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Principles of Site-formation or Depositional Processes

1.1 The Concept of the Deposit

In its broadest definition, an archaeological deposit is what encloses the archaeological finds and, as a result, the finds constitute an inseparable part of the deposit (cf. Stein, 1987). In other words, the archaeological deposit is the material that is excavated in order to ‘reveal’ the archaeology of a site. *Deposit* is a broader term than sediment: it constitutes more of a general and generic use. For example, ‘glacial deposits’ refers to a general class of sediments deposited in a glacial environment. However, archaeological sites contain only sedimentary deposits with very few exceptions like volcanic deposits. In the vast majority of cases, all archaeological objects were deposited penecontemporaneously (essentially at the same time as far as we can resolve) with the enclosing material; of course the degree of penecontemporaneity depends on temporal resolution, which is obviously greater for younger archaeological sites and less so for prehistoric ones dating to, say, one million years ago. Indeed, the separation of an archaeological object from its excavated matrix is artificial (and virtually impracticable to do). Understanding the deposits as part of the archaeological record has changed throughout time, disciplines, and regions. In many sites, excavated deposits are water sieved for recovering charcoal and macrobotanical remains, but this has not been always the case, and at many sites they do not even sieve the deposits to collect microarchaeological debris (e.g. lithic debitage, microfauna, beads) let alone botanical remains. To accept that the materials of archaeological interest are mostly deposited penecontemporaneously with their enclosing deposits is an essential tenet in interpreting formation processes.

This is not to deny that archaeological objects could not be deposited first and then covered with sediments, but we must realize that it is fruitless to treat objects and deposits separately from the excavation point of view and later in their interpretation phase. However, it should be noted that erected constructions (e.g. walls, bridges, dams, etc.) do not follow the above rule, and enclosing deposits

are not always contemporaneous. Indeed, buildings are always filled with deposits after their construction, although some of them accumulated penecontemporaneously in the sense defined above (e.g. the first floor or occupational debris within the building). As we have already discussed in the Introduction, architectural features have an internal stratigraphy defined by the typology of masonry and other architectural features, and they have to be included within the depositional stratigraphy in order to be correlated with the surrounding archaeological objects.

To illustrate the above statements we will describe a rather rare example, but one that is clear and hopefully gets the point across. During a volcanic eruption the pottery left on the surface of a floor in a house was subsequently covered by volcanic tephra (the so-called Pompeii premise) (Schiffer, 1985; Binford, 1981). In order to expose the pottery we dig through the naturally deposited tephra. Obviously, the pottery was left undisturbed intact and covered by the tephra. The study of the pottery confirms that this is an assemblage left in place. Indeed, starting from a sedimentological (depositional) point of view, we might recognize that the material that covers the pottery is a natural free-fall volcanic tephra that covered the pottery left in the house without disturbing it. Free-fall tephra is volcanic material ejected into the air during an eruption, which then settles by gravity on the ground.

Although the above description appears obvious for most archaeological sites buried by volcanic tephra, we should also consider other possibilities in which, for example, the tephra is *not* a free-fall deposit. As Sigurdsson et al. (1982) describe very impressively, the AD 79 Vesuvius eruption produced individual sequences of different volcanic deposits in each of the cities of Pompeii, Herculaneum, and Oplontis. Each sequence points to different taphonomic histories of the archaeological material, which is far from the simplistic idea we have for this type of phenomenon; note that taphonomy is concerned with all processes happening to an organism after its death. In Pompeii, for example, all excellently

preserved human bodies are found inside a second volcanic deposit in the form of a pyroclastic surge, which stratigraphically lies above an initial free-fall tephra deposit. Pyroclastic surges and flows are fast-moving currents of superheated tephra, the former being more dilute than the latter and therefore they move faster and generate surges. The first thick free-fall tephra deposit was not responsible for the deaths in Pompeii, and in fact it forced the major part of the population to flee the city before the main disaster struck the following day. It produced only roof collapse in most houses. The second phase of the Vesuvius eruption first produced a very fast-moving hot and thin pyroclastic surge that probably killed by asphyxiation those who remained in the city; then a second stage, a hot, dense, and fine-grained pyroclastic flow, buried the human bodies. It is this last powdery material that preserved the fine details exhibited in the many human plaster casts that were obtained during the excavation of Pompeii (Sigurdsson et al., 1982). The details of the taphonomy of the archaeological materials could not have been revealed without the study of the burying volcanic deposits.

