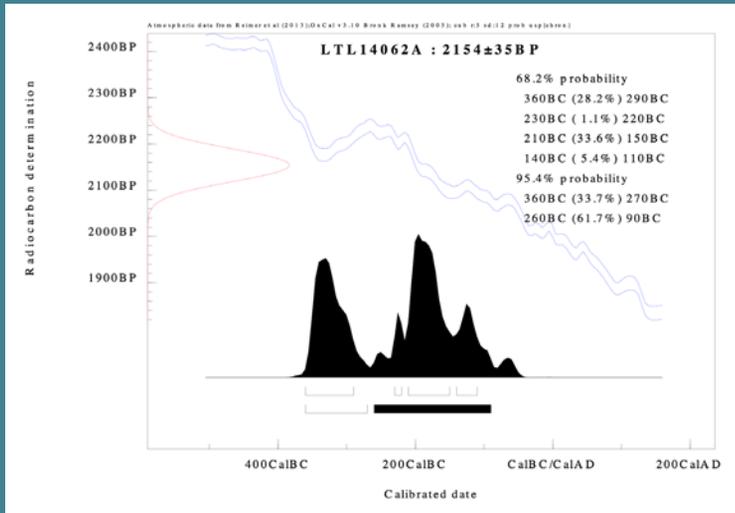


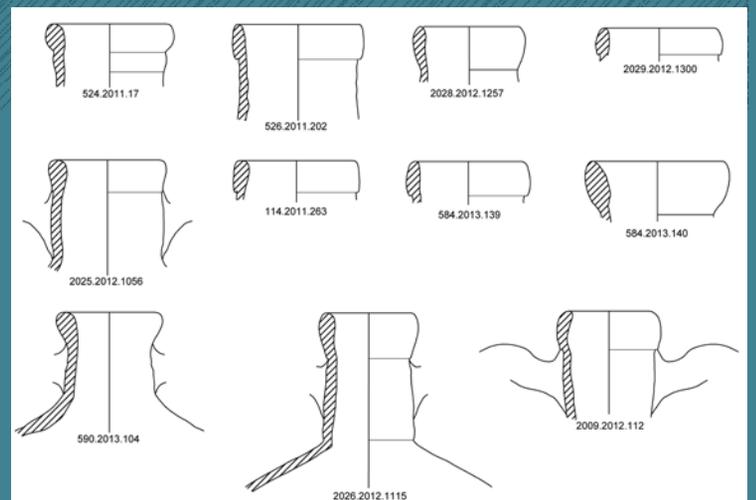
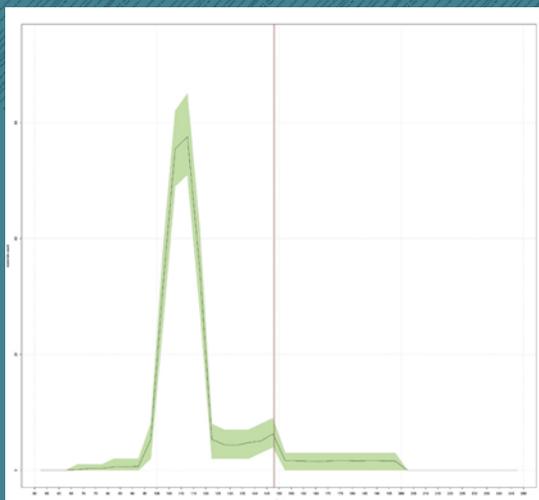
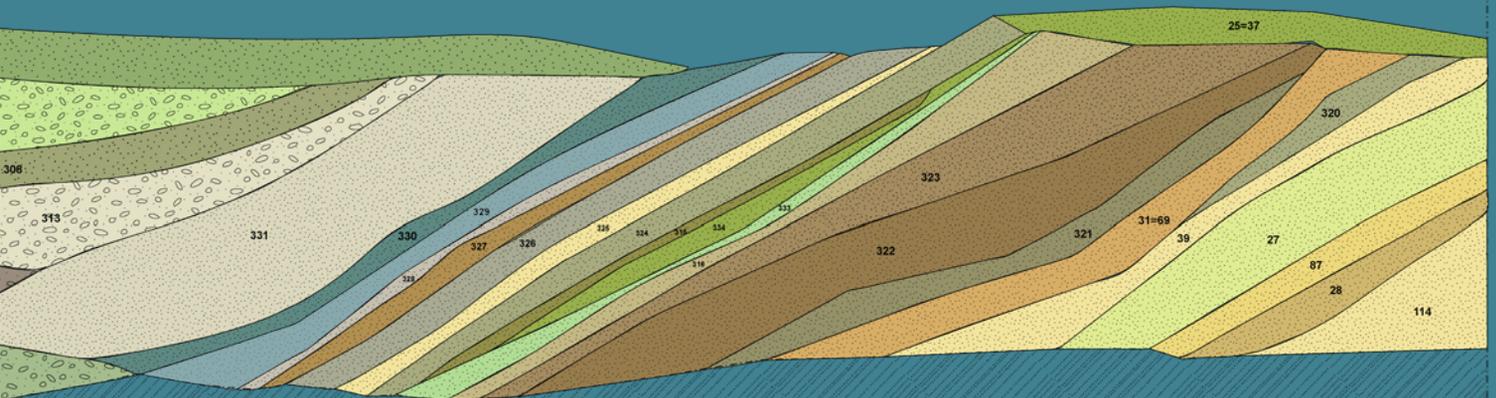
Dating Urban Classical Deposits

Approaches and problems in using finds to date strata



Guido Furlan

NORD



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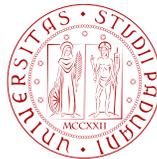
I also would like to extend my thanks to dott. S. Mazzocchin, dott. D. Dobрева and dott. A. Stella for their precious advice, provided at the time of my PhD, in the field of ceramics and numismatics; dott. E. Crema, dott. D. Francisci and dott. F. Da Re for providing me with fundamental help in statistical processing and approaches; the staff of the library 'Tito Livio', who gently provided me apparently unobtainable papers and I am particularly grateful to P. Cristofolletti and A. Muffato.

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Preface

Jacopo Bonetto, University of Padova

The stratigraphic revolution of the 1970s/1980s produced a sense of healthy optimism among the community of archaeologists engaged in field activity.

The progressive development of a rigorous methodology for reading the deposition of sediments as a product of human and natural processes contributed to the diffusion of shared techniques among field archaeologists; these techniques were based on the physical and mechanical principles of geological stratigraphy and made the practice of excavation a fairly reliable and well-organized form of registration of data.

The positive impact of the introduction of the stratigraphic method was based on rational, objective-theoretical principles, which eventually dismantled the subjective, asystematic approach (with insufficient documentary output), characterizing the large part of field archaeology of the previous hundred years.

This is not the place to propose an evaluation of this ‘revolution’ and of the actual effectiveness of the stratigraphic method, largely accepted in the United Kingdom and in Italy and occasionally introduced in other European and Mediterranean countries. Certainly, the codification of a series of operative and documentary practices stimulated the construction of depositional sequences, from which it was relatively easy to draw information to construct pluri-phase site histories, from prehistory to the contemporary age.

An important contribution to this methodology came from the introduction of the Harris matrix, a graphic representation of the stratigraphic history of the excavated sites. Many works, even recently, have expressed criticism of the undeniable aporias intrinsic to it, but the healthy debate on its validity does not reduce its importance, at least as a tool for ‘putting in order’ long and apparently inextricable sequences and for verifying, to some extent, the correctness of the observations formulated in the field, when those sequences in effect have been disassembled.

Since its entry in the archaeologist’s toolbox, the stratigraphic method has revealed all its extraordinary efficacy wherever it has been applied, but it has been particularly helpful in those so-called pluri-stratified sites, where the series of constructive and destructive episodes taking place in the same area for a long time (often more than a thousand years) is multiplied. This is the case in many modern urban centres, where rich sequences have been investigated in the frame of construction works carried out during the last century; it is also the case in Mediterranean urban sites which are no longer settled, but preserve rich stratification spanning the period from the Late Bronze/Early Iron Age to Late Antiquity.

In addition to the acquisition of a stratigraphic approach, particularly helpful for reading urban palimpsests, the last fifty years have witnessed the production of a series of systematic studies concerning many Greek and Roman finewares, representing the transversal evidence for the Mediterranean commercial networks from the Classical age to Late Antiquity.

Thanks to the works, among many others, of August Oxé and Howard Comfort (*Corpus vasorum arretinorum*, 1968 and 2000), of John W. Hayes (*Late Roman Pottery*, 1972), of Jean-Paul Morel (*Céramique campanienne*, 1981), of the authors of *Atlante delle Forme ceramiche* (1981 e 1985), of E. Ettlinger (*Conspectus formarum terrae sigillatae italico modo confectae*, 2002) or, more recently, of M. Bonifay (*Etudes sur la céramique romaine tardive d’Afrique*, 2004), we now have an impressive series of effective tools for recognizing and dating the most widespread ceramics circulating in the ancient Mediterranean and Europe. The chrono-

typologies produced by these studies, gradually improved and refined, have provided a milestone for discussing ancient commercial and productive landscapes and for analysing the chronologies of ancient stratifications with tools more reliable than local ceramic productions.

The present work arises and finds its place in the field of the conceptual and physical relations existing between strata and objects.

Nonetheless, before presenting the characteristics and aims of this research, other aspects of the current state of the art must be taken into account.

It has already been highlighted how, by the end of the last century, a high level of confidence, both in excavation techniques and in handling ceramics in terms of production and chronology, had been reached. Nonetheless, it cannot be asserted that the two research lines have developed in effective synergy. It is probably a caricature (but sadly, often, not too far from reality) to imagine on one side a field archaeologist carefully excavating single contexts, putting aside, with a hint of tedium, unstratified finds and, on the other side, a meticulous laboratory archaeologist, filing and classifying ceramics coming from poorly-known or completely-unknown deposits.

The procedure of excavation, already destructive in itself, has often produced the artificial separation of the study of stratigraphy and contexts from the study of the artefacts recovered within, therefore breaking down the composite reality of the stratigraphic context, where the single constitutive elements provide an explanation. It would not be fair to state that this phenomenon affected a large proportion of field archaeology projects during the last decades, but surely the widespread tendency to assign stratigraphic analysis and material studies to different professional figures – which is understandable for reasons of specialization – and the frequent difficulty – much less understandable – in stimulating a close interaction between the study of artefacts and the analysis of the excavated sequences must be noticed. A clear consequence of this state of the art is represented by many excavation reports or full editions, clearly unbalanced in favour of structures or strata, poorly employing the heuristic value of artefacts as indicators of formative dynamics, or, conversely, by works largely focusing on specific analyses of different classes of materials, fairly divorced from their original context; more frequently, excavation reports present an historical-topographic-architectural narrative and a separate section dedicated to artefacts, both rich but dramatically separated, also physically, even in different volumes.

Most probably this state of the art developed because the ‘stratigraphic revolution’ cited above stopped in midstream, perhaps producing a very refined technique for disassembling the stratigraphic palimpsest and for building sequences of actions and processes, but without focusing on the internal unity of contexts and on the crucial relation between the containers (strata) and the contents (materials).

In this way, the large operative field of the integrated elaboration of the data produced by stratigraphic analysis and by material studies has remained largely unexplored and uncoded, a field allowing the transformation of sequences in reliable, evolutive histories of ancient sites.

Among the diversified and hard paths for working out data from excavations, one aspect, although exceptionally important, was possibly particularly affected by this state of the art: it is the relation existing between the dates of artefacts and the chronology of strata (and sequences), a topic frequently tackled with the unforgivable superficiality of equating the two.

In this field there has been no lack, even in the recent past, of single important works, discussed in the first part of the volume here presented, but the results of these works and in general the very topic of the chronological relations existing between materials and strata formation processes, together with all its implications, have never been fully discussed among the community of field archaeologists.

This specific methodological issue and, more generally, other problems related to the processing of data coming from excavations have emerged, in their full complexity, in those urban Classical Mediterranean

sites investigated by the University of Padua since 1997. From this year, prolonged field campaigns took place in Nora, a Sardinian centre settled for at least 1500 years from the Phoenician age to the arrival of the Vandals, in Gortyn (Crete), the Greek and Roman metropolis displaying an extremely rich monumental palimpsest, and in the Latin colony of Aquileia, a site located literally between Europe and the Mediterranean and settled from the Iron Age to the Byzantine period. In all these Classical urban centres, excavations carried out in different architectural complexes (both of private and public nature) put into play thousands of contexts and tens of thousands of artefacts, to be combined to produce reliable historical reconstructions.

Among these three stimulating sites the author of the present volume took his first steps as a student and, later, as a researcher, moved by interest in the methodological issues inherent in the stratigraphic technique and in their possible consequences for the historical reconstruction of sites. This interest became the main topic of his master's thesis and then it was developed in seminars and workshops held in Padua; eventually it became the topic of his PhD programme, of which this volume represents a meditated elaboration.

The three mentioned cities represented the formative and informative basis of this study, but the author has moved well beyond the narrow borders of the sites we investigated and, also thanks to periods of study abroad, he has examined many excavation reports from Europe and the Mediterranean in the context of the major topic tackled in this volume: the dating of stratigraphic sequences.

Nonetheless, if on the one hand the main question addressed is 'how a layer is dated', the volume does not represent a 'simple' manual for dating archaeological stratigraphies; the topic is critically investigated from different and varied points of view, taking into account the current literature, tackling the principles of the formation processes of stratification, moving to the qualitative analysis of the material record and then dealing with the statistical-quantitative study of finds, for gaining from materials and their dates indications on the absolute chronology of contexts and sequences.

In this way, a path of systemic analysis taking into account the informative synergies existing between the formation processes of stratification and the presence is followed, similarly, within it, of different finds, aiming to determine the best way the chronology of those episodes which led to the continuous mutation of the ancient cities can be defined.

The book deals with a variegated set of problems connected with studying complex archaeological sequences and it is meant as a tool for those facing the dangerous challenge of destroying a stratigraphic context so that they also take the responsibility of historicizing the gained data knowing the problems and the difficulties that this implies.

Digging makes sense only if it is done with care and rigorous methodology, following well-codified practices, as suggested by many manuals; but it is not enough. This work reminds us that, after having excavated well, it is necessary, when dating a layer or an event, to consider more accurately than in the past (although some remarkable exceptions exist). This is, after all, the main ethical-professional responsibility assumed by an archaeologist, because from dating derives the whole historical reconstruction, the ultimate goal of our work.

In this panorama, the methodological considerations proposed by Guido Furlan are all the more necessary to provide scientific rigour to the deciphering of urban stratifications, so that really credible dates and histories can be achieved.

Part I

Introducing the topic

I.1 Introductory remarks

I.1.1 *The subject*

How do we date strata? The topic of the book can be condensed in this question. The subject may appear, at first sight, both simple and evanescent; one may even wonder if it really deserves some research as it seems something obvious. On the contrary, others may consider coping with dating strata as too ambitious or challenging because of the intrinsic vastness and ambiguity of the matter. As I discuss further on, I consider it simply a necessity.

Dating strata is one of the most common activities (if not the most) routinely carried out by archaeologists (and that is why challenging the topic may appear useless or excessively ambitious – why should someone tell the archaeologists how to do what they already do so often?); in particular, it represents the core of post excavation analyses and it involves the crucial passage from a relative chronology to an absolute one. Dating is, ultimately, a necessary passage for moving (or trying to move) from excavation to history (and indeed it is an inescapable factor to be considered also in an anthropological perspective).¹ This is because dating strata means dating the events and processes by which they have been formed and shaped; in other words, behind sediments there are actions, whether they are natural or anthropic, whether they involve transport or modification, deposition or removal.

The complexity and vastness of the topic do not take long in appearing. The Latin expressions *terminus post quem* or *terminu ante quem* immediately remind us that dating does not mean only and simply ‘when?’, but also ‘after which moment?’ or ‘before which period?’; ‘how long did it take?’ may as well be added to the list.

Beside this, again, *how* do we date strata? Apart from some scientific techniques for direct dating, which will be briefly looked at in Chapter III.2, the most common answer, which may well be provided by everyone who has to deal with field archaeology, would be: ‘we date a layer through the materials recovered within it’.² That is right of course. Today, as from the very beginnings of archaeology, artefacts (in particular) are the most important means of dating. It remains also obvious that this answer, by itself, is not enough. Indeed, this statement yields a second question, apparently something rarer: ‘how did the materials turn out to be embedded within the layer from which they have been recovered?’³ This is a crucial point and large parts of this work will deal with it. I strongly argue that if we do not try to know *how* the materials we use to date one layer were embedded within it, we cannot truly date the layer itself, besides, possibly, through a mere *terminus post quem*.

The present work, at the sharp end, concerns primarily time and formation processes.

¹ See Munn 1992 for an overview and for several further references.

² At the end of the 1980s, M. Carver observed that artefacts were still the most accurate method of dating (Carver 1989: 133). Despite the incredible improvements made in many fields during the last thirty years, this statement is still substantially true, at least in the field of Classical and post-Classical archaeology.

³ Fundamental in this sense, particularly for the questions posed, is Berry 2009.

1.1.2 The reasons

The reasons for the research are both personal and scientific. Before turning to the much more important scientific ones, I would like to briefly sum up the personal ones.

I already looked at the topic of dating deposits, very roughly, in my MA thesis, some ten years ago. At the beginning, the topic should have been limited to the study of residuality, its meaning, limits and potentialities. It was soon clear that it was almost impossible to fully tackle the issue by itself, as it was inextricably linked with a wide range of other topics. Thus, the subject gradually moved to dating as a whole. The idea of dealing with such a prickly matter originated from the countless discussions I had in the field and attending post-ex activities mainly with J. Bonetto and A. R. Ghiotto. In particular, the excavations carried out at the forum of Nora had just been published and we all had the impression that there was still much more which could have been squeezed out from the data collected. One of the problems was how to do it and that meant issues of theory and methodology.

Here the scientific reasons of this study arise: dealing with materials in post excavation, particularly for dating issues, soon appeared to be all but codified. Methodological issues were taken on piecemeal and spread over a potentially huge quantity of works. Moreover, large parts of excavation reports or complete publications dramatically missed (and unfortunately still miss) in presenting completely the data or the way in which they had been preferred to provide the dates presented.

The scientific reason of this work may thus be identified in the incredible lack of coherent and organic theoretical and methodological systematisation which lies behind such an important and common activity as dating deposits. I do not want to minimise what has already been written on the topic: in my view, what is mainly lacking is not content, but rather some 'shape' (very challenging in any way). I also do not want to suggest that the dates commonly provided for so many contexts, deposits, buildings, events and so on are wrong. What is missing is an *explicit and structured approach*, capable of positively answering the simple question 'why?', i.e. 'why is this forum dated 50 BC?', or 'why do you think that this building was abandoned at the end of the 5th century AD?', or 'why is this refurbishment phase dated to the age of Tiberius?' In one word, the issue is 'justifying' properly the dates we propose. What are the key concepts used? Which tools are available? How can they be used organically to achieve some date for the deposit being studied? These are the main questions from which this book begins.⁴

1.1.3 The objectives

Given the premises discussed, the target of this work is effectively somewhat ambitious: providing a tentative but coherent and structured review of concepts and methodologies for dating deposits, along with a sort of problem-oriented taxonomy for their arrangement and the presentation of case studies for comparative purposes. At the very end the target is very practical, as it may be described as the improvement (even a small one!) in the quality of the inferences we make about 'when', during and after the excavation. I also hope that these lines, in their own small way, may help revitalise a debate on the topic, which has been undoubtedly poor over the last decades. In particular, during the last few years, spatial analysis has arisen as one of the major topics in the theoretical and methodological debate, while time is a key topic of few general works, rarely concerning the dating of deposits and the post-excavation analyses. The debate about formation processes has also decreased during the last two decades, however, also within this particular field of discussion, space and function have always been the favourite targets. If this work elicits even negative, but prolific critics, a good point would have been made.

⁴ Currently, the best available and updated synthesis on the issue of dating contexts and deposits is probably provided in Carver 2009: 267-296.

1.1.4 The 'playing field': what is in, what is out

Although the topic of dating deposits, as a whole, surely crosses the chronological and spatial borders of many fields of archaeology (Prehistoric, Greek, Roman, Medieval, etc.), I decided to clearly limit the field in which I will play the dating game. This is at least for three main reasons:

1. To cover exhaustively all the possible scenarios would have simply taken a lifetime.
2. My personal background clearly does not cover all the possible cultural, spatial or temporal aspects of the discipline of archaeology.
3. Every culture (a difficult term, indeed) and depositional environment display peculiarities deserving specific attention and that make them unique.

Besides the very contingent first two points, the third one takes on scientific importance.

Specific mixtures of physical, socio-cultural, political and economic factors, which could be considered as macro-systemic contexts (for a more precise definition and for the specific use of the expression which will be made in the rest of the book, see Chapter II.2.1), define the resulting archaeological record in peculiar ways. For instance, although clearly responding to the same physical laws and to many similar necessities, etc., a complex urban society and hunter-gatherer groups produce very different records through very different processes. To safeguard these peculiarities, a choice has to be made.

It was decided to focus on ancient, more specifically Roman, urban sites. Of course, going back to point 2, among all the possible scenarios, the one this present author knew best was selected, mainly in the light of several excavation campaigns carried out in Italy and abroad.

A Classical urban environment undoubtedly displays a high level of complexity and therefore represents a great challenge from many points of view. But which are the peculiarities that make a Classical (in this specific case Roman) urban site unique, looking at the formation processes involved? An attempt will be made to try and provide answers schematically (probably with some degree of generalisation), focusing on a few crucial points, which are particularly evident in the field of Roman urban archaeology, but which are to some extent typical of urban environments in general.

The continuity of human life within the same space for a long time is, obviously, one of the first appreciable characteristics of an urban environment. This, by itself, implies a high degree of transformation, complexity and palimpsesticity. This has indeed a positive, indirect consequence in relative dating, allowing to create long and sometimes narrow sequences in which actions and processes can be framed; but it still also presents some disadvantages in terms of absolute dating, because of the higher degree of mobility of artefacts due to redeposition (see point 3).

In general, natural formation processes (say processes in which nature plays the major role, although not necessarily an exclusive one) do not have a massive impact, at least during those periods in which the city and its countryside are well managed and in absence of great catastrophes.⁵ The reason for that lies primarily in the fact that Roman cities are, in most cases, located in comparatively stable plain environments; moreover, Roman care for the maintenance of water courses is almost proverbial.⁶ Therefore, during periods of 'normal' management, episodes of colluvium or alluvium are very rare.

The other side of the coin of such an observation consists of the fact that Classical urban environments are exquisitely anthropic and anthropogenic environments, with all the pros and cons implied. Summing up, the human being is the major formative actor, although not the only one, in such an environment.

⁵ Conversely, they play a major role in non-constructed sites (Karkanas, Goldberg 2019: 9).

⁶ Brogiolo *et al.* 1988: 29.

Particularly if compared to other building traditions, Roman architecture is particularly ‘aggressive’, meaning that it commonly involves the movement of substantial volumes of sediments and building materials, along with the use of numerous and differently skilled workers. These massive operations do not concern public buildings and infrastructures only, but can also frequently be observed in private architecture. This means that the urban environment is frequently re-shaped, even substantially. The movement or the excavation of large amounts of sediments for building purposes imply also a major displacement of sherds, with clear impacts on the issue of residuality.

Although myriads of exceptions may be observed, cities during the Roman period generally benefit from a complex system of waste management and disposal, of reuse and recycling. The existence of these mechanisms, discussed in Chapter III.4.1, heavily affects the record of a whole city, and makes it very different from a small rural settlement; it also has some precise consequences on the issue of dating.

In general, given the production levels reached, Roman deposits are usually rich in artefacts, mostly ceramic; they often produce also good amounts of numismatic evidence, which in turn, generally speaking, increases the level of accuracy of our chronological inferences. Quantity, as it will be discussed further on, counts.

All these above aspects typically characterise the field of play selected for playing the deposit-dating game. Of course, some concepts, methods or observations which will emerge may well be applied to other fields, but, in general, any mechanical transposition should, perhaps, be avoided; on the contrary, some critical and thoughtful application of some methods or concepts to other fields may turn out to be useful.

It is also worth noting that the boundaries of the playing field can get blurred. Sometimes it is very difficult to clearly separate what is Roman from what is pre- or post-Roman, or to clearly establish if a given settlement displays all the requisites of a town, or if it should be simply considered as a large settlement. This, moreover, would closely depend on the criteria preferred. Thus some flexibility and uncertainty have to be allowed for: some case studies, for instance, will be drawn from periods which would be considered by some as more applicable to the field of Iron Age archaeology, or to Late Antique/Early Medieval archaeology. I think that the issue of continuity itself (see point 1), which so evidently characterises the urban environment, allows some chronological flexibility in limiting the field.

Apart from the exposed chronological limits of the research, among the deposits forming Classical urban palimpsests a further selection has been made. As mentioned above, natural/geogenic strata are comparatively few in long-lived urban environments. But, of course, they exist and participate in shaping urban stratifications, particularly in open spaces;⁷ sometimes natural phenomena heavily affect the occupational pattern of many settlements (alluvial or colluvial episodes, occurrence of volcanic activity, etc.)

This work focuses only on anthropogenic deposits, because natural deposits, in general, involve processes whose deciphering requires a more robust geological/geoarchaeological approach. Soils, with their peculiar formative histories, are therefore excluded, as well as those deposits commonly known as ‘dark earths’, where anthropogenic and natural actors seem to play at least equally important roles. Some peculiar anthropogenic contexts, such as tombs, votive/ritual offerings, shipwrecks (indeed not typical of the urban environment!), and, to some extent, coin hoards will not be discussed, by reason of their unique formative characteristics and of their relative rarity.

Although the field had to be limited, the transverse nature of the book still manages, it is hoped, to emerge. It represents an extremely positive and stimulating feature, because anyone with some excavation and post-excavation experience can engage positively with the topic.

⁷ Karkanas, Goldberg 2019: 5.

1.1.5 Topics connected

The theme of dating deposits, although very wide by itself, is strictly connected with other topics which are not targeted by this book. This means that these topics will not be examined in detail (mostly because they would deserve a book of their own), but they will be touched on sometimes in relation to specific issues.

The most important of these ‘corollary’ topics is the dating of artefacts. This is not a study on the dating of artefacts, this is a study on how artefacts (and other ‘-facts’) are used for dating deposits. Yet the strict link between the two topics is very clear, as most often artefacts are dated thanks to their association to other finds in specific deposits, in a sort of circular relationship which may be very convoluted and which should really deserve much more attention in the literature. This very important topic is not addressed in this volume, but it is hoped that some of the considerations emerging may turn out to be useful on the subject.

The issues of grouping and phasing contexts, together with issues concerning excavation techniques and practice are also linked with the main topic of this book; these will also be touched upon sometimes, by reason of specific links with the topic of absolute dating of deposits.

The necessity of making some choices in shaping the matter of the book is also evident in the literature review proposed (see Chapter 1.2): indeed, large parts of the history of archaeological thought and the development of field techniques over the last decades are taken for granted, although connected with the main topic. These, of course, would have deserved an independent treatise.

1.1.6 Structure of the book

Seeking for some structured working method (it being unavailable), the structure of the book is in some ways untraditional. Instead of a usual layout of data – analysis – synthesis, it was decided to start with a theoretical review, moving then to methods, and to taxonomy and case studies, therefore substantially reversing a more traditional order. This is because for moving from data to synthesis (inductively) it is taken for granted that the ‘way of moving’ (through which means, in reason of which theoretical framework, etc.) has already been established. In other words, we employ an already existing methodology for managing the matter and for making the data speak for the purpose we want (or at least so it should be).

In this case, it was resolved that starting from a body of data (but which data were important?), without having a clear idea of how to make them speak, would have been pointless. Conversely, we started from the basics, moving deductively/inductively and trying to provisionally test some of the expectations formulated. It is important to stress from the very beginning that the case studies presented were deliberately cherry-picked to show certain phenomena in the clearest way. The proposed approach can be considered somehow heuristic; almost infinite testing may be performed in the future and some of the theoretical and methodological tools proposed may consequently turn out to be confirmed, refined, or completely rejected. But at least, it is hoped that a basis has been laid down for further discussions.

According to these principles, the book is arranged into five main parts:

1. An introductory section with a review of the state of current thinking.
2. A theoretical discussion of the main key concepts involved on the issue of dating deposits.
3. An exposition of the main methodological tools that can be used for dating deposits, furtherly subdivided into quantitative and qualitative approaches.
4. A problem-oriented taxonomy of deposits, provided with depositional models for assessing how the assemblages can be used for dating; each type of deposit is followed by case studies, where the methodological tools exposed in the third part are used.
5. A concluding part with a synthesis of the working method proposed.

First of all, we will examine if and how a history of the way in which archaeologists date deposits can be traced.

I.2 Notes for a literature review

Just taking a quick look at the bulk of the literature concerning archaeological methods and theory, one can easily observe that the way in which assemblages are used for dating deposits (particularly in Classical urban sites) cannot be considered a topic by itself. Although dating strata is, indeed, one of the most common and historically rooted archaeological activities, as noted above, the literature on the issue is anything but organic and linear. Thus, in writing a review of the topic one must firstly acknowledge that several branches of the discipline have to be investigated to look for single scattered fragments of theoretical or methodological developments which contributed to defining today's tools for dating strata.

In some way, however, our field of play field must, again, have its correct marking before starting. As detailed earlier, in the following discourse the development of some topics, although closely connected to many issues of interest, will not be accounted for, basically because these topics already benefit from a more structured history, and/or because they would deserve more, and independent, space. This is the case with the huge topic of dating *finds*, ranging from typology and cross-dating to radiocarbon and thermoluminescence analyses. Writing a history of excavation techniques will be also avoided, although some important developments will be examined. Similarly, a complete and exhaustive review concerning the way in which assemblages have been used for dating deposits in past excavation publications would be, if not impossible, at least very difficult, even if focusing on Classical Archaeology only, as it is obviously populated by hundreds of on-going or finished excavations. However, some examples considered particularly illuminating of some developments will be discussed, again deliberately opting for a cherry-picking strategy.

The techniques of direct dating (OSL, mortar dating) are very recent and some notes are deferred to Chapter III.2; some notes on tools borrowed from other fields (ethnoarchaeology, experimental archaeology) are included in Chapter III.5; while papers concerning the important theme of waste disposal are indicated in Chapter III.4.1.

Another general note must be stressed before starting: most of the review draws on Italian and Anglo-Saxon literature. This is due to many reasons, among which my personal knowledge and background (archaeological, cultural and linguistic) have clearly played an important role. Nevertheless, except for the obvious attention paid to the Italian literature, the focus on the Anglo-Saxon material has clear historical reasons. Most of the theoretical and methodological developments concerning modern excavation techniques and post-excavation/interpretive issues have seen the light in this context,⁸ so effectively providing the largest part of those 'scattered fragments' mentioned above.

I.2.1 *The beginnings*

It is illuminating to start with a brief consideration of the way ancient writers perceived the world they lived in, i.e. their own 'systemic context' (see Chapter II.2.1). Pausanias' *Ἑλλάδος περιήγησις* of the 2nd century AD is indeed the most striking testimony of the ancients' perception of the palimpsestic nature of their urban environments. Most of the monuments, statues, objects, etc., described by the author are effectively 'false residuals' (see Chapter II.2.6) in their own cities. In other words, already 1850 years ago, Classical cities were composed of a mixture of structures and artefacts erected or produced in different times, and thus they displayed a high degree of chronological complexity.⁹ It is worth recalling this aspect because, surprisingly, it represents a key point in archaeological analysis often forgotten by archaeologists themselves. As will be discussed later, even assemblages embedded in primary, sealed-off deposits display this degree of complexity, which must be known and studied to fully understand their nature and dating. If, on the one hand, the explicit definitions of residuals and false residuals in

⁸ Leonardi 1982: 113.

⁹ This issue has been recently touched on by F. Rojas in his works on ancient antiquarianism and the ancients' perceptions of the pre-Greco-Roman past (see Rojas 2017 for some examples).

archaeology are, after all, fairly recent, on the other their implicit notions are common knowledge now, and were common knowledge 2000 years ago. Apparently, archaeologists did not create something new.

Moving to the much more recent past, we can observe the more-or-less explicit adoption of some important principles at the very beginning of modern archaeology. C. J. Thomsen¹⁰ is famously known for having first adopted, in his *Guide to Northern Archaeology* (1848), the three-ages system (Stone, Bronze, Iron). Less explicit are two other fundamental aspects of his work:

(1) the acknowledgement that tombs were privileged contexts for studying artefact associations, thus grasping their primary status; and

(2) the dialectic relation between artefact chronology and context chronology (so effectively laying the foundations for seriation and typology techniques).

Thomsen explains the matter in this way:

‘Towards determining the exact age of antiquities, or at least the period to which they belong, there is still another guide which hitherto has been but little followed with respect to the antiquities of the North, i.e. an investigation of the forms of the objects and of the ornaments with which they were decorated, with a view that by a careful comparison and by accurately noting what sorts are generally found together, we may ascertain the order in which the successive changes took place, and thus determine the periods to which a mere inspection of the ornaments will authorize us to assign the object’.¹¹

We may conclude that since the very beginning of modern archaeology an idea of what is meant by ‘primary deposit’ existed, along with the implicit assumption that what makes these deposits very informative consists of displaying *true* associations (see Chapters II.2.3-6) among the embedded artefacts.

Thomsen’s intuitions become more explicit and are largely favoured in Flinders Petrie’s famous works on the tombs of northern Egypt.¹² The primary status of tombs and their assemblages is exploited to provide the basis for a large seriation of artefacts,¹³ whose principles were first exposed in the *Journal of the Anthropological Institute* in 1899¹⁴ and discussed again in *Diospolis Parva* in 1901.¹⁵ Nonetheless it is *Methods and Aims in Archaeology* that provides new, remarkably fresh considerations concerning the assemblage-context relationship. The presence is recognised of false residuals in some contexts¹⁶ and infiltrations are evaluated, implicitly acknowledging the presence and importance of sealed deposits.¹⁷ The primary status of other types of contexts, such as rubbish mounds,¹⁸ votive pits¹⁹ and collapse debris,²⁰ is also recognised. All these considerations are still fundamental for considering the chrono-informative potential of a given deposit. In the end, Petrie went even further, realising the importance of vessel breakage ratios in seriation and in chronological issues in general.²¹

¹⁰ See Trigger 2006: 121-129.

¹¹ Thomsen 1848: 69.

¹² Petrie is considered the father of cross-dating. His work will be later developed, among others, by G. Childe (1960, in particular 80-84 and 126-130). See also Patterson 1963: 391; and, more recently, Lee Lyman, O’Brien 1999: 185-215. See also James *et al.* 1998 for cross-dating and the building of an absolute chronology for the Iron-Age central Mediterranean area.

¹³ See Trigger 2006: 294-295.

¹⁴ Petrie 1899.

¹⁵ Petrie 1901: 4-8.

¹⁶ Petrie 1904: 145.

¹⁷ Petrie 1904: 145.

¹⁸ Petrie 1904: 147.

¹⁹ Petrie 1904: 145.

²⁰ ‘Let us suppose some old country mansion, where it has been the habit to close permanently any room in which an owner had died, and leave everything in it undisturbed. If we went through such a series of rooms we could not doubt their order of date if we looked at their contents’ (Petrie 1904: 127-128). See also Petrie 1904: 148.

²¹ Petrie 1904: 16-17.

At the dawn of the 20th century, some key ideas, particularly in Petrie's work, were more widely disseminated: in general, the existence of index fossils of given periods is obviously widely acknowledged, and cross-dating allows the creation of long sequences of artefacts from Egypt, Greece and Italy. Roman archaeology, on the other hand, still relies primarily on the abundance of other sources of dating. However, two points must be stressed:

- (1) index fossils, a chrono-tool clearly borrowed from geology, are of some help when dealing with very broad periods or in seriating tombs or other primary deposits. Otherwise, as with every find, they just provide a *terminus post quem*; and
- (2) the main focus is still on tombs and other particular contexts: urban dynamics are known to a certain extent, but proper urban archaeology still has far to go.

In fact, the acknowledgment of urban formative complexity can be considered a turning point for a mature development of dating techniques in this field, and this seems to have been achieved from the 1970s.

During the 1950s, Mortimer Wheeler was already introducing rigorous techniques for stratigraphic excavation and recording, but ceramics were still being studied as a group,²² with individual studies devoted to a few specific finds only. Curiously, Wheeler's attention focused on the duration of accretion processes (in any event a matter of great importance), more than on *when* they happened.²³ It follows that at this stage a serious evaluation of the huge problem of residuality was, in fact, impossible, and therefore the complexity of dating urban contexts remained substantially unapproached. In this period, radiocarbon dating and dendrochronology are in the initial stages of their development, but it has to be stressed that from the very beginnings the notion of *terminus post quem* is acknowledged also when dealing with dated samples.²⁴

An early, but isolated, advocacy of interest in how finds reach deposits is contained in Pyddoke's introduction (1961) to his work *Stratification for the Archaeologist*: '[...] an excavation report is not complete unless the writer sets out to explain the manner in which the layers were deposited. To understand his site properly the stratigrapher must always ask himself how his finds reached the position in which he discovered them'.²⁵

The author's statement is certainly right but, unfortunately, for some time no practical consequences follow.

A few years later, the 1960s announce the advent of 'New Archaeology', with the fundamental entrance of quantitative approaches and computer science, finally providing fundamental tools for dealing with large amounts of artefacts (a key point which undoubtedly had a huge impact on postponing the development of techniques for dating deposits in urban environment). As S. Roskams stressed, developments in the archaeological discipline, besides that of individuals' dynamism, are also the products of more general changes. He considers three elements as essential in this development: intellectual framework, available technology and organisation (of fieldwork).²⁶ At the turning point of the 1970s, these three elements had made great progress; the premises for a major shift from cemeteries to settlements as targets, also for chronological inquiry, had been laid down. Starting from this moment, some main streams can be detected, although, as seen before, a linear evolution in the techniques of dating strata cannot be recognised.

For the sake of simplicity, these different branches are discussed separately, deferring an attempt to provide some synthesis and conclusions to the end of this chapter.

²² Wheeler 1954: 157.

²³ Wheeler 1954: 27-34 and 40-49.

²⁴ Wheeler 1954: 32.

²⁵ Pyddoke 1961: 17.

²⁶ Roskams 2001: 9.

1.2.2 Urban Archaeology

In Italy, at least, ‘urban archaeology’ is usually understood as the archaeology performed in today’s urban environments.²⁷ If, archaeologically, there is no substantial difference between an urban site which stopped existing, say, a thousand years ago and an urban site which still exists, from many other points of view the differences (organisational, economic, legal, political, social, etc.) are crucial, thus giving urban archaeology, so understood, its own autonomy and free-standing status. Historically the birth of urban archaeology is closely connected with the birth of contract archaeology and follows the post-war urban renewal of many western towns. This formative moment is thus spread over many years, according to the moment in which in different areas such urban redevelopment took place. The role of urban archaeology in the archaeology of urban sites (it sounds odd, but that is it) has been fundamental, as it was forced by necessities whose answers produced wider benefits. These necessities included new efficient, shared and codified ways of dealing with large amounts of data in shorter periods and the development of planning and sampling strategies. Also the use of communicational strategies to support the social role increasingly demanded of archaeology.

The first necessity led to two major innovations that greatly changed the way in which archaeology is commonly carried out, namely the single context recording system and the ‘Harris matrix’.²⁸

From the point of view of dating deposits these two improvements are fundamental for two reasons: single context recording had a compelling effect, forcing archaeologists to look *inside* each context and evaluate, at least generally, its nature and meaning – a necessary step to evaluate its status. Meanwhile, the Harris matrix provided a system for producing reliable relative sequences, even when dealing with thousands of contexts, thus making available a basic relative chronology for complex urban sites and enabling a switch to the absolute dating of deposits.

The second necessity (planning) led to the growth of evaluation and sampling techniques. On their own these two aspects do not seem to directly affect dating, but the idea lying beneath these two aspects set in motion a wide debate which also had some consequences for dating. The core of the debate may be very roughly summed up by the slogan ‘total excavation vs progressive approach’.

The spread of excavation sites in many urban centres took archaeology out of a purely academic perspective and threw it within a world made of budgets, scheduled times, citizens’ needs, construction industries, and so on. One question arising from these experiences was key, i.e. is it possible to excavate a whole site with the same level of accuracy and to its whole extent? And if it were possible, would it be ethically correct?

In England, on one side of the debate, P. Barker and the Museum of London Archaeology (MOLA) pushed towards open-area excavations carried on with standardised techniques, with no substantial differences in excavation and recording strategy. On the other, scholars such M. Carver argued for a more progressive approach, scaling ‘intensity’ according to the informative potential of deposits and applying sampling techniques when possible,²⁹ depending on specific research questions or agendas. Of course this is a very simplistic description of the issue and it does not do justice to many varied aspects and nuances of the problem. A better and more complete overview can be drawn by two more recent papers published in 1990 by P. Barker³⁰ and M. Carver³¹ in the volume *Lo scavo archeologico: dalla diagnosi all’edizione*.

²⁷ Brogiolo 2006.

²⁸ Harris 1975 and 1979. Harris also dedicates part of his work to phasing and to the relationships between materials and strata (although he mainly focuses on the problem of intrusions), drawing in particular from the important work of D. Dymond (1974).

²⁹ For a later classic application of these principles, see the excavation carried out in via Alberto Mario, Brescia (Italy). Brogiolo 1985: 71-74, Brogiolo 1988.

³⁰ Barker 1990.

³¹ Carver 1990.

Here is not the place to discuss which approach is ‘better’ (even supposing it would be a useful and meaningful discussion).³² Both approaches (not antithetical at all) provide a fundamental background for approaching dating issues. This is not just a mere compromise position and I will try to demonstrate why. In the perspective of dating deposits, an open-area excavation with a standardised recording approach presents two main advantages.

One is that sampling problems involving assemblages and deposits are considerably reduced. This issue particularly affects secondary deposits and can lead to dates which are remarkable too old, even just the *terminus post quem*. Dating the construction of a whole building after having examined just part of the backfill of one foundation trench is, to say the least, hazardous. The established *tpq* may be much older than the actual one (see Chapters II.2.2 and IV.5).

The other advantage is that a minimum standard recording system at context level represents a necessity, as it allows in post-excavation analysis at least a raw evaluation of the nature of the context and the possible formative process related. The uniformity of the system makes the comparison of two or more contexts easier, thus facilitating the operation of grouping.

On the other hand, a more selective strategy yields a more critical approach to stratification, pushing towards the evaluation of the informative potential of contexts and thus permitting an early raw distinction between context and context, speeding up some interpretive work. Moreover, in this way extra analyses, sampling and data collection can already be pushed to the maximum during the excavation, whenever it seems appropriate.

Apart from some distinctions between the two approaches, both the figures of Barker and Carver directly and importantly contributed to the development of approaches to dating.³³ Barker’s classic excavation manual, based on his experience at Wroxeter and Hen Domen, was firstly published in 1977, and it has, among others, the undeniable merit of having clearly tackled the use of *termini post quem* and *termini ante quem* when dating sequences.³⁴

Just a couple of years later, in Carver’s *Notes on some general principles for the analysis of excavated data*,³⁵ some important lines of approach, based on the author’s 1974 experience at Saddler Street, Durham, were set down. The first part of the paper focuses on artefact seriation, for which context status is not taken into account, whereas the second part discusses in more detail the status of both contexts and assemblages. Contexts with primary status are those qualified by ‘assemblages which have relevance for the activities and culture of the inhabitants’,³⁶ where the association of artefacts is reliable.³⁷ Carver also warns that ‘only material from primary contexts may contribute to the absolute chronology’³⁸ and reminds how too much effort has been devoted to sampling and dating secondary deposits. Carver’s message is pretty clear and correct; it is just worth noting that actually secondary deposits contribute to absolute chronology too, although with a mere *terminus post quem* (indeed within a whole sequence, it is the correct combination of all the three *termini* which leads to an absolute chronological grid).

These principles were already, at least partially, applied in Carver’s 1976 excavations at Sidbury, Worcester, which were then published in 1980.³⁹ The report is extraordinarily important as it provides, albeit in a concise way, an early example of a publication in which the post-excavation process of phasing and dating is somehow made explicit, along with the principles which led the work. Contexts were identified according to their status as primary, secondary or redeposited (although it is not clear how the second and the third are understood) and then presented along with some indications about both the embedded

³² For more on the ‘open-area point of view’, see Roskams 2001: 31–34. See also Bradley 2015.

³³ See also, below, the topic of residuality.

³⁴ Barker 1977: 193–196.

³⁵ Carver 1979.

³⁶ Carver 1979: 8.

³⁷ Carver 1979: 9.

³⁸ Carver 1979: 9.

³⁹ Carver 1980.

materials and their identification ('rubbish pit', 'pebble surface', and so on). It is possible to detect a certain split between the stratigraphic sequence and the pottery seriation, which seems to have been carried out quite independently; indeed, residuality thresholds were marked not in relation to each deposit, but on an absolute scale, i.e. stating after which date a single vessel type could be defined as a residual.⁴⁰

Before proceeding, it is worth briefly recalling how the necessity of improving the communicational aspects of archaeology, mainly with respect to the greater public interest, also involved important changes in scientific publications. Indeed, the need to make the excavation results public (archaeology could not keep on acting in isolation from the surrounding urban society) also responded to more pragmatic commercial demands, allowing the evaluation of 'if, how and with which results' the job had been done. This also generated great scientific benefit, compelling archaeologists to provide detailed data and interpretive syntheses. Carver's report, among others, is also the child of these new necessities.

At the end of the 1970s the important topic of the status of contexts/deposits emerges, i.e. their informative potential (spatial, functional, chronological) within urban stratification. In other words, the attention focuses on their own nature. An important fixed point is represented in the 1979 work by P. Crummy and R. Terry (Colchester Archaeological Unit) *Seriation problems in urban archaeology*. It is an extremely important paper as it combines the topic of context status with the issues of residuality (see below), of ancient productive output and of breakage rates and wear. Some of these prompts will be touched on elsewhere throughout this study. Concerning the status of deposits, Crummy and Terry state:

'In general, we can distinguish two categories of deposit which for the sake of brevity we shall refer to as class I and class II. Class I deposits can be defined as those derived from contexts where all the finds are in their original positions as either lost or discarded whereas class II deposits are those which contain residual material.⁴¹

Provisionally, at the risk of oversimplification, class I deposits can be listed as:

- i. occupation layers on floors;
- ii. destruction levels (except for the cases such as at Verulamium cited above);⁴²
- iii. middens (where the soil content is minimal and the original stratification undisturbed);
- iv. grave goods;
- v. primary deposits in some pits and ditches including cesspits;
- vi. coin hoards;
- vii. kiln dumps and loaded kilns;
- viii. thick tip-lines in pits and ditches which consist of almost exclusively broken pottery and refuse where the soil content is minimal and much of the pottery can be joined together'.⁴³

The two scholars continue:

'The number of substantial class I deposits encountered on urban sites is probably very low [...]'.⁴⁴

Class II deposits are then further split into IIa and IIb, according to a respectively low and high level of residuality and it is then noted that only class I and class IIa deposits can be used for seriation to improve the dating of finds.

⁴⁰ For Carver's great theoretical, methodological and practical activity concerning urban archaeology, see also Carver 1985; 1987; 1989. The more recent Carver 2009 somehow represents a *summa* of his research.

⁴¹ Note the ambiguous use of two different parameters for defining the two classes, namely a spatial one for class I deposits and a temporal one for class II deposits (see below for what the authors mean by 'residual'). See Chapters II.2.5 and II.2.6.

⁴² The clarification refers to the presence of residual sherds in brick-earth daub used for wall construction, as reported in Frere 1972: 9-10.

⁴³ Crummy, Terry 1979: 54-55.

⁴⁴ Crummy, Terry 1979: 55.

An in-depth discussion of this single article would deserve a much greater space; it is clearly based on instances coming directly from the urban excavation experiences gradually reached in those years. What emerges is a clear awareness that not every context is suitable for providing the same information and that, from a chronological perspective, the few primary deposits embedded in urban sites are the most important, as basically they do not contain residuals. The paper also provides a tentative definition of what a primary (class I) deposit is, along with a list of concrete archaeological examples. Implicitly the issue of false residuals (both in the cases of vessels or coins) is addressed.

Crummy and Terry's work was published in the volume *Pottery and the Archaeologist*, where other papers also deserve particular attention. Among them, it is certainly worth recalling just a few lines from R. Jones' introductory paper, as it represents a warning that should be always kept in mind when dealing with dating:

'[...] perhaps we should be willing to admit that sometimes the pottery sample available from a particular site or deposit is inadequate to fix any date but the most simple *terminus post quem*. However, when faced with a report to write, most excavators feel duty-bound to express some opinion even on inadequate grounds'.⁴⁵

At the beginning of the 1980s important urban excavations are published throughout Europe and beyond, to some extent echoing the reflections and improvements achieved mostly from the work of British archaeologists.

A typical way of presenting the dating evidence in these years can be drawn from the volumes dedicated to the excavation of the M-M3 underground lines in Milan.⁴⁶ Although some further details are provided throughout the paper, a complete presentation of contexts, status and material does not always appear. It does not mean, of course, that the post-excavation analysis did not reflect the achievements of the previous decades. What seems to emerge, most likely, is a problem with the publishing of the data, a problem which still affects a large sector of field archaeology.

In the same volumes, some papers are more detailed than others, dedicating independent paragraphs to the discussion of dating, and presenting recapitulation charts for each period.⁴⁷ In general, it is worth noting a certain use of *ex-silentio* arguments (see Chapter II.2.11), along with a certain awareness of providing chronologies from a probabilistic perspective. Dating is indeed 'proposed' more than 'imposed'.

The 1990s witness some new and interesting theoretical and methodological considerations, which find room, in particular, within the *Interpreting Stratigraphy* conferences, devoted primarily to post-excavation analyses. A full presentation of each paper would require much space and it would substantially broaden the discussion. Again, it seems better to focus on some areas of significant relevance. Among the papers presented at the conference held in Lincoln in 1992, S. Roskam's article deserves particular attention as it focuses on the relation between materials and context status, providing a new, tentative classification and a brief review of previous works.⁴⁸ Among the papers presented the next year in Edinburgh, K. Matthews' paper investigates the formative and chronological aspects of those primary deposits usually named 'occupation layers',⁴⁹ while among the papers presented between 1993 and 1997, published in 2000, the articles by M. Morris (ethnoarchaeology of abandonment debris),⁵⁰ J. Gidlow (rubbish, recycling and scavenging),⁵¹ P. Clark (grouping),⁵² V. Buteux and R. Jackson (pit backfill dynamics),⁵³ R. J. Pollard (fragmentation and assemblage formation processes)⁵⁴ and P. Rauxloh (relational databases and residuality thresholds)⁵⁵ deserve particular attention.

⁴⁵ Jones 1979: 3.

⁴⁶ Caporusso 1991.

⁴⁷ Perring 1991.

⁴⁸ Roskams 1992.

⁴⁹ Matthews 1993.

⁵⁰ Morris 2000.

⁵¹ Gidlow 2000.

⁵² Clark 2000.

⁵³ Buteux, Jackson 2000.

⁵⁴ Pollard 2000.

⁵⁵ Rauxloh 2000.

By the end of the 1990s, in the field of urban archaeology theoretical and methodological debates seem to diminish. Although obviously important urban excavations were still being published, with even larger *corpora* of data made available, critical discussion within the discipline gets less and less discernible. This may also be a consequence of the end of large urban development plans in most western cities, but it is also probably affected by a widespread shift in archaeological interests towards new disciplines, such as spatial analyses, geo-physics, statistics, building analyses, etc., which seems to draw much of the attention in the field of archaeological methods and theory.

1.2.3 Behavioural Archaeology: objects

Behavioural Archaeology took shape in the United States in the early 1970s and it developed from New/Processual Archaeology, within a markedly anthropological framework. Its epicentre was the University of Arizona, with some major exponents such as J. J. Reid, W. L. Rathje, J. M. Skibo, and M. B. Schiffer. Its American origins led to an obvious focus on American history and archaeology, thus delaying its own impact on the archaeology of other cultures and on urban archaeology, which had a typically European characterisation. Indeed, within the current European theoretical debate, still saturated with the opposition Processual/Post Processual Archaeology, this school did not find much room.

What makes Behavioural Archaeology extremely interesting within the perspective of dating deposits through assemblages is the explicit focus on the people/artefact relationship at various scales.⁵⁶ Of course, Behavioural Archaeology has evolved over the last decades, both through internal development and by external impulses, and it now embraces topics ranging from technological change to ritual and religion.⁵⁷ Nevertheless, the field which is of interest when dealing with dating is still the very core of Behavioural Archaeology, i.e. the understanding of formation processes as a fundamental tool for drawing reliable inferences from the archaeological record.

It has to be stressed that, although the existence of two main groups of processes involved in shaping ancient systemic contexts into archaeological contexts was fully recognised, namely the so-called *c*-transforms and *n*-transforms (respectively cultural and natural processes of change), most of the focus has been devoted to *c*-transforms. This seems to be due to the anthropological approach which so deeply characterises American archaeology in general and Behavioural Archaeology in particular, with its typical attention to human behaviour. Certainly, a substantial corpus of literature concerns *c*-transforms too, but the wider theoretical trend remains clear and explicit.⁵⁸

This tendency presents pros and cons: natural formation processes, geological and micromorphological aspects and post-depositional processes step slightly to the background leaving mainly cultural processes in the foreground, which, in turn, are mainly pre-depositional and depositional. Indeed, in the Classical urban environment, cultural formation processes play a major role in shaping the record, simply because human activity lasted for long in the same place.

Moreover, as already mentioned, the ancients' approach to the urban environment, in particular the Roman one, could be particularly incisive in terms of architectural effort, heavily modelling the space both above and under the ground. In general, a behavioural approach seems to suit well the area of study and the target addressed.

⁵⁶ Schiffer 2010: 14.

⁵⁷ For a useful collection of articles summing up the development of the discipline from the very beginning, see Schiffer 1995a. For a recent synthesis see Schiffer 2010. Perhaps, the most complete and organic work is still represented by Schiffer 1996 (first edition in 1987). Each work provides a substantial bibliography. See Lamotta, Schiffer 2005.

⁵⁸ See Schiffer 2010: 6: 'One day in 1972 Reid solved the definitional problem: archaeology, he insisted, was the study of relationships between human behavior and material culture in all times and all spaces'. It is curious observing how in 1972 Schiffer himself noted the opposite imbalance: 'The branch of archaeological theory which treats these and related questions may be defined as the conceptual system that explains how the archaeological record is formed. As such, it has both cultural and noncultural components. The latter area has received major emphasis to date' (Schiffer 1972: 156).

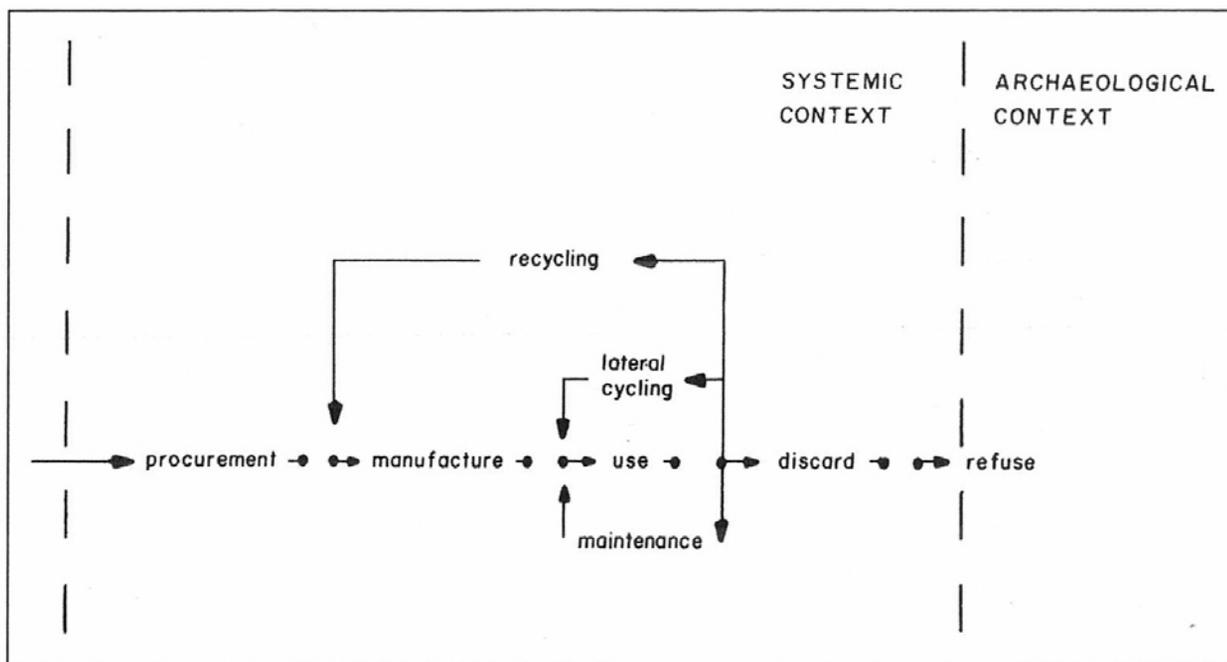


Figure 1: The life-cycle of durable elements (Schiffer 1972).

Some main points characteristic of this field of archaeology assume a certain importance according to the aims of the present work:

1. The theoretical shaping and distinction between *systemic context* and *archaeological context* (Figure 1; see Chapter II.2.1).
2. The consideration of *formation processes* as the link between the two contexts.
3. The distinction between *c-transforms* and *n-transforms*.
4. The notions of *primary refuse*, *secondary refuse*, *de facto refuse*.
5. The acknowledgement of the importance of the processes of *reuse* – *recycling* – *lateral cycling*, *storage*, *transport*, *discard* and *maintenance* (see Chapter III.4.1).

All these aspects have been discussed over the years, and they were developed particularly in the scope of American Southwestern archaeology, but a full display of these notions in European archaeology, particularly Classical, still has not been fully achieved.

One last aspect of this branch of theoretical and methodological thought needs to be stressed: clearly continuing a tradition born with New/Processual Archaeology, Behavioural Archaeology largely employs ethnoarchaeological and experimental approaches (along with quantitative techniques) when dealing with the interpretation of the record. The (underestimated) importance of these tools in dating is discussed in Chapter III.5 (ethnoarchaeology and experimental archaeology), below and in Chapter III.3 (quantitative approaches).

Concluding, it has to be acknowledged that Behavioural Archaeology, with its pros and cons, still provides, more or less explicitly, much of the theoretical framework for dealing with the complex relations people – artefacts – deposit, representing, in turn, the key to the use of materials for dating.

1.2.4 Other approaches to formation processes: stratification

While Behavioural Archaeology had its main focus on human behaviour, on the other, between the 1980s and the early 1990s, in Padua, another school returned to examining formation processes as a whole, this time, possibly, with a slight preference for natural ones. Theoretically this school, dealing mainly with Italian pre/proto history, can be considered a legitimate heir to the more mature forms of Processual

Archaeology, but some legacies from Behavioural approaches are indeed also present. G. Leonardi is to date one of the main contributors to this cause and the proceedings of an international seminar held in 1991 are still the cornerstone of the body of literature produced.⁵⁹ Except for the slight shift to n-transforms as a privileged field of investigation (also due, I think, to the different necessities implied by dealing with pre/proto historic sites/deposits), another important point marks the difference from Behavioural Archaeology, i.e. a great interest in sediments and soils (the matrix) and a close connection with geoarchaeology and micromorphology. This time the attention shifts from the finds to the deposit as a whole.

This jump ‘back to the basis’ has been indeed very healthy, as defining and understanding single contexts is the first, unavoidable step towards their grouping and then their dating. A knowledge of their general and specific dynamics, along with the post-depositional processes occurring, is a prerequisite that can never be taken for granted, but which has to be investigated, discussed and evaluated each time. The more the stratigraphic *reading* is difficult (see particularly ‘aggressive’ environments), the more such an approach, markedly geoarchaeological, shows its benefits.

One major theoretical contribution provided by the ‘Padua School’ concerns the topic of ‘basins’ or catchment/depositional areas. Up to now, the importance of defining the status of each deposit has been stressed and the attention has been focused on primary ones. Conversely, the shaping of the concept of ‘basin’ provides the tools for fully tackling the dynamics of secondary deposits, their formation and the way to date/non-date them. G. Leonardi proposes a basic distinction between physical and conceptual basins, with a further split into potential and specific basins and into source/catchment basins and depositional basins. The consequent concepts of ‘local’ and ‘allochthonous’ are also reviewed and shaped.⁶⁰

Among the issues discussed, it is of great consequence to recall at least the definition of ‘source basin’:

‘corrisponde all’ambito spaziale e materiale da dove è stata prelevata la materia. Determina quindi il luogo di prelievo, la qualità e (teoricamente) la quantità della materia prelevata (che, tramite trasporto, sarà deposta nel bacino di deposizione)’.⁶¹

These sections of the theoretical framework assume great importance, as they are the basics for coping with the issues of redeposition and residuality (see below) and they represent an important *tessera* to answer the question ‘How did it get here?’, i.e. the *fil rouge* of dating through assemblages.

This school has also been characterised by a constant attention to post-depositional processes; these are one of the causes of the presence of intrusive materials in assemblages, thus representing another important factor to be looked at when evaluating how to date a deposit.

In the same period, A. De Guio’s considerations about the nature of the archaeological stratigraphic unit itself (or context), with the acknowledgement of its operational nature,⁶² basically provided – an aspect which seems still largely unnoticed – theoretical foundations for the activity of their grouping in larger interpretive sets, a topic which is in fact connected with dating (see Chapters II.2.2-3). The author seems (provocatively?) to reject the idea that stratigraphic units have an actual, physical nature;⁶³ in any event, recognising the dual role of contexts as both physical and operational entities, the issue of their dating can be handled much more effectively.

1.2.5 The study of residuals

A topic playing a fundamental role in the dating game in urban environments is represented by residuality. The topic arose, obviously, after the basics of archaeological stratigraphy, excavation and recording were

⁵⁹ Leonardi 1992a. See also the pioneering work Leonardi 1988.

⁶⁰ Leonardi 1992b.

⁶¹ Leonardi 1992b: 19.

⁶² De Guio 1988.

⁶³ De Guio 1988: 9.

established and it is child of both urban archaeology and material culture studies. Although these studies are rooted in the 1970s, their main development occurred during the 1990s and the topic is still matter of some debate.⁶⁴

Residuality represents a phenomenon typical of urban sites, where the redeposition of large amounts of sediments and materials is very common. Indeed, residuality may be seen as a function of two factors: the intensity and invasiveness of building activity and the duration of human continuative settling in the same place.

Roughly speaking, we may observe that the combination of these two main factors is typical for urban sites, while their impact decreases moving to smaller, short-lived settlements.

A residual is a find definitely discarded in a systemic context predating the systemic context in which the deposit where it was recovered was formed (see Chapter II.2.6). In the beginning these finds were treated mainly as a problem, while the focus fixed on ‘dating materials’, i.e. the ones at least broadly contemporary with the formation of the deposit which embedded them. This approach is somehow evident both in Barker’s manual and in Carver’s first papers (Figures 2, 3); the identification of residuals was delegated to a form of empirical seriation of deposits.

The definition of ‘residual’ itself was not explicit. Nevertheless, already in those years residuality drew the attention of methodological considerations. The above-mentioned paper by P. Crummy and R. Terry also take on the topic of residuals, defined as ‘pottery and other finds which derive from occupation earlier than their respective contexts suggests’.⁶⁵

The topic was challenged again in the early 1990s by J. Evans and M. Millet: the title of the paper, *Residuality Revisited*,⁶⁶ is self-explanatory: the informative potential of these materials is investigated, and their nature clarified.

Residuality seems to have been one of those rare methodological issues which also caught scholars’

Structural Periods	Pottery Types
Z	g + f + e + d + c + b + a g + f + e + d + c + b + a g + f + e + d + c + b + a
Y (ACERAMIC)	f + e + d + c + b + a
X	f + e + d + c + b + a e + d + c + b + a
W	e + d + c + b + a d + c + b + a d + c + b + a
V	c + b + a b + a
U	b + a
T	a a

attention in Italy, even in the field of Classical Archaeology; in fact, the phenomenon of residuality is quite evident when dealing with Classical and post-Classical stratigraphies, and its magnitude stands even clearer thanks to the great abundance of materials (ceramics in particular) produced, particularly, during the Roman period.

Indeed, the major recent works on the topic turn out to involve also Classical archaeologists. That is the case of *I materiali residui nello scavo archeologico*,⁶⁷ a collection of papers edited in 1998 and completely devoted to various aspects of residuality. How the notion of residual remained fluid for so long is demonstrated by the different definitions opted for within the same volume. For C. Cecamore a residual is a ‘manufatto che, prodotto in un dato momento, dopo esaurita la sua funzione, si ritrovi in un contesto posteriore al suo periodo d’uso’,⁶⁸ while R. Santangeli defines residuals as ‘quei reperti

Figure 2: Seriation as a tool for investigating residuality (Barker 1977).

⁶⁴ For a brief review, see Bonetto *et al.* 2017 (in particular 67-70). See Haselgrove *et al.* 1985 for the use of residuals also in unstratified contexts.
⁶⁵ Crummy, Terry 1979: 51.
⁶⁶ Evans, Millet 1992.
⁶⁷ Guidobaldi *et al.* 1998.
⁶⁸ Cecamore 1998: 117.



Figure 3: Serialiation of contexts and residuality thresholds (Carver 1980).

che, esaurito il loro periodo di utilizzazione e stratificati, sono stati in qualche modo riciclati in contesti posteriori insieme alla loro matrice terrosa' or 'che restano in circolazione per un periodo di tempo più lungo dell'usuale'.⁶⁹ J. P. Morel, instead, prefers to simply consider residual 'un oggetto la cui presenza sorprende per motivi cronologici, o funzionali, in un determinato contesto',⁷⁰ while E. Zanini proposes an original and stimulating definition of residuals 'come componente antropica della matrice, o meglio come la parte della matrice di cui è più facilmente riconoscibile l'origine antropica'.⁷¹ J. T. Peña considers a residual 'any sherd initially discarded before the beginning of the formation of the context from which it was discovered as a residual'.⁷² Furthermore, the paper by Peña is extremely important because he wonders how much time has to pass between the end of the 'systemic life' of an artefact and its last deposition in order that it may be defined a residual. The issue, in turn, involves the topic of accuracy and the distinction between a continuous and a discrete view of time, both discussed in Chapter II.2.8.

The same volume also contains an important paper by N. Terrenato and G. Ricci, concerning one of the statistical tools which can be used for the study of residuals (and finds in general). This approach (the 'weighted mean sum') is discussed in Chapter III.3.5.

The turn of the 1990s apparently witnessed also the shaping of the concept of the 'false residual', namely a find which lived an extraordinarily long systemic life (heirlooms for instance).⁷³

After about a decade the topic of residuality was treated again in C. Tronchetti's excavation manual,⁷⁴ and then, more extensively, in a paper by E. Giannichedda, who considers residuals 'ciò che non è pertinente al contesto dal punto di vista cronologico';⁷⁵ the approach proposed for their study and identification is very articulated and it uses a mixture of functional, contextual and chronological criteria (Figure 4).

Up to the present, although theoretical and methodological discussions on residuals seem to have ended, in material culture studies, when assemblages are presented, more and more often residuals, false

Esempio	Il reperto ha giacitura 'alterata'	Il reperto pone un problema di decorso di tempo	Il reperto ha una funzione nella Us di giacitura	
1 Coccio romano in strato romano	No	No	No	Reperto in fase; giacitura primaria
2 Anello romano in tomba medievale	No	Si	Si	Cimelio
3 Concio romano reimpiegato	Si	Si	Si	Reimpiego
4 Coccio romano in strato medievale	Si	Si	No	Residuo archeologico
5 Anello romano in strato medievale	?	Si	?	Cimelio smarrito o residuo
6 Fr. olla funeraria in livelli di sepolcreto	Si	No	No	Residuo stratigrafico; giacitura secondaria
7 Oggetto in posto	No	No	Si	Reperto in situ
8 Monumento in elevato	No	Si	No	Sopravissuto
9	Si	No	Si	Non determinabile

Figure 4: Residuals, false residuals and reused materials according to E. Giannichedda (Giannichedda 2007).

⁶⁹ Santangeli 1998: 268.

⁷⁰ Morel 1998: 281.

⁷¹ Zanini 1998: 293.

⁷² Peña 1998: 296.

⁷³ See Rizzo 1998: 811-812 (in particular footnote 39). Later in Rizzo 2003: 21. On the topic, see also the more recent works: Wallace 2006; Schindler Kaudelka, Zabehlicky-Scheffenegger 2007; Zanini, Costa 2011. Coins present peculiarities appreciable in Gorini 1999-2000; Guest 2007; Lockyear 1999; Lockyear 2012 (see Chapter III.3.3).

⁷⁴ Tronchetti 2003: 120-128.

⁷⁵ Giannichedda 2007.

residuals and in-phase materials are recognised and separated.⁷⁶ The way in which this is achieved is, of course, a completely different matter.

1.2.6 Quantitative approaches

A much more extensive use of statistics and quantitative approaches in general is among the most evident legacies of New Archaeology. This small revolution within the discipline of archaeology was possible thanks to the more general development of computer science, which provided the essential tools for performing quantitative analyses. Historically, the two privileged fields of application of quantitative approaches have been spatial analysis and seriation, but soon also assemblages drew the attention of quantitative analysts.

The leading figures in this field are certainly represented by C. Orton, whose contribution to the ‘meeting of sherds and numbers’ is fundamental,⁷⁷ and S. Shennan.⁷⁸

Unexpectedly, quantitative studies applied to assemblages will not be fully drawn on for the present work. The reason can be traced back to the very peculiar nature of this field of studies. As stated in Orton *et al.* 1993: ‘We use the term “quantification” in a precise and restricted sense, to mean the measuring of the amount of each type of pottery in an assemblage, with a view to describing the assemblage in terms of proportions of each type present’.⁷⁹ Indeed, the quantification methods developed over the years (see Chapter III.3.4 for further references) aim primarily to compare different assemblages and evaluate the economic impact of some types compared to others.

In short, quantitative techniques have not been developed for the investigation of chronological patterns. To perform this temporal analysis a simulative approach has been opted for in this present study (see Chapter III.3.5).

Archaeological simulation, as a quantitative approach to the record, represents itself a branch stretching back to the 1970s, but it has had an extraordinary development over the last two decades.⁸⁰ As E. Crema rightly points out, the role of time in quantitative analysis is still somehow neglected,⁸¹ and, traditionally, simulative approaches have also mainly dealt with other issues. The role of chronological patterns, along with the fundamental topic of uncertainty, has been recently addressed by E. Crema himself, drawing on the comparatively recent body of literature concerning temporal analysis in general. In particular, he focused on the wide development of prehistoric Jomon pit-houses (Japan), but, as discussed in Chapter III.3.5, with further references, the same simulative approach can be selected to model intra-assemblage chronological data. As far as is known, a simulative approach (Monte Carlo simulation) for modelling assemblage chronological data has never been used before.

Other quantitative approaches to the chronology of assemblages (such as the above-mentioned method proposed by N. Terrenato and G. Ricci) are, again, discussed in Chapter III.3.5.

1.2.7 Synthesis and conclusions

As discussed at the beginning of this chapter, the picture emerging from the review is anything but organic; nevertheless the framework of the theoretical and methodological development that has occurred over, say, the last century, has been at least broadly sketched out (Figure 5). Moreover, although the overall image is still somewhat incoherent, some important links between the different branches outlined can be traced. One of these is the clear link that can be traced between urban archaeology and the development

⁷⁶ See, e.g., Panella, Sagù 2013.

⁷⁷ For more references, see Chapter III.3.4.

⁷⁸ See the classic Shennan 1988. For comparisons, see also the more recent Fletcher, Lock 2005.

⁷⁹ Orton *et al.* 1993: 21.

⁸⁰ An exhaustive literature review, with further updated references, is provided in Lake 2014.

⁸¹ Crema 2012: 441.

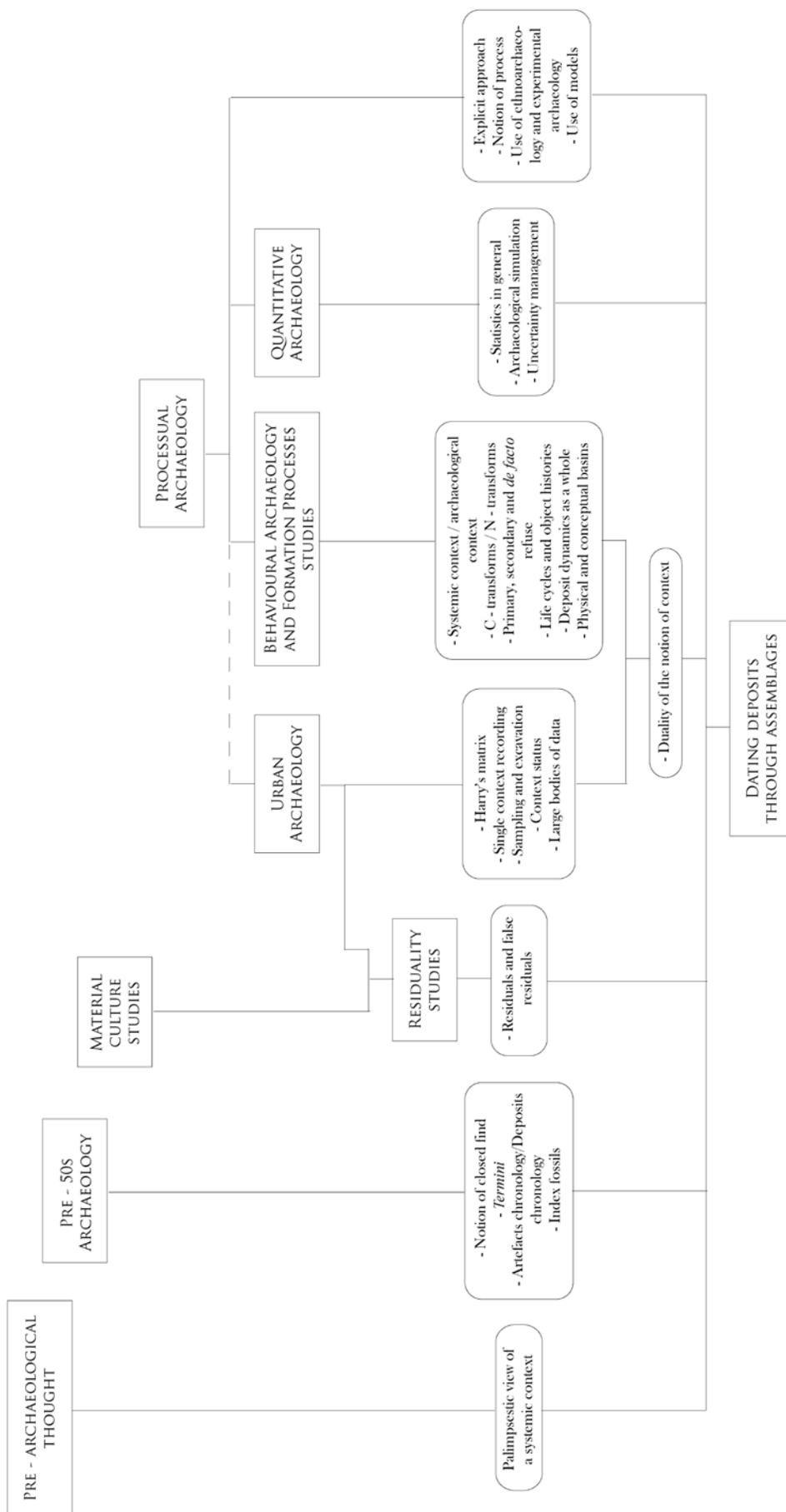


Figure 5: Hypothetical diagram illustrating the contribution of different branches of archaeology to the issue of dating deposits.

of studies concerning residuals, which, in turn, employ some quantitative techniques. What keeps these issues together is, indeed, the urban environment, with its high rates of change and redeposition and its abundance of products (ancient) and finds (contemporary). From a more theoretical point of view, processual and behavioural archaeology can provide a good framework, if for no other reason that they traditionally focused on 'how'. Yet, by the mid 1990s, the theoretical and methodological debate about formation processes (both focusing on deposits as a whole or on artefacts) has, if not stopped, at least vigorously slowed down. The more evident consequence of such a position is that we still heavily draw on theoretical and methodological thought taken largely from the literature of the 1970s to 1990s. This fact should stimulate an in-depth review of the debate, which would surely have positive consequences on the issue of dating as well.

As for why there should have been such a period of substantial inactivity, an important role may have been played by both a general shift in archaeological agendas and by a subtler conviction that the massive help afforded by scientific techniques would by itself have solved post-excavation interpretive problems, including problems of dating. The full exploitation of the wide range of techniques now available, in particular within the field of dating (i.e. the powerful Bayesian modelling),⁸² can only be achieved if framed and contextualised in a robust and continuously updated and debated theoretical and methodological background, concerning the way in which the archaeological record is formed. In addition to the fact that it would allow us to avoid rough misinterpretations, such a framework is the only way to move securely from the smaller horizons of the field to the possibility of 'making history'.

Another point that emerges pretty clearly, with few remarkable exceptions, is the deafening silence from Classical Archaeology in the matters of theory and methodology in general, and concerning formation processes in particular. This absence is even more notable because the availability of large bodies of data (with various natures), which typifies Classical Archaeology when compared to other archaeologies (Prehistoric, Early Medieval), should have spurred the discipline on to better and more sophisticated systems in terms of their theoretical management and also to the generation of articulated and specific methods for extracting information from them. Borrowing models from other 'archaeologies' cannot be considered sufficient, and it implies the underestimation of the peculiarities inherent in the ancient systemic context studied. The reasons lie in the fact that models, to have some practical impact, cannot be general (not only at least), but must be specific. For instance, studying the impact of waste disposal on assemblage formation processes in the Roman world, only and simply borrowing models from ethnographic literature or from prehistoric case studies, may obviously lead to wrong conclusions. The specific features of Classical Archaeology, particularly in urban sites, should, hopefully, compel the discipline to produce much more independent theoretical and methodological literature.

Fortunately, exceptions exist, and they show how such an approach produces invaluable benefits. This is, for instance, the case with the study of residuals. But it is also the case with some recent developments in Classical studies of material culture, which are devoting more and more attention to the contextualisation of ceramic assemblages and to the 'systemic life' of ancient pottery. In this field, the work of J. T. Peña, drawing on both the tradition of Roman material culture studies and on a behavioural theoretical framework, has been pioneering and represents a cornerstone of the recent literature on the issue.⁸³ The *Pompeii Artifact Life History Project*⁸⁴ and the *Palatine East Pottery Project*⁸⁵ are providing new and interesting inputs in this sense.

While the theoretical and methodological debate proceeded, field archaeology kept on producing fresh data and interpretations through excavations, with their publications sometimes taking into account the indications emerging from the debate (but more often not doing so).

⁸² See the important remarks made by A. Bayliss (2009: 129-130).

⁸³ Peña 2007.

⁸⁴ See Peña 2014.

⁸⁵ See, in particular, Ikäheimo, Peña 2009 and Peña 2009.

Within the framework of Italian Classical Archaeology, A. Carandini's excavations and later excavations led by scholars who matured in the same academic environment, have long been a reference point for many. The Villa dell'Auditorium excavations (which in turn stem from the Villa di Settefinestre excavations) represent a good attempt to present a full body of data in an organic way, integrating information drawn from the stratigraphic analysis with information drawn from the study of artefacts.⁸⁶ Residuality is allowed for and crucial contexts and materials are presented in some detail, along with some quantitative information. Chronology building is to an extent explicit, and allows for a certain evaluation and discussion, although it is not always clear if *all* the data is presented. Other excavations involved the very centre of the city of Rome: it is worth citing here, in particular, the excavations on the Palatine slopes,⁸⁷ as their publication generated a robust interpretive debate, precisely about the date of some of the evidence that emerged.

This was possible thanks to the main publication (where some materials are discussed by context and not by type) and several other papers, allowing a critical and wide-ranging view of the data collected. Other good examples throughout Italy, although existing, are comparatively rare. Large bodies of data from urban excavations lie unpublished, and, among the published excavations, too many still provide insufficient data to allow for an evaluation of dating (along with many other conclusions). Far too often the main excavation report consists of a brief summary of the site's history, followed by a long typological list of finds. The key link between deposits and finds (i.e. a contextual approach) is seldom provided, or, at most, can only be traced with difficulty. Presenting a simple list of contexts and embedded materials and, possibly, their dates, would be an objective fairly easy to achieve. A complete Harris matrix (or at least some selected fragments of the matrix) would also be very valuable, but this is a very rare occurrence. Finally, the status of the deposits is rarely discussed, thus the crucial question 'how did these finds make their way into the deposit?' remains substantially unanswered; knowing how the chronology was built and the single deposits were dated remains substantially unattainable. Most dates of structures, deposits and whole occupational phases (which are not raw data, but, at most, interpreted data) have simply to be taken for granted (according to a sort of principle of *auctoritas*), with no actual possibility of re-evaluation.

This aspect of Italian urban archaeology has been already discussed under different lights and a change has been urged. A complete exposition of data would compel us to use them in a clear and probably more concrete way, with great benefits for the quality of the interpretations provided as a whole. This kind of change cannot after all be viewed as utopian, as other European experiences reveal that more integrated publications of stratigraphic and artefactual data from urban excavations, even involving large numbers of contexts, can be achieved.⁸⁸

⁸⁶ Carandini *et al.* 2006. It has to be stressed that, although the site is now part of the periphery of Rome, the *villa* was in ancient times part of the *suburbium*.

⁸⁷ Carandini, Carafa 1995, Carandini 1995, Carandini, Papi 2006.

⁸⁸ See, e.g., Hill, Rowsome 2011, or Bateman *et al.* 2008.

Part II

Theory

II.1 Preliminary observations

II.1.1 Assumptions

The operational field where the game of dating has to be played lies within a grey, shapeless area commonly known as the 'post-excavation' process. If on the one hand excavation theory, practice and methods have been the subjects of many manuals and works, post-excavation seems to be a much less codified field. There are no post-excavation manuals and the unwritten rules are also pretty variegated. Perhaps the explanation for this is after all relatively simple: excavation is more about getting the data while post-excavation is more about interpreting it. This is a very rough distinction and certainly the two fields are closely connected (in fact, interpretation begins before and during the excavation, even if sometimes we are not aware of that), but for certain interpreting represents the core of the post-excavation process and, at least at first sight, it is much more complicated than retrieving data.⁸⁹ How can we codify interpretation? It is even possible to question whether looking for a theory and a method in this field at all is a good idea.

Of course, archaeology is populated by a considerable number of works on theory and methodology dealing with the interpretation of data; in any event they often concern more general aspects of the discipline or they employ data which is not exactly raw, but more often already partially interpreted.⁹⁰ For instance, seriating sites (where sites and their chronology are the data) implies that sites have already been dated. This, in turn, implies that materials and other information were chosen to date them, as stones and pottery do not speak by themselves. In the broad spectrum of interpretations, excavation interpretation has seen comparatively little attention. There is no doubt that there is no organic view of what should happen after the trowel is put back in the drawer, and indeed there is little hermeneutics of excavation. Some aspects of formation processes and spatial analysis are considerable exceptions, but certainly theory and methods concerning the use of artefacts for dating contexts and sequences represent a sort of black hole.⁹¹ The hole is even darker within the field of Classical Archaeology, where modern excavation techniques arrived fairly late.⁹²

Given this position, it is necessary to review some fundamentals of theory (concepts) and methods (operative tools) and then try to combine them to formulate models that are helpful in solving problems concerning dating deposits. However, before starting with theory, some assumptions have to be made.

The first assumption concerns the excavation itself. The single context, stratigraphic excavation is the basis for any reasoning about dating, simply because otherwise we cannot date actions, groups of actions or processes. Collecting pottery with no link to stratigraphy can, at most, allow us to date the occupation span of a whole site, not the construction of its buildings or infrastructures, nor its phases of abandonment or refurbishment. An excavation made by artificial cuts with no attention paid to actual strata would be useless as well.

The excavation must also be well documented; much information is necessary before being able to investigate the nature of the excavated deposits and their chronology; among them a complete report of the artefacts and ecofacts embedded, a good description of the geogenic matrix, the stratigraphic relations and other data are necessary. Samples for analysis are also fundamental, as they may be used

⁸⁹ Barker 1986: 141, 147.

⁹⁰ See Sullivan III 1978: 188-189 for the difference between data and phenomena in archaeology.

⁹¹ Roskams 1992: 27. A considerable exception is represented by the already cited *corpus* of works by M. O. H. Carver.

⁹² Altekamp 2004.

during the post-excavation process for getting data which at first, during the excavation, were not considered relevant.⁹³

The availability of a Harris matrix (or its more sophisticated forms) is also very important, especially in urban environments, where hundreds or even thousands of contexts are the norm. It is necessary not only as a tool for ordering and managing small or large numbers of layers, but also because it is 'problematic', meaning that it obliges the compiler to review what has been observed in the field, correcting errors and noticing anomalies. Indeed, it is a tool for reasoning. Finally, it provides by itself an organic, relative chronology, i.e. the basis for moving towards an absolute one.⁹⁴

Single contexts should be at least tentatively grouped⁹⁵ together when possible (the problem of grouping later will be addressed later) and at least broadly phased. Here 'phasing' does not mean incorporating contexts and groups within a precise historical and chronological absolute framework. A phase should just be a broad container for contexts and groups that are physically and logically related to common macro events (e.g. construction, destruction, refurbishing, abandonment) and should be considered as just non-definitive working tools.

Of course, all these assumptions make sense only within the framework of a wider approach:⁹⁶ digging up or investigating only one or two contexts alone would make no sense, as one single context acquires a full meaning only if placed within a sequence. This is fundamental to avoid coarse errors: quantity and seriation count.⁹⁷

A serious and complete work on the artefacts and ecofacts recovered must also be assumed. The dates of these materials are necessary too. At this stage, only materials whose chronology is well known independently should be used. This is to avoid the obvious problem of circularity. As we use, among other tools, materials to understand the nature of a context or of a group of contexts, and as the nature of the context determines the nature of the association of the embedded materials, using materials whose chronology has been defined, corrected or influenced by the context itself (and by the other materials) would introduce a huge problem of circularity, distorting and biasing at the very beginning the data which will then be used. Chronologically undefined materials should be avoided, whereas safe, broad chronologies should be preferred to closer, tentative ones. Only later, just in case certain circumstances occur (for instance in the case of a primary deposit with no or few residuals and responding to certain requisites) a context can be used as a tool for dating artefacts of unknown or imprecise dating.

Of course, a problem of circularity in dating may have also affected the chronologies of some artefacts that are already taken for granted. This is not the subject of the present book and careful selection of contexts (usually tombs) and the use of independent sources have certainly strongly narrowed the possibility that this phenomenon occurred. For the moment, it is just worth noting that this is an issue which could arise in some cases when clear anomalies are detected.⁹⁸

Given all these assumptions, we can finally move on to examining the first ingredient necessary to propose formative models oriented to dating – theory.

⁹³ Watson *et al.* defined relevant archaeological data as 'anything observable which pertains to the solving of the investigator's particular problem (Watson *et al.* 1971: 114).

⁹⁴ See Gallina 2012 for a recent discussion of the use/non-use of the Harris matrix in architectural analysis.

⁹⁵ It seems sufficient to start with defining nodal points and segments. See Carandini 1990: 41; Roskams 2001: 246-254.

⁹⁶ Bowkett *et al.* 2001: 118.

⁹⁷ See Barker 1993: 226.

⁹⁸ Where evident chronological outliers were detected within an assemblage, and no evident mistakes in the excavation procedure were recognised, along with no possibility of intrusions or misunderstanding of the nature of the deposit, a revision of the outlier chronology should be considered.

II.1.2 Which Theory?

This is not the place to discuss, even in brief, what theory is and the role it plays in archaeology. However a few points that seem necessary to proceed in a structured way can be highlighted.

The term theory has been defined by M. Johnson as ‘the order we put facts in’;⁹⁹ he also underlines that it originates from the necessity of justifying what we do, moving from simple common sense to something more structured and motivated. Indeed, common sense is still the main tool selected (often implicitly) when dating contexts and it can be argued that it deeply pervades Classical Archaeology in particular.

E. Giannichedda defines theories as ‘insiemi di idee strutturate in modo coerente al fine di riconoscere, spiegare, interpretare, talvolta anche prevedere, fatti’.¹⁰⁰ He also stresses that theory should not be developed for its own sake, but should be helpful for practice. He sees theory and practice as closely connected and not opposed each other.¹⁰¹

From the points of view of the two authors, we can pick three fundamental aspects:

- (1) the necessity of moving from common sense to something more structured;
- (2) the definition of theory as a set of ideas; and
- (3) a practically oriented conception of theory.

Theory as a practical aim is exactly what is needed for tackling the topic of this book, and common sense is obviously not enough to build a solid model that is useful for comparisons. Theory will also be favoured here as something made up of ideas, with ideas, in this sphere, defined as mental tools oriented to a practical aim (dating contexts); ideas need to be indicated by terms, and terms of course need to be defined. After all, defining terms is always part of the theoretical debate.¹⁰² What follows is a series of theoretical tools¹⁰³ that seem necessary to build the models we are looking for.

It will be immediately clear that some of the definitions presented are different from the common acceptance of the term discussed. Sometimes the difference may seem to be slight, but are indeed substantial if the aim is to get a proper tool. Most of the differences are due to a common factor, that is that many terms (for instance ‘primary’, ‘secondary’, etc.) are commonly preferred in a spatial perspective rather than a temporal one. As will be explained later, one deposit may be primary from a temporal point of view, but secondary from a spatial one. Often these terms are used with a mixture of spatial, functional and temporal meanings. Most archaeologists, of course, have some kind of idea of the meaning of the terms, even if they are not universally codified, so it has been decided here to employ them, giving their meaning a new acceptance or choosing the one which best applies to the goals of this present work. Using new terms, in this case, would have created more confusion than using new acceptations. In the future, the use of new terms may well be accepted; after all, terms by themselves are just labels.

II.2 Key concepts

II.2.1 Archaeological context/systemic context/context

It is well known that the notion of ‘systemic context’, opposed and related to the notion of ‘archaeological context’, is associated with the studies carried out during the 1970s by M. B. Shiffer and then further developed by other scholars grouped under the label of Behavioural Archaeologists (see Chapter I.2). In his first published work on the topic, Schiffer states that the ‘*Systemic context* labels the condition of an element which is participating in a behavioural system’, while ‘*Archaeological context* describes

⁹⁹ Johnson 2010: 2, 216.

¹⁰⁰ Giannichedda 2002: 9.

¹⁰¹ See also Chapman, Wylie 2015: 7.

¹⁰² Hodder 1991: 8.

¹⁰³ Some are briefly discussed and systematised in Peroni 1998. Given the different initial perspective (the paper of R. Peroni focuses on typology and seriation) some differences emerge in the use of some terms and the way in which they are defined.

materials which have passed through a cultural system, and which are now the objects of investigation of archaeologists'.¹⁰⁴ The definitions are then recalled in successive works. What is meant by 'systemic context' is basically a living system, made of people, structures, objects, ideas, behaviours, practices occurring in a given time and space. Sticking to a chronological perspective, it can be argued that every single moment represents, theoretically, a different systemic context. Systemic contexts succeeded one another through time: they may be viewed as successive 'slices' of time, whose width depends on our capacity of dividing the actual time continuously into larger or smaller parts. Dating a deposit (the part of the archaeological record we are interested in), in this way, may be seen as assigning it to the right systemic context. Of course, between actual ancient life and the archaeological record stand cultural or natural processes which have to be deciphered and make the relations between the two extremes non-linear.

One important point needs to be made about the temporal meaning of 'systemic context' and its relation to the archaeological one: even excluding a problem of time resolution, a given systemic context is populated not only by contemporary objects or structures. It is also made up of things produced by previous systemic contexts: for example, right now, in 2019, the present author is writing on a two-year-old laptop in a building built in the late 1930s. The city itself where this is being written still displays many Late Medieval buildings. Each one of these elements was produced years ago, but it does not mean that they are not in use now. So, even if the present systemic context was perfectly mirrored archaeologically, the result would be a temporal palimpsest¹⁰⁵ (see *infra* the concepts of false residuals and primary deposits).

It must also be stressed that the term 'context' by itself is a difficult one. Apart from very broad meanings referring to historical, social, political or more strictly archaeological circumstances in which a find has to be placed, in Anglo-Saxon archaeology the term context indicates specifically what in Italian is called *unità stratigrafica*, which literally means 'stratigraphic unit'. There is no need to linger on what a stratigraphic unit is and how its boundaries may or may not be detected; its dual nature as a physical entity and as an operative/interpretative tool has already been mentioned in the literature review section above.

In this present work, the term 'context' is also used to indicate a stratigraphic unit.¹⁰⁶ As the topic of this work is dating deposits through the use of artefacts, positive stratigraphic units (deposition of matter) will be clearly focused on, i.e. layers or strata, not negative ones (removal of matter), because evidently these latter contain no material. As will be explained later, the Italian word *contesto* sometimes assumes different meanings from the Anglo-Saxon one.

II.2.2 Sampling

As C. Orton rightly pointed out, '...almost all archaeology involves sampling; indeed, one could say that there is a sense in which much of archaeology is sampling, echoing David Clarke's remark that "Archaeology... is the discipline with the theory and practice for the recovery of unobservable hominid behaviour patterns from indirect traces in bad samples".' (Clarke 1973: 17)¹⁰⁷

The reason is easily detected: 'It is a truism that archaeological remains, whether in the form of features or artefacts, are rarely the totality originally created by, or used in, the activities that they represent. In a sense, they are a "sample" from some original but unknown "population"... The question is: *what sort of a sample?*'¹⁰⁸

¹⁰⁴ Schiffer 1972: 157. See also Lucas 2001: 148-152.

¹⁰⁵ Bailey 2005: 269.

¹⁰⁶ For other common terms or locutions, see Karkanas, Goldberg 2019: 1, 151.

¹⁰⁷ Orton 2000: 1.

¹⁰⁸ Orton 2000: 40.

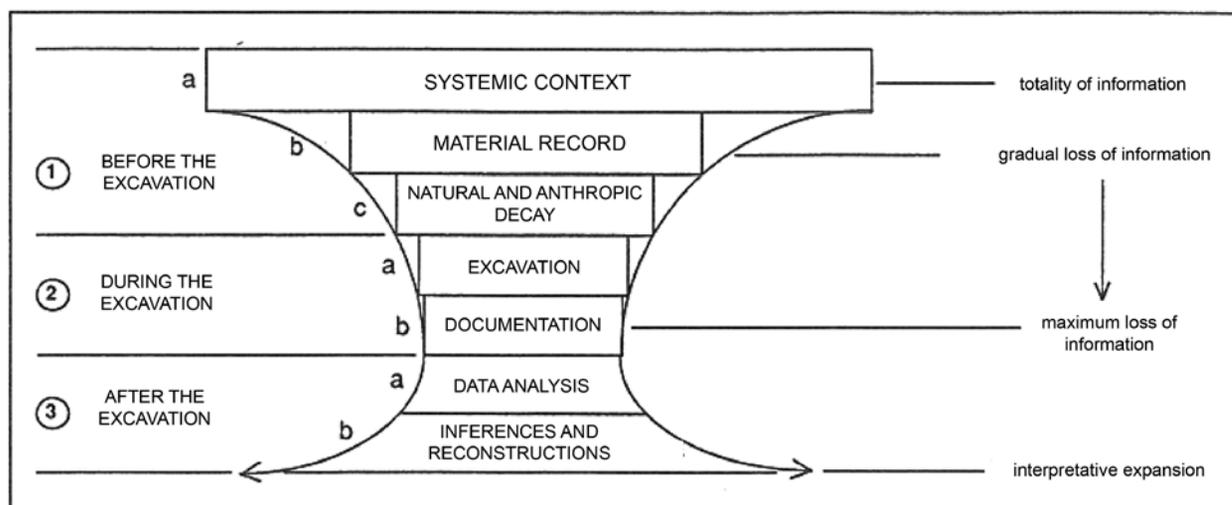


Figure 6: Information loss and partial recovery in archaeological investigation (after Leonardi 1992a)

These basic assumptions play a fundamental role also when it comes to dating deposits, as what we commonly do is employ dated artefacts or samples (!), which are only part of a usually larger assemblage,¹⁰⁹ which in turn is what has been *recovered* within all or part of a deposit, to (finally) date it. This has to be kept in mind when evaluating the strength and reliability of the inferences we ultimately make about the date of a given deposit (Figure 6).

