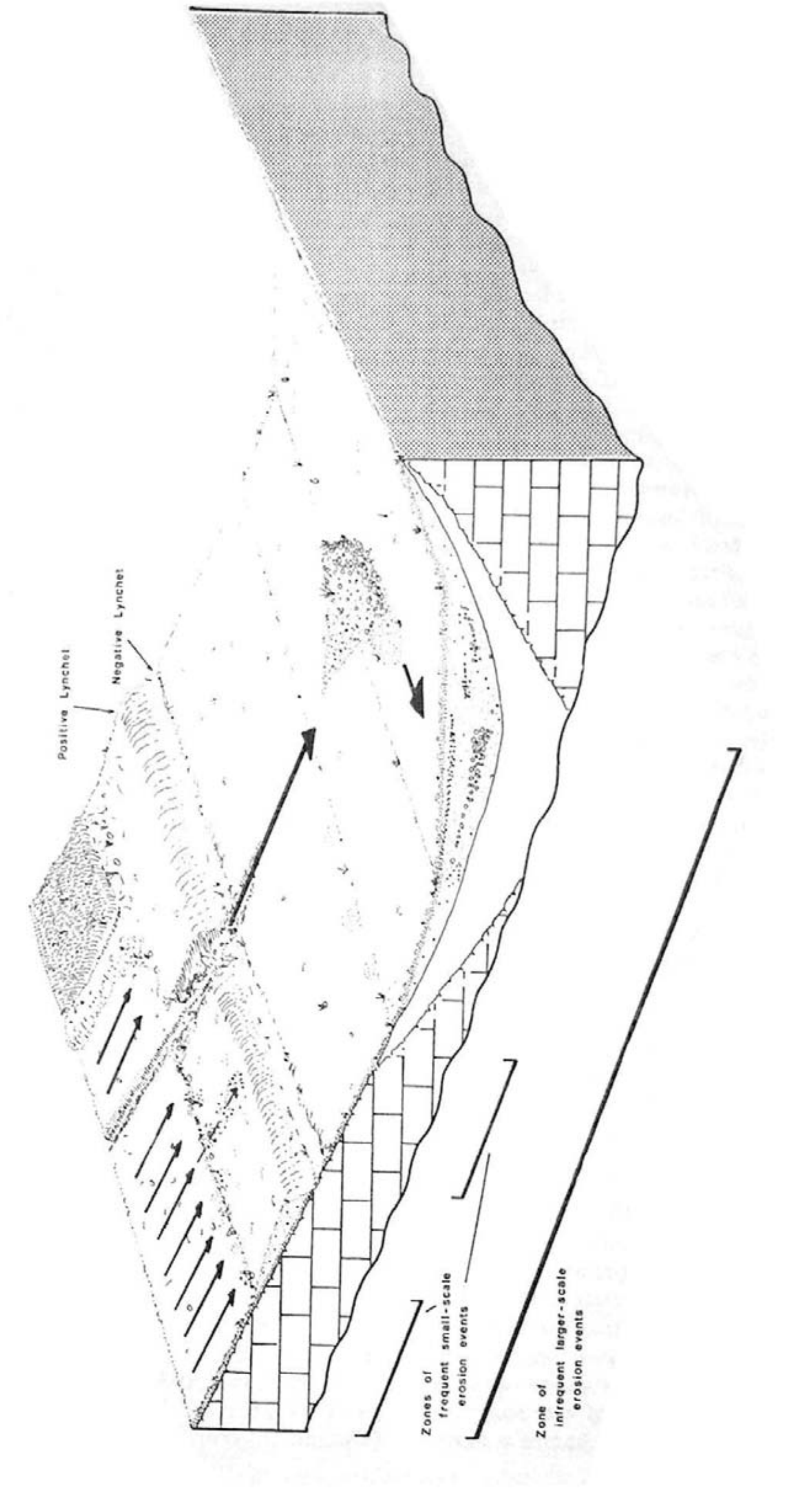

Figure 1: Formation of Natural Processes (Allen 1991: 42)