An even more complicated case involves Herculaneum, where ample evidence shows that tephra-rich mudflows (lahars) were also encountered in the final stages of the eruption. This type of deposit is often observed immediately after volcanic eruptions when eruption-induced rainstorms remobilize tephra and other material, and deposit them downhill as thick slurries. Although not reported in this case, there is a hypothetical possibility that archaeological material was deposited by such mudflows, which, for instance, resulted in the mixing of objects from a room and an adjacent yard. Depending on the local depositional processes in some cases, whole parts of the original archaeological assemblage could have been moved *en masse* by dense mudflows. Analysis of the pottery alone, for instance, would not reveal such subtle mixing processes.

The reason for presenting the above examples is to stress that it would be naïve to think that we can understand the patterning of the artefacts and features without understanding the sedimentary matrix that contains them. It is that simple. These sediments have accumulated by a certain process, and it is this process that explains the patterning of the artefacts. Even in cases where fragments of artefacts can be put back together, making one think that therefore they come from a primary context, it is the surrounding matrix that will lead us to confirm or reject this interpretation. There is no doubt that a separate analysis of the archaeological finds and the sediments would be mutually beneficial. However, within the framework of excavation both the finds and the deposits have to be examined together in order to interpret correctly the archaeological assemblage. In other words, it is the deposit

as a whole that contains the archaeological finds, which will ultimately define the context.

The Pompeii example obviously is the exception. Most of the time, archaeological objects are affected by complex combinations of natural processes and therefore are contemporaneously deposited with the enclosing sediment or incorporated within the sediments by syn-depositional anthropogenic processes such as dumping, trampling, or construction of earthen structures (e.g. floors, walls, mounds). The archaeological objects, together with all other materials that are not of direct archaeological interest, are parts of the organization of the sediments. The way they have been incorporated inside the sediment is reflected in the fabric of the deposit, which is the three-dimensional arrangement of the constituents and their size, shape, and form (Stoops, 2003).

All these attributes inform us about the dynamics of deposition of the materials by natural forces. We have to consider that there are only a limited number of basic human actions that occur, such as laying down, dropping, compacting, and throwing materials. Therefore, compacting, kneading, and applying, sweeping and raking, trampling, dumping, backfilling, and levelling are fundamental actions that together with burning and animal husbandry activities form the majority of archaeological sediments (see Chapter 3). It is the combinations of these actions that lead us to interpretations of overall human activity.

Likewise, in the realm of the excavation, the possibility that the archaeological objects are buried at a later time by sedimentary deposits is meaningless, with very few exceptions. By definition, the archaeological finds are recovered by digging the deposits. If we accept that there is no way of interpreting correctly the archaeology of a site without understanding its stratigraphy (see Chapter 4) and context, then the smallest depositional unit recognized in the site is what defines the smallest informational unit, its time resolution, and its archaeological/anthropological significance (e.g. Goldberg et al., 2009a). When objects are referred to their excavated unit in order to define their stratigraphic position they cannot be treated separately from their matrix.

Nevertheless, in the case of a dumped accumulation of only bones (see section 5.2.1) or the construction of a wall, the archaeological objects can be recovered as a discrete continuous body, devoid of any sedimentary matrix. In this instance, the objects can have an identifiable discrete stratigraphic position on their own without being referenced to their enclosing sediment. Such features are usually walls and similar architectural constructions, and this is the reason why, during excavation, they are commonly treated as part of a different stratigraphy, that of the architectural or construction phases. In all other cases, archaeological objects are parts of the sedimentary deposits and at a first stage cannot be studied separately. Of course in a

later stage individual archaeological objects can be studied on their own or combined into groups and assemblages, but their original context is defined in the excavation and in relation to the depositional unit with which it was associated.

In sum, archaeological objects cannot practically be separated from the deposits in which they are included, and in the majority of the cases they are part of the fabric of the deposits that characterize the way they accumulated in the site. In cases where the archaeological objects can be treated separately from their deposits, they already constitute a discrete field of archaeological study (e.g. architectural phases) and normally they are not excavated or they are removed at a much later time after being documented. Other rare exceptions are artefact lags (Figure 1.1), which are concentrations of archaeological objects that are left behind after their sedimentary matrix has been winnowed out by wind or rainwash in so-called 'deflated' deposits, for example (see section 2.7.1). In this case the assemblage is the direct product of a natural process of concentration, and therefore the objects by themselves make up the deposit. The same could be said when anthropogenic activities have led to a single concentration of objects in discrete, identifiable excavation bodies (e.g. shell middens) (Figure 1.2), and as a result constitute a single layer. Even with shells in middens, their orientations and fabrics can guide interpretations of how they accumulated or what happened to them afterwards. In all these cases, however, the fabric of the



Figure 1.2 Shell midden at Nelson Bay Cave, South Africa (LSA). Note the middle part of the section composed only of shell.