A key point in the issue of sampling is that of *representativeness*, namely the degree to which what is observed in a sample is true also for the population it belongs to. This involves both quantitative and qualitative issues. Take the deposit made of the backfill of the robber trench of a Roman wall 10 m long. Where we manage to dig only a small section of the trench and we recover only ten sherds, of which only two are dated with sufficient approximation, would we consider the chronological data provided by the two sherds representative of the chronological information provided by the whole assemblage of the backfill? Is the size of the sample sufficient for making safe inferences? We will see that we can draw *some* conclusions also from small samples (in this case a very vague *terminus post quem*), but they have to be carefully handled.

In this case representativeness was clearly affected by a quantitative factor, but quality may also play an important role. Take the same backfill and suppose we manage (time, money, bad planning) to excavate only its upper part. Based on what we can draw from literature, observation and field experience, we suppose the assemblage is largely formed by residuals, excavated together with sediments when the wall was dismantled and then redeposited. If there is any chance that systemic materials turned out to be embedded in the backfill, it may have occurred while the trench was temporarily empty, and therefore these materials should be recovered at the bottom. Excavating only the top part of the deposit may well deprive us of important information, provided only by the lower part. In this case, a qualitative issue would clearly produce a substantial bias in the representativeness of the collected sample.

Another issue of representativeness in terms of quality arises also when directly handling assemblages. According to their nature and formative history, they may display a high or low degree of chronological (as well as functional, typological, etc.) homogeneity. Examining a sample from homogeneous or inhomogeneous populations implies different issues of representativeness, which are born in mind when assessing the strength of our inferences.

Take two different deposits, a primary and a secondary one, each excavated only in part. Assuming that the assemblage embedded in the primary deposit (sample A) displays a higher degree of homogeneity (in

¹⁰⁹ See Ceci, Santangeli Valenzani 2016: 25-32.

terms of chronological patterning) than the assemblage of the secondary deposit (sample B), it follows intuitively that the two must be handled differently. In the first case, if the sample is considered to be large enough, we may conclude that we have enough elements to date the deposit *ad quem*. In the second, we can ask ourselves how likely is it that we detected (or not) the latest material?; in other terms, we can merely try to model how far the *terminus post quem* produced by sample B is from the actual *terminus post quem* of the whole deposit; this, in turn, represents only a moment after which the deposit was formed.

In any event, sampling produces a higher degree of uncertainty than dealing with a hypothetical population, and we will see how coping with uncertainty is a key issue in dating.

The awareness that we usually handle ‘parts’ and not ‘wholes’ has to be constantly kept in mind; the issue stands out even clearer if forced to investigate large entities (features, buildings, etc.) through small trenches, producing small bodies of data.

II.2.3 Deposit

Except for very general meanings assigned to the term, a general review of what is commonly meant by ‘deposit’ in both geology and archaeology has been provided by J. K. Stein, who nuanced the ‘concept of deposit’ itself in different ways.¹¹⁰ In fact, what clearly emerges is a lack of consensus about the meaning of the term. Sometimes it is used to indicate a single context (or layer, or stratigraphic unit, usually a positive one);¹¹¹ often it refers to a physical three-dimensional unit; at other times it indicates a sort of operative-interpretative tool with certain cultural, chronological or formative features.

P. Karkanas and P. Goldberg define an archaeological deposit as ‘what encloses the archaeological finds’ or as a ‘building block of stratigraphy’.¹¹²

In our case, it seems much more useful to start with what we want to name, and here the point is what we date. The basic unit which is dated using assemblages is the context or stratigraphic unit (except for interfaces or negative stratigraphic units). However, it may turn out to be necessary to move from one single context to a group of contexts sharing the same features. The reason is both ‘quantitative’ and ‘qualitative’.¹¹³ In the first case dating a single context by the embedded artefacts may mean using an insufficient amount of data. For instance, dating the backfill of one single post pit through one or two sherds (see Chapter III.3.2) would be almost useless, apart from having a very vague *terminus post quem*, which moreover may be very far from the actual time of deposition. On the other hand, dating the whole group of backfills of the post pits pertaining to the construction of the same house would allow the use of more data, permitting at least a better definition of the *terminus post quem* and avoiding a further problem of sampling. Indeed, as a large part of archaeology is a matter of sampling and data loss (see above), any unnecessary loss should be avoided.

From a qualitative point of view, it has to be stressed that some processes (or actions or groups of actions) can only be fully understood by applying a wider approach. For instance, one single hole is just one single hole and sometimes it will be very difficult to understand its function. Only by widening the view that we have is it possible to see whether the hole is related to the removal of a post, which in turn was part of a structure. Moreover, when dealing with chronology, there is no theoretical reason for keeping separate two or more contexts related to the same action or group of actions.

The point is how to group contexts, i.e. which criteria we intend to use to define what a deposit is. It should be noted that the activity of grouping contexts, which has a very fundamental role in post-excavation interpretation, is again very understudied and uncodified.¹¹⁴

¹¹⁰ Stein 1987. The author draws in particular from the work of H. Gasche and O. Tunca (1983).

¹¹¹ In the MoLAS Archaeological Site Manual the term ‘deposit’ is used to indicate contexts results of positive actions.

¹¹² Karkanas, Goldberg 2019: 11, 19.

¹¹³ See Tronchetti 2003: 112.

¹¹⁴ For a brief discussion of the issue and for further references, see Roskams 2001: 257-261.

As strata are physical volumes defined by specific features, one deposit has, consequently, its own material connotation, given by the sum of each context involved. This means that deposits are not only theoretical or operational constructions, but actual, measurable amounts of sediments, artefacts and ecofacts. A deposit consisting of the backfill of the construction trenches of one room has a defined volume, weight, and so on, made up of the sum of the volumes and weights of each single backfill involved.

Nevertheless, of course what defines the deposits are other features which are not physical. Within a chronological perspective it is fundamental to ensure that the grouped contexts pertain to the same action or group of actions, i.e. that they are the product of the same formative process. This means, for instance, that different parts of the collapse debris discovered in different rooms of the same building, with the same stratigraphic position, may well be associated in one deposit, while a floor and its covering 'occupation layer' should be split into two different deposits. This is perhaps one of the most difficult points, not so much from a theoretical point of view, but from a methodological/operative perspective; it also seems to involve a good amount of interpretation and discretion. Sometimes it may be almost self-evident how to group some contexts (walls built all together, two different contexts that are in fact the same floor cut by a trench through the middle, post holes aligned in a circle, and so on), in other cases it may turn out to be much more difficult. A cautious approach should be preferred, without grouping contexts in cases of doubt, so as to determine a more solid, although less productive, base of data.

One obvious and very important consequence of such a consideration is that one deposit is equal to one date. One deposit cannot have multiple moments of formation. Of course, it may have a long history behind it, but the 'main formation moment' (thus excluding post-depositional processes) must be one single event. Of course, the formative moment can be abrupt (or 'punctual'), or it may have lasted for a length of time which is appreciable archaeologically; it can also be less or more precisely defined.

In conclusion, a deposit can be defined as a group of contexts (one or more) produced by the same positive formative process within the same timeframe; it is both a physical volume and a theoretical/operative tool. From this perspective, the assemblage *is* part of the deposit.¹¹⁵

Indeed, this use of the term is more or less similar to that adopted by P. Crummy and R. Terry in their 1979 paper,¹¹⁶ where they also propose a kind of typology based on the different informative potential of different deposits.

Given this definition, there are some terms that are frequently used with similar meanings: 'feature'¹¹⁷ is often intended as 'recurrent patterned arrangements of archaeological contexts forming an interpretative category recorded during an excavation'.¹¹⁸ The term, including its definition and use, is arguably ambiguous, as the parameters on which the interpretation is based (spatial? temporal? formative?) are unclear.

Another term used very similarly to the way the term 'deposit' is preferred here is 'group'; with 'group' (or 'sub-group', 'context series', 'block', 'text section')¹¹⁹ obviously meaning 'group of contexts'. It is a very neutral, un-connoted, and, consequently, flexible term. Of course, a group can also be used to indicate a combination of post holes, which of course are the result of negative processes, so they do not involve the presence of datable artefacts. Although the term 'group' (alone) is very generic and the expression 'group of contexts' is somewhat too 'long', they both in any event represent convincing alternatives when dealing with a whole sequence, as they allow the progressive grouping of every context, including interfaces.

¹¹⁵ See Karkanas, Goldberg 2019 for the importance of considering materials as parts of deposits. The authors go even further, considering deposits as artefacts.

¹¹⁶ Crummy, Terry 1979.

¹¹⁷ Barker 1986: 139; Carver 1983: figure 10.

¹¹⁸ Darvill 2008: 154.

¹¹⁹ Roskams 2001: 257-258. See also Thorpe 1998: note 11.

The way the English term ‘deposit’ is preferred here is often indicated in Italian by the term *contesto*,¹²⁰ while the term *deposito* is used, often within the field of archaeological risk evaluation, to indicate the stratification of a site as a whole.¹²¹ Sometimes, contexts are grouped in *attività* or in *avvenimenti/periodi*,¹²² which literally mean ‘activities’ and ‘events/periods’. This kind of terminology is unhelpful as it mixes up agents and products; in other words, groups of contexts, physical slices of stratification, are named ‘activities’, while in fact these are what produced them. An activity is by definition an action or group of actions and it is not ‘material’. On the other hand, ‘events’ and ‘periods’ indicate a chronological (historical) partition, which uses time and not formation processes as a discriminant.¹²³ These are way of arranging stratigraphic units which have to be made *a posteriori*, once their date is known, while grouping contexts in deposits has to be done before, exactly to infer their date.

II.2.4 Assemblage

An assemblage can be defined as a set of artefacts, ecofacts and datable samples recovered within a given deposit.¹²⁴ Including datable samples recovered within the deposit may seem odd, but they are an invaluable source of chronological information, in the same way as are pottery, coins, etc. Of course ecofacts are also part of the assemblage, although most of them are usually undated. Obviously chronological analysis will only be carried out on the ‘datable part’ of the assemblage. Thus, in a more restricted way, when dealing with dating, an assemblage might be defined as ‘whatever is datable within a deposit’.¹²⁵ Ultimately, in this present work, an assemblage is understood as part of a deposit (a subset of a deposit), carrying, among other data, chronological information.

According to the nature (or status)¹²⁶ of the deposit, an assemblage may reflect the systemic context of the moment in which the deposit formed, or it may not. Its composition is thus closely influenced by the processes that contributed to the formation of the deposit.

A few words have to be added to take us a little deeper into an important issue concerning assemblages, i.e. the type of relationship that links single artefacts to each other.¹²⁷ Two main, but different, associations can be distinguished, labelled ‘true’ or ‘false’. By ‘true association’, or ‘systemic association’ an association is meant which is substantially *the product of a contemporary living system* – two or more artefacts recovered within the same deposit were truly associated in a certain systemic context and consequently they were in use in the same period (and space). Thus, some sort of link existed between them at a certain moment in the past. This may be illustrated, for instance, in the case of those deposits sealed by the sudden collapse of a building: in this circumstance, supposing a lamp and a jar were recovered together, we can argue that they were in use at the same period. In this case, the assemblage mirrors a single past ‘systemic context’.

Conversely, by ‘false association’ or ‘depositional association’ an association is meant that is mainly *the product of depositional processes* – the link between two or more artefacts may not have existed in any past living system, but it is only ‘archaeological’. In other words, two artefacts are present within the same deposit because of certain processes of redeposition or infiltration. This is, for instance, the case with the backfilling of a robber trench. As will be examined in more detail later, part or most of the backfill may come from adjacent strata (cut by the trench), which in turn may belong to different periods. Thus, within the backfill, we may find a mixture of artefacts that may have never been in use all together.

¹²⁰ Carandini 1991: 52.

¹²¹ Leonardi 1992^o ; 1982. More ambiguous is Leonardi 1992b.

¹²² Carandini 1991: 140-143. See also Roskams 2001: 259-261.

¹²³ See for instance Bonetto 2009a: XXIX.

¹²⁴ This definition, at least, is generally widely accepted (see Jameson 1999: 89 and Carver 1990: 89, also underlining the point that the assemblage is selected by the data acquisition strategy).

¹²⁵ Therefore, including Class 1 and Class 2 finds, according to the classification offered by D. H. Brown (1995: 3).

¹²⁶ See Crummy, Terry 1979.

¹²⁷ The topic is briefly looked at in Vince 1987: 201-201.

The distinction between ‘true’ and ‘false’ associations¹²⁸ clearly recalls the issue of primary and secondary deposits (see below). Assemblages can contain four types of materials: *residuals* (see Chapter I.2.6); *false residuals* (see Chapter I.2.6); *intrusions* (see Chapter I.2.10); *in-phase (or synchronic or co-systemic) materials*, i.e. those materials belonging to the same systemic context in which the deposit was formed (production, use and discard); amongst these, only false residuals and in-phase materials reflect true, systemic associations.

It is important also to note here that sometimes among Italian archaeologists the terms *contesto*¹²⁹ and *facies*¹³⁰ are used as equivalents to ‘assemblage’.

II.2.5 Primary and secondary

The above-mentioned definitions of systemic/archaeological context and deposit lead us to what is meant by ‘primary’ and ‘secondary’ deposits; but before this some clarifications are needed.

The adjectives ‘primary’ and ‘secondary’ are commonly applied to both artefacts and deposits. M. B. Schiffer himself uses the terms referring to both, stating that ‘artifacts discarded at their locations of use are termed primary refuse; those discarded elsewhere are known as secondary refuse’;¹³¹ the scholar is clearly referring to materials, however, he also observes that ‘primary deposits¹³² were formed by cultural deposition at that place, whereas secondary deposits contain materials redeposited by environmental processes, usually flowing water’.¹³³ J. K. Stein went as far as to heavily criticise the idea itself of talking about primary and secondary deposits, claiming that one deposit (the one we are investigating) was laid down only once.¹³⁴

Despite Stein’s objection (which seems correct from a geological point of view, but which is of little help from an archaeological one, as it does not consider the fundamental role of redeposition), the terms ‘primary’ and ‘secondary’ deposits are preferred here and will be adopted for grouping deposits with different formative models. However, the two terms will be interpreted in a very specific way. If one goes back to Schiffer’s above-mentioned statements, as well as to a conspicuous body of literature, it can be appreciated that the two terms ‘primary’ and ‘secondary’ (both applied to materials and deposits) are basically meant in a spatial/functional way. At other times a spatial/functional meaning is mixed (implicitly or explicitly) with a temporal one,¹³⁵ or indicates more generally an informative potential, useful in evaluation practices.¹³⁶

For a conceptual tool useful for practical purposes it seems much more helpful to distinguish between temporal, spatial and functional issues. In dating, it is obviously time that counts, so the definition applied here to the two terms has a clear temporal sense.

In this work, a ‘primary’ deposit is one whose assemblage largely belongs to the same systemic context in which the deposit itself was formed; while a ‘secondary’ deposit is one whose assemblage largely or completely belongs to a systemic context previous to the one in which the deposit was formed.

In the first case, the materials embedded within the deposit are some of those that were actually in use when the deposit was formed. Of course, it does not mean that those artefacts had been necessarily

¹²⁸ See also Barker 1993: 228–229.

¹²⁹ Terrenato 2006a; Giannichedda 2006: 125; Peroni 1998: col. 15.

¹³⁰ Tronchetti 2003: 112.

¹³¹ Schiffer 1996: 58, recalling Schiffer 1972: 161.

¹³² Here apparently meant as the body of archaeological stratification making up a whole site.

¹³³ Schiffer 1996: 199. Cultural redeposition seems to be underestimated, even though the chapter is dedicated to environmental formation processes.

¹³⁴ Stein 1987: 350–351.

¹³⁵ It is impossible to list all the times that such common expressions have been used. They are also fairly common in didactic and unpublished works. For a brief discussion, see Roskams 1992: 28. For one example of a mixture of spatial/functional and temporal meaning, see Outram *et al.* 2010: 2826.

¹³⁶ Roskams 1992: 28.

produced in the same systemic context: they may have been produced previously, within an appreciable time lag or not (see below, ‘real time’ and ‘archaeological time’), but they were certainly still in use in some way (see above, ‘archaeological context/systemic context/context’). We may say that they were still ‘in use’, with whatever function (even stored), and had not already been discarded and deposited. Summing up, they were not yet ‘archaeological’ objects.

These deposits seem to correspond in some way to the so-called closed finds, to Crummy and Terry’s class I deposits,¹³⁷ and to deposits containing Roskams’ Type A finds.¹³⁸ However, at least both the last two types entail some degree of spatial relation between the artefacts and the activities producing them. This is not the case for the definition used here: take for instance the fill of a small rubbish pit located within a Roman house. In the perspective of dating it can be considered a primary deposit (the pit was mostly filled with materials which were in circulation). But, in a spatial perspective, the same deposit cannot be considered primary as the artefacts were displaced some distance from their use area. Indeed, they would probably inform the researcher of which activities were carried out in the house as a whole, but not necessarily of the activities carried out in the room where the pit was located.

The concept of ‘closed finds’ has a long tradition, particularly in archaeological seriation, and it goes back to Flinders Petrie and Thomsen (see Chapter I.2); it is often used with a meaning close to the one proposed here for ‘primary deposit’. It is usually applied to burials and shipwrecks (which form no part of the discussion here), while in urban environments its codification seems to be much less clear, apart from the most evident ‘Pompeii cases’. In any event, it is meaningful that the term used is ‘finds’ and not ‘context’ or ‘deposit’, thus indicating a clear focus on the pattern displayed by the assemblage. In general, the term refers to those groups of artefacts that seem to be linked by a relation of contemporaneity and this seems to generate some misleading conclusions, as contemporaneity in use does not imply contemporaneity in production at all (see above). Finally, the term sometimes also carries the meaning of ‘sealed off’, which yet refers to the problem of infiltration, which is something quite different (see below).¹³⁹

‘Secondary deposits’ are deposits embedding high percentages (or the total) of materials that reflect systemic contexts previous to the systemic context in which they were finally laid down. It includes events where sediments are simply redeposited with the materials they already contained; these artefacts do not inform us of the systemic context in which the deposit was laid down for the last time. In other words, they do not inform us of the moment of their final deposition; they can only inform us of the moment after which the last deposition happened. Certainly, they carry other important information and they are commonly known as residuals (see below).

By using the terms primary and secondary in this dating-oriented perspective, it is unnecessary to use other expressions, such as ‘tertiary deposit’, which indicates the number of redepositions rather than which kind of link connects the materials and the deposit. Looking at the number of redepositions, some primary deposits would turn out to be secondary or even tertiary (see the case of the above-mentioned rubbish pit); in the same way, secondary deposits may be tertiary, quaternary, and so on. Besides the practical impossibility of determining the number of redepositions that possibly occurred, ascertaining whether a given context or group was redeposited is, of course, fundamental in modelling its formation profile and then dating it, but the primary distinction has to be made by looking at the possibility and modality of dating the deposit.

It has also to be remembered that, particularly in British archaeology reports, that pits, ditches and other similar features are said to have a ‘primary fill’: this, *per se*, has nothing to do with the informative/chronological status of the deposit, it simply refers to the sediments derived from the weathering of the sides of the feature. ‘Secondary fill’ usually refers to a successive accumulation of fine sediments, often of Aeolian origin.

¹³⁷ Crummy, Terry 1979: 54-55. See the Literature review.

¹³⁸ Roskams 1992: 28.

¹³⁹ See, for instance, the entry ‘primary context’ in Darvill 2008: 365 and compare it to the entry ‘closed association’ in the same volume on page 99.

II.2.6 Residuals and false residuals¹⁴⁰

Given the above-mentioned definitions of ‘primary’ and ‘secondary’, and given the concept of ‘systemic context’, definitions of what are commonly known as ‘residual’ and ‘false residual’ follow on rather logically: a residual is an artefact, ecofact or sample which was discarded/deposited in a systemic context previous to the one in which the deposit was formed; and a false residual is an artefact, ecofact or sample which was produced before the systemic context in which the deposit was formed, but which was still in use at that time, belonging in effect to that systemic context.

Both definitions require further explanation.¹⁴¹

Residuality is primarily an effect of redeposition and time (see II.2.8).¹⁴² It implies that materials which had been discarded and deposited (i.e. they had already become archaeological objects, thus stepping out of the systemic context) were relocated and redeposited (more probably along with sediments) in their final ‘resting place’ after a time-span sufficient to be considered relevant, or one difficult or impossible to model. These materials can provide valuable information, e.g. about the formation processes themselves; the original basin(s)/catchment areas; trade, economy and activities within a site as a whole; and undetected or lost phases of occupation.

Nevertheless, they cannot directly tell us when the deposit was formed nor which systemic context produced it.

On the other hand, false residuals were somehow in use when the deposit was formed, even though they were produced some time before (say a length of time that is archaeologically appreciable). Their persistence in the systemic context may be due to their natural long life on average, or to the phenomena of curation, usually because of their value (economic, social, or whatever). To be false residuals that can be archaeologically appreciable, two circumstances must occur.

First, the life of the artefact has to be sufficiently long (say, for instance, an object passed through two or more generations, such as an heirloom). The broader the dates of the artefacts of the assemblage, the longer its life has to be in terms of being detected; conversely very well-dated and short-lived artefacts within the assemblage will allow us to pinpoint even a slightly older object. Second, the examined deposit has to be primary, otherwise, obviously, any chronological difference may be ascribed to formation processes.¹⁴³

II.2.7 Index fossils/horizons¹⁴⁴

The archaeological concept of index fossil, borrowed from geology, is, perhaps, misleading on occasion. Basically, an index fossil is something (whatever) that distinguishes something else (a period, a space, a culture, a gender, and so on, or the combination of two or more). In other words, they are specific traces that can be helpful for detecting something: in our case, artefacts distinctive of a given period. What is sometimes forgotten, possibly, is the fact that they are distinctive of periods and not of deposits: for instance, Italic *sigillata* is distinctive of the Early Roman Imperial era, but not necessarily of the deposits formed in the same period; at best it can be considered distinctive of some primary deposits then. If one takes the building of a temple under the reign of Augustus, the deposit made up of the backfills of its foundation trenches may or may not contain Italic *sigillata*, according to its formation process. If the backfill consisted mostly of the more ancient sediments intercepted by the trench, it is likely to also

¹⁴⁰ See Rovelli, Sagui 1998. Strangely, the distinction between residuals and false residuals is not always acknowledged, also in recent works (See Ceci, Santangeli Valenzani 2016: 22).

¹⁴¹ For an overview of some of the most popular uses of the term and for a review of the approaches to residuality, see the literature review above.

¹⁴² A. Vince defined residuals as ‘soil-derived sherds’ (1987: 202); see also Terrenato 2006b for a very similar definition of residual, bearing in mind redeposition and time.

¹⁴³ Otherwise it would be easy to run into the mistakes, as suggested in Lucas 2005: 101.

¹⁴⁴ For an overview of the use of the two terms, especially in American archaeology, see Lee Lyman, O’Brien 1999.

contain more ancient finds, and the Augustan deposit may turn out to be characterised by republican black-glazed ware.

Index fossils refer to the continuum of time, to historical time intervals, and not to discrete deposits; so do the so-called horizons, which are associations of more index fossils typical of a given period.¹⁴⁵

Both the concepts of index fossils and horizons, though useful at other levels of interpretation, are not useful and possibly misleading in the specific case of dating deposits and they will not be used here, apart from dealing with the issue of *ex silentio* arguments (see below). As much as every piece of information we can gather, except for the case of intrusions, they can be selected as *termini post quem*.¹⁴⁶

II.2.8 'Real time' and 'archaeological time': accuracy

It is not the concern of this book to discuss any philosophical or physical implication of the idea of time. Even in archaeology, as a whole, the topic has been discussed according to many different points of view.¹⁴⁷ The point here is primarily that of archaeological time resolution.¹⁴⁸ Given time as a continuum, the contemporaneity of two events depends very much on the accuracy of our measurement: for instance, with a common clock, two events happening in the same second can be considered contemporary, but in many sports one thousandth of a second can separate winner from loser. In archaeology, the accuracy of our measurement tools is obviously far lower, therefore even events that happened in different years are considered as contemporary. We may say that in this case archaeology looks at history through a very unfocused lens, and thus approximation is a necessity closely connected with the nature of archaeology itself. Without this important conceptual tool, the idea itself of primary deposit as described above would not exist (every deposit is subsequent to the events which produced it) and its materials would be, at most, all false residuals.

Residuals and false residuals can be appreciated only as long as deposition-redeposition and production-deposition are separated by a sufficiently long time-span. Different systemic contexts, understood as 'time slices' (see above), are appreciable only in this discrete view.

The concept of accuracy is closely connected to the concept of time scale:¹⁴⁹ the higher our chronological accuracy, the wider is the time scale we can adopt, and consequently the shorter the time intervals in which we can divide time (high temporal resolution). As accuracy depends mostly on the quality of dating of each single artefact we recover, we can also claim that the quality of the initial chronological data is better and the scale we can adopt is greater and the intervals in which we can divide the time line are smaller.¹⁵⁰

For instance, when handling materials broadly dated to one/two century intervals (take many amphora types), using a time scale that adopts intervals/boxes of 25 years would be useless; on the contrary, using time lapses of 50 years when we date single artefacts within boxes of 10 years would lead to a needless loss of information.

If we move from assemblage-deposit relation to that of deposit-deposit, we obviously have a relative sequence that allows us to order them. The only important issue to be determined is simple: we need to know safely whether a given context or deposit is *after* or *before* another one. In the activity of grouping contexts in deposits this is an issue that assumes some importance. When we group together layers that

¹⁴⁵ Apparently, the term is also used sometimes as synonym for 'deposit', as meant here (see Martin 2012).

¹⁴⁶ As they are usually well known and recognisable, they can be effective operative tools for guiding the excavation in its progress; the presence of plastic materials, for instance, quickly points to the contemporary era.

¹⁴⁷ See Bailey 2005 for a brief but fundamental overview. See also Lee Lyman, O'Brien 2006: 97-166; Lucas 2005, Bailey 1981 and Bailey 1983.

¹⁴⁸ See the fundamental inputs of Stein 1993: 1-6 and Blackwell, Schwarcz 1993: 39-40.

¹⁴⁹ For an original dissertation on the role of scale (both in time and space) in archaeology, and for 'the fractal dimension of archaeological patterning', see Edgeworth 2013. See also Gosden, Kirsanow 2006.

¹⁵⁰ Karkanas and Goldberg link time resolution primarily to how finely we recognise stratigraphic units in the field (Karkanas, Goldberg 2019: 2). This aspect seems to be related, more than anything else, to the relation between stratification and stratigraphy (Urbańczyk 1986: 198-199), and to the creation of a thin or thick relative sequence.

lie one above the other, conjecturing that they were laid down for, say, the same building necessity (having well-drained foundations for the upper floors), we can rightly assume that this activity took place in a time length shorter than the accuracy allowed by our dating tools, even if we can recognise a sequence of *after* and *before*. They may be viewed as the product of successive actions pertaining to the same process and with the same date. On the contrary, we do not group together a mosaic floor and a dump laid down on its surface, because they are products of distinct processes, potentially (if not probably) far from each other in time, and we do that even though, finally, the quality of the artefact dates will not allow us to clearly distinguish them chronologically.

These topics introduce another, which is the duration of the deposition of a given deposit. In an urban environment, excluding natural strata, most of the deposits are likely to have been formed in short date range. However there are remarkable exceptions (large dumps, dark earths – although very particular – and others) which are to be treated specifically.

II.2.9 Termini post quem, ad quem, ante quem

Once defined how and what we date, some notes must be dedicated to what the date means or refers to. It is commonly known that one context or deposit formation can be dated *ad quem*, *post quem*, or *ante quem*,¹⁵¹ but it is astonishing to ascertain how these *termini*¹⁵² (Figures 7, 8) are still misused or confused.

The most important and applicable *terminus* is the *terminus post quem* (or *terminus ante quem non*):¹⁵³ it is a date, a more or less precise moment within the time continuum, after which a deposit was formed. Within a deposit with an assemblage, a *tpq* is provided by the most recent embedded artefact (or ecofact or sample), as the deposit cannot have formed before the most recent artefact contained was at least first produced and discarded. As most of the artefacts are dated within a date range, with a diffusion start point and an end point, the start point has to be chosen. For instance, if in a given deposit the most recent artefact is a sherd of stamped Samian ware dated AD 20-50, the *tpq* is AD 20, as the artefact, possibly, may have entered the deposit just after the beginning of its production. Theoretically any deposit is provided with a *terminus post quem*, but particular care has to be devoted establishing whether there is any intrusive material (see *infra*), as any intrusion would create a false, more recent, *tpq*. Unfortunately, very often, *tpqs* are chosen for dating straight *ad quem* (see *infra*), i.e. assuming to some degree that the date of the most

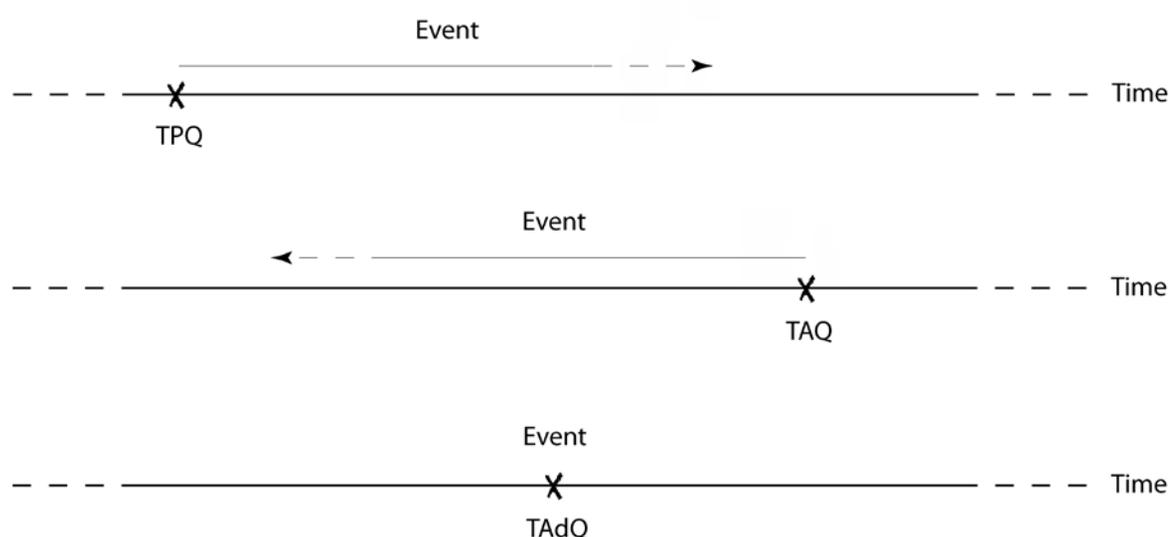


Figure 7: *Terminus post quem*, *terminus ante quem* and *terminus ad quem*.

¹⁵¹ See Harris 1989: 121, 125-126; Barker 1993: 224-229; Shaw 1999a; 1999b. Less clear is Terrenato 2002: 267-268.

¹⁵² Literally boundary-marks.

¹⁵³ Theoretically this seems to be a more correct expression, but it sounds more like a pedantic complication.

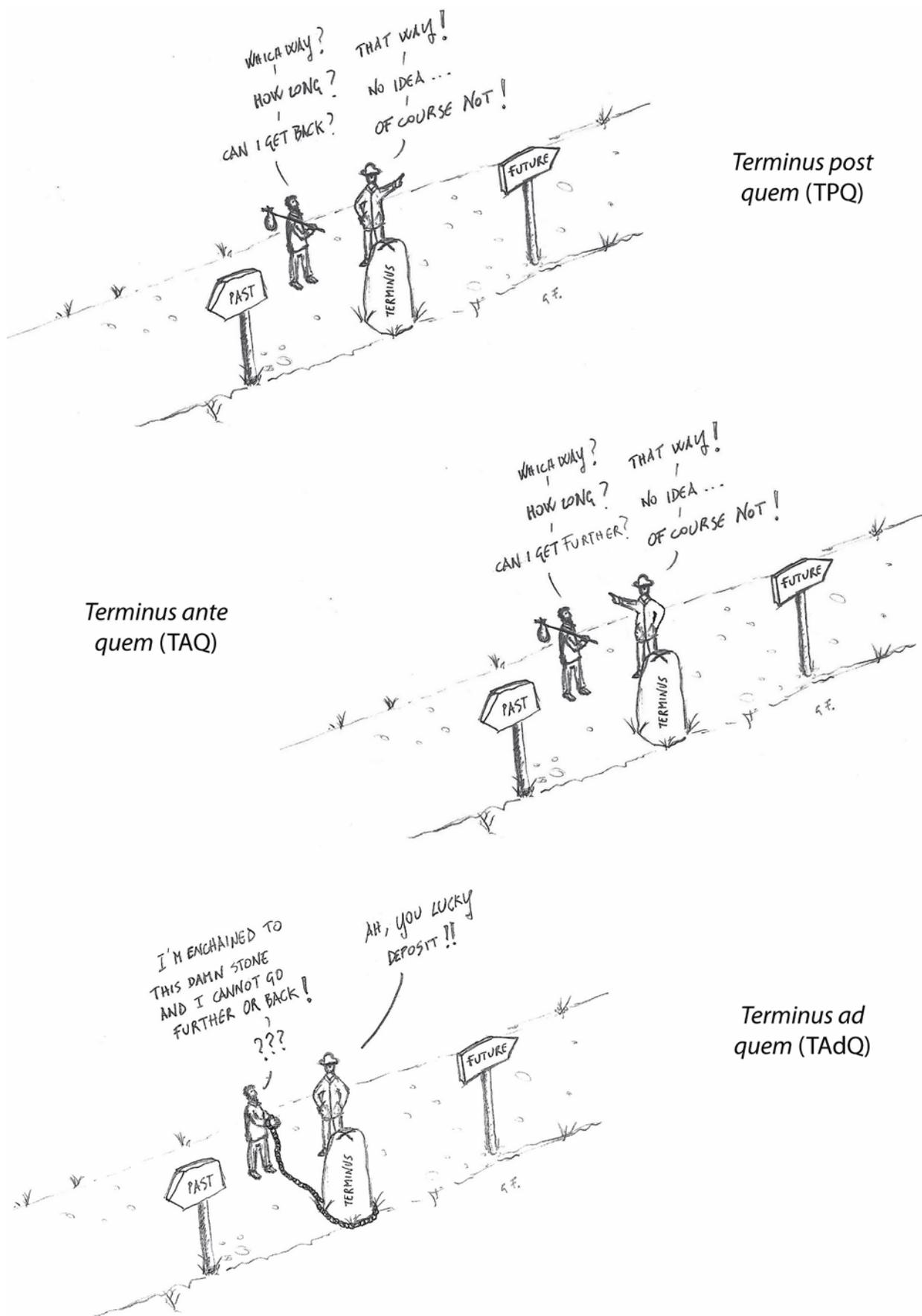


Figure 8: Termini as stones.

recent artefact must have been very close to the moment in which the deposit was formed. Of course, this is a conclusion which has to be somehow supported, otherwise it may be true or false as well.

The *terminus post quem* has an important characteristic: it is transferable to later deposits. If 'deposit A' yields a *tpq* of 125 BC and 'deposit B', successive to 'deposit A' (say B covers A), yields a *tpq* of 200 BC, deposit B acquires a *tpq* of 125 BC. This simple and well-known characteristic is extremely helpful in moving from the dating of single deposits to that of whole sequences. It also reminds us of the difference occurring between the date of objects and the date of deposits and it is clearly the result of the presence of residuals in secondary deposits.

The *terminus ante quem* (or *terminus post quem non*) is a date before which a deposit was formed. While the *tpq* is provided by inner data, the *taq* is usually given by external ones, i.e. by information embedded in later contexts, deposits or structures. For instance, one layer, covered by debris certainly related to the great fire which devastated Rome in July AD 64, was formed before, or, at the latest, exactly in July AD 64. To use a *taq* properly, it is extremely important that it should be irrefutable: *taqs* should be structures, or layers or deposits, whose formation is placeable in a time frame with a high degree of certainty, possibly through the use of historical or epigraphic sources. Primary deposits (whose nature has been fully studied) can play the same role. If this prerequisite is not met, serious problems may occur in dating a whole sequence. The issue has been clearly explained by P. Barker: '[We] must be careful not to be led into a circular argument. A *terminus ante quem* cannot be given by a layer which is dated by an object embedded in it which merely gives it a *terminus post quem*. For example, if a floor in a house contains a coin of AD 267 firmly stratified in it, the floor must have been laid in AD 267 or after. It does not follow that the layers below the floor were deposited in AD 267 or earlier. Subsequent excavation of another floor many layers below the first might produce a stratified coin of say, AD 370. In that case, all the layers above take a new *terminus post quem* of AD 370 or later. The whole complex might ultimately turn out to be tenth century. Unless the limitations of stratified datable objects are fully appreciated there is a danger that serious dating errors will occur in interpretation, to be perpetuated in the literature'.¹⁵⁴ Nothing more needs to be added, but these indications are, in fact, still somehow misused or misinterpreted.¹⁵⁵

Dating *ad quem*¹⁵⁶ means determining in which date or within which time frame a given deposit was formed. In other words, it is simply dealing with when (and not 'before which date?' or 'after which date?'). It may assume the form of either a punctual date or a time-span, more or less wide according to the quality of the available data. Within the given time the event of interest (the formation of the deposit) has occurred. A palisade dated to the period 70-35 BC was built between 70 BC and 35 BC, but we do not know if it was built in 50 BC or in 41 BC.

The duration of the process involved (for instance, the construction operations for erecting an aqueduct may last for years or decades) may necessitate the use of two dates or two date ranges, one for the beginning of the process and one for its end. For instance, a large dump may be dated 30-20 BC/AD 15-20, meaning that the deposition began between 30 and 20 BC and was carried on until a moment between AD 15 and AD 20.

¹⁵⁴ Barker 1993: 226.

¹⁵⁵ See Malnati, Stoppioni 2008: 53 for the case of a 3rd-century BC dump investigated near Cattolica. Similar oversights occur in manuals as well (see for instance Drewett 1999: 113).

¹⁵⁶ Sometimes the expression '*terminus ad quem*' is preferred as a synonym for '*terminus ante quem*' (*ad quem* has this meaning in juridical language). This seems to be due to the many meanings of the Latin preposition *ad*. In this case, I employ it with the meaning 'in relation with', 'bonded with', 'referred to', and not meaning 'until'. Indeed, using two different Latin expressions to indicate the same concept seems to be redundant. Contrary to the two other Latin expressions, which are better codified parts of the common baggage of many archaeologists, this one is less codified and is not often used. But the necessity to indicate an element which allows a precise dating would still stand. The existence of the two codified Latin expressions suggested the use of another Latin expression, and, instead of formulating a new one, I preferred to clearly codify an existing (even though not common) expression. For a use of the expression *terminus ad quem* equating to the one here proposed, see, e.g., D'Agostino 2006: 5. For a similar use, see Gelichi 1992: 271. If on the one hand the use of the whole expression is uncommon and different shades of meaning can be assumed, on the other, when it is used, even with the meaning here proposed, the juxtaposition of the word *terminus* (boundary) and the expression *ad quem* does not seem to be a problem. This may give rise to some logical criticisms, as 'boundary' recalls something where something else begins or ends, more than recalling something where something else 'is'. In this case thinking of the physical meaning of *terminus*, i.e. the stone itself marking the boundary, may be a way to approach this apparent contradiction (see Figure 8).

A *tadq* can be provided internally if the deposit is primary, or at least if it is possible to establish a solid chronological relation between some of the artefacts embedded and the moment in which the deposit was formed; it can also be provided externally, coming from the combination of the *tpq* of a more ancient deposit and the *taq* of a more recent one (it is the case of a layer or structure which does not contain any datable artefact). Finally, it can be provided by both internal and external data or by a combination of its own *tpq* and the *taq* of a more recent deposit.

Concluding, in general the possibility of dating *ad quem* or merely *post quem* relies on which type of deposit is under examination; the quality and quantity of the available data; and the nature and the data provided by the deposits which are stratigraphically related to the examined deposit.

II.2.10 Intrusions and the issue of closed finds/sealed deposits

The issue of intrusions is very thorny and cuts across every consideration concerning dating deposits. Intrusions are commonly understood as artefacts or ecofacts deriving from contexts or deposits later than the examined one, somehow infiltrated within the sediment.¹⁵⁷ They may end up within the assemblage of a given deposit via three main routes: archaeological practice; post-excavation analysis; and post-depositional processes in combination with the physical nature of the deposit and the length of its exposure.

In the first case, the missed identification of context boundaries, chaotic management of the archaeological site, or later mistakes in washing/labelling/stocking artefacts may lead to mixing up materials from two or more different assemblages. These are all operative issues that can be assessed to reduce the risk of these types of infiltrations to the minimum.

For second case, intrusions may derive from wrong grouping, associating within single deposit contexts formed in different periods. False intrusions due to the wrong dating of single artefacts can also arise, but clearly this is a factor affecting materials as a whole; whereas with the third case, long exposure and post-depositional processes such as wet/dry fissuring and cracking or bioturbation may play an important role in mixing deposits and relocating some artefacts; it may be very hard to detect in the field the effects¹⁵⁸ of these processes and artefact size plays an important role.

Another type of post-depositional process lies between practice and theory – those deposits which are, by physical nature, very permeable to intrusions especially by means of simple gravity. This is the case of layers of rubble or building collapse debris, basically comprising stones or other building materials. The structures of these kinds of deposits, featured by numerous interstices, allow the entrance of sediments, artefacts and ecofacts from above. The abundance of unoccupied spaces may also drive materials to the surface of the underlying deposits, thus causing even more problems. Theoretically, underlying layers, rubble and infiltrated material are three different deposits connected to three different depositional episodes; however, practically, it may be extremely difficult to clearly, physically distinguish them in the field.

What makes the issue of intrusions (particularly in post-depositional processes) very difficult, is the fact that they seem to be particularly undetectable *a priori*, while *a posteriori* they are often recalled to explain any chronological anomaly, assuming the equation ‘intrusion = outlier’. This is, at least theoretically, a dangerous path, because in absolute terms the chronological pattern ‘artefacts embedded during the deposition – intrusions’ traces the ‘residuals – in phase/co-systemic materials’ pattern (Figure 9).

The problem of intrusions is indeed considerable, and no easy solutions seems to be suggested; Chapter III.6 suggests at least a way to evaluate and tackle the issue, mixing *a priori* and *a posteriori* considerations.

¹⁵⁷ See Carver 1990: 104. See also Ceci, Santangeli Valenzani 2016: 23.

¹⁵⁸ Tronchetti 2003: 113.

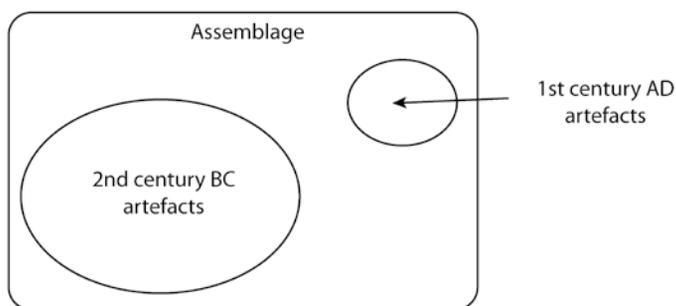


Figure 9: Residuals and systemic materials, or systemic materials and intrusions?

In this perspective, deposits with particularly low permeability (low chances of intrusions) assume a certain importance because of their reliability. Sometimes, as already mentioned, the expression 'closed find', mostly used to indicate primary deposits (see *infra*), implies also that the deposit is particularly well sealed.¹⁵⁹

Needless to say, the two concepts of primary deposit and sealed-off deposit are different: in the first case, what is important is the quality of the information procured, in the second what is important is its reliability. For example, a secondary deposit may be sealed off by a mortar floor, so producing a reliable assemblage, but not allowing any *ad quem* dating. On the contrary, a tomb may have been heavily disturbed by later activities and post-depositional processes, which may compromise the theoretical possibility of dating *ad quem*. The best combination in terms of dating is, of course, produced by a sealed-off primary deposit.

Finally, a terminological problem emerges with the Italian expression *contesto chiuso*, which by itself recalls the idea of a sealed-off deposit more than a primary one.

II.2.11 *Ex silentio* arguments: evidence of absence or absence of evidence?¹⁶⁰

The issue of *ex silentio* arguments is certainly another very problematical one. The question may be put in this way: within a given deposit, does the absence of a popular index fossil (see above) suggest that the deposit was formed before the diffusion of the said index fossil? In other words, can the production start date of such a material be used as a *terminus ante quem* for dating the deposit?

Again, some distinctions must be made. When dealing with a primary deposit, using *ex silentio* arguments may be unnecessary, as an *ad quem* date should be provided by the existing materials. However, such an argument may be useful for narrowing the interval in cases where: the index fossil was very diffused; the studied assemblage is significantly large; and/or there are no other manifest reasons for the deposit not to contain it.

If the first two factors underline a quantitative issue, the last poses a qualitative problem: before using absence as a chronological tool, other factors should be investigated. A social factor may play an important role. For instance, the absence of a given artefact may be due to the fact that the social group supposed to have produced the deposit simply did not use it; it seems unlikely to find, say, military accessories in a civil production area. Reasons may also be economic: the investigated site may be far from the main routes of diffusion of a given artefact, or the status of the individual (or group) likely to have produced the investigated deposit may be too high or too low. A gender explanation could be advanced as well: women's accessories are unlikely to be part of assemblages recovered in an area where males lived. Other factors may be listed; the point is that each has to be evaluated and weighted before assuming absence as a chronological indicator.

For secondary deposits the issue is even more complicated, because we basically do not know which index fossil we have to look at, unless we actually have an idea of when the deposit was formed. In this case the use of this kind of *terminus ante quem* should be avoided or, at most, it should be used very cautiously, possibly combined with additional, independent sources.

¹⁵⁹ See for instance Biers 1992: 20.

¹⁶⁰ Barker 1986: 108.

II.2.12 Analogy and its use

Analogy is ‘the use of information derived from one context, in this case usually the present, to explain data found in another context, in this case the past’.¹⁶¹ It ‘implies similarity between the analogues in some respects and dissimilarity in others, since otherwise the analogy would amount to identity’.¹⁶²

Analogy is a widespread theoretical tool, used both for describing and explaining processes, phenomena, etc. The explicit use of analogy in archaeology is linked to the era of New/Processual Archaeology. Binford’s ‘Middle-Range Theory’ is a classic example of the use of analogy to explain past behaviour and the related archaeological record.¹⁶³ One of the two analogues is usually a past process, which we hypothesise may have occurred and producing the archaeological record we are examining. The second analogue is usually picked from ethnological observations or experimental archaeology, i.e. from the present.

For instance, we may suspect that a certain pattern in ceramic breakage is due to practices of provisional discard. In this case, the observation of practices of discard among present cultures may lead us to observe the record produced and establish (or not) an analogy between the system observed and the past one. Summing up, we may say that if the records are similar, it is possible to infer that they were produced by similar processes.

Of course, things are not that easy. Different processes may produce a similar record and, on the contrary, different records may have been produced by the same process; moreover, analogy works only if some kind of historical continuity is assumed. The use of analogy in archaeology has thus even been heavily criticised.¹⁶⁴

It should be kept firmly in mind that analogy does not prove or test anything.¹⁶⁵ Nevertheless, if the use of analogy is not generic, but firmly and formally related to other sources of data within a coherent framework, and if analogy shows forms of statistical recurrence,¹⁶⁶ then the analogical tool can be preferred for excellent reasons.

In this present work analogies are used in a traditional way for comparing past evidence with present evidence. The sketch of a sort of catalogue of types of deposits (see Part IV), usable for comparisons, suggests by itself the adoption of a critic analogical procedure to compare freshly studied deposits with those already analysed.

As suggested by M. Vidale, a comparative procedure helps to highlight not only analogies, but also anomalies,¹⁶⁷ directing research to new models. Models themselves (see *infra*) are linked by analogy to the processes modelled.

II.2.13 Process

The core meaning of the term ‘process’ may be summed up by another: ‘how’.¹⁶⁸ It also implies the concept of transformation, indicating something dynamic more than something static. In general, the term is largely used dealing with cultural change and it is a strong trait of New/Processual Archaeology reasoning, and, among others, of the *Annales* historians. Moving to our case, i.e. at a lower level of interpretation, when dealing with deposits,¹⁶⁹ with ‘process’ we mean the combination of agents and actions that led to

¹⁶¹ Johnson 2010: 50.

¹⁶² Clarke 1972: 2.

¹⁶³ For a detailed account of what Binford meant by ‘analogy’, see Binford 1967.

¹⁶⁴ See Allison 1999 for a critique of the use of some analogies, with both present models and models derived from literary sources.

¹⁶⁵ Johnson 2010: 62.

¹⁶⁶ Vidale 2004: 20.

¹⁶⁷ Vidale 2004: 20.

¹⁶⁸ *Contra* Johnson 2010 : 75. Johnson sees process as being more about ‘why?’. The author, however, deals with processes in cultures more than processes in stratification.

¹⁶⁹ See Leonardi 1992a: 15.

the formation and transformation of a given deposit and its assemblage, with particular focus on how artefacts (the main means for chronology building) entered a given deposit. In this sense, the term is used in a way which stands very close to what behavioural archaeologists call the ‘formation processes of the archaeological record’. The same expression is used by the scholars of pre/proto history at Padua (*processi formativi*)¹⁷⁰ and it is, in general, fairly widespread. In these cases, the term ‘process’ is associated with the term ‘formation’, meaning the investigation of the processes that produced (which ‘gave birth’ or ‘formed’) the record as we recover it in the field.

As outlined in Chapter I.2, if, on the one hand, the American school has placed much more emphasis on the human factor in approaching formative processes (the label ‘Behavioural Archaeology’ is fairly explicative by itself), on the other, in Padua, research has focused particularly on natural, physical, geological and post-depositional factors. Another distinction can be noticed in terms of the targets: behavioural archaeologists worked mostly on the assemblages embedded within the deposits (producing clear object histories or biographies),¹⁷¹ while the ‘Padua School’ worked mostly on the matrix of the deposit (the geological component).

Both approaches are necessary; in urban Classical environments, human activities certainly had a much deeper impact than natural phenomena, largely contributing to the formation of deposits and assemblages. Decoding human activities (with all the risks this entails) thus seems to be the main challenge in dealing with urban deposits. However, the deposit has to be approached as a whole, because what we want to date is precisely the process connected with its formation and not the formation of the assemblage alone. For instance, when examining the assemblage embedded in the backfill of the construction trench of the wall of a temple, what we want to date is when the trench was backfilled, i.e. when the temple was built, and not when the assemblage formed. Dating when the assemblage was formed is used as a tool to investigate when the deposit was formed. Finally, sediments and assemblages interact (for instance they may have a common depositional history or not) and their relation is sometimes important in qualifying the deposit (see the case of the intentional insertion of sherds in a given geological matrix, for implementing, say, its hygroscopic characteristics).

Some human activities play a major role in the formation processes of Classical urban deposits and assemblages including: building practices and techniques; maintenance and cleaning; recycling, reuse and disposal of waste; refurbishing; deliberate selection of material and/or sediments; and other economic, political and military factors.

Other factors, surely present, although difficult to detect, seem to have a more minor impact on the bulk of sediments and materials and may contribute to complex mixed patterns, e.g., casual loss; significantly long storage/conservation/use of some artefacts; scavenging; etc.

Physical and natural factors are, of course, omnipresent (before, during and after the deposition), while some cultural and social practices assume a particular importance in a few specific cases (for instance votive depositions or the building of places of worship).

As most of the processes we intend to investigate have long since concluded, they cannot be described, but they can at least be modelled.

II.2.14 Model

A model is a simplified representation of something which is more complex.¹⁷² It usually describes only some features, some traits, which are considered to be fundamental in describing the object, phenomenon, process, etc. to be studied.

¹⁷⁰ See Leonardi 2006.

¹⁷¹ The title of a recently edited book is self-explanatory: *People and things. A Behavioural Approach to Material Culture* (Skibo, Schiffer 2008). See also Leonardi 1992a: 14.

¹⁷² See Orton 1999.

It is possible to consider the relation between the model and the modelled as one of analogy,¹⁷³ i.e. similarity in some features. Which features are to be considered depend strongly on the research aim and, unfortunately, also on the researcher’s own knowledge and cultural superstructure. Between the object and the model there is evidently some form of indeterminism or chance.

But what purposes do models serve? D. Clarke defined them also as ‘heuristic devices for manipulating observations and hypotheses’¹⁷⁴ and ascribed to them the possibility of playing different roles,¹⁷⁵ i.e. visualising devices; comparative devices; organisational devices; explanatory devices; devices for the construction and development of theory; predictive devices; etc.

Given all these assumptions, we will try to model formation processes of different type of deposits to clarify what we know (or do not know) about their dating (Figure 10). Dating correctly is the research aim and this target will influence the features to assess.¹⁷⁶ The sought models have basically an organisational/ explanatory function by themselves, but hopefully they should practically be comparative devices.

There is perhaps a thin line separating models which are too generic, resulting in them being more or less useless, and models which are so specific that they actually fit only one or two case studies. Trying to walk a middle way, we can start by devising a ‘typology’ of deposits that is neither too specific nor too generic, built up around specific but recurrent human activities,¹⁷⁷ such as building a wall, or dumping rubbish, or around physical/natural occurrences mixed with human activities, such as the collapse of a building. Each one of these actions, combined with other factors, represents processes producing different kinds (or types) of deposits which have to be dated.

It has to be stressed that a model is something different from a law; a law is indeed a single general statement which has been proved and it embeds an absolute value. Far from offering any law, we will be content with formulating models.

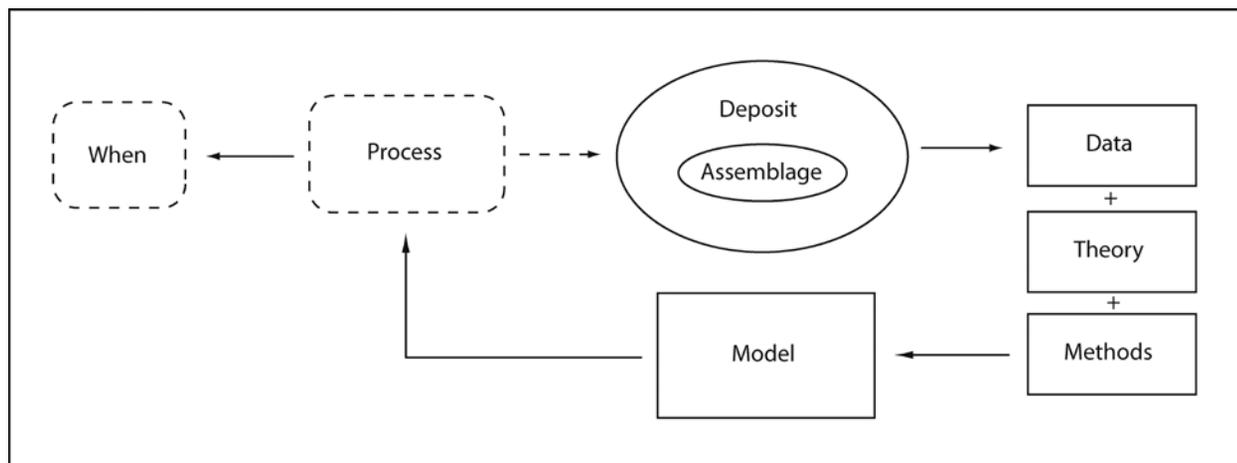


Figure 10: Developing models for formation processes and dating (what is unknown is marked with a broken line).

¹⁷³ Clarke 1972: 2.

¹⁷⁴ Clarke 1972: 2. See also Shanks 1990: 380-381.

¹⁷⁵ Clarke 1972: 2, recalling Harvey 1969: 141.

¹⁷⁶ For a typology of contexts based on spatial/functional factors, see Garrow 1984.

¹⁷⁷ After all, as Karkanas and Goldberg rightly point out, '[There] are only a limited number of basic human actions that occur, such as laying down, dropping, compacting, and throwing materials' (Karkanas, Goldberg 2019: 12).

Part III

Tools

III.1 Introduction

Once the main conceptual tools have been reviewed, it is necessary to move on to those operative tools that can be used in dating, meaning those methods and sources of useful information that can be used to address the issue of dating a given deposit.

The first chapter deals with some scientific techniques which allow for the direct dating of deposits; they therefore represent a sort of theoretical shortcut, as they do not consider the use of the assemblages embedded (particularly OSL). These techniques are not, up to the present, very diffused in urban excavations, primarily because of the accuracy of the results provided. In the near future, however, they may represent much more useful tools and might be routinely performed.

This part of our study focuses then on the core of the methods to be used; they can be further divided into two main categories, one grouping those methods whose target is the deposit itself, and one grouping external sources that can provide key interpretations.

The first group can be further split into quantitative and qualitative methods, although sometimes the difference between the two becomes somewhat blurred. Among the qualitative ones, a brief digression can be inserted concerning the practices of reuse and recycling in Roman times. This topic is of interest as a result of the impact it has on the quality of the record, particularly concerning issues such as fragmentation and sherd dimensions. The impact of reuse and recycling practices on the archaeological record produced in ancient cities is still far too poorly investigated and discussed. What follows, then, is an attempt to demonstrate its importance for understanding the quality of the assemblages we handle in urban sites and, ultimately, its importance also for dating.

Among the qualitative traits displayed by a given assemblage, particular attention is paid to those indicating that intentional selection and insertion by human agents occurred, thus possibly leading to some *ad quem* dating.

Moving to the second group, i.e. external sources of information (ethnoarchaeology, experimental archaeology and literary sources), it can be stressed that their contribution in dating a deposit is fundamentally analogical. This means that they do not demonstrate, by themselves, the nature of the studied deposit and the way in which it can be dated; nevertheless, they can be used, in accordance with the other methods selected, for building more robust models, as they cast light, in different ways, on some aspects of past behaviours and processes that most likely contributed to the formation of many assemblages and deposits.

As far as this present author knows, until today, ethnoarchaeology, experimental archaeology and the study of literary sources have never been directed to the study of problems in dating; it follows that what is proposed in this chapter should be considered as a first sketch, which, hopefully, will develop in the future.

This chapter will also endeavour to review the very transversal and troublesome topic of intrusions. This time the topic is not discussed from a theoretical perspective, but from a practical one, seeking some useful approaches for both an *a priori* and an *ex post* evaluation.

III.2 OSL, TL, mortar dating and non-mediated chronology

Associated artefacts and dated samples are the main means used for dating deposits. In any event, other tools allow the direct dating of the formation/building of deposits/structures. Theoretically, albeit with some caution, these scientific techniques completely bypass the thorny problem of linking artefact age and

their final deposition, making it *de facto* unnecessary for any reasoning about residuality, false residuality, assemblage formation processes, and so on.

From a theoretical and methodological point of view, the most interesting of these techniques is optically stimulated luminescence (OSL),¹⁷⁸ as it provides a direct date of formation for sediments.¹⁷⁹ In other words, this technique allows the direct dating of the deposition of a given deposit, measuring how long ago some minerals (typically quartz or feldspar) were last exposed to daylight.¹⁸⁰

If a given sediment is exposed to daylight for sufficient time (bleaching), electron traps form within the mineral grains (due to imperfections in the crystal lattice, i.e. atom vacancies); once filled, these are emptied by solar radiation. It means that electrons remain trapped until light provides sufficient energy to the conduction band. When the grains are buried (time 0), the traps start being refilled over time at a rate determined by natural radioactivity (in most cases the saturation point is over 100,000 years); a new laboratory irradiation, usually with green light, will empty the traps again, entailing a certain release of energy in the form of luminescence. Therefore the amount of energy released is proportional to the time the grain being examined has been buried. The older the sample, the more light is emitted¹⁸¹ (Figure 11). The luminescence age is proportional to the total radiation absorbed, divided by the annual dose rate: the absorbed dose is estimated from laboratory luminescence measurements, while the dose-rate is determined from radioactivity analysis.¹⁸²

This technique, usually preferred for dating geological sediments (particularly aeolian sediments, but also water-laid and glacial sediments, peat, etc.), is now finding more and more applications within the field of archaeology.¹⁸³ Its accuracy, usually ranging between 5% and 10%,¹⁸⁴ makes it suitable, in perfect conditions, for dating Classical contexts and even far more recent ones.

Given the great advantages provided by this technique, one would ask why it is not more widespread among the common archaeological scientific dating methods. Apart from a general diffidence and delay in handling scientific techniques by archaeologists, some objective shortcomings have distracted attention from OSL, among these the most relevant are:

1. Cost. One single analysis costs twice that of standard radiocarbon analysis. Costs can also rise rapidly as sampling often requires the presence of a specialist.¹⁸⁵
2. Sampling. The necessity of maintaining the sample in the dark makes this procedure more complicated, even though sampling during the night can be easily avoided using a pvc tube for extracting the sample. Apart from these practical issues, more serious problems arise when dealing with the quality of the sample itself. To ensure good reliability some conditions must be satisfied:

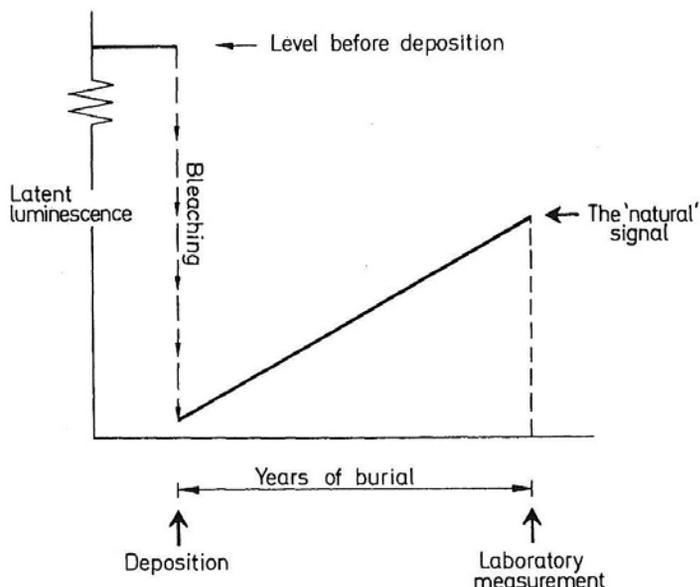


Figure 11: The principle of OSL in a schematic sketch (Aitken 1998).

¹⁷⁸ On luminescence dating in general, see Liritzis *et al.* 2013.

¹⁷⁹ Feathers 2003: 1493 and 1495.

¹⁸⁰ Similar to OSL, IRSL, or infrared stimulated luminescence, works with different wavelengths.

¹⁸¹ For a complete and detailed overview of the technique, see Aitken 1998; for more recent advances, see Duller 2004. See also Weiner 2010: 22-23, 252-254.

¹⁸² For a quick list of the methods used for measuring the dose rate, see Liritzis 2000: 5-7.

¹⁸³ Feathers 2003: 1493.

¹⁸⁴ Liritzis 2000: 4; Jacobs, Roberts 2007: 212; Outram *et al.* 2010: 2825. For modern sediments, see also Murray, Olley 2002.

¹⁸⁵ See <https://www.geog.ox.ac.uk/research/landscape/old/dating.html> (accessed July 2019)

- a) To avoid excessive γ radiation influence, the sample must be extracted at least 30 cm beneath the surface,¹⁸⁶
- b) Moisture content should be constant or at least measurable (water absorbs radiation to some degree);
- c) Compaction, leaching and post-depositional disturbances in general should be avoided;
- d) On a micro scale, suitable grains must be present in sufficient number (bright grains are usually 5-10% of the total, although sometimes the percentage is higher).¹⁸⁷
- e) The environment within 30 cm of the sample should be relatively homogeneous, as radiations from different strata or large clasts may affect the estimation of the dose rate.¹⁸⁸
- f) The required amount of sediment is around one kilogram,¹⁸⁹ entailing the whole removal of the smallest contexts for such a purpose.

These requirements make the application of the technique more difficult in urban environments, where some of the factors have significant impact (particularly b), e), f));

3. Incomplete zeroing, due to insufficient exposure to light, may create some problems, although methodological developments enable the effective handling of the issue.
4. Fine-grained sediments (such as loess) are more difficult to process.¹⁹⁰

Despite these limitations, the application of OSL to anthropogenic deposits, even in urban environments, has started to spread. In most cases it is opted for along with other techniques to check its consistency with other dates, but its value seems to be interesting: anthropogenic infills of cellars in the Iron Age settlement of Herrenbrunnenbuckel (Germany) have been dated using OSL with a good level of consistency with other sources of data.¹⁹¹ An Iron Age broch at Old Scatness (Shetland) has been dated via a Bayesian approach, mixing archaeological and formative data, radiocarbon and OSL dating, again with good consistency.¹⁹² Similarly, Medieval anthropogenic layers at Santiago de Compostela (Spain) have been dated via OSL, with errors ranging from ± 140 to ± 198 years.¹⁹³ OSL has also been selected for dating natural deposits linked with artificial structures in urban environments, i.e. the ancient city of Tayma (Saudi Arabia), against which a thick sandy aeolian layer was deposited. OSL dating of this layer permitted the inference that the examined walls already existed in the second half of the 3rd millennium BC.¹⁹⁴

In conclusion, although not currently widespread, and despite some factors that can seriously affect its reliability or accuracy, in particular in urban contexts, OSL may develop in the coming years to become a more useful tool in chronological analysis, above all by virtue of its capability of providing direct dating of archaeological deposits. Until, hopefully, OSL and other scientific techniques become part of common archaeological practice, dating archaeological deposits will still rely on datable artefacts and samples embedded within.

Clearly there are also more important reasons for studying assemblage formation processes in a chronological perspective. It is an invaluable tool for understanding several other topics of interest (residuality and false residuality, formative dynamics, provenance basins and so on) and it is still the only available tool for re-examining old/current data and excavations and for evaluating the reliability of the chronological inferences proposed. Furthermore, primary deposits can be safely dated through materials, so saving both money and time, and, in common circumstances, allowing for more accurate dating.

¹⁸⁶ Aitken 1998: 62-63.

¹⁸⁷ Feathers 2003: 1502.

¹⁸⁸ Feathers 1996: 27.

¹⁸⁹ Aitken 1998: 62.

¹⁹⁰ See Lang *et al.* 1999.

¹⁹¹ Lang *et al.* 1999.

¹⁹² Outram *et al.* 2010.

¹⁹³ Sanjurjo-Sánchez, Pérez Mato 2013.

¹⁹⁴ Klasen *et al.* 2011.

OSL can be applied also to ceramics¹⁹⁵ and lithics; of course, once applied to movable objects it loses the ability of directly dating deposits, but if it is applied to structures such walls or floors, the moment when they were last exposed to daylight can be determined. OSL has also been preferred for determining the age of known Classical stone structures, targeting when the single ashlars were placed next to each other, so blocking solar irradiation on the inner surfaces. Accuracy, in this case, was relatively low for Classical Archaeology standards, ranging from ± 200 to ± 350 years, with the Temple of Apollo in Delphi (about 550 BC) apparently being the best dated (OSL age 470 ± 200).¹⁹⁶

Hearths and brick structures can also be dated using thermoluminescence (TL).¹⁹⁷ Once that the possibilities that the bricks were re-used (see Chapter III.4.1) or stored for an appreciable long time have been excluded, TL can provide useful insights into the chronology of a studied wall. In this case, indeed, walls should be seen as common deposits, embedding datable materials, and bricks should be handled as common potsherds. Their dating through TL cannot be considered as direct as in the case of OSL applied to sediments.

Another dating technique, namely mortar dating, can provide a direct age for masonry structures. It is a relatively young technique, developed in the mid 1990s in northern Europe (mainly Finland). The technique, based on the ¹⁴C principle, was first applied to date the Medieval stone churches of the Åland Islands (located between Sweden and Finland) and it was fully revised after the introduction of ¹⁴C AMS (accelerator mass spectrometry) analysis.

The principle behind the technique presents some important differences from common radiocarbon dating. Obviously, mortar itself is not organic, but carbon dioxide in the atmosphere is fixed in the calcium carbonate (CaCO₃) formed during the hardening of the lime mortar at the time of construction¹⁹⁸ (Figure 12).

Besides technical problems,¹⁹⁹ two main factors strongly affect the reliability of the results achieved: the presence of older limestone, yielding dates that are too old; and long-lasting hardening in thick walls and phenomena of re-crystallisation, yielding dates that are too young.

Roman *pozzolana* proved datable with difficulty, along with hydraulic mortars with crushed ceramics or bricks. Mortars from Pompeii and Herculaneum, buried by ashes, have also turned out to be unsuitable for dating.

For evaluating the reliability of the results achieved, the mortar dating team has established some criteria, ordered according to the strength of the chronological information provided,²⁰⁰ and based on mutual agreement and/or consistency with other sources of data. The most reliable result is achieved when two or more fractions of the same sample agree in their individual results (Criterion I).

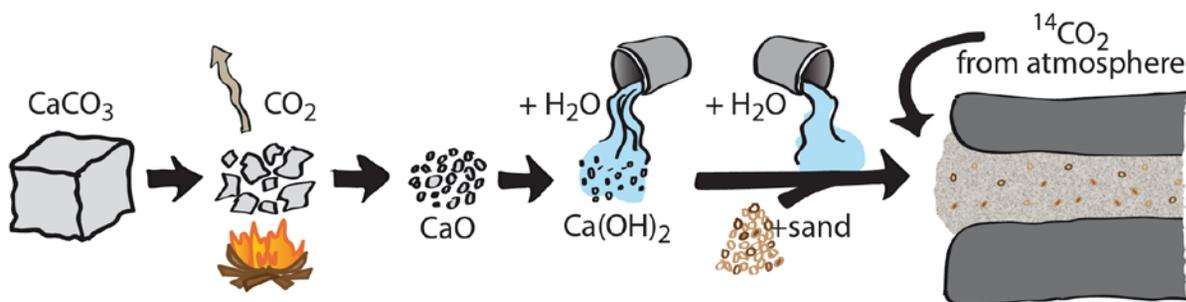


Figure 12: The principle underlying mortar-dating techniques (Ringbom *et al.* 2001)

¹⁹⁵ A different and promising approach to dating fired-clay ceramics, based on rehydroxylation, is proposed in Wilson *et al.* 2009. The first experimental tests showed reasonable standard deviations, well compatible with the necessities of Classical Archaeology.

¹⁹⁶ Liritzis, Vafiadou 2005: 31-35.

¹⁹⁷ The technique, frequently favoured and more widespread than OSL, is based on similar principles, the main difference being that the zeroing event is provided by a high temperature, commonly ceramic/brick production or successive heating, due to more or less dramatic events; see Martini, Sibilia 2002. For the effects of post-burial alterations on both TL and OSL dating, particularly on calcareous ceramic, see Zacharias *et al.* 2003.

¹⁹⁸ Ringbom *et al.* 2011: 188.

¹⁹⁹ See also Boaretto 2009: 277.

²⁰⁰ Ringbom *et al.* 2011: 193-197.

Among the case studies concerning Classical and Late Antique archaeology, the one which has seen the largest employment of mortar dating technique is the Portuguese site of Torre de Palma, up to now the largest Roman villa ever excavated in Iberia.²⁰¹

Here mortar dating has been combined with new excavations and with an overall review of the ceramic evidence (particularly *terra sigillata* and African red slip ware). Apart from some inconsistencies (possibly due to rough context selection or stratigraphic analysis on standing structures?), the technique by itself provided interesting results. Sixty-five samples were analysed, with eighteen fulfilling Criterion I requirements. Most of them provided chronologies with common radiocarbon standard deviations. Eventually, although some of them show fairly wide ranges, Bayesian approaches on coherent groups of dates may help to narrow the intervals making them suitable for Classical chronological standards.

At present, dating lime fragments embedded in the mortar yields the best results; it is cheaper and shows good possibilities for further development.

Concluding, the above-mentioned techniques can provide non-mediated dating for sediments deposition (OSL) or for structures construction (OSL, mortar dating), bypassing several theoretical problems; still, the chronological ranges provided and a series of limitations make the application of these techniques in Classical Archaeology, up to now, somewhat difficult. Hopefully in the next few years deficiencies will be corrected, making these techniques more reliable and affordable. In this sense, more attention should be paid by archaeologists and more trials are needed. For the moment, integrating the data obtained with other sources seems to be necessary; Bayesian approaches can supply a good basis for this integration, leading to some refinement in the chronological framework.

OSL, in particular, may turn out to be particularly appreciable for dating secondary deposits, especially the ones embedding few artefacts; in the case of primary deposits, particularly if containing sufficiently well-dated artefacts, the use of assemblages (samples included) will presumably procure more accurate dates.

III.3 A quantitative approach to assemblages

III.3.1 Introduction

It is an assumption of this book that the chronological data provided by the materials recovered in a given deposit can provide useful information about its formation processes. These, in turn, play a fundamental part in guiding the way in which we can date the deposit through the very same materials.

One may ask, if the chronology of the artefacts and the chronology of the deposit are two different issues, why should we focus on plotting the data provided by the materials? The answer is: the chronology of the artefacts cannot inform us *directly* of the date of the deposit (a mistake made too many times), but it can inform us of the processes involved in its formation, so helping to distinguish primary and secondary ones, and make better inferences about the chronology of the deposit itself.

For handling the chronological information provided by an assemblage, it is necessary to plot them in some way, but if we look at the bulk of the excavation reports published every year, we may conclude that it is not a common practice at all. Very often we do not even know exactly which and how many artefacts were recovered in each context/deposit. The idea itself that the chronology of the artefacts recovered within a given deposit may inform us of its formation processes does not seem to be very popular.

An empirical display of the chronological data provided by the artefacts contained in each context has been proposed in the recent publication of the excavations carried between 1997 and 2006 in the forum of

²⁰¹ Langley *et al.* 2011. Other useful sources on the site include Lancha, André 2000 and Maloney, Hale 1996.

the ancient city of Nora (Sardinia),²⁰² and this approach is now becoming a little more widespread. What follows may be seen as a development of this empirical/graphic method and represents one of the ways (not the only one) to formalise it.

Before discussing how to plot the data, it is necessary to examine some preliminary issues concerning the minimum number of artefacts, the quality of the chronological data we have, and the quantification method preferred.

III.3.2 Minimum number of data and sampling

Some basic concepts concerning the role of sampling in dating have been discussed in Chapter II.2.2.

As mentioned previously, a first important distinction must be made between those deposits that have been entirely excavated and those deposits that have been excavated only partially.

For entirely excavated deposits, we assume that all the sediments have been removed. What about the artefacts? Can we assume that they represent the totality ('population'), or just a non-random sample of the whole, affected in particular by factors such as size and visibility? We have to keep in mind that the aim of the study is the dating of the deposit. What really matters is the recovery of (good) datable artefacts, and practical experience teaches that, in general terms, it is very difficult to reliably date small body ceramic sherds. It does not mean that we can be less accurate in the practice of excavation and recovery of materials, but it means that the impact of small, very broadly or tentatively datable sherds is, in practical terms, not very effective in dating a deposit.²⁰³ In this case, we are interested in what is datable and we assume that, apart from a small percentage of materials unrecovered by chance or by human error, the very great majority of 'what is datable' is recovered. We assume the artefacts we are handling comprise a population and not a sample.²⁰⁴

A few words must be dedicated to a particular class of finds, namely coins. There are two main aspects which make them peculiar: the fact that they are, after all, well datable (we will return later to the problems concerning the dating of coins) and the obvious fact that they are generally small. In terms of evaluating the population with which we are dealing this implies that a number of potentially well-datable finds may have been unrecovered just because these are small. Apart from the uncommon silver ones and the very rare golden finds, the bulk of ancient coins was minted in copper alloys, which usually deteriorate, forming greenish, opaque coatings. This implies that the size is not balanced by a particularly striking colour.

The possibility of missing some important pieces of (chronological) information due to the non-recovery of a number of coins should be at least evaluated in every excavation where the metal detector is not extensively used in the field, or where sieving is not a systematic procedure.

In Aquileia, the 'House of *Titus Macer*', a broad idea of the percentage of unrecovered coins is given by the ratio of coins recovered during the excavation and the coins subsequently retrieved using the metal detector to screen the mass of sediments generated by the excavation itself. For reasons of time and money, sieving had been reserved for a few particular contexts and the metal detector was available only occasionally. The bulk of the coins turned out to be made up of small copper-alloy specimens, minted mostly between the 3rd and 5th centuries AD. During the investigations carried out from 2009 to 2012, 594 coins were recovered from secure, identifiable contexts (i.e. without accounting for those finds deriving from cleaning operations, humus, etc.). A coin hoard of 561 further specimens was recovered, but, as the coins themselves were all grouped together, it may be counted as one single element. In the

²⁰² Bonetto *et al.* 2009c.

²⁰³ Ceci, Santangeli Valenzani 2016: 26, with further references.

²⁰⁴ One may argue that carbons or bones sampled for ¹⁴C analysis represent just one part (a small one) of a hypothetically much larger population. The point is that this population would be impossible to evaluate. So, being more realistic, we can just say that our population includes everything we managed to date.

same period, 76 coins were recovered using a metal detector, which was used mostly on the surface of the mound of sediments produced by the excavation. The latter amounted to 12.77% of the total coin assemblage. Nevertheless, investigations with a metal detector, albeit carried out with great accuracy, were occasional and could not affect the core of the sediments that gradually accumulated. Therefore the proportion of coins not recovered during the excavation should be realistically considered as a minimum; this implies that although the sample of coins recovered during an excavation seems to be significant, a certain degree of uncertainty has to be considered.

Once it is assumed that we are dealing with a (more or less well defined) population, a second question arises: is the number of individuals of the population we are handling sufficient to perform some quantitative analysis? The answer, of course, is 'it depends'.²⁰⁵ Once the possibility of intrusions has been excluded, then, theoretically, even one single potsherd, coin, carbon or bone can provide a *terminus post quem*. We may argue that the minimum number of datable artefacts is one, but we have seen that the availability of a graph plotting the chronology of the artefacts may be particularly useful in trying to distinguish what kind of deposit we are handling. What can we infer from the plotting of one single sherd? Not a lot, of course. If we suspect that we are dealing with a primary deposit, one single sherd cannot confirm our assumption. When really dealing with a primary deposit, we may prefer to date it *ad quem*, but it is unlikely we can do that with any reliability on the basis of one sherd only.

A single sherd, once excluding the possibility of intrusions, can give a *terminus post quem*, but it is, in practice, useless on its own in terms of creating a graph. So, is it worth plotting, say, ten sherds? Perhaps, particularly if we suspect the deposit to be a primary one. The point is that the more data we have, the more reliable the graph we obtain from it. Conversely, the less data, the less reliable the graph.

In the literature, some estimation of a minimum number of artefacts employable for quantitative analysis has been attempted, but in this case the aim of the study was different (primarily the comparison of different assemblages): the suggested minimum number of artefacts varies from 30-60 diagnostic individuals to 260.²⁰⁶ Orton stressed that for these kinds of analysis (which are, it should be repeated, different from the one we intend to carry out) what really matters is quantity in relation to the proportion of a particular type.²⁰⁷

There would be another way to approach the problem, so as to get at least a very broad idea of the minimum number of artefacts necessary. We may take a large number of assemblages ('real' ones, or randomly generated ones to some degree), and, for each of them, pick up randomly a crescent number of dates. When the graph generated from time to time stops changing *significantly*, we can fix the minimum number of artefacts necessary to obtain a reliable result. By repeating this mechanism a large number of times, we would obtain an assessment of the minimum number of artefacts that would, generally, be required to create a reliable graph. That would be, indeed, a kind of Monte Carlo simulation (we will return to this later).

Nevertheless, the variability existing from deposit to deposit (*in primis* between primary and secondary ones), and from assemblage to assemblage, is so great that even this kind of indication would be misleading in many cases.

For the moment, it would be enough if each time a graph is produced, the amount of chronological data used was indicated, leaving us with the possibility of evaluating the level of reliability that might be expected.

²⁰⁵ Recently, with good reasons, C. Orton refused to suggest a specific value (Orton 2009: 70).

²⁰⁶ Slane 2003: 324.

²⁰⁷ Orton 1982: 17-18.

Let us move now to cases where we are not handling a whole deposit/layer, but just a part of it. This means we are not dealing with a population (the complete assemblage, the full pot of chronological data available) but we are dealing with a sample (just a spoonful of data).

First, it would be very helpful to have at least a broad idea of what percentage of the population we are dealing with. It means that we should estimate the volume of the whole deposit, compare it with the volume of the excavated portion, and, assuming the artefacts are not clustered within the deposit, use the drawn proportion to have an idea of the numeric consistency of the whole assemblage.

It seems to be a complicated, time-wasting business, and it may not always be possible to get the necessary data and consequently to have a general knowledge of the population handled; nevertheless, where one can gather the necessary data, an attempt should be made. It is very important to have an idea of the quantity of data we have if we want to evaluate the quality of the conclusions we draw.

Once we manage to have an idea of the (invisible) population, we may face two main cases: one in which we suspect that we are dealing with a primary deposit; and one where we suspect we are dealing with a secondary one. The conclusions we may draw, as seen in Chapter II.2.2, are very different.

If all the data we have for the sample (both qualitative and quantitative) point to the fact that we are handling a primary deposit with abrupt formation (see Chapter IV.2), we may conclude that we can safely employ them to get an *ad quem* date; this will be more or less precise or reliable according to the quality of the data we have and to the size (both absolute and relative) of the sample.

When we are likely to be dealing with a primary deposit with a continuous formation (see Chapter IV.3), i.e. we have artefacts distributed across a long time-span, some problems arise. Take the possibility we are dealing with a dump used for an unknown period. Which 'slice' of this period have we sampled? It would be rather difficult to determine it. In this case we can only reliably assume that the deposit we have sampled had formed during the date range suggested by the assemblage we have, but we cannot assume that dumping activities were not being carried out also before and/or later.

Facing the concrete possibility that we are handling a secondary deposit, things are different. We must start with the assumption that probably we may obtain only a *terminus post quem*. As observed in Chapter II.2.2, the question which arises is: did we catch the *tpq* with our sample? Is it likely that digging the whole deposit we would get a later *terminus post quem*? In other words, what is the probability that the *terminus post quem* for the formation of the deposit is actually later than the one we obtained?

The full nature of the issue and the problems that may arise are very well exemplified in a paper by M. T. D'Alessio. Investigating the chronology of the Casa delle Nozze di Ercole, in Pompeii, D'Alessio states: 'Più si scava in estensione più dati si hanno a disposizione, quando invece la stratigrafia conservata indagabile è poca, la cronologia sembra risalire'. The author refers mainly to the chronology of the structures pre-dating the great atrium houses of the ancient town. Although the difference between primary and secondary deposits is not mentioned, D'Alessio is clearly referring to secondary ones. The author suggests that small excavations provided dates that were older than the dates provided by larger excavations. Nevertheless it has to be stressed that if the dates acquired had been handled correctly, that is as mere *termini post quem*, the problem would not have arisen. Instead, a date which should have only fixed in the timeline a point after which the investigated event took place (the construction of the house) was used more or less as a *terminus ad quem*.

If the *termini* are employed correctly, more recent and older dates are not in contrast, all providing only *termini post quem*. In any event, even a *terminus post quem* has great utility within a whole sequence: thus, when dealing with deposits that were excavated only partially, the *terminus* can be used, but the possibility that it may shift to more recent periods has to be considered, and the actual meaning of *terminus post quem* must be kept in mind even more firmly.

III.3.3 Types of artefacts and different dates: the nature of data

A further, and important, issue has to be addressed before turning to the plotting of any profile, one concerning the nature itself (the quality) of the data we have. We have artefacts or ¹⁴C samples and we have their dates. But what do these dates refer to? To the production of the single artefact we are handling? To the diffusion of its type as a whole? It is a crucial point, because if we want to plot together the dates of the artefacts (or samples) we are studying, the dates must refer to the same ‘thing’. We cannot mix data of different intrinsic nature under the same label: this means that under the label ‘dates’ we cannot group dates referring to the production of specific specimens and other dates which refer to the general distribution of a whole group.²⁰⁸ Unfortunately, this is exactly the case with the data we usually handle. For instance, the chronology of an amphora is commonly related to the presence²⁰⁹ in the systemic context (among the materials circulating in a precise time-span) of one sort of amphora in one given place. Amphorae Dressel 20 were part of the systemic context from the Augustan age to the mid 3rd century AD. Differently, the date of a coin refers to the minting (production) of that one exact specimen. Similarly, the date of some stamped Samian ware usually refers to its production.²¹⁰ Radiocarbon dates refer to something still different, i.e. the death of the examined plant²¹¹ or animal. It is not just an issue of precision, but a qualitative problem (Figure 13).

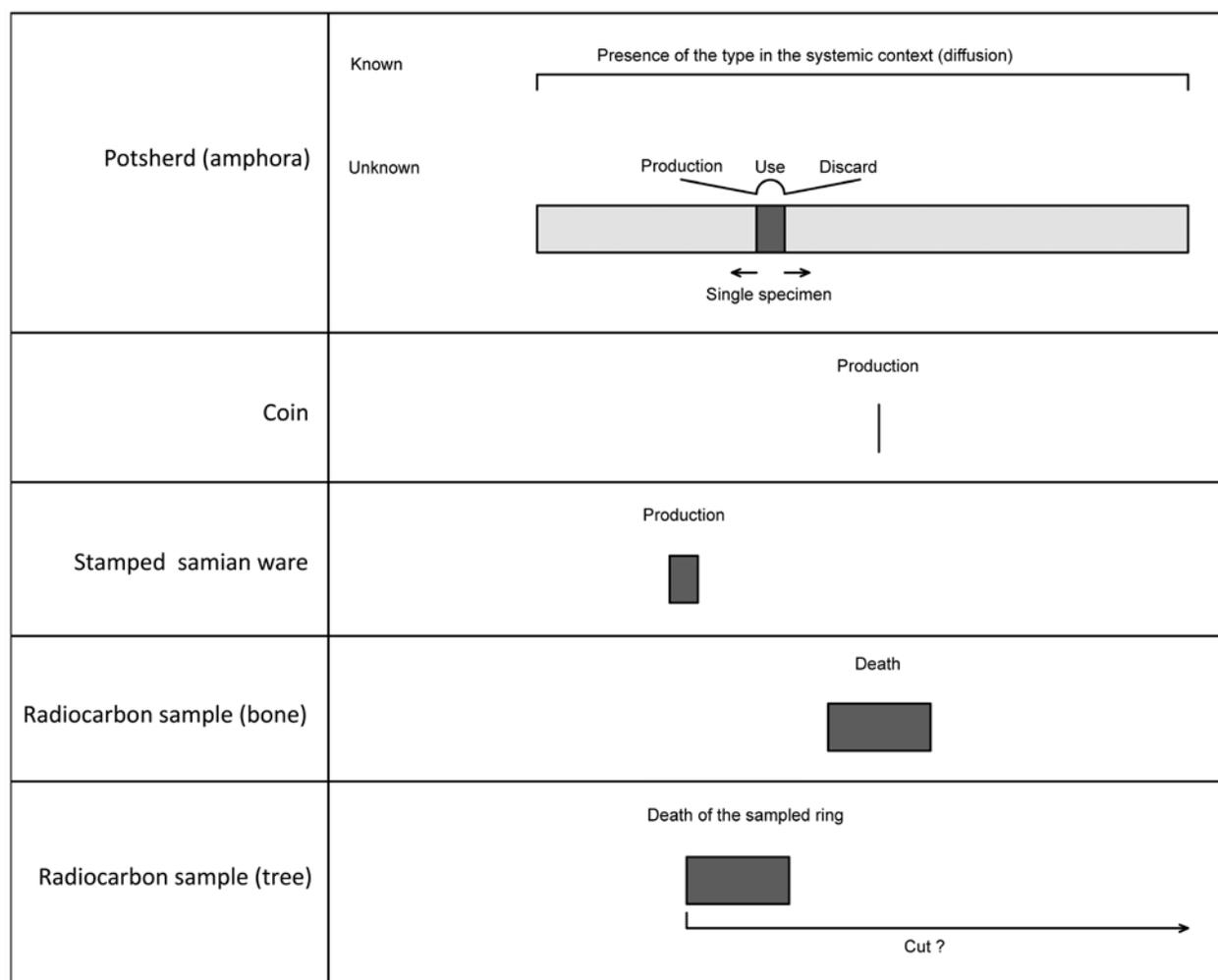


Figure 13: Different finds, different dates.

²⁰⁸ The topic is briefly addressed in Giot, Langouet 1984: 23.

²⁰⁹ That is what M. Millet defined as ‘aggregate lifespan’ (Millet 1987: 101).

²¹⁰ See Hartley Dickinson 2008: 4.

²¹¹ The issue, in the case of trees, is even more complicated: if the sample does not come from one of the external, living rings, we are not dealing with the date referring to the felling of the tree, but with the ‘death’ of that precise ring. The topic is discussed in more detail later.

How can we deal with such an inhomogeneous mass of information? There are basically two ways to challenge the issue. The first would consist in plotting separately different classes of data. But this practice would entail some serious disadvantages. First, in order to examine one single context or deposit we would need more than one graph; this is, substantially, a practical disadvantage. Second, the basic aim is to get one date (or two in the case of a primary deposit with a continuous formation) for the formation of the deposit. It means that once we produced, let us say, three or four different graphs, we would still face the problem of a unitary explanation and of a unique date.

A second way to challenge the issue of inhomogeneity is, of course, to make the gathered data homogeneous. This is surely the most difficult way and it entails many risks, as some parameters will be forcedly be, at most, best-guessed. There is also the double risk of creating false precision, or, conversely, of diluting precise data into something too vague. It is extremely important that this step involves specialists of each type of artefact or sample.

It would be extremely chancy to transform a date referring to the presence of a type in the systemic context into the date of the production of a precise specimen. That would inevitably lead to the creation of false precision, thereby biasing every plot built up.

Inevitably, we can only transform a date related to the production of a specimen into the date of its hypothetical presence in the systemic context. This means that we have to evaluate the length of the artefact's life after its production, 'broadening' the date we have towards a later moment in time. Fortunately, this process involves just those few classes of artefacts whose production dates are known. Nevertheless, some of these artefacts are particularly susceptible to forms of curation, primarily because of their own value.²¹² Therefore, a major problem arises when fixing a hypothetical date which stands between what can be referred as the most common period of use-life and what represents a process of curation.

Coins²¹³ represent the clearest case: we know, often very precisely, their date of minting. If we want to 'transform' the minting date into a date indicating the presence of the coin within the systemic context, we have to evaluate how long the coin circulated. In general, according to the value of the alloy opted for, we can conclude that the higher the value the most likely it is that the coin circulated (or was stored) for a long period. This means that gold coins are likely to have a longer use-life than bronze ones. Of course, such a broad indication is, in practice, almost useless.

An archaeological indicator of the length of 'a coin's life' seems to be its wear. G. Gorini, referring to the specimens found in *Regio X Venetia et Histria*, has attempted to quantify, at least coarsely, the correspondence between the two phenomena; he has given some useful indications (Table 1):²¹⁴

This is, of course, an empirical evaluation, coming largely from experience. It presents the indubitable advantage of being applicable to every single specimen; in this sense it is not generic, but specific. Nevertheless, this kind of evaluation seems biased by the actual incapacity of distinguishing wear due

Table 1: The relation between coin wear and coin circulation according to Gorini 1999-2000.

Wear	Life
Typological and weight features are maintained	Until 25-30 years after minting
A medium degree of wear: type and legend are recognisable, weight loss around 5-10%	Until 50-60 years after minting
The original type is vague and the coin assumes a lenticular shape	Until 100-120 years after minting

²¹² See Giannichedda 2006: 119.

²¹³ For coins and excavation, see, in general, Gorini 2002, Catalli 1997; Rizzi 1985. See also Poblome 2008: 194-199, for a contextual comparison of numismatic and ceramic data. See also Stella 2018.

²¹⁴ Gorini 1999-2000: 76-78.

to circulation from wear due to post-depositional factors.²¹⁵ Use-wear can be reliably observed only in similar specimens buried in similar conditions approximately at the same time, as in the case of coin hoards.²¹⁶ But unless (or until) it is possible to reasonably exclude a large range of factors (including type of alloy, different periods of deposition, physical-chemical features of the stratigraphic unit, etc.) it seems very difficult to apply firmly the evaluation of wear as the only tool in estimating the length of the circulation of a given coin²¹⁷ in a given context.

Fortunately, the study of coin hoards can be used to evaluate the use-life of coins also on a different basis. K. Lockyear examined the expected coinage pool (the composition of the systemic context of coins) in different periods from the mid 2nd century BC to 2 BC.²¹⁸ He used Crawford's method of die-counts and then compared the obtained results to the empirical observation of a number of coin hoards. He plotted the presence of coins minted in a given year in later hoards, so, basically, allowing a broad estimation of the use-life of specimens minted in a given year.

It has also been observed, for instance, that hoards put aside in the early 4th century AD rarely contain coins more than 20-30 years old;²¹⁹ this element implicitly gives us an idea of the average use-life of the coins hoarded. A similar approach has also been proposed in the already cited 1979 paper by P. Crummy and R. Terry²²⁰ (Figure 14).

The cross combination of such information and the careful and contextual observation of wear may hopefully bring numismatists to a broad estimation of the use-life of the specimens recovered during the excavation. It is not a very common practice at all and it presents clear risks, but it is a path which that has to be followed (in ceramics studies as well) if we want to make better, more substantial, and more realistic chronological inferences about the deposits and the assemblages we study.

Suppose we have a group of early 4th-century coins, still highly legible and close to the expected weight; adding to the minting date a life-time of about 15-30 years seems to be reasonable, and more realistic; most importantly it would also allow us to move from the date of the production of a coin to the date of its presence in the coinage pool (i.e. the systemic context). Clearly, it is an estimation that has to be attempted by the experienced numismatist, in collaboration with the excavation team. In this case, we assumed that after 15-30 years the coin, if not discarded, may have been curated or become a residual, and we consequently fixed an end date to its use-life.

One last thing has to be noted in terms of coins: if the *terminus post quem* for the formation of a given deposit is procured by a coin, and if it is clear that the coin circulated at least for a given period, the *terminus post quem* for the formation of the deposit should be moved forward as well.

Slightly different problems emerge as we turn to examine stamped fine wares, such as *terra sigillata* (also known as Samian or Arretine) ware. In this case, the date is usually referred to the production of a given group of stamped wares,²²¹ but of course it cannot be as precise as the date of the minting of a series of coins: date ranges can be very narrow, but they refer to a period of some years, more than to a single year. For instance, we know that the Gallo-Roman Samian ware specimens marked in different ways by the potter *Ambitoutus* were produced between AD 130 and 160.²²²

²¹⁵ DeRose Evans 2013: 113.

²¹⁶ See Duncan Jones 1994: 180-192, and the more updated, statistically structured Hoyer 2013.

²¹⁷ In any event, the evaluation of coin wear has been used as a chronological refinement tool in Bonini 2004, and it seems to have provided dates consistent with the other available dating sources.

²¹⁸ Lockyear 1999.

²¹⁹ Lockyear 2012: 197. A similar trend is observed in Guest 2007: 298; a significant proportion of the coins lost in c. 450 AD had been in circulation for 30-50 years.

²²⁰ Crummy, Terry 1979.

²²¹ Hartley, Dickinson 2008: 4, 28.

²²² Hartley, Dickinson 2008: 180-181.