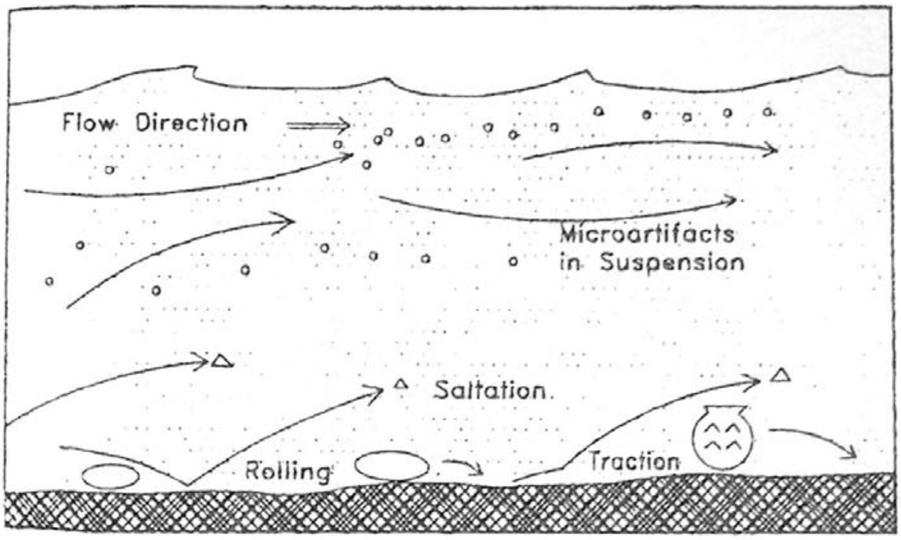

Figure 2: Water Transport (Rapp 1998: 41)

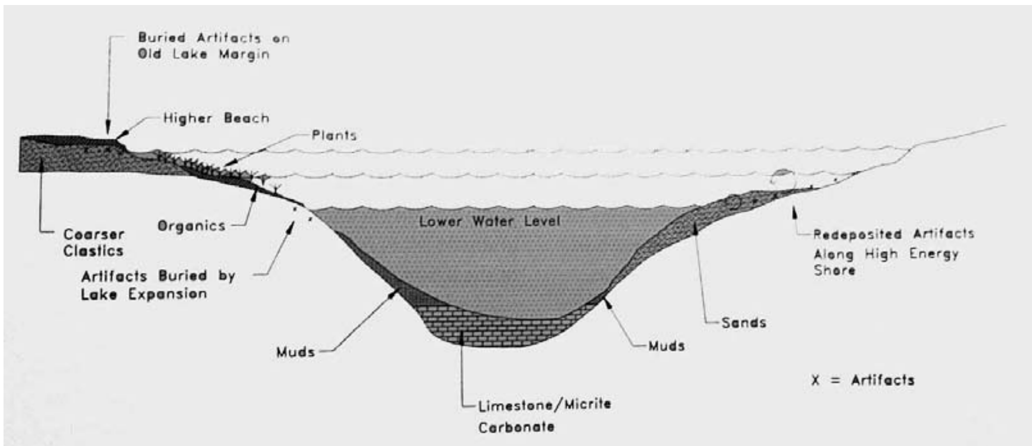

Figure 3: Lake Deposits (Rapp 1998: 58)