Figure 1.1 Dense concentration of bone that by itself makes up a layer. MP, Jonzac, France. Courtesy of Shannon McPherron.

assemblage has to be studied in addition to the typology because natural formation processes or certain anthropogenic processes impact the size distribution and arrangement of archaeological objects.

Another very compelling reason for studying archaeological deposits is to reconstruct the completeness of the archaeological record. Only by understanding the nature of the components in a deposit (minerals and organic matter) can we make an assessment of the possible absence of archaeological artefacts that were lost due to physical or chemical alteration (diagenesis – see section 2.7.2) (Karkanas et al., 2000; Weiner, 2010). The absence of certain materials (plant, bone, ash, shell, and others) is not always related to human choices, actions, and use of space. Post-depositional processes are often very aggressive and they can lead to disintegration and dissolution of several archaeological materials of interest. In Chapter 2 (section 2.7.2) we give a detailed overview of the processes that lead to the destruction of archaeological materials and how we study them.

1.2 Types of Archaeological Deposits

Archaeological deposits encompass all deposits found in an archaeological site, whether geogenic (natural) or anthropogenic. From a practical perspective, they can be separated into three broad categories: (a) those deposited by natural processes but without materials produced, modified, or re-organized by humans, (b) those deposited by natural processes but also containing anthropogenic materials, and (c) materials (natural or anthropogenic) deposited only by anthropogenic activities and processes. Natural sediments are materials deposited at the earth's surface and denote transport before deposition. Production of new materials (e.g. minerals) without transport is often part of soil formation (pedogenesis; see below), which follows incipient weathering stages in the formation of regolith (loose, heterogeneous superficial material covering solid rock) or saprolite (soft, thoroughly decomposed, and porous rock) (see relevant sections in section 2.7.3). Weathering produces or releases new materials, both physical grains as well as solutions rich in ions that can recombine to form new minerals elsewhere, below, or at the surface; these substances are transported and deposited by gravity, water, or air. Deposition can be physical or chemical and produce clastic or organic and chemical sediments (see Chapter 2 for details).

In the realm of an archaeological site, it is impractical to separate purely geogenic deposits from archaeological ones. Often, the majority of archaeological deposits are naturally deposited mixtures of geogenic and anthropogenic sediments. Geogenic deposits may provide important

information about the nature of open areas in architectural sites where they are more 'connected' to geological systems and processes; they often can inform us about the prevailing environmental conditions in various types of sites. In addition, since the topography of the depositional surface influences the physical characteristics of the deposit, any previous anthropogenic activity or sediment would affect the deposition of subsequent natural deposits. Therefore, even post-abandonment geogenic deposits may reveal important aspects of the decay and destruction of a site or part of it, such as buildings and other features.

1.3 Anthropogenic Sediments

Human activities create a variety of anthropogenic sediments that include products, by-products, and refuse. Sediments can be organic and inorganic, and composed of materials used in a number of activities: the construction of dwellings, tool manufacture, remains from the processing and consumption of food and combustion, cloth, buttons, bottles, decoration materials, etc. We consider all these items to be sedimentary particles for a number of reasons:

- 1) Anthropogenic sediments can be integrated with naturally deposited sediments, as for example discarding artefacts in streets or yards or generally in open areas that are affected by natural sedimentary processes (water flow, wind, and gravity). In such cases, they behave as any other sediment and obey the natural laws of transport and deposition. Indeed, they are often the most important element of the fabric of naturally deposited archaeological sediments. Note that what are traditionally called 'natural disturbances' are included in this type of sediment, as, for instance, in the case where archaeological sediments have been redistributed by natural processes after the abandonment and destruction of a building or campsite (e.g. decay of a mudbrick wall or wind-eroded hearth) (Figure 1.3a,b).
- 2) They can be the result of transient reorganization of natural sediments by humans and are inseparable from the excavated deposits (e.g. mud floors, earthen mounds, backfilling of tombs). In cases of intentionally formed materials (e.g. mudbricks, mud floors), they almost always readily weather or decay back to 'natural' sediments. In addition, the original process of their construction is governed by the mechanics of the individual actions (the functional and technical aspects of an activity – see above) and therefore they can be interpreted by analysing their fabric and structure in a way similar to what one does for natural sediment (Figure 1.4).