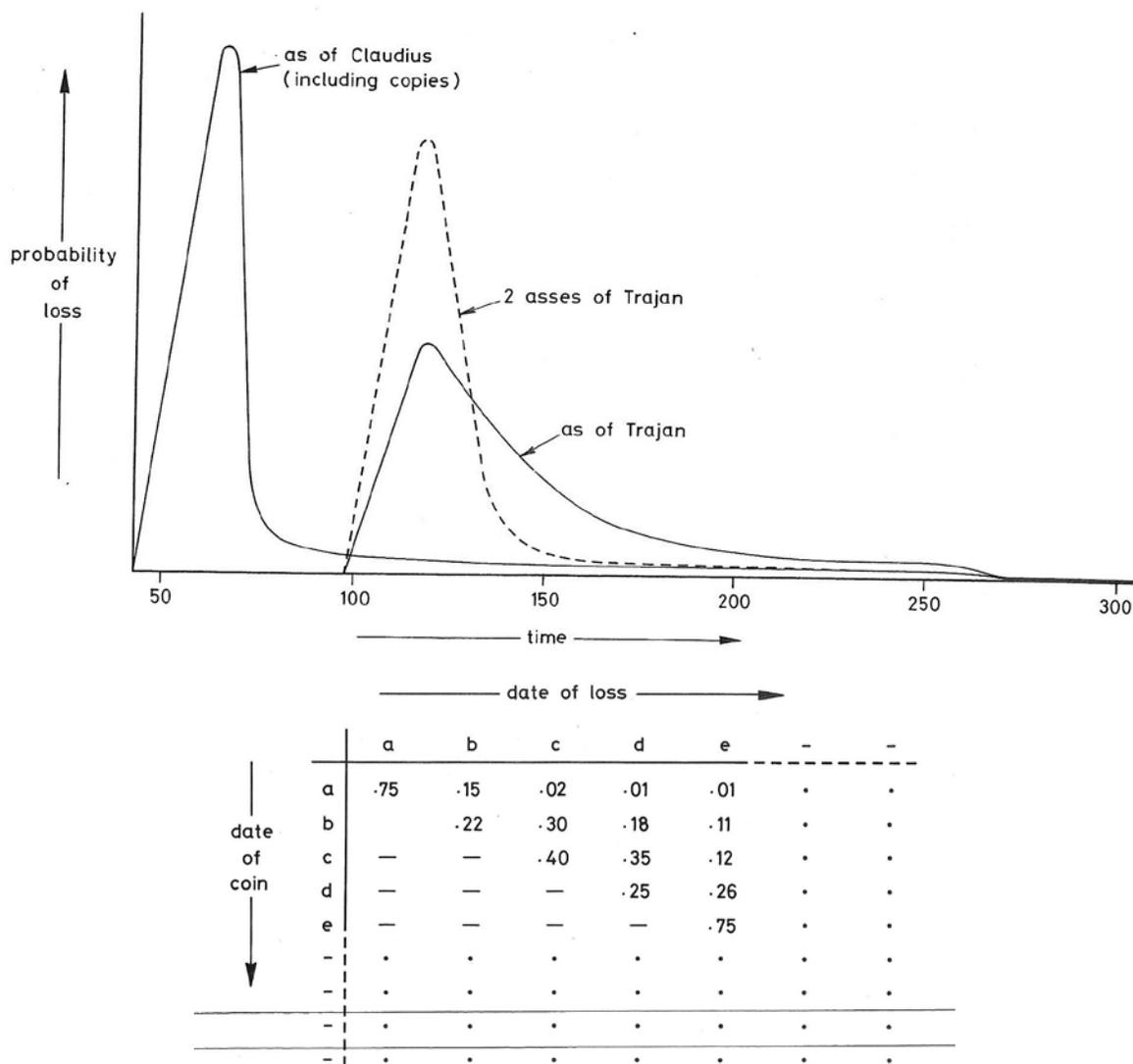


Figure 14: The P. Crummy and R. Terry modelling of coin loss (Crummy, Terry 1979).

Since the date we are dealing with refers to production, we are forced to investigate the common use-life of these kinds of artefacts; nevertheless, in this case, the starting point is not represented by one single year, but by a period more or less wide. Clearly, the additional use-life time-span we have to formulate must be applied starting from the date of the end of the production.

What information do we have about the use-life of this class of vessels? T. Peña discussed the cycle of production–use–discard–reuse of some different classes of pottery, trying to give to the model obtained a chronological perspective.²²³ Unfortunately, among the classes discussed, fine ware is not mentioned, but the problem of the life of this class of vessels has been addressed in other works (although, in general, it has to be stressed that not much work deals with this topic in the current literature).

Interesting suggestions come from a work by C. Wallace dated to 2006.²²⁴ The author examined the presence of Samian ware in a number of Romano-British graves and in other selected contexts to highlight the presence of vessels that were commonly dated to a period prior to the burial. This gap may range from ten years to more than a century or two, reaching a peak when Samian ware is recovered in

²²³ Peña 2007: 322-337. See also some earlier works (Deboer 1974; David 1972; Foster 1960) and more recent papers (Shott 1996; Mayor 2003; Giannichedda 2006: 107).

²²⁴ Wallace 2006.

Early Medieval burials. For South-Gaulish examples the ‘time drift’ varied from 30 to 60 years.²²⁵ Apart from the possibility of multiple depositions,²²⁶ the omnipresent chance that infiltrations occur,²²⁷ and the selection/curation processes involved in funerary practices, the author raises the larger question of Samian dating, circulation and long life. We should not be very surprised that such vessels, surely of some value, particularly if compared to others, were commonly preserved with some care;²²⁸ furthermore, their use did not entail great mechanical stress, reducing the possibility of premature breakage. These aspects alone surely contribute to a longer use-life than amphorae or coarse wares. Even in this case a few more indications may come from wear studies, but at present this is an almost unexplored field.

Apparently, we may say that one of the best chronological tools commonly used in Roman archaeology is particularly affected by processes of particular care. But when does a reasonably common care stop, giving way to practices that can be certainly defined as a form of curated behaviour? Again, the answer can be only tentative. Possibly, when the dates we have are related to the production of a particular kind of fine ware (as is the case with many stamped – and non-stamped – Samian wares), we may safely add about 10-30 years to the proposed time frame to account for the concrete possibility that vessels of this kind were commonly used for a long time.

Ultimately, in this case as well as for coins, we have to keep in mind that we are adding a certain percentage of uncertainty to the equation and not some false certainties.

Even more difficult issues arise when dealing with radiocarbon samples. This is not the place for retelling the principles, history, and general implications for the whole discipline of the radiocarbon-dating technique in archaeology.²²⁹ It is more relevant, however, to focus on a key point: radiocarbon-dated samples present specificities, but they also share fundamental traits with the other sources of chronological data: they can be either residual or false residual, they can be intrusive, or they can be synchronic with the depositional event in the same way a potsherd or a coin can.

The study and use of radiocarbon samples often proceed separately from stratigraphic analysis or from the study of ceramic assemblages. Dating samples has become more and more sophisticated, but their proper use, together with other sources, for dating events of interest, still has a long way to go. Fortunately, what has been called the third radiocarbon revolution, i.e. the introduction of Bayesian statistics,²³⁰ is leading, during these last decades, to the increasing interaction and structured combination of different sources of chronological information, particularly between the typical prior belief produced by excavations, that is a relative chronological sequence, and the analytical data provided by laboratories. This interaction is now able to produce high-definition chronologies, dramatically improving the accuracy of radiocarbon dates. In the near future, the Bayesian combination of different sources of data may be even more effective, also better integrating the data produced by assemblages.

Nevertheless, even powerful Bayesian statistics can be fully and correctly exploited only if the taphonomy of every dated sample has been evaluated.²³¹ Again, what counts is the link between what is dated and the deposit containing it (formation processes). Although this aspect is widely recognised and discussed, it has been noted that still too often the issue is poorly addressed or avoided all together.²³²

²²⁵ Wallace 2006: 260.

²²⁶ See, for instance, Vanzetti 1992 and Gambacurta, Ruta Serafini 1998. In Roman cemeteries, burial re-openings seem to be less attested. This may be due to the actual, scarce diffusion of this kind of ritual or to less careful stratigraphic examinations. Nevertheless, some clear examples are available. In Padua, tomb 39 from the cemetery of via Tiepolo - via S. Massimo, dating to the early Augustan period, was certainly reopened to reunite the family members (Rossi 2014: 32-61).

²²⁷ See two classic examples concerning cremation burials in Leonardi 1986 and Cupitò, Leonardi 1999.

²²⁸ A similar pattern is suggested in Mogetta, Terrenato 2007: 118. A use-life for Samian ware imported to Armorica of about 10-15 years is suggested in Giot, Langouet 1984: 23. Common forms of curation for fine wares (10-50 years) are also suggested in Zanini, Costa 2011: 36 and 40; Schindler Kaudelka, Zabezhlicky-Scheffenecker 2007 (indeed a wonderful example of ethnoarchaeology); Schindler Kaudelka 2010, in particular 475.

²²⁹ See the updated Taylor, Bar-Yosef 2014. See also Bayliss 2009: 123-127 for a critical overview, and the classic Libby 1955.

²³⁰ Buck *et al.* 1996; Bronk Ramsey 2009.

²³¹ Boaretto 2009; Bayliss 2009: 129-130.

²³² Ambers 1994: 7; Bayliss 2009: 125 and 130.

Besides these general considerations, we have to clearly distinguish different types of samples, each one presenting peculiar problems and potentialities in terms of chronological inference. The most common samples are bones, wood, and seeds.²³³

Bones. The dates we have from laboratories reveal when the body (human or animal) died. Theoretically, this is the simplest case, as the time frame we have is directly related to a precise event. Indeed, bones should be a privileged target; curation processes can be also considered very rare, except for the case of bone artefacts. These last deserve some special attention: even though there are no elements for claiming for curation, it has to be stressed that we assume that the death of the animals from which the bones derive and the production of the objects are temporally close (a few years at most?) events.

Wood. This is probably the most complicated case.²³⁴ The date indicates when the sampled ring ceased to exchange carbon with the atmosphere. Apart from episodes of sudden fire and from extraordinary preserved timbers, the most common wood we collect during excavations is recovered in small, charred pieces. Two main problems arise in this case:

The first is that we do not know where the carbon comes from. If it had any structural function, it may have been in place for decades before being burnt and incorporated into the sediments where we finally dug it out. As a piece of furniture, the process may have been similar.²³⁵ Moreover, as will be examined in Chapter III.4.1, wood was recycled in antiquity in the same way it is recycled today. Certainly, the wood usually gathered for fuel was comparatively young,²³⁶ gathered directly from trees or bushes, but we cannot say this was a rule.²³⁷ This issue has to be addressed both by the archaeologist and by the archaeobotanist.

A further problem is that we may get the outer rings of the branch/trunk or we may not get them. In the second case the date we can obtain is indeed a mere *terminus post quem* for the cut of the plant the sample comes from. In other terms, if we sampled one internal ring, belonging to an old tree, the difference between the date provided by the sample and the actual moment at which the plant was cut (or when it fell) may be substantial. If the sampled ring belonged to a young twig, the difference may be irrelevant. This issue has to be addressed by the archaeobotanist and may be modelled mathematically.²³⁸ Again, we have to keep in mind that the sample itself, if coming from a secondary deposit, would provide just a *terminus post quem*, and this is for the archaeologist to deal with.

The combination of the two factors (the so-called ‘old-wood’ effect – see also Chapter III.4.1) leads to different degrees of chronological uncertainty: if we have a sample presenting outer rings, and which is unlikely to have come from a long-lived structure, we can use the sample to date a primary deposit *ad quem*. A sample without outer rings, perhaps coming from a long-lived structure, will yield just a *terminus post quem*, even for a primary deposit. The gap separating the *terminus post quem* and the actual moment of formation of the studied deposit may be considerably wide.

Seeds. Seeds are very suitable for radiocarbon dating,²³⁹ as they were usually not stored for more than one season/year; if recovered in a primary deposit, they can provide excellent *ad quem* dating.

²³³ Clearly, other less common types of archaeological materials are suitable for radiocarbon analysis, e.g. shells, textiles, hair, lime mortar, etc. (see Chapter III.2).

²³⁴ Gillespie 1986: 25; Waterbolk 1971.

²³⁵ See Schiffer 1995b, 112 for an extremely interesting contemporary comparison, demonstrating how, also within a society usually assumed to be a ‘waste maker’, such as the American one, reuse affects the vast majority of pieces of furniture. For an exceptional example of reutilisation of archaeological wood, see Giot, Langouet 1984: 115.

²³⁶ Waterbolk 1971: 22.

²³⁷ See the extremely interesting reconstruction of Pompeii’s economy of wood and charcoal provided in Veal 2012.

²³⁸ Waterbolk 1971: 21.

²³⁹ Waterbolk 1971: 21.

As observed for stamped wares and coins, plotting together with the other available data, the dates returned by the laboratories without any critical evaluation may be seriously misleading, particularly creating false certainty where it actually does not exist.

Wood, in particular, seems to create serious problems in directing us to ages which may be too old, basically unrelated to the moment of formation of the deposit investigated. As suggested for other classes of data, and particularly when dealing with structural timber or samples from pieces of furniture, it may be reasonable to extend (together with the archaeobotanist) the time frame revealed by the laboratory, before plotting it with all the chronological data available.

III.3.4 The quantification method

Discussing how to count the data we have may seem excessively pedantic, nevertheless the topic has to be briefly addressed, at least because of the existence of a huge body of literature concerning how to quantify ceramics,²⁴⁰ the main source of dates. The issue arises from the simple fact that vessels recovered in the archaeological record are usually reduced to fragments. A wide range of factors and phenomena affect breakage rates and modes, so simple sherd counts have been questioned as to whether it represents the most appropriate tool to estimate ancient economic trends, trade volumes, and so on. Furthermore, comparing assemblages and classes within assemblages is complicated because of the different nature and size of the investigated deposits and because of different breakage rates for different classes/types. In response to these problems, many techniques have been developed, ranging from the simple weighing, to the estimation of the vessel equivalents (EVE), and including the estimation of the minimum and maximum number of vessels, rims and/or bases counts, etc.

These are procedures which are, unfortunately, still not very common in Italian Classical Archaeology, and which should become a much more standard practice, so as to enhance many of the conclusions we draw, for instance, about ancient economy.

Nevertheless, as noted above, these techniques were developed mainly to compare assemblages; it has been stated that they have little value in breaking down one single assemblage.²⁴¹ They were not developed to model inferences about formation processes and dating deposits. What we are handling when plotting the dates of the artefacts embedded within a deposit is 'simple' information, and we can say that every single, dated sherd corresponds to one piece of information. Clearly, joined fragments must be verified before proceeding, to avoid false redundancy. This would lead to a preference for simple sherd counts.

There is also a very practical reason for which it seems better to choose sherd counts: in this way, no piece of information is overlooked, while most of the other quantifying techniques use only rims and/or bases. Take the case of an assemblage largely made of a variety of materials dated to the Roman Republican period. In the case that two or three body sherds of a Late Antique amphora were associated to these materials, their presence would not be counted via EVE, MNI (mni), thus severely biasing any consideration about the chronology of the associated deposit.

In the end, the use of sources of data (coins, bone radiocarbon samples) that are not broken into pieces makes a parameter, such as weight, useless. Even a mixed approach presents severe disadvantages: counting

²⁴⁰ See, in particular, the huge body of literature produced by C. Orton: Orton 1975; Orton, Orton 1975; Orton 1978; Orton 1980; Tyers, Orton 1991; Orton, Tyers 1992; Orton 1993; Orton *et al.* 1993; Orton 2000; Orton 2005. See also Vince 1977; Millet 1979; and the more recent Cortese 2006.

²⁴¹ Orton 1982: 1.

coins and samples and quantifying ceramics by, let us say, minimum number of vessels, is still incorrect, as, again, it would exclude some potentially useful sources of information, such as datable sherds with no rim or handle or base.

One simple, common way of quantification, bearing in mind a variegated panorama of sources of information, seems to be recommendable, and that is why, ultimately, it was preferred in this study to quantify data by simple count.

III.3.5 A chrono-formative profile: South formula, aoristic sum, weighted mean sum and Monte Carlo simulation

Once the quality of the chronological data has been evaluated and made uniform, and once it has been decided how to quantify it, it is possible to express the information gathered in a cumulative and synthetic way.

The starting point is basically a series of pairs of values, each one indicating:

- (1) the older possible date for the entrance of each artefact (or sample) within the systemic context; and
- (2) the more recent possible date for its exit from the systemic context (abnormal curate behaviour excluded).

We may say that the two dates indicate the extremities of the (more or less narrow) chronological window in which we know the artefact *may* have lived.

This first level of representation has been expressed graphically, for instance, by the tables supplied by the already mentioned publication of the excavations of the forum of Nora (Figure 15).

Within each gap, the related artefact was manufactured, used and discarded, and this may have happened throughout the whole period indicated, or, much more often, in a narrower, unknown time lapse located within the gap.

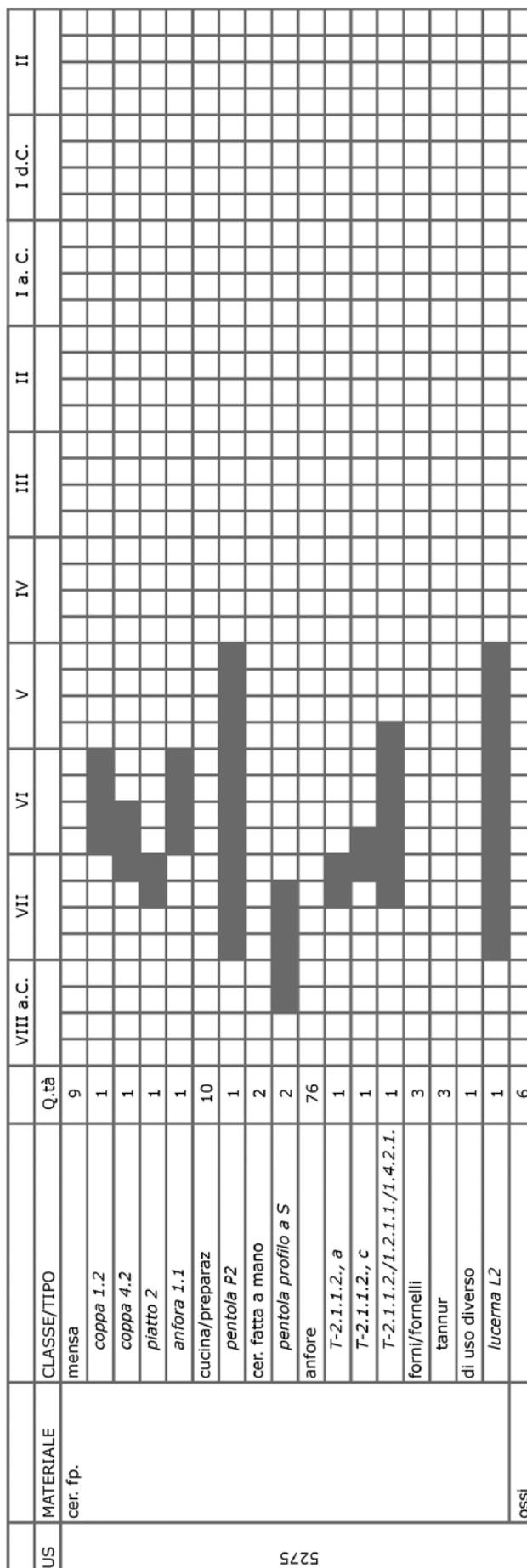


Figure 15: One of the tables provided in Bonetto et al. 2009c.

This graphical device has the undeniable advantage of being very clear and analytic, providing an excellent overview of the quality and quantity of all the finds recovered within a context/ deposit. It is definitely an invaluable tool for publishing, but as an inquiry tool it displays some disadvantages:

1. it is graphic and not numerical, so making statistical modelling difficult;
2. it is analytic, but not synthetic (which periods are represented to a degree by the finds can be observed only roughly, in an 'impressionistic' way); and
3. it is rigid, as it has to employ one fixed measurement unit (in this case time is divided in 'boxes' of 25 years), possibly not too small.

Referring further to the latter point, the length of the 'boxes' used determines the accuracy of our final knowledge, and it is a direct function of the quality of the available data: the more accurate the initial find dates, the more accurate the sum of the whole body of information will be. Having closely dated finds and using boxes which are too big would lead to a waste of good information; on the contrary using a narrow grid for broadly dated materials would represent a waste of time (see Chapter II.2.8). A critical point arises when considering that the quality of dating of different types of artefacts may be very inhomogeneous. This implies that the length of the breaks we use has to be carefully evaluated in advance. This point will be returned to later, as it represents a serious disadvantage of some types of representation, lacking the flexibility needed to fit the available data properly.

To obtain a more effective tool, it is possible, of course, to start expressing the same list numerically. For instance, the graphic table in Figure 16 can be easily expressed as follows in Table 2.

US	MATERIALE	CLASSE/TIPO	Q.tà	VIII a.C.	VII	VI	V	IV	III	II	I a. C.	I d.C.
	cer. fp.	mensa	243									
		<i>coppa 5.2</i>	1									
		<i>coppa 6.1</i>	1									
		<i>coppa 10</i>	1									
		<i>coppa tripode</i>	1									
		<i>brocca 2</i>	1									
		<i>cucina/preparaz</i>	26									
		<i>pentola P2B</i>	1									
		<i>pentola P7</i>	1									
		<i>cer. fatta a mano</i>	1									
		<i>teglia</i>	1									
		<i>anfore</i>	61									
		<i>T-2.1.1.2., a</i>	1									
		<i>T-1.2.1.1., a</i>	1									
		<i>forni/fornelli</i>	9									
		<i>tannur</i>	9									
	ossi		19									
	conchiglie		1									
5148												

Figure 16: A further table provided in Bonetto et al. 2009c.

Table 2: Numerical transposition of the graphic table reported in Figure 16.

Entrance	Exit
-650	-575
-650	-550
-650	-550
-700	-600
-650	-500
-625	-550
-300	-100
-750	-600
-650	-600
-625	-575

Nevertheless, the main questions to be answered are: how can this body of data be expressed to show which periods of time are represented to some extent? Is it more likely that there are more 7th- or 6th-century materials? And how many more? How does the chronology of artefacts fluctuate through time? Can we detect any peaks, or, conversely, unrepresented periods? As a result, we will be able to inquire about the meaning of the detected fluctuations.

In answering these questions we need to express the information gathered in one single plot; in other words, we have to move from analysis to synthesis. In these terms, this issue has never been fully analysed (apart from the suggestion of a ‘triangular model’, see below), but some useful tools have been preferred in fields extremely close to the one we are examining, such as the study of residuals, the study of artefacts recovered in surface surveys, and the examination of the overall distribution of whole ceramic types or classes through time and space.

A first approach, initially used by S. South for studying the length of periods of site occupation,²⁴² was then applied by A. Martin to residuals.²⁴³ It is commonly known as the South formula and employs the median date of the ‘popularity’ window of each type (a date in the middle of the known gap) to create a median date of the artefacts studied. The approach provides that the median date of each type distribution is multiplied by the number of sherds of that type. The sum of the products is divided by the total number of sherds.

This approach presents serious disadvantages. First, it takes neither variability nor uncertainty into account, *de facto* cancelling the heterogeneity that we want to plot (and which is the most informative tool we have); and also it assumes a normal distribution of a type through time, with a maximum frequency in the middle of time lapse considered. The distortions that this view may introduce in ceramic studies will be discussed later, but for now it suffices to add at this point that cumulative frequency and ancient economy fluctuations are not considered.

These disadvantages make this procedure of little help when describing the chronological information provided by the artefacts and samples embedded within a given deposit.

An alternative, much more robust way of elaborating the data has been proposed by N. Terrenato and G. Ricci: it is referred to as the ‘weighted means sum’, and is, basically, a more elaborate form of aoristic sum.

The aoristic sum seems to have been first introduced in police investigations, as a means to model the frequency of crimes in the space of a day. The issue arose because often the interval in which a crime (thefts in particular) occurred was known, but the precise moment it happened was unknown. Once a full day is divided into convenient intervals (or ‘search blocks’; say, for instance, that one day is divided into 24 blocks lasting one hour each) and once start and end points are conferred to each event (incidents, i.e. thefts), search blocks are weighted accordingly: incidents with longer time-spans are less likely to have occurred within a precise search block.

The result is a histogram showing accumulated temporal weights, i.e. exactly what we are looking for. In other words, for each block we have a sum of probabilities, known as the aoristic sum. The histogram thus suggests which periods, over the span of a day, are preferred for committing a crime and can be considered as more at risk (Figure 17).

²⁴² South 1972.

²⁴³ Martin 1998.

The same procedure is the basis of the method suggested by N. Terrenato and G. Ricci, and which has been applied to the study of residuality in some contexts of the northern slopes of the Palatine Hill in Rome²⁴⁴ (Figure 18).

The main difference from ‘straight’ aoristic analysis is the introduction of a quicker procedure where we have more sherds (thefts or incidents in the example cited above) with the same start and end points. The number of sherds is directly divided by the number of boxes covering the time lapse. Suppose that we have four sherds dated AD 100-225 and that we intend to use boxes of 25 years (Table3).

Clearly, we just divide the number of sherds (4) by the number of boxes (5) to have the value corresponding to each box (0.8).

Although used from time to time, this method has never become a common, widespread means for representing the chronological information embedded in strata. Apart from the study of residuals, it has been used for creating ‘dating profiles’ of entire sites in spatial analysis projects²⁴⁵ (Figure 19), of whole periods in excavation reports,²⁴⁶ or, as already discussed, it has been used to quantify the overall production and distribution of mass-produced pottery.²⁴⁷

Indeed, this method provides a very good way of showing the dating profile of artefacts or samples collected within a context or a group of contexts. Informative wealth is maintained and presented in a synthetic way. These profiles can be used, without any doubt, as a useful tool for characterising deposits according to the chronology of the embedded artefacts. Nevertheless, they still present some shortcomings which are due to be corrected. For example, they present a value on the y axis that does not correspond to a number of artefacts, but which just indicates a sum of weighted means, i.e. a value of probability. This makes it more difficult, for archaeologists in particular, to get a concrete idea of the number of materials circulating in a given period. In brief, it is simply less comprehensible.

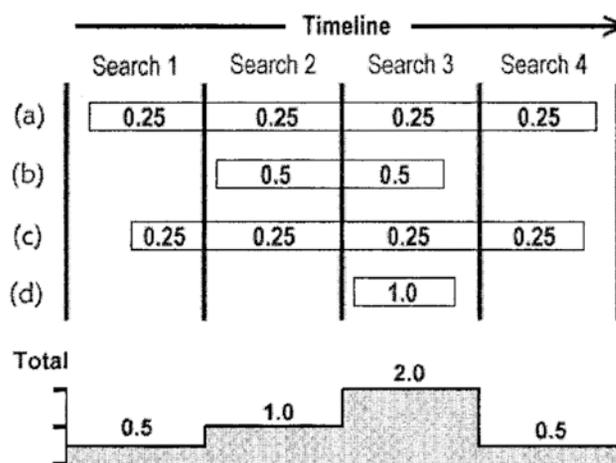


Figure 17: Aoristic analysis (Ratcliffe 2000).

Table 3: Weighted mean sum: four sherds dated AD 100-225 and 25-year time brackets.

Sherd 1	0.2	0.2	0.2	0.2	0.2
Sherd 2	0.2	0.2	0.2	0.2	0.2
Sherd 3	0.2	0.2	0.2	0.2	0.2
Sherd 4	0.2	0.2	0.2	0.2	0.2
Sum	0.8	0.8	0.8	0.8	0.8

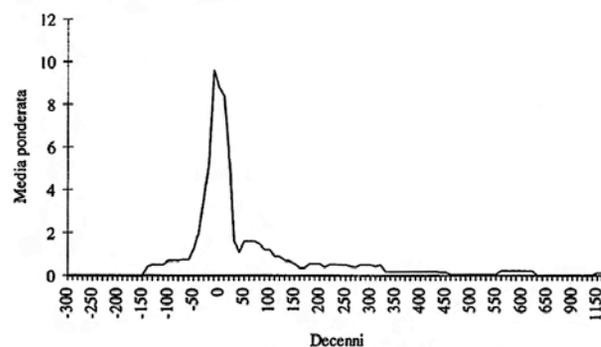


Figure 18: Weighted means sum used for the analysis of an assemblage of 78 items (US 5150) from the northern slopes of the Palatine Hill, Rome (Terrenato, Ricci 1998).

²⁴⁴ Terrenato, Ricci 1998. The method has also been favoured by other scholars, but surprisingly it seems that Italian and anglophone scholars did not interact very much. The work of N. Terrenato and G. Ricci seems never to appear among the references in anglophone works. E. Crema (2012: 447) suggests that aoristic analysis was first introduced in archaeology by I. Johnson (2004), but the paper by N. Terrenato and G. Ricci is far older. On the other hand, recent papers by anglophone scholars do not appear among the references of Italian papers, still referring mainly to Terrenato and Ricci. The two Italian scholars, in turn, apparently draw on older works by G. Marsh and the ‘London School’ (see Marsh 1981: 181, Symonds 2008).

²⁴⁵ Millet 2000. The method has been favoured by A. Roppa in his survey of urban and rural communities in Hellenistic Sardinia (Roppa 2013: 104-107).

²⁴⁶ Argento, Di Giuseppe 2006: 34-36.

²⁴⁷ Fentress, Perkins 1988; Fentress *et al.* 2004; Lund 2005; Bess, Poblome 2006. A more sophisticated form of aoristic analysis, using different statistical distributions, is presented in Willet 2014 (see below).

They also transform our preliminary uncertainties about the dating of each artefact into some kind of certainty (but multiplied uncertainties should increase more than decrease the overall uncertainty level).

This last point has been discussed by E. Crema and it represents the main input for finding different ways of representation: ‘[When] the input data are probabilistic, the output data should also be probabilistic. This implies that the aoristic sum could be a misleading approach, as it will obscure possible alternative time series by showing one possible dynamic which is not necessarily the one with the highest chance of occurrence’.²⁴⁸

In his paper, focusing on variations in the temporal patterns of Japanese Jomon pit-houses, E. Crema challenges the topic from its very basis and suggests a possible way out. Mathematically, probability calculus, based on the multiplication rule, would be the best way to address the problem. We know the probability that two independent events occurring at the same time is equal to the product of the probability of each event. Even so, the number of permutations that should be performed even for small numbers of blocks and events cannot be computed. Fifty events with a time-span of just four temporal blocks would have $1.27 \cdot 10^{30}$ permutations.

So, if cumulative probability is misleading, exact probability is practically impossible. The way out suggested by Crema consists of moving to a simulative approach, and here the Monte Carlo method offers a ‘simple but effective approach’.²⁴⁹

This method has already been applied in archaeology,²⁵⁰ but never to the study of the chronology of artefacts within a deposit, even if its possible use had already been suggested by C. Orton.²⁵¹

D. L. Clarke, in the early 1970s, defined the Monte Carlo technique as a tool to ‘suggest solutions to stochastic problems by employing sampling experiments upon a simulated model of the process under investigation’.²⁵² In our case, the basic assumptions are the same as for aoristic sum analysis: we have events (types diffusion) and we have time blocks (5, 10, 25, 50 years); we do not know when the sherds we are handling have actually lived within their range of diffusion. Finally, we want to look at all the information and examine which boxes are represented and to what extent.

Let us take one single event and divide it into boxes, each having the same probability of ‘containing’ the actual life of our sherd.²⁵³ We randomly pick up one of the boxes; then we repeat the process for each sherd (event) we have. Basically, we have just simulated a temporal pattern; clearly, one simulation run is almost meaningless. But if we repeat this simulation, say, 50, 100, or 1000 times, we acquire an increasingly higher probabilistic value. The analysis can stop ‘when we start to observe a relatively good degree of convergence [...] or when the standard error of our results becomes minimal’.²⁵⁴

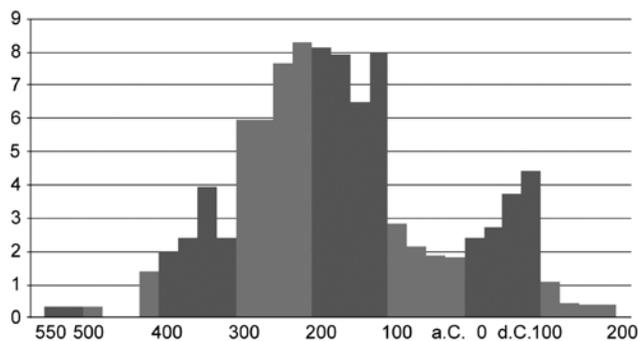


Figure 19: *Riu Mannu survey project*, Sardinia; the ‘dating profile’ for site 05A (Ingraxioris), based on the study of 95 dated specimens (Roppa 2013).

²⁴⁸ Crema 2012: 449.

²⁴⁹ Crema 2012: 451.

²⁵⁰ Buck *et al.* 1996; Lake, Woodman 2003; Crema *et al.* 2010; Crema 2012; Baxter, Cool 2016 (an interesting case study concerning the distribution of brooches in Roman Britain, in which some of the issues here addressed are also assessed); Orton *et al.* 2017 (concerning fishbone remains); Furlan 2017 (concerning the impact of waste management in Roman times in shaping the *intra moenia* urban assemblages).

²⁵¹ Orton 2009: 69.

²⁵² Clarke 1972: 24, recalling Haggett 1965: 58-60 and 97-98. The application of the Monte Carlo techniques was suggested for solving problems in spatial analysis.

²⁵³ Uniform distribution and other forms of distribution are discussed later.

²⁵⁴ Crema 2012: 451.

If the cumulative result of the simulation run is plotted, having time (divided into boxes of adequate density) on the x-axis and the simulated number of artefacts on the y axis, the resulting graph no longer shows a single line with peaks and troughs, but a band which is more or less wide according to the quality of the data used. A larger band implies the poorer the quality of the input (broadly dated vessels, scarce materials); a thinner band, conversely, is produced by a good number of good dates. This makes the evaluation of the overall quality of the dates on which the graph is based much easier and more explicit. Uncertainty is considered and formalised, and the final result fits the data more accurately.

The two main problems presented by aoristic sum analysis (uncertainty management and moving from probability to artefacts) are consequently solved. The Monte Carlo method is also flexible and can be improved and modified with more *a priori* knowledge to obtain more accurate and realistic simulations. As this method can be modelled and performed automatically using programmes for statistics (for instance 'R'),²⁵⁵ add-ons can also be modelled and automated to reduce significantly the time taken.

For instance, instead of single years, we may decide to pick up periods of different length according to the known ordinary lifespan of each type (let us say 15 or 25 years for *terra sigillata*, 5 years for amphorae, 2 years for common ware, and so on...). We can also easily divide time into narrower boxes if the available dates are more accurate. For example, if we have plenty of red slip ware dated 30 BC - AD 10 we can use 10-year boxes; if we have many coins, or if the start/end points of a number of events are dated *ad annum*, we can even employ 1-year length boxes.

Below, the same assemblage has been plotted using, respectively, an aoristic sum and a Monte Carlo simulation (Figures 20, 21).

The two graphs clearly display the same trend, but the first is produced by a sum of means, while the second (the dark grey line) represents the mean of the values of one thousand simulations; the first and the ninth quantiles (light grey lines) are also reported, thus showing where the great majority of

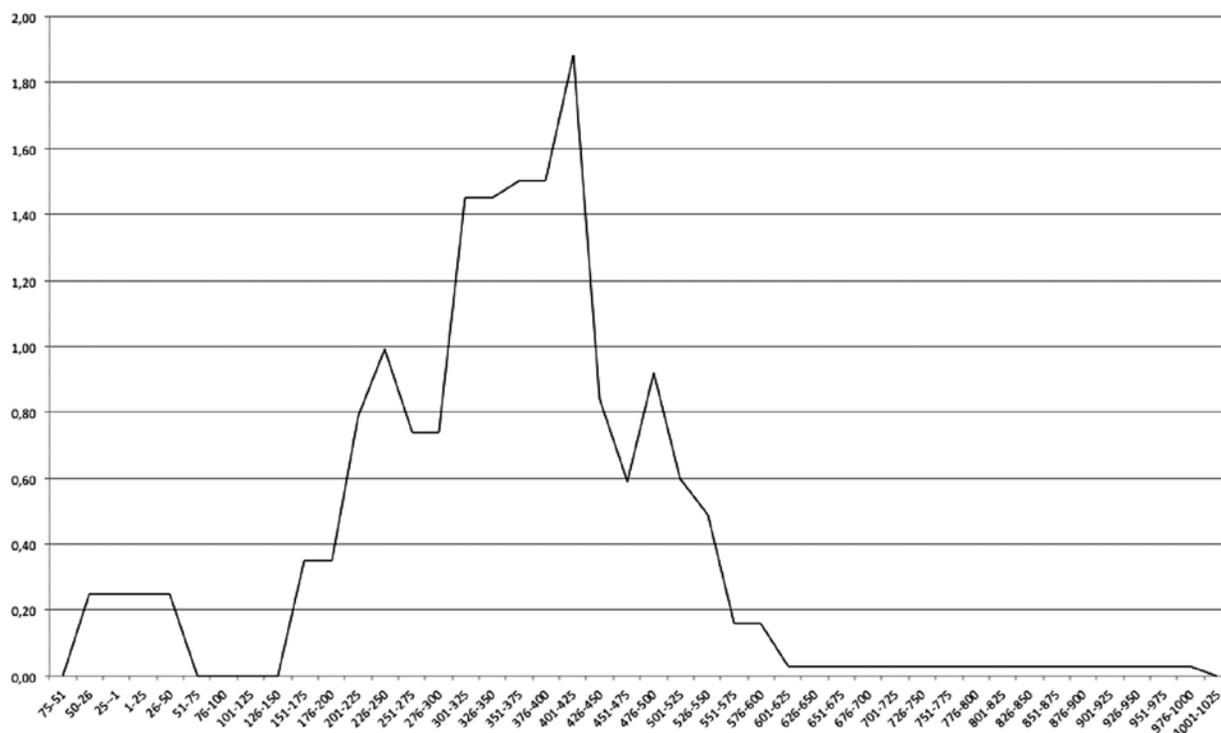


Figure 20: The plot of an hypothetical assemblage obtained through aoristic sum.

²⁵⁵ See Dalgaard 2008.

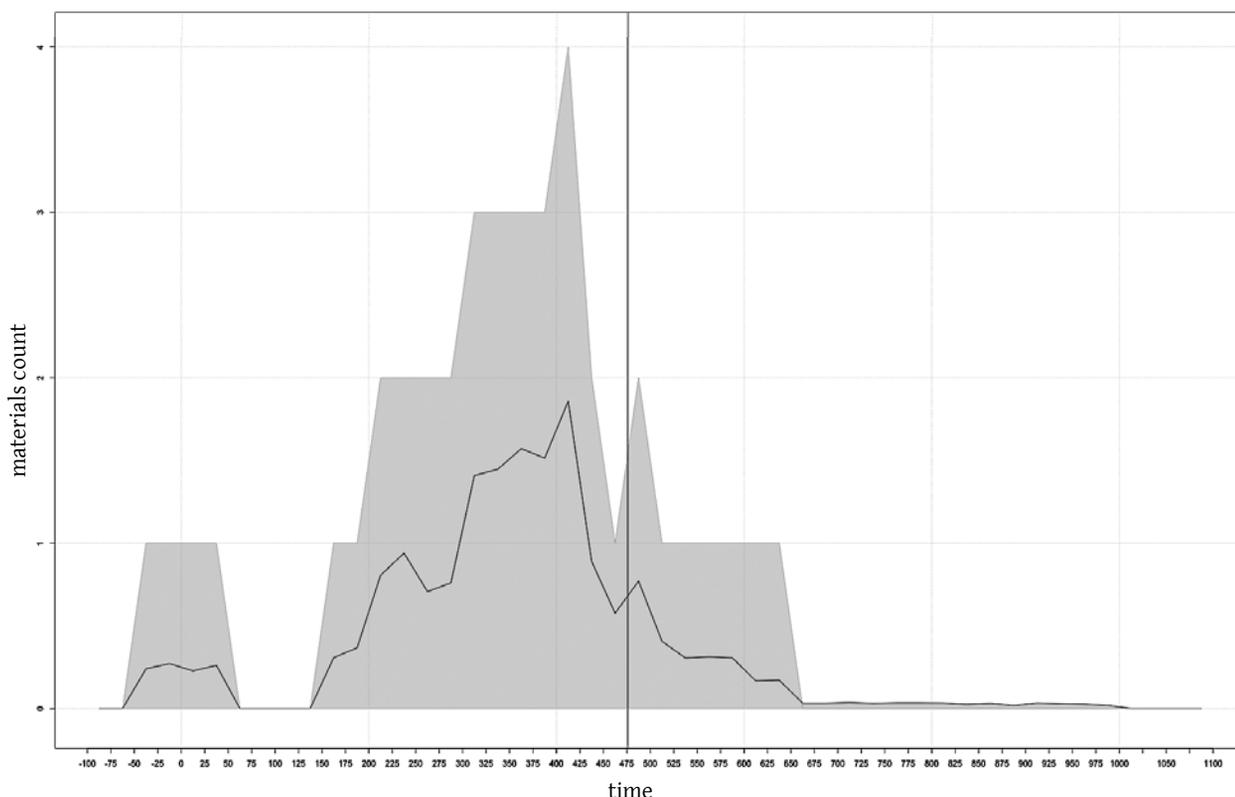


Figure 21: The same assemblage from Figure 20, plotted using a Monte Carlo simulation.

the performed simulations lie.²⁵⁶ It is also worth recalling that the y axis refers in the first case to a sum of means, while in the second it refers to the proposed number of artefacts. It has to be stressed, however, that, in the second case, a different plot with 10-year windows, or, say, 5-year windows, may be performed, just replacing one single value within the script used. Theoretically *ad hoc* boxes may also be opted for.²⁵⁷ The red line, automatically generated, indicates the *terminus post quem* provided by the starting point of most recent item of the assemblage.

III.3.6 Uniform vs normal distribution

Both using aoristic analysis and the Monte Carlo simulation, we moved from the assumption that each box within an event had the same chance to be selected. This means that each period within the larger diffusion span of a given artefact had the same possibility of having been the actual period of life of the single specimen studied. In other words, we have used a uniform distribution to model the possibility of picking one moment of time. That means that every outcome of the same length is equally likely to occur (Figure 22).

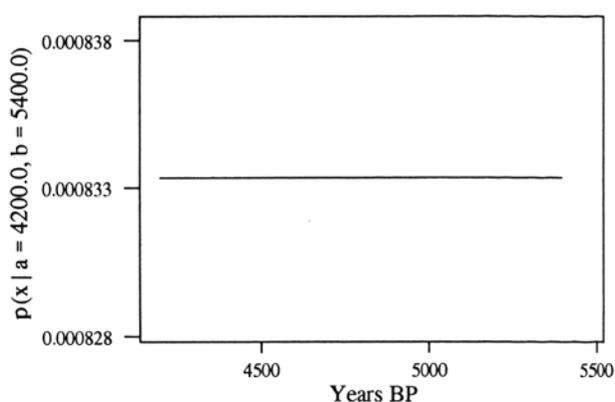


Figure 22: Continuous uniform distribution (Buck *et al.* 1996).

²⁵⁶ Each simulation produces a single line. In this case, and further on in this study, to make the graphs more legible, the mean values provided are only produced by the totality of simulations performed (1000) and the 1st and 9th quantiles, indicating the intervals into which the majority of the values fall.

²⁵⁷ One of the most widespread series of periods of variable lengths is the one preferred by British numismatists to subdivide time when dealing with coin loss in Roman Britain. In this case, the 21 periods in which the time-span ranging from AD 41 to 402 has been subdivided fit the reigns, monetary reforms and other major political events that had a substantial impact on coin circulation in the province. This articulation of time, proposed by R. Reece (1987), is thus specifically suitable for dealing with numismatic issues.

Clearly this is a generalisation and ancient reality must have been different. But how different? It is likely that the point is we mostly do not know. Before reviewing how this question can be answered, it seems to be useful to recall a few issues:

1. As discussed above, the dates of artefacts refer precisely to production only in a few cases. Mostly they refer to a more general 'presence' within the systemic context of the class/form/type the single specimen belongs to.
2. We know little about the volumes and fluctuations of the production of ancient ceramics, or of many other products.
3. Archaeological time resolution is often much lower than 'real life time resolution' and consequently it can lead to broad approximations, even where very rapid processes, e.g. the quality of the available data, may lead to the collocation within a 25-year box both an event that occurred within a few hours and a process that lasted five years.
4. A distinction has to be made between the actual ancient popularity of a form/type and the confidence the specialist has in dealing with that particular form/type. 'This amphora was more popular during the 2nd century AD than the 3rd', and 'This amphora is attested during the 2nd century AD, but was probably also used in the 3rd' are two very different statements: the first measures the actual ancient distribution through time of the amphora, the second measures the quality of the data and the confidence displayed to date the artefact.

Keeping these issues in mind, we can turn to examine how the distribution of probability has been addressed.

The main alternative to a model based on uniform distribution is a model based on normal distribution, that is a distribution modelled according to a Gaussian curve.²⁵⁸ We say that x has a normal distribution if its values follow the pattern of a symmetric, continuous bell-shaped curve. Each normal distribution has its own mean and its own standard deviation (Figure 23).

Where such a unimodal distribution varies, it can take the form of a unimodal curve skewed left or right (Figure 24).

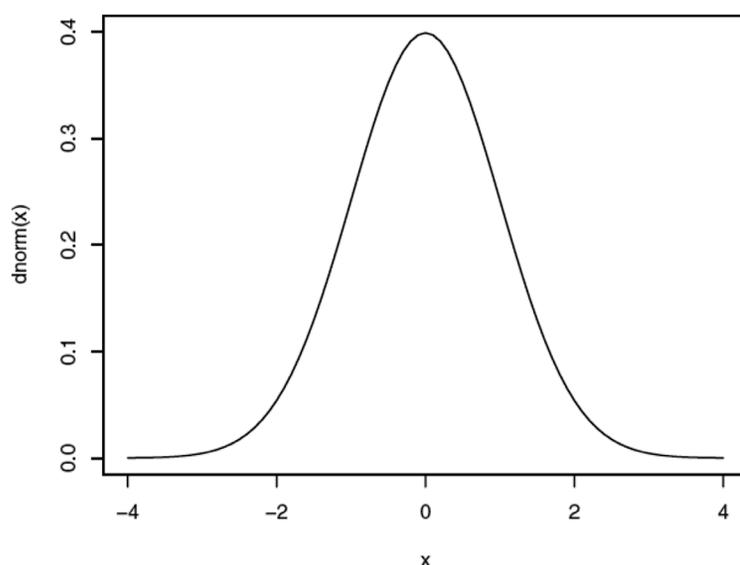


Figure 23: Normal distribution (Dalgaard 2008).

In the first case, we obtain a distribution very similar to a so-called 'battleship' curve, a well-known shape in archaeology and with a certain importance in seriations (Figure 25).

This last kind of distribution has been used by M. Millet to model the typical frequency of a pot type through time, assuming it rises steeply to a peak, then declining more gradually (Figure 26). However, the author states that '[It] should be noted that the shape of the frequency curve is a matter of assumption since few stratified sequences have been critically examined to provide

²⁵⁸ Gaussian curves have been opted for to model the data set provided by an assemblage recovered in Pisa, San Rossore (Ferrarese Lupi, Lella 2013). The approach then involved the use of a mix of weighted means and triangular representations (see below). Gaussian curves are used also in Roberts *et al.* 2012.

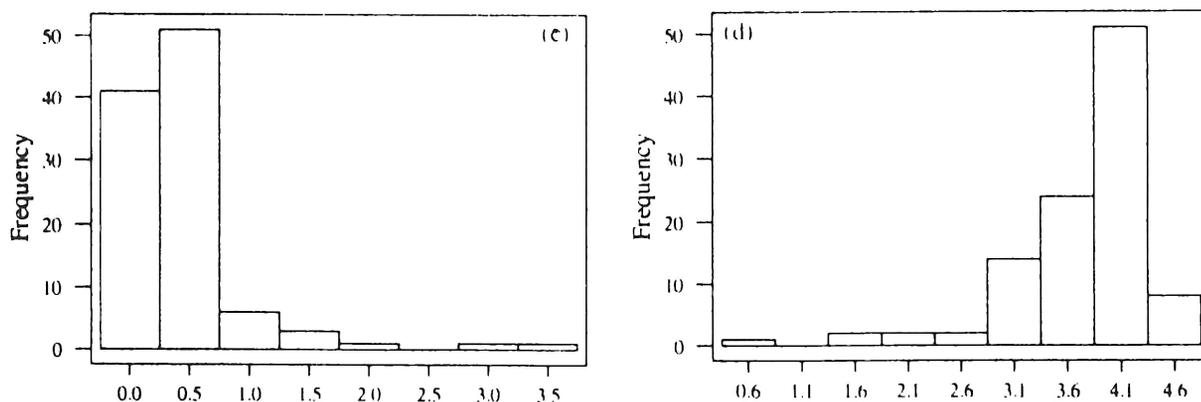


Figure 24: Distributions skewed left and right (Buck *et al.* 1996).

empirical validation of the shapes of their curves'.²⁵⁹ This curve has also been interpreted as the aggregate of a curve of production and a curve 'of rubbish'. The curve of production has been modelled with normal/Gaussian distribution.

E. Zanini and S. Costa used both a uniform and a normal distribution to model the production of a ceramic type through time;²⁶⁰ then they created curves shifted to the right to simulate different use-lives for the studied type (Figure 27). Other scholars have hypothesised or deduced further, different curves (Figures 28, 29).

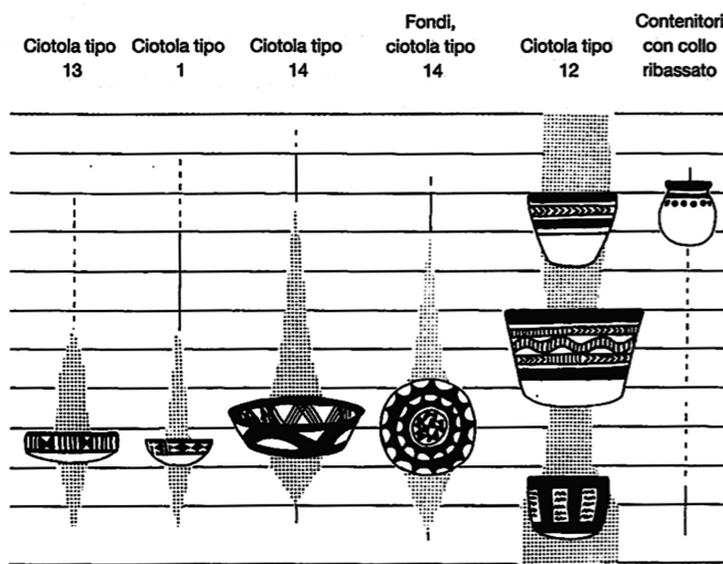


Figure 25: Examples of 'battleship curves' (Renfrew, Bahn 2006).

Even though both the papers of M. Millet and E. Zanini - S. Costa tackle the major problem of what we date (see above), if we turn back to the remarks previously proposed, we note that shifted curves simulating use-life should be used to implement realistically the model. Nevertheless, this can be done only when the dates we have refer to production, not to the general 'diffusion' or 'circulation' of a type, as probably these dates already 'contain' the whole process of production-use-discard of the single specimen (point (1)). In addition, as we know little about the fluctuations of the production of ancient pottery (point (2)), simulating it with a curve of normal distribution may be potentially very misleading.

To appreciate this problem, it may be helpful to move to a present-day example. We can have a look at the recent global economic crisis, which heavily affected the production output of many goods. It is very unlikely that goods whose production began, let us say, in 2007, reached a consistent peak a few years later, in the middle of one of the worst crises that Europe and America have faced since 1929.

²⁵⁹ Millet 1987: 99.

²⁶⁰ Zanini, Costa 2011.

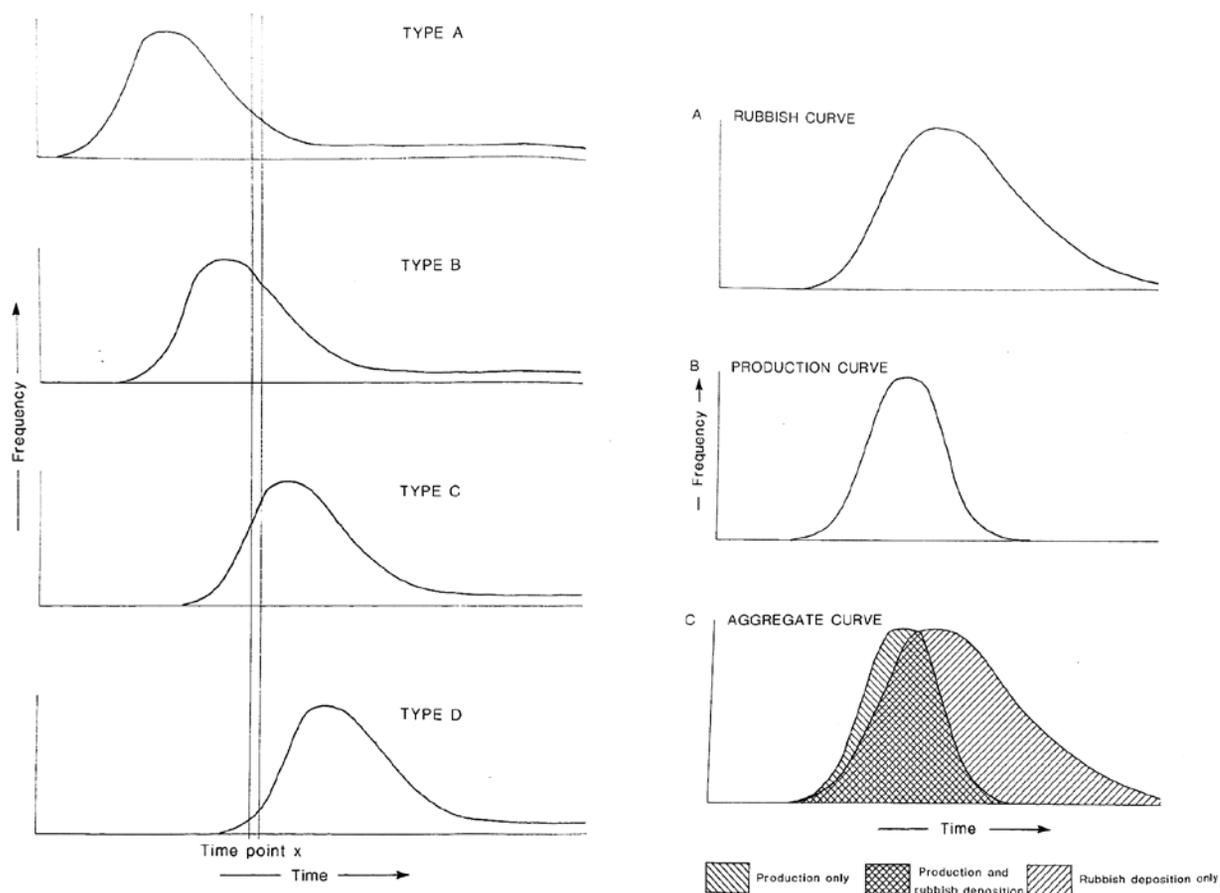


Figure 26: Hypothetical frequency of pottery types; their 'representation' at a given moment in time on the left, and the formation of an 'aggregate curve' (production + rubbish deposition) on the right (Millet 1987).

Certainly, comparisons between the current and ancient economies are dangerous, but if one thinks of the famous 3rd-century crisis faced by the Roman empire, it is likely to suppose that at least some of the existing production centres involved in successive political, military and/or economic crises may have witnessed a sensible reduction in goods production. If one pottery type had a starting point before the beginning of some kind of crisis, it seems at least hazardous to model its following distribution with a Gaussian curve. On the contrary it may well show a bi-modal distribution specularly reflecting a normal one.

Moreover, even if one acknowledges that production gradually rises and falls, how long do these processes last? If they lasted for months, or even for two or five years, they would be far shorter than our archaeological perception of time (point (3)). In other words, if a given article (or type, in our case) has been produced, for instance, for 25 years, and it took two-three years to reach a full production regime, and if the production declined in five years, we may not be able to distinguish variation in such short time lapses. In this case, our approximation of the phenomenon should follow a uniform distribution more than a normal one.

A product life-cycle modelled through a unimodal (Gaussian or skewed) distribution is indeed a common tool for today's production strategies, but it has to be stressed that the whole cycle is much shorter than the time ranges we usually handle in archaeology. Even without taking note of the obvious differences existing between the current and the ancient economic systems, this means that the so-called 'maturity' of a product was much longer in antiquity. In other words, as observed, the rising and the declining parts of the curve are comparatively shorter, while the central, upper part of the curve is longer, implying that the overall distribution can be approximated as uniform more than normal.

This emerges also by trying to simulate a hypothetical production and the presence of the produced items among the systemic pool according to different replacement ratios. We can imagine, for instance, that the

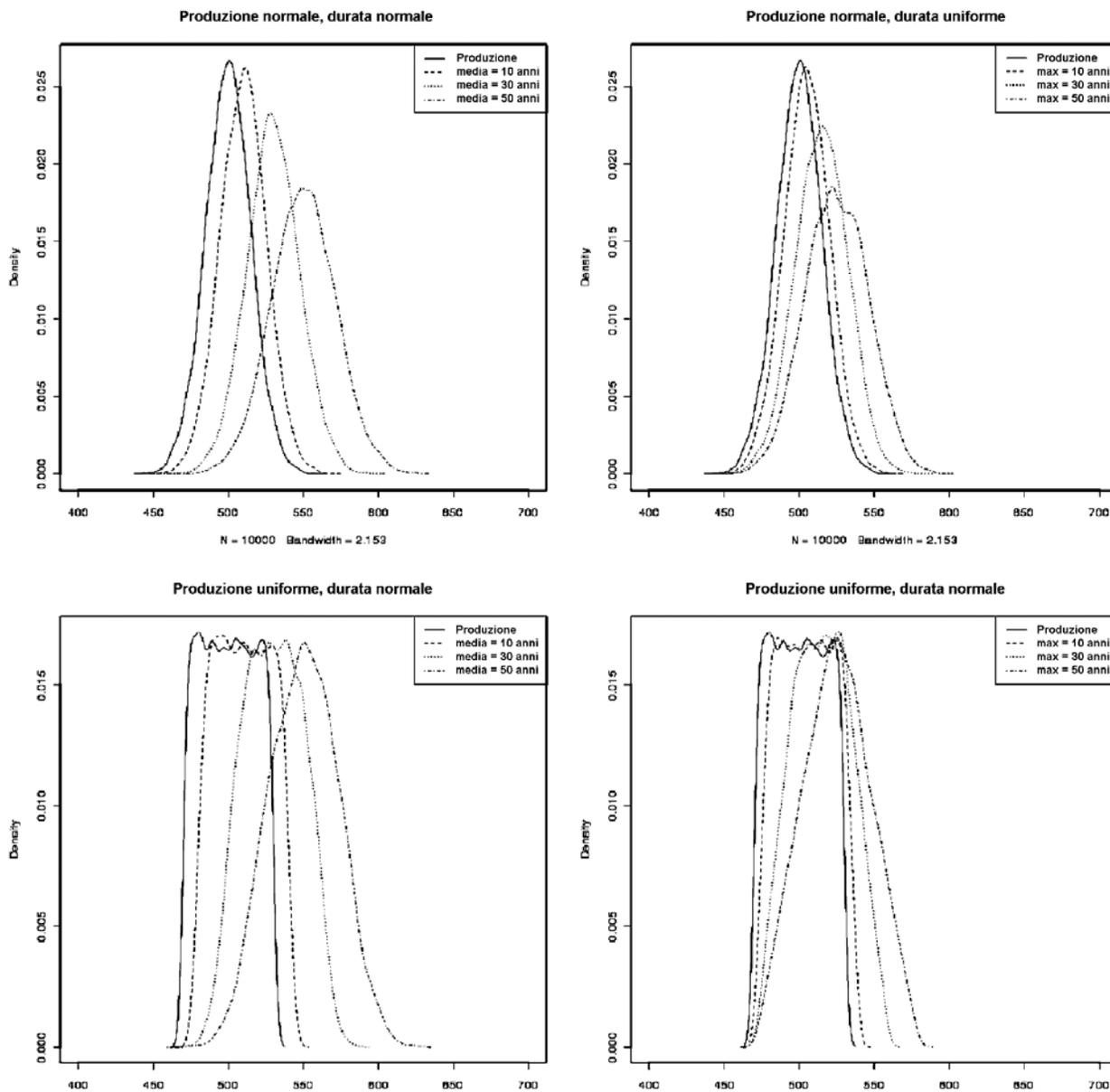


Figure 27: Normal and quasi-uniform distributions applied to the production and use-life of a given ceramic type (Zanini, Costa 2011).

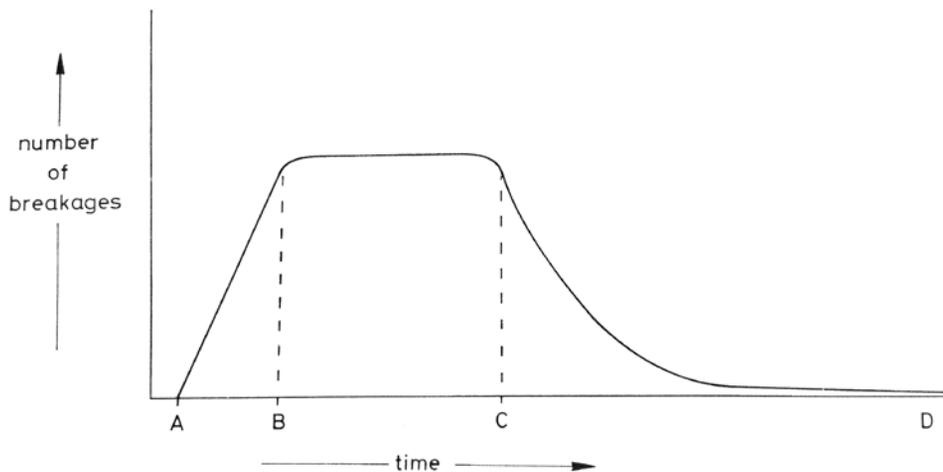


Figure 28: Another representation (in number of breakages) of the distribution of a given ceramic type through time (Crummy, Terry 1979).

production of a given article, began in AD 55-60 and terminated in AD 110-115. The production, say, of a new type of *terra sigillata* with particular decorations, is supposed to have gone to full capacity in a date range shorter than five years (Figure 30).

Moving to actual archaeological examples, interesting data emerge from the study of well-known ceramic types whose dates are precise and consolidated. M. Trivini Bellini has recently studied the presence of African red-slip ware in Friuli Venezia-Giulia, Eastern Veneto and Slovenia, and she plotted the distribution through time of different macro-groups with different fabrics.²⁶¹ Indeed, what strikes one more is the extreme variability displayed by the four curves (Figure 31; see also Figure 29).

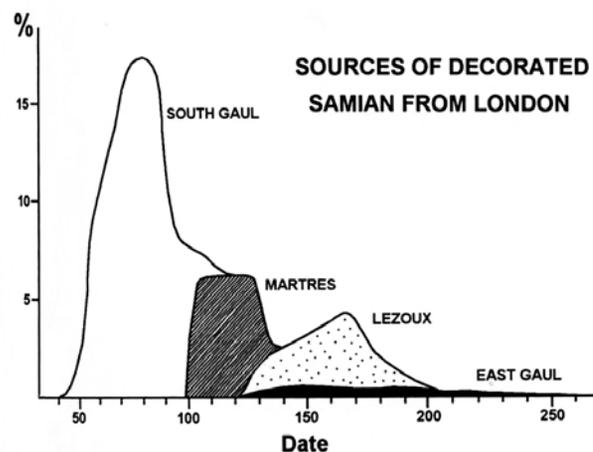


Figure 29: Sources of decorated Samian ware from London, notice the different shapes of the four wares plotted (Marsh 1981).

Clearly what has been observed does not mean that ‘battleship’ distributions or normal distributions cannot be postulated for many goods in antiquity (particularly for short-lived products). These curves also seem to fit particularly well the distribution of macro categories of artefacts, whose presence was related to substantial technological or more global changes, but this issue would surely deserve a much larger examination.

Year	Produced items	Circulating items (RR=5)	Circulating items(RR=10)	Circulating items (RR=15)	Circulating items (RR=20)
55	0	0	0	0	0
60	300	300	300	300	300
65	300	300	600	600	600
70	300	300	600	900	900
75	290	290	590	890	1190
80	320	320	610	910	1210
85	190	190	510	800	1100
90	250	250	440	760	1050
95	300	300	550	740	1060
100	310	310	610	860	1050
105	290	290	600	900	1150
110	300	300	590	900	1200
115	0	0	300	590	900
120	0	0	0	300	590
125	0	0	0	0	300
130	0	0	0	0	0

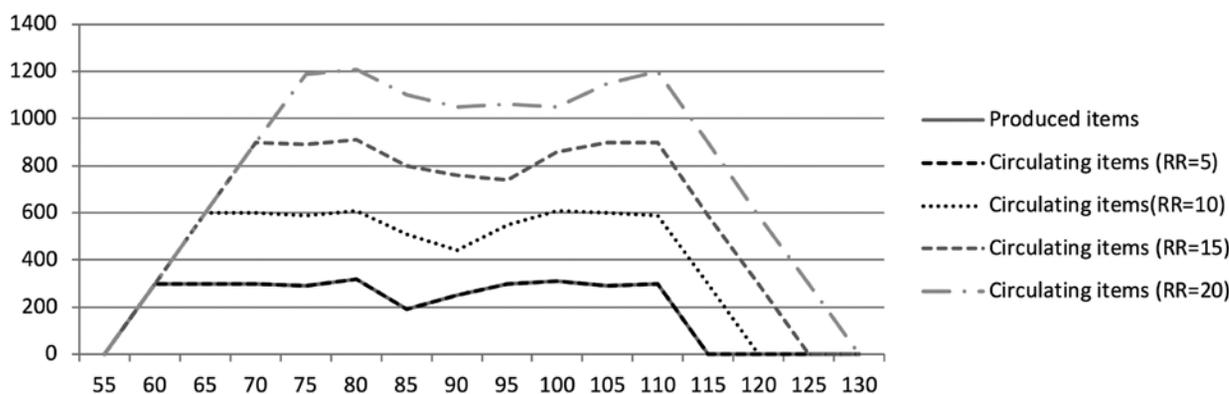


Figure 30: The production of an hypothetical artefact, with different replacement ratios (5, 10, 15 and 20 years).

²⁶¹ Trivini Bellini 2014.

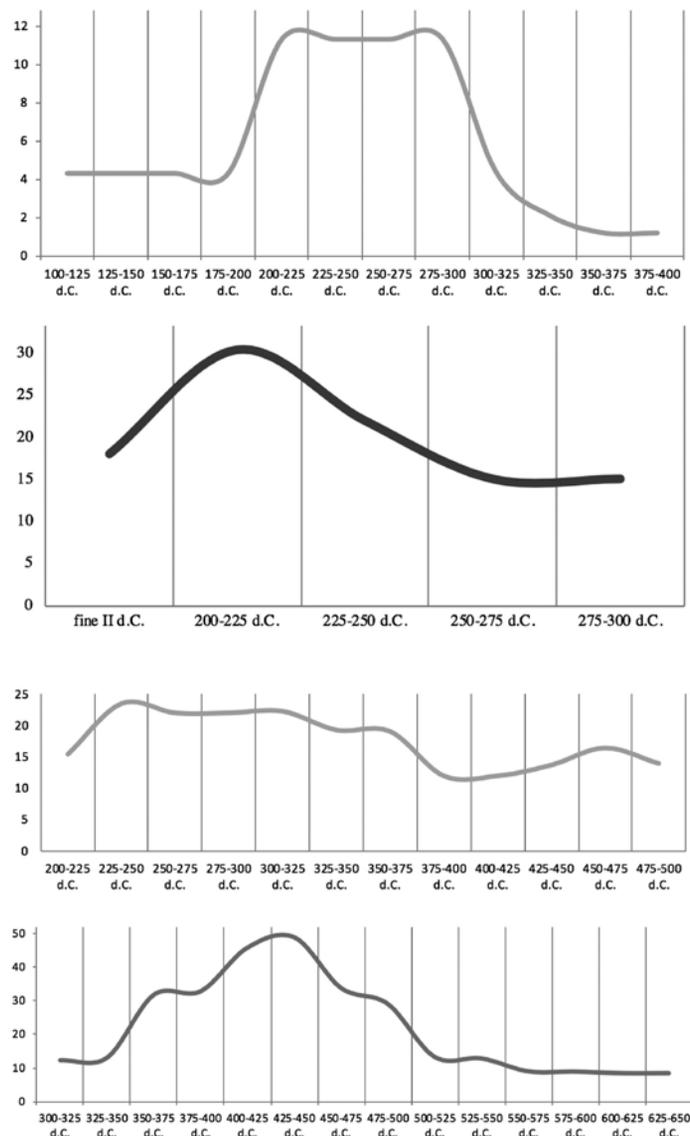


Figure 31: The popularity, over time, of different groups of African red-slip ware: from top to bottom, fabric A, A/D, C and D (courtesy of M. Trivini Bellini).

productions that we commonly handle, and this is why in this study it was decided to employ this simple kind of distribution for Monte Carlo simulations; in any event, if substantial knowledge of a given type/form allowed us to model a precise curve, or suggested that a normal, bimodal, ‘battleship’, or other distribution curve would be more appropriate to describe the phenomenon, this new curve may be applied to the single simulation, contributing to a more accurate example.²⁶⁴

III.3.7 The triangular model: an alternative representation of the chronological content

In 2007, van de Weghe *et al.*, pushed by the necessities posed by the extremely complex site of Carthage, proposed an alternative method to visualise and analyse residuality.²⁶⁵ It represents an attempt to go beyond the system proposed by N. Terrenato and G. Ricci and its main point of interest lies in the fact

The purpose of all these examples is just to show that normal distribution is not necessarily the most common or probable one in our case. The point is that basically ‘we do not know’.

In a recent paper, R. Willet applied the use of different distribution methods (Gamma, Gaussian and linear, or uniform) to the diffusion of Eastern *Sigillata A* vessels in the Eastern Mediterranean.²⁶² A weighted mean sum was used for plotting the data. The three curves obtained display general similarities: the overall trend is very similar, with the same peaks and descents. What appears to mostly differentiate the curve produced by linear distribution from the two other curves seems to be the accentuation of the macro-differences existing from period to period. Conversely, the two other curves are less pronounced, but they are beset with more, smaller fluctuations.²⁶³

The use of different distributions may, therefore, affect the overall curves produced comparatively slightly; macro-trends highlighted by uniform distribution seems to have for us much more importance than the micro-fluctuations detected thanks to Gamma and Gaussian distributions.

Uniform distribution is used as a very approximate model where there are very little or no available data. This seems to be exactly the case for most of the pottery

²⁶² Willet 2014.

²⁶³ Willet 2014: 51-52.

²⁶⁴ *Ad hoc* probabilities for different periods of diffusion of single specimens have been preferred by Bevan *et al.* to extrapolate chronological profiles from the data set produced by the Antikythera Survey (Bevan *et al.* 2013).

²⁶⁵ van de Weghe *et al.* 2007.

that it does not employ a two-dimensional graph, but it employs a three-dimensional one. According to the authors, the aim was to allow the visualisation of three variables:

1. time (phases);
2. quantity (percentages); and
3. quality (fabric types).

Another objective was the reduction of the ‘blurring effect’ produced by the presence of many specimens badly dated within large forks (one or more centuries).

Indeed, this visualising device is very clear and it enables an immediate appreciation of the order of magnitude of different productions in different periods (Figures 32, 33). The authors, however, acknowledge that evident problems of visibility arise when multiple temporal intervals are to be represented, and, dealing with urban assemblages, this is often the case. It can also be suggested that the production of these graphs may be somewhat more complicated if compared both to the weighted means sum and the Monte Carlo simulation. In any event, compared to the weighted means sum, this latter method allows for a more effective, although empirical, evaluation of uncertainty. One other point in favour of this method is represented by the opportunity to deal with specimens with time intervals whose starting and/or ending points are uncertain and which are, in turn, represented by intervals.

This flexibility is not enabled by the Monte Carlo simulation proposed, which requires precise dates (numbers) as start/end points.

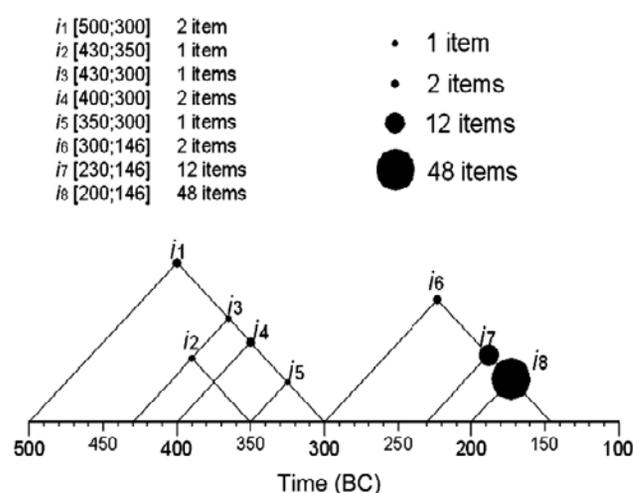


Figure 32: An application of the triangular concept (van de Weghe *et al.* 2007).

In general, the triangular model presents some very interesting characteristics which make it a potential auxiliary device for showing particular aspects, or dealing with, small amounts of materials. However, with larger numbers of items the legibility of these graphs is seriously affected: for urban excavations, where sizeable assemblages are usually handled, Monte Carlo simulations represent a more effective and rapid tool.

III.3.8 Conclusions

The necessity of handling large (and often inhomogeneous) assemblages in urban excavations has led to the development of some quantitative techniques accounting for

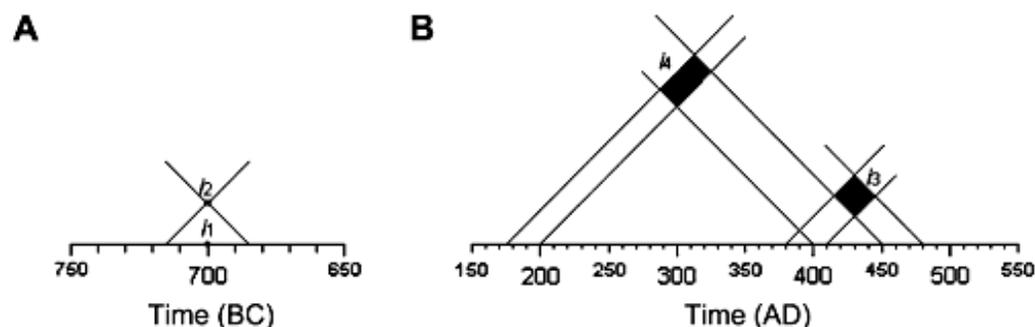


Figure 33: Different temporal intervals in the triangular model (van de Weghe *et al.* 2007).

the temporal factor. These, informing us of the overall chronological profile of the assemblage, can be used for studying the deposits, their genesis, and their dating. Of course, these kinds of methods cannot be used without a parallel, qualitative approach to the assemblage and to the deposit as a whole.

Among the quantitative methods discussed, the Monte Carlo simulations perform more or less well, particularly in handling the uncertainty affecting large amounts of data. It is also a perfectible methodology, which can be further enriched with future knowledge of production/consumption rates of different typologies of artefacts, particularly ceramics. The less it is used a-critically, the better the achieved results may be.

Finally, it has to be stressed that in this work simulation performs mostly a descriptive role, but further analysis (rates of change, model matching?) could be later applied exploiting the developed tool.

III.4 Qualitative approaches to assemblages and deposits

III.4.1 A brief digression: Roman waste management and reuse practices and their impact on the issue of dating

Introduction

As is well known, the passage of artefacts from the systemic context (past, everyday life) to the archaeological context (what we record in the field) is affected by a large number of factors; these have been theoretically ordered and discussed mostly by M. B. Schiffer²⁶⁶ and other behavioural archaeologists.

Among these processes, reuse and discard affect enormously in particular the record produced by complex societies. We could argue the more complex the society we are dealing with, the more complex the processes of reuse²⁶⁷ and discard affecting the archaeological record produced.²⁶⁸

Despite this, the importance of both reuse and discard in the Classical world is somewhat underestimated, in particular concerning the way in which they influence the most important archaeological tool we use to date contexts, i.e. ceramics. The reuse of ceramics is usually regarded only in the most evident cases,²⁶⁹ the most typical of which is the secondary use of whole amphorae as building material, to lighten the upper part of some structures, or their secondary use in drainages.

In this chapter, we will briefly discuss what we know about urban solid waste disposal during the Roman period and how this process affects the archaeological record, with consequences on, and the way in which we date contexts and groups of contexts.

Waste disposal in Roman towns²⁷⁰ and consequences for dating

Known structured systems of waste disposal in Italian towns go back as far as the Republican period.²⁷¹ Complex drain grids guaranteed efficient disposal of the liquid waste, together with rainwater, in new colonies and in existing *municipia*. Nevertheless, drains were also a favoured conduit for solid

²⁶⁶ Schiffer 1996: 25-35, 47-75.

²⁶⁷ Schiffer uses the term 'reuse' to indicate a process by which there is a 'change in the user or use or form of an artifact'. Different kinds of reuse are lateral cycling, recycling, secondary use and conservatory processes. These different shades mean different formation processes, implying different deductions, particularly in terms of spatial and functional analyses, although they appear less decisive in a chronological perspective.

²⁶⁸ Indeed, a similar trend is implicitly suggested in Murray 1980, and is more explicitly stated in Vidale 2004: 49.

²⁶⁹ Rodríguez-Almeyda 2000: 125-126; Peña 2007: 119-192.

²⁷⁰ For an overview of the management of rubbish from the Middle Ages to the dawn of the Industrial society, see Sori 2001 and Manacorda 2000. For ancient Greece, see Lindenlauf 2007: 92-98; Lindenlauf 2001. For the Roman period, in general, see Jansen 2000; Raventós, Remolà 2000; Remolà 200; Toniolo 2007: 109-111. For the Bronze Age see the extraordinary case of Runnymede Bridge, Egham (UK) and the thoughtful investigations carried on refuse patterns (Needham, Sørensen 1989).

²⁷¹ Gelichi 2000: 15.

waste and therefore they were emptied and cleaned routinely to some degree by workers called *stercorarii*.

The remaining part of the solid waste stream seems to be more indistinct and difficult to track; it started in most cases with the rubbish thrown directly out of the window, as suggested by a number of literary sources,²⁷² while other dwellings may have been provided with pits for temporary disposal. In both cases rubbish was then periodically removed.²⁷³

The existence of a local management of solid waste, indeed, is proved by both archaeological data and literary sources; even if scholars disagree on the administrative organisation of this management, in particular whether it was up to the local authority or to private landowners to physically provide for the removal of waste,²⁷⁴ written sources clearly indicate the existence of forms of periodical *purgatio* (cleaning) of public spaces. In the same way *stercorarii* had the task of cleaning the drains, other personnel (maybe the *stercorarii* themselves)²⁷⁵ were in charge of keeping the streets clean, using carts (*plostra*). In this case, fortunately, literary sources and graffiti inform us of a process that leaves no direct trace in the archaeological record.

Instead, archaeological data can show us how and where waste collected in this way was disposed of: several urban dumps have been excavated in sites located all over the Roman world (some interesting case studies in Pompeii,²⁷⁶ *Mons Claudianus*,²⁷⁷ *Augustodunum*,²⁷⁸ *Lugdunum*,²⁷⁹ *Londinium*,²⁸⁰ along with many cases in Roman *Hispania*).²⁸¹ The dumps were located preferably outside the city walls (*extra muros*) or in proximity to rivers,²⁸² i.e. often near city boundaries.

We do not know how often public spaces were cleaned and waste brought to the main communal dumps, but certainly the literary and legal sources show that Roman cities, compared to modern standards, were pretty grim.²⁸³ In Rome, cleaning activities must have been more rigorous when the *aediles* checked the state of the roads four times a year.²⁸⁴ The street levels may well have risen,²⁸⁵ but the point is that the waste accumulated was then periodically removed.

The mechanism described represents one of the main reasons why what is usually called ‘the living phase’ of an archaeological site is almost unrepresented in the *intra moenia* archaeological record of many Roman towns: operations of continuous cleaning and maintenance did not allow the formation of conspicuous deposits within the city.²⁸⁶ We may say that everyday life, when cities were well administrated and

²⁷² See Panciera 2000: 96-98.

²⁷³ In kitchens, considerable amounts of ash and carbons may have been provisionally disposed of before final discard. See Peña 2007: 312 and De Caro 1994.

²⁷⁴ For the hypothesis of private management, see Liebeschuetz 2000: 54. *Contra* Panciera 2000: 98-99, 102-105. See also Nin, Leguilloux 2003: 160-161.

²⁷⁵ Panciera 2000: 105.

²⁷⁶ Peña 2007: 279-282; Maiuri 2002: 174-175; Chiaramonte Treré 1986: 21-54; Romanazzi, Volonté 1986: 21-54.

²⁷⁷ Maxfield, Peacock 2001a.

²⁷⁸ Kasprzyck, Labaunne 2003: 103-104.

²⁷⁹ Desbat 2003.

²⁸⁰ Miller *et al.* 1986.

²⁸¹ For a general overview, see Remolà Vallverdú, Acero Pérez 2011.

²⁸² A famous case study is represented by the Walbrook stream, in London. Here, both rituality (Merrifield 1995) and simple dumping (Wilmott 1991) have been addressed in the interpretation of the assemblages. A similar example is represented by Roman Tours (Dubant 2003).

²⁸³ The case of dead bodies abandoned in public spaces recurs frequently in literary sources: the most famous episode is reported by Suetonius, describing the scene of a stray dog bringing a human hand to the Imperial dining room while Vespasian was dining (*Suet., Ves* 5.4). Suetonius himself reports the episode of Nero's horse prancing *ex odore abiecti in via cadaveris* (*Suet., Nero* 48). Other cases of dead bodies left in the streets are attested in Martial (*Mart., 10, 5, 11* and following), Cassius Dio (*Dio, 65, 1*), Petronius (*Satyricon, 134, 1*), and Ausonius (*Auson., Epigr., 24, 1*).

²⁸⁴ The general neglect of public roads is suggested by many other sources: muddy and uneven streets are mentioned by Martial and Seneca (*Mart., 7, 61, 6, Sen., De ira, 3, 35, 5*), while *cacatores* are mentioned, among others, by a number of Pompeian graffiti (see CIL, IV 3782, 3832, 4586, 5438). These widespread practices were persecuted, more or less effectively, by law, as suggested by the *Lex libitinariorum* of Puteoli and the *Lex tabulae Heracleensis*. Other sources are mentioned in Panciera, 2000 and the fundamental Scobie 1986.

²⁸⁵ Liebeschuetz 2000: 55. See also Saliou 2003.

²⁸⁶ Liebeschuetz 2000: 55.

²⁸⁶ Schiffer 1996: 59, 64-72; Lamotta, Schiffer 1999: 21; Putzeys 2007: 49; Furlan 2012: 81. The topic is also discussed in Matthews 1993, whereas, more generally, the topic of negative evidence in archaeology is discussed in an extremely interesting paper by G. D. Stone (1981). See also Furlan 2017.

appeared to suffer no effective external reason for crisis, is so far unrepresented in the archaeological record within the city itself.²⁸⁷

The public system of waste disposal worked throughout the Imperial age, and we have no evidence of widespread collapse until Late Antiquity and the Early Middle Ages. Archaeological excavations show that in this period drainage systems were often filled with rubbish, whereas organic layers frequently accumulated in public and private areas, leading to the formation of dark earths. Thus, substantial amounts of rubbish encroached again on town borders, where now more unmanaged or abandoned spaces were available.

Alongside a main, public ‘waste stream’, another mechanism of disposal seems to have existed during the Roman period: smaller dumps related to workshops²⁸⁸ or private dwellings are attested in some Roman towns (mostly in peripheral neighbourhoods), whether during initial periods,²⁸⁹ or in phases of general decline or local crisis, and also in times when no evidence of falling off is documented.²⁹⁰ In all these cases, abandoned/collapsed buildings/areas represented an immediate and irresistible opportunity for quick dumping, even within an intensively occupied urban context.²⁹¹

The existence of organised forms of waste management in ancient towns leads to a first, general series of consequences of some interest when dealing with dating urban deposits.

The system allows for the formation of two peculiar types of very informative deposits, which can be defined as primary deposits with continuous formation (see Chapter IV.3): large urban dumps and drain fills.

It also affects the issue of vessel breakage, an index sometimes used as a proxy for determining the primary or secondary status of deposits (see Chapter III.4.2). Loading discarded pottery may have been carried out with the deliberate intention of breaking the bulkiest vessels to reduce their volume and maximise the useable space in the carts (or other means of transportation) used to transfer the waste. Loading and unloading, may well anyway have entailed the unintentional breakage of vessels. The distance of the journey may not be a significant factor, but the point is that this process, by itself, foreshadows that fragmentation indexes cannot be used as an effective tool for discriminating primary and secondary deposits in absolute terms. Primary deposits, such as dumps, *can* contain complete or sub-complete materials, but fragmentation ratios can equally be fairly high, as is, indeed, demonstrated from several archaeological examples. This aspect is even emphasised when combined with the existence of practices of recycling (see below) and is not balanced by high, post-depositional breakage ratios (see Chapters III.4.2 and III.5.2).

Evidence of reuse in Roman towns and consequences in dating

Looking briefly at the highlighted evidence, we can formulate a sufficiently sophisticated model of discard, transport and disposal of rubbish in a common Roman town. But the *chaîne opératoire* described still lacks a fundamental ‘ring’: that of reuse. Reuse may take the shape of simple lateral cycling, defined by M. Schiffer as the simple ‘change in an artifact’s user’²⁹² and, in this case, may leave no trace within the archaeological record.

²⁸⁷ Carver 1989: 34.

²⁸⁸ Kasprzyck, Labaunne 2003: 101-102; Nin, Leguilloux 2003: 152-160; Ballet 2003: 224-226; Dieudonné-Glad, Rodet-Bellarbi 2003.

²⁸⁹ Kasprzyck, Labaunne 2003: 99-100.

²⁹⁰ Monteil *et al.* 2003.

²⁹¹ Jacobs 2013: 606-610. See the cases of *Mons Claudianus* (Maxfield, Peacock 2001a; Maxfield, Peacock 2006), Nora (Albanese 2013) and Gortyn (Bonetto 2004). For the peculiar case of the *Crypta Balbi* in Rome, see Manacorda 1984 and Sagui 1998.

²⁹² Schiffer 1996: 29.

On the contrary, secondary use (the new use of an artefact without substantial modifications)²⁹³ and recycling (the return of an artefact to a manufacturing process)²⁹⁴ deeply affects the archaeological record and both had an extremely important role in ancient economy and social practices.

They may have occurred in different stages of the waste stream, from the very beginning to the very end. Secondary use and recycling of some materials must have been so considerable that it is more reasonable to assume the existence of a systematic and well-organised collection, than an occasional one.²⁹⁵ Unfortunately, the available sources cast little light on the structure of this phenomenon; but to underestimate it, just because the data available is scarce, would be misleading.

Along with more organised forms of recycling, scavengers (*scrutarii*) may have played a consistent role, at different steps of this chain, in removing from the waste stream whatever could have been reused.²⁹⁶ Ethnographic studies attest very clearly this kind of practice also in modern and contemporary urban environments.²⁹⁷ Secondary use and recycling carried out within workshops themselves may have been consistent factors too.

Reused materials were different in type and quantity and affected the archaeological record in different ways: for instance wood is relatively rare in most archaeological sites and is usually well preserved only in waterlogged environments, in extremely dry areas, or under exceptional conditions (see the case of Herculaneum). Carbonised wood is common within most archaeological deposits, but it is rarely preserved in large pieces.

Nevertheless, there is strong evidence of wood, particularly timber, recycling. Ancient sources mention the reuse of large timbers: e.g. those from Nero's wooden amphitheatre, where an extraordinarily long beam was salvaged from a Tiberian *naumachia*.²⁹⁸ Shingles were also removed from demolished buildings and reused, as attested by archaeological evidence at Vindolanda.²⁹⁹ The exceptionally well-preserved evidence from this site also suggests a more complete form of recycling of timber structures, carried out by what has been defined as a 'demolition gang' once the fort had been temporarily abandoned: major beams and spars from the roofs and planks from the floors were systematically salvaged.³⁰⁰ But even when the fort was occupied, wooden structures were commonly reused.³⁰¹

Archaeological analysis, combined with dendrochronological data, attests other episodes of recycling of wood: this is the case of another amphitheatre, this one in London. The first timber building (AD 75-125) used recycled posts and post-pads,³⁰² and, again, wooden planks were reused for the building of the drain of the masonry amphitheatre after AD 125.³⁰³

The well-known 'old-wood' problem, or 'old-wood' effect, is often due, apart from the process of progressive formation of the rings by the tree,³⁰⁴ to scavenging and reuse of timber.³⁰⁵ In a temporal perspective, this factor has to be assessed and combined with the obvious fact that structural timber may remain in place for long periods.

²⁹³ Schiffer 1996: 30.

²⁹⁴ Schiffer 1996: 29.

²⁹⁵ See Nin, Leguilloux 2003: 151-152.

²⁹⁶ Liebeschuetz 2000: 55.

²⁹⁷ Gidlow 2000: 39-40, figure 5.3; Rathje, Murphy 1992: 40, 43, 191-196, figure 9-A; Peña 2007: 317-318.

²⁹⁸ Pliny, HN 16.200.1.

²⁹⁹ Birley 1994: 90; Ulrich 2007: 123.

³⁰⁰ Birley 1994: 90.

³⁰¹ Birley 1994: plate IV, figure 2. See also Hanson 1978.

³⁰² Bateman *et al.* 2008: 19, 30, 37.

³⁰³ Bateman *et al.* 2008: 56, 82. In general, see Tyers 2008: 220.

³⁰⁴ Weiner 2010: 21.

³⁰⁵ Schiffer 1986.

Timber was not the only building material suitable for recycling. Building materials in general (bricks, tiles, stones, marbles, whole architectural elements, etc.) are attested by archaeological evidence to have been reused often in both Roman and Medieval times.³⁰⁶

For the Roman period, literary sources mention this practice as something ruled by municipal laws and it seemed to be far from uncommon. In fact, there may be little doubt that the building rubble from Antioch cited by Libanius in his Oration L,³⁰⁷ which had to be disposed of just beyond the city walls, was expected to be at least partly reused. Other juridical sources confirm the existence of similar patterns: a law dating to AD 397 ordered that material from demolished temples was to be used for the maintenance of public routes,³⁰⁸ while another source states that if the owner of a collapsed building did not provide for the removal of the debris, anyone could claim ownership of the resulting material.³⁰⁹

The economic advantage of using second-hand material is self-evident:³¹⁰ some elements were no doubt more suitable for reuse (roof tiles, ashlar walls, complete columns and capitals, etc.), while others may have required a greater effort (*crustae, sectilia*, bricks),³¹¹ but, in any event, the economic benefit was consistent. It has been estimated that second-hand ashlar blocks, reused on site, costed about 20% of the price of freshly made blocks.³¹² There is also evidence that second-hand building material was preferred by both public and private builders,³¹³ for new constructions on site, as well as in new buildings located elsewhere.

It clearly emerges, therefore, that the use of second-hand material has to be born in mind when dealing with Roman buildings. Reuse practices in ancient building activity produce forms of false residuality that have to be assessed when dating the buildings themselves. The possible secondary use of stamped bricks, tiles and structural timber (possibly dated by radiocarbon analysis) must be evaluated with particular care.

The reuse of building material is particularly important in a chronological perspective because it has to be combined with the fact that previously it may have remained in place in other structures for long time, e.g. timber. The time gap between the production of a given brick or tile (or the felling of a tree used for manufacturing timber elements) and its secondary use may be particularly large.

Turning to materials favoured in the manufacture of movable objects, we know that glass was also widely reused.³¹⁴ This practice is attested by literary sources and by archaeological and archaeometric evidence.

The collecting of cullet is attested in Martial,³¹⁵ who describes a door-to-door collection, and in Petronius' *Satyricon*.³¹⁶ A similar practice is attested in Statius,³¹⁷ while Pliny's references seem to be more controversial.³¹⁸

³⁰⁶ The reuse of Roman architectural elements in post-Antique times is widely recognised and often linked to economic crises or particular cultural and ideological mechanisms of self-representation and use of the past. But re-use of building materials in Roman times has been far less investigated (less obvious?). This disproportion is a clear trait of the literature concerning re-use in architecture and it can be appreciated by just taking a quick look at the list of contents from a recent work on the topic: among about 50 papers, only a very few deal with re-employment of building materials in Antiquity (Bernard *et al.* 2008). See also Mills 2013: 5, 117.

³⁰⁷ *Libanius, Or. L.* See also Liebeschuetz 2000: 51-52.

³⁰⁸ *CT, XV.1.40*, see also Liebeschuetz 2000: 54.

³⁰⁹ *Gaius, 381.38*, see also Liebeschuetz 2000: 54. For an overview of Roman legislation about building materials re-use, see Marano 2012.

³¹⁰ An extremely vivid overview and a more detailed quantification of the impact of reuse of building material by Roman builders is proposed in Barker 2010.

³¹¹ Among others, many case studies concerning Aquileia are proposed in Cuscito 2012.

³¹² Barker 2010: 135.

³¹³ A painted sign in *Insula 7, Regio III* in Pompeii seems to attest the sale of second-hand roof tiles (*CIL IV, 7124*).

³¹⁴ See Stern 1995; 1999: 450-456.

³¹⁵ *Mart.*, I. 41.3-5.

³¹⁶ *Satyricon*, 10.1.

³¹⁷ *Silvae*, I.6.74.

³¹⁸ In one passage of his *Natural History* the author seems to suggest that pieces of broken glass could only be stuck together (*HN 36.199*), but earlier it is stated they could be fused (*HN 36.193*). See Perez-Sala, Shepherd 2008: 143.

Archaeological evidence also strongly suggests the recycling of glass: substantial volumes of glass vessel fragments, which were likely to have been stored for future melting, are attested in Nijmegen,³¹⁹ Agen,³²⁰ Amiens,³²¹ Reze,³²² Lyons,³²³ Saintes,³²⁴ Aoste,³²⁵ the London amphitheatre,³²⁶ and Basinghall Street in London.³²⁷ Cullet stored in a barrel within the shipwreck discovered near Grado seems to have had the same function,³²⁸ therefore attesting to the trade of cullet itself.

Chemical analyses and archaeometry have provided evidence of glass re-melting spanning continents, from Britain³²⁹ to Asia.³³⁰

Metals have been so systematically collected and re-melted throughout history that it would be a huge task to list all the evidence available, which ranges from proto-historical³³¹ metal hoards to the demolition of ancient buildings in post-Classical times in search of iron and bronze clamps.³³²

Even though ancient sources mentioning the re-melting of metals are rare,³³³ we may be sure that during the Roman period it was a common practice, as is indirectly suggested, also, by the cyclic practice, attempted by the central authority, of removing old coins from circulation for the purpose of minting new ones with a lower percentage of precious metal³³⁴ (a phenomenon well known to numismatists as the main cause of what is referred to as Gresham's Law).

In any event, in general, recycling of glass and metals seems to have little consequence in the issue of dating, whereas metal and glass objects were occasionally re-used as any other artefact.

Bone and organic matter were also collected: the former was used by workshops or in smaller-scale domestic productions (appliques, dice, tokens, small boxes, etc.), while the latter³³⁵ played an important role in both crafts (urine³³⁶ was used to process leather) and agriculture.³³⁷

Also in this case, consequences in dating issues are minimal, but the idea emerges that the process of recycling involved almost every kind of material and was extremely common.³³⁸ It permeated Roman society and urban life so deeply, that E. Rodríguez-Almeida provocatively defined Classical Rome as a 'self-cleaning' city.³³⁹

This is the framework in which the process of secondary use and recycling of ceramics has to be placed.

³¹⁹ Isings, Bloemers 1980: 281, 341-344.

³²⁰ CNAU 1999, 21.

³²¹ Bayard, Massy 1983; Dilly, Maheo 1997: 17.

³²² Foy, Nenna 2001: 50.

³²³ Monin, Becker 2000.

³²⁴ Nicolini 1977: 377-379; Hochuli-Gysel 1993.

³²⁵ Veyrat-Charvillon 1999.

³²⁶ Perez-Sala, Shepherd 2008.