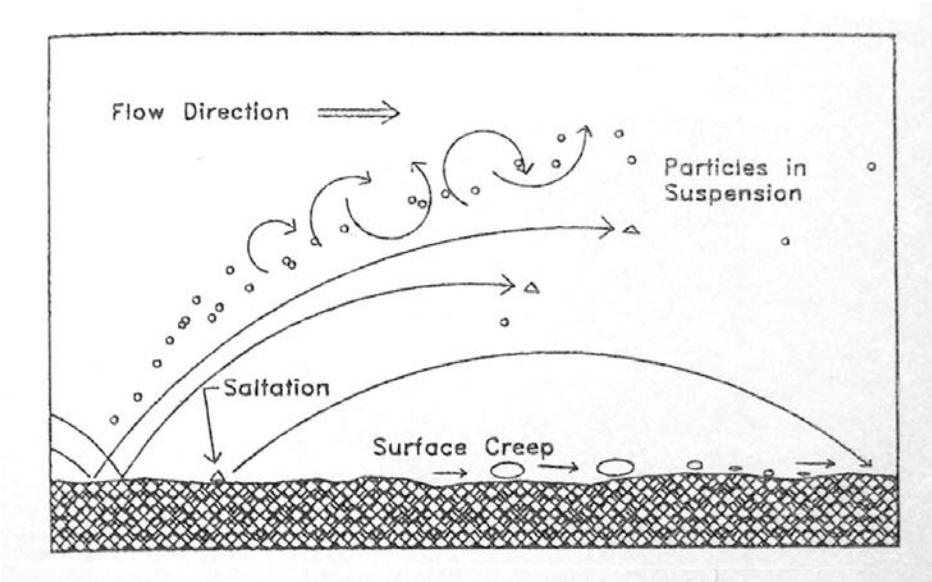

Figure 4: Wind Transport (Rapp 1998: 41)