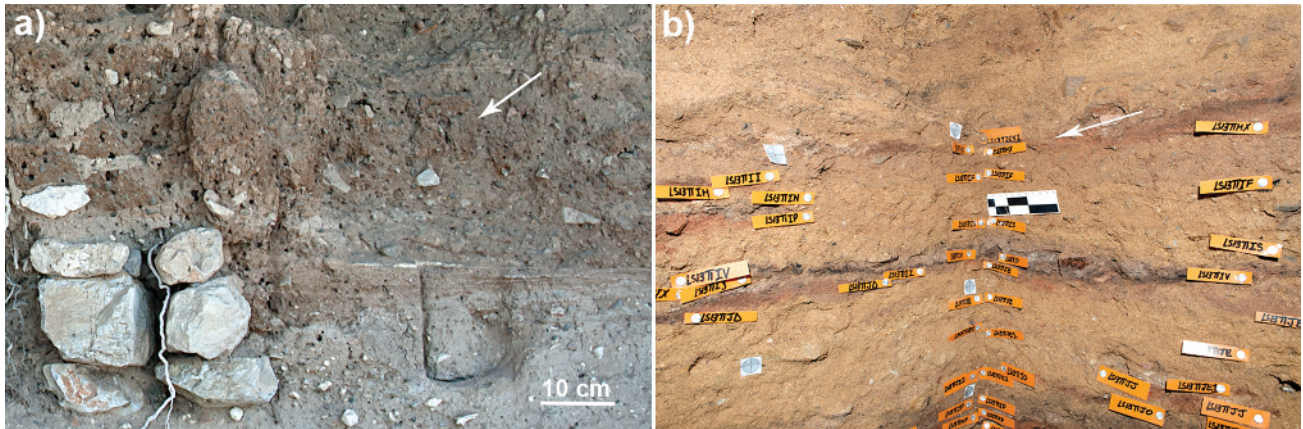


Figure 1.3 (a) Decay of the mudbrick wall at the upper left has produced an array of mudbrick fragments (arrow) floating in a fine-grained sedimentary matrix. EBA, Mitrou, Greece. (b) The ash and charred remains of the upper hearth (arrow) have been washed out, leaving only the red burnt substrate. Compare with the better-preserved hearth beneath it in the middle. MSA, Site PP5-6, South Africa. From Karkanas et al. (2015a).



Figure 1.4 Remnant of a constructed floor (F) fading into the darker surrounding sedimentary fill. LBA, Mitrou, Greece. Tag is 10 cm long.

- 3) They can be transformed into permanent artificial materials, such as pottery, brick, mortar, glass, and metals. However, as part of an anthropogenic deposit, their spatial distribution and orientation can be analysed using sedimentary techniques in order to provide information about the formation of the deposit that contains them (e.g. pottery distribution in an occupational deposit).
- 4) They can be materials that involve permanent chemical transformations, such as ashes. Ashes may be produced by both human and natural agents, and thus there is no reason for *not* treating them as sediments. Consider the somewhat hypothetical case of a natural ash accumulation resulting from a Holocene forest burned by a lightning strike. Such a build-up would readily be called a deposit by a geologist, and would be studied sedimentologically as any other chemical sediment (ashes are composed mainly of

calcium carbonate). In addition, ash produced at one location is easily distributed over a large area by wind or rainwash. Thus, for the same reason there is no real rationale for not considering it a deposit if it were to be found in an archaeological context, whether it would be from an intact fireplace, ash dump, or layer of burned goat dung.

Following the above reasoning, it is important to consider what constitutes a deposit: a standing mud wall is not archaeological sediment *sensu stricto*, but fallen parts of the wall *are* because they are elements within the excavated deposits. Strictly speaking and along the same lines, stone pavements or mosaic floors when intact are not sediments because they can be treated as continuous non-movable elements of anthropogenic construction (features) that can be clearly separated from the overlying and underlying deposits; they themselves are not commonly excavated. As such, they have their own internal stratigraphy that is based on architectural attributes and typology, and not on depositional stratigraphic principles.

At first glance, a constructed mud floor would not seem to be different from a mud wall or a mosaic floor. However, a mud floor is closely intermixed with non-constructed occupational debris and deposits (Figure 1.4). Thus, it is the product of a temporary resurfacing and reorganization of natural sediment in which parts of the floor are readily transformed into natural sediment. As a consequence, mud floors are excavated together with their occupational deposits and they cannot be practically removed as one single body from the overlying and underlying sediments, as in the case of mosaics, for example. Moreover, the internal stratigraphy of mud floors and their relation to the overall stratigraphy of the surrounding deposits can be analysed using depositional stratigraphic principles (see

Chapter 4). Mud floors can be studied typologically and architecturally, and thus form part of the architectural system of the site as well.