³²⁷ Shepherd, Wardle 2009; Keily, Shepherd 2005.

³²⁸ Silvestri *et al.* 2008: 331; Toniolo 2007: 131-142; Dell'Amico 2001; Foy, Nenna 2001: 111.

³²⁹ See Foster, Jackson 2009: 193, 195-196.

³³⁰ For the case of Sagalassos, see Degryse *et al.* 2006.

³³¹ Metals could be recycled a long time after the mining of the original raw material. An example is given in Bray, Pollard 2012: 862, mentioning prehistoric evidence of objects produced with metal smelted about 500 years earlier.

³³² See for instance, see Bernard 2008.

³³³ Rodríguez-Almeida 2000: 124.

³³⁴ This process seems to have excluded *orichalcum* coins (Dungworth 1996; Bayley *et al.* 2008: 49).

³³⁵ Cordier 2003.

³³⁶ It is attested that urine was collected in certain amphorae located at crossroads. See Panciera 2000: 101, in particular footnote 41; Peña 2007: 200-202; Cordier 2003: 55. Ancient sources include *Mart.* 6, 93 and *Macrob.*, *Sat.* 3, 16, 15. An extremely interesting case study is in Brissaud 2003.

³³⁷ Rodríguez-Almeida 2000: 127.

³³⁸ Nin, Leguilloux 2003: 151-152.

³³⁹ Rodríguez-Almeida 2000.

Evidence of secondary use and recycling of pottery and consequences in dating

Particular attention has been devoted in literature to the most evident cases of reuse of ceramics, usually amphorae.³⁴⁰ The best-known features in which amphorae were recycled (usually complete or almost complete) are drainage systems and walls. In the first case, vessels no longer suitable for containing goods were re-used in large numbers in wetland areas to guarantee a stable and drained soil.³⁴¹ In the second case, vessels were re-used in particular circumstances, i.e. when some parts of walls or vaults,³⁴² for stability reasons (or more likely for economic ones),³⁴³ needed to be less heavy.³⁴⁴ Amphorae were fixed with mortar and they allowed the building of robust but light structures, both in public and private buildings.

Apart from these most striking (and perhaps comparatively rare) cases, pottery was involved in much more widespread and consistent processes of recycling.

Two main flows can be detected: first, a chain of activities leading to the production of mortar and *cocciopesto*, and, second, a flow connected to the use of grog temper (*chamotte*) for the production of new pottery or building material.

The use of primary, and even secondary, grog³⁴⁵ for the production of new vessels and building materials is well known, but it has little impact on dating issues.

Conversely, the use of ceramic materials, in the form of fragments, for manufacturing mortar, *cocciopesto* and floor beddings, has much more consequences; moreover, thanks to the larger dimensions of the single sherds, it is usually much easier to detect the fragments originating from pottery.

Cocciopesto is, by definition, produced from *testae tunsae*³⁴⁶ and was widely used for constructing pavements, hydraulic infrastructures, and also wall plaster (i.e. in the amphitheatre of El Djem³⁴⁷ or the Insula of the Menander in Pompeii).³⁴⁸ It was so widespread that it would be impossible to compile a list of every case in which it was used. As mentioned previously, on many occasions, and when aggregates are big enough, it is relatively easy to detect potsherds included in the mortar, excluding in this way the reuse of architectural materials. In the case of *cocciopesto*, or hydraulic plaster and mortar, crushed ceramics play the same role as that of *pozzolana*, i.e. as a reagent with the lime in the mortar, leading to the production of an impermeable compound.

If we focus on pavements, using both literary and archaeological sources, we know that the amount of pottery used in these features can be broadly estimated as about one-third of the whole volume,³⁴⁹ giving an idea of the consistent stream of recycled vessels involved in the process.³⁵⁰ Potsherds were also inserted, more or less systematically, directly in the mortar binding of masonry structures.

Here it is worth noting that the practice of adding crushed pottery to mortar may not have been very systematic, but at least we can assume it was not a rare exception.³⁵¹ The important cases where potsherds were intentionally added to mudbrick/*pisé* structures, or in groundworks, is discussed respectively in Chapters III.5.1 and IV.4, but crushed vessels were also used in an uncountable variety of minor examples,

³⁴⁰ For a general discussion of the reuse of amphorae, see Peña 2007: 119-192. See also Martin-Kilcher 2003.

³⁴¹ See Chapter IV.2.4 and IV.2.6. For a general overview, see Peña 2007: 181-192.

³⁴² For a recent review of the use of amphorae in vaults, see Lancaster 2005: 68-85.

³⁴³ Lancaster 2005: 77-78.

³⁴⁴ Peña 2007: 174-178.

³⁴⁵ Quinn 2013: 58, 59, figure 3.30; Quinn, Burton 2009: 284, figure 8c.

³⁴⁶ *Vitr.*, 7, 1, 3.

³⁴⁷ Peña 2007: 263, figure 9.5.

³⁴⁸ Many examples in Arthur 1997.

³⁴⁹ Peña 2007: 265-267.

³⁵⁰ Analysis conducted in some mortar-based building materials from the temple of Venus in Pompeii may suggest an overall ratio of 1:1 between aggregates and binder (Piovesan *et al.* 2009: 71-73 and 75). In this case part of the ceramic aggregate resulted allochthonously (Piovesan *et al.* 2009, 76-77), suggesting the possibility that it derived from vessels. See also Weiner 2010: 189-190.

³⁵¹ For an example of a wall almost totally made up of pottery, see Adam 1994: 153-154.

spanning from the coating of basins to the repair of cracks or gaps in masonry structures.³⁵² Some extreme cases of large-scale recycling of vessels in smaller or larger pieces, and with different functions, have been observed in proto-Byzantine hermitages in Egypt.³⁵³

Secondary use and recycling of ceramic vessels were common practices in the Roman world. It is still difficult to quantify this phenomenon, but the clues in our hands indicate that it was not infrequent, in particular if we look at the recycling of potsherds as fill/reagent for coverings and pavements.

Once the existence of a structured mechanism of recycling of pottery of some sort³⁵⁴ has been assumed, the next step is to examine how this process affects the archaeological record, and in particular the means we use to date archaeological deposits.

First, the systemic process of recycling may, again, seriously affect the fragmentation index of the pottery recovered in the archaeological record. Recycling (in particular for grog temper) has been claimed to be one of the possible causes of incomplete vessel re-fitting in contexts considered primary;³⁵⁵ incomplete re-fitting itself implies an increase in the fragmentation of the record, therefore relating recycling and fragmentation.

Turning to specific case studies, ethnographic research carried out in the Kalinga Province in the Philippines³⁵⁶ has shown that domestic dumps (i.e. one kind of deposit archaeologically considered primary) did not receive freshly broken vessels. About one third of the vessels were first provisionally discarded for possible re-use, implying that domestic dumps/discard areas were filled with material damaged from the very beginning; in fact, an average of 74% of the midden sherds were under 5cm². Communal dumps, on the contrary, received both more intact vessels and heavily damaged ones, coming from domestic dumps/middens. These observations are in exceptionally good accordance with what has been observed for Roman urban dumps.

Apart from fragmentation, a second important consequence of ancient practices of recycling within the archaeological record consists of the introduction of 'freshly made' potsherds in archaeological contexts, which, consequently, may be targeted for *ad quem dating*.³⁵⁷

This is the case with mortar floor beddings or *cocciopesto*: from a functional or spatial point of view they may be considered secondary contexts, as the potsherds embedded were not used and discarded in the same location from where they were recovered: in fact, they have passed through a chain of different transformations and disposals.

Nevertheless, in a chronological and formative perspective, the same sherds may have a much higher value. Considering the fact that it is unlikely that sherds were obtained from buried vessels, there are two main channels through which they may have entered the mortar as fill/reagent: one is through the reuse of more ancient building materials coming from dismantled structures or whole buildings; a second is through vessels recycled as soon as they had been discarded.

The latter seems to be the most reasonable route for potsherds to have been embedded in mortar, even if both the other two processes may also have occurred. As examined in this chapter (and in Chapter IV.6), there are some means by which we can differentiate the three different processes: dealing with freshly recycled sherds, we are also substantially dealing with a primary deposit, suitable for *ad quem* datation.³⁵⁸

³⁵² Respectively Peña 2007: 261, figure 9.3 and Adam 1994: 152-154.

³⁵³ For an overview and for further references, see Ballet 2003: 226-227.

³⁵⁴ It has already been discussed how the Roman practice of discard can affect the record, in particular by creating 'patterns of absence' within the city.

³⁵⁵ Chapman 2000: 54.

³⁵⁶ Beck 2006: 42-44.

³⁵⁷ See the fundamental considerations of R. Ling (1997: 19).

³⁵⁸ A direct connection with potters has been advanced too (Greco 2011: 62).

In fact, even though we do not know exactly the duration of the process that brought the discarded sherds into their final context, we can safely assume it was not relevant, given the approximate level of our chronological inferences. For instance, if we are faced with an assemblage of amphora sherds, broadly dated to the 1st century AD, it makes little difference if it took even five years, after the amphorae were discarded, before they were incorporated into the structure from where they were finally recovered. The point, as we will see, is trying to demonstrate it, case by case.

One last consequence of the practice of recycling (in general) in antiquity, concerns the formation of dumps of different quality. In fact, we may recover dumps made up of:

1. material not really suitable for recycling;³⁵⁹
2. both recyclable and un-recyclable material; and
3. recyclable material that was never recovered.³⁶⁰

This consequence does not directly affect how the dumps are dated, but it influences the quality of the artefacts recovered within such deposits. Thus, when dealing with the interpretation of a deposit as a dump, we have to keep in mind that it can show these different features.

III.4.2 Evaluating fragmentation and other characteristics of the assemblage

We have discussed the impact of recycling on the fragmentation index and also observed that loading and unloading rubbish carts may have played some role.

Nevertheless, the analysis of the fragmentation index has often been used as tool for recognising primary and secondary deposits:³⁶¹ in other words, high ratios of breakage are usually ascribed to re-deposition,³⁶² rather than processes taking place between primary use and final discard (i.e. recycling or transport). It has to be stressed that the effectiveness of this method has already been questioned,³⁶³ in particular, it has been noticed that both archaeological and ethnoarchaeological evidence does not always (but we may say very rarely) match the expected fragmentation variability.

An interesting investigation of breakage rates has been carried out in Leicester.³⁶⁴ Two methods (total weight/number of sherds and number of sherds/EVEs – rims) were used to evaluate fragmentation, but both failed to differentiate different kinds of features or primary and secondary contexts, apart from some extreme cases. In particular pits filled with contemporary rubbish did not show a markedly different pattern compared to re-deposited old rubbish.

Given this data, it seems confirmed that breakage ratio analysis does not seem to be an appropriate tool for assessing that a deposit is secondary: even highly fragmented assemblages may turn out to be primary. In other words, we do not expect primary deposits necessarily to show low breakage rates.

Finally, the moving of amounts of sediments along with the potsherds within them (eventually generating secondary deposits) may not entail a sensible increase of the breakage ratio of the sherds themselves; potsherds, embedded in the matrix, should suffer a consistent mechanical shock to be cracked again. This phenomenon may affect only few sherds in the ‘periphery’, while the bulk would not change its characteristics that much. It has been possible to provisionally test this model experimentally, as described in Chapter III.5.2, and a similar pattern may be observed when dealing with wear (see below).

³⁵⁹ For instance, see Adam 1994: 153 and Nin, Leguilloux 2003: 156.

³⁶⁰ Among other instances, a typical case is represented by marbles collected (presumably to be reduced for lime) and evidently never recovered. See Nin, Leguilloux 2003: 151. Another possible case study is in Bonetto *et al.* 2005.

³⁶¹ For a more general use of indications derived from sherd size analyses, see Bradley, Fulford 1980.

³⁶² Puschnigg 2006: 107-108. *Contra* the fundamental Halstead *et al.* 1978.

³⁶³ Dubant 2003: 167.

³⁶⁴ Pollard 2000.

We can still assume that a high preservation of vessels implies, if any, a low frequency of re-deposition, but we cannot assume that low preservation of vessels necessarily implies a high frequency of re-deposition.

Other factors surely contribute to create the fragmentation patterns that we observe in ceramic assemblages: the most important is the different breakage ratio of different vessels, due to the technology of manufacturing, the thickness of the body and the size of the whole vessel (amphorae clearly have a different breakage ratio when compared with, say, lamps).

Nevertheless, we may consider this aspect to be very influential faced, for instance, with the percentage of different classes of pottery within an assemblage; but if we are considering whole assemblages, we may argue this process affects our ability to define primary and secondary deposits only slightly.

Other physical, and possibly chemical, characteristics of the assemblage may also provide useful insights into the flows delivering the single materials to where they were recovered.

Ceramics

Every single sherd represents a micro-basin carrying a variety of information,³⁶⁵ from its manufacture to its diagenesis: of course, it is the last part of its life which is of great interest in this case.

Related to the issue of fragmentation is that of conjoinable pieces. The topic has been discussed in many ways,³⁶⁶ and it represents an issue well known in every excavation; it is worth focusing on how it may affect the way of dating. Conjoinable pieces within the same context, or even deposit, may represent, at most, a ceramological or spatial issue, or yield a problem in counting. Sometimes conjoinable pieces recovered close each other are claimed to be *in situ*. This may well be true if they comprise a whole vessel, or at least a specimen that can be largely restored, but where they form just a larger piece this conclusion is not straightforward at all, as large sherds may have fractured just during/after deposition/redeposition, possibly because of the weight of the upper sediments.

More complicated is the issue of joining sherds from different assemblages. One first interesting way of using conjoinable fragments from superimposed strata is represented by the attempt to assess that vertical displacement, and therefore infiltrations, occurred (see Chapters II.2.10 and III.6). This tool was used also at prehistoric sites to assess the formative homogeneity of levels that had been at first kept divided.³⁶⁷ In urban Classical environments, using conjoinable pieces to assess the presence of infiltrated materials in the lower levels can surely be considered, but great attention has to be paid to other possible causes. Generally speaking, the high rates of fragmentation and continuous redeposition typical of such an environment can much more easily bring different sherds of the same vessel into different contexts, without producing contamination or wrong stratigraphic readings by the excavator. The simplest example may be represented by the case of a robber trench (Figure 34).

In this case, destructive activity may crush some sherds embedded within the nearby layers and some of the resulting pieces may get embedded within the backfill of the trench. In this case, the 'freshly made sherds' will be residual materials of the assemblage of the backfill. Similarly, much more complex and even repeated processes are, after all, quite common in cities.

³⁶⁵ Vidale 2007: 72. See also Mannoni, Giannichedda 2003.

³⁶⁶ Chapman 2008; Chapman, Gaydarska 2006; Chapman 2000. See Schindler Kaudelka 2010 for conjoinable sherds that were most probably separated (they were recovered at distances of 50 m or more) by colluvial episodes.

³⁶⁷ Villa 1982.

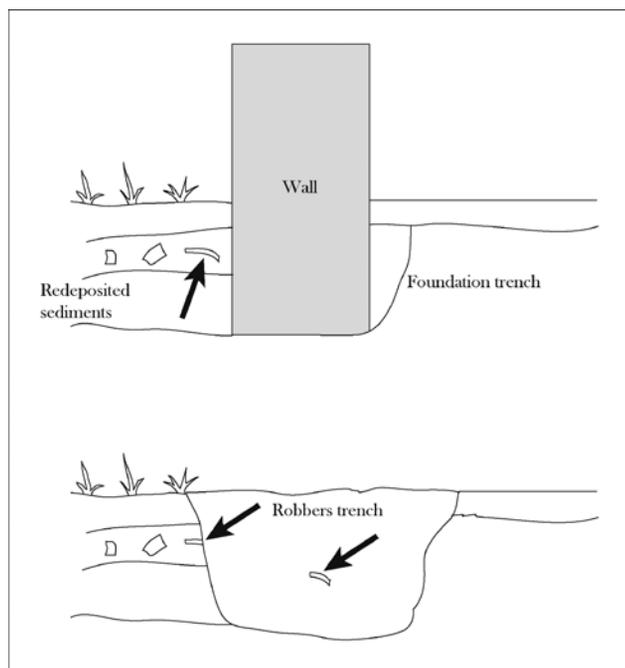


Figure 34: Conjoinable sherds in different contexts: the case of a robber trench.

Indeed, apart from infiltration, conjoinable pieces may simply indicate that redeposition occurred, but how long it took is another matter. Sometimes the presence of conjoinable pieces in different backfills is used to postulate a unitary and contemporaneous combination of actions, and/or a common source or basin.³⁶⁸

Some interesting conclusions can be drawn also through the examination of deterioration/wear.³⁶⁹ Given the fact that this is a characteristic affected by many factors (manufacturing technique, typology and use of the specimen, depositional environment, etc.) some key features can suggest the informative potential of the whole assemblage or of the single sherd. In fact, it has to be stressed that a large part of the available studies focus on use alteration (therefore pre-depositional) while diagenetic processes are still neglected to some extent.³⁷⁰ Use wear can be a helpful tool only in some particular cases, i.e. when we are handling the most recent material of an assemblage and

when it is well dated. In this case, we can try to refine the *tpq* or the *tadq* that this provides (see below. For coins see Chapter III.3.3). When dealing with post-depositional alteration, fractures assume a particular importance, as what happened to them must have occurred much more probably after the sherd was deposited, or at most after the vessel had lost its primary function.

Another important key point is represented by the relationship between the physical characteristics of the artefact and the characteristics of the deposit: discrepancies between the two may raise the doubt that redeposition, possibly after perceivable time, occurred. For instance, sherds worn by water in a dry environment may suggest that they have been redeposited, indicating a fluvial or coastal environment as a catchment area. This would suggest the secondary nature of the deposit. The case has been discussed by A. R. Ghiotto in the analysis of the Roman forum of Nora and it allowed him to track the potential source basins of some sherds (coastal deposits).³⁷¹

Looking at the assemblage as a whole, it is sometimes assumed that visibly worn sherds must have been redeposited, while primary deposits (in any sense) should, generally speaking, display materials with little post-depositional wear. Apart from general considerations about the burial environment, which can play a fundamental role, some other observations, similar to those made about fragmentation, can be advanced. If on the one hand severely abraded sherds are likely to have had a particularly intense ‘afterlife’ and thus redeposition is likely to have occurred,³⁷² the contrary cannot be taken for granted. Indeed, once buried the sherd meets relatively stable conditions³⁷³ (moisture, temperature, etc.) and the mechanical stress necessary to produce abrasion³⁷⁴ is very low. Thus, even sherds redeposited more than once, along with their matrix, may display little abrasion, thus being similar to ‘untouched’ sherds.

³⁶⁸ See the case of Drain 1971 - 1 from Corinth (Mc Phee, Pemberton 2012: 1-17).

³⁶⁹ Skibo and Schiffer define deterioration as ‘breakdown by non-cultural processes’ and wear as ‘artifact modifications resulting from human use’ (Skibo, Schiffer 1987: 83).

³⁷⁰ Weiner 2010: 198. For use alteration, see in particular Skibo 1992 and Arthur 2002.

³⁷¹ Ghiotto 2009: 265-267 and Bonetto *et al.* 2017: 74.

³⁷² Ploughing also plays an important role where superficial materials in open areas. In this case, more than redeposition *stricto sensu*, the wear points to mixing and re-elaboration.

³⁷³ Lega *et al.* 1997: 88.

³⁷⁴ Schiffer, Skibo 1989: 103.

Yet, within the same assemblage, general and transversal inhomogeneity in roundness may represent a clue about the status of the deposit, here suggesting that we are handling a secondary one. In this case, it is likely that more than one source basin has been notched, thus some upstream redeposition must have occurred, probably after an appreciable period of time (for the more worn materials).

We have mentioned that abrasion and roundness, produced by flowing water, found in sherds recovered in a more or less dry context, if not produced by environmental changes, suggest redeposition (it is even more evident when just some of the sherds present these characteristics).

If this characteristic involves the more recent specimens, these must be assumed to provide only a *terminus post quem* for the deposit formation, which, furthermore, must have occurred much later. Post-depositional processes (following the last deposition) in this case must also be evaluated to detect any localised disturbance that may have affected the wear rate just in part of the assemblage.

An even closer examination, for dating purpose, may target only the most recent items included in the assemblage under examination. If this is the case of particularly well-dated finds, an evaluation of both pre- and post-depositional wear/deterioration could provide useful insights for refining the *tpq/tadq*. One sherd showing markedly different degrees of abrasion on different fractures is likely to have been redeposited, thus the date provided should be handled as a generic *tpq*.

Blackening is another physical/chemical characteristic that can be observed by the naked eye to some advantage. Again, it is an issue well studied with regard to vessel use, but much less attention has been devoted to what happens after the deposition.³⁷⁵ In this sense, the blackening of sherds pertaining to vessels whose primary function was not cooking may represent an interesting clue.

Together with other parameters, post-depositional blackening of pottery is a key feature to help recognise a layer that was the product of an episode of fire (thus potentially a primary one): in Aquileia, long tradition attributes 'black layers' to the destruction brought by Attila and his Huns in AD 452. During and after the excavation of the 'House of *Titus Macer*', Fondi Cossar, some Late Antique dark layers, which were liable to be attributed to that episode, according to the material's physical status (in particular no blackening was observed), were instead interpreted as the dumping of various items together with substantial amounts of ash and charcoal, possibly produced by domestic activities. Although on the one hand the deposit could anyway have been claimed as a primary one, on the other the wider interpretation of the evidence resulted in a very different picture, and precise dating to AD 452 could no longer be sustained.

Concerning blackening, it has to be stressed that free carbon can be wiped off a ceramic surface very easily, thus this physical aspect of the assemblage has to be described and investigated before the ceramics are washed.³⁷⁶

Blackening of a different kind, made of manganese and iron, may also be produced in particular conditions by micro-biological activity,³⁷⁷ while the blackening of glazes or lead-rich enamels is produced by anaerobic bacteria that flourish in the presence of decomposing organic material³⁷⁸ (see dumps), thus pointing to the original context of burial.

Indeed, the burial context does not only affect the physical characteristics of ceramics, but also their chemical status. By now the literature has largely acknowledged that the burial environment affects the chemical profile of ceramics³⁷⁹ (particularly the more superficial layers of sherds), with particular consequences in provenance and use analysis. Less attention has been devoted to the compatibility/

³⁷⁵ See Banducci 2014 for a recent overview.

³⁷⁶ Banducci 2014: 808.

³⁷⁷ Lega *et al.* 1997: 88 with further references.

³⁷⁸ Lega *et al.* 1997: 93.

³⁷⁹ Freestone 2001; Schwedt *et al.* 2004; Maritan, Mazzoli 2004; Maritan *et al.* 2007. See Hally 1983 for alteration due to use. For more in general, see the classic Rice 1987.

accordance of the characteristics of the alteration with those of the environment in which the sherd was recovered, leading in some cases to postulate redeposition after some time. Again, efforts could just focus on some key sherds, such as the most recent ones.

In general, in this field archaeometry may play, in the future, an important role, although up to now research has not pointed in this direction.

Coins

For the coins here, See Chapter III.3.3.

Bone

The weathering of bone³⁸⁰ also poses some problems in dating. It can, indeed, be a very suitable source for radiocarbon dating, but if weathered, it has to be assumed that for a certain period (of various lengths according to the severity of turbation) the find was abandoned on the surface of the ground. Indeed, apart from aggressive (acid) conditions, most of the weathering of bone occurs on the surface³⁸¹ (among many factors, sunlight probably plays an important role, along with gnawing), and it causes typical longitudinal cracks.³⁸² The length of any such period may well be archaeologically irrelevant, but this fact may help indicate that redeposition occurred. *In situ* weathered bone may also be used to infer that a given surface had been exposed for a long period. In any event, given the multitude of factors involved, the quantification of the time during which the bone remained unburied is far from easy, making this aspect of the record fairly difficult in terms of fruitful inferences in dating. Much more work is needed in this field, and for the moment it has to be considered as a pointer to be integrated with other observations.

On the other hand, articulated bones within a given deposit indicate that they were discarded when some flesh or tissue was still holding them together, therefore suggesting that it is very unlikely that redeposition occurred. This makes these bones particularly suitable for radiocarbon dating and they should allow for a good *ad quem* dating of a primary deposit.

Unlike ceramics, chemical weathering of bone³⁸³ does not seem to produce substantial consequences to the issue of dating.

Suggestions for recording the assemblage's physical status

Given all the potential helpful information which can be drawn from the physico/chemical status of the assemblage, it is worth thinking about how these should be collected. As already mentioned, urban excavations require effective and quick methods of recording; moreover, it has to be acknowledged that, at present, the overall weight of the information available from these observations, when compared with other sources, is after all fairly low. A good compromise between the necessity of good recording and its actual practicability may be achieved with a high-resolution picture of the whole assemblage. Two pictures, one taken before washing and the other after it, possibly with conjoinable pieces placed close together and provided with a metric scale, would be even better. This simple and quick procedure would enable at least a rough but effective and speedy visual evaluation of fragmentation, wear, blackening, etc., whereas other pictures may be dedicated to particularly informative pieces, showing some peculiarities. If this procedure was part of find specialists' standard procedure, excavators would also draw great benefits, and at the end of the excavation a visual collection of assemblages would also be available for quick, comparative observations. Some more precise indications about wear may be obtained later through comparison with sphericity roundness charts (Figure 35).

³⁸⁰ Behrensmeyer 1978.

³⁸¹ Wiener 2010: 115-116.

³⁸² See Schiffer 1996, also for further references.

³⁸³ White, Hannus 1983.

More detailed information could be later collected using other techniques, even quantitative ones.³⁸⁴ In any event, greater attention earlier on during excavation would be very welcome, and more information, from the excavator’s point of view, should be given space on the standard single-context sheet. In general, it has to be acknowledged that these aspects of the record are rather neglected in the field of Classical Archaeology, but some useful data could be collected, even with relatively low costs in terms of both time and money.

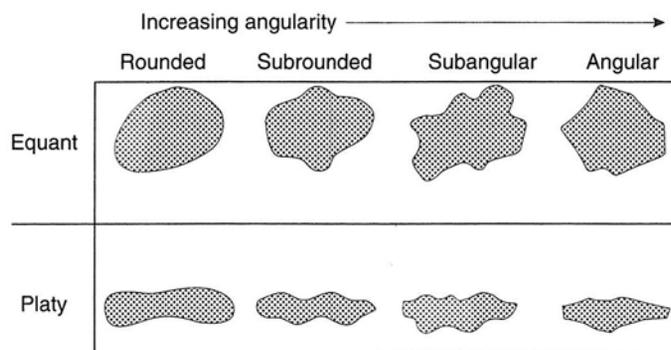


Figure 35: Angularity (Goldberg, Macphail 2006).

III.4.3 Coping with the issue of selection and the intentional addition of materials

When dealing with recycling, particularly concerning pottery, it has been observed how some ‘freshly made’ sherds become part of masonry structures, plaster, etc. The intentional addition of these materials is self-evident, and it has been demonstrated that they can be used, if other requisites are observed, for tempting *ad quem* dating. The intentional addition of both sherds and charcoal is also discussed when dealing with literary sources (see Chapter III.5.3). Other cases may be much less obvious, but similar conclusions may be drawn. Thus, given this general knowledge provided by literary sources, as well as by the knowledge of recycling processes, it is necessary to examine which other aspects of the record may suggest the intentional addition of materials (Figure 36). Intentionality does not always imply *ad quem* dating, but quite often it seems to be the case.

Intentional deposition may be suggested *in primis* by the spatial arrangement of finds: regularity, iso-orientation, and any non-chaotic and non-natural feature, may represent important clues in this sense. Even though deposition was not intentional, sometimes it may be possible to ascertain if the sherds were redeposited together with their matrix or not by observing their spatial arrangement, i.e. observing if their three-dimensional position is due simply to gravity or also to the presence of some matrix compelling their movements.

Another key criterion for assessing intentionality is the one of human selection. If the materials within a given anthropogenic deposit have been somehow sorted, it is unlikely that they were redeposited

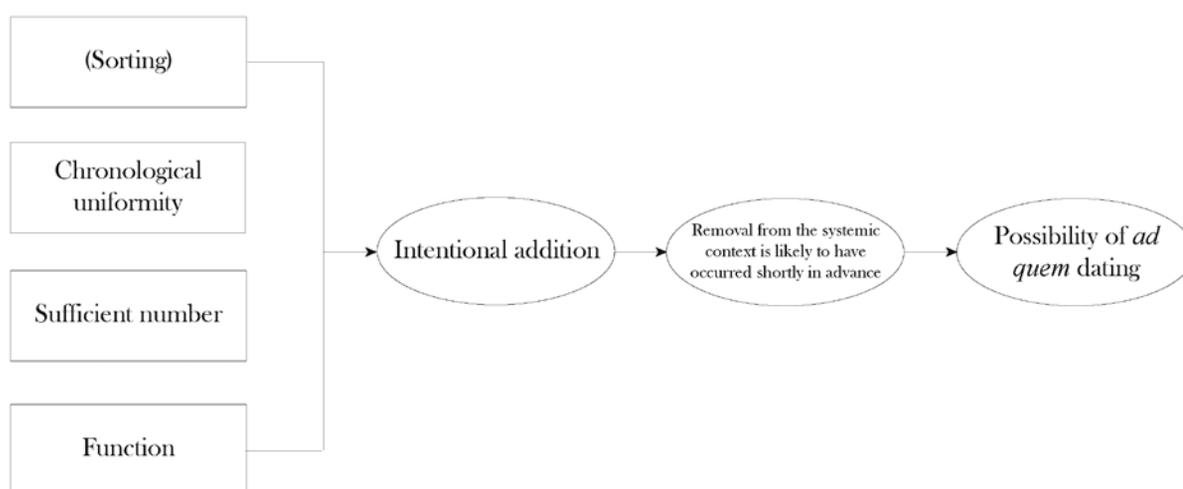


Figure 36: A sketch of the ‘clues’ possibly suggesting the intentional addition of materials within a given deposit.

³⁸⁴ Allen 1989.

together with the sediments forming the deposit, whereas it is probable that they were removed from circulation and added to the deposit. Selection does not necessarily occur if intentional addition occurs, but if selection occurs, then intentional addition must have occurred too.

The assemblage may display selection, for instance, according to type and/or size.³⁸⁵ Take for instance one deposit containing high proportions of decimetric amphorae body sherds or only amphorae stoppers: casualty in this sorting seems to be unlikely, as well as natural sorting. Human sorting, and thus intentional addition, seem much more probable.

In this case, another kind of sorting must also have occurred, i.e. a chronological one: the vast majority of the assemblage should display dates in reciprocal accordance, although some false residuality may be observed.

The example also introduces another important criterion, i.e. the total amount of the material involved. It is unlikely that just a few pieces were intentionally included within a given deposit (to make what difference?), while to play any role they must be present in significant number. These conclusions recall, in turn, another fundamental criterion, which is that of the function (the reason) of the embedded assemblage. The intentional addition must respond to some necessity and thus the inserted assemblage must play some function within the deposit. This seem to be much more probable in deposits linked with building activity, where the added materials can have, for instance, a mechanical or draining function.

Amphorae used for drainage can be considered a matrix-less, extreme case of deposits made of selected items, picked among the freshly discarded ones, deposited in large numbers and fulfilling a specific function³⁸⁶ (see Chapters IV.2.4 and IV.2.6).

A similar case, still quite explicit, is provided by the excavations carried out in 1990 in Concordia, north-eastern Italy (VE).³⁸⁷ Here the partial removal of a floor brought to light its bedding layers, one of which was almost completely made of amphorae stoppers. These were certainly laid down to prevent ground water from damaging the top floor and had most probably been collected at the nearby fluvial port, thus picked from the systemic context in which they were probably playing the role of stored or provisionally discarded items.

It has to be stressed that other materials, already embedded within the redeposited matrix, may substantially mask the pattern displayed by the intentionally added materials and that great care must be taken, in any event, before attempting some *ad quem* dating. Another useful example, in this sense, comes from the Fondi Cossar area.³⁸⁸ One layer was made almost entirely of fragments of wall plaster (selection, total amount), which had the function of bedding a floor made of bricks (function). Although the single fragments displayed two different superimposed plasterworks, they were likely to come from the same room, thus being contemporary phase by phase (chronological uniformity).

Summing up, all the previously listed requisites were fulfilled. However, obviously, the plaster fragments (even if they could ever have been precisely dated) would not allow any *ad quem* dating of the layer, but would provide a mere and very generic *terminus post quem*. Indeed, they had been obtained, most probably, through the demolition of the decorative apparatus of the very room where they were finally laid down, after having lived a presumably long, systemic life (*in situ*). In this case, the plaster fragments were not the more recent finds recovered, and this immediately suggested that they had nothing to do with the moment in which the deposit was formed. Again, qualitative and quantitative approaches cannot run separately, but must support each other. Moreover, this example shows clearly how the indications provided should be used as a guide, not as a rule, and how important is the class of materials used. In

³⁸⁵ As mentioned above, another possible clue may be a clearly artificial spatial arrangement.

³⁸⁶ Monte Testaccio, in Rome, may also be seen as the product of an extreme process of selection. See Blázquez Martínez *et al.* 1994 and Rodriguez-Almeida 1984.

³⁸⁷ Gobbo 1998; Rinaldi *et al.* 2014. Similar cases reported in Omari 2010-2011.

³⁸⁸ Furlan 2012: 76-77.

general, building materials have to be treated very carefully, considering that they normally have a long life, i.e. commonly they are false residuals. Asking how materials entered the record is, again, the key point.

III.4.4 The importance of the characteristics of the geological matrix and the role of geoarchaeology and micromorphology

In addition to OSL, discussed in Chapter III.2, sediments, by themselves, cannot provide an excavation with direct dates. Indeed, one of the major aims of this work is to elucidate how assemblages can be used to date when they, and the sediments in which they are embedded, were deposited.

Apart, however, from the obvious interpretive role played during excavation,³⁸⁹ some characteristics of the matrix can play an indirect role in dating and the disciplines which specifically study sediments, and their formation (i.e. micromorphology, geoarchaeology, sedimentology, pedology) can profitably contribute to the understanding, and thus to the dating, of deposits, particularly in some more difficult cases.

There are three main ways in which these disciplines can contribute to the correct dating of deposits:

- (1) helping avoid mistakes in stratigraphic reading and grouping;
- (2) clarifying how a given deposit was formed; and
- (3) providing information about the duration of the process of deposition.

The three aspects are, of course, linked together. The first refers to the obvious risk, in particularly difficult cases, of misreading a sequence, for instance keeping together what should have been kept separate, thus yielding substantial problems in dating. Matthews *et al.* noticed that ‘The only difference between observations and interpretations in the field and in thin section is the greater visible resolution provided by microscopic analysis. Micromorphology could be used much more widely by archaeologists’.³⁹⁰ Indeed, these disciplines can provide archaeologists with high resolution observations, thus helping avoid misreadings at least in the more difficult cases. Perhaps this is also one of the reasons explaining why they are preferred on a much wider scale in prehistoric archaeology.

The second point is possibly the more interesting. A wrong interpretation of a single context or of a whole deposit can change the way in which materials are used to date it.

Geoarchaeological analyses have been undertaken in the urban Phoenician site of Tel Dor (Israel) to help recognise floors and distinguish constructional deposits from deposits accumulated through continuous *in situ* habitation.³⁹¹ Concerning floors, the typical ones were made of tiny fragments of local carbonaceous sandstone; analyses enabled the detection of one ‘false floor’, actually made of phytoliths, thus indicating that it was not the product of human activity, but of natural processes. It has to be stressed that initially it had been interpreted as a floor, because to the naked eye it looked identical to the other ‘real’ floors. Important information was also gained on the use of the floors, enlightening dynamics similar to those discussed in Chapter III.5.2 about earthen floors. Consequences for dating and the overall interpretation of the sequence are, in this case, obvious. Even more cogent conclusions, from a chronological point of view, were drawn dealing with ‘fill’ deposits. As mentioned above, in this case microstratigraphic analyses allowed archaeologists to distinguish constructional deposits from deposits accumulated through continuous accretion. In terms of dating, the difference is substantial, as constructional deposits are redeposited (after an unknown time lapse) and will probably be dated by a mere *tpq*, whereas accretion

³⁸⁹ Often, rubbish layers contain soft, dark sediments, rich in organic matter; construction fills can display evident selection of matrix (see, e.g., Previato 2012); robber trench backfills are incoherent: sediments filtered through rubble are soft, etc. These coarse observations of the matrix are common ground of field archaeologists for sketching the first *in fieri* interpretations of the deposits already, when the excavation is still in progress.

³⁹⁰ Matthews *et al.* 1997: 285.

³⁹¹ Shahack-Gross *et al.* 2005.

deposits are formed *in situ* with circulating materials, thus enabling some *ad quem* dating. In our case the two types of deposits were difficult to discern with the naked eye, but they were clearly characterised microscopically, with backfills containing a random orientation of components, and accretion layers presenting micro-laminated structures.³⁹²

The work at Tel Dor also took advantage of some previous work carried out at Çatalhöyük and Tell Brak;³⁹³ a wide typology of deposits was investigated and each was characterised micromorphologically, thus providing a very useful reference for comparison in further studies. Deposits ranged from floors, middens and stable areas to unroofed trampled surfaces, streets, and so on. This high-resolution strategy allowed archaeologists to relate artefacts and micro-artefacts to discrete single episodes/actions of deposition or use, together with the post-depositional activity that affected each one.

Extremely interesting data, with important consequences for dating, were collected, in particular concerning the issue of redeposition. In streets and courtyards it was possible to assess that some aggregates were coated in sediments differing from the surrounding matrix, thus suggesting that they had been redeposited³⁹⁴ and, consequently, that they were in a secondary context from a spatial/functional point of view, and probably also from a temporal one. This achievement sounds interesting in perspective, and may go hand-in-hand with chemical analyses conducted on ceramics and other artefacts.

Another big issue where geoarchaeology plays a fundamental role concerning the way in which urban deposits are formed is the one of dark earths, which, as already mentioned, will not be treated in detail.

The relationship between the formation of these deposits and their dating is controversial and it seems to depend on a case-by-case interpretation, which, in turn, cannot be done without the assistance of micromorphology. The debate about the formation of these deposit types, which markedly characterise Late Antique/Early Medieval sequences of many European towns, has lasted for about 30 years.³⁹⁵ Their formation has been linked mainly to rubbish disposal (particularly charcoal), timber structure decay, and cultivation in urban environment.³⁹⁶

Of course, several phenomena may have occurred together, and heavy bioturbation certainly seems to play a key homogenisation role. As previously mentioned, their formation has to be evaluated case by case. Concerning chronology, it has to be stressed that sometimes high rates of residuality have been observed,³⁹⁷ this collides with the hypothesis that dark earths were produced mainly by rubbish disposal, which, in turn, has been demonstrated through micromorphology in other cases.³⁹⁸ It might be helpful if some of the tools proposed in this work (particularly a quantitative approach on artefacts) are viewed in reverse, exactly to support or contest one of the formative hypotheses proposed.

It has also been acknowledged that the formation of dark earths did not happen *abrupto*, but, on the contrary, they were the products of prolonged deposition and reworking. This leads to the third of the above-mentioned topics for which geoarchaeological sciences can provide useful insights, i.e. the duration of the processes of deposition. Laminae and beddings are well known in geological (natural) strata,³⁹⁹ and, as observed above for Tel Dor and Çatalhöyük - Tell Brak, they can also be observed in urban anthropogenic strata. In the case of dark earths, although macroscopically one single layer is observed, micromorphology, increasing the resolution of our observations, enables the detection of single episodes of deposition, thus allowing us to distinguish contexts that were the products of quick, single depositions from those contexts formed in longer time-spans.

³⁹² Shahack-Gross *et al.* 2005: 1429.

³⁹³ Matthews *et al.* 1997.

³⁹⁴ Matthews *et al.* 1997: 287. See also Matthews 1995: 52.

³⁹⁵ See, above all, the recent work of C. Nicosia (Nicosia 2018). See also Brogiolo, Gelichi 2005: 90-95, Nicosia *et al.* 2012; Goldberg, Macphail 2006: 271-273; Macphail 1994; 2013; Borderie *et al.* 2013.

³⁹⁶ Brogiolo, Gelichi 2005: 92-93.

³⁹⁷ Brogiolo, Gelichi 2005: 91.

³⁹⁸ Nicosia *et al.* 2012: 117-120.

³⁹⁹ See Reineck, Singh 1980.

This brief overview, with a few cherry-picked examples, does no more than scratch the surface of the topic of the relation between geoarchaeology, formation processes and chronology, but some prompts for future, further considerations are evident. Again, as a whole, it is a topic that urban Classical Archaeologists need to take up more actively.

III.5 The contribution of ethnoarchaeology, experimental archaeology and literary sources

In general, ethnoarchaeology and experimental archaeology have been somewhat neglected by most Classical Archaeologists for a long time.⁴⁰⁰ Possibly, the main explanation for this is the relative abundance of other sources, *in primis* literary and historical, which can provide similar information in a much more direct way.

Nevertheless, within the particular field of formation processes and dating, literary sources have also been greatly understudied. An attempt will be made here to demonstrate that the three disciplines can provide valuable and unique information. Therefore, this brief chapter also aims, at least, to stimulate more attention in this specific topic, in the hope that in the future more studies may be dedicated to it.

III.5.1 Ethnoarchaeology

The meaning and validity of the use of analogy have already been discussed (see Chapter II.2.12), which constructs the theoretical link between what we observe in the present and what we recover in the field. When approaching ethnoarchaeology, to make the analogy a good one, among other things, it seems important to select a living, systemic context, sharing as many traits as possible with the systemic context that produced the archaeological record being investigated.

For instance, when investigating the dynamics of assemblage formation processes within an abandoned Roman *domus*, it seems more fruitful to know the abandonment formation processes of buildings erected with similar building techniques, with similar functions, etc., than knowing about the abandonment processes of, say, a small, wooden hut with both domestic and productive functions. Given the complexity of the Classical world in terms of production, trades, technology, social structures, building practices, etc., examples drawn even from present everyday life, even within ‘Western society’, can help enlighten some processes that may have played a key role in antiquity.

In terms of usefulness in dating Classical urban deposits, there are, perhaps, two main streams where ethnoarchaeology can provide interesting data:

1. how assemblages and deposits are formed and patterned; and
2. how artefact use-life affects the chronological patterns detected within assemblages.

On deposits and assemblage formation, one very evident case study is provided, for instance, by ancient and modern mudbrick/*pisé* structures.⁴⁰¹ These structures were widespread in antiquity,⁴⁰² and they often present clear use-continuity up to the present. At Nora (Sardinia), excavations below the Roman *forum* brought to light the structures of a previous Punic quarter: the lower part of the walls was made up of cobblestones and orthostats, bound with silt and clay, while the upper part was built using the *pisé* technique. Even though when the new *forum* was built the upper part of the walls was demolished and used to backfill the resulting grid of structures, it was possible to postulate the nature of the deposit thus

⁴⁰⁰ In a recent overview of the different ethnoarchaeological traditions in different countries, the Italian ethnoarchaeological school is linked directly only with pre- and proto-historical scholars (Lugli 2013). For a rare ethnoarchaeological approach to pottery in Classical antiquity, see Peacock 1982.

⁴⁰¹ Indeed, there is a vast bibliography about the topic. Here just a few works considered necessary to make specific points and/or containing further references are presented. [should there be some references here??] I meant that the references provided in the following footnotes has to be considered as very specific and partial

⁴⁰² See Adam 1994: 104-111 and Bacchetta 2003: 127-132. More references in Bonetto 2009b: 119, footnote 175. See also the recent de Chazelles *et al.* (eds.) 2011 for a wide overview.



Figure 37: Present-day mudbrick wall at Sarroch, Sardinia (Bonetto 2009b).



Figure 38: Present-day earthen roof from Dagpazari, Turkey, note the abundance of sherds (courtesy of G. Rossi).

generated, drawing from a wide archaeological and ethnoarchaeological series of case studies, which also includes the present town of Pula, just few kilometres away from the archaeological site (Figure 37).

Indeed, earthen structures are still in use in many towns in Sardinia today, as well as at many other sites⁴⁰³ (Figure 38). Apart from helping define the nature of the excavated deposit, knowledge of this building technique allows an explanation of the presence of many potsherds: the introduction of sherds as aggregate may, in fact, have been intentional, to make the mudbricks stronger, more suitable to receive plaster, and, if sherds were worked into the facing, for protection from running water. This use of aggregates has been studied in contemporary systems and it seems to provide a coherent explanation.⁴⁰⁴ The deliberate introduction of artefacts within structures and deposits is a key factor in establishing whether an assemblage is suitable for dating *ad quem* or not. If it is likely that the artefacts were not recovered in earlier deposits, but were circulating somehow within the time lapse in which the structure was built, they can be used for *ad quem* dating. Of course, this issue has to be fully investigated and other tools are necessary. For instance, at Nora it has been demonstrated that some sherds were already residuals when they were embedded within the walls. Furthermore, as previously mentioned, intentional addition does not mean by itself dating *ad quem*, as is quickly demonstrated by another ethnoarchaeological example.

Villa Asiola, an old mansion just four kilometres from the centre of ancient Aquileia, was recently completely refurbished and converted into a guesthouse. Some of the refurbished walls still display a mixture of modern bricks and Roman tiles, potsherds and bricks (Figure 39). These artefacts were obviously intentionally added, possibly for aesthetic reasons, but they are also clearly residuals. Continuous reincorporation of older pottery within mud walls has also been observed and studied in some

⁴⁰³ See, e.g., Schiffer 1996: 112, figure 5.4.

⁴⁰⁴ See MacIntosh 1974: 159; MacIntosh 1977; Cooke 2010: 13, for further references.

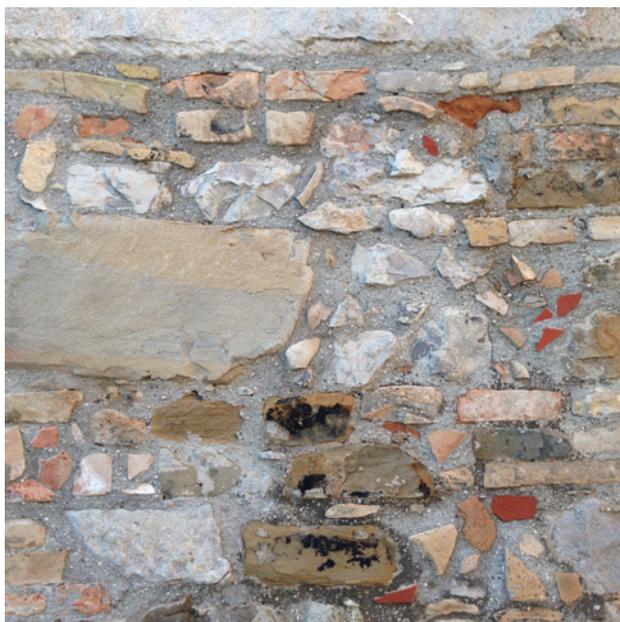


Figure 39: Present-day wall from the Villa Asiola, Villa Vicentina (north-eastern Italy), note the mixture of modern and ancient stones, bricks and sherds.

contemporary structures in West Africa, a clear ‘warning to those hoping to use the incorporated pottery to date a wall’.⁴⁰⁵

Thus, even when intentionality is suspected as a factor behind the presence of some artefacts in a given deposit, it has to be combined with other sources of data when endeavouring to employ the assemblage for *ad quem* dating. In the case of the Punic walls below the *forum* of Nora, other factors that might support an attempt of *ad quem* dating could be the coherent chronology of the materials preferred and the abundance of freshly discarded vessels and the shortage of previous stratified sherds when the walls were erected.

The case of Nora (which is resumed in Chapter IV.5.7) also raises another chronological issue, which, again, can be handled (mainly) through the use of ethnoarchaeological analogy, i.e. how long earthen structures can stand without

significant reconstructions. The work of R. MacIntosh in contemporary West Africa provides interesting insights into the decay rates of these kinds of structures. Ethnoarchaeological evidence showed that walls directly built on the ground needed some repair after two or three years if uncovered, and after up to seven if plastered. The Punic walls below the *forum* of Nora, erected on a lithic base and probably covered, are likely to have stood unaltered for even longer. Moreover, apart from the repairs needed,⁴⁰⁶ the core of the structure may have been unchanged for a significantly long time, thus confirming the excavators’ hypothesis that the same structures remained in use for a very long time, up to the time of the *forum* construction.⁴⁰⁷ Ethnoarchaeological evidence from many other contemporary sites, for instance, clearly points in the same direction.

It is clear in the case of earthen structures how ethnoarchaeological analogies can contribute to strengthening our models on formation processes and dating, and how they enlighten us on some aspects of the duration of some activities. A similar analogy can be advanced for wooden structures, with clear consequences for evaluating radiocarbon dates and the duration of some processes. The lifespan of woodworking proposed by J. P. Adam is indeed taken from present-day knowledge and observations, thus involving a form of ethnoarchaeology.⁴⁰⁸

Another clear circumstance in which ethnoarchaeological comparison is fruitful occurs when dealing with deposits likely to be the product of abandonment/collapse/reuse processes or rubbish disposal. Some interesting studies concerning abandoned buildings have been carried out in the Irish Midlands: M. Morris studied what is commonly known as occupation debris at an early stage in the site-formation process⁴⁰⁹ (Figure 40). In this case, the attention was focused on spatial patterning and functional analysis, but, as will be developed later, chronological patterning can also be addressed, with very promising results.

⁴⁰⁵ MacIntosh 1977: 195. See also MacIntosh 1974: 159.

⁴⁰⁶ See Cooke 2010 for further, well updated, references.

⁴⁰⁷ Bonetto 2009b: 139-141.

⁴⁰⁸ Adam 1994: 156-161. Scientific measurements seem also to have been used.

⁴⁰⁹ Morris 2000.

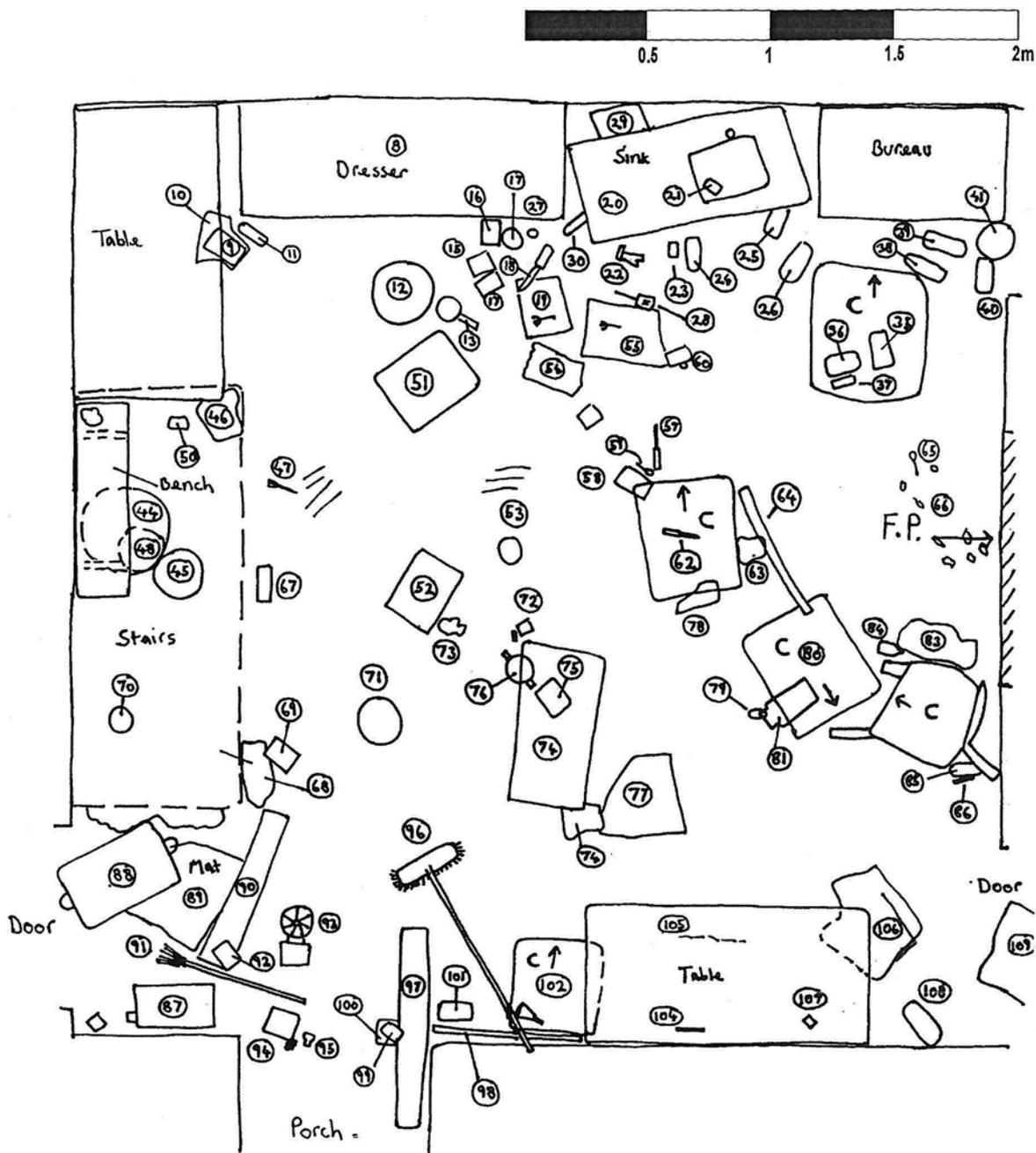


Figure 40: Sketch of the materials recovered in the present-day kitchen of an abandoned rural dwelling (Morris 2000).

Even a basic, qualitative study can contribute to our understanding of some formation processes that impact on the confidence of our chronological inferences. In particular, the entrance within the deposit of anomalous elements has been tracked in one interesting case study drawn from the excavations carried out at Aquileia, Fondi Cossar.

One deposit was interpreted as a small dump activated when the building, still standing, was presumably partially abandoned. Given the small amount of debris, the dump seemed to have been used for a short time. The chronology of the artefacts, their physical state, the abundance of bones, shells, charcoal and ash seemed to support the interpretation of the deposit as a dump (primary deposit). Some lithic *tesserae* clearly originated from the break of an underlying floor, being indeed residuals/false residuals. But the presence of several fragments of plaster (Figure 41) raised the hypothesis that the deposit could have actually derived from demolition activities, therefore partially invalidating the initial hypothesis. In this case, however, it would not have been easy to explain the copious presence of bones and shells. Observing

<i>Materiale</i>	<i>Cronologia</i>	<i>Classe</i>	<i>Totale reperti</i>	514
<i>leganti</i>	<i>romana</i>	intonaco ←		39
<i>leganti</i>	<i>non determinata</i>	preparazione parietale		7
<i>manufatti litici</i>	<i>tardo romana</i>	pietra		33
<i>materiali organici</i>	<i>non determinata</i>	malacofauna		63
<i>materiali organici</i>	<i>non determinata</i>	ossa animali		56
<i>materiali vitrei</i>	<i>romana</i>	pasta vitrea		4
<i>materiali vitrei</i>	<i>tardo romana</i>	vetro		104
<i>metalli</i>	<i>non determinata</i>	bronzo		1
<i>metalli</i>	<i>non determinata</i>	ferro		9
<i>metalli</i>	<i>non determinata</i>	piombo		1
<i>terrecotte</i>	<i>tardo romana</i>	africana da cucina		1
<i>terrecotte</i>	<i>non determinata</i>	comune depurata		1
<i>terrecotte</i>	<i>non determinata</i>	comune grezza		6
<i>terrecotte</i>	<i>romana</i>	comune orientale		4
<i>terrecotte</i>	<i>tardo romana</i>	contenitori da trasporto		165
<i>terrecotte</i>	<i>non determinata</i>	laterizi		5
<i>terrecotte</i>	<i>romana</i>	pareti sottili		2
<i>terrecotte</i>	<i>tardo romana</i>	sigillata africana		11
<i>terrecotte</i>	<i>tardo romana</i>	suppellettile da illumin.		2

Figure 41: The materials recovered from the small dump US 4046, excavated in Aquileia, Fondi Cossar; the arrow indicates the presence of plaster fragments.

today's abandoned buildings provided a possible explanation for the presence of a significant amount of plaster within the deposit (Figure 42). Basically, plaster could have simply come from decaying walls and ceilings just near the small dump. This explanation seems, so far, a simple and realistic one, and the primary status of the context (along with the possibility of *ad quem* dating) has been exploited.

Moving to the point about how artefact use-life can affect the chronological patterns detected within assemblages, even more interesting conclusions can be drawn from ethnoarchaeological observations.

A series of extremely illuminating observations can be drawn, starting from the very simple question: what if my house were abandoned or collapsed right now? Archaeologically this process would be translated into the simplest and perhaps most informative case study, a primary deposit with 'Pompeii premise' features, without any curated behaviour occurred. Here we are clearly not interested in social or economic patterns (which surely would emerge) and we focus merely on the chronological ones.

Below (Figure 43) is a sample of a form handed out in 2014 to friends and colleagues (of course the sample cannot be considered completely random,



Figure 42: Marrakech, Morocco. Earthen structure (note the presence of potsherds within the wall, well visible in section) with plastered walls and ceiling. On the floor it is possible to observe a mixture of rubbish and fragments of plaster (photo by the author).

as the proportion of archaeologists was abnormally high!). The starting point for this exercise was provided by a paper published by E. Schindler Kaudelka and S. Zabehlicky-Scheffenecker, in which the two authors suggested some archaeological conclusions (particularly about false residuals) moving also from their own personal 'assemblages'.⁴¹⁰

The form is very simple. The upper section asks for some basic data: location, type of building, type of room, date of occupancy, proportion of the objects analysed compared to the total.

The lower section requires the type of objects present within the studied room, their quantity, the materials they are made of, and their purchase date. It also has to be specified if the objects were presumed to have been produced substantially earlier than the purchase date (i.e. an antique) and if the purchase were linked to some special event (wedding, birthday, etc.).

For each case a series of three graphs was produced, using a Monte Carlo simulation, according to the description in Chapter III.3.5. The top graph shows chronological patterning with 'standard' 25-year intervals. The second uses 10-year intervals, and the lower one 50-year intervals. The simulations were run 1000 times each, and 0.1 and 0.9 percentiles are shown. It is also provided a snapshot of the lengths of the date ranges occurring between the deposition date and the *terminus post quem*, between the *terminus post quem* and the main peak of counts, and between the main peak and the date of the oldest object.

The results are presented in Appendix 1.

General observations

Some initial notes have to be devoted to the sample as a whole. One point to stress from the beginning is that the sample is not statistically representative of anything. It just represents a small group of case studies, picked up for the sake of simplicity, mainly among friends. Although not statistically relevant, it highlights some tendencies and suggests some explanations that appear consistent with archaeological observations and models. It also seems to provide at least a minimum basis for drawing some conclusions of chronological relevance. Summing up, much more investigation in this field is required to make such studies definitely relevant, but one has to start somewhere. A second issue affects the validity of the analogy with the archaeological data, that is the *quality* of the sample. The question is: does the systemic context favoured fit in some way with the systemic contexts likely to have produced the archaeological contexts we are interested in? Is the distance between Roman society and our society, in this particular field, too great, or can it be bridged somehow, recognising similar phenomena, behaviours and patterns? Taken for granted a very long list of differences, some crucial affinities can be listed:

1. The mass products available for everyday life.
2. The (self-evident) existence of breakage rates.
3. Common necessities (cooking, storing, cleaning, furnishing) within the household.
4. The existence (for long periods, in urban sites) of articulated systems of rubbish disposal.
5. Domestic spaces with functional patterning (articulated to some degree).
6. Processes of curation and inheritance.
7. The sudden or slow abandonment of buildings (often with clear continuity in building techniques), or sites in similar forms.

Among the differences, the scale of production of goods and different replacement rates seem to be the most substantial, but, as a whole, some analogies can be attempted.

Moving to more particular issues, inside the sample, it is worth noting that most of the dates provided by the interviewees are very precise and are usually expressed by one single calendar year. This seems to be clearly forced, probably because of the desire to provide precise data, and some more uncertainty

⁴¹⁰ Schindler Kaudelka, Zabehlicky-Scheffenecker 2007.

should be taken note of. Indeed 0.1 and 0.9 percentiles are rarely discernible, thus variation is almost non-existent. Although less realistic, at least the resulting pattern is clearer, but of course the level of precision reached is much higher than in a common archaeological sample. It should also be kept in mind that dates refer to the presumed production (or purchase) of the item. To 'soften' this high precision problem, as mentioned above, the timeline has been subdivided into boxes of 25, 10 or 50 years (and not in boxes of a single year).⁴¹¹

The size of each assemblage presented ranges from 46 to 267 objects, thus providing a number comparable to many archaeological samples. Most of the investigated rooms are living/dining rooms (choice of the interviewees), therefore it was decided also to add one last case study (the kitchen of the present author's mother, examined in 2009) to show some more functional variability. Of course, it would be interesting to extend the study to bathrooms, utility rooms, warehouses, etc.

Let us examine the single cases somewhat more closely.

Case 1 presents a very narrow profile. The apartment was occupied very recently and furnished with modern items. False residuality is almost non-existent and the shape of each curve (particularly with 25- and 50-year intervals) could easily approach a normal distribution, with the *tpq* very close to the mean.

Case 2 shows a much larger and more articulated assemblage, whose chronological structure is only slightly appreciable, even employing 25-year intervals. The most consistent group of items (main peak) belongs to the mid 1960s and comprises inherited objects. The second largest group is made of items purchased from the 1990s until the present day. The third group, the smallest, consisted of a very few old, inherited objects. The three peaks are more appreciable with 10-year intervals, whereas with 50-year windows, the curve gets unimodal and approaches a normal one. The *tpq* substantially corresponds with the second peak observed.

Case 3, the assemblage of a living room occupied since 1991, shows a unimodal distribution with a 25-year intervals graph, while three close peaks can be observed with 10-year breaks. The main peak consists of wedding presents from the late 1980s, the second highest peak is provided by very recent items, and the smaller peak is made of ceramics inherited in 1960. The third graph (50-year breaks) displays a unimodal distribution approaching a normal one. The *tpq* lies in proximity of the second peak.

The fourth case is very similar to the third, displaying three clear peaks using 10-year intervals, with the second peak somewhat wider (distributed along a longer time-span) and less evident. The main peak is more distant from the *tpq*.

The fifth case shows a three-modal distribution with 25-year breaks, but in this case the three peaks are the main one (some older than the *tpq*) and two older peaks (the oldest almost indiscernible) of false residuals. The 10-year graph shows four peaks, displaying also the one related to the more recent items, a little earlier than the *tpq*.

Case 6 shows three peaks with both 25- and 10-year breaks, again with a central main peak, a second peak of recent items, close to the *tpq*, and a third, small peak of curated objects. Again, the graph with 50-year breaks shows a sub-normal distribution.

The last case presented shows unimodal distributions with 25- and 50-year breaks, whereas with 10-year intervals the curve becomes bimodal, with a main peak on the left and a slightly smaller peak on the right (more recent items). In this case false residuality is very low (note that this is a kitchen).

⁴¹¹ Note that, obviously, wider breaks imply less variability.

The maximum date range covered by the examined assemblages is 139 years and the minimum is 25, with most ranging between 40 and 100 years. The *tpq*, in the presented cases, is never earlier than five years in relation to the deposit formation moment.

General conclusions

From what has been observed some provisional conclusions can be drawn:

- (1) When plotted in graphs of 50-year breaks, these hypothetical primary deposits assemblages display a unimodal distribution approaching a normal one;
- (2) the main peak of evidence usually predates the *terminus post quem* (25-50 years);⁴¹²
- (3) The *terminus post quem* is very close to the 'actual' date of deposit formation; and
- (4) Some patterning seems to emerge, according to the sketch outlined below (Figure 44).

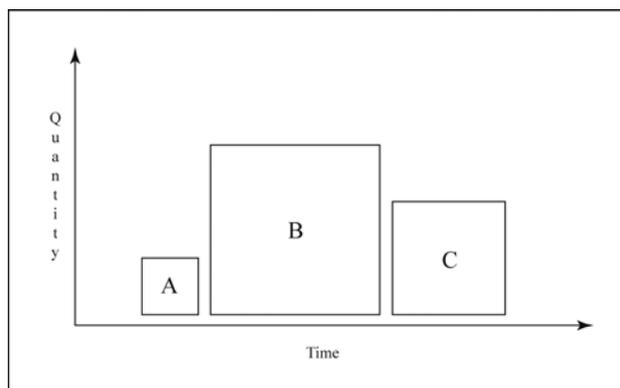


Figure 44: Sketch of the typical chronological pattern of a present-day systemic assemblage, according to the observation made using the 'self-archaeology' forms.

The three groups highlighted lead back to three main sources:

- (A) inherited/family objects (heirlooms), possibly moved from one generation to another. Also, collected 'antique' items find the same place;
- (B) the main body of evidence, often linked to marriage, moves, inheritance, or important events in the household life;
- (C) items with higher replacement rates, possibly of daily use.

Discussion: archaeological relevance

Although the sample is still far from being sufficient, at least some improvable tools have been established for understanding the chronological patterning in primary deposits assemblages.

For drawing solid dating evidence, the number of materials recovered has to be sufficient and a minimum number of 50-60 finds, at first sight, seem to be recommendable. The quality of the data is important too: to get a clear appreciation of some patterning, the presence of several finds dated within 25 years or less seems necessary (and everyone knows how hard it is).

Given this premise, some useful indications seem to emerge:

1. Primary deposit assemblages, when plotted in graphs of 50-year breaks, should display a unimodal distribution approaching a normal one. Of course, some forms of residuality or anomalous false residuality may occur.
2. The *tpq* should postdate the main peak or, at most, be consistent with it.
3. When dating primary deposits, a date very close to the *tpq* seems to be very likely, say within the span of the find providing the *tpq* or slightly later.
4. Dating within the main peak, thus considering, for instance, a later *tpq* due to intrusions, may lead to too old dates. On the contrary, finds much younger than the main peak, say more than 50 years, should be handled with suspicion or the nature of the deposit itself should be re-discussed.
5. Where the quality of the data was high and the pattern of 'three groups' was detected, similar explanations may be advanced. Samian ware, for instance, may well play the role of group B, while coarse ware (unfortunately the most broadly dated) may play the role of group C. Particularly valuable items may be expected in group A.

⁴¹² In six cases out of seven. The only example in which they correspond is Case 1 (it is notable that only 47 items were available for computing and that the room had been recently occupied).

Concluding, it is worth repeating that what has been observed is some tendencies in a small sample of today's case studies, and the indications proposed, are far from being laws. They are understood as interpretive tools that must be consistent, first of all, with the archaeological evidence.

III.5.2 *Experimental archaeology*

Experimental archaeology represents a wide and independent field within the broader limits of archaeology. As in the case of ethnoarchaeology, a complete approach to the matter is impossible in this work, so we focus on some peculiar points that appear more closely connected to the practice of dating.

As a whole, the discipline has manufacturing as its preferential target⁴¹³ and pre-*proto*-history as its more common temporal reference area. Again, Classical Archaeology has displayed, unfortunately, insufficient attention to this branch.

At least five main types of experiments are usually carried out:⁴¹⁴

1. Construction (constructing – and destroying! – buildings).⁴¹⁵
2. Processes and function experiments (e.g. what the function of one tool or building was and how it was used).
3. Simulation (of formation processes, included post-depositional ones).
4. Eventuality trial (complex experiments with more variables combined with each other, for instance land productivity).
5. Technological innovation (e.g. the testing of non-invasive techniques over a simulated archaeological site).

The third aspect will be looked at here, including those experiments that seem more promising for studying formation processes and dating; within this group, experimental archaeology brings to the practice of dating deposits three main contributions:

- (1) the effects of trampling⁴¹⁶ and its implications in chronological patterning;
- (2) the effect of (post)depositional processes in the dispersal of materials, thus influencing residuality and dating; and
- (3) the effects of transport and building activities over ceramics breakage rates.

Point 1, at first sight, may appear after all fairly marginal. Moreover, although approached experimentally, practical conclusions for field and post-excavation activity do not seem to have been drawn. However it is an aspect that can have important consequences for dating one of the most controversial, and at the same time one of the most important, types of deposits commonly present within an urban Classical (and obviously non-Classical) stratification, i.e. an earthen floor. Of course, trampling, as a relatively substantial means of artefact displacement, may play an important role not just in chronological patterning, but also in functional/spatial analyses.

An earthen floor consists basically of a layer of various thickness of sediment, laid down in a certain space, on the surface of which some human activity occurs. It is, in itself, a secondary deposit from every point of view, as the finds possibly embedded in the sediment do not inform us either of what activities were

⁴¹³ Bell 1996b: 244-245.

⁴¹⁴ Reynolds 1999. Summed up in Outram 2008: 3.

⁴¹⁵ See Coles 2008: 49-62 and Harding *et al.* 1993.

⁴¹⁶ For a general overview and additional references, see Schiffer 1996: 126-129. Curiously, behavioural archaeologists did not seem to pay much attention to what is *inside* floors, focusing more on what happens on their surfaces. A typical structure's life history is, indeed, usually seen as a sum of habitation, abandonment and post-abandonment processes, thus laying aside the construction process (LaMotta, Schiffer 1999: 20), the ones bringing most of the materials *within* the structures. For a geoarchaeological/micromorphological approach and more references, see Goldberg, MacPhail 2006: 258-264. Fundamental is the recent Rentzel *et al.* 2017, providing updated references, a structured overview of the main modifications caused by trampling, illicit removal, and traffic (passage of wheeled vehicles), and examples of both field and laboratory experiments on the effects of these processes in different conditions.

carried out on its surface, or when these activities took place. Nevertheless, two other main processes can bring materials into the floor:

- (1) the intentional addition of some artefacts or ecofacts (say sherds or charcoal), with the aim of improving some physical characteristics of the layer, such as its drainage property or its compactness; and
- (2) the unintentional insertion of finds, usually small, due to trampling, and its interaction with clearance activities.

These factors lead to a mix of materials of different origins carrying different information, some valuable, some less so. For instance, intentionally added artefacts may suggest *ad quem* dating for the construction of the floor, and trampled artefacts may inform us of the activities carried out on the surface and of their dating. The critical point consists, of course, in recognising the ‘three groups’ (assuming this is possible).

Focusing on trampling, it is obvious that it implies the insertion of artefacts or ecofacts within the underlying floor, only if the latter has some penetrability; thus, needless to say, some kinds of floor (concrete, mosaics, etc.) suffer no impact. Instead, the consequences of trampling on sediments have been tested experimentally with very interesting results.

Different kinds of sediments, with different textures, and in both dry and wet conditions, have been tested. If, on the one hand, horizontal displacement does not seem to affect our dating practices, vertical displacement can play an important role on the other, with artefacts from the surface becoming embedded within the sediment.

It has been clearly demonstrated that vertical displacement affects only the upper part of the sediment, a loose top sediment formed by trampling, and does not affect the hard-packed bottom level. The top layer, indeed, embeds the vast majority of the trampled artefacts, and according to its texture is not thicker than 3 cm, usually measuring just 1.5 cm in thickness. In hard-packed surfaces (it may well be the case with clay layers) vertical displacement does not exceed 1.5-2 cm.⁴¹⁷

What helpful, practical conclusions can we draw from this data? Given the general mixed nature of these kinds of layers, and given that, in the field, it may not always be possible to clearly distinguish the top, loose sediment from the core (and geoarchaeological or micromorphological support may not always be available), it seems to be reasonable, in any event, to split the observed layer into two different contexts, a first one for the top 2-3 cm of sediment and a second for the bottom layer. This makes sense from a formative perspective (different agents involved) and from a chronological one as well, as it may lead to an easier and safer distinction between the possibly present primary refuse and the materials carried with the sediment. Monte Carlo profiles may detect slight differences in the chronological patterns observed for the two contexts, therefore corroborating the model proposed.

Finally, although probably very close, a more solid *tpq* may be proposed for the layer construction, while some *ad quem* dating may be supposed for the activities that took place on the layer’s surface and, therefore, some *terminus ante quem* for the layout of the floor (Figure 45).

Clearly this very articulated and subtle patterning may be detected only if the finds embedded within the sediment used for the earthen floor are substantially older than the trampled finds.

Four variations to this scheme may also occur. In one case, we may suppose that the original sediment was well selected and without finds. In this case, most finds should be concentrated within the top context, thus the division proposed may turn out to be helpful again, also allowing the employment of the upper finds for *ad quem* dating of the activity carried out in the space investigated and providing a *terminus ante quem* for the floor construction (presumably relatively close to the actual moment of construction).

⁴¹⁷ Nielsen 1991 (also for further references). See Gifford-Gonzalez *et al.* 1985 for soft sediments. See also Fontana, Bagolan 1992: 326.

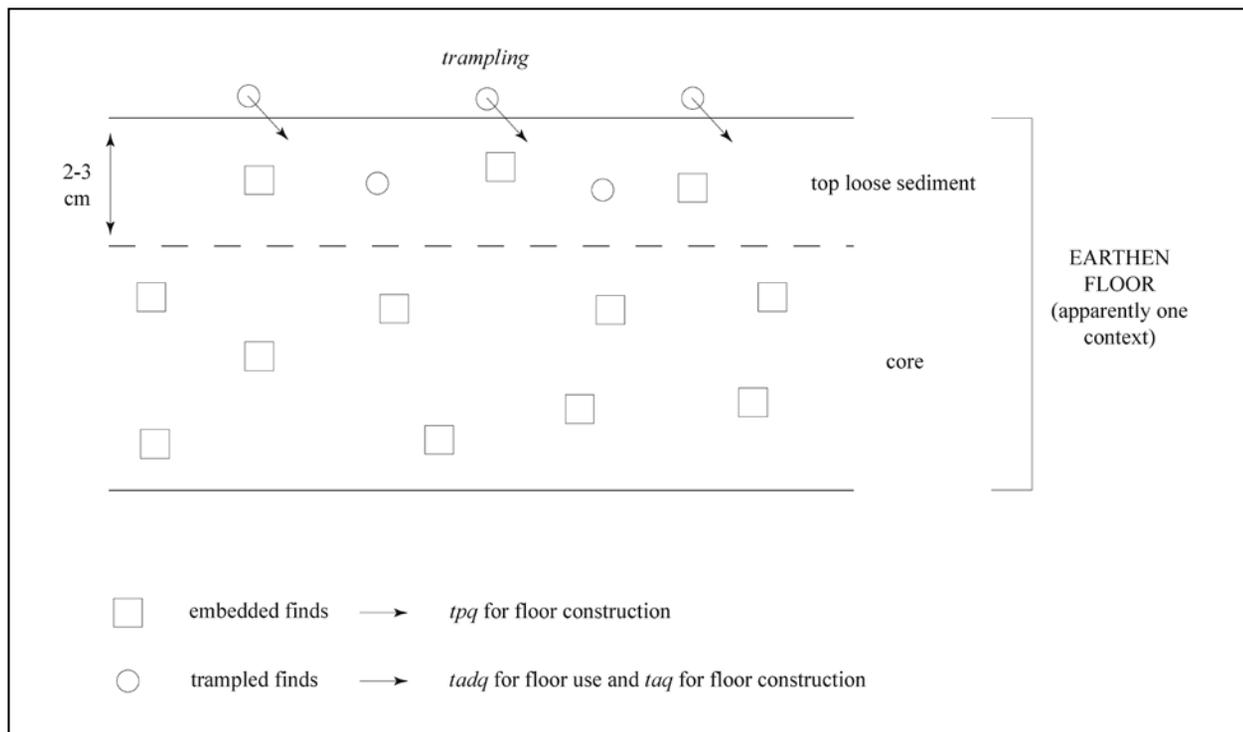


Figure 45: Scheme of the possible effects of trampling earthen floors.

In another example, no clear distinctions in artefact patterning may be due to the absence of trampled material. This may be verified only for extremely well-dated (and generally examined) materials, and this would appear to be unlikely. Nevertheless, to be verified, this case requires division too.

A third case arises if the earthen floor is thinner than c. 3 cm. In this event, the origins of the finds may be assessed only through a clear chronological patterning.

A last instance (sadly perhaps the most common) may show no evident chronological or vertical patterning, probably due to insufficient dating precision of the single finds. Again, in this case, some suggestions may come from the observation of the overall chronological spectrum. However, no clear indications may come by this means, nor by the observation of the physical state of the finds. In this case any spatial/functional analyses may be put aside and the final dating should be left to the overall chronological framework, particularly to the contexts that are stratigraphically closer.

One further area in which experimental archaeology can provide some very interesting insights is the one of depositional and post-depositional processes, involving both sediments and materials (point 2). These can, obviously, have important repercussions for dating.

One of the most ambitious and fruitful works in this sense is doubtless the Experimental earthwork project,⁴¹⁸ which provided data for many fields of investigation, particularly concerning material deterioration and micromorphological aspects. Two main earthworks were built in 1960 at Overton Down (Wiltshire, England) and in 1963 at Wareham (Dorset, England), both made of a bank and a ditch in which different types of artefacts and ecofacts were buried. Many excavations were scheduled during the following years (the last are yet to come), so as to check the transformations that occurred. A few aspects of interest can be isolated.

⁴¹⁸ Bell *et al.* 1996.

OVERTON DOWN
Experimental Earthwork

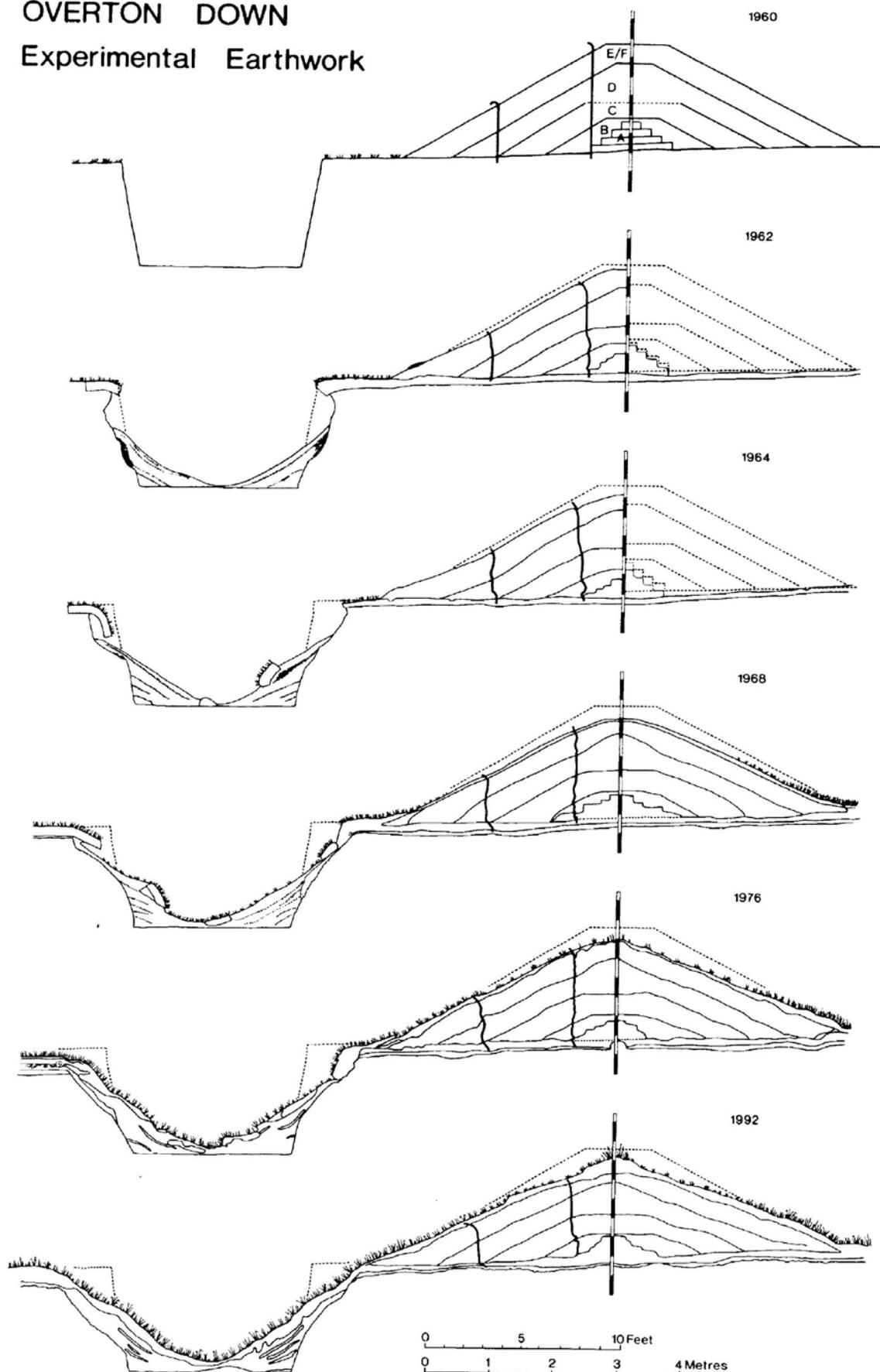


Figure 46: The Overton Down earthwork: cross-section showing the profile changing between 1960 and 1992 (Bell *et al.* 1996).

An important body of data concerns the movement of sediments and materials⁴¹⁹ and the formation of the so-called ‘primary fills’, i.e. a particular class of deposits, usually the first to accumulate in the bottom of a ditch or pit once it has been dug (see Chapter II.2.5).

These deposits are produced mainly by natural agents (water, wind, gravity), which, of course, may in turn have affected both anthropogenic and natural deposits, thus moving the buried materials. These deposits should of course be considered as secondary ones, but ‘archaeologically it is generally accepted that any artefacts in the primary fill of a feature date to approximately the time of its construction or earlier’.⁴²⁰

The earthwork experiment showed clearly how these fills are formed and how materials may become embedded within the sediment (Figure 46). Most of the materials may well be residuals coming from the bank or from the eroded sides of the ditch, while the possibility of later intrusions seems to be considerable, thus meaning that the actual informative dating potential of these kind of deposits is fairly low.⁴²¹

Another aspect of interest concerns the *duration* of the process of filling and of the simultaneous process of erosion involving the sides of the ditch (and the bank),⁴²² thus helping detect abrupt backfills and allowing at least a rough evaluation of how long a given negative feature has been exposed. Although this data does not appear to be directly connected with dating, an evaluation of the duration of the processes studied surely contributes to the wider chronological framework.

One last interesting body of data concerns post-depositional activities (mainly biological) and their impact on the movement of artefacts. The topic of intrusions crosses the whole practice of dating (see Chapters II.2.10 and III.6) and must also be approached, *a priori*, through a general environmental evaluation and a more specific archaeological one. Mole and earthworm activities in particular can have a very different impact according to the environment, with effects ranging from negligible to substantial⁴²³ in terms of artefact disposal.

The earthwork project provided also some data on wear and weathering, affecting mainly surface materials, demonstrating that the topic of the physical state of materials can be also tackled through other experimental approaches. This is the case of ceramic breakage rates (point 3).

Chapter III.4.1 already mentioned that post-depositional transport of sediments (together with the embedded assemblages) has little effect on breakage ratios. Most of the fragmentation seems to be pre- or sin-depositional. This has been verified during the excavations carried out at Aquileia, Fondi Cossar, in September 2013, 50 potsherds of different sizes and types, gathered from the modern topsoil (which had been removed by the bulldozer during the campaigns carried out in 2010-2012), were marked (Figure 47, a) and then mixed with sediment. Both the matrix and the sherds were then loaded into two (metal) wheelbarrows (Figure 47, b) with a common shovel, transported for 100 m, and finally unloaded (Figure 47, c). Of the 50 sherds, just three were cracked, bringing the total number of fragments to 55. It was also possible to observe that the damages were caused during the processes of loading and unloading, while the distance covered was substantially non-influential.

Although it has been sufficiently demonstrated how the use of breakage ratios may be misleading when trying to distinguish primary and secondary deposits, it is important to fully understand breakage dynamics; experimental archaeology in this field may represent a good means of investigation. Much

⁴¹⁹ Fowler *et al.* 1996: 45-50.

⁴²⁰ Darvill 2008: 365.

⁴²¹ Bell 1996a: 79; Bell 1996b: 234.

⁴²² Bell 1996b: 230-237.

⁴²³ Fowler, Swanton 1996: 10; Fowler *et al.* 1996: 47; Bell 1996b: 236-237.



Figure 47: An experiment on the effect of transportation on fragmentation carried out in Aquileia.

more sophisticated experiments could be set for checking the impact of redeposition and transport on ceramic breakage, providing a more structured comparative body of data.

Recording chrono-profiles of *ad hoc* laid deposits may represent one useful approach, as much as verifying the actual consequences of the intentional addition of some materials (ceramics, carbons) to sediments to enhance their physical features. Factors of construction and destruction already provide interesting insights in terms of abandonment deposits, and more problem-oriented work will be of help in detecting temporal patterns.

III.5.3 *The use of literary sources*

The good availability of literary sources represents one of the main strengths of Classical Archaeology and meaningfully separates it from the archaeology of other periods. Literary sources have, of course, been used in several ways for interpreting, supporting or rejecting archaeological data *stricto sensu*. They also represent, together with epigraphic sources, an obvious and widely preferred tool for direct dating. They are useful for dating the construction of many public buildings; often even deposits linked with episodes of destruction (earthquakes, fires, etc.) can quite easily be attributed to a precise date thanks to this kind of data. However, again, they have been rarely used as a tool for interpreting some formation processes (mainly depositional and pre-depositional) and, least of all, for drawing chronological conclusions.

Besides this general tendency, some fruitful indications can be gleaned, although, again, the topic requires far more future development.

One important use of literature data has already been presented in Chapter III.4.1, where references are provided; in this case, literary and juridical sources have been used to model the (pre)depositional processes of secondary use, recycling and disposal that affect the characteristics of the record in Roman urban sites.

Occasionally literary sources can corroborate ethnoarchaeological observations, i.e. for the earthen structures examined above. Their extraordinary longevity is stated also by Pliny the Elder (*Quid? Non in Africa Hispaniaque e terra parietes, quos appellant formaceos, quoniam in forma circumdatis utrimque tabulis inferciuntur verius quam struuntur, aevs durant, incorrupti imbribus, ventis, ignibus omniue caemento firmiores? Spectat etiam nunc speculas Hannibalis Hispania terrenasque turres iugis montium inpositas.*),⁴²⁴ who also suggests the existence of standing structures more than 200 years old.

Another field in which literary sources can provide interesting insights is the use of some materials in construction practices.⁴²⁵ Apart from the case of *testae*, already mentioned when dealing with recycling, and mentioned also in Cato,⁴²⁶ Varro,⁴²⁷ Columella,⁴²⁸ Pliny⁴²⁹ and Palladius,⁴³⁰ charcoal fragments are also of interest here. Their intentional insertion in some particular contexts can make them very informative indeed. This practice is mentioned in particular by Vitruvius, who prescribes their use when the soil is especially moist and soft.⁴³¹ He also mentions a particular type of floor, the so-called *graecanicum*, in which a certain amount of carbon and ash is added to improve its ability to absorb liquids.⁴³² Although archaeological evidence of such floors, in Italy at least, is limited, the intentional use of charcoal lumps in flooring,⁴³³ and also in mortars,⁴³⁴ is well known.

This intentional insertion of materials has great importance for dating some contexts or deposits, which may be defined as mixed, i.e. with possibly both a primary and a secondary component (see Chapter IV.4), and in determining the primary status of other particular deposits (see Chapter IV.6). The insertion of freshly crushed pottery is discussed in Chapter III.4.3; a similar model can be proposed for charcoal fragments, but some peculiarities emerge.

Intentional insertion implies the much more likely use of systemic wood (whatever the function carried out) rather than archaeological wood, thus leading to the possibility of gaining some *ad quem* dating. Intentionality, nevertheless, has to some degree to be proved not just by a generic use of Classical

⁴²⁴ NH, 35, 48.

⁴²⁵ See Greco 2011.

⁴²⁶ *De agric.*, 18, 7.

⁴²⁷ *De re rust.*, 3, 11, 2.

⁴²⁸ *Ars Agriculturae*, 1, 6, 13.

⁴²⁹ NH, 35, 165, NH, 36, 175-176, 186.

⁴³⁰ *Opus Agriculturae*, 1, 10, 3 e 1, 40, 1.

⁴³¹ Vitr., 3, 4, 2 e 5, 12, 6.

⁴³² Vitr., 7, 4, 5. Similarly NH, 36, 63.

⁴³³ See, e.g., Chapter IV.2.11 and the case study presented therein.

⁴³⁴ See, e.g., Bonetto, Novello 2000: 186-187 and Martinelli 2009.

literature, but also through a serious challenge with the archaeological record, especially using criteria of quantity and selection of finds (see again Chapter III.4.3). A chrono-profile can provide a useful aid for investigating intentionality and also for tackling the next step, i.e. dealing with the old-wood effect caused by the use of false residual wood or by having sampled internal rings. Homogeneity in radiocarbon dates would suggest a low old-wood effect, while scattered dates would suggest a more patterned and complex scenario, thus imposing a very cautious approach to any *ad quem* dating. Archaeobotanical observations in this case are also fundamental: the presence of small, well-recognisable logs dramatically lower the effect produced by both the sampling of internal rings and the use of old wood, leading to the desired *ad quem* dating.

In this case, the combination of knowledge drawn from literary sources and from archaeological, archaeometric and quantitative analyses is fundamental and can ultimately provide very strong indications.

III.5.4 Conclusions

What emerges clearly from this brief review of other sources of information for dating, besides their single value, is indeed the clear necessity of combining them with other sources of data so as to compose a model which should be, as far as possible, organic and reliable for explaining how finds entered the studied deposit and how to date it. The usefulness of this approach has already been demonstrated for some types of deposits:

- (1) earthen walls and deposits generated from their demolition;
- (2) masonry walls;
- (3) deposits produced by episodes of abandonment/reuse within standing buildings;
- (4) 'Pompeii premise' deposits;
- (5) earthen floors;
- (6) ditch 'primary' infillings (actually secondary);
- (7) some types of floors;
- (8) deposits intentionally made up completely or partially of carbons.

Other more transverse information concern the exposure duration of some interfaces and the usefulness, or not, of fragmentation as a marker between primary and secondary deposits.

Just quickly browsing these above depositional factors, it is easy to appreciate just how substantial is the contribution made by the sources of data cited, and how it is possible to imagine how it could be even greater.

III.6 Coping with intrusive materials⁴³⁵

As indicated in Chapter II.2.10, intrusive materials may turn out to be embedded into the assemblage of a given deposit through three main processes:

- (1) archaeological practice;
- (2) post-excavation analysis;
- (3) post-depositional processes, in combination with the physical nature of the deposit and the length of its exposure.

The first point refers to human mistakes in excavation (missed boundaries) and post-excavation activities, such as washing, labelling or stocking artefacts or samples; these may lead to the accidental mixing of two or more assemblages, thus creating completely false associations. Indeed, the assemblage as a whole

⁴³⁵ See Harris 1989: 120-122 for an early discussion of the topic.

is affected. Where younger materials are mixed with an older, target assemblage, we may well consider them as intrusive, but, in fact, the whole assemblage is (possibly irremediably) biased.

In the field, the presence of intrusive materials in the assemblage of a given deposit may be due to the insufficient cleaning of its surface, a practice which leaves remains of the upper deposit, together with the materials embedded, on the top of the target deposit. When excavated as a whole, more recent materials may turn out to be associated with the target assemblage, thus producing false associations.

In this sense, a classic adage of field archaeology seems to be correct: 'Better scratch 1 cm more than 1 cm less'. Indeed, it is much easier to deal with one untrue residual (upper deposit) than with one intrusion (lower deposit).

At many other times, the issue can be simply traced back to the wrong identification (or non-identification) of boundaries between different layers, which represents, at the sharp end, the core activity of the practice of excavation. No one enjoys it when the reading of a given stratification is questioned. If it is true that from one stratification there are correct and wrong stratigraphic outputs, with surely some degree of flexibility, we must also acknowledge that errors occur (in archaeological excavation as in any other human activity). As well as accepting human errors of this kind, there seems to be only one reasonable thing to be done to minimise the effects of excavation errors on the chronology of a sequence: in case of doubt, it seems reasonable to split one context into two or more. If on the one hand, at a later time, it is relatively easy to re-group the assemblages of dubious contexts into one, on the other it is impossible to split one false assemblage into two or more.

In the field, the possible mixing of assemblages may also occur, for instance, when cleaned surfaces (particularly those of soft layers) are carelessly trampled; more in general, a lack of good organisation surely contributes to mistakes that may lead, among others, to the mixing of some assemblages. In any event, this is an issue that can be taken on with good organisation and some discipline, as it is an operational matter more than a *stricto sensu* methodological one.

The same applies to post-excavation activities involving the cleaning, stocking and labelling of artefacts and assemblages.

The second point above (post-excavation analysis) mainly refers to wrong grouping, namely to the association of contexts actually produced by different processes at different times.

In this case, the careful evaluation of the deposits and of their possible formation processes, together with the detection of possible anomalies in the assemblages, should lead to proper grouping; if any doubt, grouping should be avoided and contexts treated separately.

The third point, post-depositional practices, surely deserves deeper explanation and presents major challenges to be tackled effectively.

Post-depositional processes of interest when coping with intrusions include

- (1) bioturbation,
- (2) fissuring,
- (3) trampling,
- (4) exposure, and possible mixing by means of digging.

Bioturbation encompasses a wide range of phenomena and actors determining natural changes in deposits by means of biological activity.⁴³⁶ Paedogenesis, with its peculiar effects on the parental material, is excluded from the present work, as stated in Chapter I.1.4. In addition, three main actors seem to play

⁴³⁶ See Karkanas, Goldberg 2019: 71-75, for updated references.

some role in displacing materials and/or in mixing deposits, potentially contributing to the presence of intrusions, i.e.

- (1) earthworms,
- (2) burrowing animals, and
- (3) roots (minimal).

Earthworms seem to play primarily an indirect role, through mixing the geological matrixes of distinct layers, thus creating a problem of visibility.⁴³⁷ This, in turn, implies that two or more contexts, corresponding to different depositional episodes (with related assemblages), may be excavated and analysed as one; they may in turn produce biased assemblages, suggesting completely false associations. Clearly, the effect of earthworm activity may be particularly aggressive when combined with other biological or chemical post-depositional processes.

Another indirect role, which may create some issues in dating, is played by worms burying superficial finds or whole assemblages.⁴³⁸ This is a consequence of their casting activity: earthworms ingest both organic matter and sediments, releasing then their faeces, or casts, in the body of the layer (or soil) or on its surface. The depth which may be affected by their activity may vary substantially, but in general it can be estimated between 10 and 25 cm from the surface.⁴³⁹

This process, if particularly intense, can lead, in a relatively short time, to the complete burial of surface artefacts, whole assemblages, or any feature somehow permeable to the activity of earthworms.

If repeated with different, successive surface groups of materials, this phenomenon may lead us not only to postulate wrong sequences, but also to the actual mixing of different surface assemblages, again potentially creating false associations (Figure 48).