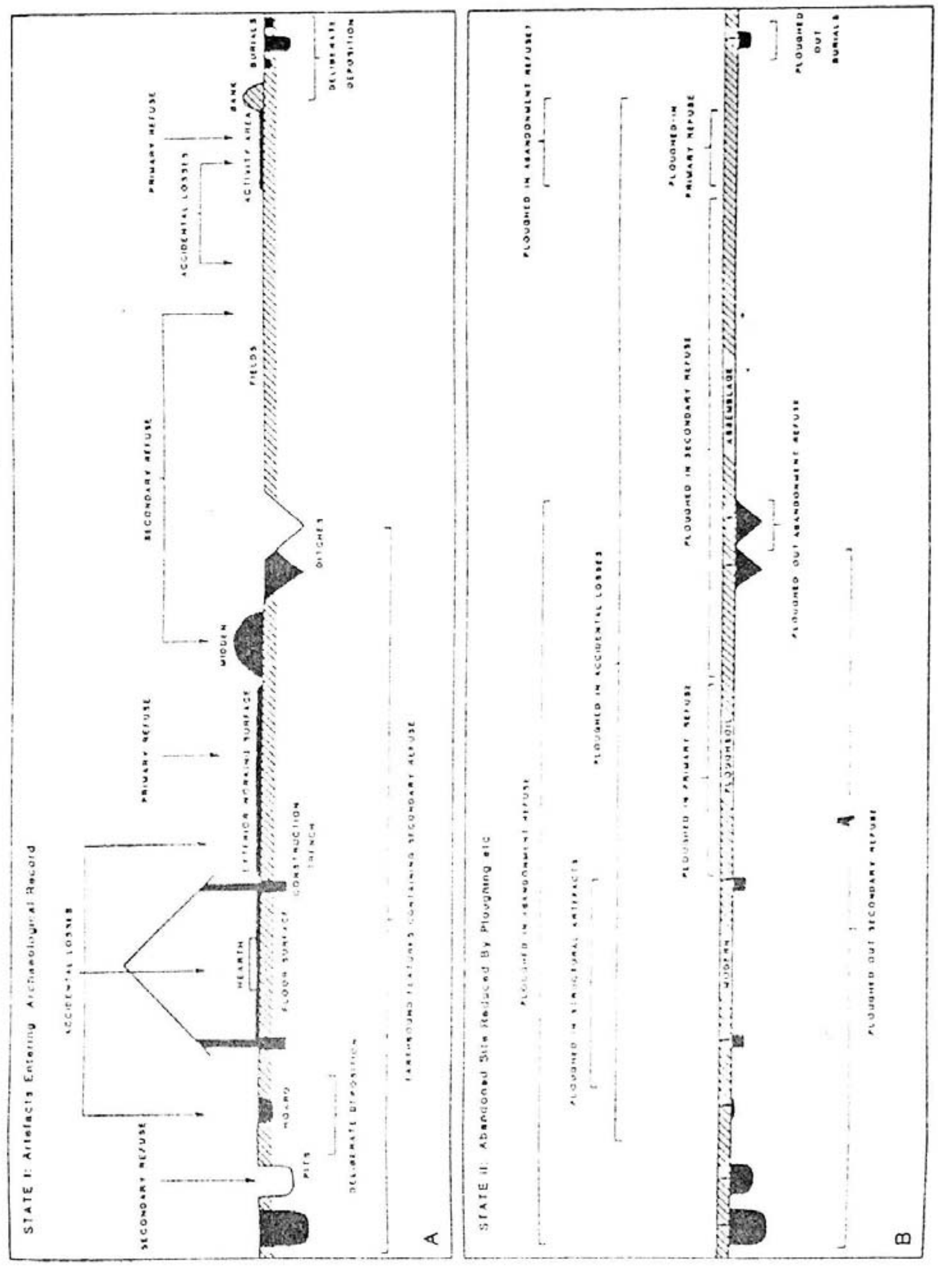

Figure 5: Formation of archaeological assemblage after ploughing (Taylor 2000: 18)

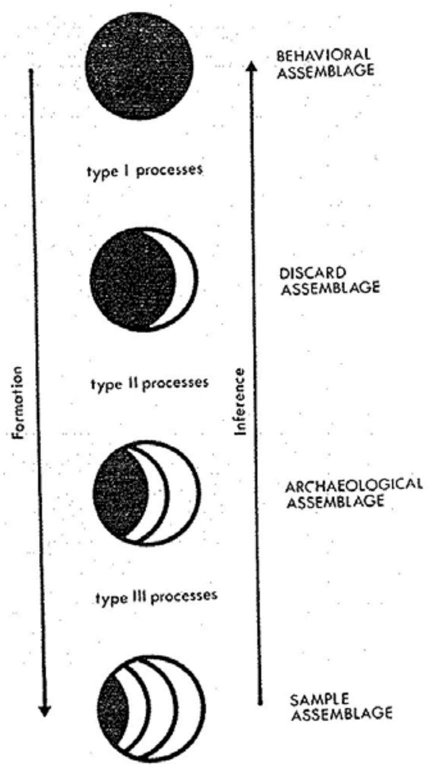

Figure 6: Formation of Archaeological Sample (Deboer 1983: 21)

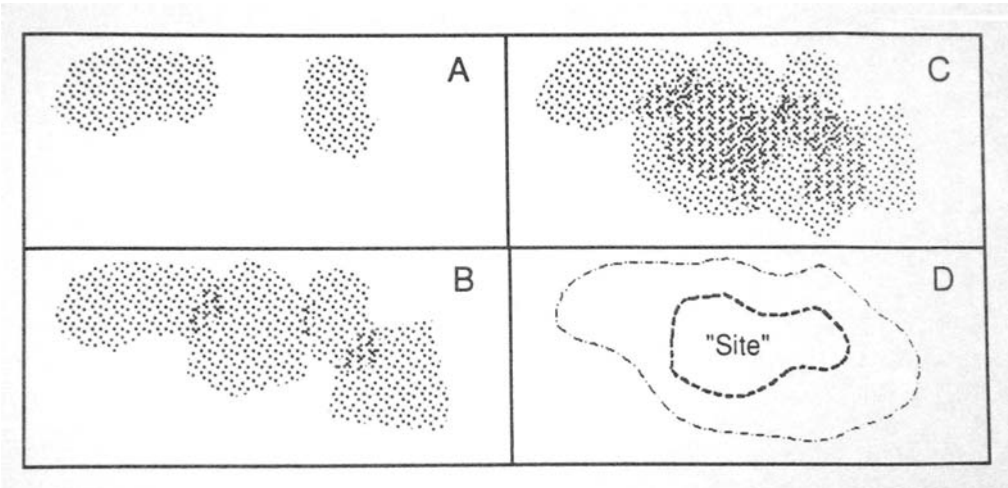

Figure 7: Palimpsest Model, Formation of Site (Banning 2003: 19)