In summary, ‘anthropogenic’ sediment should be treated as natural sediment from a practical, methodological, and technical point of view. There is no doubt that there are ‘grey areas’ in this view. However, we believe that the above characterization is valid for the overwhelming majority of cases. We also wish to clarify that the reason we so painstakingly examine anthropogenic sediment is that terms like ‘sediment’ and ‘deposit’, which are derived from terminology used in the earth sciences, have been uncritically used in archaeology without having been analysed and defined (see below for discussion of the term ‘deposit’). Consequently, such practices can lead to misconceptions and misunderstandings. We do believe that the misuse and lack of understanding of what deposits are and how they form has led archaeologists to criticize the application of earth science-based techniques and concepts in urban archaeological sites (see, for example, Harris, 1989).

1.4 Some Misconceptions of Site-formation and Depositional Processes

Schiffer (1972, 1987) was the first to champion, systematize, and formalize the concept of ‘site-formation processes’ and introduce a theoretical framework for analysing them. In his approach, past cultural systems related to the original behaviours associated with the artefacts (i.e. systemic context) are transformed by two kinds of formation processes, cultural and natural transformation processes (C- and N-transforms, respectively), and they are responsible for the formation of the archaeological context. Any object can participate in a behavioural system in several stages that include procurement, manufacture, use, maintenance, and discard and all these are included in C-transforms. However, in our minds it is only the last of any of those actions – whereby an object is ultimately deposited – that contributes to the building of a site. Among the different cultural transformation processes, the ones that lead to the final emplacement of an object in its depositional context participate in the formation of a site.

N-transforms are by definition transformation processes that disturb, alter, or obliterate the original patterns of the objects and obviously participate in the building of a site (see discussion in Shahack-Gross, 2017). However, as very nicely shown by Stein (2001), there is a misconception on the use of the term ‘deposition’ in the archaeological literature. Archaeologists often use ‘depositional processes’ to generally imply behavioural processes or cultural activities and their roles in creating the archaeological record. They

overlook the basic processes that led to the final emplacement of an object on the earth’s surface.

We need to remind ourselves that excavation yields a body of sediment that includes, among others, objects that were once part of a behavioural system. In order to furnish an unbiased interpretation of the behaviour of the people that were using and discarding these objects, we must accept the idea that the basic raw data of this study are the excavated deposits that fill the three-dimensional space, particle by particle and object by object. The manner in which these objects and particles were laid down – one upon the other – should be the primary focus of the analysis of depositional processes.

Obviously, all activities related to the use of an artefact during its life history – except its final abandonment or discard – are not the ones that led to its final emplacement. They can be indirectly inferred – in the sense that they restrict the possibilities of the final emplacement – but they do not participate in this accumulation and cannot be revealed by the analysis of their depositional pattern alone. This *chaîne opératoire* should be the target of a ‘meta-analysis’ of the original data that are produced by the excavation of the deposits in a site, taking into account the characteristics of the object itself. For example, in order to understand the activities related to a tool, someone has also to consider the activities that are related to the procurement, manufacture, and maintenance of the tool. The analysis of the sediments that contained this tool will provide information on the relationship of this tool to the other archaeological objects. However, this relationship is always depositional in the sense that it is about the last human action of laying it down.

1.5 Soils and Post-Depositional Processes

A very broad definition of soil is the altered surface of the earth by atmospheric, physicochemical, and biogenic processes. According to Joffe (1949): ‘The soil is a natural body of animal, mineral and organic constituents differentiated into horizons of variable depth which differ from the material below in morphology, physical make-up, chemical properties and composition, and biological characteristics.’ Therefore, sediment and soil are discrete concepts and each term implies a set of materials and processes. In respect to sediments, soils are post-depositional creations. With time, sediment or rocks are altered by surface processes, their material reorganized into millimetre- to centimetre-sized soil aggregates (peds), and a vertical differentiation of the material is developed in the form of soil horizons (not ‘layers’ or ‘depositional units’),

which differ from each other in aspects such as colour, texture, composition, etc. (Figure 1.5a,b). Therefore, a more restricted definition would be that soil is the product of *in situ* alteration of sediments and rocks (and even previously developed soils) at the earth's surface for a considerable time so that the original sediment or rock structure has been modified, and a soil structure has developed.

It follows that soils have a strong built-in 'internal' temporal dimension, whether it spans years or millennia. Yet, from a purely pedological point of view, any sediment found at the earth's surface for a short period of time can be called an incipient soil. Indeed, the soil class 'Entisols' signifies those soils that have little or no evidence of the development of pedogenic horizons (Soil Survey Staff, 1999). For pedologists, plant growth is evidence enough that the unconsolidated materials are functioning as soils (Buol et al., 2003: 259). Thus, a one-year-old river flood sediment that is colonized by plants is considered soil by pedologists. Although this definition is probably valid for pursuing the particular interests of pedology, it is obviously not constructive for understanding depositional processes. For instance, data gleaned from Entisols generally do not provide more useful information on pedological-specific processes than can be provided by sedimentological studies.