Looking at their primary activity, earthworms move only extremely small amounts (max. 7 mm),⁴⁴⁰ thus having little impact on the direct displacement of finds; further consequences may occur where small

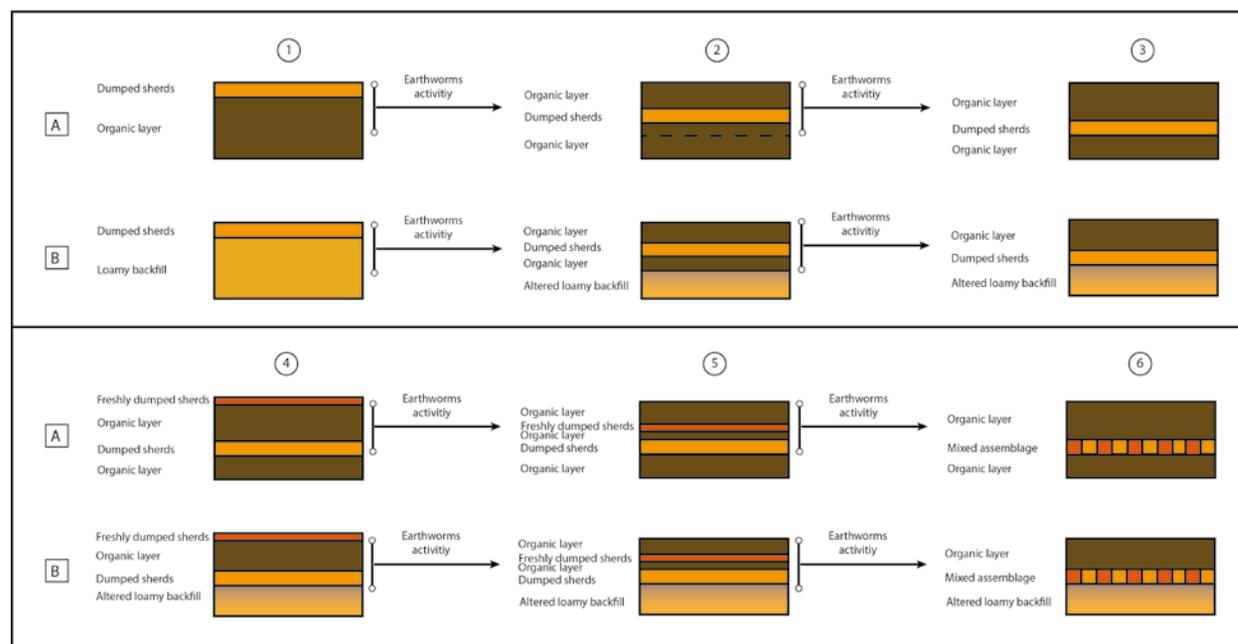


Figure 48: Scheme representing the possible effects of earthworm activity on stratification and assemblage composition.

⁴³⁷ Canti 2003: 142.

⁴³⁸ See Canti 2003: 139-142, with further references, and the classic Darwin 1881.

⁴³⁹ Canti 2003: 141.

⁴⁴⁰ Canti 2003: 143.

seeds or carbon fragments, used for radiocarbon dating, are moved up or down through the investigated stratification. Small materials may also fall within active or abandoned burrows, but, again, their size makes them almost irrelevant.

In general, some important exceptions to the impact of earthworms, apart from broad macro-environmental considerations,⁴⁴¹ can be identified.

Coarse deposits are not very suitable for worm activity, apparently because of attrition and feeding capability;⁴⁴² and clay sediments, especially in regions of high rainfall or poor drainage, also do not appear conducive.⁴⁴³

Collapse debris and some clay floors (to cite two common typologies of deposits), or the underlying deposits (if not separated by a great temporal hiatus), should not display substantial problems in this sense, although, of course, they can yield other kinds of disturbance.

In general, intact solid floors should represent an impenetrable barrier, but it has been observed that earthworms can also affect solid structures: once these are cracked, or their integrity somehow compromised, worms may cast sediments on their surface.⁴⁴⁴ Paved features, characterised by interstices among the single elements, may be similarly affected by the activity of earthworms.

In urban contexts, their impact seems to be higher in open spaces, particularly in green areas such as gardens and yards, and they seem to also play a prominent role in shaping many of those deposits currently known as 'dark earths'.

Concerning dating strata, earthworms can also have a very beneficial impact that is worth recalling; they produce calcite granules up to 2.5 mm in size, which are expelled in casts. Carbon in calcium carbonate comes from diet and atmosphere, implying that granules can be dated through radiocarbon with good consistency with the occurrence of pedogenic and stratigraphic events. Experiments conducted at the sites of Westward Ho! (Devon, England) and Silbury Hill (Wiltshire, England) proved that the technique is effective, particularly when the targeted deposits are sealed from later earthworm burrows.⁴⁴⁵

Bioturbation also includes the activities of larger animals with fossorial habits. Moles and their activities are fairly common in many European environments and it has been shown that their distribution and abundance is related to the abundance of earthworms, and thus to their habitat.⁴⁴⁶ Of course, their burrows should leave, theoretically, substantial traces. Theoretically, the problem of infiltrations would not exist, as burrows and their backfill would represent different stratigraphic units.⁴⁴⁷ However, also in this case, other post-depositional factors may seriously mask their existence, thus leading the archaeologist to mix what should be kept separate. Moles (*talpa europaea*) usually dig their burrows at a depth of around 15-25 cm beneath the surface (with a maximum range of 70 cm-1 m) and their impact should not affect deeper strata.

From the point of view of archaeologist dealing with intrusive materials, the main difference between the activity of earthworms and the activity of moles (or other burrowing animals) is the size of the artefacts involved. Unlike earthworms, burrowing animals can transport up and down a given stratification much larger finds, including artefacts with chronological relevance. Similarly, their burrows are larger and whether they are active or abandoned, artefacts can more easily find a way through the empty space.

⁴⁴¹ Edwards, Lofty 1977: 149-167.

⁴⁴² Lee 1985: 16. See also Edwards, Lofty 1977: 162-163.

⁴⁴³ Lee 1985: 16, 54-55.

⁴⁴⁴ Darwin 1881: 111-113 (in G. Scarpelli's 2012 Italian edition).

⁴⁴⁵ Canti *et al.* 2015; Canti 2017.

⁴⁴⁶ Funmilayo 1977.

⁴⁴⁷ These are tubular features commonly known as *krotovina*.

In general, the impact of faunalurbation⁴⁴⁸ depends on the environmental conditions of the investigated site (temperature, moisture, pH, flora) and it may range from very low to very high. This implies that a general *a priori* evaluation, at least broadly, can be performed.

Moving to floralurbation, the activity of roots,⁴⁴⁹ has, *per se*, only a slight impact on the issue of intrusive materials. The cracking effect of roots is higher when combined with wetting and drying conditions or with cryoturbation, but whether the plant is living or dead, no intrusive materials are expected to be mixed into the sediments. One possible issue arises where organic material from undetected root casts is used for dating the sediment incorporating the casts.

More visible effects can be observed with tree uprooting, when old soils and/or sediments are lifted up together with the materials contained.⁴⁵⁰ Both are then gradually deposited on the surface, implying that the falling process produces residuals and not intrusions.

Fissuring,⁴⁵¹ a well-studied phenomenon in geology, soil science and archaeology, plays a much greater part in generating intrusive materials. Alternate wet and dry conditions, or freeze-thaw processes, can determine the fissuring of deposits. When the fissures are open, the overlying matrix and materials can leach downwards. Similarly, if the surface of the deposit is (even temporarily) exposed, single artefacts or ecofacts, simply discarded or moved by flowing water or gravity, can find their way down the cracks. The physical characteristics of the deposit, combined with the intensity of cryoturbation or wet/dry conditions, determines the force of contraction, the size of the fissures, and thus the likelihood that intrusions occur.

Cryoturbation and humidity conditions are dynamic processes: once temperature and/or humidity return to their original value, the sediments involved return to their original state and the cracks close again. The presence of the latter may go undetected when the sediments or soils are excavated; it follows that intrusive materials may turn out to be mixed with the original assemblage of the investigated deposit, creating again a fictitious association.

Trampling can be considered a post-depositional process, but it is, in fact, synchronous with the use of a *given surface*, therefore presenting those peculiar aspects discussed in Chapters III.5.2 and IV.4. Here it is worth recalling that trampling involves the mixture of materials related to the *deposition* of a given deposit and materials related to the *use* of its surface.

Looking at definite intrusive materials, there is a slightly different scenario that needs to be mentioned, i.e. the use of an exposed surface that was originally buried. In cases of trampling on sediments, or soils that have been artificially or naturally truncated (e.g. the removal of a large area of topsoil or sediments for building purposes, or simply for quarrying), there may be a relevant chronological (and functional!) hiatus between the deposit and the use of its surface. Again, two groups of materials, possibly very distant in time, may turn out to be mixed into one 'false' assemblage.

More generally, digging older sediments and exposing surfaces, can be considered irrelevant in terms of intrusions only theoretically; any digging activity can produce all but even surfaces, and can involve trampling on temporarily exposed surfaces or the partial reworking of sediments with shovels or picks. Scavenging can involve digging and it may, similarly, be a factor assessed, particularly when dealing with deposits such as dumps, usually coarse and rich in voids (see below).

The possibility that bioturbation, fissuring, trampling and later digging occur is combined with two other transversal factors: the geological matrix of the investigated deposit and the duration of its exposure to one or more agents (Figure 49).

⁴⁴⁸ Schiffer 1996: 207-210 for more references. See also Wood, Lee Johnson 1978: 318-328.

⁴⁴⁹ Schiffer 1996: 210-212; Karkanias, Goldberg 2019: 75. See also Leonardi, Balista 1992: 90-91; Ciarla, Natapintu 1992: 196-198.

⁴⁵⁰ Schiffer 1996: 211.

⁴⁵¹ Schiffer 1996: 213-217; See Limbrey 1975: 210-211 and 219-221 for fissuring in vertisols.

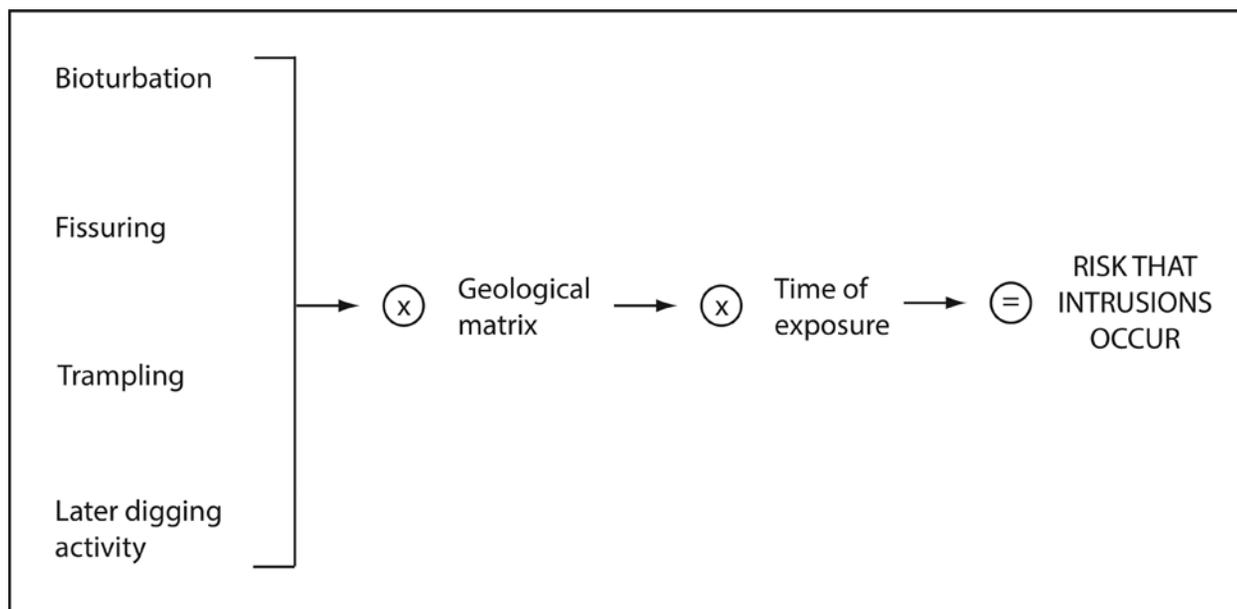


Figure 49: Factors and interactions producing intrusions (except for archaeological practice).

Soft or incoherent matrixes are more likely to be subjected to the presence of intrusions than compact geological matrixes.

An extreme case is represented by the rubble resulting from the collapse of a structure, certainly containing many voids, which, in turn, could be filled by later sediments and materials.⁴⁵² Theoretically, the rubble and the percolated sediment (with materials) are in fact two different contexts, with different origins, formation, and more or less evident different dates. However, in field practice, it may turn out to be very difficult to distinguish between the two, and an actual excavation of two different stratigraphic units may be impossible. In this case, the texture of the layer itself (its permeability) plays a fundamental role in receiving intrusive materials, which, if on the one hand are theoretically inexistent, on the other are, in practical terms, a serious issue.

At the other end of this scale we may find masonry structures, mortar floors and other solid stratigraphic units. In this case, obviously, the risk of intrusions is close to zero.

The duration of the exposure to the post-depositional processes described is proportional to the possibility that intrusions occur; floors, as mentioned, yield long exposition and use of their surfaces, while construction layers yield a shorter one.

Given all the aspects described, there are three main ways to manage the issue of intrusions *a priori*:

- (1) a general environmental evaluation;
- (2) an active use of contexts as operational tools; and
- (3) a context-by-context evaluation.

A general environmental evaluation can start even before the excavation begins and it should consider the basic post-depositional agents to be expected, with particular focus on those agents producing vertical displacement. This evaluation can provide at least a broad idea of the agents to be dealt with and of the impact that they can produce. For instance, the detection of molehills on the surface surely indicates that the upper layers have been somehow affected by the activity of fossorial animals; thus, particular attention can be devoted from the beginning to the detection of their burrows, or at least to be alert to their activity for evaluating the reliability of dubious assemblages.

⁴⁵² These may also deposit on the surface of the bottom layer.

Active use of contexts as operational tools means mainly the possibility of splitting one context in two or more contexts where need arises. One occasion has been discussed in Chapter III.5.2, concerning the peculiar nature and dynamics of trampled earthen floors. Another emerges with the necessity to deal with proper intrusions. In a few words, although in the field one unique layer may be ‘physically’ recognised, if part of the layer is likely to have been affected by one of those factors discussed, this can then be divided and another number (or whatever identification method is preferred) can be assigned. A couple of examples drawn from recent excavations carried out in Aquileia, Fondi Cossar (see Appendix 2), may well illustrate the issue.

The *domus* investigated was provided with a well-structured drainage system, mainly made of masonry culverts. Once maintenance stopped, the drains went out of use, filled, more or less rapidly, with sediments, artefacts and ecofacts; later activities resulted in the removal of substantial parts of the ‘skeleton’ of the house, thus exposing and partially taking away the drains, along with part of their fillings. Given the high informative potential of the fillings in many respects (see Chapters IV.3.4 and IV.3.7), in some cases they have been split into two or more contexts, thus separating what had lain untouched under the drain cover from what had been affected by the later activities.

A similar procedure was used when dealing with the robbed/foundation trench of a lead *fistula*. The *fistula* was initially laid within a trench that was later backfilled. Still in antiquity, the pipe was then truncated in two points and a certain length was removed. Apparently to remove the pipe it was not necessary to dig a trench: two holes⁴⁵³ were dug where the pipe had to be cut, and the resulting portion was then lifted. The removal was probably helped by some movement of the old backfill; this, once the *fistula* was taken away, was simply readjusted (the volume of the pipe was negligible). The resulting record was basically a trench that was still the old foundation trench, filled with altered sediments and materials and cut at two extremities by two holes. Fortunately, the height above sea level at which the pipe had been laid down was precisely known, so it was decided to split the uniform backfill of the trench into two different contexts, one for the volume of sediment above the known height and one for the small amount of volume situated beneath that hypothetical line. The aim was to keep separate materials among which there may have been some intrusions and materials potentially unaltered, carrying information (a *tpq*) about when the *fistula* was installed.⁴⁵⁴

Although often charged with being too inflexible, single-context recording allows some flexibility, which can be profitably used for dealing with some potentially confusing situations, among which the issue of intrusions can be surely listed.

The third proposed approach more explicitly concerns the ‘quality’ of each context. The factors listed above should be evaluated context-by-context and then broadly (and quickly) expressed.

Table 4: Different deposits grouped according to the risk that infiltrations occur.⁴⁵⁵

High risk	Low risk
Destruction debris made of rubble	Very compact or solid layers (layers linked to construction activities)
Soft sediments affected by later activities of removal and/or sensible alteration	Deposits sealed off by compact or solid layers and likely to have been exposed for a short time
Layers severely affected by bioturbation	Closed structures infillings (culverts, drains), if not notched by later activities
Soft sediments exposed for a long time	
Very soft/rubble contexts in contact with very soft/rubble contexts	
Dumps and other strata poor in sediment and rich in coarse materials (rubble, sherds, bones)	

⁴⁵³ Only one was detected, the second was, presumably, somewhat further from the border of the excavation trench.

⁴⁵⁴ The finds recovered are about to be published.

⁴⁵⁵ Earthen floors are not mentioned (see Chapter III.5.2).

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PIANTE	SEZIONI	PROSPETTI		FOTO	TABELLE MATERIALI					
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CRITERI DI DISTINZIONE										
MODO DI FORMAZIONE										
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CONSISTENZA		COLORE		MISURE						
STATO DI CONSERVAZIONE					POSSIBILITA DI INTRUSIONI <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>B</td> <td>M</td> <td>A</td> </tr> </table>			B	M	A
B	M	A								
DESCRIZIONE										
SEQUENZA FISICA	UGUALE A	SI LEGA A		SEQUENZA STRATIGRAFICA POSTERIORE A ANTERIORE A						
	GLI SI APPOGGIA	SI APPOGGIA A								
	COPERTO DA	COPRE								
	TAGLIATO DA	TAGLIA								
	RIEMPITO DA	RIEMPIE								

Figure 50: Proposal of a standard Italian context sheet modified for the evaluation of the intrusion risk.

In the middle, between the two ‘extremes’ of risk, lies a wide range of deposits whose ‘infiltration risk’ could be described as ‘medium’ and which probably make up the majority of the evidence.

The obvious place for this kind of evaluation is the single-context sheet. Below (Figure 50) is a proposal for the modification of the standard Italian context sheet (*scheda di unità stratigrafica*). The risk of infiltrations is just evaluated as ‘low’ (B), ‘medium’ (M) or ‘high’ (A), so that compiling the form is as less time consuming as possible. It has also to be stressed that the same form includes an entry named *affidabilità stratigrafica* (roughly translated as ‘stratigraphic reliability’), which apparently would already fit the aim of evaluating infiltrations. However, our confidence in reading the stratigraphic sequence (as mentioned, it is rarely admitted that when ‘reading’ and interpreting strata their boundaries and relations can be difficult to detect) can be somewhat different from the informative reliability of a context in itself, particularly concerning the possibility that later materials might have intruded. The two entries should

be kept firmly separate, as they refer to two different things; we may be very confident in determining the boundaries of a given stratigraphic unit and yet it could present a high risk that infiltration occurred.

The proposed aim of the ‘devices’, on the one hand, is to reduce the impact of infiltration in the post-excavation inferential process, and, on the other, to allow some form of *ex post* evaluation if some doubts arise. Where a well-sealed deposit marked with ‘B’ (low risk of intrusions) should display unexpected ‘too recent’ sherds, then before claiming for an intrusion, it should be better practice to re-evaluate the context status, its supposed date of formation, and even the correctness of the dating of single specimens. On the contrary, severely affected deposits, which may substantially bias later inferences, could be put aside, giving way to other deposits to build a solid chronological framework. Still too often many artefacts are addressed as intrusions if they do not fit the excavator’s provisional chronological framework and it happens without substantial bases.

This approach echoes what C. Orton called ‘self-fulfilling prophecy’, namely the tendency to look for what confirms what one already knows (or supposes to know).⁴⁵⁶

The proposed tools may help distinguish those cases in which some materials are correctly identified as intrusions from those cases in which the decision appears, at most, arbitrary; it still has to be acknowledged that much more work has to be done, keeping in mind that the issue of intrusions can bias transversely⁴⁵⁷ any inference about dating deposits.

An important role can be played by the overall number of items supposed to be intrusive. As suggested in Chapter II.2.10, the non-intrusive/intrusive chronological pattern mimics in some way the pattern residuals/in-phase materials. Once the factors cited above are evaluated, then numbers count as well. High rates of ‘intrusions’, particularly if compared to the bulk of the older specimen, should sound an alarm and lead to a review of the nature of the examined context and assemblage.

⁴⁵⁶ Orton 2000: 2-3.

⁴⁵⁷ Harris 1989: 121.

Part IV

Typology and analysis

IV.1 The arrangement (a typology for deposits?)

IV.1.1 Why a typology?

Why is it necessary to create a typology of archaeological deposits for dating them? (And not just because typology is one of archaeologists' favourite sports.) The reason lies in the fact that according to the nature of the investigated deposit, the way of dating it changes. Therefore, it seems convenient to group deposits according precisely to the way they can be dated; that is, just to begin, according to a first, coarse distinction between deposits that can be dated *ad quem* and deposits which can be dated merely through a *terminus post quem*. This is simply a very practical necessity.

However, creating a typology⁴⁵⁸ is fundamental not only for practical reasons, but also because, by being compelled to insert a single case study within a precise frame, it forces us to discuss the nature of the deposit itself and the way it can be dated, hopefully avoiding any mechanical approach.

The typology proposed can be used then as a sort of comparative device, which can also be used to help explain some phenomena observed in a precise case study. Clearly, every single deposit has its own peculiarities and its own story, but through coherent analogy (see Chapter II.2.12) it can be approached in terms of one of the proposed sub-categories and, consequently, can be more effectively understood and dated.⁴⁵⁹

IV.1.2 What is in and what is out

As observed in the introductory chapter, the field in which the dating game is played, in this work, is that of Classical towns. Therefore, the proposed typology concerns the most common urban Classical deposits. Of course, it does not include every kind of deposit and it may well be expanded in the future (see below).

As referenced in Chapter I.1.4, some types of deposits have been deliberately put to one side, either because of their peculiarities or because, within the panorama offered by an ancient urban environment, they can be considered exceptional: among the primary deposits, the main exceptions are tombs, votive offerings, shipwrecks, and, to some extent, coin hoards; among secondary ones are all deposits clearly and predominantly produced by natural agents (alluvium, colluvium, etc.). Soils (and re-deposited soils) have also not be considered, because of their very peculiar formation processes, which, without doubt, deserve much more detailed consideration, certainly beyond the range of the present work. Dark earths are still the object of some debate concerning their formation processes, and their nature seems to vary from case to case (see Chapter III.4.4). Moreover, it has been ascertained that bioturbation plays an important role in their formation, thus, again, it was decided to keep them out of the proposed arrangement.

Conversely, we will deal with another type of deposit in which the main agent of deposition, *stricto sensu*, is natural, but which is very common and characteristic of urban environments, i.e. the filling of drain culverts. As examined later, except for cases of deliberate backfilling, these are peculiar types of primary deposits.

⁴⁵⁸ See, in general, Adams, Adams 1991: in particular 3-95. The authors provide the following definition of typology: 'A typology is a conceptual system made by partitioning a specified field of entities into a comprehensive set of mutually exclusive types, according to a set of common criteria dictated by the purpose of the typologist. Within any typology, each type is a category created by the typologist, into which he can place discrete entities having specific identifying characteristics, to distinguish them from entities having other characteristics, in a way that is meaningful to the purpose of the typology.' (Adams, Adams 1991: 91). See also Peroni 1998, Adams 1988 and Hill, Evans 1972.

⁴⁵⁹ For the different roles played by a given typology, see Adams, Adams 1991: 157-168.

Besides these exceptions, the deposits arranged in the typology proposed are the most common results of the actions of building, destruction, or everyday life, which constitute an ancient urban environment. As mentioned in Chapter II.2.14, the discussed deposits are produced by specific but recurrent human activities. Of course, many specific case studies, experienced every day in any given excavation, may prove impossible to label and be precisely placed within the framework proposed. These will clearly deserve case-by-case evaluation.

IV.1.3 Criteria

The crucial point in ordering any set of things is represented by the criteria preferred. The aim of this typology, or taxonomy, is grouping deposits according to the possibility of dating them in one way or another. Time is, of course, the key point. If one would like to group deposits according to their possibility of providing spatial or functional information, the resulting grid would be obviously different. Of course, time, although being the prevalent criterion, is not the only one: the typology proposed is arranged around three main successive filters: the first being theoretical; while the second may be defined as qualitative; and the third may well be called formative. In the first two filters, time plays, of course, the major role in defining categories. But in the third one, more components are assessed to help answer the basic question linked with dating deposits through assemblages, i.e. 'How did the materials enter the deposit?'

The proposed path can then be followed, starting from the more general filter, or from the more specific one, according respectively to a deductive or inductive approach, or using the taxonomy as an organisational device or an operative one.

The theoretical filter

One first, rough, distinction has to be made between what can be dated *ad quem* and what can be dated only with a *terminus post quem*, i.e. a distinction between primary and secondary deposits, operated according to what has been exposed in the first part (see Chapter II.2.5). It is worth recalling briefly the two definitions proposed:

a primary deposit is one whose assemblage largely belongs to the same systemic context in which the deposit was formed; whereas a secondary deposit is one whose assemblage largely, or completely, belongs to a systemic context previous to the one in which the deposit was formed.

One of the clear consequences is that the former can be dated more or less precisely *ad quem*, while the latter can be dated merely by a *tpq*.

Between the two extremes it turned out useful to insert a third type of deposits, which one might call 'mixed' and which cannot be considered primary, but may lead rather to some *ad quem* dating: Deposits that can be labelled as such contain conspicuous amounts of residuals, but also clearly contain systemic materials, either deliberately (see Chapter III.4.3) or incidentally embedded within the deposit. Mixed deposits may include, for instance, those sediments which were redeposited, along with the materials embedded, for building activities, and which were intentionally mixed with freshly discarded sherds for increasing the resulting hydraulic/mechanical characteristics. It may also apply to redeposited materials, in which some systemic items were accidentally embedded (obviously, the casual loss of such an item has to be, even if not proved, at least the most probable cause).

Finally, it was also considered useful to add a box to contain all those deposits requiring case-by-case evaluation, and which might only safely be considered primary or secondary after having been properly investigated.

One could ask where the *terminus ante quem* might be of most use (see Chapter II.2.9). Apart from the use of historical or epigraphic data, which are not strictly a matter for discussion, a *terminus ante quem*

for more ancient layers can be provided only by those deposits whose primary nature has been firmly established; therefore, the use of this chronological indicator, when dealing with assemblages, can be considered a second step, following the necessary distinction between what is primary and what is not. It is worth recalling that a *terminus ante quem* for an underlying deposit should be provided by the more recent possible date of deposition of the upper primary deposit: for instance, a primary deposit firmly dated AD 140-190, provides the *terminus ante quem* (or *terminus post quem non*) of AD 190 for the underlying deposits. That is because it is assumed that within the range AD 140-190 the primary deposit could have effectively formed in AD 190, i.e. being the previous layers, say, dated to AD 150.

The qualitative filter

The first distinctions proposed are still too vague to allow us to label a given deposit one way or another; nevertheless, before moving to the 'formative' filter, another step is necessary.

A particular deposit could have formed over a period of time, shorter or longer, which, according to the accuracy of our ability of measuring time (see Chapter II.2.8), may be considered abrupt or continuous. That means that we may be able to distinguish the date in which the deposition began and the date it ended, or we may not. For instance, a rubbish pit, filled, say, in one month or one year, could be dated *ad quem* AD 230-300 (its assemblage mirrors what was circulating in the period in which it was filled); conversely, a large urban dump, remaining in use for a long period, may be dated AD 200-250 to AD 370-390, or, should the materials embedded be particularly well dated and/or the overall chronological framework be particularly favourable, it might be dated, say, AD 232- 371. In this, the embedded materials mirror a longer systemic context, or, in other words, the materials were circulating over a longer period, being the same in which the dump was formed.

Thus, before proceeding to the formative filter, it was considered useful here to introduce this further subdivision, which, of course, can only be applied to primary deposits. This does not mean that, theoretically, secondary deposits could not have formed over long time intervals; the point is we cannot know, as their own nature allow us to date them merely through a *tpq*, because their assemblage mirrors one or more systemic contexts predating the formation of the deposit itself.

The formative filter

This is probably the most important, as it should enable the insertion of a given deposit within one precise category. In this case, time is not the only parameter considered, as what is important is how the assemblage was formed and how it became embedded within the deposit. To attribute the specific case study to one type or another, at this level, all the tools described in Part III play a part.

It is worth quickly recalling them; besides the information obtainable from the general archaeological considerations, summing up they are:

- The possible application of scientific techniques.
- The evaluation of the presence of intrusions.
- A quantitative approach to the assemblage.
- A qualitative approach to the assemblage and the evaluation of intentional insertions.
- A qualitative approach to the deposit as a whole.
- The use of analogy with ethnoarchaeological or experimental cases.
- The use of information obtained from every relevant source, particularly literary.

Each type represents, with its own characteristics, the archaeological result of a coherent group of actions distinguishing it from the other types, and corresponds to a precise formative model (see Chapter II.2.14).

The actions producing each type of deposit are specific, but recurrent in human life, such as building, dumping, removing something valuable, or lighting a fire.

If, on the one hand, the way in which they are distinguished from each other is formative, the way in which they are grouped responds to the criteria adopted for the first and second filter, according mainly to a temporal parameter.

IV.1.4 The scheme proposed

What follows (Figure 51) is a scheme resulting from the proposed arrangement of deposits. On the first row (theoretical filter), macro-types are arranged from the more informative to the less, in terms of dating.

For the sake of simplicity, a code was given to each type of deposit.

IV.1.5 Implementability

Clearly, the types proposed cannot cover every deposit type and the arrangement focuses only on the most common deposits in every excavation. It follows that the list proposed could be easily widened, or types could be split further into more specific sub-types. However, creating types that are too specific may easily turn out to be unproductive, or be relevant for just a very small number of deposits. Thus,

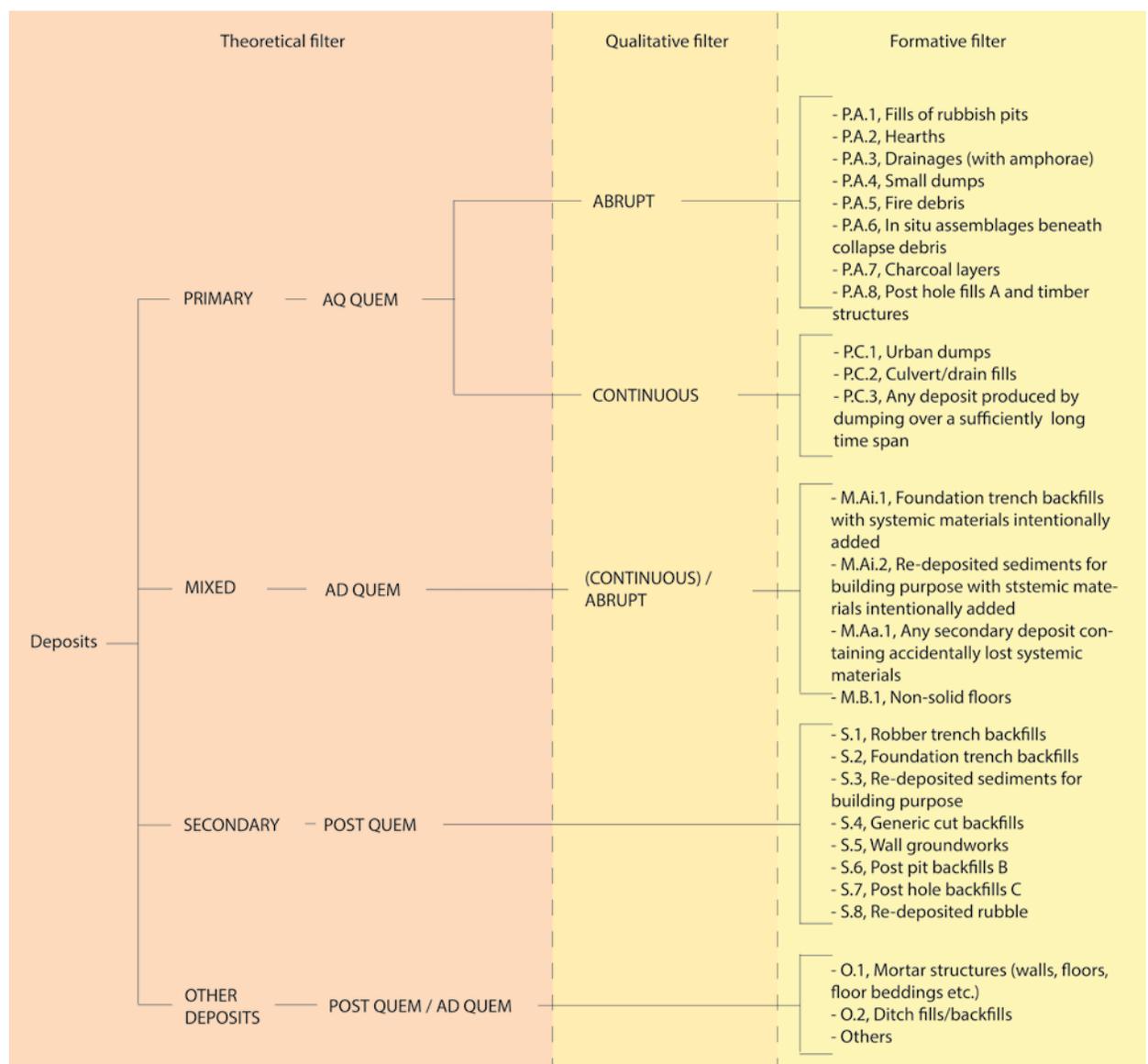


Figure 51: A typology for deposits.

the eventual implementation of the typology should, arguably, be more vertical than horizontal. In the future it will be possible to develop further the typology and provide a much larger number of specific case studies for useful comparisons.

IV.2 Primary deposits with abrupt formation

IV.2.1 Definition

In Chapter II.2.5, a primary deposit is defined as a deposit whose assemblage largely belongs to the same systemic context in which the deposit was formed. It is also worth recalling the temporal nature of this definition, by which spatial relocation is not accounted for. It was also explained earlier (Chapter IV.1) that a combination of the accuracy of our observations and of the past duration of the depositional process makes a further distinction useful between those deposits whose formation can be dated as a whole (in a ‘punctual’ way) and those whose formation can be dated through a starting and an end date.

Given the fact that the quality of the date of single artefacts does not change in function of the quality of the deposits (lamps are not better dated in urban dumps and less well dated if they are recovered within the backfill of a foundation trench), much of the difference between the two sub-types of deposits lies in the length of their formation.

It follows that a primary deposit with abrupt formation may be defined as a deposit whose assemblage largely belongs to the same systemic context in which the deposit was formed and whose formation lasted for a short time (where short is taken to mean ‘not sufficiently long enough to be appreciable through the means currently available’).

In some way, the information drawn from these deposits may be seen as quick insights to past systemic contexts. For dating purposes, they are indeed the best suited, as they allow more or less precise *ad quem* dating of the actions or processes producing them. Within a whole relative sequence, which is commonly schematised through a Harris matrix, these deposits and their dates assume a particularly relevant importance, as they can fix a grid of absolute dates for the whole sequence itself.

Unfortunately, the common field experience suggests that these kinds of deposits, particularly within an urban environment (with all the peculiarities discussed, see Chapter I.1.4), are usually a tiny fraction of the whole. This, along with their high informative potential, should lead us to focus resources and attention on them, even though they are apparently not directly related to critical or particularly important features, such as structures or infrastructures (the construction of a temple, street, etc.). The reading of the sequence as a whole, along with the most important features, will anyway benefit from this, being framed within an absolute grid whose points can be used in turn as *termini post quem* or *termini ante quem* for other deposits.

Taking for granted any false residuality, these deposits, or at least the most reliable among them (no intrusions or interpretive doubts, clear formation processes and dating, etc.), may also be used for performing possible corrections, adjustments, or refinement of existing dates of artefacts, also through seriation.

IV.2.2 General expectations

What is expected from these deposits? In other words, what kind of answer do we expect from the application of the tools discussed in Part III?

Pushing aside the issue of intrusions, which has to be evaluated for every deposit, and which can dramatically lower the reliability of primary deposits also, and OSL, which may be theoretically applied to every deposit (precisely on the surface of the one underlying the deposit we are interested in), it is worth starting with some quantitative expectations. In general, the profile expected from these deposits

(generated by a Monte Carlo simulation, or other useful tool) should be fairly narrow, by reason of their primary status and short formation. This should lead to a normal/sub-normal distribution of the chronoformative profile.

Clearly, some residuality and false residuality have to be realistically accounted for, and thus some ‘tails’ may be present in the profile; nevertheless their absolute weight should be sensibly lower than the main pike.

Our expectations can be to some extent refined, having in mind the tentative and provisional ‘ethnoarchaeological experiment’ proposed in Chapter III.5.1 and the conclusions drawn from it. Apart from an approximation to a normal distribution, particularly evident using brackets of 50 years, it is worth recalling here some of the other conclusions:

- The *tpq* generally post-date the main peak or at most it is consistent with it.
- An actual date very close to the *tpq* seems to be very likely, say within the span of the find providing the *tpq* or slightly later.
- Dating within the main peak, thus considering, for instance, a later *tpq* due to intrusions, may lead to dates that are too old. On the other hand, finds too much younger than the main peak should be handled with suspicion, or the nature of the deposit itself should be re-discussed.
- Where the quality of the data was high, and the pattern of ‘three groups’ detected, similar explanations might be advanced.

It has to be considered that the proposed ethnoarchaeological cases substantially simulated *in situ* assemblages, which might have been recovered beneath collapsed debris (type P.A.6, see below), thus representing a particular type among the primary deposits with an abrupt formation. In general, it has to be remembered that even primary deposits with abrupt formation are palimpsestic, embedding assemblages that in turn may have been made up of objects that were all truly systemic, but produced in different periods, curated, or stored for some time.

The qualitative characteristics of this kind of deposit will be examined in some more detail case by case. Nevertheless, it is worth recalling here some of the observations made in Chapter III.4:

- High rates of breakage may well be compatible with this kind of deposit (recycling, scavenging).
- In any event, low rates of breakage strengthen their interpretation as primary.
- Selection (functional, qualitative, dimensional, etc.) represents another element suggesting a primary status.
- Post-depositional wear should be homogeneous (taken for granted the different characteristics of different vessels) and compatible with the depositional environment.
- The presence of articulated bones also strengthens the likelihood of primary deposition.

Another general consideration can be made about the spatial arrangement of finds recovered in these deposits. Given the fact that most of the materials recovered were not buried in sediments before reaching their final places within the deposit, it follows that no substantial amount of sediments could have affected their spatial orientation. This suggests that most of the flat or sub-flat finds should be recovered lying horizontally, according simply to gravity and to their own shape; potsherds and coins, for instance, should lie mainly horizontally, whereas their vertical or sub-vertical position should suggest that they were already embedded in some matrix (i.e. they were buried) before entering the deposit.

In addition, some deposits may contain only small fragments of building materials, as the larger ones could easily be re-used in building activities.⁴⁶⁰

⁴⁶⁰ Mills 2013: 74.

The largest combination of both the quantitative and qualitative traits described should strengthen the interpretation of the deposit as a primary one.

One final observation can be made about their abrupt formation: given the fact that the duration of the process of deposition should be short, the volumes of these kinds of deposits should be generally low. A rubbish pit or a small dump, if produced in a short time, should not produce incredibly high volumes of matter. A useful comparison is provided by the Southern *Sebakh* of *Mons Claudianus*, which, although produced by a comparatively small settlement, measured some 60x20 m and reached a height of 1.80 m. It was produced mostly in a decade, but the whole dumping activity lasted for about 30 years.⁴⁶¹

For primary deposits with abrupt formations we must seek for much shorter periods of deposition and lower volumes. We will see later how *in situ* assemblages preserved beneath collapse debris represent an extreme case of almost matrix-less deposits.

IV.2.3 Dating

This ‘taxon’ of deposits can be dated *ad quem*, using a window reasonably extending from the *tpq* to the point in which the profile reaches a low point after the last peak. Using the brackets provided by artefacts providing the *tpq* also seems to be a reasonable solution. In any event, dates closer to the *tpq* (usually when the curve is higher) seem to be the most probable. In the end, the *tpq* provided by the most recent artefact may be refined, possibly, looking at its wear, or at any clue suggesting a long systemic life.

IV.2.4 Formative typology

What is the archaeological translation of abruptly formed primary deposits? And what is the formative typology that can be proposed for these deposits? As outlined in Chapter IV.1, the typology proposed has to be considered provisional and could be widened in the future. It includes:

- P.A.1. Rubbish pit fills;
- P.A.2. Hearths;
- P.A.3. Drainage;
- P.A.4. Small dumps;
- P.A.5. Fire debris;
- P.A.6. *In situ* assemblages beneath collapse debris;
- P.A.7. Charcoal layers; and
- P.A.8. Post hole fills A and preserved timber structures.

P.A.1. Rubbish pit fills

Some expectations of what should be found in a ‘typical’ rubbish pit have been outlined by V. Buteux and R. Jackson,⁴⁶² namely:

- large parts of individual vessels;
- sherds should be large and not very abraded; and,
- apart from a small number of residuals, the majority of sherds should be contemporary.⁴⁶³

The above authors explicitly refer to Medieval rubbish pits; for the Roman era (and whenever a complex and structured system of waste management exists), it may be argued that the first expectations may unnecessary, as the pit may well contain only what had escaped in some way the different filters that existed in the waste disposal/reuse system. For similar reasons the second expectation is also unnecessary and the thorny topic of abrasion has already been addressed (see Chapter III.4.2).

⁴⁶¹ Maxfield, Bingen 2001: 109-125.

⁴⁶² Buteux, Jackson 2000: 193. See also Wilson 1985.

⁴⁶³ See also Ceci, Santangeli Valenzani 2016: 23.

The last point, on contemporary sherds, however, is pertinent; this should lead to a chrono-profile similar to the one suggested above.

The bulk of the material should refer to the last deposition, where the pit was used more than once, which means that they were deposited, and later the pit was never emptied again.

These materials should be largely systemic. But what about any more ancient materials? They may have entered the deposit by three main routes:

- (1) they are residuals, most likely redeposited with other dumped materials or detached from the pit walls or bottom during routine emptying;
- (2) they are false residuals, i.e. they are systemic and entered the deposit along with the bulk of the material, however they were produced some time before and curated/stored for a perceivable time; and
- (3) they are systemic materials but not false residuals, i.e. they entered the deposit during a deposition prior to the last one, which produced the bulk of materials.

Once the meaning of the probable chronological profile of the assemblages of these deposits has been roughly modelled (Figures 52, 53), it is worth observing which other characteristics they should display.⁴⁶⁴ Except for particular deposits with selected items or linked with workshops activities, domestic refuse should display products reflecting daily activities, among which cooking seems to be the most frequent and unavoidable one. Therefore, good amounts of charcoal and bones should be present; moreover, the decay of organic material should produce soft, dark sediments. Occasionally lost, small items may also be part of the assemblage, along with, of course, any potsherd that not entering the reuse/recycle circle. Certainly, although not necessarily (see above), complete or (more likely) sub-complete vessels may also have been buried.

It has to be stressed also that post-depositional agents may play an important role, given the high presence of organic material, and they may severely affect the possibility of reading any clear internal lamination or stratification, at least with the human eye. Intentional levelling layers (e.g. to restore a flat surface) should be considered as something different from the primary fill and their status has most probably to be considered as secondary.

As a whole, when recognised as rubbish pits, these deposits may well be dated in the way suggested above. They of course represent excellent windows for obtaining other precious information, for instance about

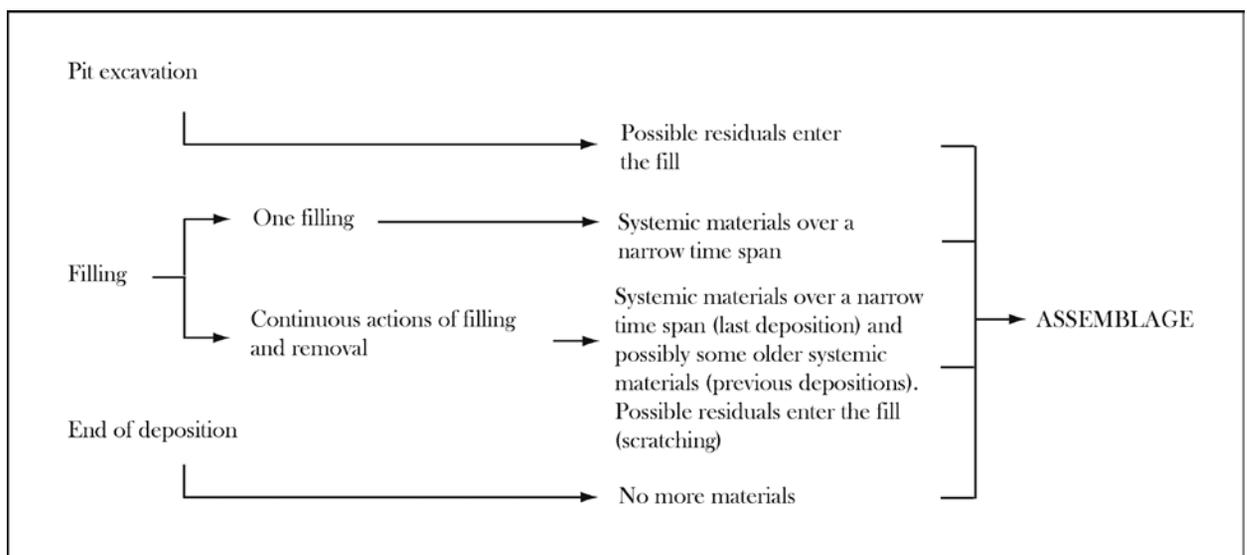


Figure 52: A possible model for the formation of the assemblage of the fill of a rubbish pit.

⁴⁶⁴ For certain micromorphological characteristics of these deposits (shared with P.A.5 deposits), see Matthews 1995: 60.

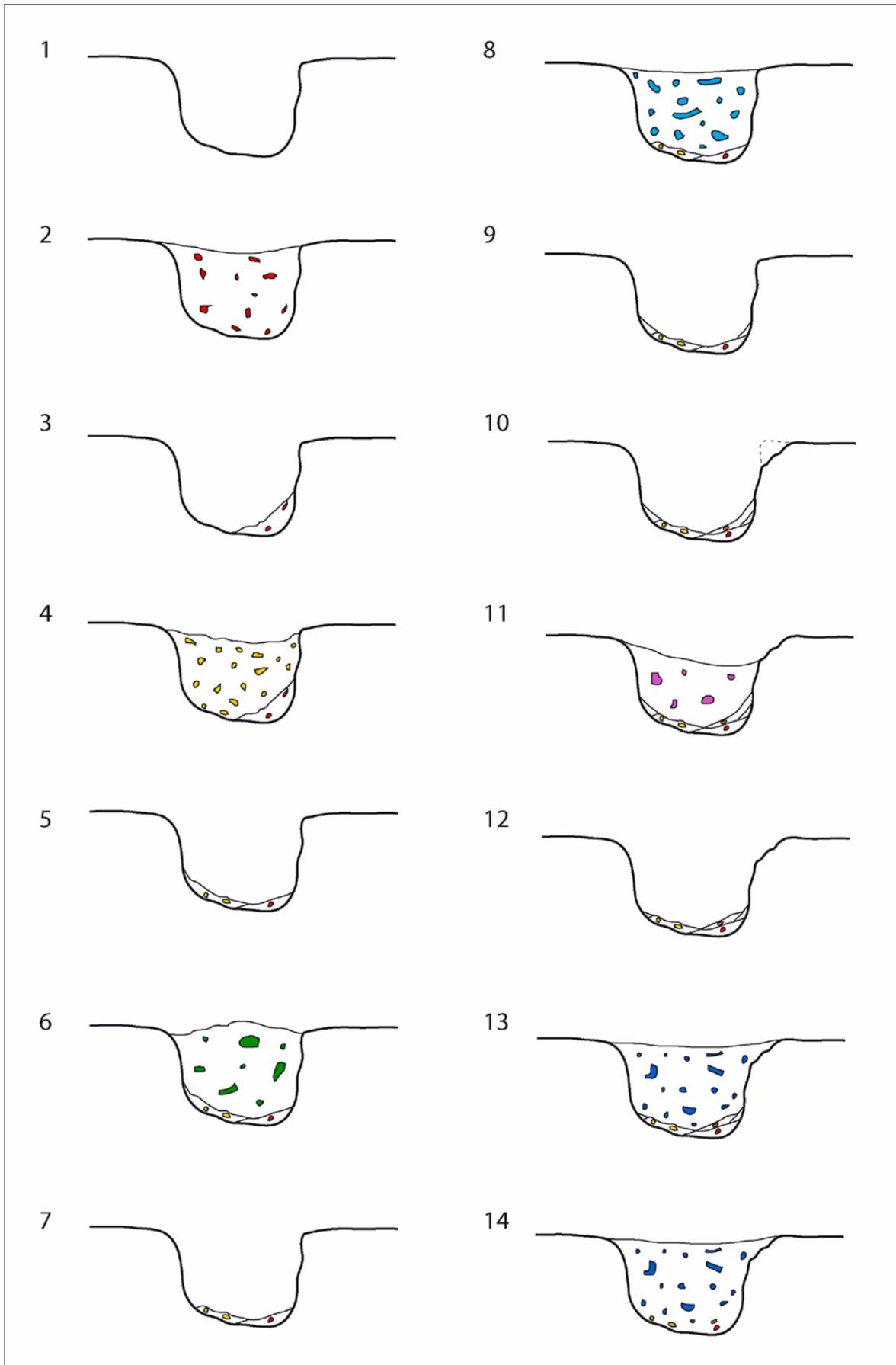


Figure 53: Hypothetical sequence producing the fill of a rubbish pit.

diet, or those activities carried out in the proximity of the pit. Archaeobotanical evidence may also be used to infer the season in which the pit was ultimately filled.⁴⁶⁵ Cesspits,⁴⁶⁶ which are not treated here, may for many aspects be assimilated to rubbish pits.

P.A.2. Hearths⁴⁶⁷

Hearths (places for making purposeful fire) are usually detected by a fireplace, such as a simple pit or any unoccupied surface, possibly, but not necessarily, with some plastering. The fireplace can be a more structured feature, such as a solid surface or even a masonry counter, oven or kiln. They may also reveal themselves via the products of combustion. If more than one combustion occurred (i.e. a fire was lighted repeatedly in the same place), the bulk of what is recovered should refer to the last combustion or to the last few combustions, because of previous, probable clearance.

The outcome of combustion activities should be a layer substantially made of ash⁴⁶⁸ and/or charcoal, while the fireplace should display signs of the exposure to heat.

Figure 54 sketches a possible and very simple model for the formation of the assemblage produced by a hearth made of clayish plaster, and the outcome of some burning activity.

Any sediment used for plastering has to be regarded, in fact, as a secondary deposit, providing at most a *tpq* for the layout of the fireplace. A masonry structure should also be treated as something different, and particular attention should be devoted to the possibility that reuse of building material occurred (see Chapter III.4.1).

What attracts attention, seeking for a primary deposit, is the layer(s) resulting from combustion. Apart from ash and charcoal, it may also contain a few materials that are very likely to be systemic, although some attention should be paid where layers produced by combustion were then redeposited. These materials may accidentally be lost small items, discarded items, or simply bones and other remains connected with cooking activity. Clearly, if the fire were used for activities other than cooking, artefacts connected with the activity carried out may be recovered.

Finds may or may not display traces of blackening, as they may have been lost or discarded both previously, or some after the last combustion. Occasionally whole vessels or other artefacts may also be recovered in association with the hearth and they may also be assessed when evaluating the date of the (last) burning activity.

In general, in any event, these layers are not expected to produce large amounts of artefacts, therefore the resulting assemblage should be relatively small, raising the problem of representativeness for the sample collected. In this case the sample be strengthened through radiocarbon analyses carried out on the bones, carbons or other remains recovered, which are very likely to be systemic.⁴⁶⁹ Of course, for charcoal, the old-wood effect has to be evaluated (see Chapters III.3.3 and III.4.1).

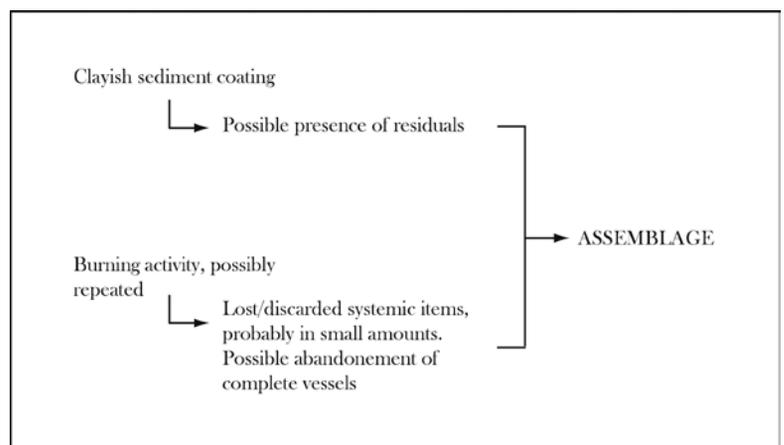


Figure 54: A possible model for the formation of the assemblage of a hearth.

⁴⁶⁵ Dickens 1985.

⁴⁶⁶ Van Oosten 2017.

⁴⁶⁷ See Karkanas, Goldberg 2019: 100-116 and Mallol *et al.* 2017.

⁴⁶⁸ See Weiner 2010: 168-178.

⁴⁶⁹ Radiocarbon dating of ash is very problematic (see Weiner 2010: 177).

Concluding, looking at the layers that are a product of direct combustion, the artefacts recovered should be chronologically consistent with each other, thus producing a typical primary profile with a more or less narrow width, according to the quality of the artefacts' dates. Again, some issues of residuality may arise, but they should be exceptional. Some false residuality, conversely, must definitely be considered, although the bulk of the material should be consistent in terms of date. On the other hand, as referenced above, much more residuality is likely for plastering or any associated structure.

*P.A.3. Drainage (with amphorae)*⁴⁷⁰

More or less extensive drainage works, usually employing reused amphorae, are very peculiar to the Roman management of water and soil; they are a common presence all over the Empire, whenever particular hydrologic and morphologic characteristics required some intervention. In particular, they are widespread in northern Italy, where they have been studied in many different lights. Indeed, amphorae, thanks to their wide availability and to their peculiar shape, provided a perfect means for this kind of works; they were used in two main ways: extensively, for draining a whole area, preventing the rising of groundwater, or forming pipes for making the water flow away from the targeted area. Of course, once deposited, the vessels had to be covered with sediments, but here we focus on the amphorae themselves. They were usually laid down complete or at most sub-complete (for drainage reasons a hole was often opened on their walls near the spike) and it seems very unlikely they were chosen among buried materials. When they were selected for use they were most likely systemic, picked up among the circulating (or provisionally stored) specimens. Clearly, they may have been previously used more than once⁴⁷¹ and they could have been stored for some time, but they were effectively part of the systemic context in which the drainage was made. Moreover, they were not particularly affected by curation and J. T. Peña has estimated their average life expectancy (primary use) as 5 years.⁴⁷² This is, in general, by far beyond the common accuracy of archaeological temporal observations. The overall chronological profile of such an assemblage has to be seen in a palimpsestic view. In any event, the systemic nature of the assemblage makes it suitable for *ad quem* dating and it should produce a normal or sub-normal distribution.

Unfortunately, among the wide range of Roman ceramic types, amphorae generally provide fairly wide ranges; therefore, although the deposit itself is primary and has an abrupt formation, the overall profile may turn out to be fairly wide. For narrowing it and for providing a closer *tpq*, stamped specimens or vessels displaying *tituli picti* play an important role.

Other cases of clear selection of vessels among the circulating, or provisionally stored, items for structural reuse or similar (whole vessels re-used in walls or vaults, reused as *sarcophagi*, as pipes, etc.) may be modelled in the same way.

*P.A.4. Small dumps*⁴⁷³

The formation and dating of small dumps can be roughly assimilated to those of rubbish pits, the main difference being the depositional basin. Two slight differences may occur:

- (1) the presence of residuals due to the notching of existing nearby strata should be lower; and
- (2) where the depositional basin was open and the deposit exposed for a long period, a higher risk of intrusions should be prepared for.

⁴⁷⁰ See Pesavento Mattioli 1998 for a fundamental overview.

⁴⁷¹ Toniolo 2007: 120.

⁴⁷² Peña 2007: 325-327.

⁴⁷³ For a detailed case study of dump formation processes in craft activity areas, see the fundamental Vidale, Balista 1988. A milestone is represented by the excavation, carried out in 1982, of a relatively small 18th-century dump in the *Crypta Balbi* area, in Rome. The sequence and artefacts have been fully recorded and published (Manacorda 1984). In particular, the excavation well illustrates how residuals occur in low proportions in this type of deposit. See also Saguì 1998.

Intrusions in some cases may produce the paradoxical presence of specific sorts of residuals: this case is well illustrated in Chapter III.5.1, where old fragments of wall plaster are suggested to have been embedded within a small dump after having been detached from the still standing walls and ceilings of the very room in which the dump was formed. It is worth remembering that disused, abandoned buildings are often targeted, even within still well-maintained settlements, as favourite locations for dumping (see Chapter III.4.1).

P.A.5. Fire debris

In this example, we clearly refer to *in situ* fire debris, as this type of debris may be redeposited in the same way as any sediment could.

A sudden episode of fire, accidental or intentional, leads to the ‘sealing’ of an existing situation. Of course, the layer formed may later be subject to reworking, scavenging or other ‘disturbance’ process. In any event, whenever and wherever undisturbed, such a deposit represents an extremely valuable source of information, obviously not only in a chronological perspective. Along with the next type of deposit, i.e. *in situ* assemblages preserved beneath a collapse debris, this is the case that can be considered most similar⁴⁷⁴ to the Pompeii premise, so often cited in the Binforf-Schiffer debate. The ‘ethnoarchaeological’ case studies presented in Chapter III.5.1 may also be considered a good simulation of this occurrence, and similar chronological palimpsests may be detected. From a chronological point of view, some differences may arise in the form of a higher percentage of false residuals where structural timbers were sampled for radiocarbon dating. Bones and seeds represent, on the contrary, excellent targets, allowing always for old-wood effects.

Burnt, charred and decomposed materials are likely to provide part of the matrix; this may also turn out to contain large quantities of building materials, which, in turn, may contain some residuals.

The *in situ* assemblage, which should be treated as an independent context or deposit, should display blackening or other alterations produced by heat and/or direct exposure to fire; a large percentage of complete or sub-complete vessels, although reduced in fragments, should be retrieved if the deposit has not been reworked.

It is worth recalling that it is sometimes possible to relate major episodes of fire to specific historical events, e.g. Rome’s great fire of AD 64, or London’s destruction in AD 60-61 (the Boudican revolt). The deposits produced by the two events represent a familiar feature in their urban sequences and they are often used as reliable *termini ante quem* for the previous activities documented.⁴⁷⁵

Some post-depositional mixing can involve fire debris as well as any other deposit; an interesting case study is represented by a domestic building investigated in Southampton, southern England, whose destruction by fire is well related to a French attack that occurred in AD 1338. Most of the pottery (burnt) was indeed systemic and residuality was generally low. Some unburnt sherds were conversely attributed to post-fire dumping activities that took place within the abandoned dwelling. In this case, the physical characteristics of the investigated sherds played a fundamental role in sorting pre/sin-depositional artefacts and intrusions.⁴⁷⁶

⁴⁷⁴ At least in the perspective of dating.

⁴⁷⁵ This is also the case of a minor centre such as Cremona, considerably damaged by Vespasian’s troops in AD 69. The episode is archaeologically marked by several traces of fire and by the sudden collapse of many structures. The dynamics of the episode and the following restoration strategies have been investigated in detail: see Arslan Pitcher *et al.* 2017 and, in particular, Santangelo 2017, Arslan Pitcher 2017 and Arslan Pitcher, Bonardi 2017.

⁴⁷⁶ Brown 1995: 7 (with further references).

P.A.6. In situ assemblages beneath collapse debris

This is a form of ‘Pompeii case’ which may have been produced by either simple abandonment and deterioration of a standing structure or sudden episodes, typically earthquakes.

The major difference between them is that the first occurrence implies a much higher risk, in sequence, of items being removed, scavenging, space reuse (typically for dumping), and, eventually, that intrusions occur. It follows that the first case should be approached with great care, as buildings untouched and undisturbed until their final collapse represent a rarity.

Here we will focus on the second case, i.e. *in situ* assemblages beneath debris produced by sudden collapse. Clearly collapse can be produced by accidental or intentional fire: in this case, it follows that the distinction between fire debris and collapse debris, *stricto sensu*, is more theoretical than practical. Fortunately, the two cases share formative affinities and, particularly, the modality through which they can be dated.

When handling assemblages preserved beneath collapse debris, the major interpretive risk connected with dating is produced by the presence of more recent materials filtered through the debris itself, due to the most probable presence of empty spaces (see Chapters II.2.10 and III.6). Except for the matrix produced by the decay of perishable items, and possibly by the diagenesis of building materials and plasters, the deposit of interest is therefore substantially matrix-less and is completely made of the assemblage. Recently, a very accurate attempt to distinguish the status of different artefacts associated in this kind of deposit has been attempted for the so-called ‘Earthquake House’ at Kourion, Cyprus, which collapsed at the end of the 4th century AD and which was excavated by the University of Pennsylvania Museum in 1934-35 and by the University of Arizona in 1984-87.⁴⁷⁷ Unfortunately, the work focuses primarily on functional and spatial aspects, and artefact dates are not readily available. Nevertheless, from a qualitative point of view it represents a case study more or less explicative of the expectations we should have of this type of deposit:

- (1) the vessels should be, although in pieces, complete or sub-complete (high conjoinability);
- (2) complete, articulated skeletons could be present;
- (3) other complete items may be present.

Some problems may arise for small items such as coins, where their belonging to the main assemblage or to the group of intrusions was in doubt. Single, small sherds unconnected with dumping activity prior to collapse, or not reliably ascribable to the activities carried on before the deposit formed, should not be considered.

Given all the above, residuality should be almost non-existent, making, in turn, false residuality more easily detectable if present. Given the possible high risk of intrusions, the *ad quem* dating of the deposit should be based primarily on those materials whose status is sure, namely those listed above.

P.A. 7. Charcoal layers

This particular type of deposit has been suggested by personal experience in Aquileia, where a layer of clean charcoal fragments was laid down, most probably with hygroscopic function, as part of the bedding for an upper mosaic floor (this exceptional find is discussed in detail further on). This typology, although rare, is not unknown: the intentional insertion of charcoal in some types of floors and preparatory layers has been discussed in Chapter III.5.3; moreover, charcoal was also often intentionally added to *cocciopesto* and mortar.

⁴⁷⁷ Costello IV 2014.

In the case of Aquileia, freshly burnt wood was intentionally laid down in the building site for a precise function: it is thus likely to provide good *ad quem* dating, although affected by some old-wood effect according to the age of the wood used. For assessing its primary status, it is important that the sampled pieces of charcoal provide consistent dates, thereafter statistical approaches could also be selected to narrow the obtained results.

P.A.8. Post hole fills A and preserved timber structures

Post holes/pipes and post pits are one of the most common features of any archaeological site; they are usually thought to be characteristic of wooden architecture, but it is worth recalling that timber structures, play an important role also in the process of constructing masonry buildings. Posts can have a wide variety of functions (not strictly structural), such as limiting a space⁴⁷⁸ or being part of light structures, such as looms or devices for drying. Formative dynamics and excavation of post holes and post pits already been discussed in the literature:⁴⁷⁹ what is of interest here is the chronological information that they provide. To take on the issue more easily, four main possibilities are highlighted and sketched below (Figure 55). Clearly, what is important in this scheme is how we can date the different types of stratigraphic units emerging, not the structural/functional characteristics of holes, pits and respective fills. This kind of typology would be indeed much larger.

The four main possibilities described produce, in turn, three ‘types’ of contexts/deposits which can carry different chronological information; the first can be interpreted as primary, the others as secondary:

- (A) context formed by the *in situ* decay of the post itself (i.e. the post was never removed);
- (B) the backfill of the post pit, formed when the post was installed; and
- (C) the backfill of the post hole, formed once the post was removed.

Here we focus on the first type (A). This kind of fill should be recognisable by its highly organic, dark matrix, made of the decomposed post itself. What is to be dated, the targeted event, is the installation of the post itself (construction of the related structure). Among primary deposits, this is perhaps the most potentially confusing as it seems very difficult to distinguish a genuine fill produced by post decay from a backfill made with organic sediment. Moreover, given the very rare case of a post still recognisable (charred or not), what might be expected for dating is, at most, small fragments of charcoal or wood, thus making it very difficult to select possible external rings.

It follows that the main problems concern the interpretation of the deposit itself, the lack of conspicuous dating materials, and the possibility that old-wood effects may seriously affect the samples. In the end, the quality of the obtainable date closely depends on the quality of the record and on the quantity of samples. If the interpretation

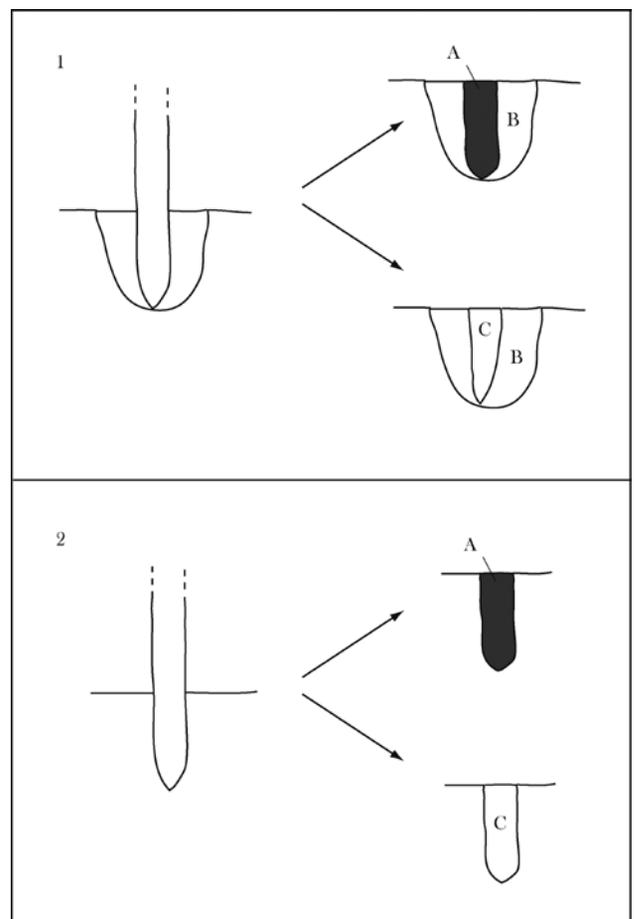


Figure 55: Post pits and post holes; different fills with different meanings.

⁴⁷⁸ See Carver 2009: 21.

⁴⁷⁹ Among them, see in particular Barker 1969, 1977: 83-90 and Fronza, Valenti 2001, with further references.

of the deposit as *in situ* decomposed post were confirmed, even in the absence of large samples of well identifiable wood/charcoal, a *terminus post quem* not very far from the actual date may be obtained for the post installation. Where large pieces of wood are recovered, with outer rings identifiable, the death of the tree from which the post derived may be dated *ad quem*. Assuming that a brief time (from an archaeological perspective) passed between the felling of the tree and the installation of the post, this could also be dated substantially *ad quem*.

The recovery of *in situ* timber structures can be seen as an extreme case of this kind, where dendrochronology can also profitably be combined with radiocarbon dating to obtain exceptionally high definition dates.

A very peculiar example, lying somewhere between types A and C, has been recorded mainly through experimental observations and has interesting consequences in terms of dating. This situation occurs when some post bases of a given structure (still in use) rot away because of weathering, rodents or fungi; the outcome of this process was described by P. J. Reynolds when the experimental Pimperne house at Butser (Hampshire, England) was demolished.⁴⁸⁰ The post voids were partially filled with soil particles, rotting wood fragments and some artefacts; these derived from activities carried out within the house while in use (the house had remained stable). In other words, the materials recovered within the post pipes were contemporary with the use of the building rather than with post building sedimentation.

If this peculiar scenario is detected, surviving wood fragments may lead to some *ad quem* dating for the *construction* of the investigated structure, while associated artefacts, whether sufficient in number and quality, may provide *ad quem* dating for its *use* (or part of its use). In fact, the distinction may be more theoretical than practical, particularly where the

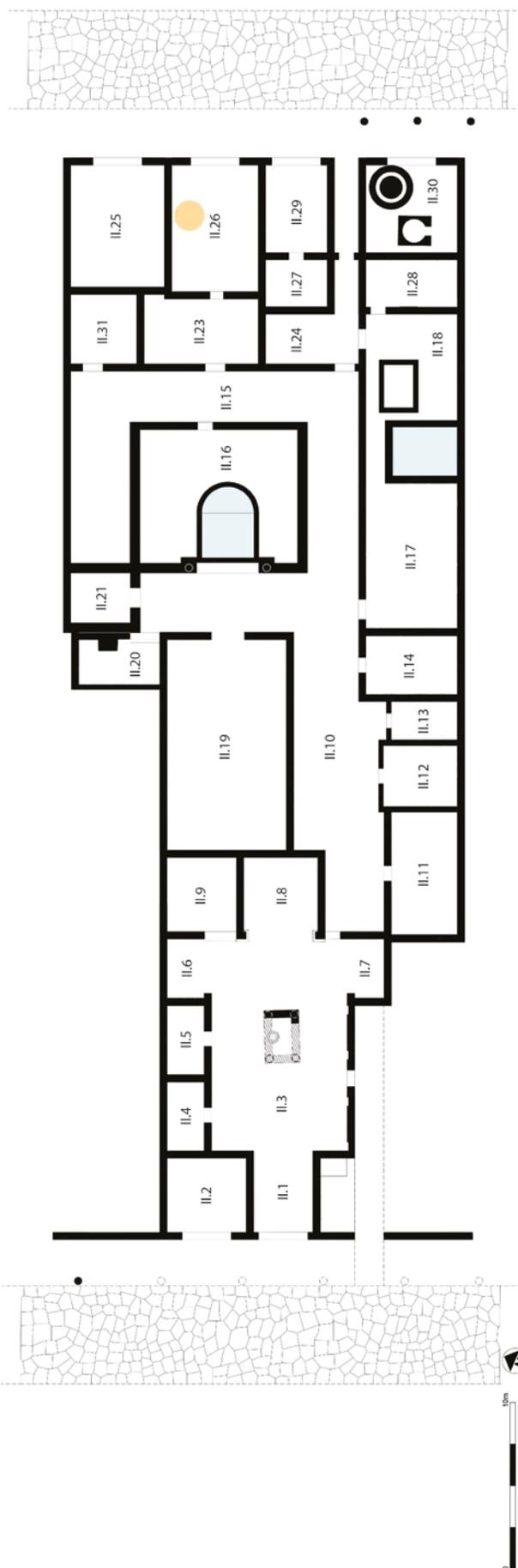


Figure 56: Location of the hearth excavated in taberna 26, 'House of Titus Macer', Aquileia.

⁴⁸⁰ Reynolds 1995, Bell 2015: 52-54. For a complete report of the excavation of the Iron Age site and the reconstruction, maintenance and dismantlement of the experimental roundhouse, see Harding *et al.* 1993.

structure was short lived, as the accuracy of the dates of artefacts and samples may well be too low to allow any distinction between construction and use.

IV.2.5 Case study 1: a small hearth within a taberna in Aquileia (P.A.2)

*Topographic and archaeological background*⁴⁸¹

The hearth considered in this discussion was recovered within one of the rooms, probably *tabernae*, located on the eastern side of the ‘House of *Titus Macer*’, excavated in Aquileia (see Appendix 2 for a wider contextualisation). This area had already been partially investigated, but poorly documented, during the early 20th century; unfortunately, this entailed the loss of the upper part of the sequence without adequate record.

This part of the *insula* was laid out between AD 25 and 75, but the main body of the excavated strata refers to the later activities carried out in these spaces, along with their evolution and transformation before their final abandonment.

The hearth was located on the northern side of room 26 (Figure 56); the fireplace was set up when the *taberna*’s tessellated floor (made with tile tesserae) had already been very damaged and cut by several post holes: it was made of a layer of brickearth (which was then renovated a few times) as a basis, and by a small wall forming a corner with the northern wall of the room. Here several burning activities occurred and although their function is still unclear the presence of some animal bones and of two net weights, one in an upper combustion level and the other in a deeper one (confirming the substantial unity of the sequence), seems to suggest food processing as a credible hypothesis.

Deposit description

The deposit was made of layers produced by combustion, alternating with layers of burnt clayish sediments (Figure 57). The two groups should theoretically be kept separated, being the outcome of different processes



Figure 57: North-eastern view of the hearth excavated in *taberna* 26, ‘House of *Titus Macer*’, Aquileia.

⁴⁸¹ The deposit is substantially unpublished. A general overview of the area is in Centola *et al.* 2012. Recently the coins have been fully examined by A. Stella (2018: 66-69).

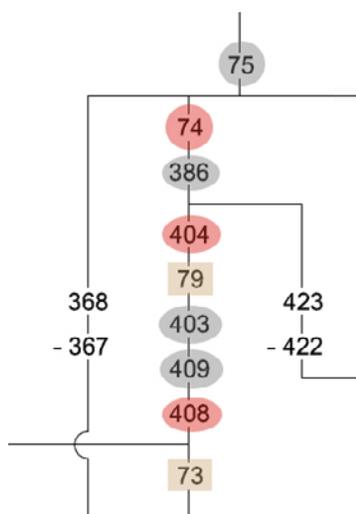


Figure 58: Part of the Harris matrix of the ‘House of Titus Macer’ showing the hearth sequence; brickearth layers are in red, layers produced by combustion are in grey, and structural elements are in light brown.

and having furthermore a different status. In this case the whole sequence is presented for practical and ‘didactic’ purposes. The clayish layers provided few artefacts, which turned out to be residuals, exactly as might be expected.

Figure 58 presents the whole sequence: in red are the brickearth layers, in grey the layers produced by combustion, and in light brown the small wall (73) and a few fragments of bricks laid to create a flat surface (79).

Focusing on the layers produced by combustion, the two lower ones (403 and 409) were made almost entirely of whitish ash, layer 386 had a matrix rich in greyish ash and charcoals, while the upper level (75) was almost black in colour and extremely rich in charcoal.

Assemblage - physical state

The general physical state of the assemblage was partially recorded: it can be noted that all the materials were relatively small and that fractures in ceramics were neat. Traces of blackening or burning were not recorded, making it difficult to assess whether the artefacts were discarded during, or immediately after the firing episodes, but the tight chronological relation between the artefacts and the formation of the combustion layers is beyond dispute.

The finds⁴⁸²

Unfortunately the available dates are scarce, as part of the assemblage provided no helpful chronological information. This is indeed a major deficiency in this case study, as the total amount of dated finds is, thus far, only 15. Fortunately, among them, a high percentage of coins allows for some accuracy.

The dated finds, divided by context, are reported in Table 5.

Table 5: Finds recovered in the hearth within the taberna in Aquileia, Fondi Cossar.

Context	Dated Finds
75	Coin, AD 268-270
	Coin, AD 270-300
	Coin, AD 260-268
	Coin, AD 244-249
	Coin, AD 236-238
	Coin, AD 251-253
	Glass, AD 200-500
	Coarse-ware, AD 200-700
386	African sigillata, AD 200-500
	Black-glazed pottery, 150-50 BC
	Coin, AD 145-176
	Coin, AD 1-300
408	Glazed coarse-ware, AD 200-600
	Thin-walled ware, AD 25-75
	Thin-walled ware, AD 25-75

⁴⁸² See the previous footnote.

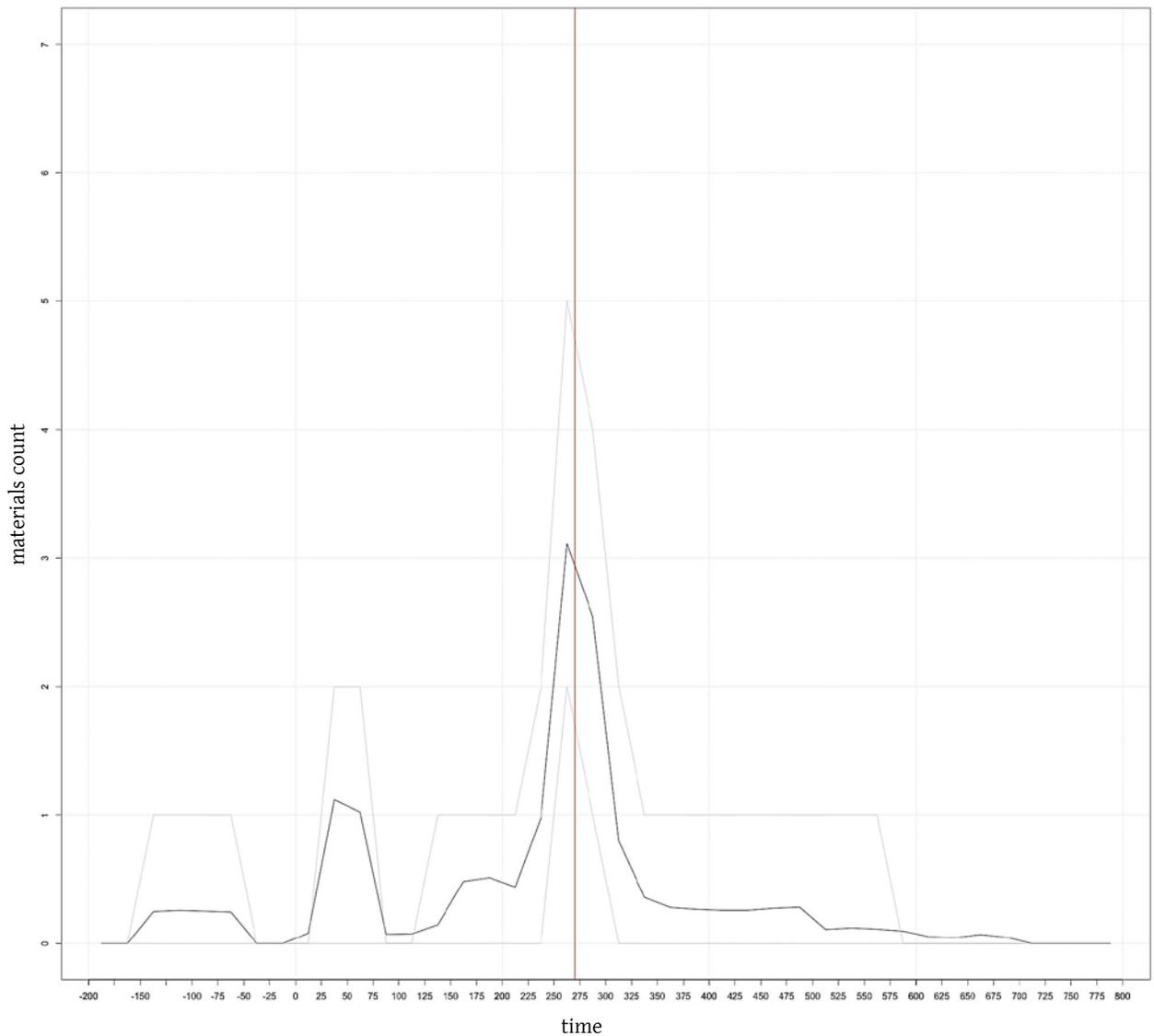


Figure 59: Hearth of *taberna* 26: profile with 25-year brackets.

Three specimens appear clearly residual: two (thin-walled ware) are embedded in one of the clayish layers, while a third (black-glazed pottery) is a residual within a primary context. The *tpq* is provided by the coin dated AD 270-300.

Profile

Below are proposed the Monte Carlo simulations applied to the studied assemblage (Figures 59, 60, 61). Coin life has been extended by 30 years to account for their possible circulation for some time (see Chapter III.3.3). The first graph uses 25-year brackets, while the second has brackets of 50 years. The third, with time windows of 10 years, is applied to the assemblage without computing the three residuals detected.

Discussion

The major spike of the graph is clearly produced by the coins recovered in the upper level, but in general the other finds (except for the three residuals detected) are consistent with them, producing a unimodal, narrow distribution. The coin dated to the period of Antoninus Pius or Marcus Aurelius may well be a false residual, curated for a long time. As observed earlier, the dated sample is very small, thus the conclusions drawn are far from conclusive. For the moment it is possible to observe that the case study, as a whole, well answers the expectations advanced.

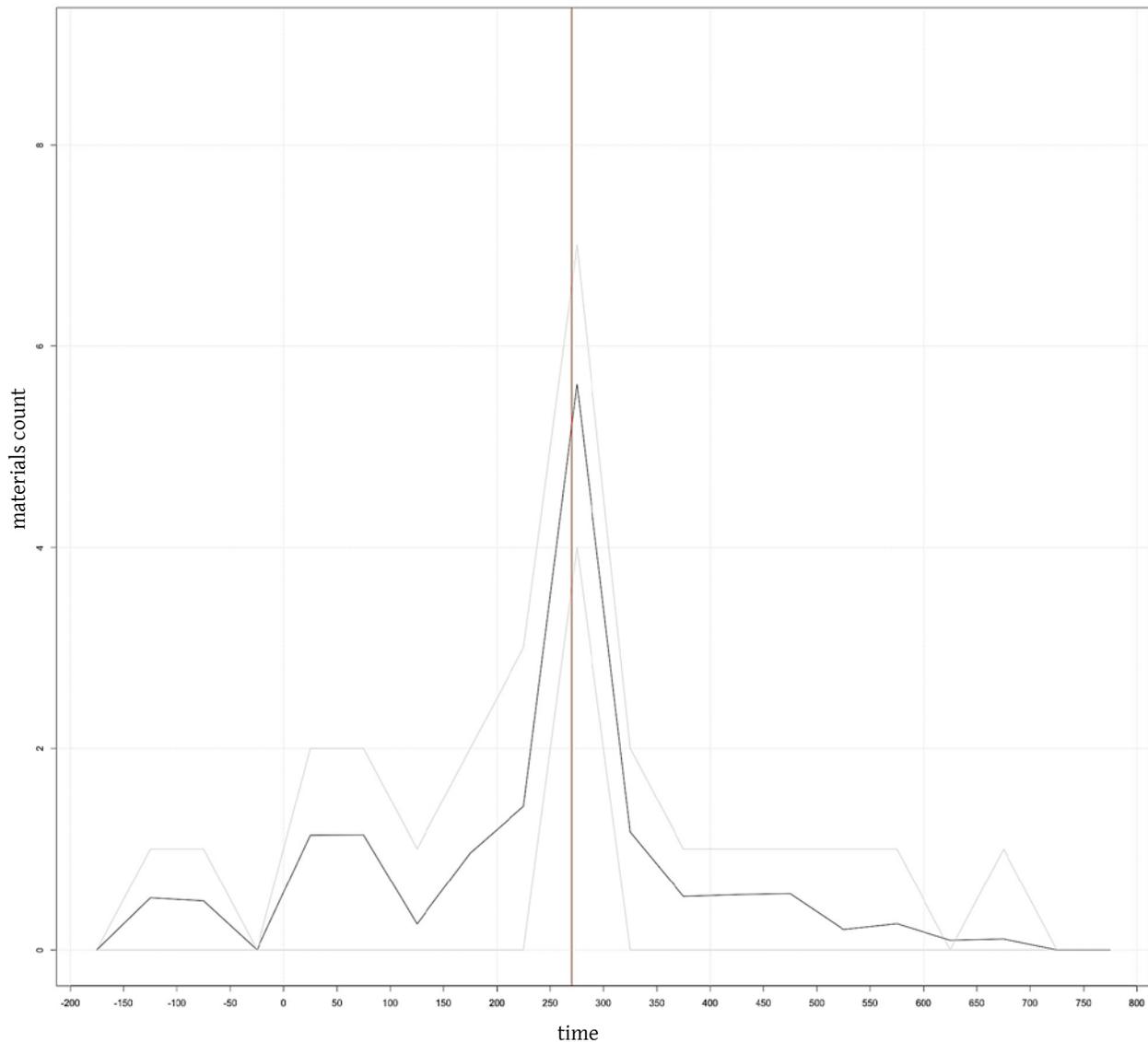


Figure 60: Hearth of *taberna* 26: profile with 50-year brackets.

Date proposed

Ad quem: AD 270-340. The examination of the whole sequence indicated a date of AD 270-300.

Duration

Although not clearly distinguishable, some clearance may have occurred, producing the removal of some layers. The fireplace was in use more than once, but the overall duration of the activities which took place seems relatively short, far below the accuracy threshold that would allow us to distinguish an initial start and end date.

IV.2.6 Case study 2: a drainage with amphorae within an earthwork from Vicenza (P.A.3)

*Topographic and archaeological background*⁴⁸³

Vicenza is located in north-eastern Italy, in the Veneto region. The foundation of the urban centre is commonly dated to the 6th century BC, during the so-called ‘second urbanisation phase’ of the region.

⁴⁸³ The case study is presented in Mazzocchin 2013 and in Mazzocchin, Furlan 2016.

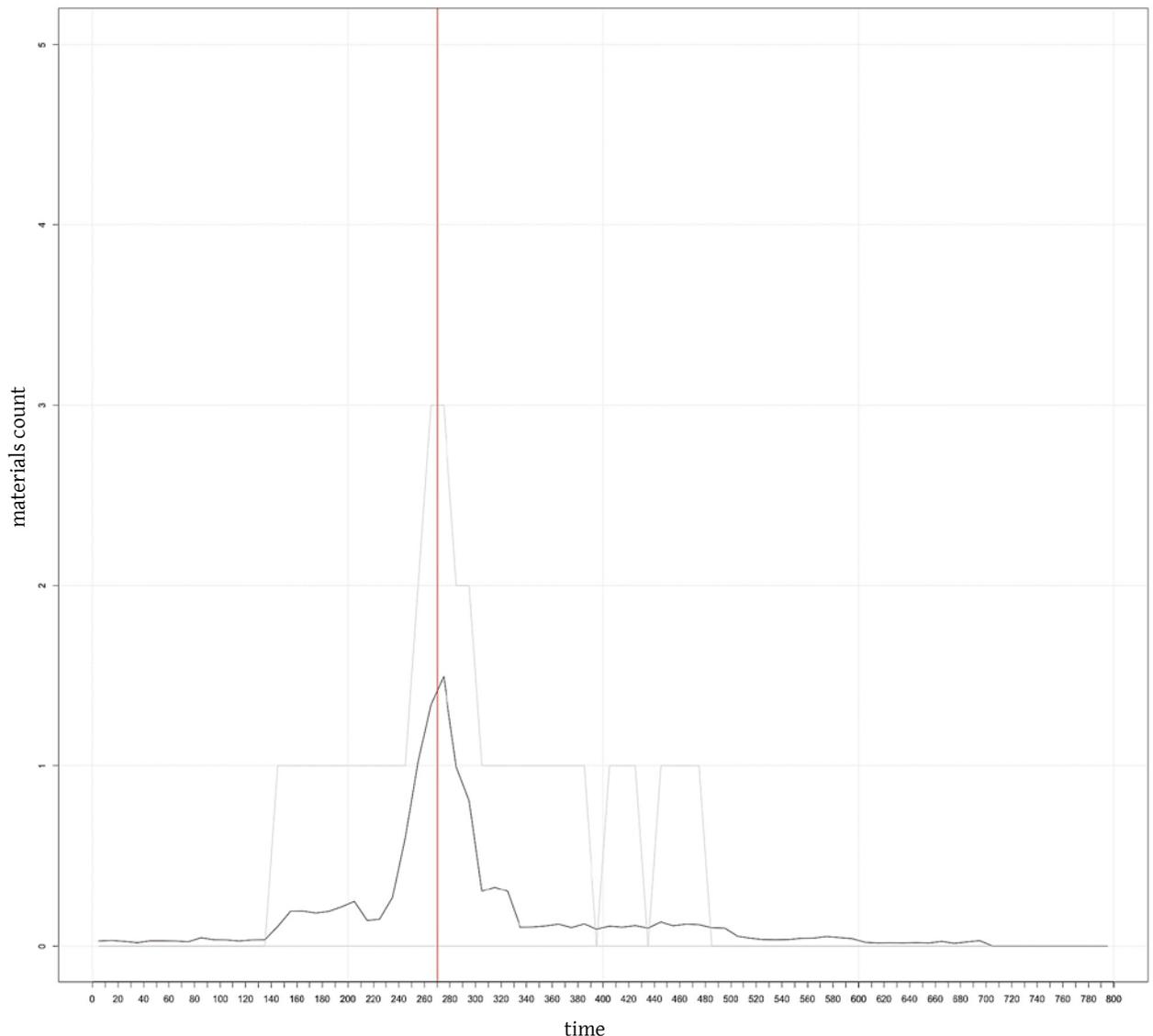


Figure 61: Hearth of *taberna* 26: profile with 10-year brackets.

The area in which the town developed is located near the confluence of two rivers, on slightly higher ground surrounded by marshlands; this peculiar hydraulic and geomorphological situation made some water management works necessary.

The infrastructure examined below forms a part of the Roman city's defences, which were laid out against floods.

In the early 1990s, some excavations were carried out between Contrà della Piarda and Contrà Mure S. Michele, in the south-eastern suburbs of the ancient city (Figure 62). Here emerged part of a considerable earthwork, most probably an embankment dividing the urban centre from the marshlands and protecting the town against river floods. The bank was built up of successive layers to a total height of at least 4 m. Examined here are the lowest ones, particularly contexts 145 and 155, which consisted of complete/sub-complete amphorae, laid down for obvious draining and stability purposes.

Deposit description

As previously mentioned, we are discussing here only the two layers of amphorae used for draining and stabilising the earthwork (contexts 145 and 155, although unnumbered, visible in Figure 63). These have a

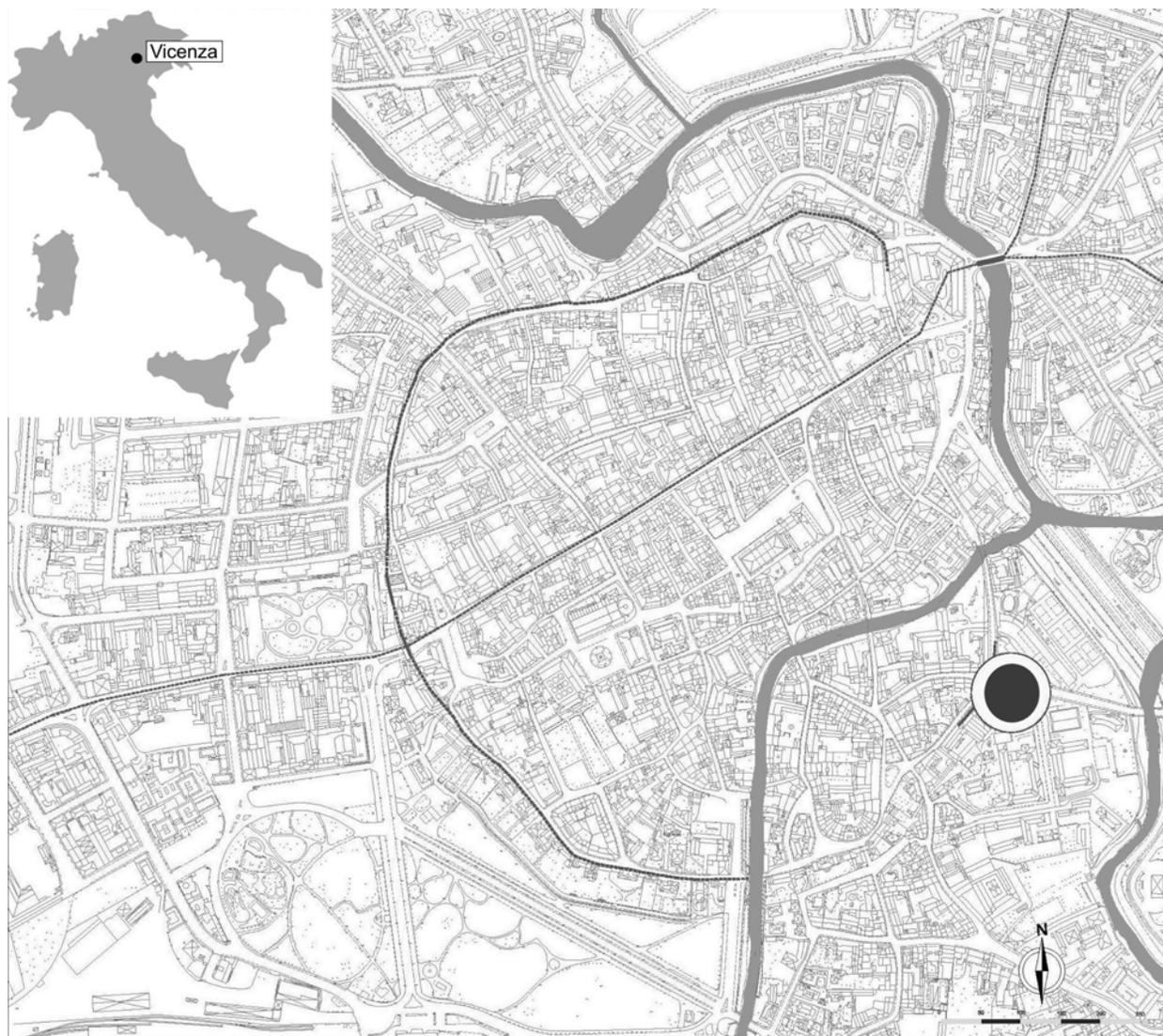


Figure 62: Vicenza: location of the investigated earthwork (after Mazzocchin, Furlan 2016).

history quite different from the sherds embedded within the sediments, which were redeposited for filling the empty spaces left and for elevation of the *agger* (contexts 153, 152, 149), although it has been possible to demonstrate that, apart from amphorae, other vessels were intentionally redeposited, particularly in the upper layer (made apparently of ‘second-choice’ materials), for draining the embankment foundation. The data provided by these materials are consistent with those provided by the amphorae alone, but here they have been kept separate for the sake of simplicity.

Assemblage physical state

Most of the vessels are complete or sub-complete (Figure 64), with the top layer displaying a higher rate of fragmentation. This may reflect a precise choice: the better material was used first, but when the builders ran out of first-choice vessels, they began progressively to use vessels that were less well preserved.

The finds⁴⁸⁴

In this case it was possible to process 275 items, all complete or sub-complete amphorae. They include the types Lamboglia 2, Dressel 6A, Dressel 6B, Fondo piatto, Troncoconica da olive, Dressel 1, Dressel 2-4,

⁴⁸⁴ The complete list of finds is provided in Mazzocchin 2013: 42-43.

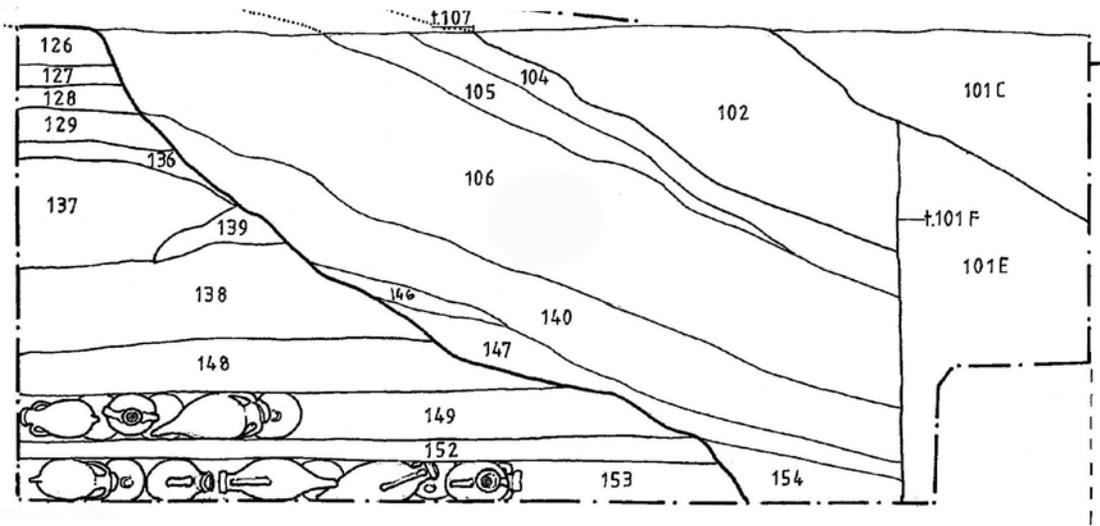


Figure 63: Vicenza: detail of the cross-section of the investigated earthwork (Mazzocchin, Furlan, 2016).



Figure 64: Vicenza: the lower drainage during the excavation (Mazzocchin, Furlan 2016).