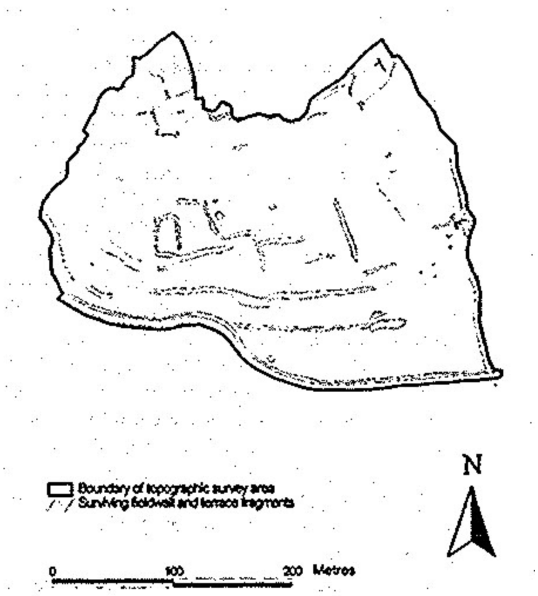

Figure 8: Surveying Area Topography (Gillings 1999: 113)

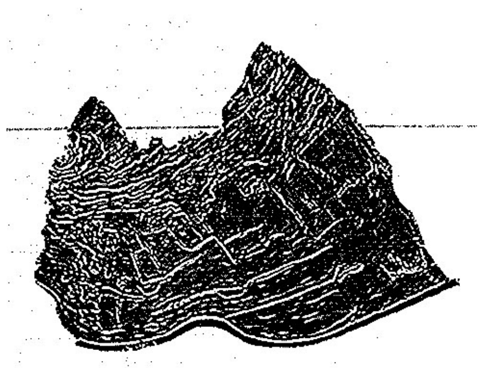

Figure 9: DEM (Digital Elevation Model) of Surveying Area (Gillings 1999: 114)

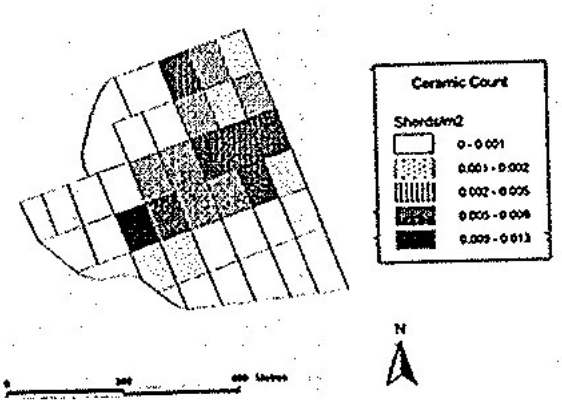

Figure 10: Sherd Distribution of Surveying Area (Gillings 1999: 114)

APPENDIX A

Terminology

Aerial photogrammetry: A surveying technique in discovery from air or space by oblique or vertical photographs of either black and white panchromic films or infrared films (Renfrew *et al.* 1997: 80).
Accretion (additive-deposition process): Deposition (LaMotta *et al.* 1999: 20)
Anthropogenic activity: All sorts of human activities (Ault *et al.* 1999: 43).
Attrition (subtractive-deposition process): Abbrasion (Schiffer 1987: 273).
Clutter refuse: Provisional deposition of broken items of value (Schiffer 1987: 66).
Cropmark: The growth of crops over a buried architectural item (Banning 2002: 4).
Cultural transforms (processes): Effects of change caused by human activities interacting with the whole system (Schiffer 1987: 47).
Curate behaviour: Transportation of objects still functional, with a priority of small size and high cost (Schiffer 1987: 268).
***De facto* refuse:** Still functional objects left on the abandoned settlement in the place of utility.
Depletion (subtractive-dislocation process): Removal (McKee 1999: 35)
Extensive survey: Large sampling areas, stratified according to geomorphological characteristics and then divided into broad transects with systematically fixed sampling points (Van de Velde 2001: 30).
EVE (Estimated Vessel Equivalent): Estimating the ratio of a vessel from the percentage of the sherd compared with the total size (Orton 2000: 163).
Frison Effect: Modification on artefacts for alternative utility (Schiffer 1987: 268)
Fossil (Dead Assemblage): The state of an archaeological object during

recovery (Schiffer 1987: 48).