From a sedimentological point of view, all transformations affecting the sediment after its deposition are lumped together under the term diagenesis (see section 2.7.2). These include mechanical disturbances produced by fauna and flora, loss of water, compaction, and chemical or biochemical transformations, such as mineral alterations, oxidation of organic matter, and precipitation of new material in voids (cementation). Since soil-forming processes

also include many of the above processes there is an overlap between the two approaches.

Nevertheless, understanding an archaeological sequence is first and foremost about understanding the processes of deposition, which will reveal the original context of the deposit at the time of its formation. By treating almost all sediments as soils we are biasing our approach towards post-depositional processes, and indeed those that are related only to soil-forming processes. As such, this bias highlights the identification of soil horizons and not the substrate on which it has developed (cf. Holliday et al., 2007 vs. Velichko et al., 2009; Sedov et al., 2010). For example, it is of crucial importance to identify that a sequence is produced by slope processes and how they have originally affected the archaeological materials. Then, all post-depositional processes have to be taken into consideration to further elucidate the present pattern of the archaeological finds. Finally, if there are well-developed soils in the sequence, they can be studied from a pedological perspective in order to reveal information that cannot be revealed by treating them as sediments.

A well-developed soil can provide valuable information on climate, topography, and biogenic factors (Birkeland, 1999). The formation of a soil is environmentally controlled and, therefore, the conditions of moisture, temperature, seasonality, vegetation type, and organisms are decisive factors in soil development. However, probably the most important information is the establishment of how long it took for a particular soil to form, which is tightly linked to depositional stasis. A buried soil defines an old stable relief because, by definition, a soil is formed always on the surface and needs time to develop (Figure 1.6). In addition, in alluvial terrains the geoarchaeological mapping of surface soils with

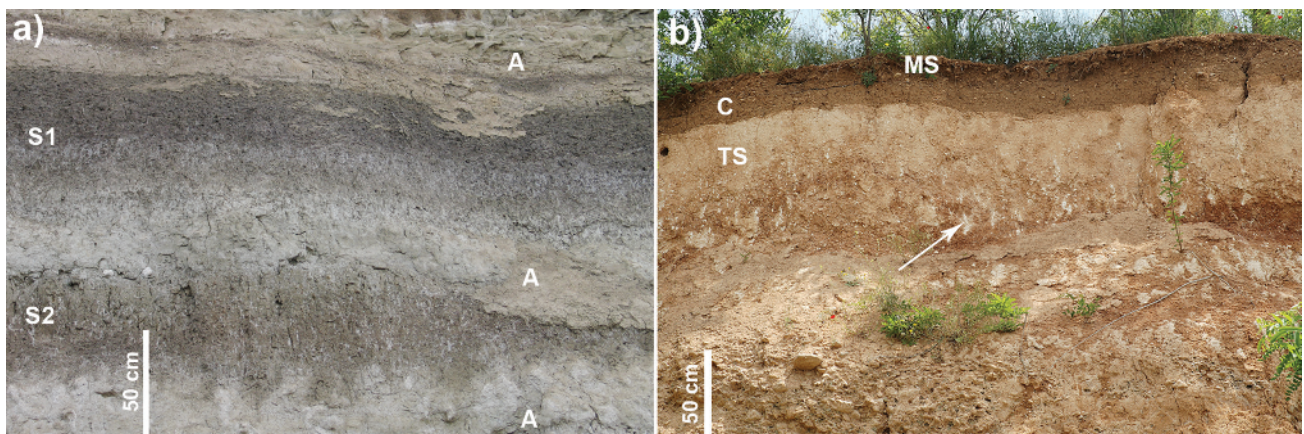


Figure 1.5 (a) Two main grey soils (S1 and S2) formed on parent material of alluvial sediments (A) that were deposited during periods of basin flooding. Note 'layering' of soils that is attributed to soil horizon formation during long periods of sedimentary stasis. Pleistocene, Aliakmon River, Grevena, Greece. (b) A lower soil (TS) characterized by the formation of white nodules and calcareous filaments (arrow) is truncated and overlain by brown colluvial sediment (C) with a clear and sharp erosional surface. A modern soil (MS) is developing on top of the colluvium producing a dark top humus-rich horizon. Ylike Lake area, Greece.