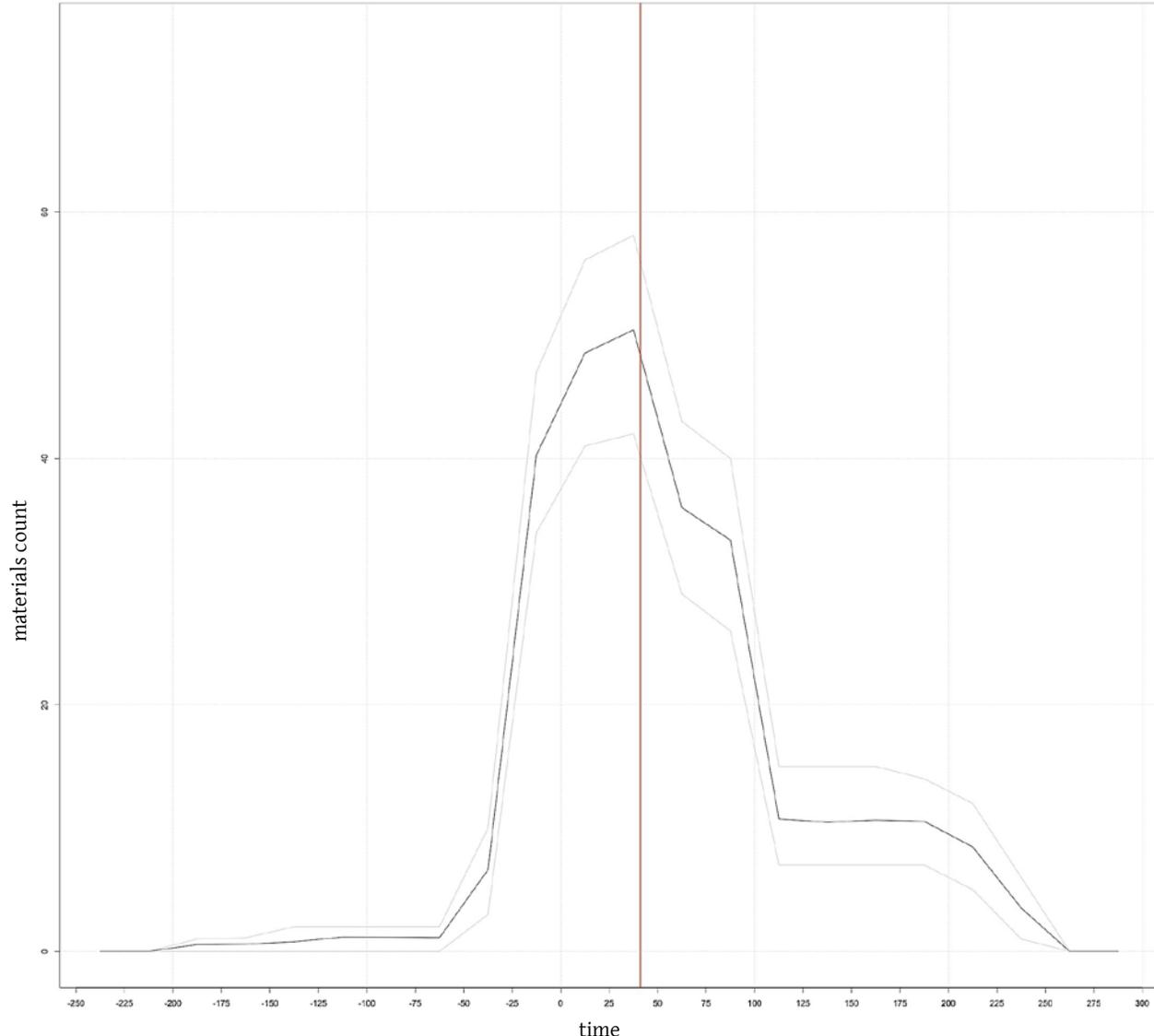


Figure 65: The investigated drainage: profile with 25-year brackets.

Dressel 7-11, Tardo Rodie, Dressel 25, AC3, AC4, and Tripolitana I. The vast majority of the specimens consists of Dressel 6A and Dressel 6B amphorae. Some of the vessels were stamped, thus carrying more accurate dates. No finds other than amphorae were processed. The *tpq* is provided by five stamped amphorae dated to the time of Claudius (AD 41-54).

Profile

The profiles are plotted below, with windows, in order, of 25, 50 and 10 years (Figures 65, 66, 67). No corrections were applied.

Discussion

The chronological profiles perfectly meet the expectations for a primary deposit with abrupt formation, although the curve is somewhat wide because of the poor dating of many specimens (one or more centuries). The peak is consistent with the *tpq* and residuality is nil. This is clearly due to the fact that the vessels preferred were picked directly from the systemic ones, were they circulating, provisionally stored or reused. In any event, intrusions do not seem to have played any substantial role, because of the short exposition of the deposit, its depth, and the absence of any later recorded 'disturbance' activity.

Date proposed

Ad quem: AD 41-100. Within this window, given the normal life expectancy of a common amphora, the status of the deposit and the overall chronological profile, the period AD 41-60 AD seems the best option. It has to be stressed that this date is consistent with the data provided by the other materials recovered

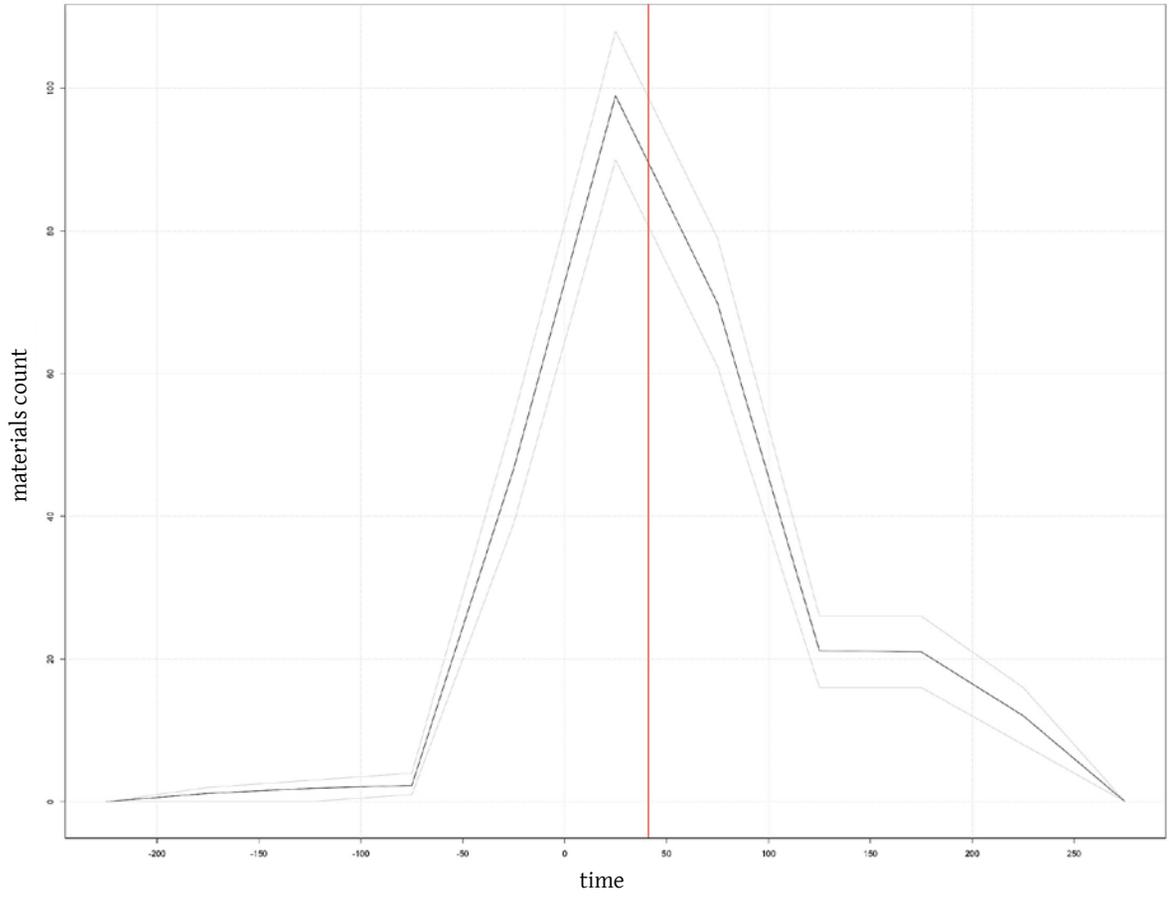


Figure 66: The investigated drainage: profile with 50-year brackets.

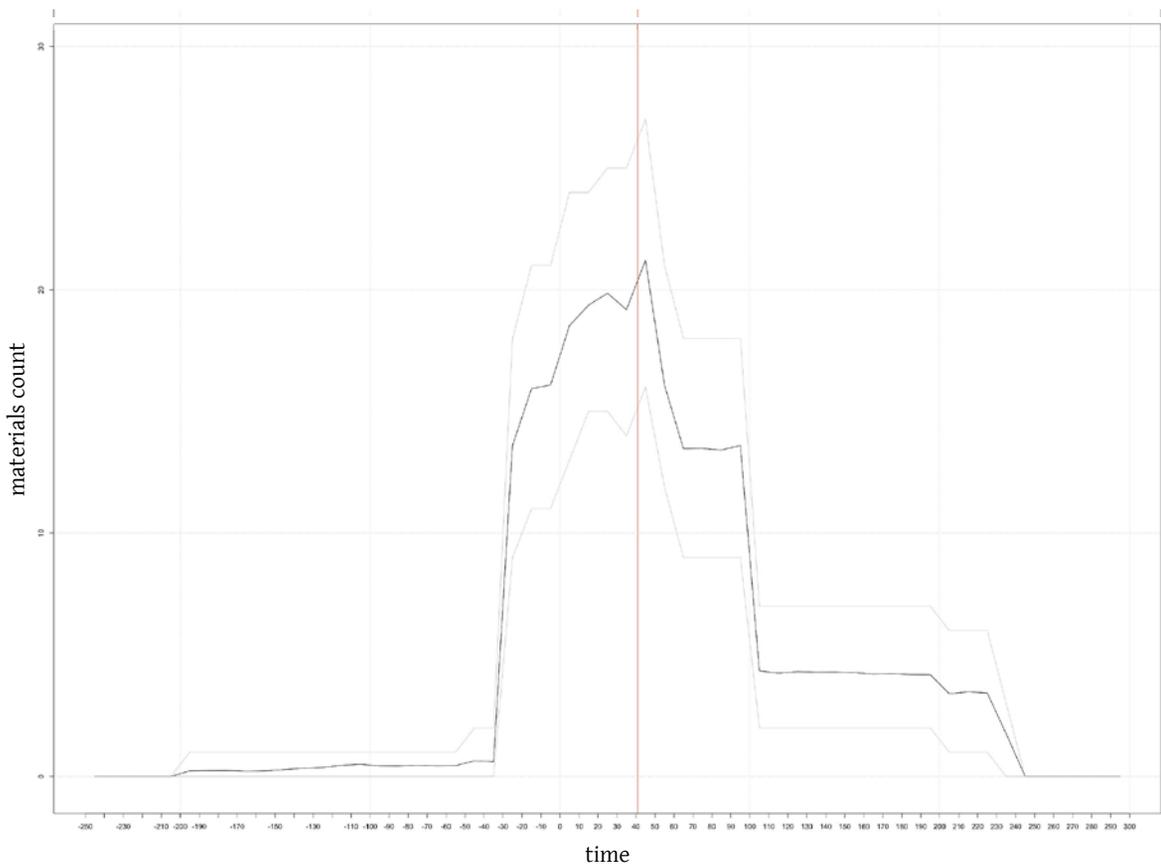


Figure 67: The investigated drainage: profile with 10-year brackets.

within the earthwork section excavated and with the overall historical and monumental background, in particular with a documented expansion of the city towards the south-east in the middle of the 1st century AD.

Duration

The duration of the process that led to the construction of earthwork as a whole is unknown; the building of the small section excavated may have been a matter of days, or months at most, according to the organisation of the construction site and the abundance of manpower. In any event the window seems to be far narrower than the accuracy of our temporal observations.

IV.2.7 Case study 3: a small dump in an ancient atrium from Aquileia (P.A.4)

*Topographic and archaeological background*⁴⁸⁵

The deposit is located in the western part of the ‘House of Titus Macer’, arranged with a typical atrium scheme (see Appendix 2).

In particular the examined dumped material was accumulated in the eastern part of the atrium and in the northern ala (Figure 68). Although the excavation of the southern corridor was suspended, it is probable that the whole atrium was involved in dumping activities.

The stratification here had been left substantially untouched by the excavations carried out during the 20th century, and, although the deposit considered was one of the top ones, it was comparatively well sealed by an upper thick rubble debris, preserved right below the plough soil.

It is also worth considering schematically the extremely rich and interesting sequence forming the framework in which the deposit is placed.

The deeper strata excavated in the area refer to the construction of the house and they

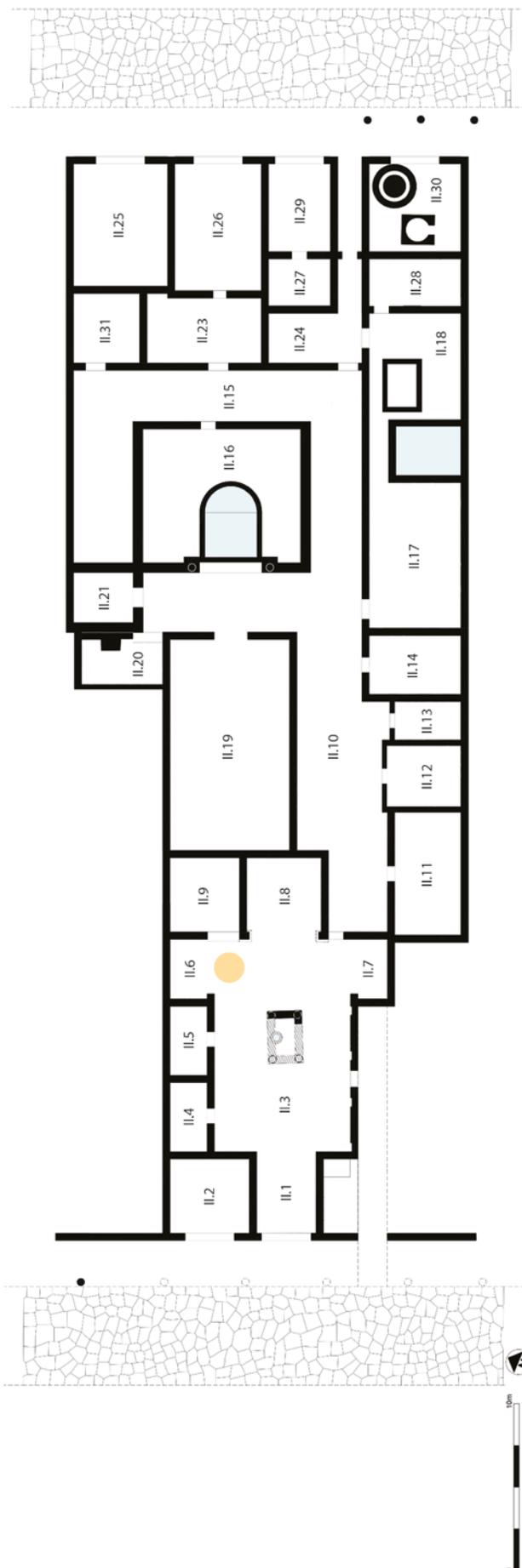


Figure 68: Location of the small dump excavated in the ancient atrium, ‘House of Titus Macer’, Aquileia.

⁴⁸⁵ This deposit is substantially unpublished, but some notes are available in Furlan 2011. A complete list of the finds recovered is available in the same report (Dobrova 2011).

may be dated to a quite ancient phase, i.e. the very beginning of the 1st century BC. This part of the *domus* (which was greatly expanded between AD 25 and 75, did not witness substantial structural changes over a long period, apart from the reflooring of a few rooms and some adjustments in the area of the *impluvium*. Routine maintenance and cleaning activities prevented sedimentation, and, except for some traces of wear on the mosaic surfaces, there is no significant record attesting to the use of the house in the mid Imperial period. Major re-arrangements took place much later, at the very beginning of the 5th century AD: they entailed the widening and re-paving of the central open space, the re-flooring of the corridors with bricks, and the walling up of some passages. This situation apparently did not last for long: a great number of small post holes and some traces of fire are documented soon after the brick floor was built, before dumping activity took place. A first series of episodes was followed by some attempts of provisional reflooring, laying down clayish layers, but dumping soon began again. The deposit examined is made of the layers produced by this last activity.

After, or, most probably, at the same time the deposit was formed, a significant coin hoard was hidden and never recovered. This has been closely examined and discussed by M. Asolati⁴⁸⁶ and it seems to be datable to the third quarter of the 5th century AD, most probably after AD 460. This episode does not represent the end of this rich sequence: later a new brick floor was probably laid down. Here an amphora containing lentils was set close to the north-eastern corner of the northern *ala*. Again, its contents were never recovered (clearly before the recent excavations), in this case, because of a fire involving this part of the house. This episode marked the end of a substantial continuity in the occupation of the house. Later activities are not attested until the remaining structures of the building were robbed, most probably in post-Medieval times. A soil profile finally developed on the rubble produced by robbing activity.

Deposit description

As previously mentioned, the deposit is made of the upper layers produced by the dumping activities occurring in the area (contexts 4071 and 3016). The hoard is not treated here and the dispersed coins recovered in the assemblage are provisionally kept out of this examination. In any event, the date of the burial of the coin hoard provides a precious chronological element to check against data suggested by the study of the dumped layers.

The deposit had the appearance of an approximately 10-cm thick, dark, brown-greyish, sub-tabular layer, fairly soft and with a sandy-loamy texture. It was rich in ash, charcoal pieces and small bones, thus in general, its identification as a small dump seems to be reasonable. Part of the sandy matrix may be related to the decay of fragments of mortar and plaster, which were also present within the strata.

The heterogeneity of the assemblage suggests a mixture of source basins or a mix of original activities; it cannot be excluded that the dumping layers derived from some clearance activity taking place somewhere else in the neighbourhood, possibly very roughly. This may explain the presence of an anomalous number of iron items in the assemblage (see below).

Assemblage physical state

Concerning the pottery and glass recovered, their fragmentation is quite high and they show no signs of blackening or burning. Their wear seems in general to be low and homogeneous.

The absence of blackening and the absence of any complete vessel, in particular, exclude the hypothesis that the deposit was the result of an episode of *in situ* fire, strengthening its interpretation as a dump. Charcoal and ash are likely to have been produced by cooking (most probably, given the amounts of bones and shells) or craft activities.

Some of the bones recovered display clear cuts, probably due to butchering, but no signs of long exposition on the surface.

⁴⁸⁶ Asolati 2018.

*The finds*⁴⁸⁷

As mentioned, the materials recovered included substantial amounts of bones and shells, small amounts of fragments of mortar and wall plaster (see the case cited in Chapter III.5.1 – same sequence – and Figure 42), a good number of potsherds, glass fragments and iron items. Among them, it was possible to provisionally process 22 items, i.e. eight potsherds, a metal knife, and 13 fragments of glass. Among the unprocessed artefacts, the most represented are unidentified amphorae body sherds and glass fragments, followed by iron items.

Again, the total number of finds is, unfortunately, somewhat poor. Noticeable among the finds is a surprisingly high percentage of iron objects, which could have been profitably reused or recycled.

The knife, dated to the 1st century AD (but some review of the date may be required), and one black-glazed potsherd are clearly residuals, while the other dated items are substantially chronologically consistent. A *tpq* at the middle of the 5th century AD is provided by an African *sigillata* sherd and a glass fragment.

Profile

Standard profiles follow, with 25-, 50-, and 10-year brackets, accounting for all the dated finds but the residuals (Figures 69, 70, 71).

Discussion

The profiles display a main peak, very evident using brackets of 25 and 50 years, and a neat tail of residuality, produced by the two items cited above. With 10-year brackets the main peak appears somewhat wider, mostly because of the presence of finds (coarse-ware in particular) dated very broadly. These items also produce a profile stretching onwards, but the bulk of the material is plotted between AD 300-500.

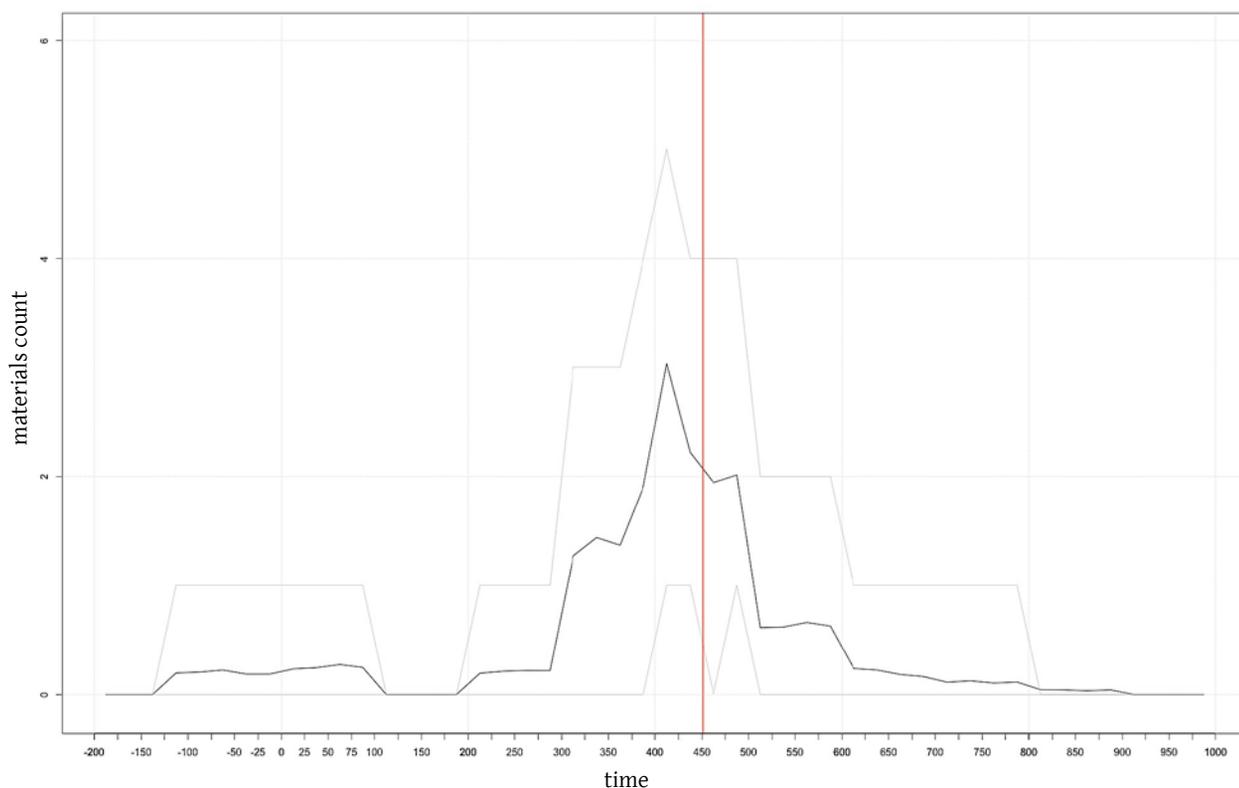


Figure 69: The small dump investigated: profile with 25-year brackets.

⁴⁸⁷ See the previous footnote.

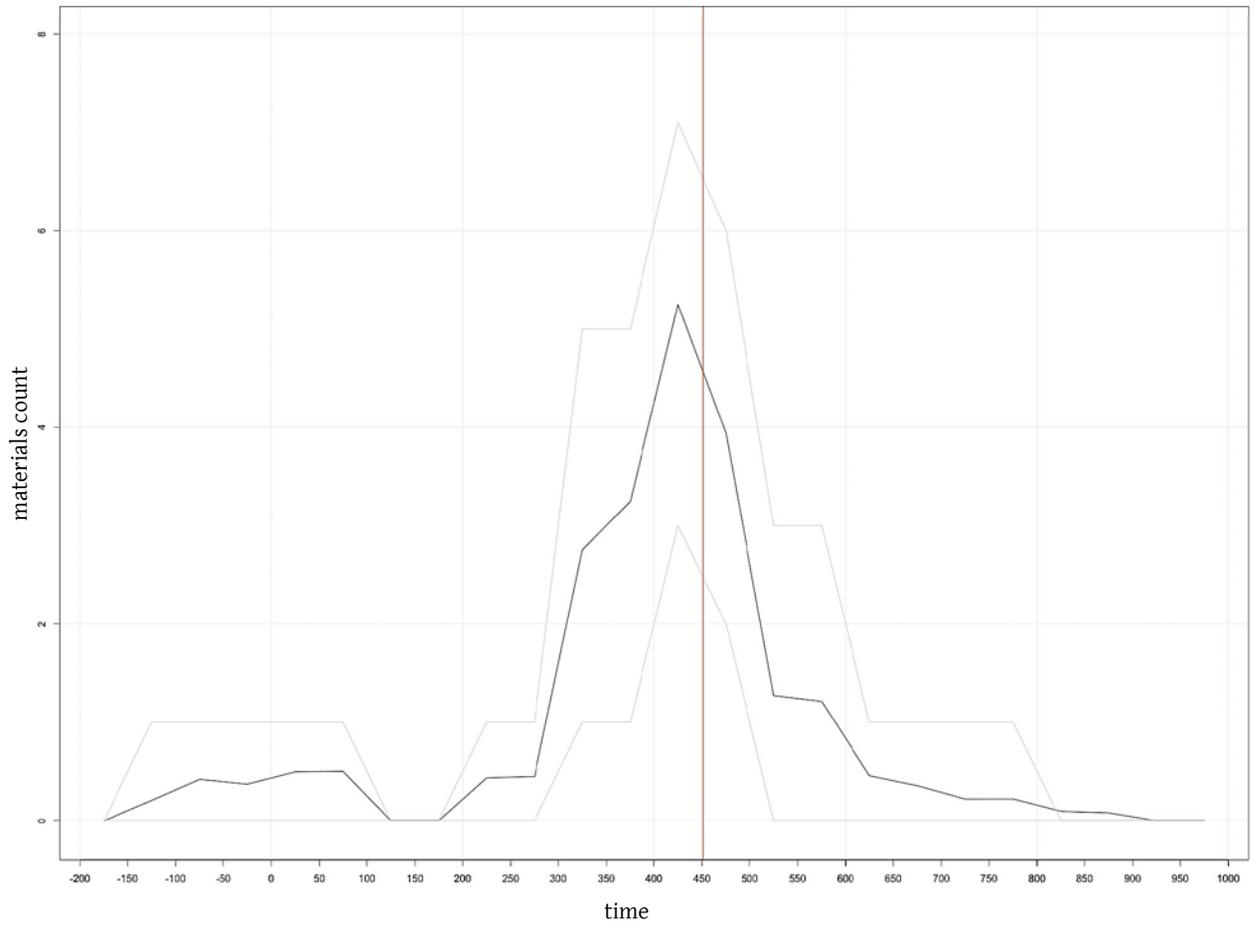


Figure 70: The small dump investigated: profile with 50-year brackets.

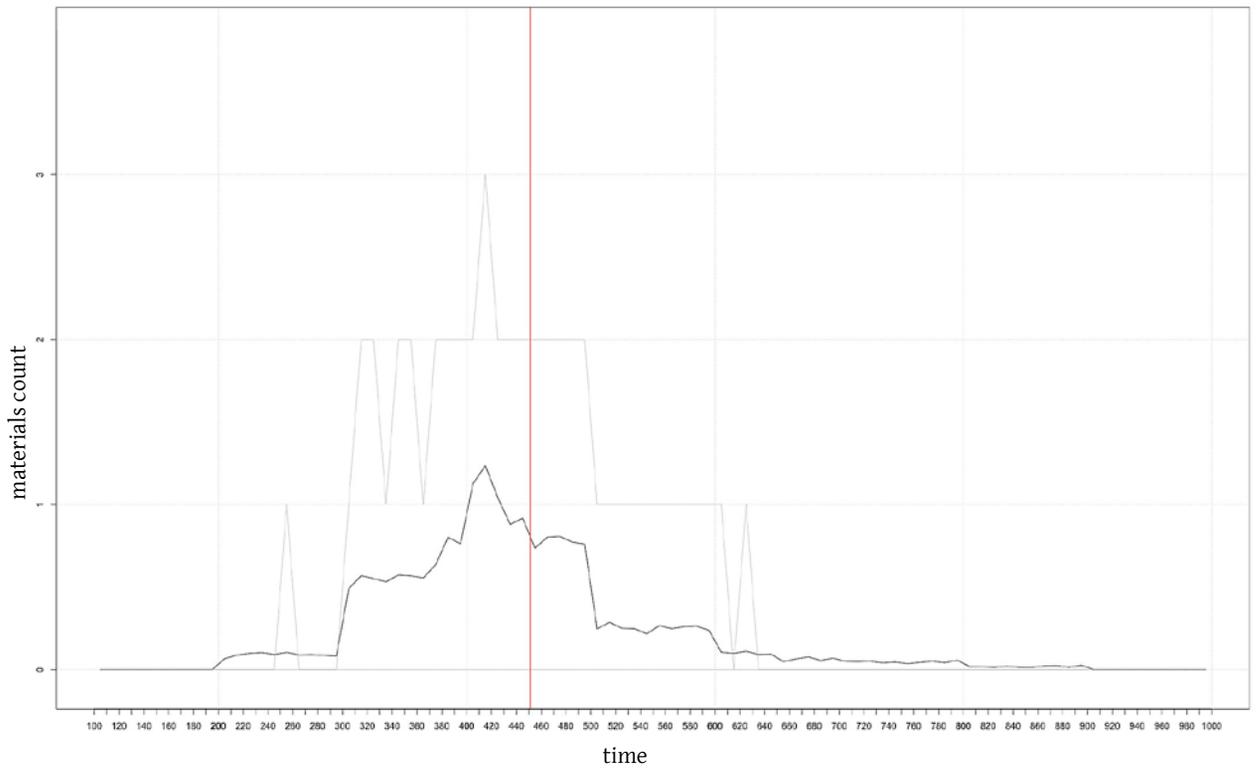


Figure 71: The small dump investigated: profile with 10-year brackets.

It is interesting that, although only roughly, the 10-year bracket profile seems to suggest the pattern of ‘three groups’ observed in Chapter III.5.1. A detailed selection of the coins embedded may strengthen the overall picture and allow more accuracy.

Date proposed

Ad quem: AD 450-500. The evaluation of the assemblages of the whole sequence, and the coin hoard, confirmed, and further narrowed down, the proposed date (AD 460-470).

Duration

Given the relatively poor thickness of the deposit (even accounting for a volume decrease typical of layers containing high percentages of organic material), this is likely to have formed over a time-span much narrower than our chronological accuracy, thus it can be considered as having an abrupt formation. The deposition of the whole dumping sequence (including the lower levels) may have taken longer, but probably not enough to enable us to detect start and end dates.

IV.2.8 Case study 4: an in situ burnt amphora and content from Aquileia (P.A.5)

Topographic and archaeological background

The deposit represents the product of the last actions of the long life sequence discussed for the previous case study. After this, a lengthy occupational hiatus seems to occur until post-Medieval times.

*Deposit description*⁴⁸⁸

Compared to other case studies, this one looks undoubtedly very clear. In any event, it is worth briefly discussing it, at least to underline a crucial operative key point, i.e. using scientific techniques at the point where the status of the deposit is particularly clear, and where the huge amounts of processes that can interfere with dating are reduced to the minimum. The deposit itself consists only of a single amphora (reused for storing food) and its contents of lentils; these were charred and the vessel itself displayed traces of blackening due to fire. It is difficult to say whether the fire was accidental or intentional, and how far it spread, but indeed the issue has little interest from a purely chronological point of view. Ash and unidentified charcoal fragments completed this almost matrix-less deposit (Figure 72). The primary status of the deposit is unquestionable from both a spatial and temporal point of view.

The finds

The amphora containing the legumes has been dated to the 4th-6th century AD, but what draws the attention in this case are the contents, i.e. the charred food stocks. They offer an invaluable opportunity for dating, as they are not affected by the old-wood effect, and they were likely to be stored for no more than a season (see Chapter III.3.3). They represent, along with primary bones, an invaluable means of dating. In this case two samples were selected for radiocarbon dating, undertaken later by CEDAD (Lecce, Italy); the resulting curves are provided below (Figures 73, 74).

Profile

The peculiar nature of the context makes it unnecessary to plot a graph in this instance; nevertheless, its solid primary status, along with the almost certain contemporaneity of the lentils, meant we could combine the two dates to try and narrow down the chronological window. This necessity was even more cogent, as the plateau characterising the calibration curve in Late Roman/Early Medieval times implies wide date ranges for single samples. Moreover a sure *terminus post quem* was offered by the hoard preserved

⁴⁸⁸ The discovery is reported in Villa 2012, however the radiocarbon dates are still unpublished.



Figure 72: Aquileia, ‘House of Titus Macer’: burnt amphora and content.

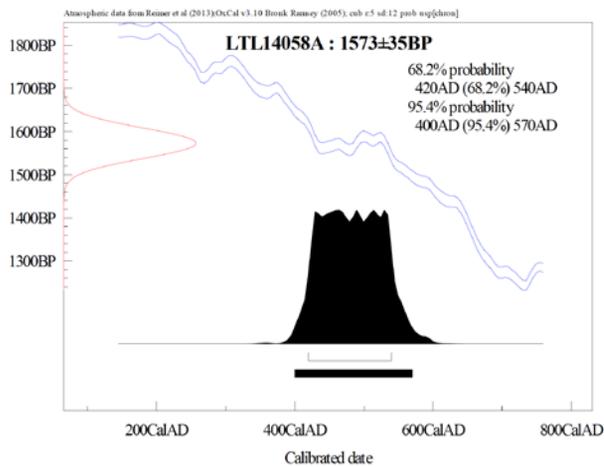


Figure 73: Burnt amphora and content of the ‘House of Titus Macer’; calibrated date of the first sample collected.

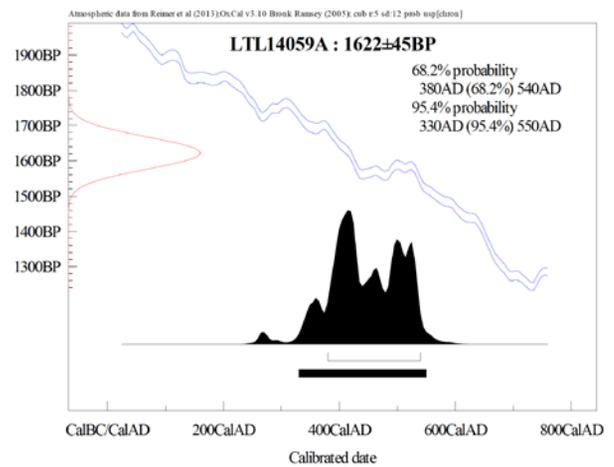


Figure 74: Burnt amphora and content of the ‘House of Titus Macer’; calibrated date of the second sample collected.

in the lower strata (see above). This *terminus* was fixed very cautiously at AD 450 (but we have seen that it may be pushed forward to AD 460-470) and combined with the radiocarbon dates. The resulting plot, obtained with Oxcal,⁴⁸⁹ is provided below (Figure 75).

Date proposed

Ad quem: AD 450-540, with a slight preference for the later period, perhaps after AD 480. The examination of the whole sequence confirmed the date (AD 475-540).

⁴⁸⁹ Bronk Ramsey 2017; Reimer *et al.* 2013.

Duration

The formation of the deposit seems to have been a matter of minutes/hours.

IV.2.9 Case study 5: an in situ assemblage beneath collapse debris: the case of the Pythion theatre in Gortyn (P.A.6)

Topographic and archaeological background

The deposit discussed represents another ‘extreme’, matrix-less and lucky case, neatly showing the kind of dynamics that should be expected by this type of primary deposits.

After the primary function of the Pythion theatre in Gortyn (southern Crete) was lost (see Appendix 2), probably relating to the abandonment of the cult of Apollo at the beginning of the 4th century AD, the structure was temporarily reused for activities such as stabling and marble calcination. This occupation lasted until a sudden event led to the collapse of the structure, burying whatever was located at the foot of the building.

Here we focus on the southern part of the ancient *scaena*, reused as a stable: between the earthen floor of the stable and the debris that collapsed from the upper structures some *in situ* materials were preserved. The event which produced the collapse of the structures of the theatre has been identified

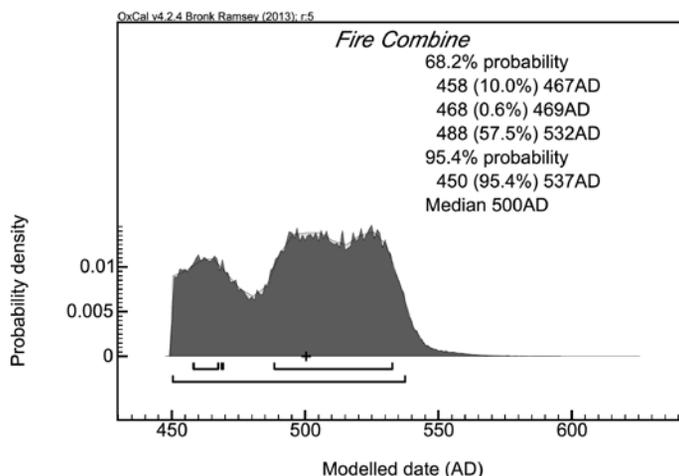


Figure 75: Burnt amphora and content of the ‘House of Titus Macer’; Oxcal combination of the two radiocarbon dates with the *tpq* provided by the underlying coin hoard.

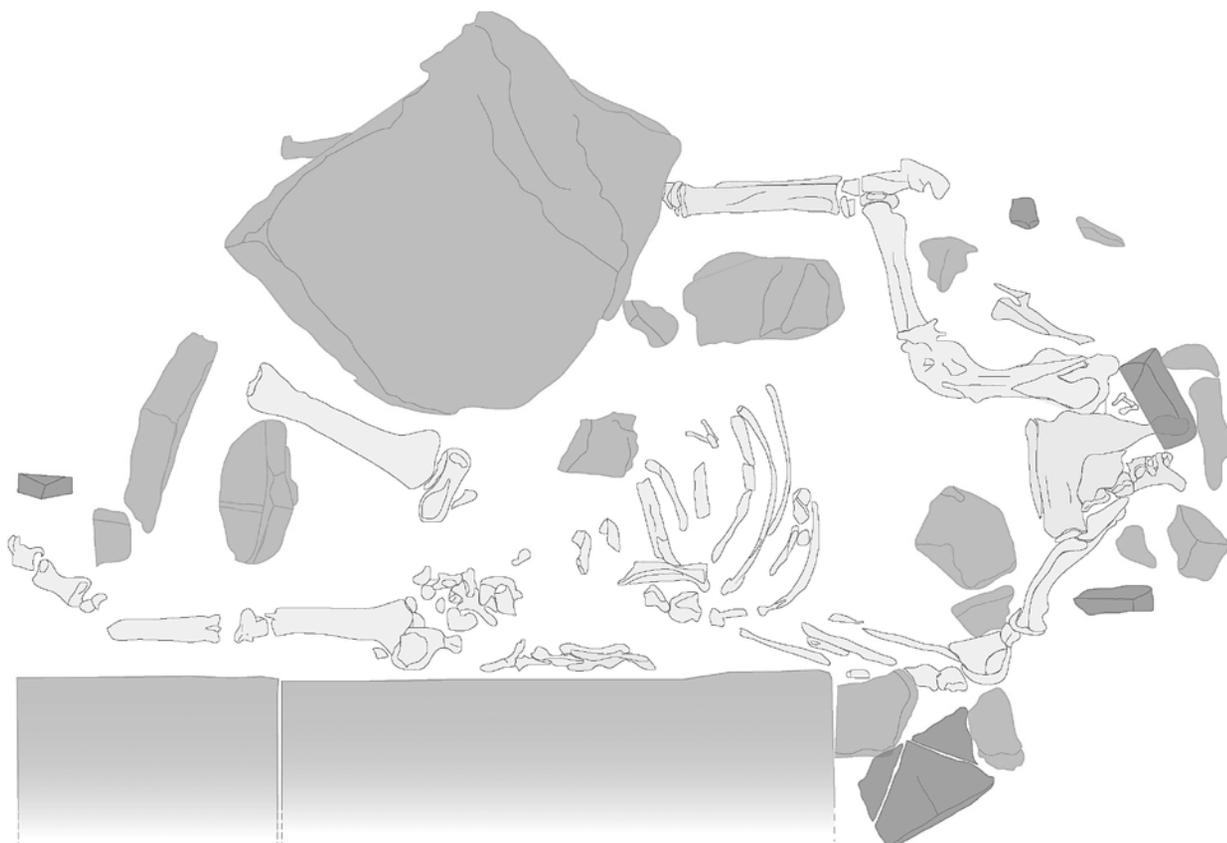


Figure 76: Remains of one of the two donkeys discovered; Pythion theatre, Gortyn.

as an earthquake that damaged the city in July AD 365; this allows for a great opportunity to check the results of the examination of the recovered assemblage.

*Deposit description*⁴⁹⁰

The stable has been only partially investigated, suggesting that more material may be preserved just some metres away from the excavated area. Two main groups of evidence were recovered: a coin hoard abandoned on the floor surface and two articulated donkey skeletons. Their primary status, from both a spatial and chronological point of view, seems unquestionable.

Assemblage: physical state

As mentioned, the remains of the two donkeys (*E. a. asinus*) recovered were articulated (Figure 76) and their death is certainly due to the collapse of the structure.

The coins were also recovered in close spatial association, and one displayed traces of the fabric bag in which they had been grouped.

*The finds*⁴⁹¹

The 34 coins forming the hoard are reported in Table 6.:

Table 6: Specimens of the coin hoard recovered beneath the collapse debris of the Pythion theatre in Gortyn.

Sons of Constantine I for Divus Constantine I, follis, AD 347-348, Antioch	Jovian, AE3, AD 363-364, Heraclea
Constantius II, AE4, AD 355-361, Cyzicus	Valentinian I, AE3, AD 364-367, Thessaloniki
Julian III, AE3, AD 361-363, Thessaloniki	Valens, AE3, AD 364-367, Thessaloniki
Julian III, AE3, AD 361-363, Thessaloniki	Valens, AE3, AD 364-367, Thessaloniki
Julian III, AE3, AD 361-363, Thessaloniki	Valens, AE3, AD 364-367, Thessaloniki
Julian III, AE3, AD 361-363, Thessaloniki	Valens, AE3, AD 364-367, Thessaloniki
Julian III, AE3, AD 361-363, Thessaloniki	Valens, AE3, AD 364-367, Thessaloniki
Julian III, AE3, AD 361-363, Thessaloniki	Valens, AE3, AD 364-367, Thessaloniki
Julian III, AE3, AD 361-363, Thessaloniki	Valens, AE3, AD 364-367, Thessaloniki
Julian III, AE3, AD 361-363, Thessaloniki	Valens, AE3, AD 364-367, Thessaloniki
Julian III, AE3, AD 361-363, Thessaloniki	Valens, AE3, AD 364-367, Thessaloniki
Julian III, AE3, AD 361-363, Thessaloniki	Valens, AE3, AD 364-367, Thessaloniki
Julian III, AE3, AD 361-363, Thessaloniki	Valens, AE3, AD 364-367, Thessaloniki
Julian III, AE3, AD 361-363, Thessaloniki	Valens, AE3, AD 364-367, Thessaloniki
Julian III, AE3, AD 361-363, Thessaloniki	Valens, AE3, AD 364-367, Thessaloniki
Julian III, AE3, AD 361-363, Constantinople	Valens, AE3, AD 364-367, Thessaloniki
Julian III, AE3, AD 361-363, Cyzicus	Valens, AE3, AD 364-367, Thessaloniki (?)

⁴⁹⁰ See Bonetto *et al.* 2005.

⁴⁹¹ See Asolati 2019.

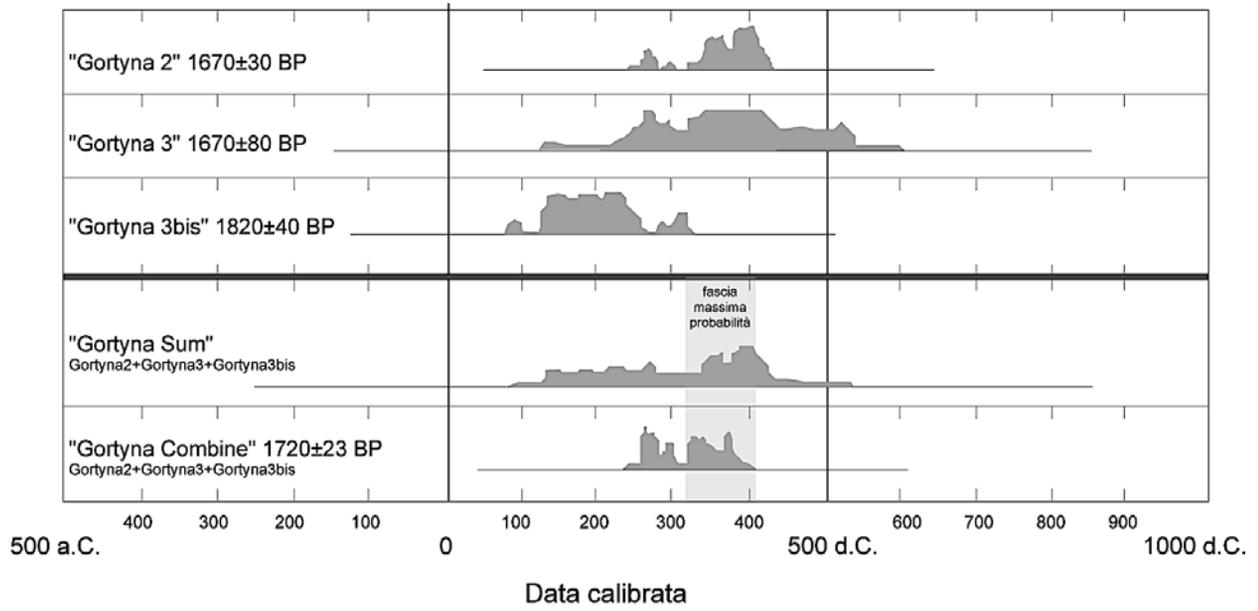


Figure 77: Radiocarbon profiles provided by the collected samples; Pythion theatre, Gortyn.

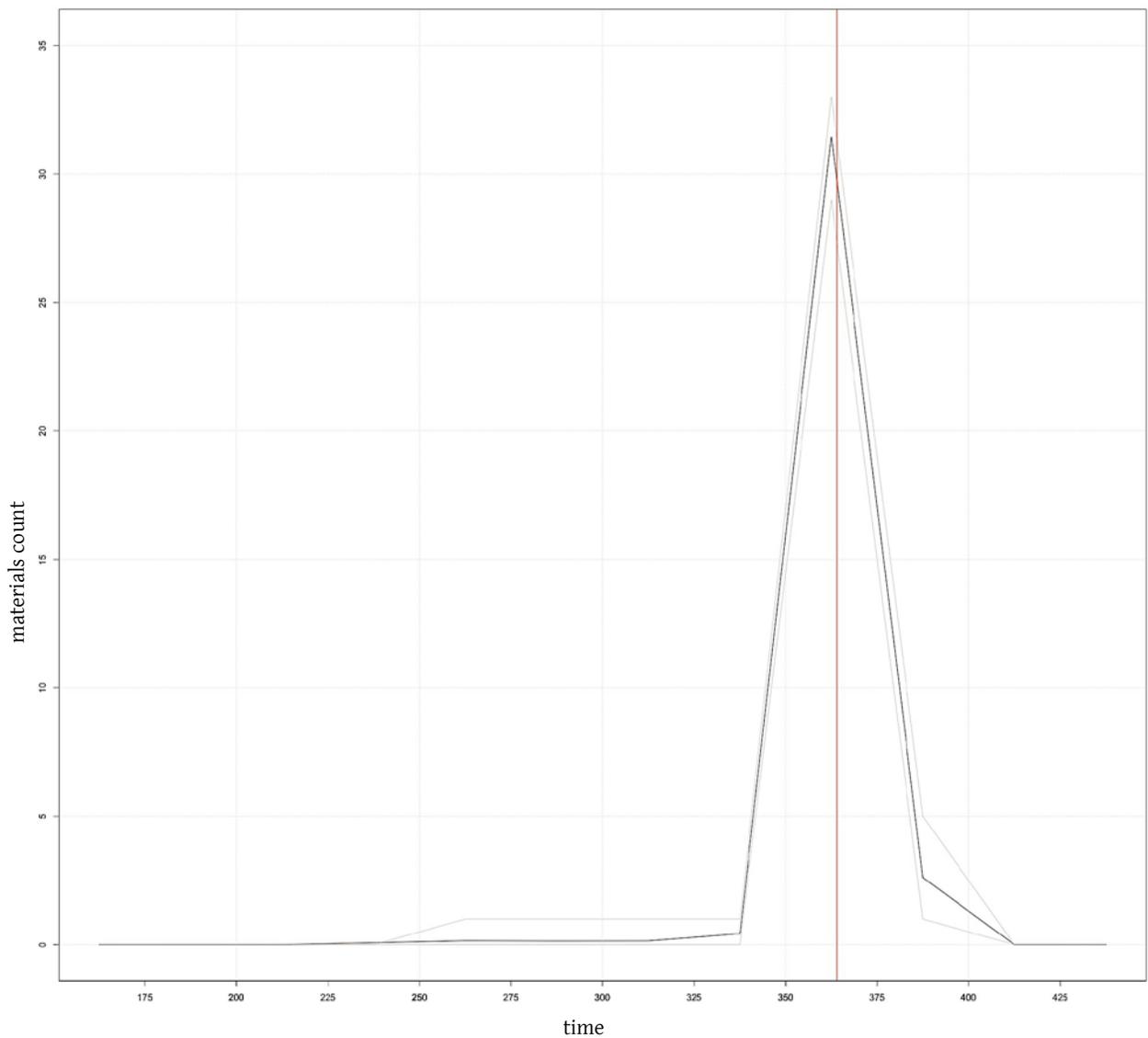


Figure 78: Gortyn, Pythion theatre: profile with 25-year brackets of the AD 365 coin hoard.

The consistency of the provided dates is, indeed, astonishing. This, along with the great predominance of specimens from one single mint, suggests that the coins circulated for a very short time.⁴⁹² 16 specimens provide as *terminus ante quem non* the year AD 364.

Turning to the donkey remains, three samples were radiocarbon dated and then combined. The results are reported below (Figure 77).

Profile

Given the accuracy provided by the coins forming the hoard, particularly compared with the radiocarbon combined date, any quantitative profile in this case seems somehow excessive. Only the 25- and 10-year bracket profiles are plotted (Figures 78, 79). The coin life has been extended 10 years.

Discussion

As mentioned, the use of any simulation in this case is almost unnecessary, although quite explicative. The hoard structure suggests a date close to the *terminus post quem* provided. We know (by historical sources) that the major earthquake referred to above took place in July AD 365.

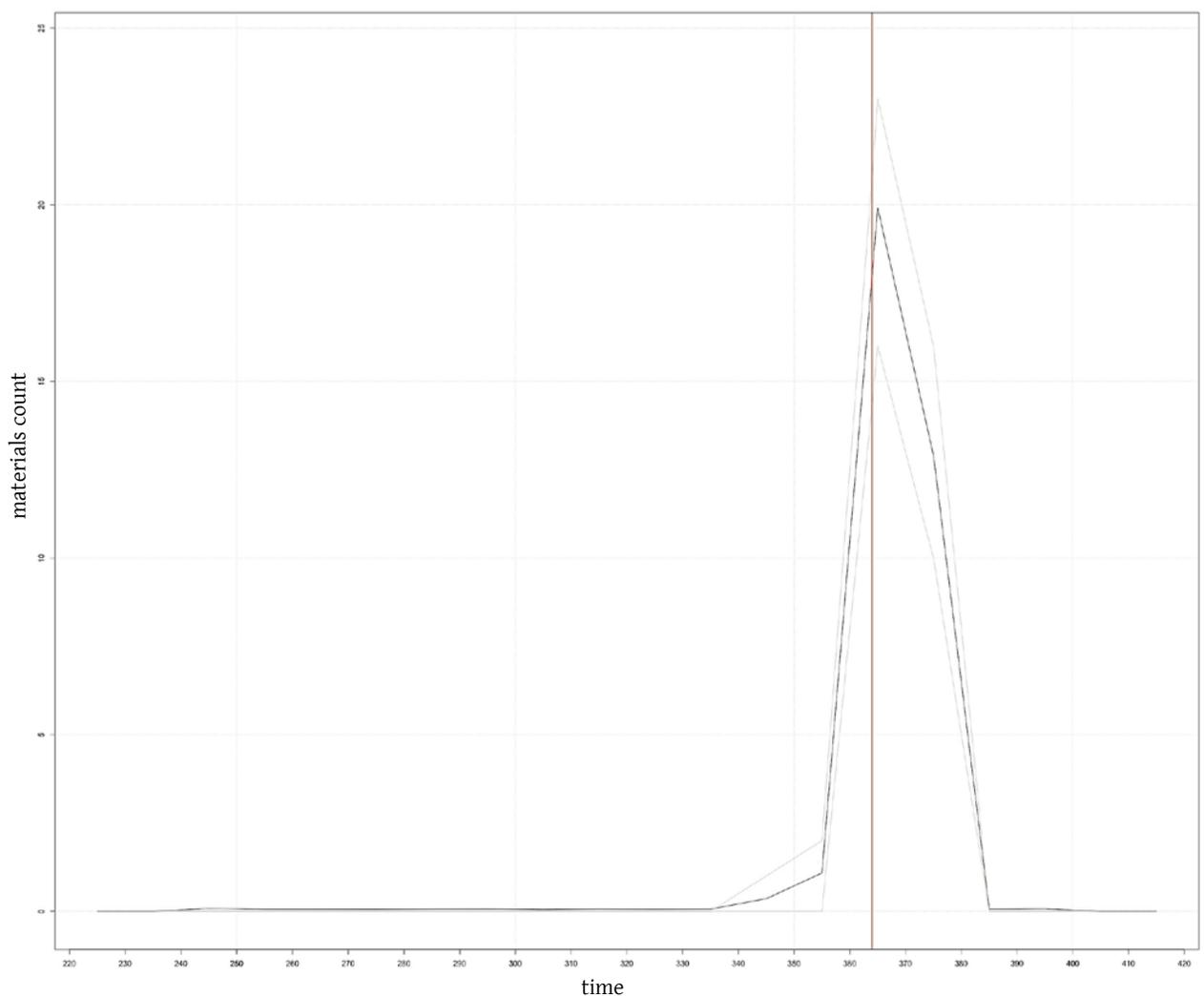


Figure 79: Gortyn, Pythion theatre: profile with 10-year brackets of the AD 365 coin hoard.

⁴⁹² Asolati 2019.

Date proposed

Ad quem: AD 364-380. We can be almost certain that the collapse occurred during the earthquake mentioned (21 July, AD 365). The assemblage formation is, thus, almost certainly related to this episode; and in this case the historical sources substantially confirm the picture emerging from the archaeological evidence.

IV.2.10 Case study 6: an in situ assemblage beneath the AD 79 pumice, House VI.13.16, Pompeii (P.A.6)

Topographic and archaeological background

Pompeii represents a unique arena for testing models of assemblage temporal patterning in an archaeological context. The eruption that sealed the city in AD 79 represents an unmistakable chronological marker: this allows us to check if the expected temporal patterning of some primary deposits is consistent with the actual date of formation. The literature on ancient Pompeii and the AD 79 eruption is clearly vast.⁴⁹³ Here, we focus on a small assemblage recovered in House VI.13.16 (Figure 80); this has been published, along with a complete archaeological review of the whole *insula* 13, *regio* VI, in 2009, by a team from the University of Trieste.⁴⁹⁴

Regio VI is located in the north-eastern part of the city; *insula* 13 is situated immediately east of the famous ‘House of the Faun’, bounded by *via della Fortuna* (south), *vicolo del Labirinto* (west), *vicolo di Mercurio* (north), and *vicolo dei Vetti* (east).

In AD 79 the *insula* was occupied by two large *domus* and four smaller dwellings; House 16, or ‘House of P. Gavius Proculus’, is the northern of the smaller houses and is arranged around an *atrium* (east) and a second block interpreted as a sort of guest house with annexed *caupona* (west).

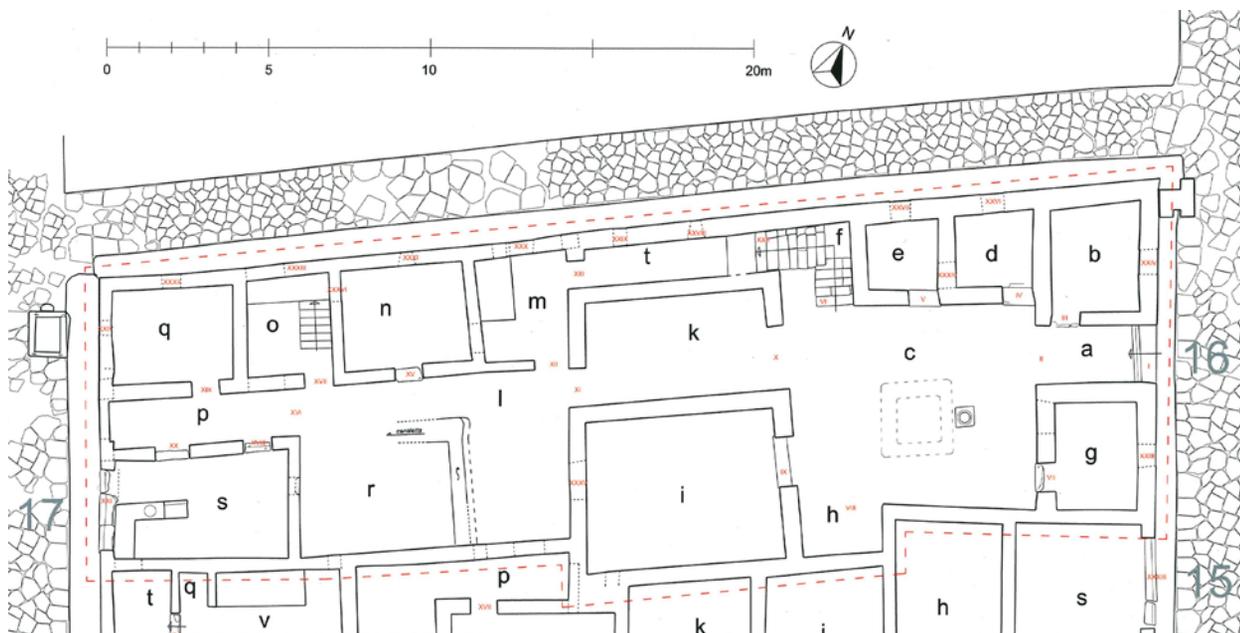


Figure 80: Pompeii, House VI.13.16 (Verzár-Bass, Oriolo 2009).

⁴⁹³ For the city and its (debated) development, see Bonghi Jovino 2011; Ellis 2011; Guzzo, Guidobaldi 2008 and Zevi 1979. For the AD 79 eruption, see Sigurdsson *et al.* 1982; Cioni *et al.* 1990; Cioni *et al.* 1992; Varone, Marturano 1997; Cioni *et al.* 2000 and Luongo *et al.* 2003. Each work contains further references.

⁴⁹⁴ Verzár-Bass, Oriolo 2009.

During the excavations carried out in the *viridarium* of the guest house, led by G. Fiorelli in 1876, an important group of amphorae was recovered, many of them displaying *tituli picti*.⁴⁹⁵ On the north side of the *viridarium*, Room n, already partially investigated in 1876, was re-excavated and fully examined in 2005.

*Deposit description*⁴⁹⁶

‘Room n’ was most probably provided with a new earthen floor after the famous AD 62 earthquake; a group of artefacts (US 75) was recovered on its surface, piled up and directly covered by the debris and ashes produced by the AD 79 eruption. Between the accumulation of the objects and their burial some time may have passed, but it seems reasonable that this gap is far beyond our scale of measurement.



Figure 81: Pompeii, House VI.13.16: the assemblage examined (Verzár-Bass, Oriolo 2009).

Assemblage physical state

The objects were crushed, but it was possible to restore them⁴⁹⁷ (Figure 81).

*The finds*⁴⁹⁸

The assemblage was formed of 22 items, and the artefacts that provided helpful chronological information are reported in Table 7.:

Table 7: The assemblage recovered beneath the AD 79 pumice, House VI.13.16, Pompeii.

Common ware, 1st century AD
Lead weight, 1st century AD
Lamp, Deneauve V B, Augustan - end of 1st century AD
Thin-walled <i>boccalino</i> Ricci I/23, 1st century AD
Common ware, end 2nd century BC - end 1st century AD
Lamp, Bisi Ingrassia IX H, second half of 1st century AD
Stamped Samian Conspectus 21.3.2, AD 30-80
Lamp, Deneauve V D, AD 25-100
Common ware, end 1st century BC - end 1st century AD
Common ware, 1st century AD
Samian ink bottle, Augustan – Flavian eras
Common ware, end 2nd century BC – end 1st century AD
Lamp, Deneauve V F, second half of 1st century AD
Lamp, Deneauve VII A, second half of 1st century AD

⁴⁹⁵ Tiussi 2009.
⁴⁹⁶ Mian, Tiussi 2009: 440-441.
⁴⁹⁷ Mian, Tiussi 2009: 441.
⁴⁹⁸ Mian, Tiussi 2009: 449-453.

This is clearly a small sample, but its internal consistency, its primary status, and the extraordinary archaeological context in which the artefacts were recovered make them worth plotting, if only to compare what can be deduced from their study and the actual date of formation of the assemblage.

Profile

The profiles show 25- and 10-year brackets (Figures 82, 83).

Discussion

Although the small number of processed items allow for much variability (the band included between the 1st and 9th quantiles is broad) the unimodality of the curve is evident. The *tpq* predates the main peak by about three decades, and the main peak indeed coincides with the actual period of formation of the deposit.

Date proposed

With the available data, the date proposed (*ad quem*) would have been, reasonably, AD 50-100. The actual date of formation of the deposit falls roughly in the middle of the proposed date range; indeed, there is an excellent consistency between what can be deduced from the data provided by the assemblage and the actual date of its formation.

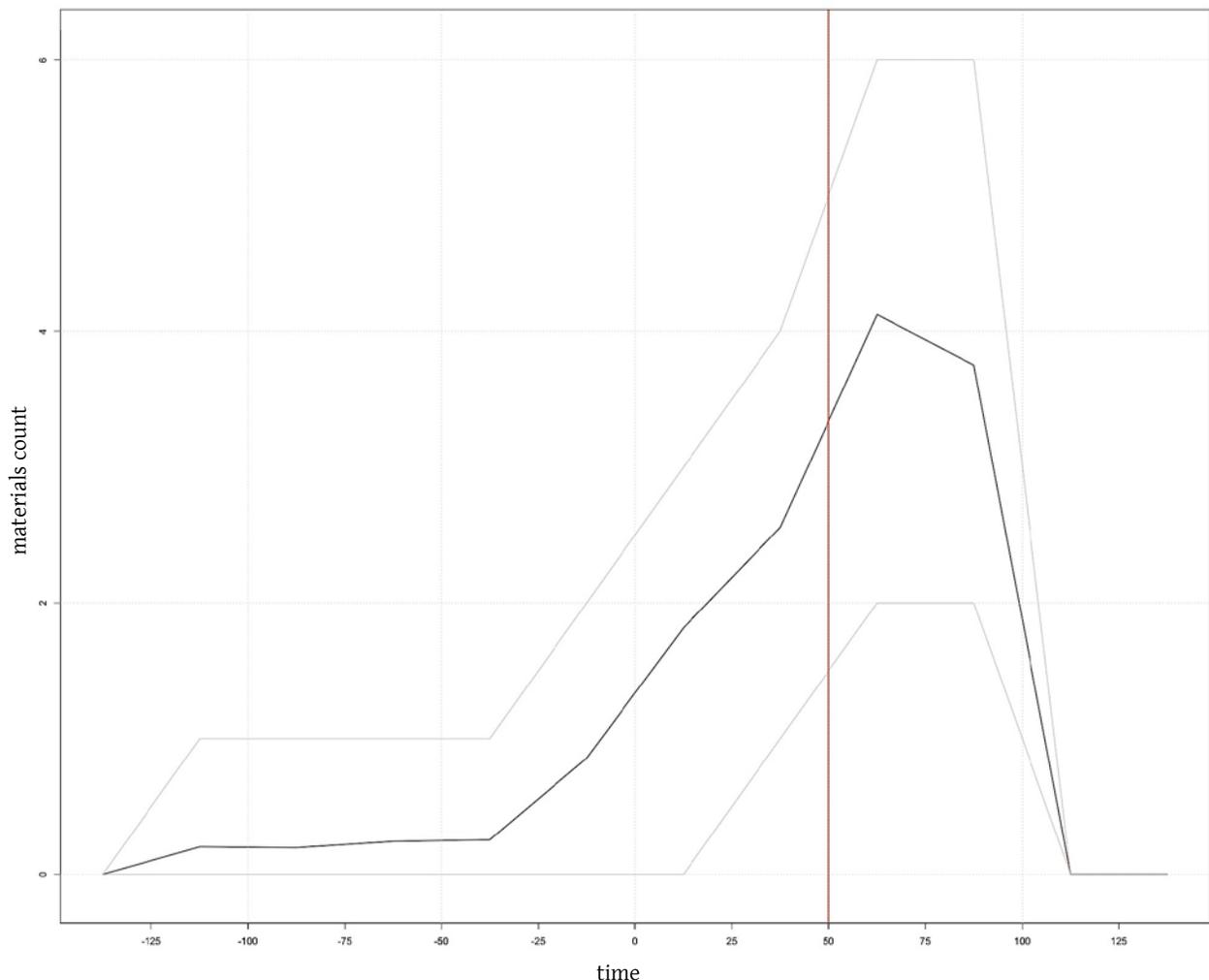


Figure 82: Pompeii, House VI.13.16: profile with 25-year brackets of the assemblage examined.

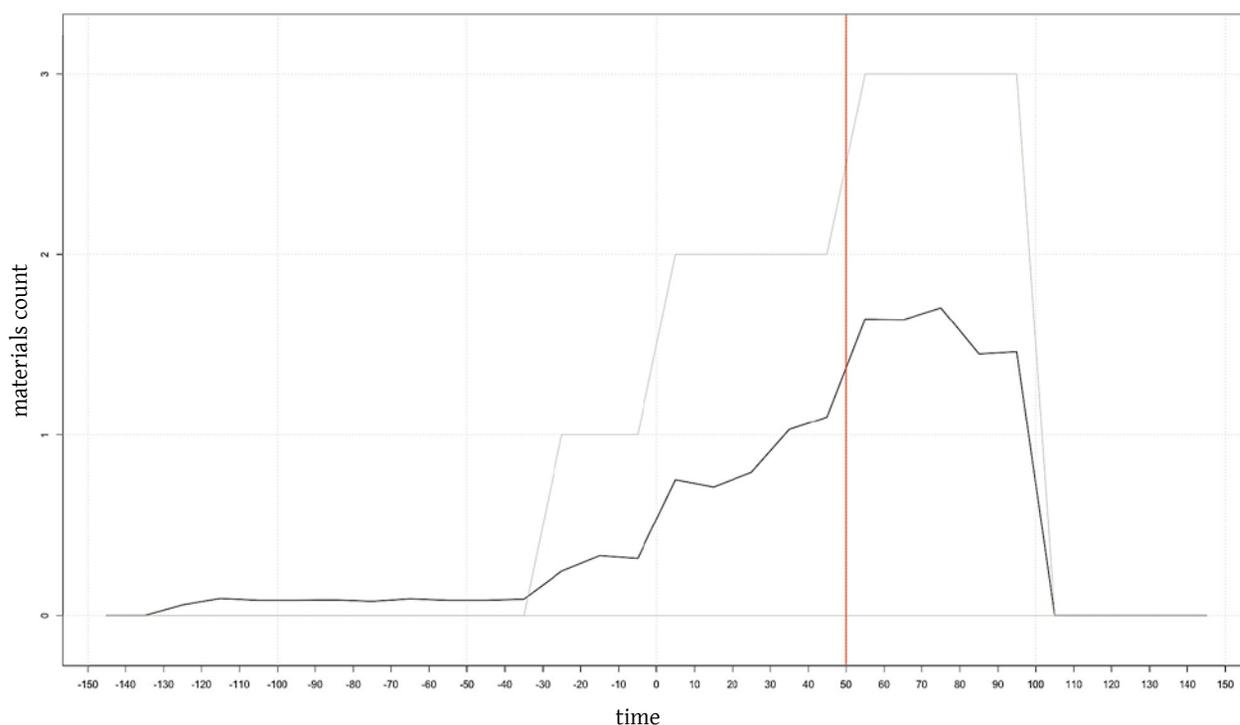


Figure 83: Pompeii, House VI.13.16: profile with 10-year brackets of the assemblage examined.

Duration

The accumulation of the assemblage, most probably, was a matter of minutes, i.e. its duration was archaeologically irrelevant.

IV.2.11 Case study 7: a layer of charcoal from the ‘House of Titus Macer’, Aquileia (P.A.7)

*Topographic and archaeological background*⁴⁹⁹

The deposit is part of the sequence of strata connected with the construction of the first *atrium* house in the Fondi Cossar area, Aquileia (see Appendix 2). It consists of a single layer, observed mainly in section, on the south wall of the robbing trench marking the northern border of the dwelling (Figures 84, 85). The surface of the layer was exposed in a minimal area, but it was likely to extend all over the surface of Room 9. The context (US 4474) lay directly on the surface of a silty bedding, which, in turn, covered a layer made of brick fragments. The target layer was covered by a loamy layer holding a second layer of brick chips; later, on top of this one, the mortar bedding for the more ancient mosaic of the room was laid down. Given all this, the relation of the deposit with the construction of the house can be taken for granted. It has to be stressed that all the other layers forming part of the sequence are basically secondary ones, therefore redeposited and containing many residuals.

Deposit description

The layer is made exclusively of pieces of charred twigs; it is easily recognisable and does not appear to have been mixed with sediment, or contain artefacts or any materials other than charcoal. It seems most probable that the layer was laid down intentionally, possibly for hygroscopic reasons; some selection of the wood seems also to have occurred and the fragments are likely to have been burnt for this specific purpose, a short time before being deposited. The primary status of the deposit seems consequently by far the most probable.

⁴⁹⁹ The sequence examined is briefly discussed in Berto *et al.* 2013: 58. The analyses carried out (see below) are still unpublished.

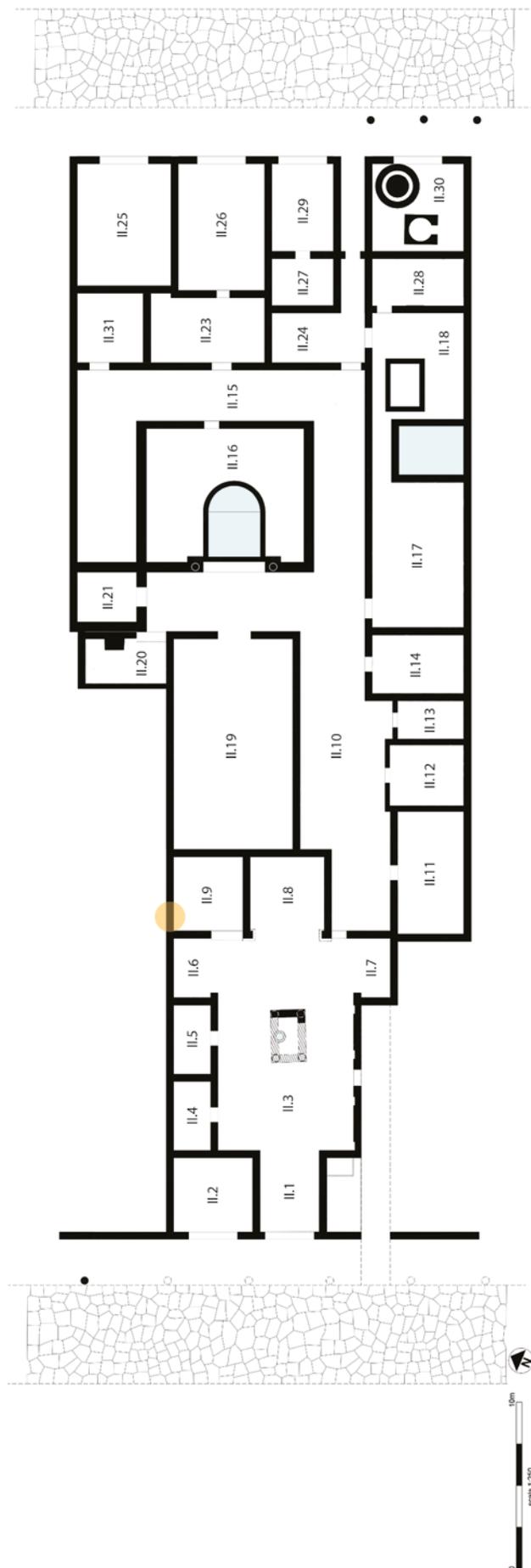


Figure 84: Aquileia, 'House of Titus Macer': location of the layer of charred twigs.

Assemblage: physical state

The pieces of charred wood are well preserved. The majority of them, apparently, were small twigs, but it was not possible to ascertain the species.

The finds

Samples were collected during the end of the last excavation campaign.⁵⁰⁰ Three were selected for radiocarbon dating; these were particularly well preserved and the external rings were, if not present, at least fairly close to the sampled ones – the old-wood effect was therefore expected to be minimal. The three radiocarbon dates are shown in Figures 86-88.

Profile

The three dates were combined with Oxcal⁵⁰¹ to reduce the time window (the three twigs originally were most likely cut in the same period). A solid *terminus post quem* was also introduced to further try and reduce the gap: this was provided by the foundation of the colony itself, in 181 BC. The resulting plot is shown in Figure 89.

Discussion

The three dates provided by CEDAD are by themselves very consistent, further suggesting they were little affected by old-wood reuse or storage for long time. It is also possible to advance that the materials recovered within the other layers referring to the construction of the building do not conflict with the evidence suggested by the radiocarbon analysis.

Date proposed

Ad quem: 181-90 BC. Five years more were added to the window to assess the possible storage of the sampled twigs for a brief period (it seems unlikely that they were stored for more than one or two seasons and they may well have been collected

⁵⁰⁰ They were examined by the archaeobotanist N. Martinelli.

⁵⁰¹ Bronk Ramsey 2017; Reimer *et al.* 2013.

Area III saggio 2

Parete Sud della fossa US - 3125 = -3053, nei pressi del muro 3005

Disegno: V. De Scarpis, G. Furlan

Elaborazione grafica: S. Dilaria

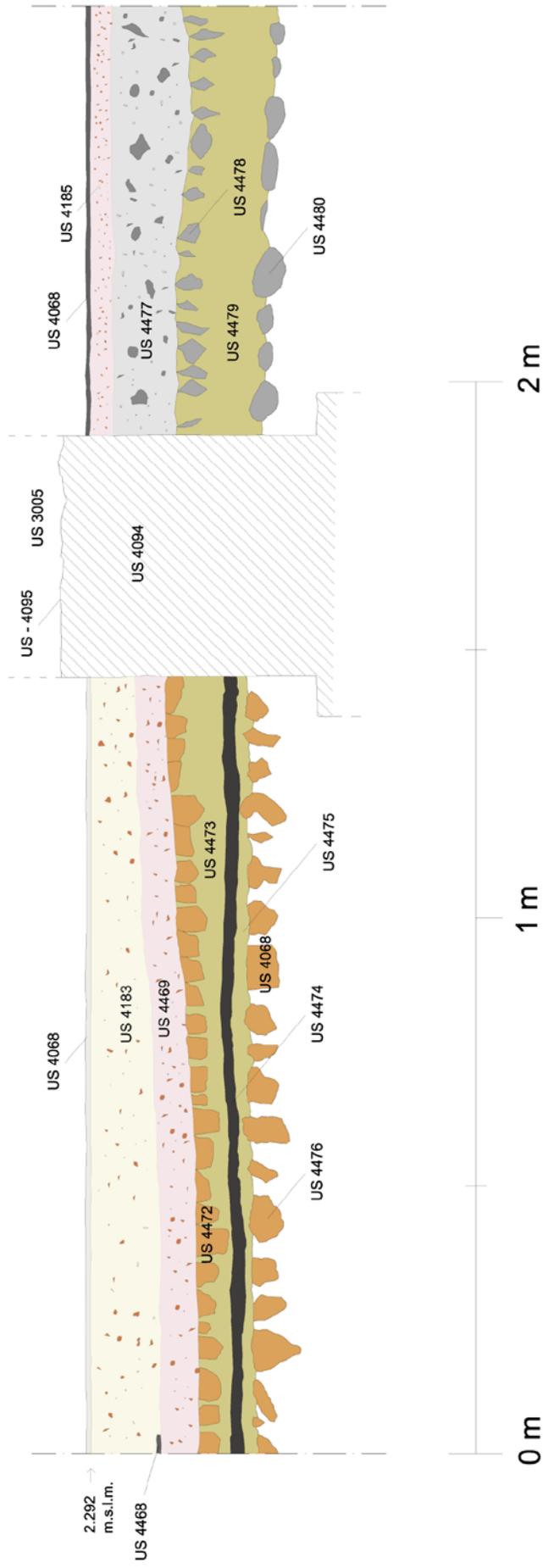


Figure 85: Aquileia, 'House of Titus Macer': cross-section showing the layer of charred twigs (US 4474).

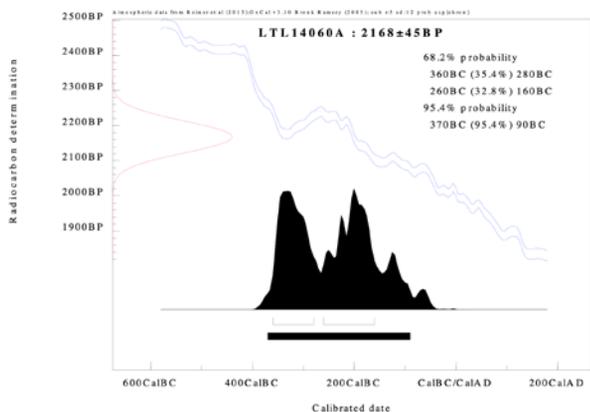


Figure 86: Charred twigs from the ‘House of *Titus Macer*’; calibrated date of the first sample collected.

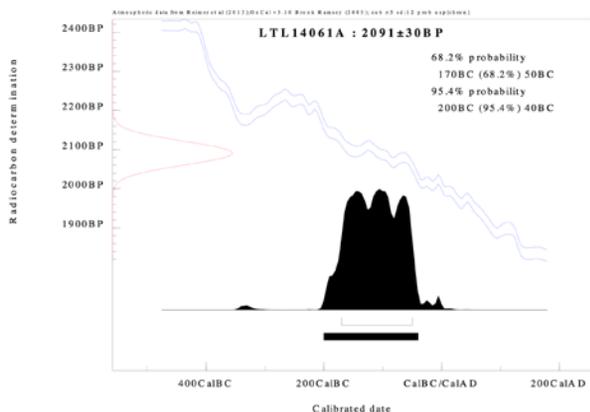


Figure 87: Charred twigs from the ‘House of *Titus Macer*’; calibrated date of the second sample collected.

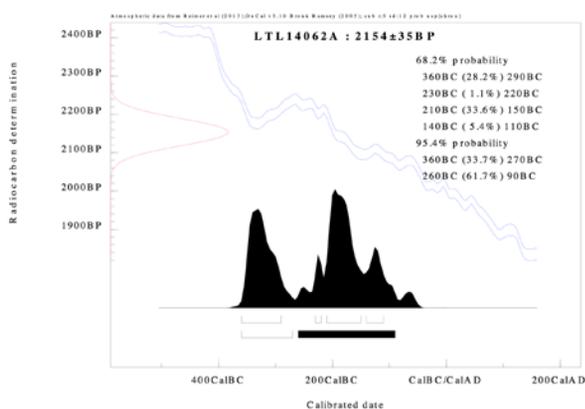


Figure 88: Charred twigs from the ‘House of *Titus Macer*’; calibrated date of the third sample collected.

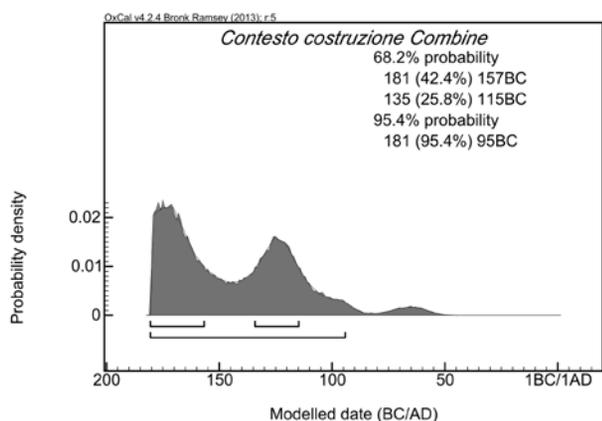


Figure 89: Charred twigs from the ‘House of *Titus Macer*’; Oxcal combination of the three radiocarbon dates with the *tpq* (181 BC) provided by the foundation of the city of Aquileia.

exactly for the purpose of being used on the construction site, just before they were burnt) and for minimal old-wood effect. The examination of the assemblages recovered in other construction layers suggested a date towards the end of the chronological frame indicated by radiocarbon dating. The date proposed for the construction of the atrium house (and therefore for the deposition of the investigated deposit) is 100-90 BC.

Duration

Per se, the process of depositing the charcoal layer was a matter of minutes or hours, at most. The construction of the whole dwelling may have taken months or a few years.

IV.3 Primary deposits with continuous formation

IV.3.1 Definition

The difference between a primary deposit with abrupt formation and a primary one with continuous formation is basically quantitative: and it is relative, more than absolute. It means that according to the accuracy of our observations we can put the formation of a given deposit on an imaginary timeline as a whole, or we may be able to discern the beginning and end of its formation. This is a matter of formation time-span and a matter of quality of data. As mentioned previously, the quality of the artefacts’ dates being substantially independent from the deposit status, the chance of recognising a primary deposit with continuous formation lies primarily in the temporal length of its own formation. It can be suggested that this length is, to this day, generally fairly long; primary deposits whose continuous formation can be

ascertained are indeed very large ones, being formed over thirty, fifty, or a hundred years. Nevertheless a general improvement in dating of finds may, in the future, make it possible to move some deposits from the status of 'primary abrupt' to that of 'primary continuous'.

It follows that a primary deposit with continuous formation can be defined as a deposit whose assemblage largely belongs to the same systemic context in which the deposit was formed and whose formation lasted for a long time (where 'long' is to be taken as meaning 'sufficiently long to be appreciable through the means currently available').

These deposits are the product of processes and actions lasting for some time; this entails that their assemblages mirror a more or less long sequence of systemic contexts, providing precious information about a date range extending longer than the one provided by a primary deposit with an abrupt formation. This makes them, particularly those with a longer 'life', special tools for reconstructing ancient economic trends and dynamics.

Unfortunately, although their single volumes should be high, their overall number in an urban excavation is not high at all, and their presence is usually confined within precise topographic areas (see below).

Grouping in this case represents an important issue; if one thinks of one typical deposit of this taxon, i.e. an urban dump, it suddenly emerges how, in fact, it is made up of contexts (when recognisable), each one, in itself, being a primary deposit with an abrupt formation. The point here is which *modus operandi* assures more results: considering each context by itself would not be wrong, meaning it would not lead to mistakes, but it would prove to be of little value, providing many correct dates of single, scarcely significant, episodes, and, moreover, preventing a general view of the economics of, say, the site producing the whole deposit. Wider groups, in this sense, although more difficult to process, hold a much more interesting and informative potential.

In this instance, grouping contexts has undoubtedly a wide margin of discretion, depending on factors including:

- (1) the research agenda,
- (2) the accuracy of available dates,
- (3) the existence of detectable depositional breaks, and
- (4) the overall length of the depositional process.

IV.3.2 General expectations

A quantitative analysis of these deposits imposes much more attention if compared to the previous ones, at least for two reasons:

- (1) apart from the 'tail' and the 'head' of any profile, in the middle any trend may be equally likely, according to the specific economic/discard dynamics which produced the deposit; and
- (2) the potential, longer exposition of these deposits makes them inherently more susceptible to mixing and to phenomena of residuality (internal and or external) and intrusions.

These two points make drafting any general expectation much more difficult and they are worth discussing in more detail.

These deposits should display, theoretically, a continuous profile, besides the instances of some sensibly older residuals and occurrences of depositional breaks (see above). Within this interval, it is almost impossible to guess how the shape of the profile will appear, as it may depend on a wide range of factors, among which economy, demography, and quality and quantity of activities and discard practices are just a few. This is because these deposits, in general, are also expected to be the product of larger communities.

For ‘open air’ deposits (i.e. dumps, see below), their longer formation times, as a whole, make it also much more probable that activities such as scavenging occurred, which produces mixing and removal of reusable items. Furthermore, bioturbation in general, is much more likely to play an important role. Therefore, apart from the presence of residuals and later intrusions, internal residuality and intrusivity may also occur, meaning that some mixing within the deposit may move some materials up or down, i.e. without changing the general profile, but changing the profile of the single contexts that make up the whole deposit.

In these ‘open’ deposits, the presence of voids also facilitates the vertical displacement of small items; indeed the presence of geological matrix in these deposits represents an interesting issue which should be addressed each time.

Where the presence of redeposited sediments can be ascertained (i.e. if building activity within the site required the removal and dumping of some volumes of sediments), the presence of residuals has to be expected and the status of the deposit, of at least part of the deposit, changes, being in all respects a secondary one.

Otherwise, the presence of geological matrix can be ascribed to infiltration (subsequent to natural or anthropogenic deposition), or, probably to a lesser degree, to the disaggregation of materials such as mortar, plaster, adobe, etc.

The general expectations we can have concerning the chronological profiles of this type of deposit are possibly large profiles with various shapes. Markedly younger or older groups of finds may well be interpreted, respectively, as intrusions or residuals, but their presence may be much less detectable.

As the reading of chrono profiles in these cases is anything but resolving, the interpretation of these deposits lies primarily on their specific identification, which will be examined later, along with the other characteristics that they might display.

IV.3.3 Dating

These deposits can be dated *ad quem*, using a ‘double fork’, one for the starting date of deposition and one for the closing date (see Chapter II.2.9). In general, it has to be noted that dating these deposits is somewhat more complex and interpretive compared to the previous type.

When we manage to excavate only part of a large primary deposit with continuous formation, the important issue of sampling has to be considered. If dealing with a dump, what we date is only the beginning and end of the deposition we managed to excavate, but the dump as a whole may also have been in use before, and/or after, the temporal interval detected.

IV.3.4 Formative typology

There are two main kinds of primary deposits with a continuous formation:

- (1) urban dumps, and
- (2) culvert fills.

Many deposits of natural origin can also be considered as primary with continuous formation: these deposits are produced by the continuous or imperceptible, constant accretion of sediments by means of water, wind or gravity. Each of these deposits presents peculiar formative mechanisms, and, as already stated, they are not treated here. Moreover their primary status is somehow more difficult to assess and requires, once more, case-by-case evaluation.⁵⁰²

⁵⁰² For a case study concerning the dating of a deposit produced by repeated, discrete alluvial episodes over a long date range, see Nicosia *et al.* 2019.

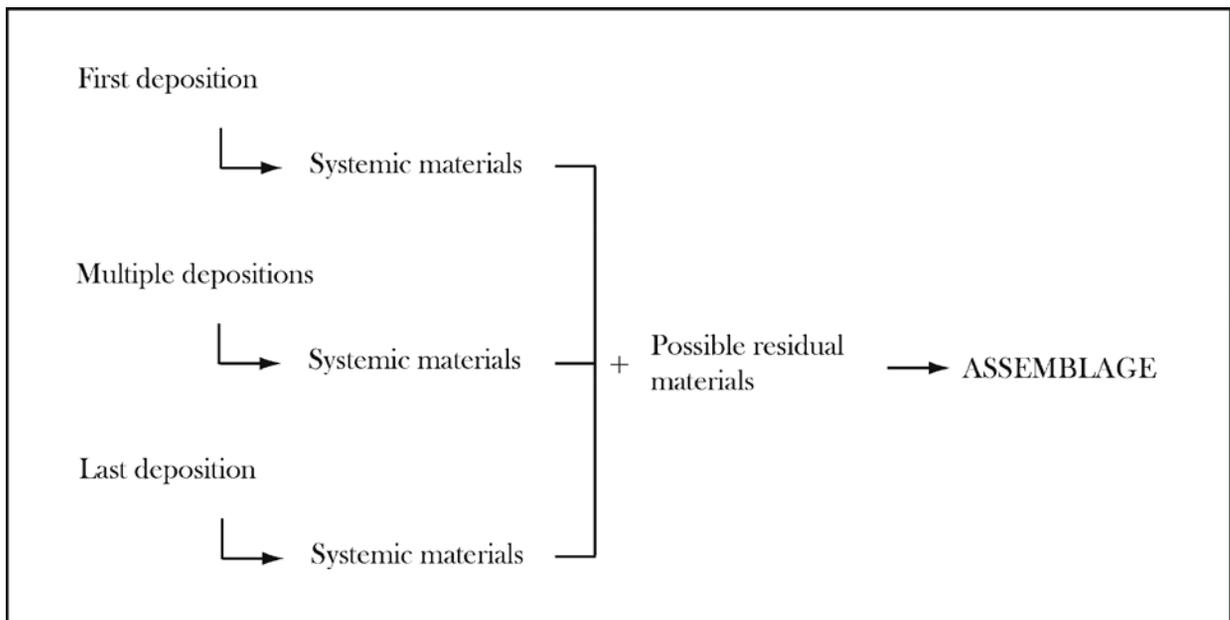


Figure 90: A possible model for the formation of assemblages in urban dumps.

P.C.1, Urban dumps

An urban dump is generally the final product of the waste stream of a whole urban community or of a large part of it. The total amount of material that can form the assemblage of these deposits is therefore potentially very high (Figure 90). Moreover, dumping being a necessary activity, deposition within the same basin may last for a considerable time, probably in some way under the aegis of the civic public authority. It is worth recalling that usually the distribution of these dumps involves the periphery of the settlement. Together with riverbanks (also *intra moenia*, and the coast) and any open, non-used space, the more common topographical features that provide suitable basins for these deposits include:

- (1) the area surrounding the city walls, particularly near the gates and the main routes; existing cemeteries may represent a casual site for dumping;
- (2) ditches surrounding walls; and
- (3) abandoned or undeveloped parcels of urban land.

Once the main probable locations of dumps are highlighted, it is worth reminding ourselves that the other side of the coin represented by the existence of these deposits is the very important phenomenon of the substantial absence of accretion (and thus of archaeological record) *intra moenia* when the waste streams are well managed and regular maintenance assured.⁵⁰³

The various factors affecting the life of any item before its final deposition in dumps (reuse practices), act through removing the large proportion of what has some value, what is necessary, or what can be recycled. The efficiency of these mechanisms can vary, but in general within the assemblages of dumps, at least in periods of 'normal' management, low rates of glass, metals and valuable items are to be expected. The last filter operating in this way, i.e. scavenging,⁵⁰⁴ can also produce some mixing (see above).

Apart from systemic items, we must remember the possibility, undoubtedly higher in comparison to smaller dumps, that some residuals turned out to be redeposited; as mentioned, these may well be the product of building demolitions or of the removal of some volumes of sediments, again probably for building purpose, within the city area.

⁵⁰³ See Furlan 2017.

⁵⁰⁴ See Mazzocchin, Furlan 2016: 227.

Another source of some residuality may be the longer time-span that may exist between provisional dumping in some intermediate smaller dumps and the final discharge within the civic dumps.

The physical state of these assemblages, particularly concerning fragmentation, has been discussed in Chapters III.4.1, III.4.2 and IV.2.2: high rates of fragmentation should not be a surprise, but the presence of some complete or sub-complete items is probable, together with the conjoinability of some sherds. Wear should be generally homogeneous, but if some redeposition with residuals occurred, some differences may be detectable. The presence of some articulated bone may also strengthen the interpretation of these deposits. In general, it seems likely to expect high rates of bones, charcoal, ash and other products of the decay of organic materials.

Turning to the matrix, besides what has been observed above, we may well expect it to be scarce, organic (dark) and soft. The progressive decay of the organic matter would surely produce over time a volume loss.

Where no clear internal stratification was detectable (high contents of organic matter make bioturbation more likely, thus masking previously existing boundaries) beddings and *laminae* may suggest the various depositional episodes occurring. Conversely, where some stratification was still observable, clusters of particular finds, concentrations of ash or charcoal or levels of lime (or anything suitable for some form of sanification) may well characterise the sequence recorded. As mentioned above, part, or most, of the matrix may be the result of infiltration/percolation processes; these may have a greater impact when the dump is located down some slopes, as the result of colluvial episodes.

To date, the list of ancient cities whose main urban dumps have been well excavated and presented is a short one, the main being cited in Chapter III.4.1. Undoubtedly, much more attention should be devoted by research agendas to these precious deposits, whose locations, furthermore, are relatively easy to predict.

P.C.2, Culvert/drain fills

The filling formed within drain culverts, which are a typical feature of classic domestic and public architecture,⁵⁰⁵ represent the product of very particular processes in a very particular environment; they are, in any event, also a relatively common deposit type in urban environments, and the information to be drawn from these deposits is particularly valuable for reconstructing the state of health of a given settlement.⁵⁰⁶ It follows that, although they clearly represent challenges, it is worth discussing the features and trying at least to propose the draft of a formative model and means of dating.

Culverts are not open-air features – a peculiarity that greatly affects the deposition of sediments and materials within the basin they constitute. They are usually masonry or timber linear features, with slightly inclining bottoms, two parallel walls creating a *specus*, and some form of top covering. They usually run well beneath the floors and represent the branches of the drainage/sewing system of a settlement.

Turning to the fill, we do not refer here to the deliberate backfill, for any reason, of the structures but to the progressive infilling that occurs by means of occasional dumping of materials in the sewer covers and by their transportation and deposition, together with large or small amounts of sediments, thanks to the presence of flowing water.

This introduces the very peculiar formative process of these deposits, in which both human and natural agents play an important role (Figures 91, 92). In this case we have no vertical deposition, by means of gravity, as would happen in any common non-fluvial/maritime environment; in this case the primary

⁵⁰⁵ For a general overview concerning northern Italy, see Annibaletto 2012: 192-197.

⁵⁰⁶ The topic has recently been addressed in Furlan 2017: 330-333 and in Dobrova *et al.* 2018.