Geochemical analysis: Taking soil samples to identify certain chemicals and mostly phosphate content (Renfrew *et al.* 1997: 542).

Geophysical prospection: Surveying an area using metal detectors, electrical resistivity, electromagnetic conductivity, ground penetrating radar, magnetometry and magnetic susceptibility devices to take measurements about the subsurface materials (Collins 2003: 77).

In-site activity: Artefact density attributed by its characteristics as an occupational area (Orton 2000: 57).

***In transit* deposition:** Primary deposition on the paths adjacent to the habitation area (Schiffer 1987: 64).

Intensive survey: Entire landsurface is close-ordered field walked to define site sizes and types (Fentress 2000: 44).

Intrasite: Between two archaeological activity units (Wagstaff 1991: 10).

Middle Range Theory: Human behaviour can be derived by using contemporary groups with similar adaptation to the environment to bridge a link to fossilised data by using ethnographical observation (Deboer 1983: 30).

Mindscapes: Trying to see the landscapes through the eyes of past occupants (Bintliff 2000c: 8).

MNV (Minimum Number of Vessels): Estimating the number of vessels using a specific part for counting as complete bases (Orton 2000: 163).

Mobile camp: Non-sedentery habitation places with limited maintenance activity and constructions (Kent 1996: 55).

Natural transforms (processes): Effects of change caused by natural processes interacting with the whole system (Schiffer 1987: 48).

Off-site activity: Human activity outside the settlement (Banning 2002: 11).

Pathway model: c_i(performance activity)= $1/b_i$ (wear during use) (Schiffer 1987: 50).

Patina: Smoothening as a result of sand-blasting (Schiffer 1987: 274).

Pompeii Premise: State of finding archaeological objects in places of use (Lightfoot 1996: 165).

POSI (Places of Special Interest): Assemblages with distinct archaeological significance as slags, fire, (Given 1999: 24).

Predictive Survey: Statistical surveying strategy, probabilistic sampling (Banning 2002: 27).

Primary deposition: Artefacts left in activity related spaces (LaMotta *et al.* 1999: 21).

Probabilistic Survey: A sampling technique using statistical consideration (Binford 1964: 140).

Prospection: Higher probability areas for possible archaeological finds are searched (Banning 2002: 29).

Proxy data: A rather qualitative or semi-quantitative data, usually derived from independent measurements (Chapman 1999: 65).

Provisional deposition: Caching behaviour for either for first or modified utility (McKee 1999: 36).

Punctuated abandonment: Abandonment with an anticipation of return periodically (Graham 1996: 25).

Residual primary refuse: Microartefacts present in floor deposits (Ault *et al.* 1999: 55).

Scavenging: Unplanned rescue of usable items (McKee 1999: 38).

Schlepping: Transportation of large quantities of waste as secondary refuse from production areas (Schiffer 1987: 69).

Secondary deposition: Depletion into a separate space (LaMotta *et al.* 1999: 21).

Site: Archaeologically significant piece of space (Gillings 2000: 110, Cameron 1996: 4).

Site furniture: The objects left all together in an abandoned site (Cameron 1996: 5).

STP (Shovel Test Pitting): 30X 30 to 50X50 cm square emptied 1 to 2 m depth by shovel and sieved in order to get a three dimensional data from a low visibility area (Orton 2000: 71).

Structural Survey: A study diversified by its strategies aiming to set archaeological sites by their relation with other sites and catchment areas (Banning 2002: 28).

Surface assemblage (cluster): Group of pottery sherds spatially connected for a specific human activity with a certain density per metre-square (Orton 2000: 128).

Systematic Survey : Survey organised by taking statistical considerations and arranging transects according to this statistical arrangement (Keay 1991 : 128).

Taphonomy: Changes occuring on artefacts and ecofacts during the burial process (Orton 2000: 47).

Tertiary Deposit: Redeposited secondary refuse (LaMotta *et al*. 1999: 25).

Trampling: Movement of sherds by animals or humans as they pass by (Schiffer 1987: 268).

Turbation: Disturbances on surface assemblages caused by animals and plants (Rapp 1998: 183).