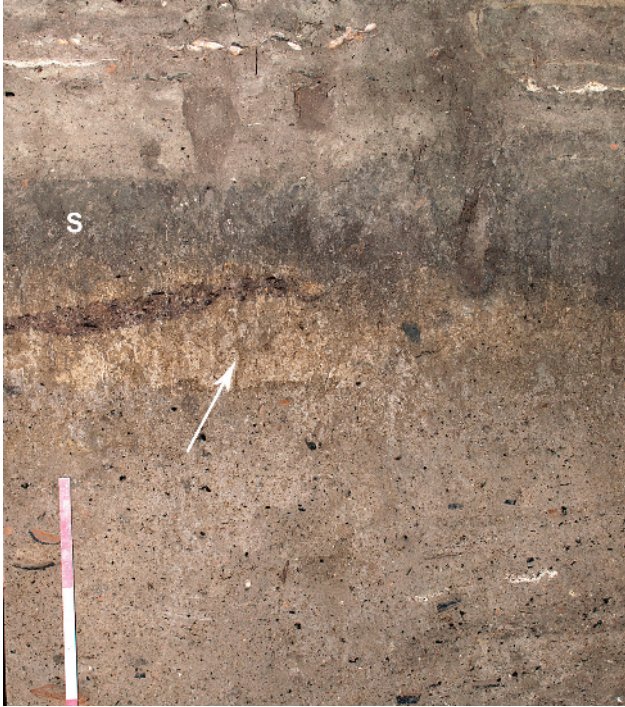


Figure 1.6 Dark soil formation (buried A-horizon (S)) on beige clay construction material at the Chalcolithic/BA boundary, Vésztő-Mágó, Körös area, Hungary. Note the numerous stripes attributed to root and faunal passages (some shown with arrow). The formation of the soil points to abandonment of the site during the end of the Chalcolithic.

different degrees of development have been effective tools in guiding the search for sites of different ages (e.g. one does not expect to find a 10,000-year-old PalaeoIndian site on a non-buried Entisol). Although such *soils* can be encountered in archaeological sites and landscapes, particularly during abandonment and pre-occupational periods, the overwhelming majority of the archaeological *deposits* are not soils, but sediments. The taking of ‘soil’ samples at archaeological sites – although seemingly a banal example – reflects a significant misconception in the distinction between these two fundamentally different classes of materials, although admittedly ‘soil’ sample is easier to say.

Obviously, the study of soils in the vicinity of archaeological sites for palaeoenvironmental reconstructions and for understanding human-induced soil disturbances is still an issue of pedology (Macphail, 1986; Macphail et al., 1987; Fedoroff et al., 1990; Holliday, 2004; Goldberg and Macphail, 2006). In the same vein, soils that normally make up the underlying substrate of a site can provide valuable information on the pre-occupation conditions of the landscape (Macphail, 1987; Sherwood and Kidder, 2011). Furthermore, soils encountered within an archaeological sequence should imply abandonment of the particular area, or an open, cultivated area, or one not in use (Figure 1.6).

In summary, all deposits in an archaeological site have to be treated as sediments. If soils are developed in the sequence they should be analysed as both sediment and soils. The pedological study should focus on aspects that cannot be revealed by sedimentological analysis alone.

Clearly post-depositional processes are those that act on a deposit after its accumulation and even after its burial by overlying deposits. Processes that are acting on a deposit as it accumulates on the earth’s surface should normally not be included in post-depositional processes because they participate in the formation of this layer and eventually how we would observe it in the field. Therefore, they should be considered as syn-depositional processes and not post-depositional ones.

We do understand that figuring out all these processes may be considered a grey zone, but if we want to reconstruct a coherent and accurate history of deposition and human activity in a site, we should clearly separate the events that led to deposition – even if they were somehow destructive – and the events that affect the deposits after their final accumulation. Cases can arise when a layer is formed and later on trampling has modified and reorganized part of it. From a stratigraphic point of view, trampling effectively has produced a new stratum, since it produced new layer boundaries along with a new shape and form of the trampled deposits; the resulting unit normally will not fill the same space as the previous layer. Indeed, this process is not much different from the erosion and deposition of a fresh layer at the expense of a previously deposited one.

1.6 Recording Deposits and Site-formation Processes (Stratigraphy)

From the above, we have a clearer idea of what sedimentary deposits are and that archaeological sites are composed of them. So the question that arises is how do we ‘manage’ and organize them in a way that facilitates our understanding of site history. The answer is in stratigraphy, the way deposits are organized *both* in space and in time. Stratigraphy is the tool for understanding the chronological order of events and artefacts at a site, and it also provides the basis of the analytical units used to discuss the human activities at the site (Balme and Paterson, 2014). Thus, stratigraphy has two very fundamental dimensions: a spatial and a temporal one. Using stratigraphy, we are able to organize in chronological order archaeological features, artefacts, soils, and sediments. Surprisingly, however, for most archaeologists the purpose of stratigraphy is only time (Renfrew and Bahn, 2005). Indeed, the *Archaeological Site Manual* (MoLAS, 1994, section 1.2) specifies that ‘...any physical relationships between one context [\approx stratigraphic unit] and another are of no assistance in the study of site’s stratification.’