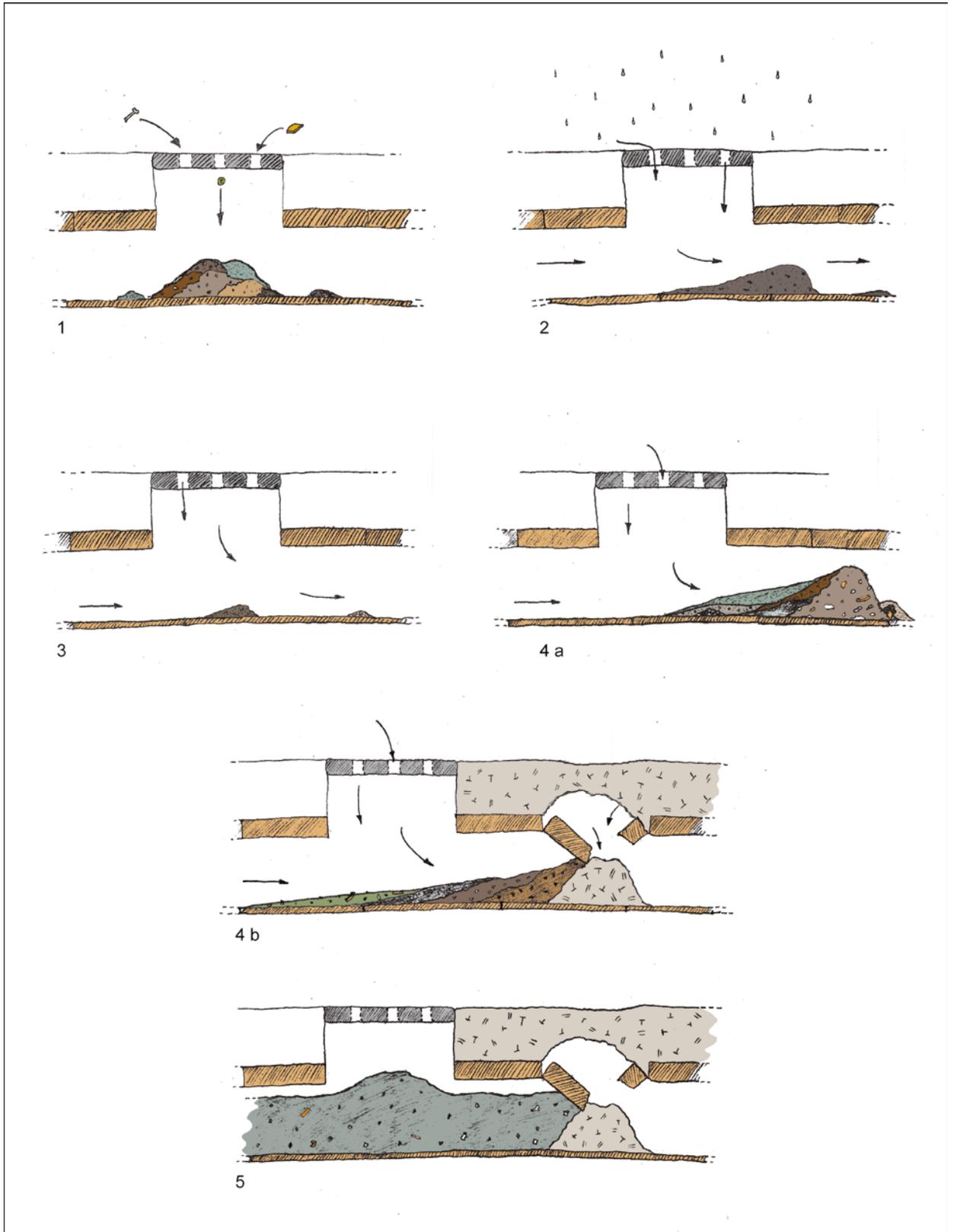


Figure 91: A possible sequence leading to the formation of culvert fills (Furlan 2017).

depositional agent is water, which plays its role horizontally. If the drain is regularly maintained, no substantial amounts of deposit should form within a given section, thanks to the more or less occasional water flow. Major sedimentation and materials deposition should begin once normal waterflow is prevented in some way by the downstream presence of obstacles, blockage or damage; if regular maintenance does not

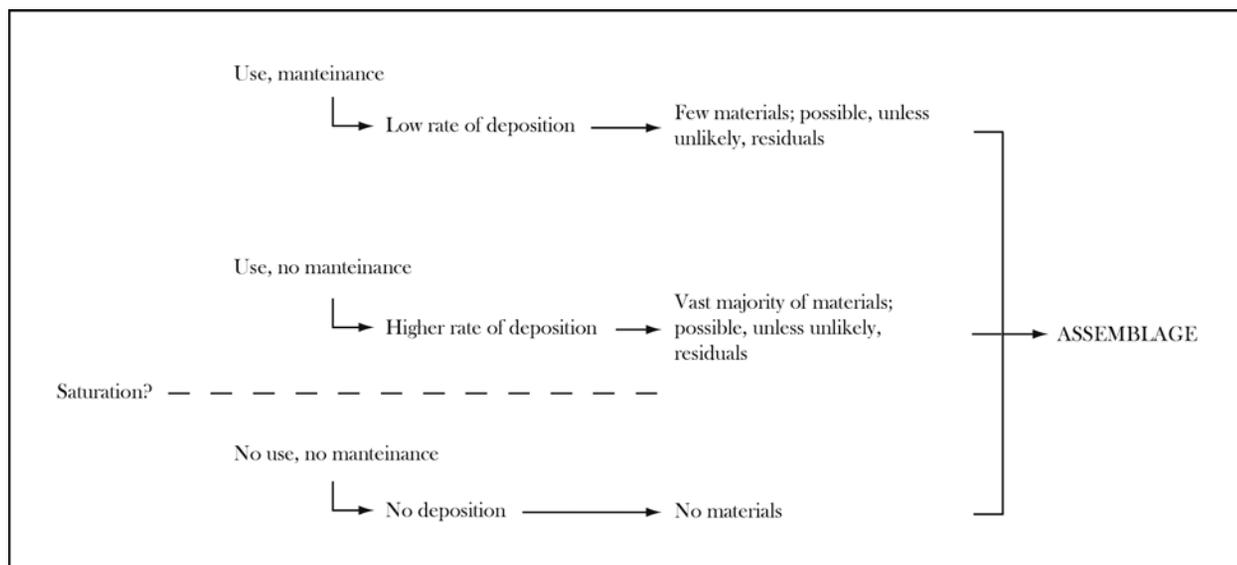


Figure 92: A possible model for the formation of assemblages in culvert fills (Dobрева *et al.* 2019).

provide for their removal some deposition may start taking place. It follows that effective maintenance of culvert ends and the start date of the formation of these deposits are closely connected.

Deposition is then likely to occur, even though the regular maintenance of the drain is no longer assured, thus forming the bulk of what is later recovered. When the deposition of material within the culvert stops (also because it is saturated), the formation of the deposit may be considered to have finished.

Certainly the deposition may experience some intervals, which would hopefully appear in the deposit profile. Beddings and *laminae* may also be visible, but, in general, it should be allowed for that the water flow may well produce substantial mixing of both sediments and materials.

In general, large-sized materials are not expected in these deposits, and some water abrasion may also be detectable; post-use wear should be quite uniform, once accounting for the different physical and mechanical characteristics of the materials involved.

From a quantitative point of view, we may expect a major peak of evidence corresponding to the last main dumping activity. Its start date can suggest, besides the beginning of deposition, also the end of some effective maintenance of the infrastructure. The end of the peak should correspond to the end of the depositional process. No later peaks should appear, as, apart from the occurrence of later trenching activities or damages, the content of the culvert is substantially sealed off. On the contrary, some tails of earlier materials may be present, due to the presence of residuals or to the outcome of earlier dumping activities that survived maintenance and water-flow activities.

As a whole, these deposits, although formed in a very peculiar way, are very similar to a type of dump, including the possibility of internal mixing. The fact that they can be substantially well sealed, however, makes them better subjects for high-level analyses, such as botanical and pollen investigations. It has to be highlighted that, unless one precise entrance point for the materials recovered is located (say a basin or a sewer cover), and other possible sources are excluded, it is quite difficult to associate the recovered materials to any precise area or activity.

One last peculiarity involves these deposits: unless they are cut by later activities, and when they have been excavated simply by pulling up the culvert covering, it is not that easy to position them correctly within the framework of a Harris matrix (they fill the culvert, but they are not covered or cut by anything); in these cases their dating cannot rely on an upper relative sequence and it is based almost exclusively on internal data, i.e. on the absolute dates provided by the embedded materials.

Other cases

Other deposits, although different in many ways, from the point of view of dating can be substantially assimilated to a large urban dump. This applies to dumps exploiting the presence of abandoned buildings, or open areas, and used for a sufficiently long time-span. Some ditch fillings may also turn out to be simply the result of episodes of dumping lasting for some time. Even some large dumps received only specific items, which were produced by specific craft or trade activities: the most famous case is that of Monte Testaccio, but many others are documented, particularly in relation to craft activities such as pottery manufacture.

Concluding, any deposit produced by dumping over a long period can be treated, for dating, as a large urban dump. Drain culvert fills represent a very peculiar case, but if a similar example should occur, similar conclusions may well be drawn.

IV.3.5 Case study 1: Mons Claudianus south sebakh (P.C.1)

*Topographic and archaeological background*⁵⁰⁷

The site of Mons Claudianus is located in the eastern desert of Egypt, in a rocky region not far from the Red Sea and about 500 km south of Cairo.

The site consists of a quarry field, which extends over 750 ha., and of a main fortified residential and administrative settlement, located in the Wadi Umm Hussein. The quarries, consisting of 130 individual quarry sites, produced the famous granodiorite, used, *inter alia*, for the Colosseum, Trajan's Baths, Markets and Basilica, and in the temple of Venus and Roma.

The settlement (Figure 93), during its main occupation phase, was substantially designed as a fort with some external annexes, comprising a large granary and a temple dedicated to Serapis. Although certainly not an urban site *stricto sensu*, it displays some characteristics typical of urban settlements and presents the advantage of being one of the few centres whose main dumping site has been well studied and published, together with the materials recovered within it. Furthermore, the dates provided by the artefacts are extremely accurate, therefore allowing detailed considerations.

The site was occupied, in a minor way, from the reign of Domitian, but its substantial period of occupation, coinciding with the greater exploitation of the quarries, occurred between the reigns of Trajan and Antoninus Pius, with occupation then continuing on a reduced scale until the Severan period. Later, until the early 5th century AD, the site was visited only intermittently.⁵⁰⁸

The studied deposit consists of the dump located just south-west of the fort and is known as the 'South Sebakh' (the term *sebakh* in Egypt generally referring to humic, organic waste). It was formed after a more ancient building, simply known as the 'East Building', had been abandoned.

Deposit description

The dump consists of a mound measuring about 60x20 m, with a maximum height of 1.80 m.

It presents a highly stratified profile (Figure 94), with single contexts accounting for specific, discrete dumping episodes; layers particularly rich in charcoal and ash alternate with layers particularly rich in organic fibres or potsherds. Other features observed were layers of sand, possibly suggesting some pauses in the depositional process, layers of lime, probably deposited for sanification purposes, and some rubble, probably deriving from the dismantlement of some buildings.

⁵⁰⁷ See Maxfield, Peacock 2001a.

⁵⁰⁸ Maxfield, Peacock 2001b: 423.

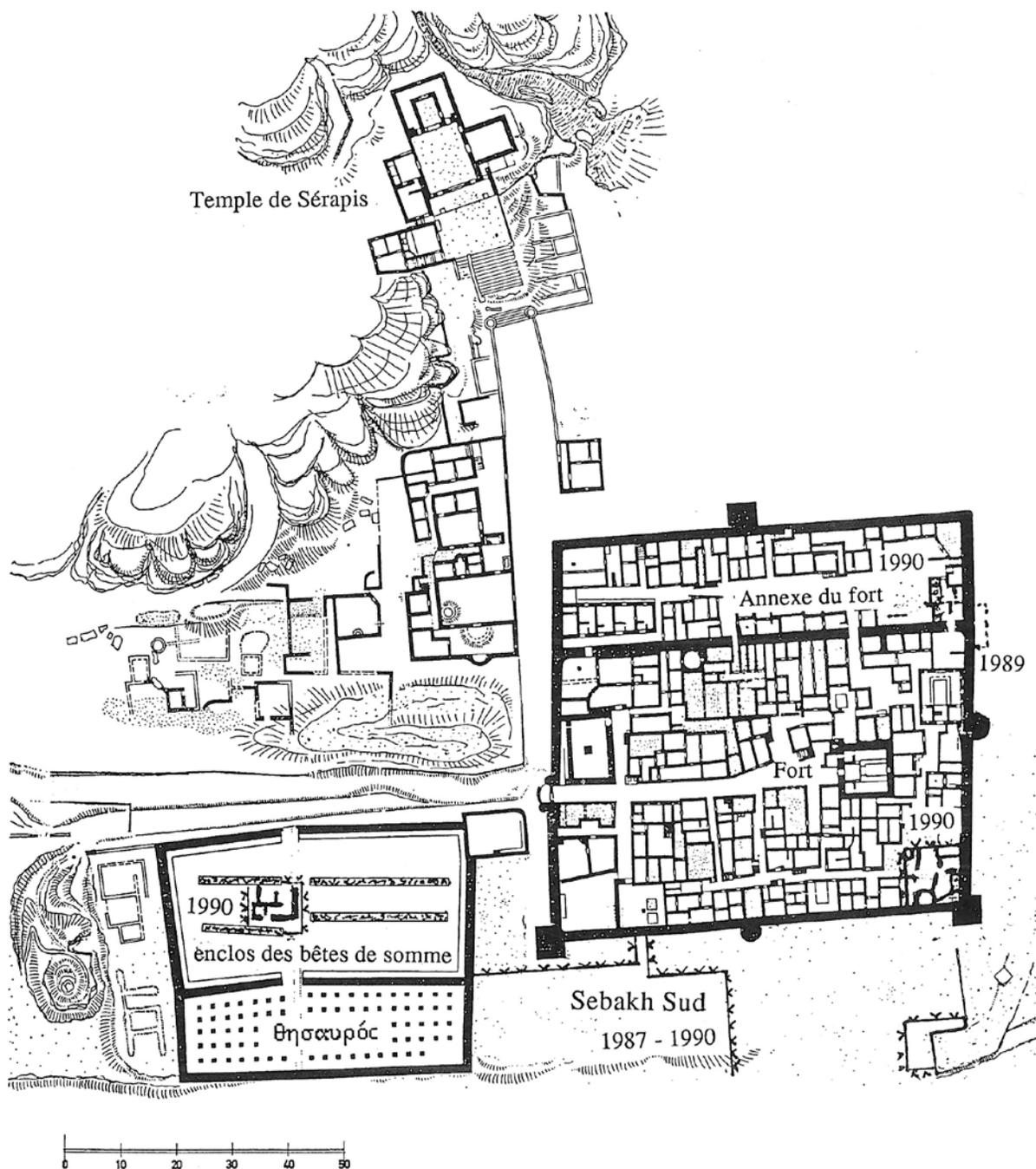


Figure 93: Mons Claudianus, Egypt: plan of the main site and location of the South Sebakh (Bingen *et al.* 1992).

The excavators noticed that internal mixing and residuality occurred. However, although the deposit was exposed for a long time, and thus being particularly susceptible to intrusions, no clear inconsistencies were noticed in the assemblage as a whole.

Assemblage: physical state

The climatic conditions of the site allowed for the extremely good preservation of organic matter, with a panorama of finds much richer than commonly uncovered. Some bones were still fleshed and others still articulated; some leather was also preserved. Ceramics, recovered literally in tons, ranged from sub-complete vessels (Figure 95) to small sherds, therefore confirming the general expectations discussed for this kind of deposit.

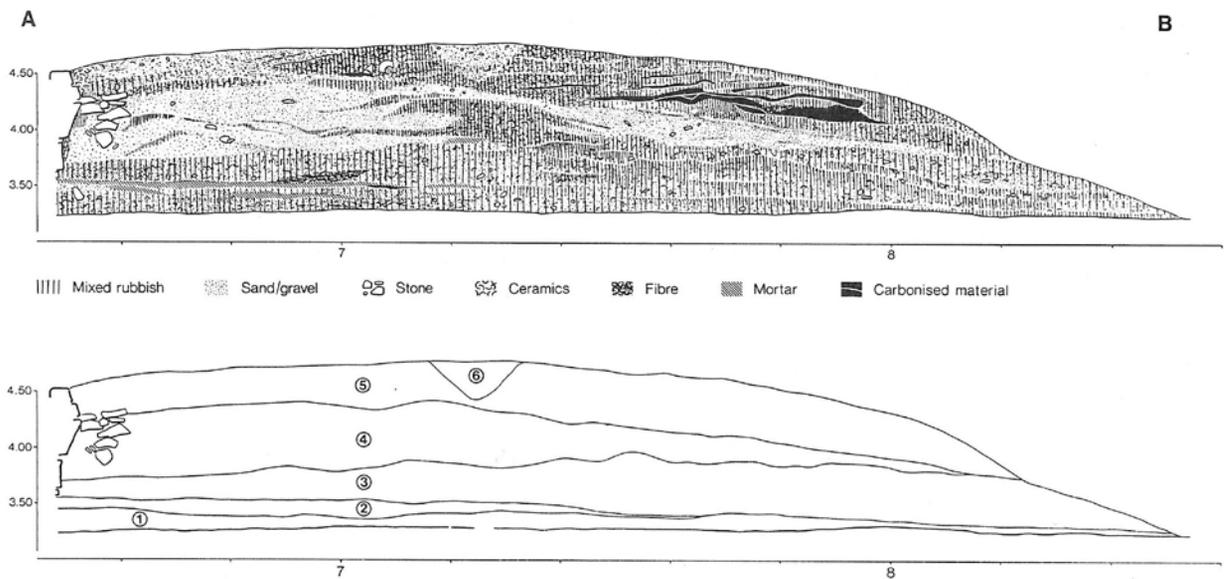


Figure 94: Mons Claudianus, Egypt: cross-section of the South Sebakh (Maxfield, Peacock 2001a).

The finds⁵⁰⁹

The time taken for the formation of the deposit is fully appreciable through the high chronological accuracy provided by the recovered materials. In particular, what makes this deposit exceptional is the presence of a great number of *ostraka*, many of them dated *ad annum*. These *ostraka* yielded valuable information on the administrative and military organisation of the site, about the cultural and social traits of its inhabitants, about its economy, and much more, thus providing an invaluable tool for a wide range of investigations. For our case we are merely interested in their dates.



Figure 95: Mons Claudianus, Egypt: complete and sub-complete amphorae from the South Sebakh (Maxfield, Peacock 2006).

The *ostraka* recovered during the Mons Claudianus excavations, up to the present, have been published in four volumes, the first of which is entirely dedicated to the South Sebakh. For this present study, all the *ostraka* published in this volume were assessed, apart from *ostraka* 79-82, for which no clear date was provided. To the specimens dated *ad annum*, or within a range narrower than five years, one year was added to the date to account for some time before their discard occurred. The range of *ostrakon* 83 was widened to ± 5 years as its date has a question mark ('?') in the report. A few more *ostraka* were published in volume two, with volume three containing no South Sebakh *ostraka*, apart from the republishing of *ostrakon* 13, already presented in volume one. Specimens from volume four were set aside, as it was clear that their dates derived from the deposit date itself; this would have raised a problem of circularity. Ultimately, 222 *ostraka* were processed.

⁵⁰⁹ Ceramics are discussed in Maxfield, Peacock 2006, whereas the *ostraka* are published in Bingen *et al.* 1992; Bingen *et al.* 1997; Cuvigny 2000; Bülow-Jacobsen 2009.

Among all the other materials recovered and published, a large number of the dates had been derived from the deposit date, therefore, also in this case, they were not plotted. A few more independently dated items, i.e. eight coins, published in the volume concerning the excavation of the site, and four fragments of imported *terra sigillata*, have been processed. To the dates of coins 30 years were added by default to their range. Imported amphorae were not computed, as their vague dates uselessly widened the general range displayed; in any event, it is worth stressing that they do not provide any inconsistency.

In all, 234 items in total were processed. The *tpq* for the end of the deposition is provided by an *ostrakon* dated to AD 148.

Profile

The Monte Carlo simulations are given in Figures 96-98, with breaks of 25, 5 and 2 years accordingly. This example shows the flexibility of the simulation used, as breaks can be easily varied according to the accuracy of the dates provided by the assemblage.

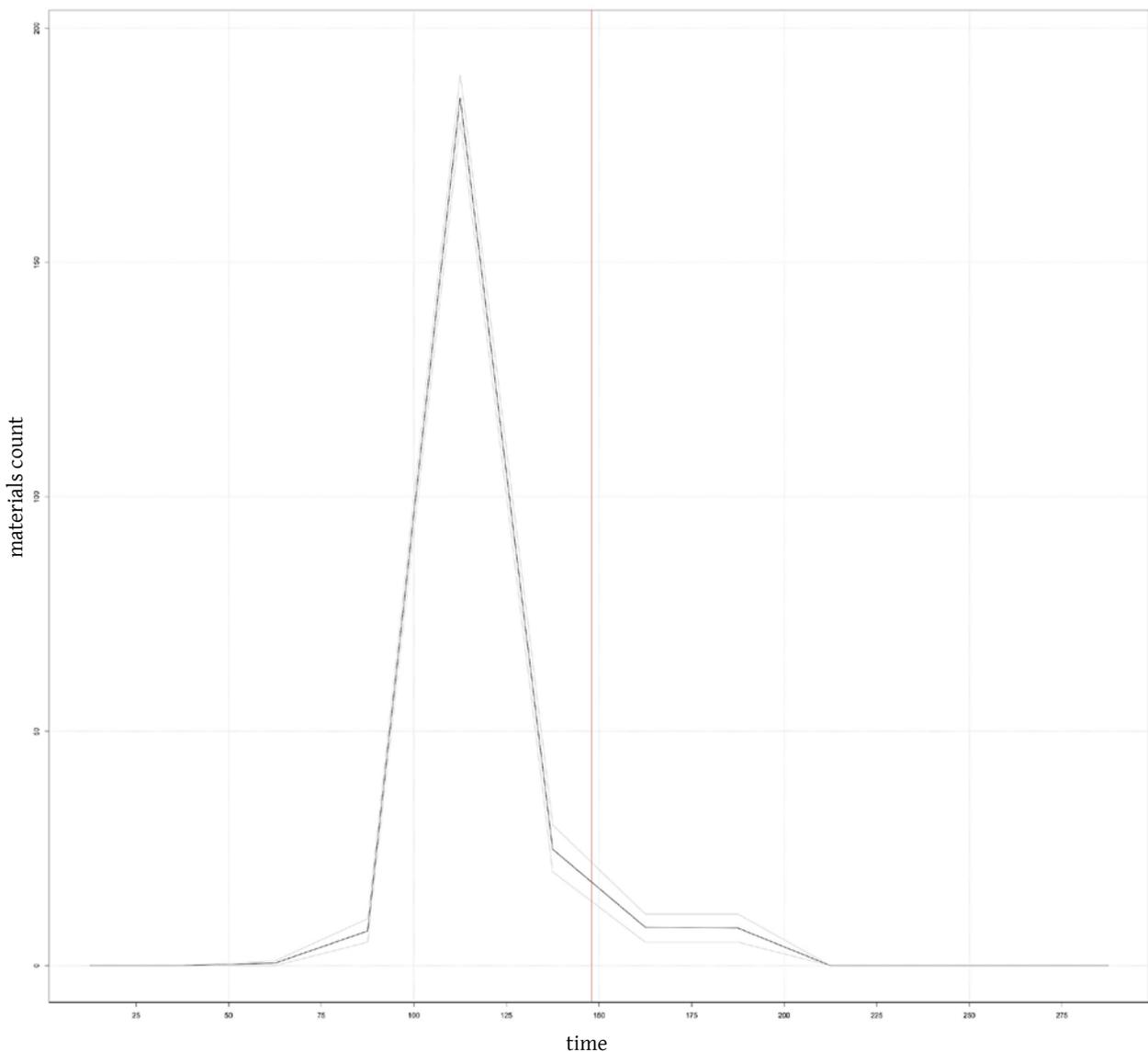


Figure 96: Mons Claudianus, South *Sebakh*: profile with 25-year brackets of the assemblage. examined.

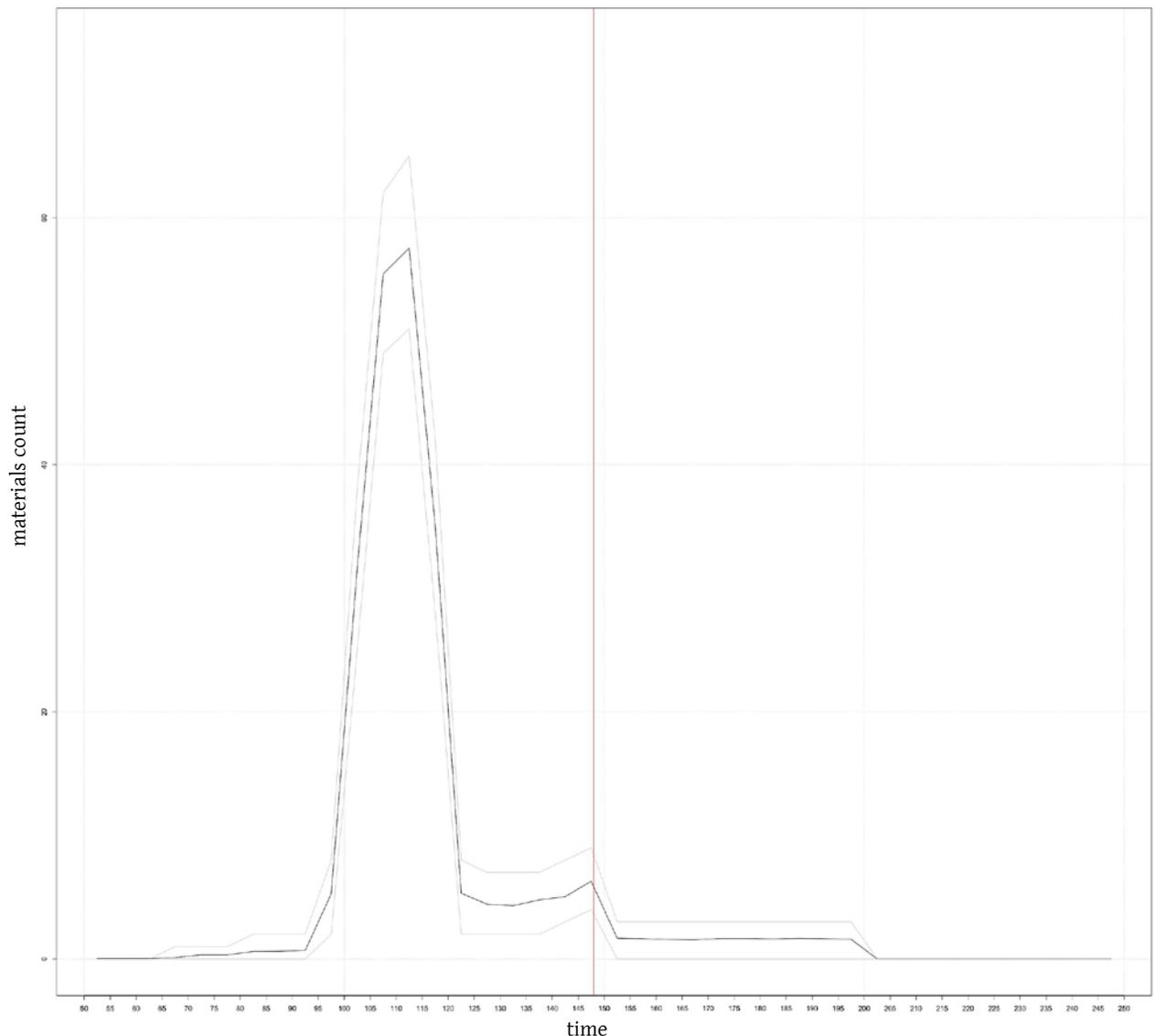


Figure 97: Mons Claudianus, South *Sebakh*: profile with 5-year brackets of the assemblage. examined.

Discussion

With 25-year breaks, and also with 5-year breaks, the assemblage profile would be basically identical to the one displayed by a primary deposit with an abrupt formation (apart from a *tpq* noticeably more recent than the main pike). In any event, with 2-year breaks the complexity of the assemblage is fully appreciable. A main group of materials is dated in a span of 20 years, from about AD 100 to AD 120. Within this span some periods are more represented, while others display a substantial decrease.

Later dumping activity, although with much lower intensity, is then documented until the mid of the century. The more recent specimens (three *ostraka* and one coin) were not considered intrusions because their location within the deposit was considered safe by the excavators. In any case, they seem to suggest that more or less occasional dumping episodes occurred for some time; considering these materials as intrusions or as later systemic materials, seems, in fact, just a matter of selective points of view.

Date proposed

The main dumping activity, *ad quem*, is given from AD 100-102 to AD 118-120;
with occasional dumping/accidental loss, *ad quem*, from AD 118-120 to AD 148-150.

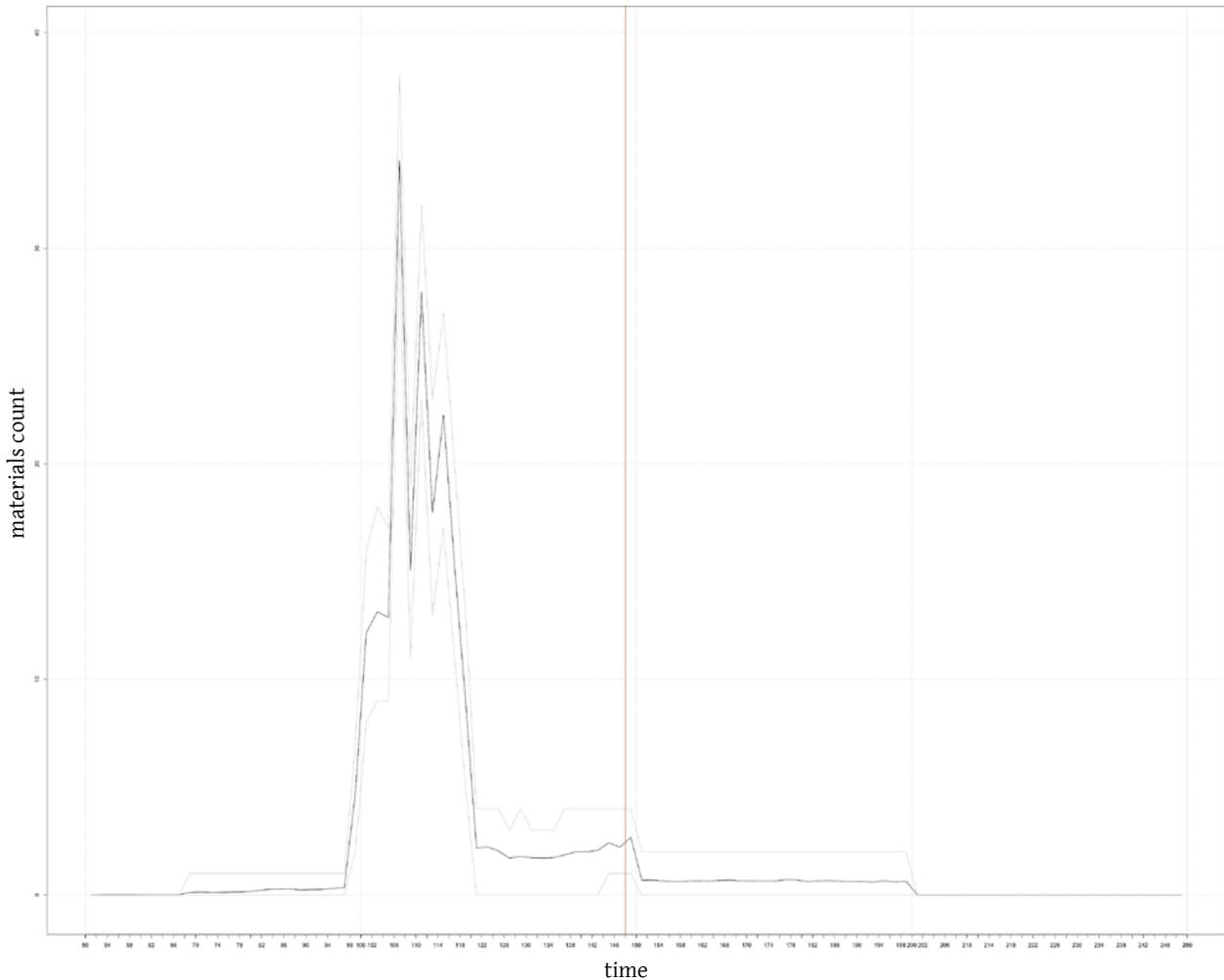


Figure 98: Mons Claudianus, South *Sebakh*: profile with 2-year brackets of the assemblage. examined.

Duration

The main dumping activity extended to about 20 years; occasional dumping/accidental loss to about 30 years.

A lengthy formation is, indeed, consistent with the volume and complex internal stratification of the deposit.

IV.3.6 Case study 2: preliminary observations on an extra-mural dump in Pompeii (P.C.1)

In 2016, within the frame of Project MACH – Pompeii, it was possible to conduct a small excavation in front of the facade of the Sarno Baths, a major complex located on the southern border of Pompeii.⁵¹⁰

The building had been erected right along the line of the ancient city walls, therefore marking the passage between the plateau occupied by the urban centre and the lowland located south of it.⁵¹¹

Given its position and morphology, the investigated area was likely to have been used also for dumping activities, but its layout and use in antiquity were substantially unknown.

⁵¹⁰ See Busana *et al.*, in press and Bernardi, Busana, in press, for an overview of the latest on the architectural layout of the building, and on Project MACH – Pompeii.

⁵¹¹ For the morphology and appearance of the area south of the Sarno Baths in antiquity, see Nicosia *et al.* 2019.



Figure 99: Pompeii, area of the Sarno Baths: location of the trench excavated in 2016 (Furlan *et al.*, in print).

A trench about 21 m long and 2.5 m wide was excavated directly in front of the building, perpendicular to its facade⁵¹² (Figure 99).

⁵¹² See Furlan *et al.*, 2019.

The area south of the Sarno Baths, today appearing substantially flat, was severely over-excavated and quarried during the 1950s, leading to the truncation of the underlying sequence.

The most ancient layer emerged near the facade in the form of the volcanic substrate, presenting a sub-vertical surface, broadly parallel to the building facade.

The southern part of the substrate was covered by levels derived from its weathering and by strata probably related to colluvial episodes; from the top of these layers the excavation documented a series of contexts related to dumping episodes, markedly dipping southwards (Figure 100). Some of these, containing building materials and plaster, may be the result of demolitions and refurbishments carried out within the urban perimeter. Others seem to be simply related to domestic life, embedding large amounts of potsherds, as well as bones and charcoal.

Dumping activities were still being carried out right before AD 79, when the most recent dumped level, still poor in infiltrated sediments and, conversely, rich in empty recesses, was covered by the pumices of the earliest stages of the eruption (Figure 101).

The recovered assemblages are still under study, but some preliminary observations on the coins and the most informative ceramic classes are available for some considerations in terms of the dump formation and chronology.⁵¹³ It seems helpful to present them in list form:

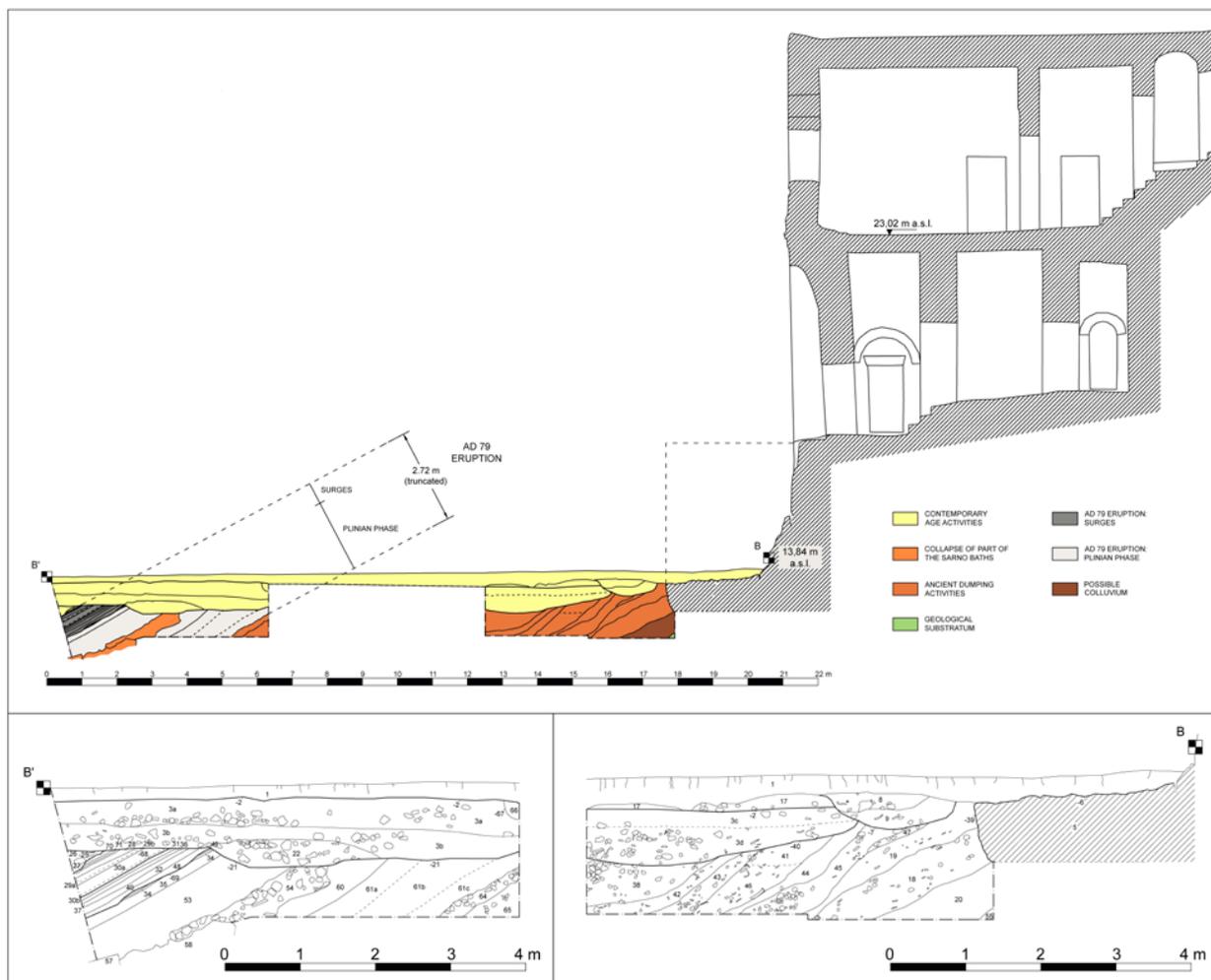


Figure 100: Pompeii, area of the Sarno Baths: cross-section of the trench excavated in 2016 (Furlan *et al.*, in print).

⁵¹³ Andreatta 2019.

1. The area witnessed dumping activities over a long time-span, roughly from the mid/late Republican age to the years immediately preceding the eruption that witnessed the end of the ancient city.
2. The dumping activities were most likely discrete, and not continuous; in particular, the construction of the Sarno baths may have determined a substantial pause, marking a hiatus between two main dumping phases: a more ancient one and a more recent one. Some of the more recent dumping episodes may be related to clearance carried out within the urban perimeter right after the earthquake of AD 62.
3. Internal residuality ratios (context by context) seem to be fairly low.
4. Except for the most recent layer, the deposit contains a good amount of sediments; this aspect may be related to the peculiar morphology of the area, and part of the sediments may be the product of post-depositional infiltration caused by water movement. Some of the sediments may also have been deposited together with the artefacts as the result of building/destruction activities carried on within the urban centre.
5. Fragmentation varies from moderate to high (Figure 102).
6. It has to be stressed that what has been excavated represents only a small part (a thin strip) of a deposit that may have been much bigger and whose extension is unknown. The urban dump may also have been significantly inhomogeneous and different specific loci may have witnessed dumping activities only in determined periods. This, in general, raises an important issue on the representativeness of the investigated sample.

The combination of the data extrapolated from this relatively small excavation with further investigations and with the data already provided by other extra-mural dumps around the city⁵¹⁴ will surely contribute to a better definition of the economic evolution of the city of Pompeii, for these deposits represent, *de facto*, a more or less clear mirror of a systemic context evolving through time.



Figure 101: Pompeii, trench in front of the Sarno Baths; the last dumped layer of rubbish is directly covered by the first white pumice from the AD 79 eruption.

⁵¹⁴ See footnote 276.



Figure 102: The assemblage recovered from one of the layers forming the dumping area located in front of the Sarno Baths (photo C. Andreatta).

Figure 103: 'House of *Titus Macer*', Aquileia: cross-section of the fill of one of the culverts examined.

IV.3.7 Case study 3: culvert fills from the Fondi Cossar area, Aquileia (P.C.2)

The area recently excavated in the Fondi Cossar area, in Aquileia (see Appendix 2), is crossed by a web of many drain culverts, which point to the major urban drains located below the street grid. Some of them were certainly built for the needs of the central *domus*, but for many their origins are still unclear and may be located beyond the excavated area. The drains are typically built with a bottom made of tiles, two walls built with brick fragments, usually poorly bound with mortar or clay, and a cover made of whole, transversal bricks.



Some of their fills have been excavated (Figure 103) and the assemblage examined. The case study is fully discussed in

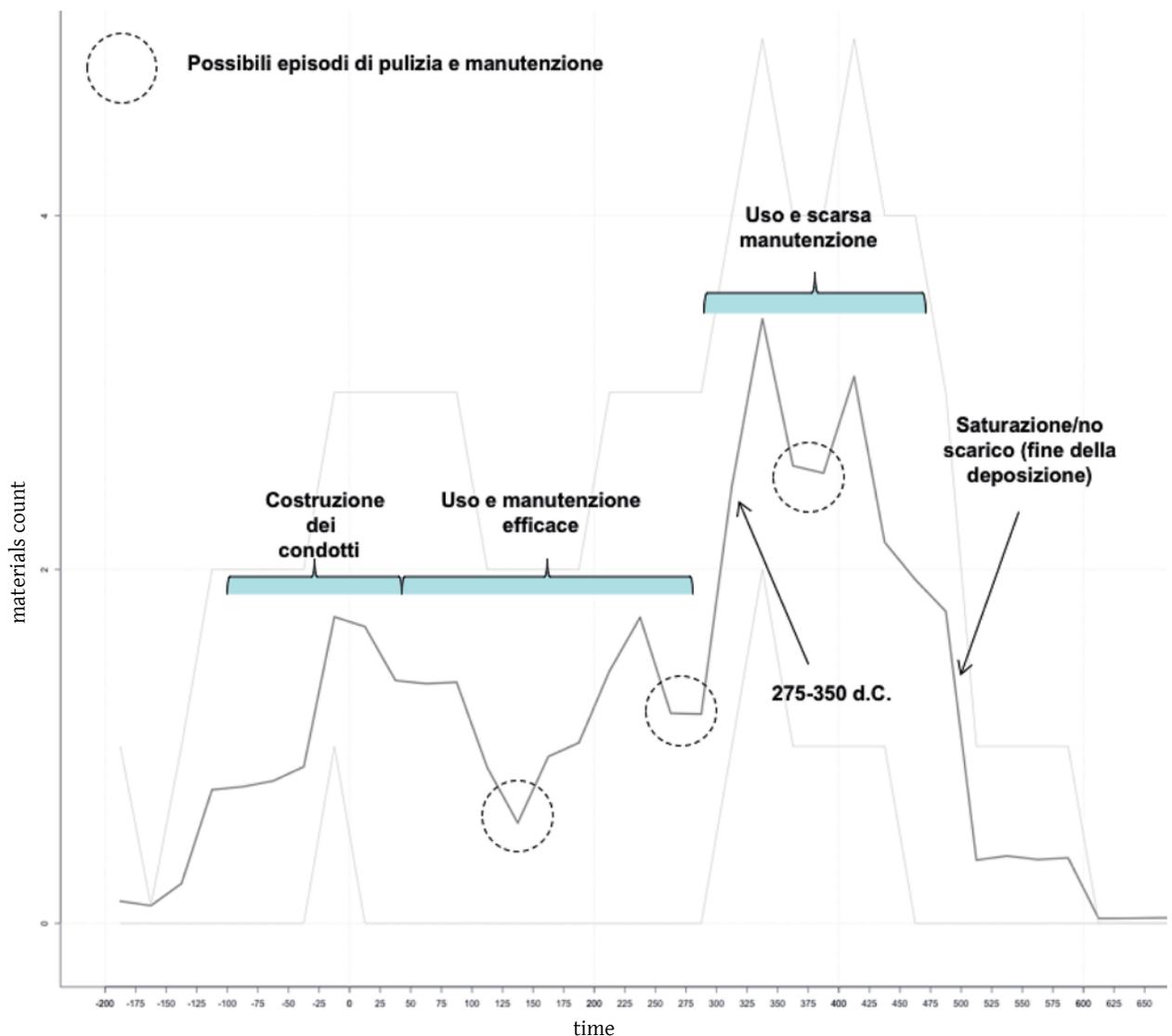


Figure 104: 'House of *Titus Macer*', Aquileia: profile of the assemblage recovered in the culvert fills (Dobrova *et al.* 2018). Braces indicate the construction of the culverts, their use with effective maintenance and their use when maintenance was no longer effective. Dotted circles indicate hypothetical episodes of partial cleaning.

two recent works, to be referred for a detailed presentation.⁵¹⁵ The chronological profile derived from the Monte Carlo simulation is presented in Figure 104, pointing to the end of substantial maintenance works (the beginning of the main depositional process) in the period AD 275-350. The accumulation ends in AD 450-475, when the culverts *speci* were saturated.

IV.4 Mixed deposits

IV.4.1 Definition

By ‘mixed deposits’ we mean those deposits in which it is possible to detect both the residual and the systemic part of the assemblage, both having some consistence. They cannot be considered as primary deposits, for primary assemblages usually largely represent the systemic context in which the deposit itself was formed. It seems much better to define them as secondary deposits with a demonstrable (or at least most probable) presence of systemic materials. Therefore, recalling what has already been advanced in Chapter II.2.5, mixed deposits are those whose assemblage belongs both to a systemic context previous to the one in which the deposit was formed and to the same systemic context in which the deposit was formed or used.

The point, of course, is establishing if systemic materials actually exist, what they are, and what they inform us of. They may tell us of the formation of the deposit, here intended as the re-deposition of the bulk of sediments along with the materials embedded, or they may inform us as to its use, having been incorporated within the deposit after it was formed and being substantially a very peculiar and informative type of intrusion.

The first group clearly allows a kind of dating, while for the second one we date different episodes in different ways. In the first case, the presence of materials consistent with the deposit formation should allow an *ad quem* dating of this episode, thus we should know when the bulk of sediments were redeposited. This is the case, for instance, of sediments redeposited on a building site and mixed with freshly discarded materials (see Chapter III.4.3), say amphora sherds. In the second case we should technically have a *terminus post quem* for the redeposition of the bulk of sediments, provided by the most recent residual, and a *terminus ad quem* for the use of the deposit surface, or for part of this period of use (this could have been longer, as in some periods any materials may not have been embedded). This is the case for an earthen floor trampled for some time (see Chapter III.5.2). Certainly, it is a very small distinction and somehow more theoretical than practical. But it has to be kept in mind that in the two cases (e.g. mixed deposits A and mixed deposits B) the more recent artefacts carry much different information.

Systemic materials of the first group (A) can be further divided into:

- (1) materials intentionally added within the deposit; and
- (2) materials accidentally lost or discarded;

If the first instance is somehow possible to engage with (see Chapter III.4.3), materials of the second type are much more difficult to detect and they may be very few. Indeed, they may be easily interpreted as intrusions, sharing with them the same chronological pattern. Nevertheless, it may be suspected that the number of secondary deposits containing this kind of materials is relatively small: what are the chances that in a building site some contemporary sherds turned out to be embedded within the sediments? What are the effective chances of encountering them?

Mixed deposits, therefore, can be further detailed in the following sub-categories:

- (A): deposits with systemic materials entered during the formation
 - i, with materials intentionally embedded,
 - a, with materials accidentally embedded; and
- (B): deposits with systemic materials entered during use.

⁵¹⁵ Furlan 2017: 330-333, Dobrova *et al.* 2018.

IV.4.2 General expectations

Given the extreme difficulty of tracing and dealing with the subtype Aa deposits, i.e. those deposits containing systemic materials accidentally embedded during their very formation, here we focus on subtypes Ai and B.

From a quantitative point of view, both are expected to display one or more peaks of residuality and a small group of more recent finds. On lucky occasions the main group of residuals and the systemic materials may be clearly distinct, but often the situation may be much more confused and blurred, thus requiring a higher interpretive contribution.

To ascribe materials belonging to the more recent group to the status of systemic finds, some factors must first be considered. For Mixed Ai deposits, these aspects are discussed in Chapter III.4.3, which deals with the issues of intentionality and selection. It is worth quickly stressing that selection is indeed a strong clue pointing to the intentional addition of materials and is, in turn, suggested by the following aspects:

- (1) sufficient number;
- (2) chronological homogeneity; and
- (3) sorting by class or size.

Ultimately, the added finds have to play some evident role (hydraulic, mechanical, even aesthetic) convincingly explaining their presence within the deposit.

Turning to Mixed B deposits, the most typical case is that of an earthen floor (discussed in detail in Chapter III.5.2), as important clues on dealing with this kind of deposit come from the field of experimental archaeology. Systemic materials related to the use of the surface of the deposit, in addition to their more recent dates, should display the following characteristics:

- (1) be small in size;
- (2) be concentrated in the upper part of the deposit (2-3 cm), which could be considered a context *per se*; and
- (3) should possibly display wear and scratches compatible with trampling.

IV.4.3 Dating

As mentioned previously, the ways of dating these deposits vary according to their more specific nature.

- Mixed Ai: *terminus ad quem* for the deposit formation.
- Mixed B: *terminus post quem* for the deposit formation and *terminus ad quem* for part of its use. Given that it is most likely that the deposit's surface starts being used just after its construction, with good approximation, the deposit formation may substantially be dated *ad quem*.

IV.4.4 Formative typology

The types proposed may be summed up as follows:

- M.Ai.1. Foundation trench backfills with systemic materials intentionally added.
- M.Ai.2. Redeposited sediments for building purpose with systemic materials intentionally added.
- M.Aa.1. Any secondary deposit containing accidentally lost systemic materials.
- M.B.1. Non-solid floors.

M.Ai.1, Foundation trench backfills with systemic materials intentionally added

To the best of this present author's knowledge, besides specific cases involving ritual activities, foundation trenches were not typically backfilled with selected systemic items. In any event, the principle being the

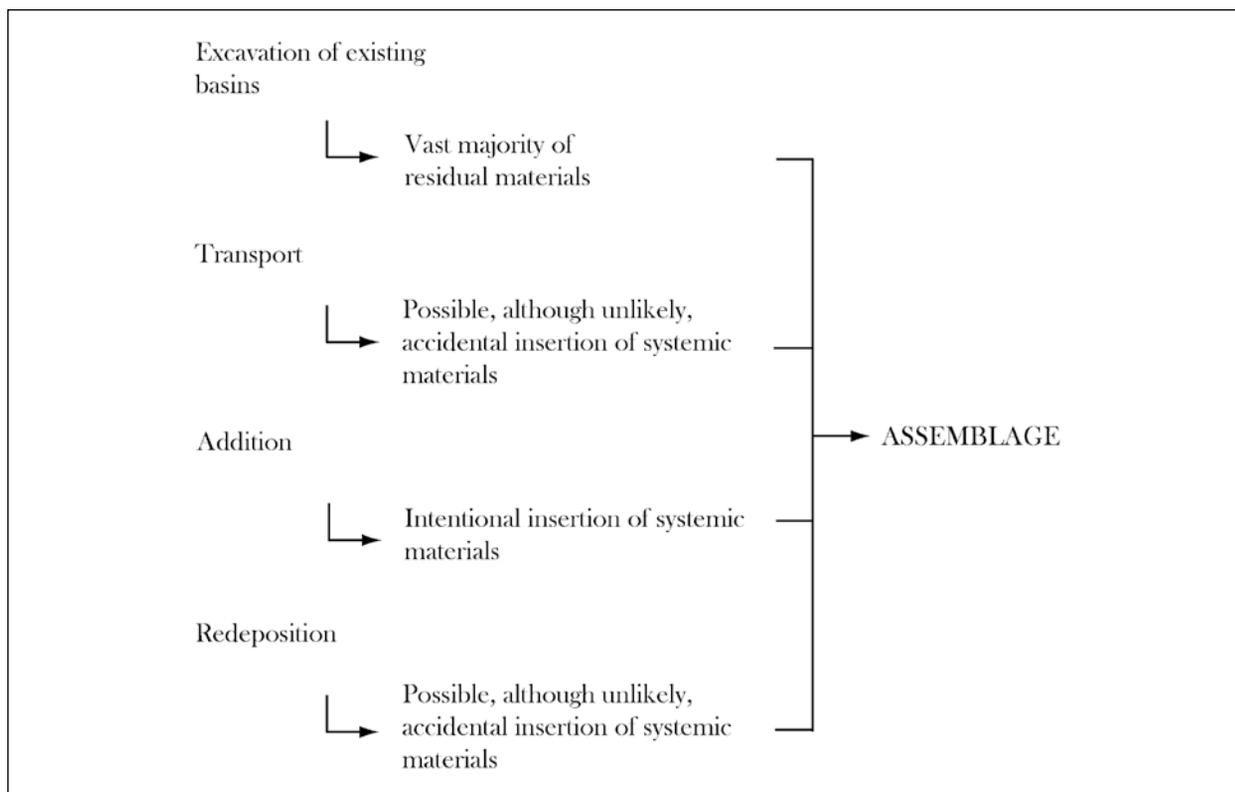


Figure 105: Possible model for M. Ai.2 assemblages.

same applying to the addition of materials to sediments for other building purposes, some examples may yet be recorded (or have already been recorded, but are unknown to the present author).

M.Ai.2, Redeposited sediments for building purposes with systemic materials intentionally added

As mentioned above, the intentional insertion of systemic materials has already been discussed in Chapter III.4.3, and the main aspects suggesting selection, and consequently intentionality and the presence of systemic materials, have already been cited. Figure 105 presents a sketch of the entire process of deposition for this kind of deposit.

These deposits are not unknown; deposits made only of freshly discarded items (e.g. of amphora stoppers or body sherds), mortar structures with systemic sherds embedded, and even charcoal layers (see P.A.7 in Chapter IV.2.11), can be seen as extreme cases of this type of deposit. In the other instances, when residuals are present, they may also display differences in terms of sherd size and conjoinability.

M.Aa.1, Any secondary deposit containing accidentally lost systemic materials

As mentioned above, these deposits are very difficult to label and process. In general, to distinguish with some plausibility a possible systemic item from an intrusion, or from the more recent residual, certain circumstances should occur, i.e.

- (1) the possibility of intrusions should be minimal; and
- (2) the item(s) should display one of those characteristics, suggesting they have been freshly discarded (for instance larger size, high conjoinability, etc.).

Without evidence of this sort, demonstrating that a given material was systemic is very difficult. Once the possibility of intrusions has been excluded, the use of the more recent item(s) to provide a more cautious *terminus post quem* seems to be the best option by far.

M.B.1, Non-solid floors

The example of non-solid floors has already been largely discussed in Chapter III.5.2.

IV.4.5 Case study 1: an earth and pebble floor from the Auditorium Villa (M.B.1)

*Topographic and archaeological background*⁵¹⁶

Among published excavation reports it is difficult to find cases described in sufficient detail. A good example, however, seems to be provided by the Auditorium Villa in Rome. Although the number of processable artefacts was low, the overall picture emerging gives a good idea of what can be expected from deposits of this type.

The Auditorium Villa, in antiquity, was located in the suburbs of Rome, thus it does not represent, technically, a case taken from an ancient urban environment. Nevertheless, the excavation was carefully carried out and well published in 2006, providing explicit bodies of data (a rarity) and much food for thought, particularly concerning the evolution of Roman domestic architecture. The whole sequence investigated spans some seven centuries and the site is indeed nowadays located in an urban area (the name of the villa derives from the building constructed in its proximity once the excavation was concluded), therefore the site shares many of the traits characterising an ancient urban environment.

The site was occasionally occupied until the mid 6th century BC, when a first farm was built; this existed for about 50 years, when a *villa* was established. The life of this second dwelling was much longer, lasting until 350-300 BC, when it was heavily refurbished. In this new phase (Figure 106) the villa is known as the 'Achelloo Villa', for a terracotta protome recovered in a certain deposit of this phase. This building stood substantially untouched until 225 BC, when a new one, a typical *atrium villa*, took its place. This new building, which witnessed substantial refurbishments in the mid 2nd century BC, was further modified in 80 BC and then occupied until the beginning of the 3rd century AD. In this period the area was used as a cemetery.

The deposit discussed below belongs to the so-called Villa di Achelloo phase, dated to the period 300-225 BC.

Deposit description

The floor examined was made of fluvial pebbles mixed with sand and it paved the southern yard (ambiente 18) of the complex; the choice of using a mixture of sand and pebbles was probably aimed at making the floor permeable to rainwater. The floor survived in three small parts: each recorded as a different context (US 904, 945, 946). The thickness of the layers is not reported.

It has to be stressed that its function and possible later activities render this deposit susceptible to potential intrusions.

No distinction was made between the upper part and the bottom of the layer, therefore a potentially useful clue was not available for dividing systemic and residual materials. This has to be attempted then relying solely on *ex post* arguments (see below).

Assemblage: physical state

Unfortunately, no information concerning the physical state of the assemblage is reported, making it more difficult to assess the status of the recovered finds. This, again, will be attempted primarily using *ex post* information.

⁵¹⁶ The whole excavation is published in Carandini *et al.* 2006. The sequence is described in Ricci 2006, in particular 198.

fragments after conjoinability had been checked. When the same type was recorded in more than a room, including Room 18, it was not possible to determine how many pieces belonged to each room. In these instances only one piece was counted for Room 18.

It was possible to process only 29 pieces; the more recent finds being four sherds whose distribution began at the beginning of the 3rd century BC.

Profile

Three canonical profiles are proposed, the first with 25-year brackets, the second with 50-year brackets, and the third with 10-year brackets (Figures 107, 108, 109). No modifications were applied to the find dates proposed. One sherd of uncertain status, dated about 300 BC, has been processed with a window of 310-290 BC, thus accounting for some further variability.

Discussion

As discussed before, missing some fundamentals data, i.e. the physical state of the assemblage and the depth at which the materials were recovered, the following observations are made *ex post*, i.e. taking for granted the site's wider chronological framework and the date proposed by the authors for the phase to which this deposit belongs. This phase is dated 300-225 BC and is in perfect accordance with the assemblage displayed by the examined deposit. Although the presence of intrusions is difficult to evaluate, the accordance between the overall chronological scheme and the peculiar situation of the deposit is striking. All the more ancient finds can well be considered residuals, and they are distributed along a wide time-span which covers the whole previous occupation of the area, since 550 BC, when the first farm was built. Two slight peaks of residuals are located in this first period and in the period 430-400 BC.

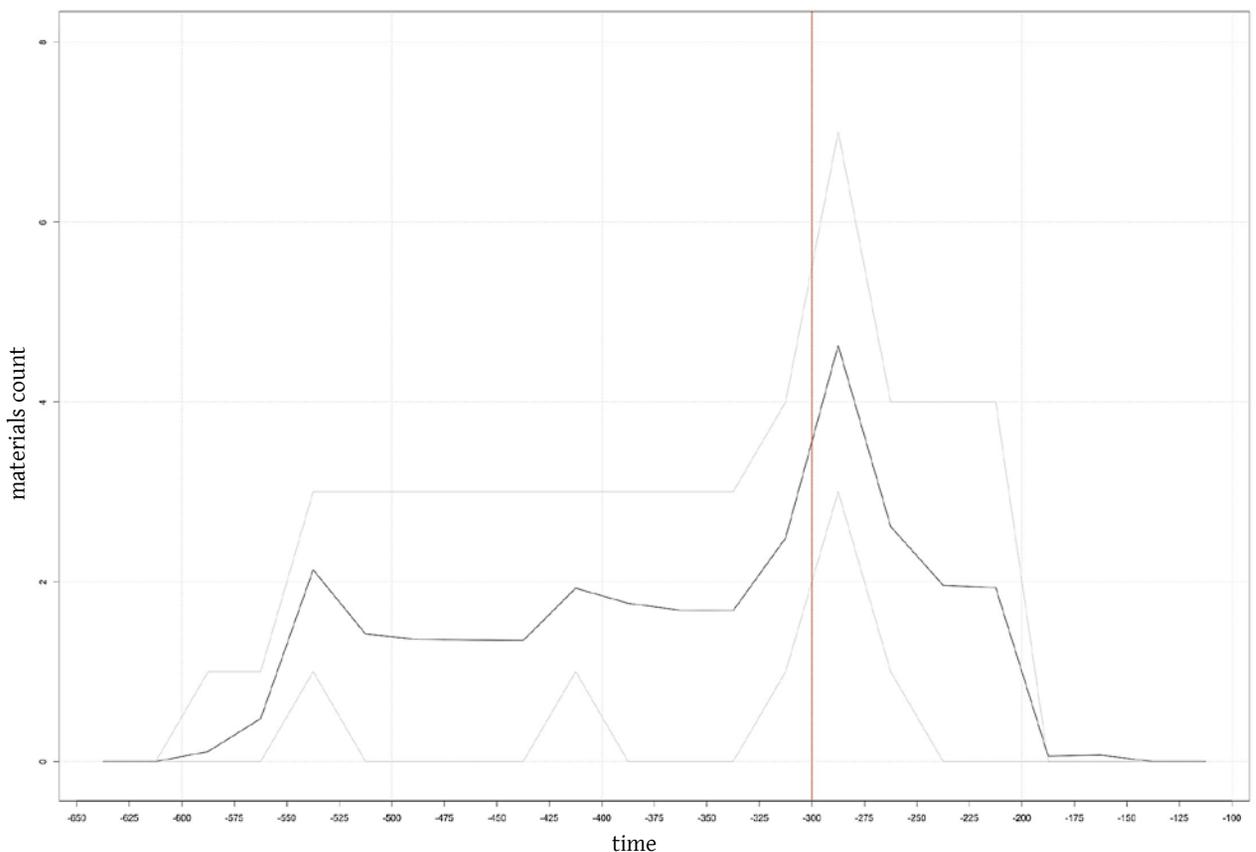


Figure 107: 'Villa dell'Acheloo', earth and pebble floor assemblage: profile with 25-year brackets.

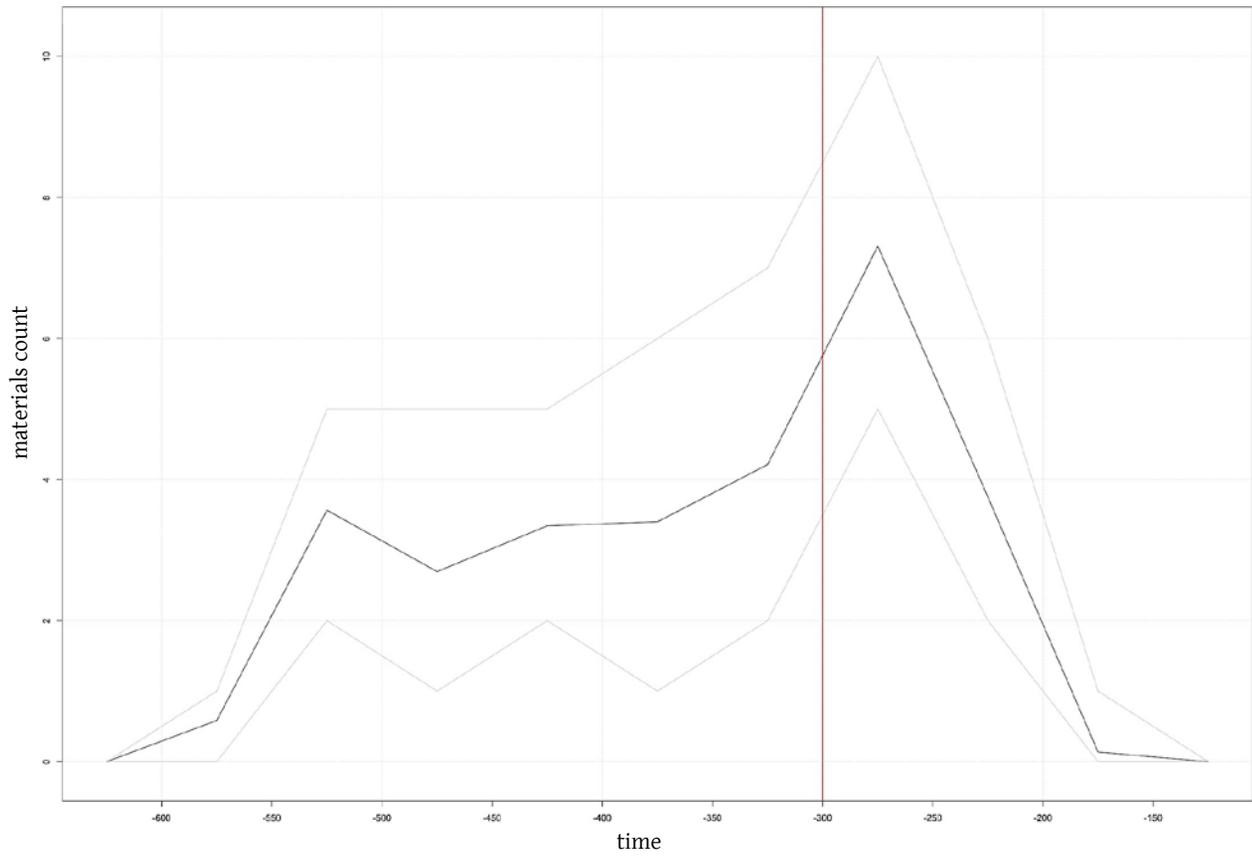


Figure 108: 'Villa dell'Acheloo', earth and pebble floor assemblage: profile with 50-year brackets.

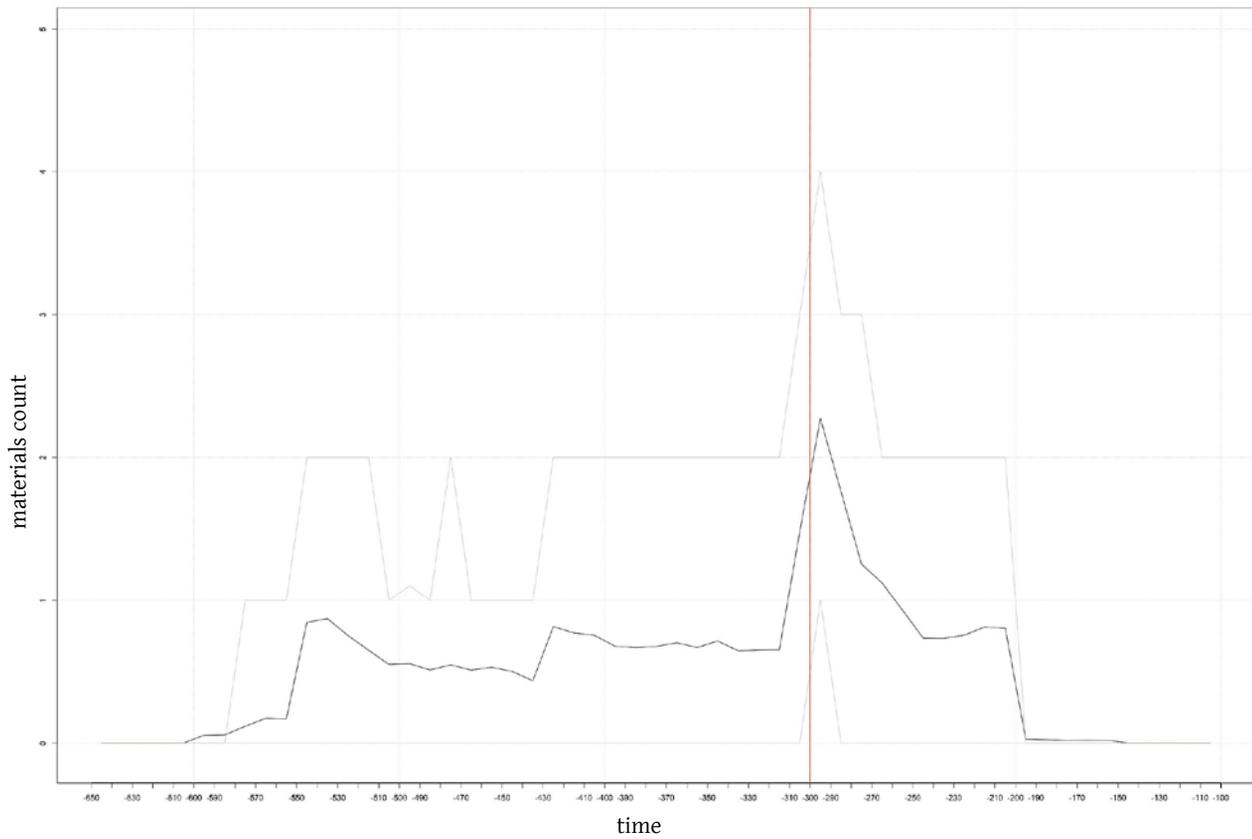


Figure 109: 'Villa dell'Acheloo', earth and pebble floor assemblage: profile with 10-year brackets.

It is even more striking when we see how the length of this phase of occupation (as proposed by the authors) substantially coincides with the length of use of the deposit's surface, which may have been advanced studying the profile: if the whole phase is dated 300-225 BC, the deposit use, according to the graph, may be dated 300-210/200 BC, i.e. with a slight difference after all of about 15-25 years.

Date proposed

We may date construction at 300 BC, and use from around 300 to 225 (or 210-200) BC.

IV.4.6 Case study 2: an earth and pebble floor from the area of the forum temple of Nora (M.B.1)

*Topographic and archaeological background*⁵¹⁸

The construction of the forum complex of the city of Nora (Sardinia) entailed the drastic transformation of an urban area that had been settled at least from the 6th century BC (see Appendix Two). A whole block of warehouses was demolished to allow the construction of the central square;⁵¹⁹ the eastern portico and the basilica of the complex also completely altered the existing urban layout.

The northern side of the forum was not changed so severely, most possibly for cultural and political reasons. Indeed, the area was occupied by a temple, most likely in the place of a previous place of worship, therefore marking an important sign of continuity.

The most ancient structure is poorly known from an architectural point of view, for the later building had, in any event, a radical impact on the existing structures. Nevertheless, areas of the more ancient strata survived the renovation works, namely the floors and layouts of the central part of the religious site (Figure 110).

The excavators date the most ancient building to a period between the end of the 6th century BC and the beginning of the 5th century BC. It should be noted that, according to the authors of the report, the floors remained in use for a very long time,⁵²⁰ until the new building (40-20 BC) replaced the old one.

*Deposit description*⁵²¹

The floor here examined (US 5408) was located underneath the eastern part of the pronaos of the Roman temple. It was a 3-10 cm-thick layer of sand and pebbles, containing occasional potsherds and shells of gastropods and bivalves; the context did not contain lime or other binders, therefore resulting, in general, in friable conditions; however its surface is described by the excavators as quite hard (effect of trampling?).

Assemblage: physical state

The physical state of the assemblage has not been recorded in detail, but the sherds were, in general, fairly small.

*The finds*⁵²²

The deposit returned only 33 datable finds out of a total of 469 potsherds (mostly tableware and amphorae) and 11 bones. The vast majority of the ceramic assemblage is made up of sherds belonging to vessels of Phoenician or Punic tradition.

⁵¹⁸ Bonetto 2009b: 141-170.

⁵¹⁹ The Punic buildings discovered beneath the Roman forum of Nora, fitted with earthen floors, have been fully excavated and published, but it has been suggested, with good reason, that they were simply used for storage and that they may have been provided with a raised wooden floor (Bonetto 2009: 123). Indeed, there is almost no evidence of materials later than the construction of the floors, except for a very few finds, most probably related to the final abandonment and dismantlement of the buildings.

⁵²⁰ Bonetto 2009b: 151.

⁵²¹ Bonetto 2009b: 146-149; Agus *et al.* 2009: 856-857.

⁵²² Bonetto *et al.* 2009c: 49.

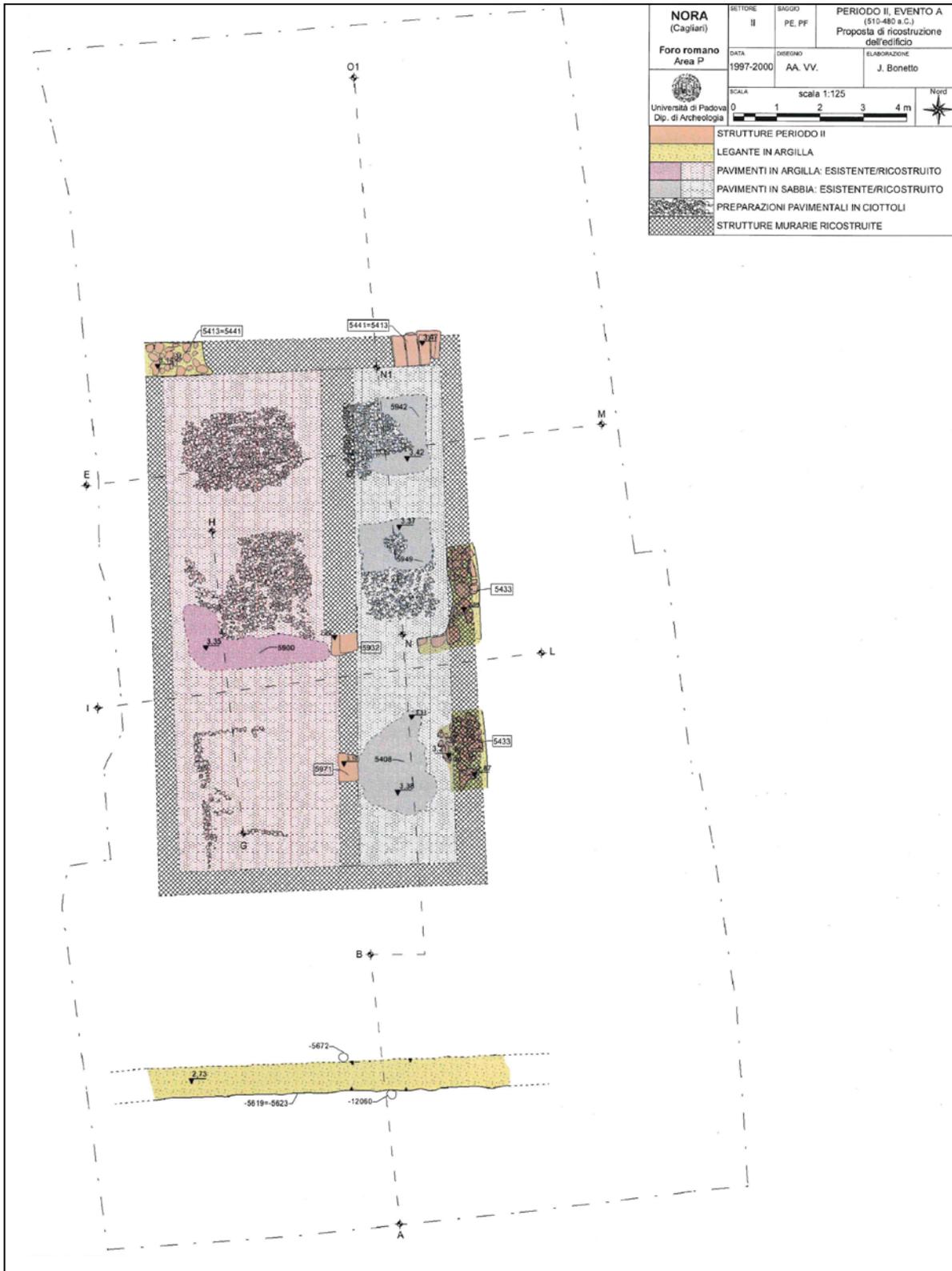


Figure 110: Nora, forum area: Punic religious site and location of floor 5408.

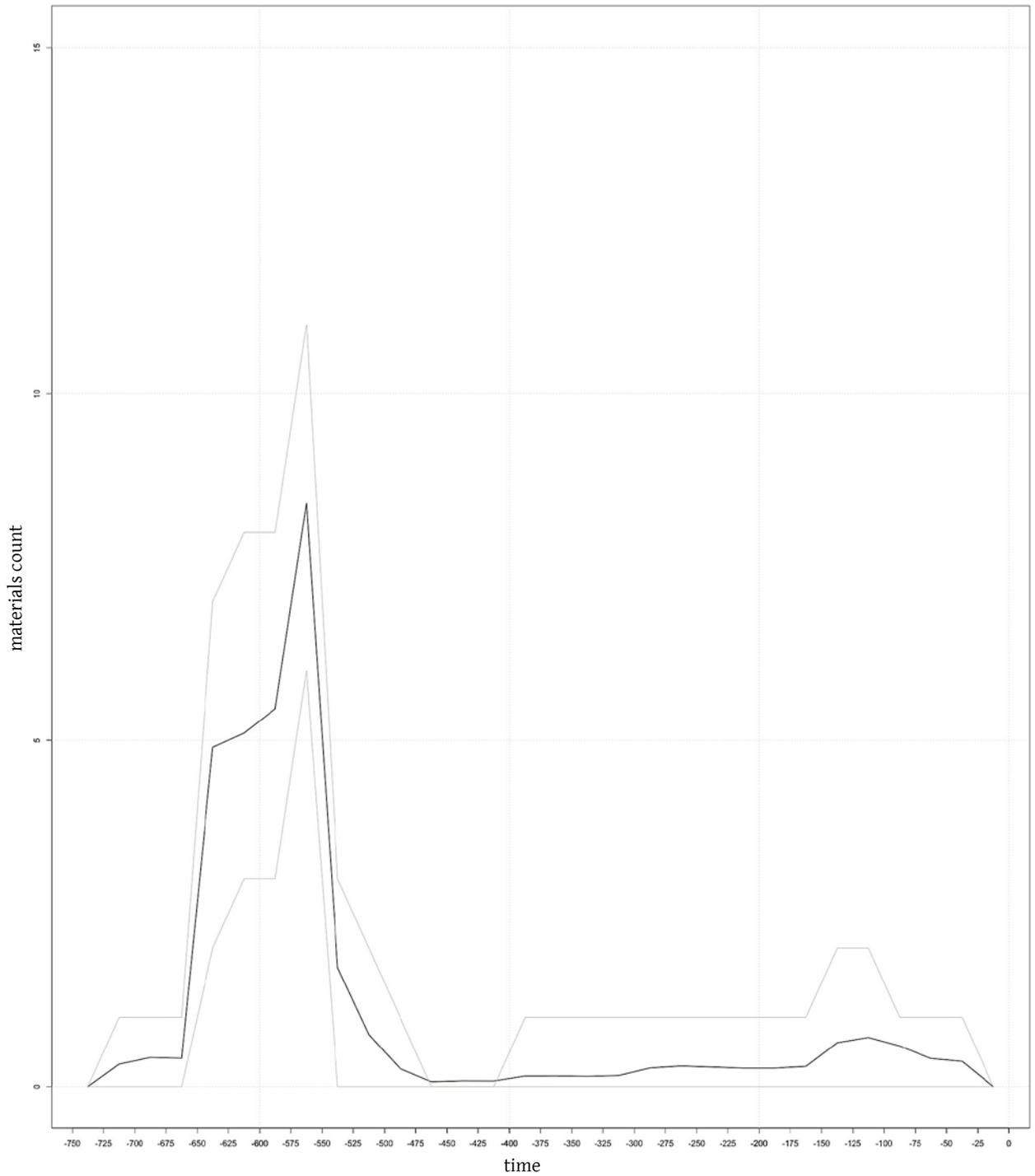


Figure 111: Nora, Punic religious site in the forum area: profile with 25-year brackets of the assemblage provided by the earth and pebble floor.

Profile

Given the accuracy of the dates provided (25 years at most), only two profiles are proposed, the first with 25-year brackets, the second with 50-year brackets (Figures 111, 112). No modifications were applied to the dates.

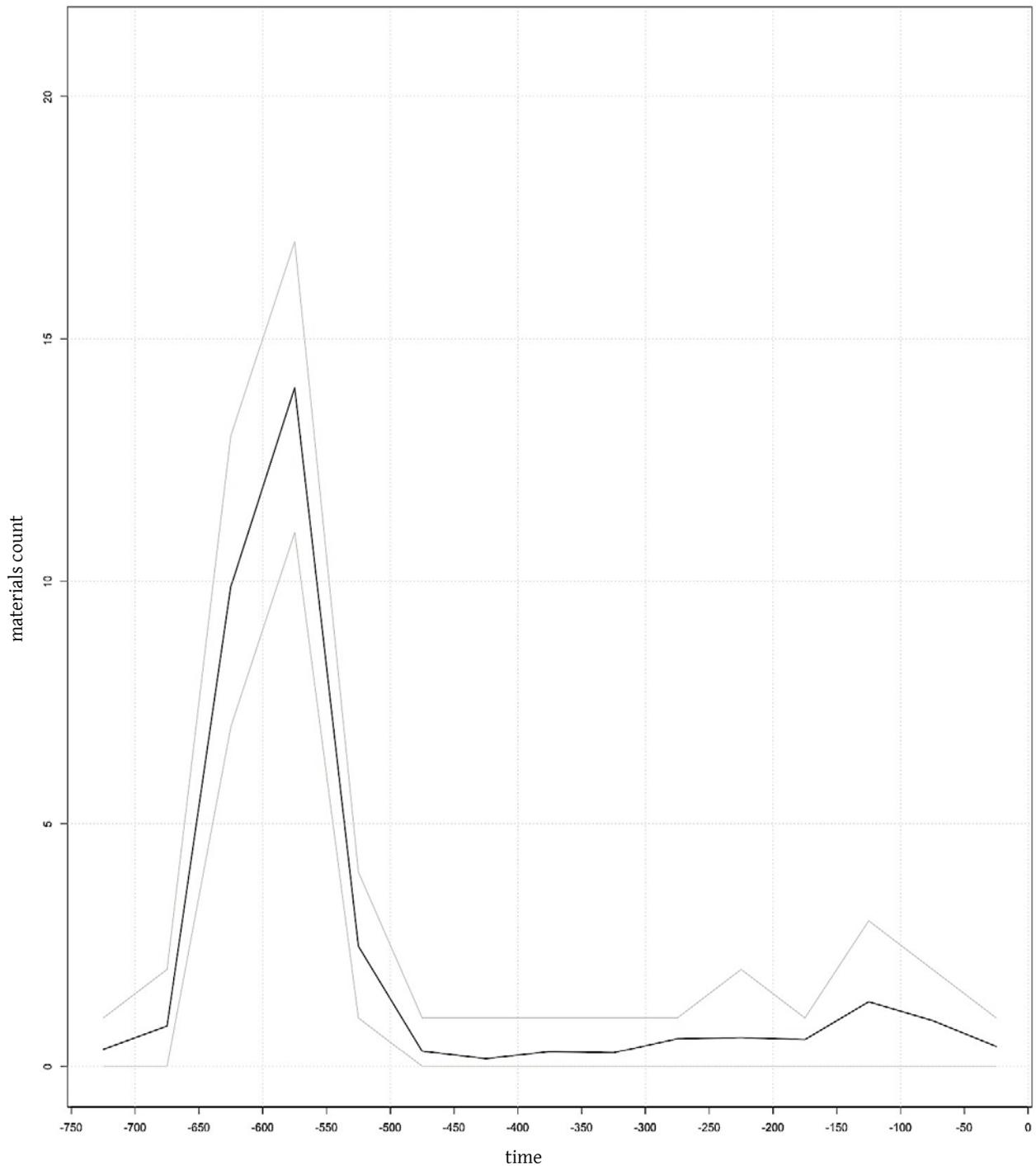


Figure 112: Nora, Punic religious site in the forum area: profile with 50-year brackets of the assemblage provided by the earth and pebble floor.

Discussion

The trend of the profile presents some peculiar aspects. It is bimodal, as in the case of the floor of the Auditorium Villa (although in both cases one of the two peaks is quite nuanced), but in this case the vast majority of finds is clustered around the most ancient peak. What is most striking is the substantial absence of evidence pertinent to the period between the 5th and 2nd centuries BC. Three main factors may play a role in producing this trend :

- (1) the relatively low number of dated artefacts as a whole;
- (2) the presence of large bodies of undated Phoenician/Punic pottery, whose actual dates may substantially soften the bimodal distribution that emerged;
- (3) the peculiar function of the floor: being related to a religious site, no substantial amounts of systemic items are expected to be embedded into the floor, as no practical activity is expected to have occurred within the building when this was in use. The more recent items may be related to the moment when the building was heavily refurbished.

Indeed, what emerges from the examination of both the case studies presented is the necessity of further investigations concerning this deposit typology. Although a characteristic trend cautiously seems to appear, more substantial bodies of data and case studies are certainly needed. However, the potential for detailed chronological analyses exists for these contexts. Again, it would have been interesting to compare quantitative data with the depth at which different groups of artefacts were actually recovered.

Date proposed

A construction date is proposed of 525-475 BC, with use until around 50-25 BC.

IV.5 Secondary deposits

IV.5.1 Definition

In Chapter II.2.5, a secondary deposit is defined as a deposit whose assemblage largely or completely belongs to a systemic context previous to the one in which the deposit was formed. This means that the recovered assemblage most probably has nothing to do with the formation of the deposit, and even less with any activity carried on, for instance, on its surface (in a word, with its function). One of the simplest and clearest examples is represented by the building of a typical ditch and rampart earthwork (this example is usually picked to explain the meaning of ‘reverse stratigraphy’): the layers forming the rampart have most probably been obtained through the excavation of the nearby ditch, together with any material possibly embedded. These materials do not inform us of when the rampart was built, what its function was or the activities carried on in it. The only chronological information we can gain from the assemblage is a *terminus post quem*, a moment after which the rampart was built; indeed, according only to the data obtained through the excavation and the examination of the assemblage, the construction of the rampart may have taken place 5, 10, 100 or even 1000 years later than the *tpq*. If no systemic materials were intentionally or accidentally added to the assemblage, all the materials recovered are probably residuals.

May the assemblage be so close in time to the formation of the deposit to be considered, according to the accuracy of our observations, contemporary, thus allowing any *ad quem* date? Of course it could be.⁵²³ The point is that we do not know.

This category groups all those deposits, probably the vast majority, that cannot be safely dated *ad quem*, because we do not recognise with some confidence the presence of any systemic material, which may well have never been part of the deposit. In other words, we cannot establish a solid link between the date provided by the assemblage and the date of formation of the deposit. In these cases, we must be satisfied with a *terminus post quem*.

Once the presence of intrusions has been ruled out, we may also postulate that the more ancient a given material is in respect to the *terminus post quem*, the more it is probable that it is a residual. The closer we

⁵²³ Bigliati, Coletti 1998.

get to the *tpq*, the more the chances that a given material was a false residual or a contemporary material rise, but, again, we cannot be sure. That particular artefact, bone or sample may also have been a residual.

It emerges that two main factors are important to define these deposits: redeposition and time. Redeposition is the main factor that causes the entry of older materials into more recently formed deposits. Time is the second key factor; we must establish the duration between the first deposition of a single material (or a whole assemblage) and its redeposition. Three circumstances can occur:

- (1) the time length can be short (according to the accuracy and scale of our observations);
- (2) the time length is long; and
- (3) it is impossible to estimate this time length.

When the first requisite is satisfied, the deposit is a definite primary one; if the second or third cases occur then the deposit has to be considered secondary.

The typical trait of these deposits is the presence of residuals. Although they do not provide direct information about the formation date of the deposit, they can cast some light on other issues, which have been listed in Chapter II.2.5 as:

- (1) the formation processes themselves;
- (2) the original basin(s)/catchment areas;
- (3) trade, economy and activities within a site as a whole; and
- (4) undetected or lost phases.

Among these, the first two assume some importance in strengthening our formative models, which are, still, a necessary step in the dating game.

For instance the presence of residuals of different ages may suggest that different basins were notched (intentionally, say for catching sediments of a given quality, or not) or that superimposed strata, belonging to different occupational phases, were cut and redeposited (see, e.g., the typical case of a foundation trench). We have also seen that peculiar physical characteristics of these materials may even suggest the spatial location of the original basins.

IV.5.2 General expectations

As usual, it is very convenient to keep the quantitative and qualitative characteristics of the assemblage separate. Looking at the quantitative characteristics that should be displayed by the assemblages contained in these deposits, it can be expected that basically any kind of profile is likely to occur, according to the basins which have been cut. Some of these profiles are surely typical of this category of deposits, while others are shared by other categories.

Secondary deposits may display a profile similar to primary ones, namely a unimodal distribution. This may be the case for re-deposited primary deposits. This is, in fact, a scenario quite difficult to detect, as every original characteristic may have remained unchanged. This occurrence may not be very frequent, but sometimes it may be assessed. Secondary deposits may display a unimodal, and even narrow profile, for other reasons too; e.g. only one further ancient basin, primary or secondary, may have been cut to provide the needed sediments, which were eventually redeposited in new forms. In Aquileia, at the 'House of *Titus Macer*', most of the robber trenches located in the western part of the dwelling (see below) cut the deposits related to the construction of the house and to the last phase of occupation. The first deposits being not very rich in artefacts, and regular clearance, maintenance and cleaning activities preventing, over the following centuries, the formation of any deposit, the last period of occupation is by far the most represented, thus entailing the formation of curves, imitating those produced by primary deposits with some 'tails' of residuality.

In these cases the comprehension of the nature and function of the deposit is fundamental to avoid any mistake.

Similar considerations arise where secondary deposits assume the shape of a primary deposit with a wide profile (i.e. with a continuous formation). Indeed the two may be identical and, again, understanding what we are excavating is essential, and keeping in mind that primary deposits with continuous formation (see the section on dumps) are usually most likely located in certain places may be of some help.

There will also be clearer examples, where neat, well-separated pikes define a multimodal curve, which in turn will strongly suggest that we are dealing with a secondary deposit originating from different basins, each one containing different assemblages. This may be more frequent where deep trenches are cut in long-lived settlements, and where the resulting sediments are preferred for backfilling the trench itself, say a foundation trench. In these instances, the 'new' assemblage should be the sum of the older assemblages affected by the excavation of the trench and may be representative of the main occupation phases witnessed by the site.

If on the one hand the shape of the profiles obtained through a Monte Carlo simulation or other methods is somehow difficult to process, on the other there are two further quantitative parameters that might be particularly helpful in detecting the secondary nature of a given deposit:

- (1) a significantly long time-span covered by the assemblage, particularly for small deposits;
- (2) a substantial time distance between the main peak displayed by the assemblage and the *terminus post quem*.

In both cases intrusions and the intentional or accidental addition of materials should first have been reasonably excluded.

Moving to the qualitative characteristics of the assemblage, it has already been discussed how some parameters (such as fragmentation, conjoinability and wear) cannot be considered as solid discriminants. High rates of fragmentation and low conjoinability, in particular, may also characterise primary deposits. Inhomogeneity in wear, with particular focus on potsherd fractures, may represent a substantial clue, suggesting that some redeposition occurred after a substantial length of time; nevertheless, homogeneity by itself does not necessarily imply that redeposition after a long interval did not occur.

As observed in Chapters III.4.1 and III.4.2, the information provided by these parameters can strengthen our thoughts that we are dealing with a secondary deposit, but they cannot be used, alone, to reject this hypothesis. More indications may come from the spatial arrangement of the assemblage: this should be somewhat chaotic in appearance, as redeposition of both materials and sediments will have occurred. In particular, the 3D orientation of each single find could be different, and horizontal find positions may not even be the majority. Coarse, friable deposits, however, can display preferential orientations due to redeposition (see the case of redeposited rubble). In these cases the quantity and quality of the geogenic matrix will play a fundamental role.

If we turn to the characteristics of the deposit as a whole, we can notice that, in general, secondary deposits entail the redeposition of sediments or rubble. This, in urban environments, often takes place for building purposes or simply for restoring a plain surface. In the first case, in particular, we may sometimes expect the use of specifically selected sediments, or at least sediments with sufficient mechanical characteristics. In any event, it seems unlikely that highly organic sediments were used, as the degradation of organic matter entails a volume loss that definitely works against stability. This very simple observation is, by itself, of use, as most of the primary deposits are, on the contrary, almost matrix-less (P.P.3, P.P.6), or connected with dumping activities, and therefore often characterised by organic matrix (P.P.1, P.P.4, P.P.8, P.C.1). Others (P.P.2, P.P.5, P.P.7, P.C.2) are very peculiar and easily recognisable. Redeposition of 'pure' rubbish after a substantial period seems somewhat unlikely, but of course it may occur.

Some problems may arise with redeposited rubble, which may remotely have the appearance of *in situ* collapse debris, although, in any event, what is primary and what draws the attention, in cases of collapse, is what is preserved beneath the debris, more than the debris itself. Both where it is *in situ*, or has been redeposited, it is worth repeating that rubble is particularly affected by intrusions, being characterised by empty spaces that may have been easily filled by upper sediments.

Of course, in all these instances the matrix is not very helpful for distinguishing a secondary deposit from a mixed deposit with systemic materials, accidentally or intentionally added. Where none of the proposed parameters are satisfied, the studied deposit should be considered a secondary one.

IV.5.3 Dating

These deposits can be dated, through the embedded assemblage, with a mere *terminus post quem*. Any attempt to close the other extreme of the chronological window basically relies on other external sources, such as historical considerations, general cultural or archaeological knowledge, the presence (up in the sequence) of *termini ante quem*, or simply personal confidence. In any event, it can be strongly claimed that the two issues should be kept separate, and it should be explicitly stated exactly what the assemblage says and what is provided by other sources.

IV.5.4 Formative typology

A formative typology of secondary deposits may certainly be extremely large, as they usually represent the vast majority of excavated sequences. Among the main categories in which we ‘taxonomise’ the totality of deposits, this is the one which may be most enriched by new types. What follows, therefore, has to be considered as a first outline and provisional subdivision, not expected to contain every possible case. The types listed are some of the more common ones, which are part of the record produced by almost every Classical (and non-Classical) urban environment, i.e.:

- S.1. Robber trench backfills
- S.2. Foundation trench backfills
- S.3. Re-deposited sediments for building purposes
- S.4. Generic cut backfills
- S.5. Wall groundworks
- S.6. Post pit backfills B
- S.7. Post hole backfills C
- S.8. Re-deposited rubble

S.1, Robber trench backfills⁵²⁴

Robber trenches are one of the most common features in any urban environment and they are, although not exclusively, typical of post-Classical activities. They are usually related to the removal of structures, particularly walls, but they can also have been dug to remove other reusable or recyclable things, such as lead water pipes. Where walls, thresholds or floors were dismantled, the intention usually was the re-use of the building materials or their calcination (e.g. the limestone). Trench excavation enabled the recovery of the lower parts of the walls, mostly their foundations, and, when removing these parts, the nearby sediments were also partially excavated. Trenches may then have been left open or, more often, they were backfilled to recreate a level surface that could be traversed. The easiest way to backfill the empty spaces resulting consisted of reusing the excavated sediments and the unusable part of the rubble removed.⁵²⁵ In this case the quality of what was used to backfill the trench was not particularly important, as usually no immediate static role was required. It follows that the intentional addition of some materials

⁵²⁴ Fundamental is Biddle, Kjølbye-Biddle 1969.

⁵²⁵ Biddle, Kjølbye-Biddle 1969: 213-214.

can be considered unlikely. On the contrary, accidental loss of systemic materials, particularly when the dismantling work went on for a long period, may have been more likely to occur.⁵²⁶

The physical state of the assemblage is expected to be fairly heterogeneous (sherd size, wear, blackened and non-blackened pottery, etc.) while the matrix is expected to be comparatively soft. If different original basins turned out to be mixed, the matrix texture, in general, may tend to be loamy; some internal stratification may well be observed, and this could lead back to single shovelling/filling episodes.

The bulk of the recovered materials should roughly reflect, chronologically, previous settlement occupational trends. A good impression of the typical assemblages recovered in the robber trenches of a densely settled urban environment can be drawn, for instance, from the reports of the excavations at Carthage carried out by the British mission (Circular Harbour)⁵²⁷ and by the University of Michigan (Avenue Bourguiba).⁵²⁸ In both cases, the recovered assemblages are notably large and markedly heterogeneous in typological and chronological terms, with an extremely high ratio of residuals.⁵²⁹ In the area east of Avenue Bourguiba it was possible to detect major robbing episodes in different phases (until the 19th century) and to appreciate the strategy used by the robbing parties.⁵³⁰

In general, what is sketched above is just a simplistic description of the main activities involved, and actual ancient processes may have been much more complicated. Other materials may well have been buried and more substantial spatial displacement may have occurred, together with more mixing.

One important issue concerns these deposits in particular: they seem to be quite susceptible to intrusions, because they were most probably left exposed and because of their internal structure, which is likely to have displayed some empty spaces. Occasional loss of items may also have occurred during their formation. The distinction of the two cases seems to be very difficult. Recording during the excavation the precise position and conditions of those materials which, at least at first sight, are likely to be the more recent may be helpful (clearly, in Classical Archaeology it is not common practice to record the precise spatial recording of each single artefact); a recent sherd on the bottom of a trench, lying sub-horizontally, may have been accidentally lost while the trench was empty, leading even to some *ad quem* dating of the backfill, if no evidence that the trench remained open for long is detected. If recovered in proximity of the top of the backfill, the same sherd may have been, more likely, a later intrusion.