Organization in space and time also implies connections and correlations among the different deposits. Indeed, the idea of stratigraphy as a simple layering of the 'soil' at a site (cf. Feder, 1997) is simplistic. From the very beginning of geological science, stratigraphy focused not only on the sequential order of 'regular' (stratified) formations, but also more generally on the spatial relations of rock masses of all kinds (Rudwick, 2008). In an archaeological site what we face are layers and features that can appear similar – or dissimilar – in different areas. As they build up on and next to each other through time they produce the stratigraphy of the site. Therefore, in order to extract from them a meaningful site history we have to correlate separate layers in space. This correlation might be established on time equivalence, which in turn can be based on absolute chronology, or by relative chronology, that is, equivalent stratigraphic position. Correlation also might be established through similarities in content and depositional characteristics. Nevertheless, archaeological content cannot be separated from the depositional characteristics because it is an integral part of the characterization of a deposit. If similar-looking deposits are not physically connected, their relative stratigraphic position and ultimately their chronology is what will define their contemporaneity. The building of stratigraphy and correlations of the different layers is based on some basic stratigraphic principles and notions that are discussed in detail in Chapter 4.

Since stratigraphy is a manifestation of the history of a site, it follows that there is no 'good' or 'bad' stratigraphy (Goldberg and Macphail, 2006). The idea that the 'stratigraphy of a site is not well preserved' is essentially wrong and is like saying that the history of a civilization is bad. A site might or might not preserve the entire history of Roman civilization, but its stratigraphy preserves the whole history of the site. In the same sense, a burrow does not 'disturb' the stratigraphy (it may disturb the deposits) because it is *part* of the stratigraphy.

On the other hand, our ability to read the stratigraphy is not connected to what the stratigraphy actually records. This ability is restricted both by theoretical misconceptions and by practical problems. The major theoretical misconception is based on the lack of understanding the fundamental aspects of a deposit as discussed above. For interpreting site history it is imperative to understand that the building blocks of stratigraphy are the deposits and how they have been formed.

We should also make clear that the theoretical aspects of stratigraphy are different from the operational ones. Indeed, there is so far no real theory in archaeological

stratigraphy, except for constructing stratigraphy in the field (see, for example, Joukowsky, 1980; MoLAS, 1994; Roskams, 2000, 2001; O'Brien and Lyman, 2002). Since excavation is a destructive process it is inescapable that a way of recording and keeping-track of the stratigraphic units as they are excavated has to be established. One of these operational systems is the Harris Matrix (Harris, 1989; Harris et al., 1993), some aspects of which we have already discussed in the Introduction and will be further discussed in Chapter 4. Most commonly these works suggest a standardized description of archaeological stratigraphy and deposits. This description is often derived from soil description manuals and may also employ laboratory data such as carbonate, carbon, phosphorous, strontium, and silica content (e.g. Pietsch et al., 2013 and references therein). However, the superficial premise that these data (while useful) can define stratigraphic units and produce stratigraphic information is misdirected. Their reliance on soil nomenclature is problematic in the first place, and their major flaw lies in the same hidden premise that someone can do stratigraphy without understanding depositional processes.

As we have already discussed, without a conceptual model for organizing observations and data one cannot obtain anything meaningful (see Introduction). All these standardized descriptions are indeed helpful in keeping an objective track of the excavated sediments, but by no means can they lead us to interpret the stratigraphy by themselves. This situation is particularly evident when trying to interpret the stratigraphy of whole sectors or the site itself and not just a portion of a profile. Some archaeologists have already noted that standardized description of archaeological sediments leads to mediocrity (Adams, 2000), which could be interpreted as an illusionary belief that everything is under control.

From the above it is obvious that stratigraphy provides the context and the means for understanding the history of a site. So the question shifts to how can we unravel it. Ultimately we should be able to replay a three-dimensional movie of how the site was actually built. Not everyone can do this in their own minds, but at least when defining stratigraphy we have to envision some sort of a dynamic three-dimensional puzzle with complex interlocking pieces that can be put together in an appropriate order. Defining the pieces and their interlocking areas is crucial, and therefore we should equip ourselves with all theoretical and practical facets of depositional processes in an archaeological site before we present in more detail the analysis of site stratigraphy in Chapter 4.