The case of backfills made of allochthonous materials and/or sediments should be relatively easy to discern.

5.2, Foundation trench backfills

Foundation trenches are another very common feature in built-up areas. These trenches are excavated in soils and sediments to lay down the foundations of the walls that will define a building (Figure 113). This is not the place to discuss all the different building techniques favoured to lay foundations in Classical times. Here, rather, we are referring to the very simple case represented by a trench in which some foundations were laid down and whose resulting empty space was then backfilled with sediments. These may have been selected according to their mechanical and/or hydraulic properties, or been simply the same sediments produced by the excavation of the trench.

In both cases, any sherd, bone or charcoal piece recovered within the deposit was most likely already embedded in the sediments (Figure 114). The case of materials intentionally added has already been

⁵²⁶ Certainly the scheme proposed may be much more complicated. For a mixture of human and natural agents producing the backfill of a robber trench, see Arnoldus Huyzenveld, Maetzke 1988: 155-159.

⁵²⁷ See Hurst 1994: 133 and Fulford 1994: 101.

⁵²⁸ See Riley 1976: tables 14, 15.

⁵²⁹ See also Ceci, Santangeli Valenzani 2016: 23.

⁵³⁰ Brown *et al.* 1976: in particular 3-4.

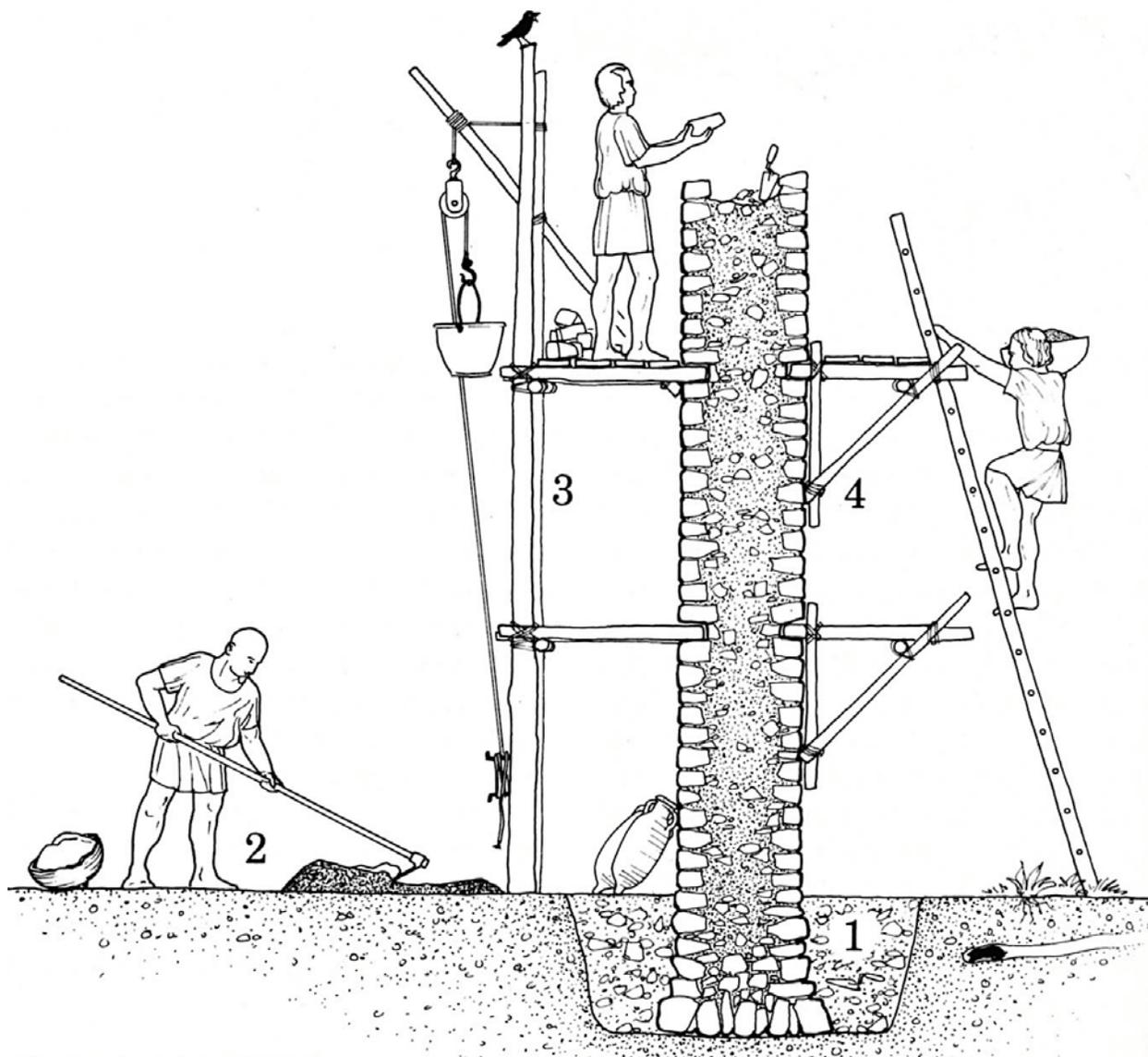


Figure 113: A foundation trench and its backfill, numbered 1 (Adam 1994).

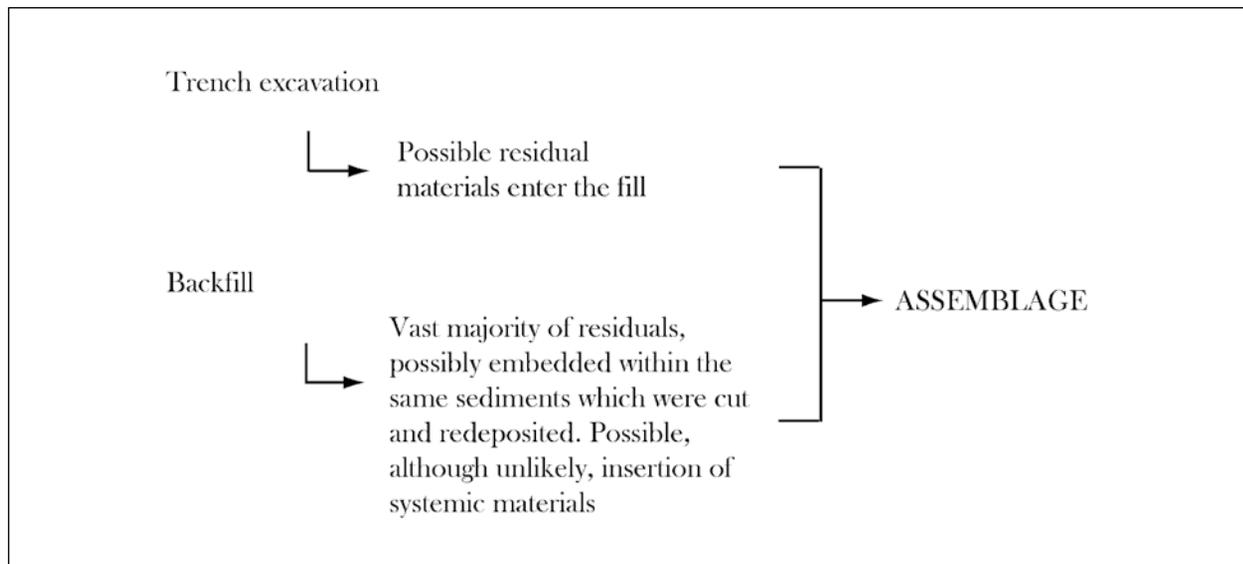


Figure 114: Possible model for the formation of the assemblage of the backfill of a foundation trench.

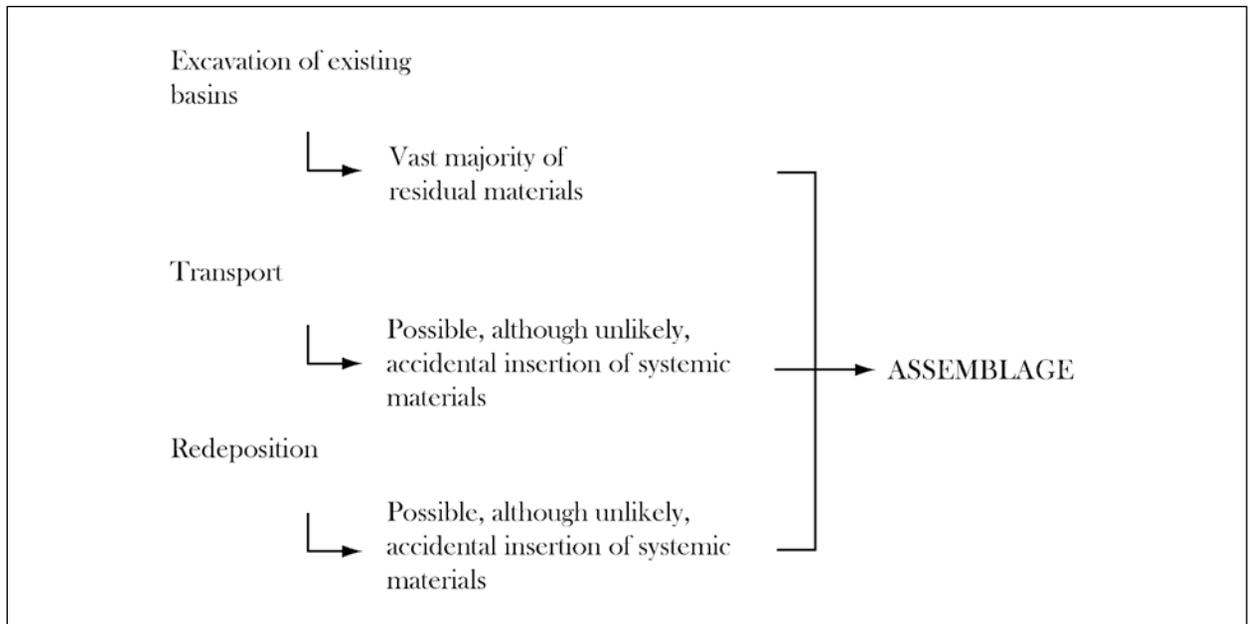


Figure 115: Redeposition of sediments and materials: a possible model for the formation of the assemblage.

discussed, while, as usual, the accidental loss of systemic material seems at the same time unlikely and difficult to demonstrate (see, however, robber trenches above).

Contrary to robber trenches, foundation trenches were usually not left exposed for long (most of the times they were soon covered by a floor or its preparatory layers where roofed spaces are involved, or by other sediments for external spaces). This makes them less susceptible to intrusions, apart of course from when later ‘disturbances’ might have occurred.

Variability in the physical state and quantitative profile of assemblages, as well as matrix characteristics, seems to be very high, according to the original basins cut.

S.3, Re-deposited sediments for building purposes

In this instance, as in every secondary deposit, redeposition is involved. This happens when sediments are redeposited on a given area (basin) in the process of further building activity. Some of the most common reasons for this to happen may be the necessity of obtaining a flat, plain surface, or raising the ground level, or a combination of the two; floor make-up layers are indeed the most typical deposit of this kind. In this case also, sediments may have been selected according to their mechanical and/or hydraulic properties or simply having been the most easily available.

Heterogeneity, also in this case, may be characteristic of both the qualitative and quantitative traits of the assemblage (Figure 115).

S.4, Generic cut backfills

Almost any cut, whatever its purpose was, implies sooner or later its own (back)filling. Many interfaces are detected in any excavation, and some of them may elude any precise interpretation, together with their backfills. This may be the case with pits dug perhaps to procure, say, clayish sediments for other buildings (quarry pits), or small or large cuts made to carry away something which we cannot now know. Or they may simply be holes we cannot safely connect to the presence of posts or any other feature. In all these instances, in which the very interpretation of both the cut and backfill is unclear, once having evaluated the issue of intrusions, only a *terminus post quem* can be provided by the assemblages recovered. In any event, these deposits should not be the key elements for building up an overall chronological

framework for the excavation. Conversely, they will in the end benefit from the information provided by the general framework of which they are part.

S.5, Wall groundworks⁵³¹

Wall groundworks represent just a sub-group of the wide range of sediments redeposited for building purpose. In this case, however, their specific function is quite clear and the use of selected sediments is much more probable. These deposits are relatively well known in the field of Roman archaeology, particularly thanks to the growing interest in Roman building techniques and architecture. From a formative point of view they can be treated as any other secondary deposit, but the possibility that some materials were intentionally added to improve the mechanical or hydraulic characteristics of the sediments seems somewhat higher (see M.Ai.2, Chapter IV.4.4). These sediments may have been laid down directly on the ground surface or within a more or less large trench, but for dating purposes this makes no difference.

S.6, Post pit backfills B

The very rough subdivision into which features connected with the presence of a post can be classified has already been proposed in Chapter IV.2.4. In this case we focus on what has been named ‘post pit backfill B’ (Figure 116). It is the sediment used to fill a post pit once the post had been put into place. The process is indeed the same as is involved in the construction of any foundation trench, but in this case it may be much less visible and neat (particularly where cut sediments are soft, thus facilitating wall collapse and substantial mixing) and particular care must be devoted in the field to detect it. Along with sediments, the insertion of stones or pebbles in the pit, for packing the space and making the structure firmer, is a fairly common practice.

The assemblage contained in this kind of backfill *de facto* provides a *terminus post quem* for the installation of the post, as the empty space of the pit is supposed to have been filled right after the post was installed. As usual, the simplest and most effective way to backfill the hole consists of redepositing the sediments excavated for the pit, but other sources may be used and sediments may also have been selected according to specific properties; in any event the materials possibly embedded within the redeposited sediments are most likely residuals.

S.7, Post hole backfills C

This is the last of the three main categories into which the features linked with the presence of a post have been subdivided. In this case, we focus on the backfill of the post hole (Figure 117). This involves the post being removed after use; it follows that the basic process behind the formation of these deposits is the same as the formation of the backfill of a robber trench. Anyhow some important differences

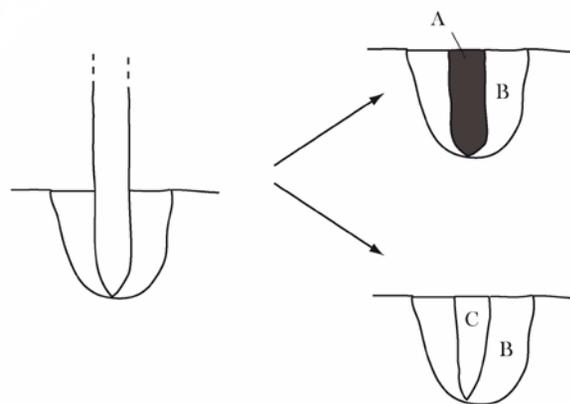


Figure 116: Post pit backfill B.

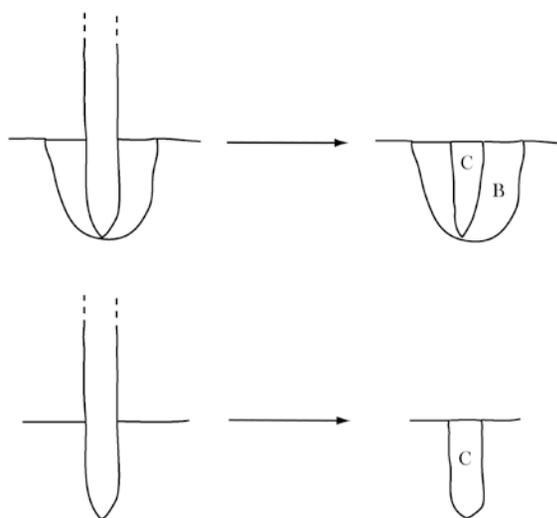


Figure 117: Post hole backfill C.

⁵³¹ For the specific case of Aquileia, see Previato 2012.

are detectable. First, the post may have been simply removed, thus no actual excavation was made. Moreover, once it was done, some substantial mixing may have occurred according to the consistency of the walls exposed. If the post was small and the post pit backfill was soft, backfilling the post hole may have been unnecessary, thus making this case very difficult to detect, particularly compared to the case discussed above (S.6). Again, the major problem is one of field legibility; where this kind of backfill can be detected with some confidence, the assemblage possibly recovered suggests a *terminus post quem* for the dismantlement of the post, thus providing valuable information about the abandonment (or refurbishment) of a timber structure.

S.8, Re-deposited rubble (and loose stone foundations)

Rubble derived from dismantled buildings or other demolition activities is fairly common in urban environments. Demolitions may occur in connection with major episodes of destruction due to military events or natural phenomena, or they may occur during refurbishment activities of some kind; they can be left untouched or be relocated for new building works, whereas single materials can easily enter reuse and recycling mechanisms (see Chapter III.4.1).

Rubble redeposited *en bloc*, say to raise the ground level in a marshy area, or to terrace a certain slope, should be discernible from *in situ* debris, at least because beneath it no *in situ* compatible structures should be recovered. Moreover, its internal arrangement should appear chaotic and no preferential alignments should be detected. The assemblages recovered within these deposits, which may consist of large amounts of building materials, some of which may be datable, can provide, at most, a *terminus post quem* for their final deposition.

However, it has to be stressed that these deposits may contain many empty spaces and few sediments, particularly where masonry structures have been dismantled, and this makes them very susceptible to the presence of intrusions; indeed the chronological palimpsests displayed by the materials possibly recovered within the volumes occupied by these deposits may be highly complex, produced by an inextricable combination of original basins. The safest approach seems to consist in keeping what is certainly pertinent to the rubble and what may have been infiltrated from upper deposits in separate contexts. In any event, these deposits cannot be considered very reliable for dating purposes and may well be put aside until the general chronological framework for the excavation has been structured. They should be examined in close relation to the upper and underlying deposits.

Loose stone foundations are physically similar; they may display the same problems in dating, but they are likely to consist of very few datable materials (if any are present).

IV.5.5 Case study 1: a robber trench in the ‘House of Titus Macer’, Aquileia (S.1)

*Topographic and archaeological background*⁵³²

The deposit is located in the western part of the area investigated in the Fondi Cossar, Aquileia (Figure 118); the area had not witnessed previous excavations. The deposit was directly covered by a layer of rubble (see Appendix 2), which, in turn was lying directly beneath the topsoil. It represented the backfill of a shallow, large areal cut, which was most probably performed to remove an existing paving made of stone slabs and reused bricks, still surviving in two small pieces. The shape of the cut was irregular but roughly rectangular, thus suggesting the shape of the paving. This last one, laid down in the first quarter of the 5th century AD, was the product of larger activities of refurbishment involving the ancient *atrium*, located in this part of the *domus*. In particular, the new floor transformed the open space of the *atrium* into a larger courtyard.

⁵³² The deposit, excavated in 2011, is still substantially unpublished. Its investigation is reported in Furlan 2011, while a list of finds is provided in Dobrova 2011.

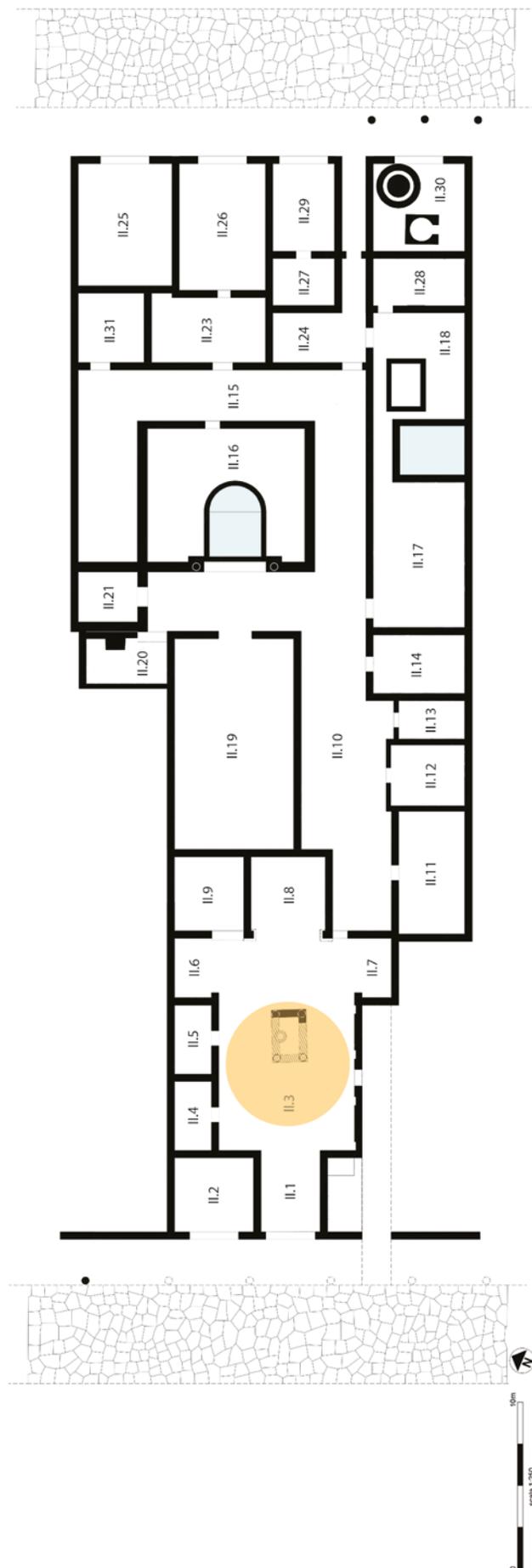


Figure 118: Location of the robber trench excavated in the ancient atrium, 'House of Titus Macer', Aquileia.

Deposit description

The deposit in question consists of a single context (namely US 3151), displaying a loamy/sandy, dark-brown matrix, with soft consistency. No internal stratification was observed, nor *laminae* or beddings; the materials were disposed chaotically. Given its consistency and location, the context may have been susceptible to some intrusions.

Apart from the dated finds, many fragments of bricks and tile *tesserae* were recovered, together with bones and shells. The bricks and *tesserae* may have originated from the partial destruction of surrounding floors, while some bones and shells may derive from the partial excavation of nearby small dumps (AD 425-475). A part of a marble column was also recovered.

Assemblage: physical state

The ceramic assemblage was heterogeneous in terms of sherds size, and wear was relatively homogeneous. No other peculiarities were recorded.

*The finds*⁵³³

Among the finds, amphorae body sherds were particularly numerous; accordingly, in general, the dates provided are somewhat broad. Nine coins and some fragments of African red-slip ware provide some narrower windows. As a whole, 203 items were plotted. It has to be stressed that the overall date range covered by the finds is very wide, the bulk of them ranging from about the 2nd century BC to the late 5th century AD. A *tpq* for the formation of the deposit is provided by the spike of an amphora Key 62Q, dated to the last quarter of the 5th century AD.

⁵³³ See the previous footnote.

Profile

Figures 119 and 120 provide two graphs, with 25- and 50-year brackets respectively. Given the quality of the find dates, a further graph with 10-year brackets was considered of no value.

Discussion

The shape of the curve is somehow irregular, presenting a main peak about 50 years before the *tpq* and another minor one at the end of the 2nd century AD. A long substantial ‘tail’ extends the profile back to the 2nd century BC. Being the main peak somewhat close to the *tpq*, it seems unlikely that it is the product of intrusions. Conversely, it seems more plausible that it was generated by the trenching of the deposits connected to the last substantial occupation of the area (see the dumping activities cited above).

The presence of fewer materials dated to the previous periods does not concern us overly as the common activities of cleaning and maintenance most likely kept the house surfaces fairly clean. Given this, it seems reasonable to ascribe these materials to ancient episodes of refurbishment and, for the most ancient ones, to the very construction of the house.

Date proposed

Terminus post quem: AD 475. The overall chronological framework and the relation of this deposit with others containing later materials, suggested a much later date of formation for the deposit; this can be safely dated after the 13th century.

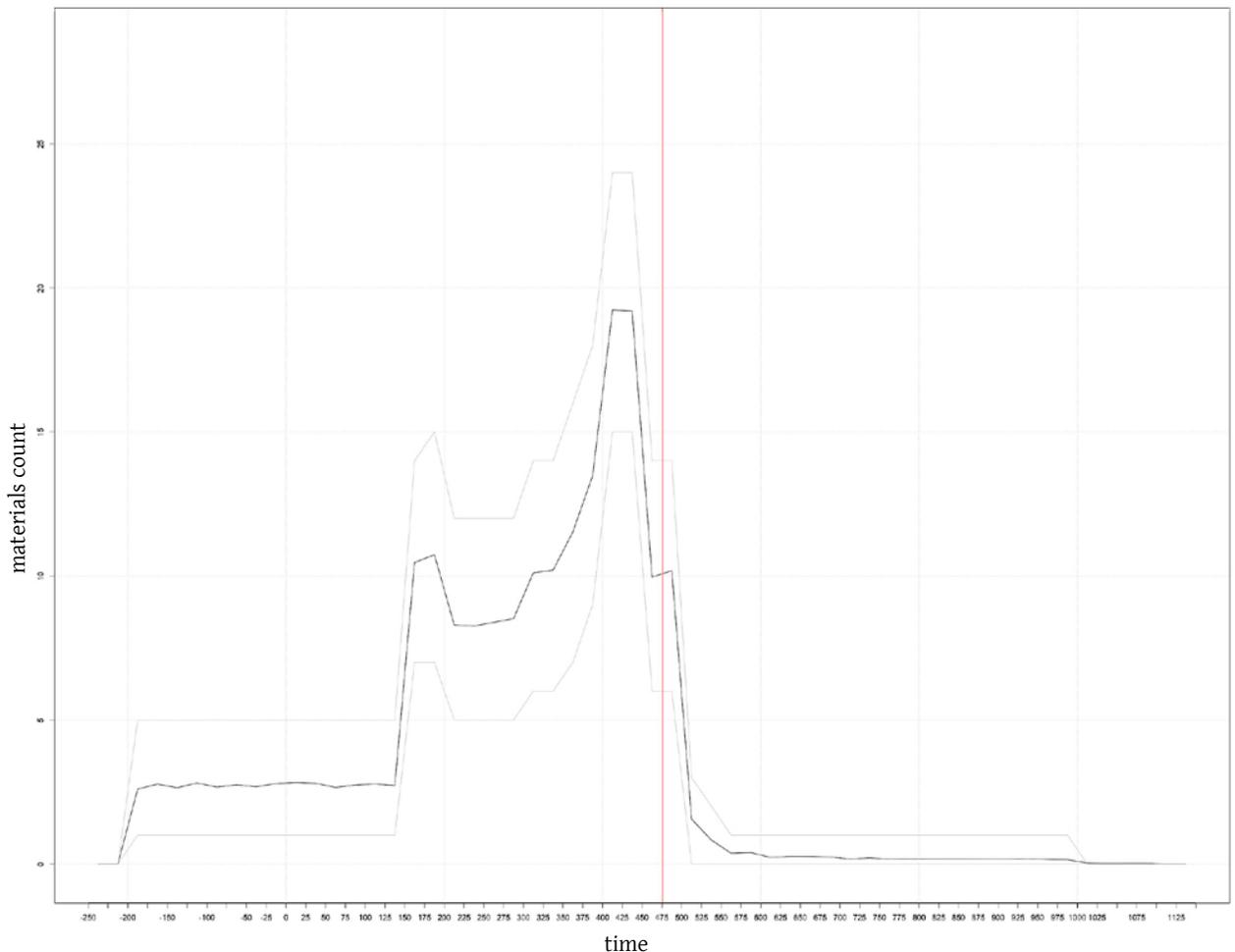


Figure 119: Backfill of the robber trench excavated in the ancient atrium, ‘House of *Titus Macer*’: profile with 25-year brackets of the recovered assemblage.

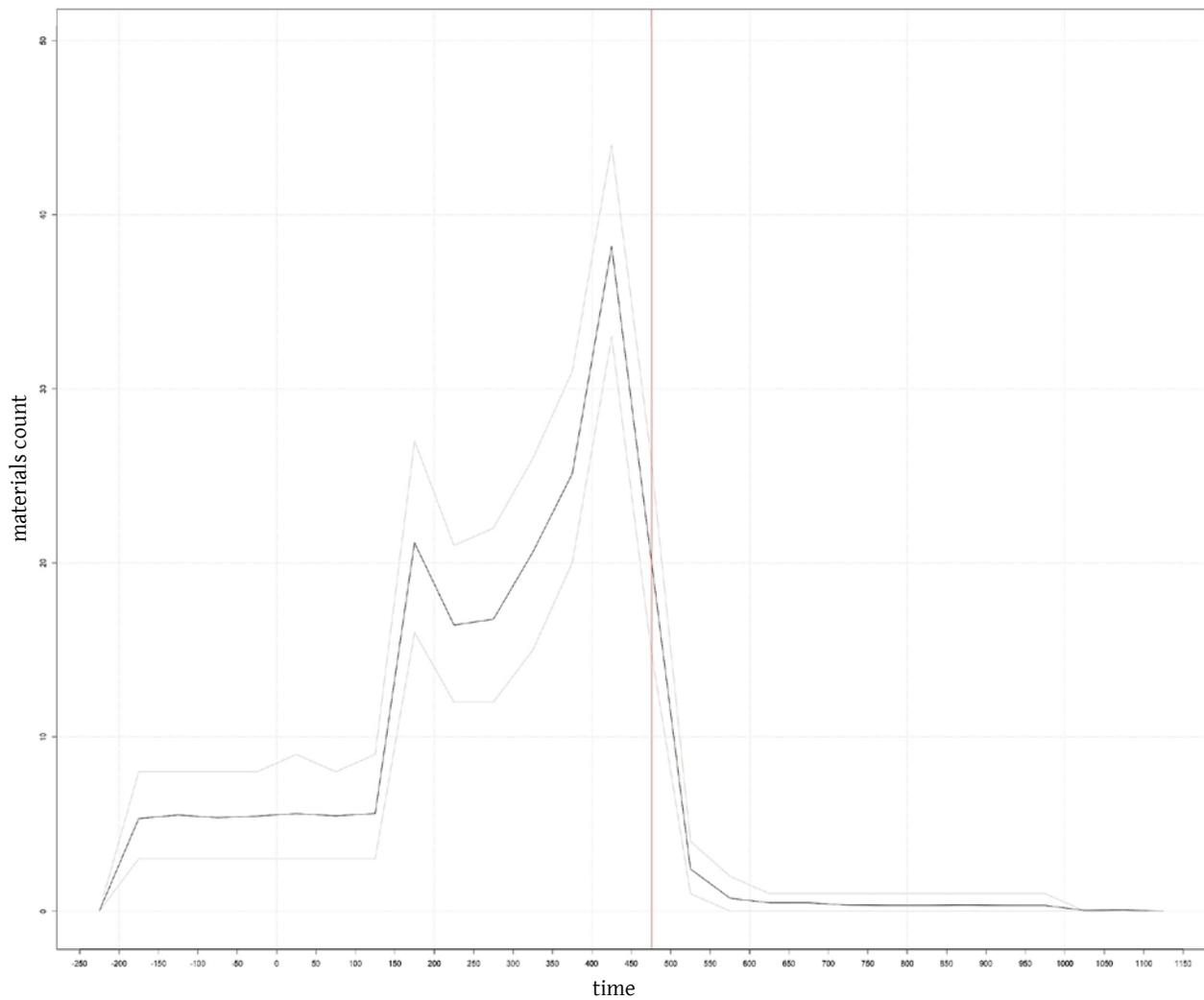


Figure 120: Backfill of the robber trench excavated in the ancient atrium, ‘House of *Titus Macer*’: profile with 50-year brackets of the recovered assemblage.

Duration

The backfill of the cut may have been a matter of hours or days at most. There is no evidence that it was left exposed for long (sharp, non-weathered sides, no ‘primary fill’).⁵³⁴

IV.5.6 Case study 2: the backfill of the foundation trenches of the forum temple of Nora (S.2)

*Topographic and archaeological background*⁵³⁵

As discussed to a greater extent in Appendix 2, the area of the forum of Nora was settled far before the construction of the Forum complex. This is also true for the area later occupied by the forum temple, which is thought to have accommodated a more ancient place of worship (see above, Chapter IV.4.6).

The new temple was laid down with the excavation of remarkable foundation trenches, where massive sandstone blocks were positioned to bear the weight of the upper structures (Figure 121). Some thin layers were laid down on the bottom of the trenches, where it was necessary to level the surface perfectly,

⁵³⁴ As discussed in Chapter II.2.5, the expression ‘primary fill’ does not often indicate a deposit with a primary status, but simply a deposit generated by weathering processes and then accumulated on the sides and/or bottom of negative features.

⁵³⁵ The construction of the temple is discussed in detail in Novello 2009, in particular 383-390 and 397-399. A list of the processed contexts is reported in footnotes 25, 26 and 38.

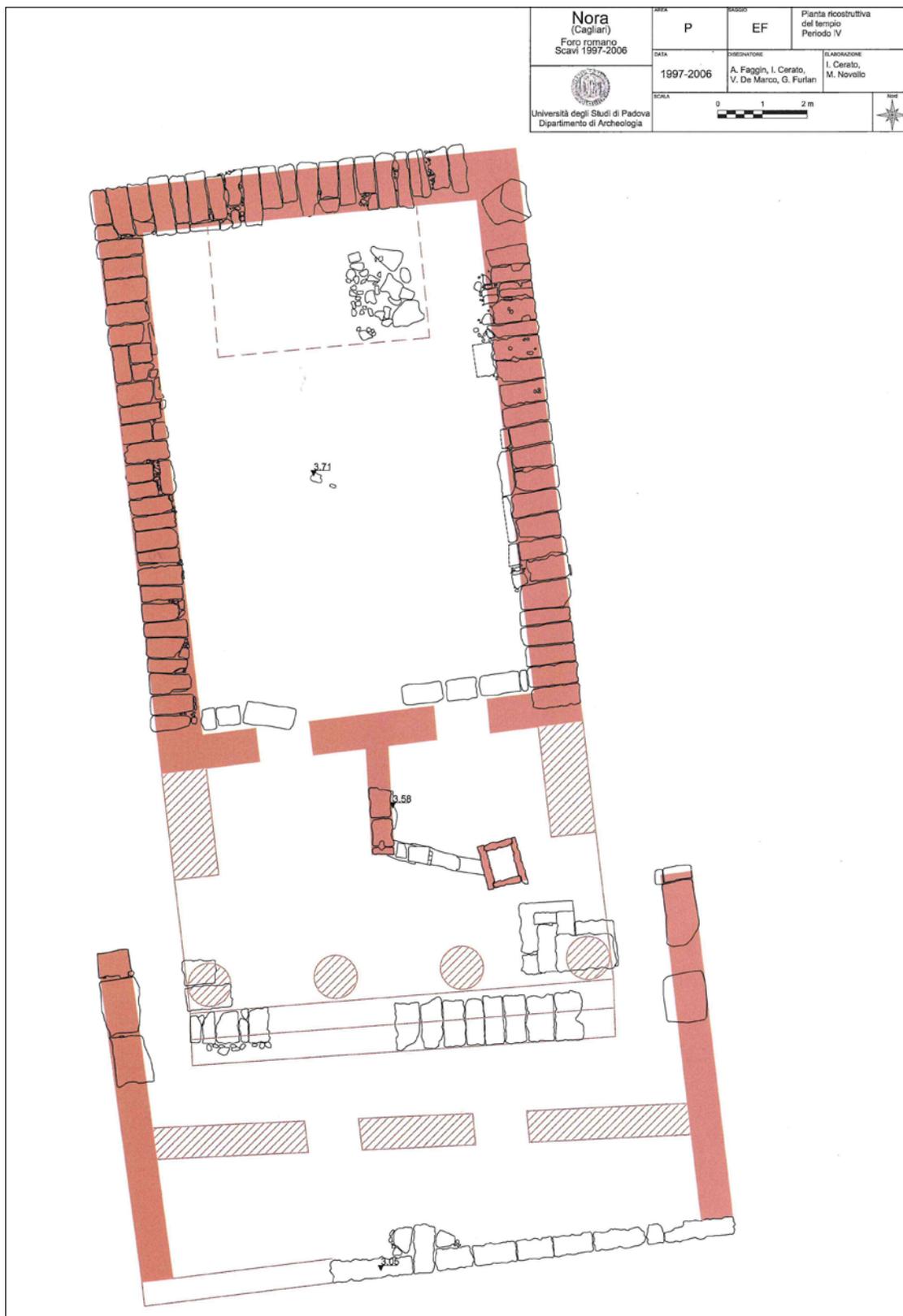


Figure 121: The forum temple of Nora: structural evidence and reconstruction (Novello 2009).

so as to place the blocks at the exact same height. The trenches were just a little larger than the blocks, but the empty space was in any event to be backfilled.

The backfill was most probably left untouched for a long period, until the structure was abandoned and almost completely dismantled. On this occasion some of the foundation blocks were also removed and the foundation backfill partially exposed and cut.

Deposit description

The examined deposit consists of all the trench backfills that produced any datable material; they include both the thin layers laid on the bottom of the trenches and the backfills deposited once the blocks had been laid down. The backfills are described as ‘non homogeneous material’, but no other information is provided.⁵³⁶

Assemblage; physical state

No information is easily available, although the drawings of all the diagnostic finds have been published.⁵³⁷

*The finds*⁵³⁸

The group of contexts returned only 36 datable finds. Many others were recovered, but no precise date was gained. The presence of numerous sherds catalogued simply as ‘Phoenician/Punic’ suggests that the overall residuality displayed by the assemblage is actually higher. Among the 36 dated finds, two were considered by the author as intrusions, mainly because of the overall chronological framework and that they were recovered in those contexts later exposed and excavated, therefore possibly subjected to some mixing.

Among the dated Roman material, thin-walled ware and black-glazed pottery (both local and imported) are the most represented classes; among the pre-Roman finds, kitchen and dining ware are the most popular. Very few bones (undated) and no coins were recovered.

It has to be stressed that the overall period covered by the dated finds is very wide, ranging about from the 7th century BC to the Roman Imperial age.

Profile

The first graph, plotted with 25-year brackets, shows the profile produced, bearing in mind the two pieces considered intrusions (Figure 122); it is followed by 25- and 50-year graphs, which do not consider the two possible intrusions (Figures 123, 124). This determines that the first graph displays a later, hypothetical, *terminus post quem* (red line).

Discussion

The curve displayed by the assemblage dates can be considered relatively typical of a secondary deposit whose materials come from different original basins. Indeed the presence of three neat, clear spikes, together with the formative model of this type of deposit, suggests that three basins were excavated. Of course we know almost nothing of the spatial location of these basins; they may have been physically separated but it seems more probable that they were simply superimposed, made of the layers cut by the foundation trench, and thus mirroring the previous activities carried out in the very area of the temple. The first circumstance (physically separated original basins) could be ascertained through a spatial analysis of the deposit, say context by context; if spatial patterning was observed in the investigated

⁵³⁶ The contexts examined are US 5400, 5622, 5747=5694=5705, 5858, 5975, 11519=11518 and 11521.

⁵³⁷ Bonetto *et al.* 2009a; Bonetto *et al.* 2009b.

⁵³⁸ A complete list of finds is available in Bonetto *et al.* 2009c: 125-137.

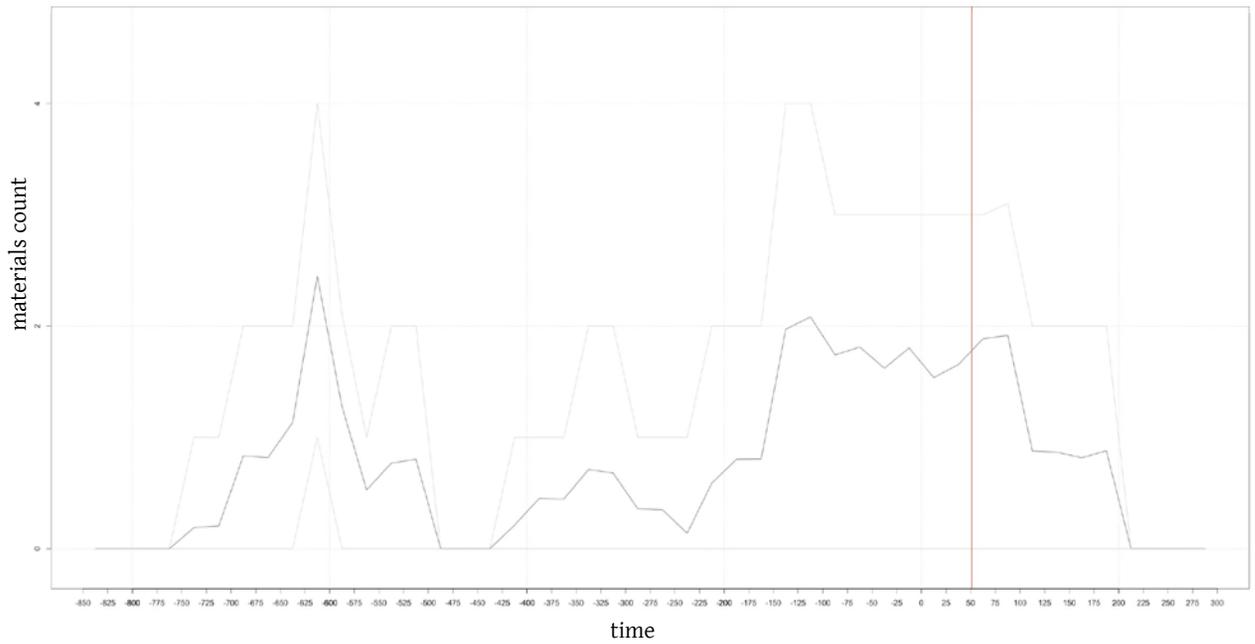


Figure 122: Forum temple of Nora: profile with 25-year brackets of the assemblage produced by the backfill of the foundation trenches. Materials considered as intrusions are included.

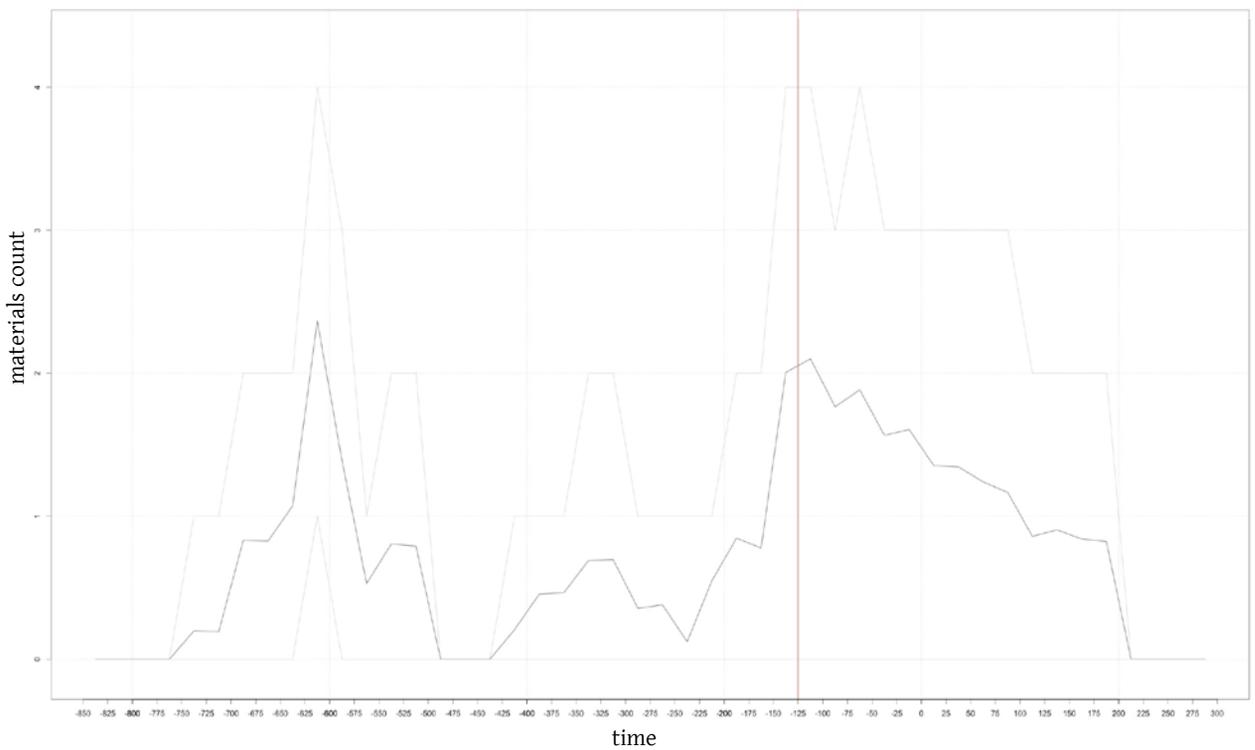


Figure 123: Forum temple of Nora: profile with 25-year brackets of the assemblage produced by the backfill of the foundation trenches. Materials considered as intrusions are excluded (note that the *tpq* red line has moved back to 125 BC).

deposit, and if it matched the chronological patterning observed in the graphs above, we may suspect that the three original basins were distinct.⁵³⁹

The first substantial peak indicates that strata with materials dated to the 7th-6th centuries BC were cut, while a second, smaller peaks suggests also that mid 4th-century materials were involved. In any event,

⁵³⁹ A similar procedure has been used by A. R. Ghiotto in Bonetto *et al.* 2017.

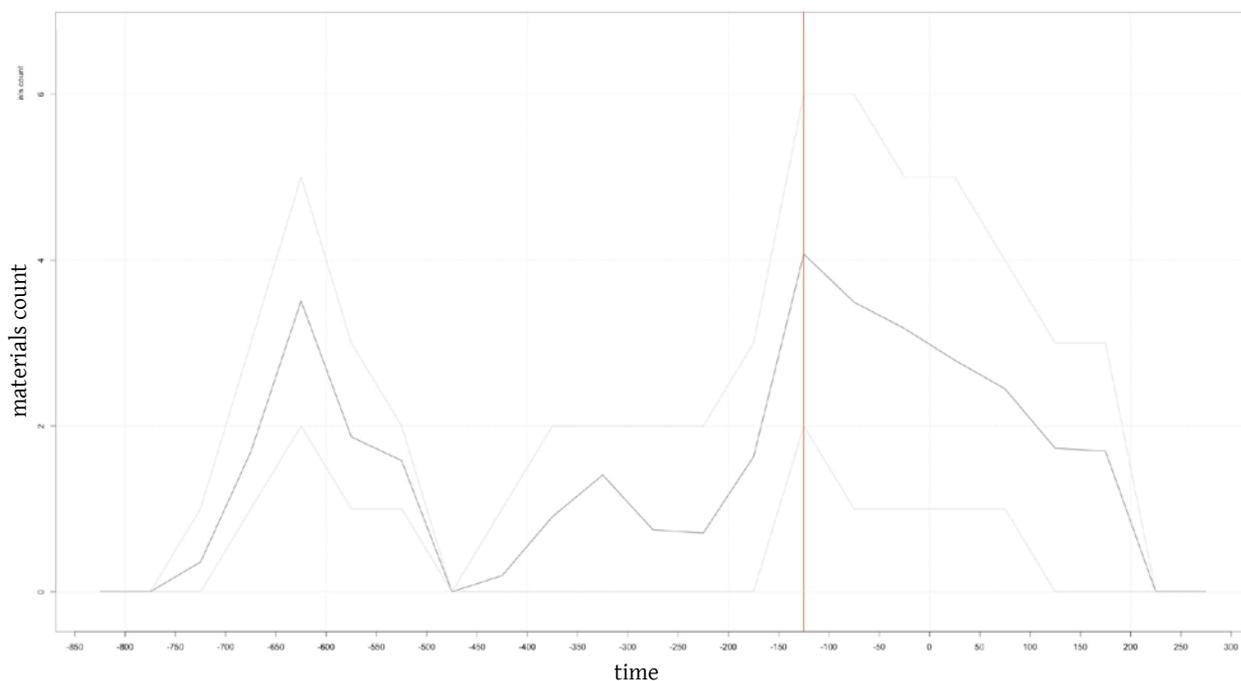


Figure 124: Forum temple of Nora: profile with 50-year brackets of the assemblage produced by the backfill of the foundation trenches. Materials considered as intrusions are excluded.

the bulk of the material recovered seems to be Late Republican and it may be linked to the last substantial activities performed in the area before the construction of the temple.

Date proposed

Terminus post quem: circa 125 BC. Indeed, the author’s proposal of dating the deposits to the early Augustan age strongly relies on external sources, primarily on the consistence of such a date with that proposed for the building of the forum square and porticoes.

Duration

The whole process of backfilling may have lasted for a few hours or it may have been spread over a longer time, according to the arrangement of the construction site.

IV.5.7 Case study 3: preparatory layers for the construction of the forum of Nora (S.3)

*Topographic and archaeological background*⁵⁴⁰

The construction of the forum of the city of Nora (Appendix 2) entailed the destruction of the more ancient Punic buildings in the area and the levelling of the surface, using both the resulting rubble and fresh sediments.

The upper levelling layers of the central area (the forum square) form a deposit of nine contexts.

Deposit description

The deposit is made of a mixture of allochthonous sediments and rubble derived from the destruction of the Punic buildings; in particular, a good amount of levelling material was provided by the *pisé* walls of the buildings themselves; they were most likely pulled down and then spread, combined, when necessary, with other sediments and compacted over the surface. The roofs of the Punic buildings may have played

⁵⁴⁰ The sequence is described in Ghiotto 2009: in particular 259-267 and 287-303. The case is also fully discussed in Bonetto *et al.* 2017: 70-75.



Figure 125: The upper preparatory layers for the construction of the paved square, forum of Nora (Ghiotto 2009).

a similar role. The resulting palimpsest was a thick, heterogeneous series of clayish layers containing chaotically disposed materials.

When, in later phases, part or the paving of the square was robbed, the underlying deposit was also partially cut and exposed, thus rendering it likely to be affected by intrusions (Figure 125).

Assemblage physical state

Although fragmentation was not documented in detail, it was noticed that sherds from different layers of the deposit were conjoinable.⁵⁴¹ Wear was inhomogeneous: some sherds, indeed, were visibly abraded and rounded by water, suggesting coastal deposits as a source of part of the material preferred.⁵⁴²

*The finds*⁵⁴³

The deposit provided a large assemblage and 452 datable finds were processed.

Profile

The graph is plotted with 25-year brackets (Figure 126); the red stripe indicates the time the forum was built.

Discussion

The profile provided by the Monte Carlo simulation shows a major peak between the 7th and 6th centuries BC. These materials most probably derive from the Punic walls and roofs, possibly also from

⁵⁴¹ Ghiotto 2009: 265, footnote 37, and 291, footnote 100.

⁵⁴² Bonetto *et al.* 2017: 74, with further references.

⁵⁴³ The processed finds belong to the following stratigraphic units: 5009, 5020, 5043, 5127, 5168, 5183, 5340, 11296, 11297. Their finds and related dates are provided in Bonetto *et al.* 2009c: 86-148.

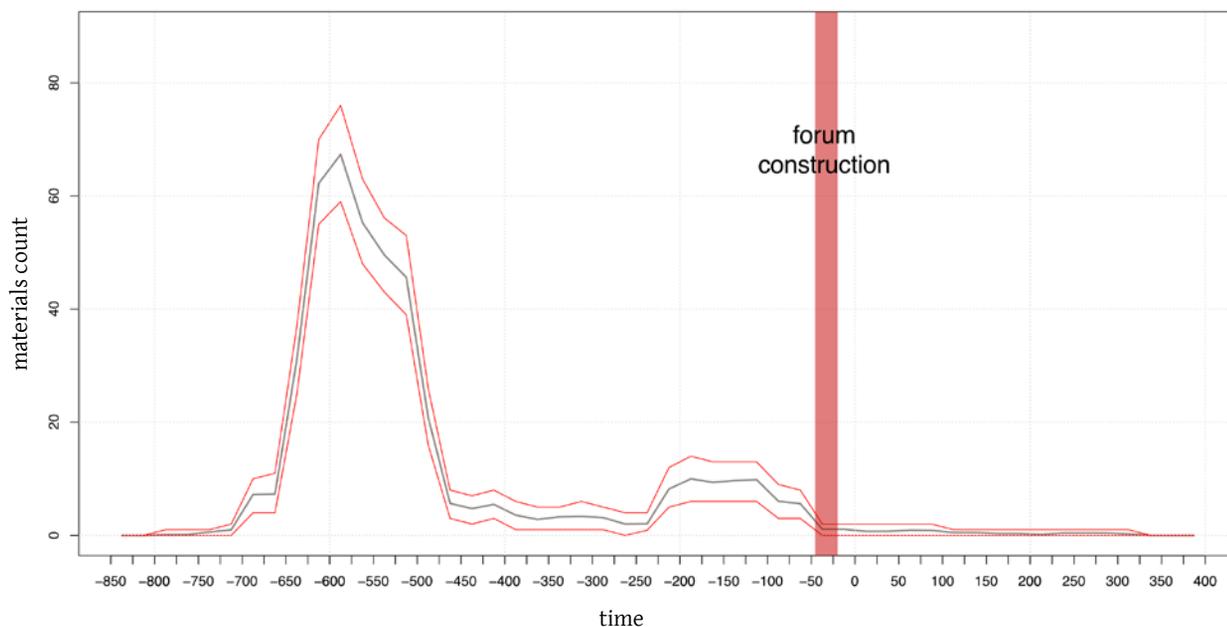


Figure 126: Assemblage from the upper makeups for the construction of the paved square of the forum of Nora: profile with 25-year brackets. Intrusive materials are included; the period the forum was built is marked by a red stripe.

other, allochthonous source basins; it has been hypothesised that the water-abraded sherds derive from a 7th- or 6th-century coastal dump, but it cannot be excluded that they had been located in a peri-marine environment before being used for the construction of the *pisé* structures.

Indeed, the Punic buildings are dated to the end of the 6th century BC, implying that most of the recovered artefacts were already residuals, or false residuals, when they were used for the walls and roofs of the block.

This major peak of evidence is followed by a period of about 250 years, poorly represented in the assemblage. This is the period when the Punic buildings were occupied, but no accumulation of sediments or artefacts occurred, most probably because of simple, regular cleaning activities; no materials of this period were redeposited to level the area.

A second, minor peak is recorded roughly between 225 and 50 BC. Two main explanations may be advanced for the presence of these materials: either they were allochthonous, redeposited as a separate group with fresh sediments or together with older materials; or they may represent what was left, and never removed, from the Punic buildings before their destruction.

After this peak, only a handful of items is attested. The construction of the forum has been dated to 40-20 BC on the basis of the wide examination of the deposits involved and also on the basis of external parameters. Later artefacts can therefore be considered intrusions, resulting from the following exposure of the investigated deposit. The more recent artefact is dated after AD 225. This case clearly shows the difficulty of treating intrusions, even when handling a large number of artefacts, if the investigated deposit is a secondary one. Besides the importance of an *a priori* assessment of the possible incidence of intrusions, it demonstrates how the picture that emerges from the whole of the excavation, and based on evidence from safer deposits, plays a fundamental role in dating. External sources of information (architectural, historical, etc.) also come in, allowing us to disentangle, at least broadly, some of the chronological issues raised by some artefacts. In this case, for instance, we know that the construction of the first and only forum of Nora could not reasonably be dated to the 3rd century AD.

It is noteworthy, nevertheless, that the construction of the forum is dated right after the more recent peak observed in the Monte Carlo chrono-profile; a reasonable procedure would have been to disregard

the dubious items and cautiously fixing a more ancient *tpq*. This would have been correct whether the forum were actually dated to 40-20 BC, AD 20, AD 50, or later.

Date proposed

As mentioned previously, the construction of the forum, and therefore the formation of the investigated deposit, is dated to 40-20 BC; this is just after the second peak occurring in the cumulative chronological profile. The more recent (intrusive) artefact would have provided a hypothetical *tpq* of AD 225.

Duration

The destruction and levelling operations prior to the construction of the forum square may have lasted for more than one season, but the accuracy of the available dates allows us to consider the episode as punctual. No soil horizons were detected on top of the levelling layers, nor were other signs of weathering and prolonged exposure documented. This seems to indicate that the paving of the square was laid down shortly thereafter.

IV.5.8 Case study 4: the construction of the forum basilica of Nora (S.3)

Topographic and archaeological background⁵⁴⁴

The forum basilica of the city of Nora is located in the south-eastern corner of the public complex. Large parts of the building have been affected by maritime erosion and nowadays only the very northern part of the structure survives (Figure 127). Its construction was very probably contemporary with the realisation of the whole forum, and in fact the building shares its western wall with the eastern portico of the central square. At most, the building may have been completed a little later than the forum, given also the fact that the whole project may have taken several years to complete.

In general, the presence of previous Punic structures in the area is well documented (see above), but the more ancient layout of the space occupied by the building is unknown. When the new building was erected, different techniques were used: the foundations of the eastern aisle were realised excavating two trenches, which then accommodated the necessary masonry structures and were eventually backfilled. The western aisle (the one nearer to the square), however, was located on lower ground, therefore the masonry foundations were raised to the correct height and the resulting empty space was then backfilled, little by little, with a 1.40 m-thick deposit. These sediments were then covered by the layer of pebbles that accommodated the upper floor beddings.

In antiquity, and for some time afterwards, the layers connected with the western nave foundation most likely remained well sealed; when the southern wall of the basilica (the one closer to the water edge) collapsed, erosion started eating away the strata beneath the floors and large parts of the building were dismantled. The upper structures of the building, along with the rest of the forum, were most probably pillaged and then reused.

Deposit description

The examined deposit consists of the tabular and sub-tabular layers, which were redeposited for the construction of the western aisle (Figure 128), namely (from top to bottom) contexts 11373 = 11255, 11374, 11377, 11380, 11383 and 11397.⁵⁴⁵

⁵⁴⁴ The sequence analysed is described in Ghiotto 2009: 272-275, 305-307.

⁵⁴⁵ The sequence is interrupted by a small hearth (US -11384 and 11385) located on the top of context 11383; this was interpreted as the result of activities that had to be performed at the building site. This is certainly a primary deposit and therefore not considered here. In any event its date substantially confirms the general chronological framework and the date proposed for the construction of the basilica (and the whole forum complex); it is absolutely consistent with the data that emerged from the deposit here.

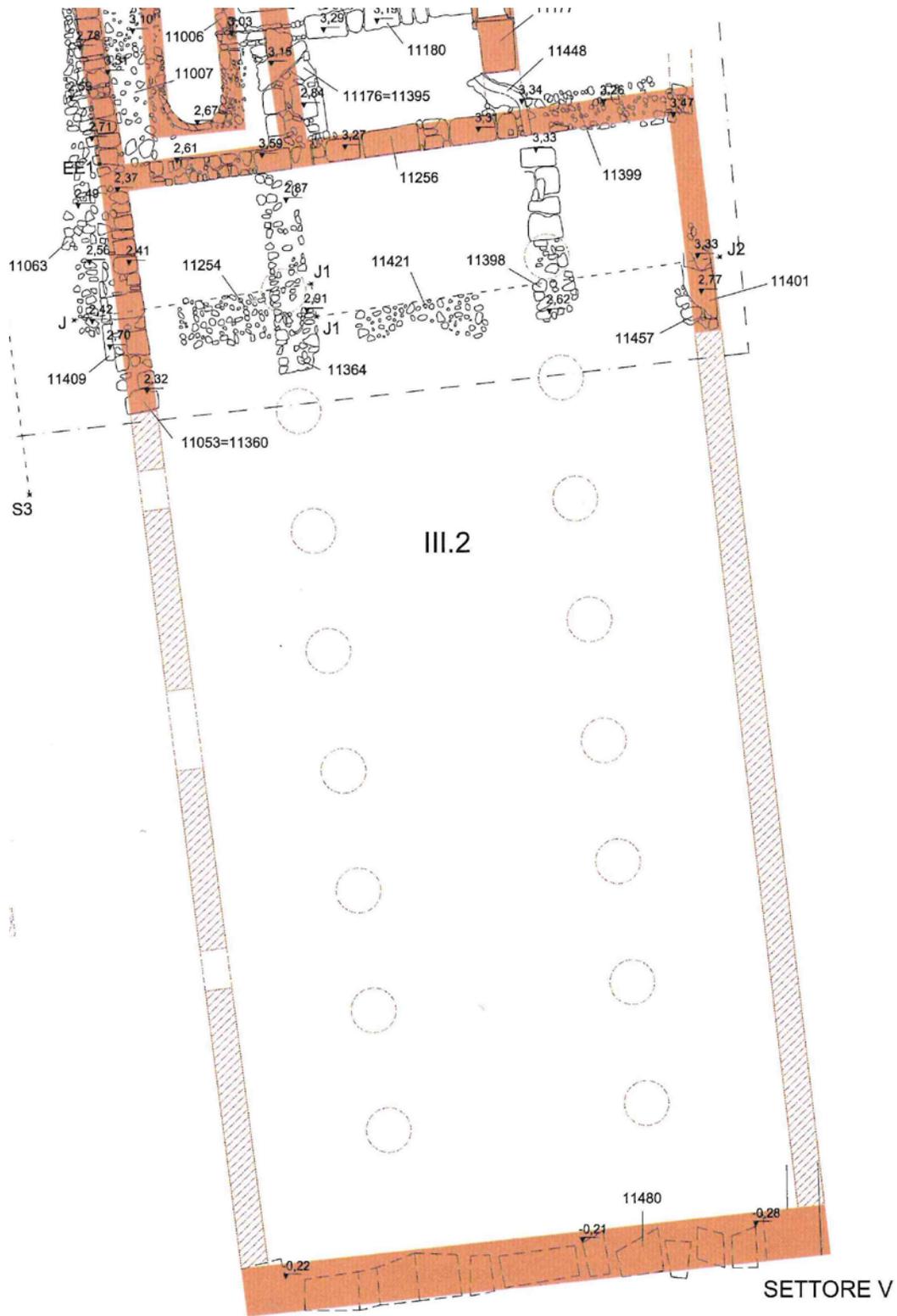


Figure 127: The basilica of Nora, in the south-eastern corner of the forum: structural evidence and reconstruction (Ghiotto 2009).

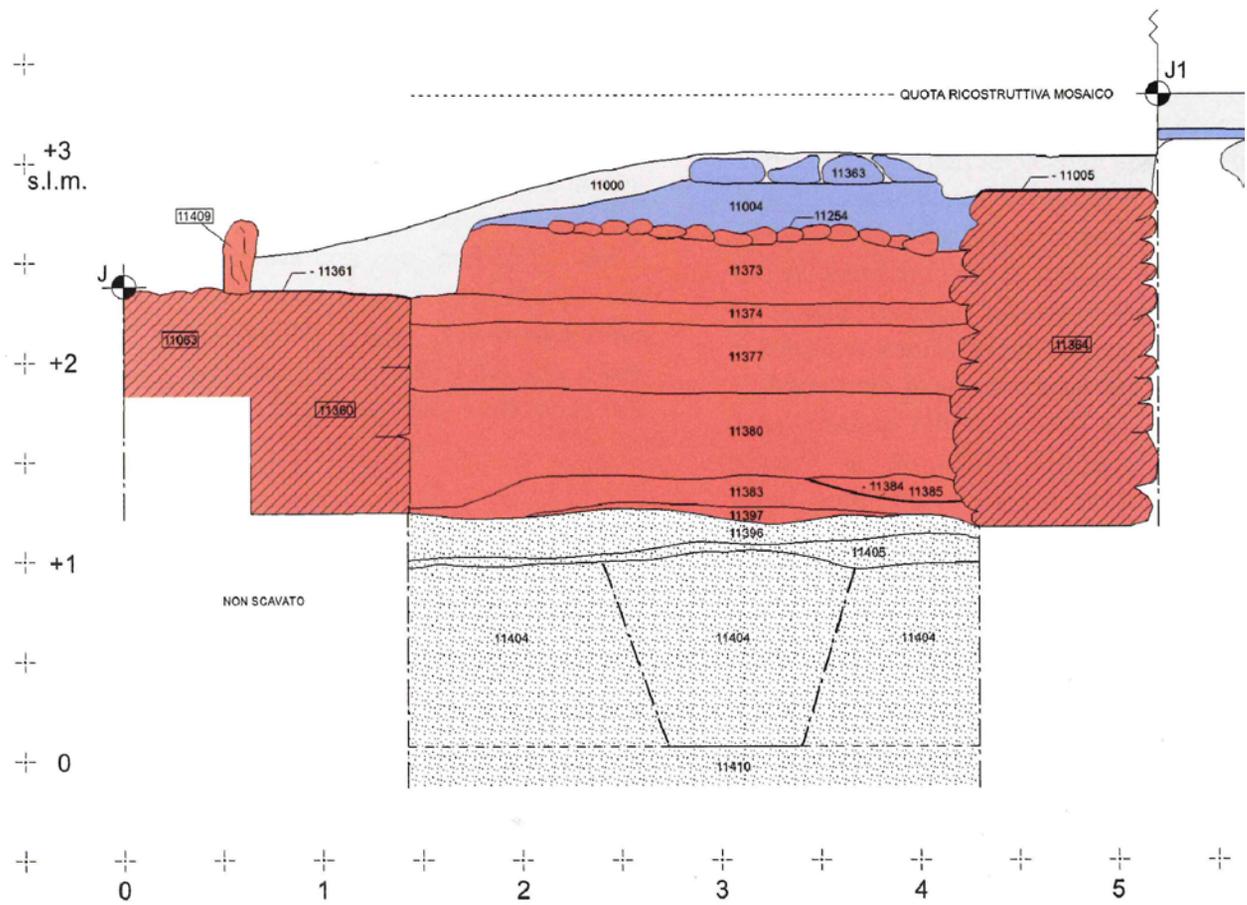


Figure 128: Basilica of Nora: cross-section of the makeup of the western aisle (Ghiotto 2009).

Among them, only contexts 11373 = 11255, 11377, 11380, 11383 provided some datable materials. In general these layers are fairly similar to each other, with soft heterogeneous matrixes, characterised by silty clusters and fragments of charcoal. No original catchment basin can be easily detected for these sediments.

Given the general development of the area, the deposit is not likely to have suffered intrusions until the basilica was abandoned; intrusions from above seem to have affected the upper strata only very marginally. Conversely, sea erosion continuously exposed the southern edge of the deposit; nevertheless the undisturbed part of the deposit was easily detectable and well cleaned. As a whole, the possibility that intrusions affected the assemblage can be considered relatively low. Ultimately, no inconsistencies with the wider chronological framework are noticed.

Assemblage: physical state

Again, no information is easily available, although the drawings of all the diagnostic finds have been published.⁵⁴⁶

*The finds*⁵⁴⁷

The examined assemblage consists of 53 datable finds. Again, the presence of substantial amounts of undated Phoenician/Punic pottery would increase the impact of residuality on the whole assemblage. Among the processed finds, Punic kitchen ware, Roman thin-walled and black-glazed pottery represent

⁵⁴⁶ Bonetto *et al.* 2009a; Bonetto *et al.* 2009b.

⁵⁴⁷ The materials recovered are presented in Bonetto *et al.* 2009c: 143-145.

the larger part of the assemblage. Some datable amphora sherds, both Roman and Punic, and some very old material ascribable to Phoenician times, complete the picture.

A *terminus post quem* is provided by a single sherd of thin-walled ware (type Vegas 29), dating from the beginning of the Augustan age. It was recovered in the well-sealed context 11377. A sherd of the same type is considered by the author as an intrusion (in the foundation trenches of the forum temple). Overall, there are no solid reasons to lead us to reject the sherd as not belonging to the context from which it was recovered: the date provided by the sherd is not inconsistent with the date proposed for the construction of the forum complex (40-20 BC). On this basis it was decided to process it. Conversely a *tpq* would have been fixed to the beginning of the 1st century BC.

The overall time-span covered by the assemblage covers about eight centuries.

Profile

Figures 129 and 130 show the two profiles, with 25- and 50-year brackets respectively. Given the arrangement of the table from which the data were extracted (the table displays 25-year boxes) it was unnecessary to use narrower windows.

Discussion

This case is particularly interesting because the plotted profile closely mimics the profile provided by a primary deposit with a ‘tail’ of residuals. However, considering the curve in more detail, it can be noticed that the main peak is about one century earlier than the *tpq* (although it has to be acknowledged that if the more recent sherd were considered an intrusion, the main peak and the *tpq* would be almost consistent). Moreover it has to be stressed that the ‘residuality tail’, albeit low, is clear and well visible and the whole profile is extraordinarily long.

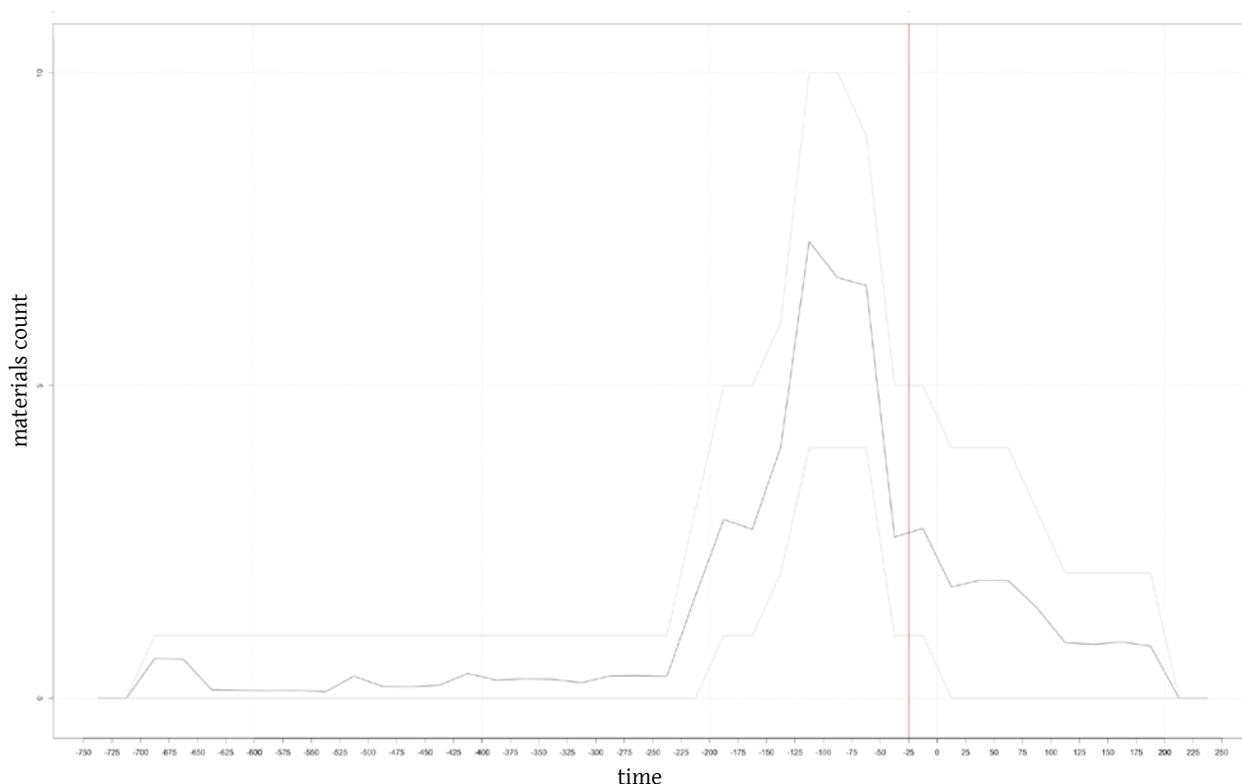


Figure 129: Assemblage from the makeup of the western aisle of the Nora basilica: profile with 25-year brackets.

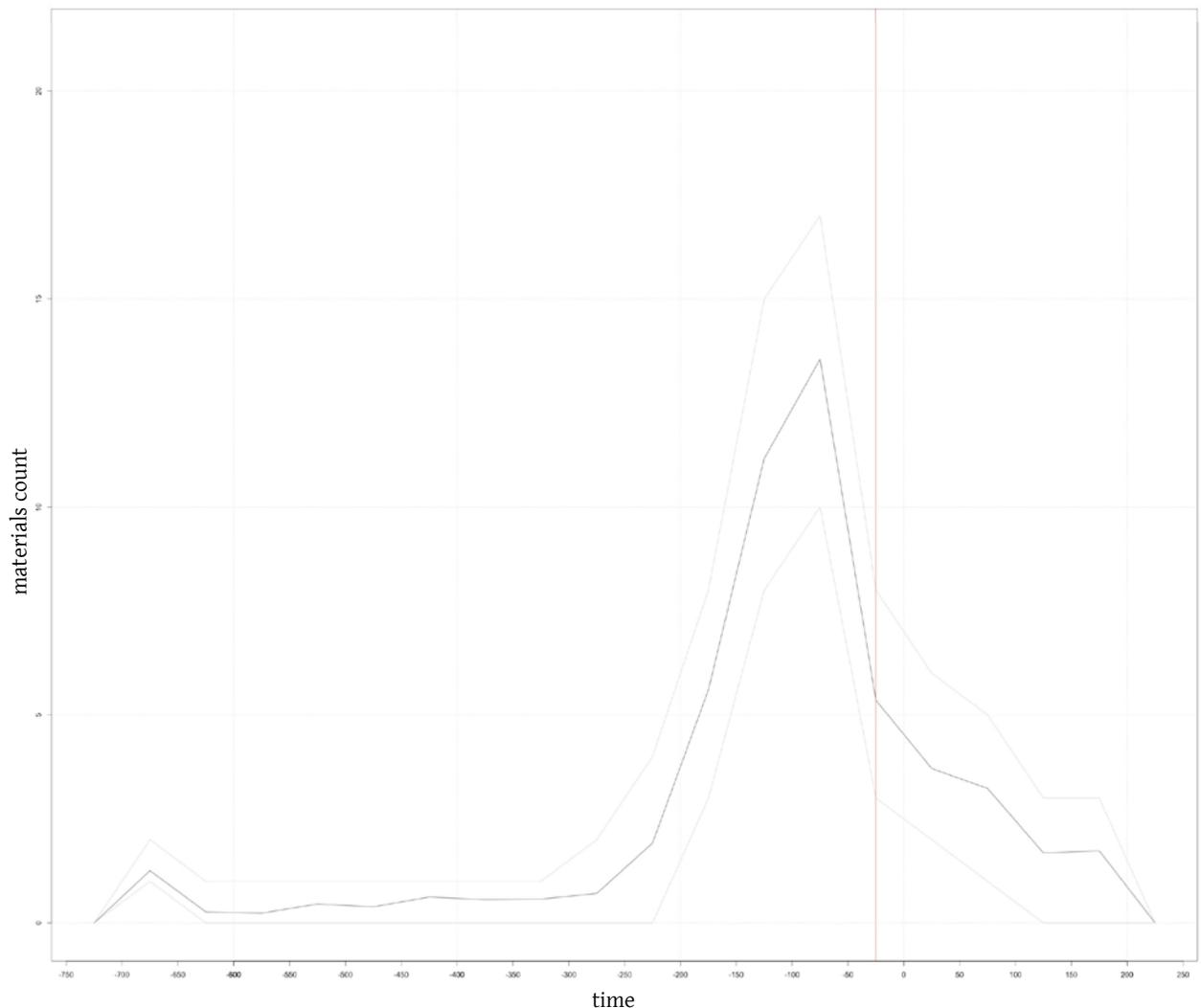


Figure 130: Assemblage from the makeup of the western aisle of the Nora basilica: profile with 50-year brackets.

The profile alone, however, seems insufficient to suggest the nature of the deposit. The lesson which can be drawn, again, is that quantitative and qualitative approaches are both important, and that the interpretation of the nature of the deposit is fundamental for its dating.

Although, *ex post*, we know, from the overall chronological framework, that the more recent sherds recovered are very close in time to the moment the basilica was actually built (accidental loss?), we should in any event bear in mind that the deposit related to the building construction was only partially excavated, and the possibility therefore considered that more recent *tpqs* could have emerged.

Date proposed

Terminus post quem: beginning of the Augustan age, e.g. after 30 BC. The date is consistent with the date proposed for the construction of the whole forum complex (40-20 BC), which may have lasted for some years.

Duration

The construction of the building may have lasted for some years, but the backfilling of the west nave, alone, may have lasted for only a few weeks or some months at most.

IV.5.9 Case study 5: the construction of a paved road in Aquileia (S.3)

*Topographic and archaeological background*⁵⁴⁸

At the very beginning of the new campaigns carried out in the Fondi Cossar area in 2009 (Appendix 2), a small, deep trench was excavated where the paving of the road limiting the investigated *insula* on the eastern side was not preserved (Figure 131). The excavation aimed to provide material useful for dating the construction of the infrastructure. The ancient stratification had been heavily affected by early-20th century excavations, carried out in the middle of the road in search of the underlying drain. Nevertheless, part of the strata was preserved and this allowed the recovery of some materials.

The road witnessed two main phases: its first configuration is poorly known, but it has been ascertained that its surface was originally simply paved with gravel mixed with compacted sand. This phase can be roughly dated to the beginning of the 1st century BC. The road was lately completely rebuilt, leaving only little evidence of the more ancient levels; the building of the new infrastructure entailed massive works: a trench was dug to accommodate a large drain; the trench was backfilled and substantial amounts of sediments then laid down to reach the height at which the new paved road was made. The deposit examined here consists of the layers laid down to level the route before embedding the paving stones.

Deposit description

The sequence observed beneath the road (Figure 132), starting from the top, consisted of a thick layer of gravel (US 18, which accommodated the surviving paving stones), a layer rich in stone chips (US 151, possibly connected with the rough-hewing

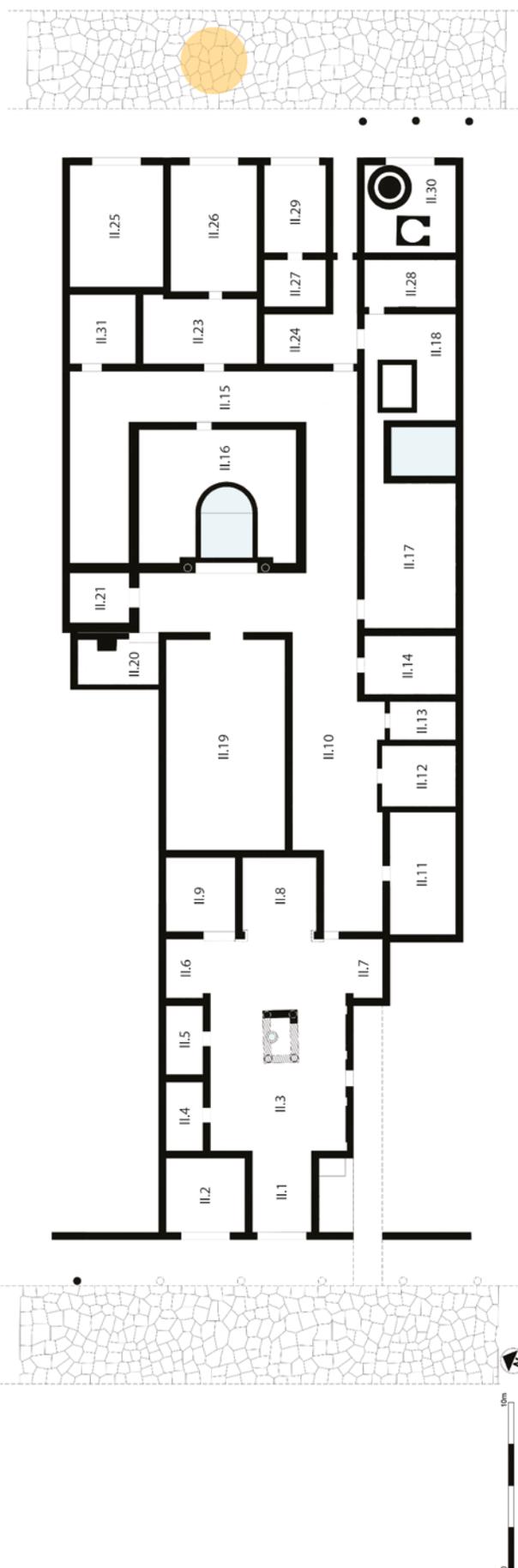


Figure 131: Aquileia, Fondi Cossar area: location of the makeup of the eastern paved road excavated in 2009.

⁵⁴⁸ A complete report of the excavation is provided in Bonetto *et al.* 2009g: 17-21.

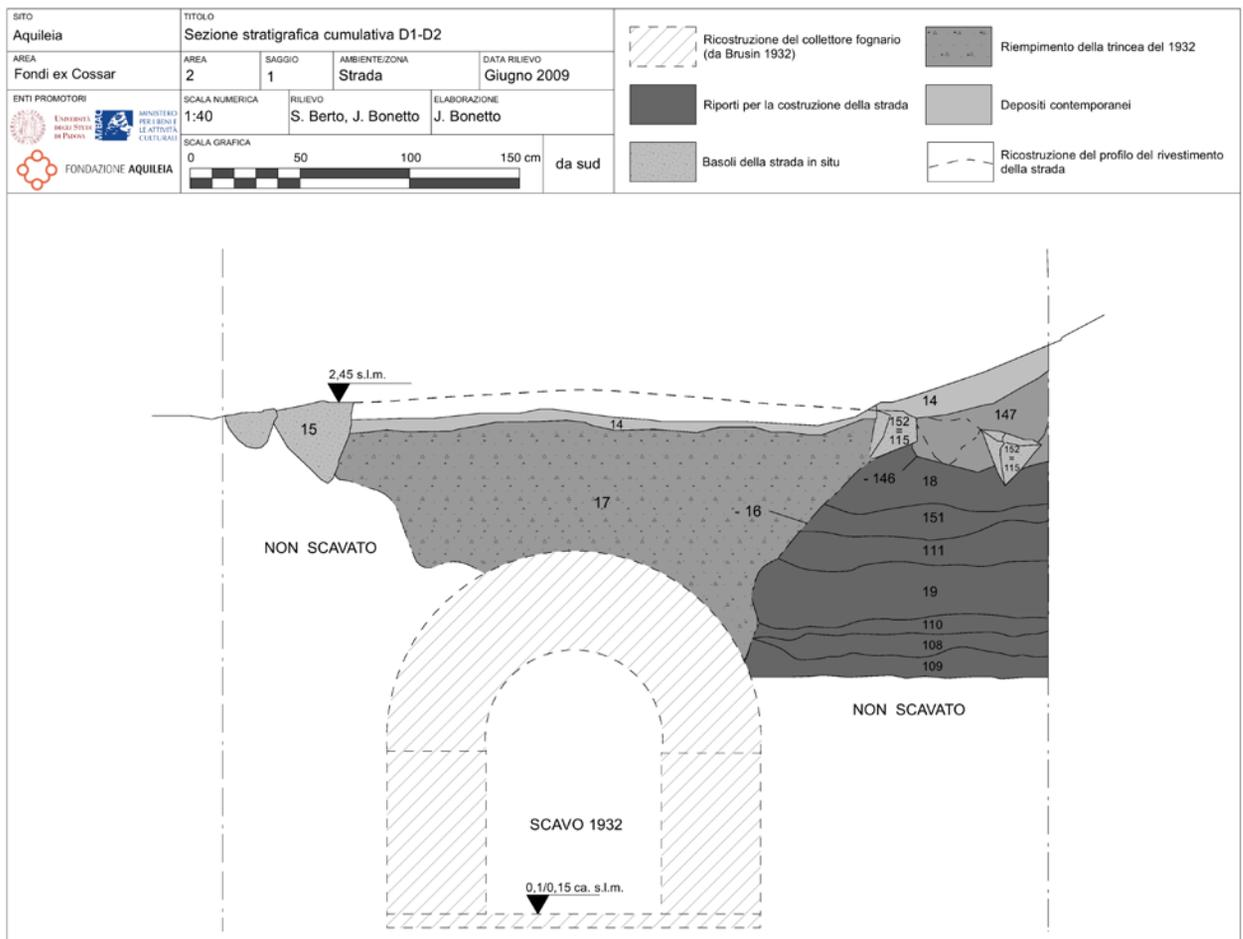


Figure 132: Aquileia, Fondi Cossar area: cross-section of the makeup of the eastern paved road.

of the paving stones), a silty layer with pebbles and ceramics (US 111), a clayish layer (US 19), a sandy and clayish sediment with few materials (US 110), a clean, sandy layer (US 108), and a layer characterised by the presence of some amphora sherds (US 109). Below this level the excavation had to stop because of the presence of ground water. All the layers are sub-tabular and some selection of the sediments used seems to have occurred.

Among the strata described, contexts 18, 151 and 108 revealed no artefacts. Among the others, contexts 19 and 109 provided the vast majority of the materials.

It has to be stressed that the whole block of strata can be considered as the product of one body of work, connected with the construction of the drain/road system. The single layers (apart from the upper one, which in any event returned no material) were most likely left exposed for a short time and then sealed by the upper ones. Thus the chance that infiltrations occurred in antiquity seems relatively low. The strata were disturbed during the 20th-century excavations and possibly earlier; fortunately, the cut produced by this recent activity was very clear, and ancient strata were very clearly distinguished by the backfill of the excavation. Substantial bioturbation was not recorded.

Assemblage physical state

No peculiarities are reported. The presence of a good number of amphora stoppers may suggest the selection and intentional addition of some materials, but their overall number and percentage is not great enough to consider them, on their own, as decisive. In any event, the dates provided are relatively broad.

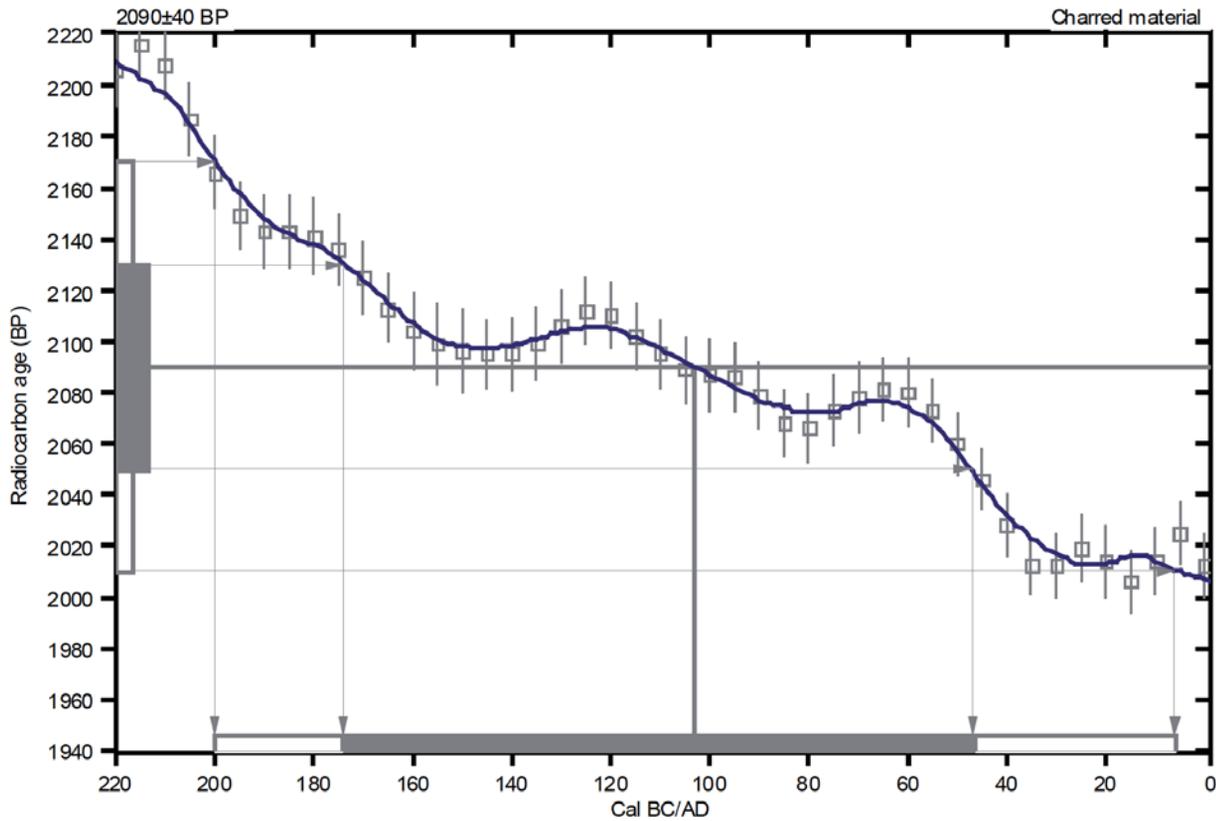


Figure 133: Fondi Cossar area, makeup of the eastern paved road: calibrated date of the first sample collected.

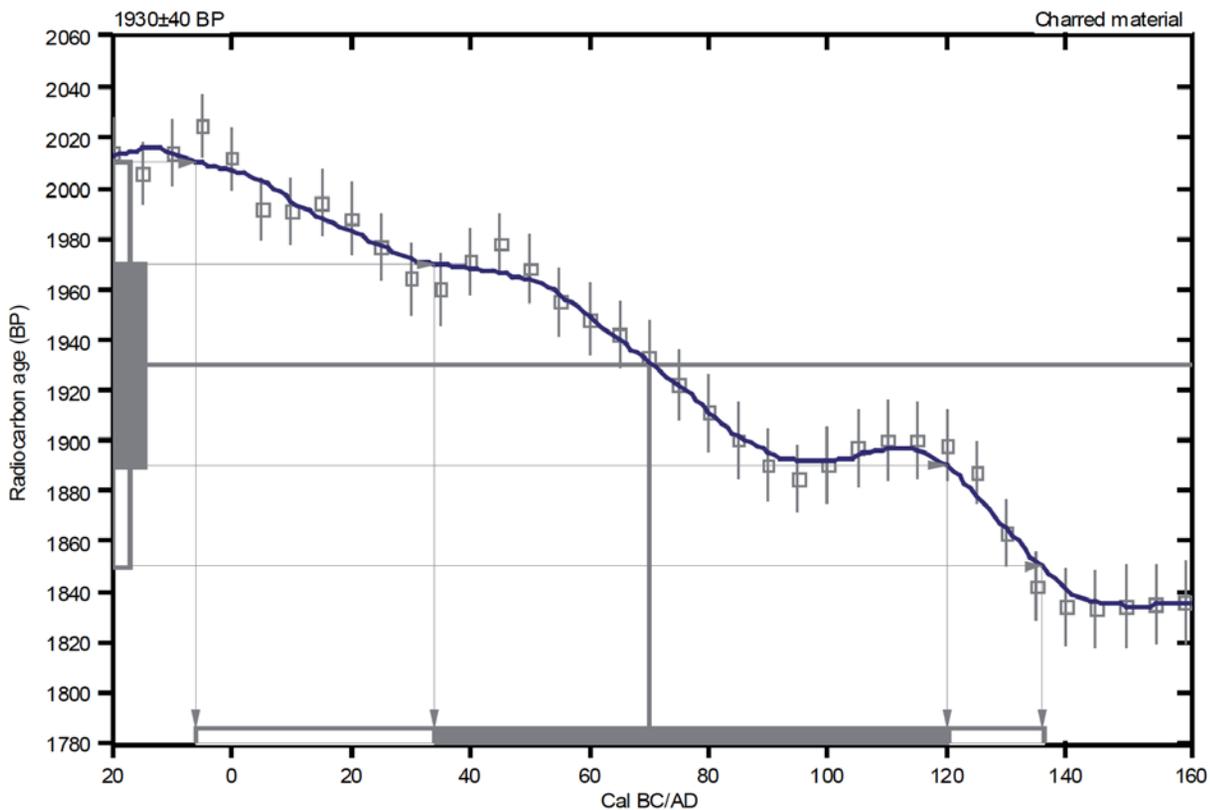


Figure 134: Fondi Cossar area, makeup of the eastern paved road: calibrated date of the second sample collected.

*The finds*⁵⁴⁹

A group of 30 dated artefacts was processed. Among these, amphorae fragments and stoppers represent the vast majority. Two charcoal samples, from contexts 19 and 108, were also collected for radiocarbon dating; the results are provided in Figures 133 and 134.

The overall *terminus post quem* produced by the assemblage is provided by a glass item whose diffusion dates from the beginning of the 1st century AD; it was recovered in context 19. It is worth noting that it is well consistent with the *terminus* provided by the second charcoal fragment.

Profile

Figures 135-137 provide graphs with 25-, 50-, and 10-year brackets.

Discussion

The plotted curve displays a markedly unimodal distribution, but it is substantially skewed to the left of the *tpq*; the time lapse occurring between the main peak, located in the last quarter of the 2nd century BC, and the *tpq* covers about one century. Sediments rich in these materials were most probably excavated; they may have derived from the same volumes of matter removed for the construction of the drain, or they may have been allochthonous, particularly if some specifically selected sediments were required. Both cases, or a combination of the two, may well have occurred.

The secondary status of the deposit seems to be confirmed by the inconsistency of the two radiocarbon dates obtained, with the one coming from a deeper layer being far more recent. In any event, given, in particular, that the two sampled charcoal fragments were fairly small, this may also relate to a problem with the sampling (internal tree rings).

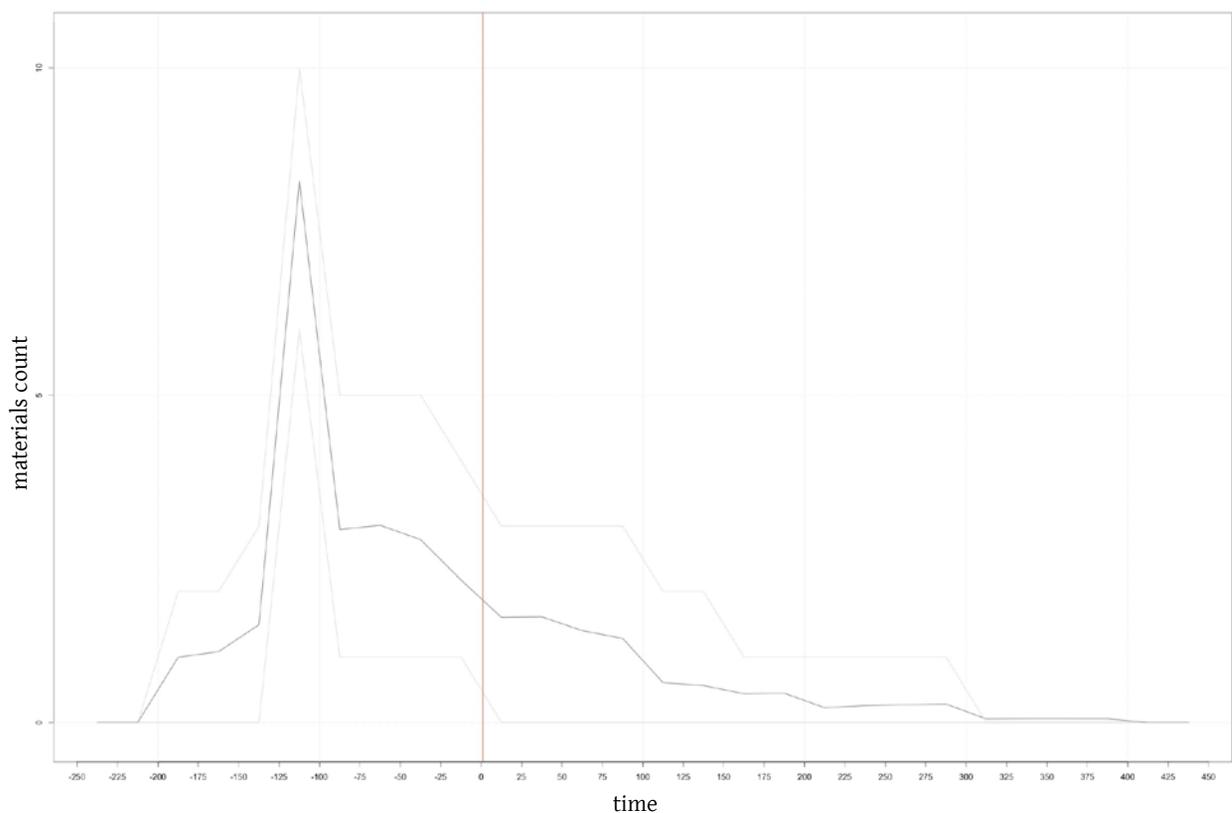


Figure 135: Fondi Cossar area, assemblage from the makeup of the eastern paved road: profile with 25-year brackets.

⁵⁴⁹ The assemblage is still unpublished. The radiocarbon dates are reported in Bonetto *et al.* 2009g: 20.

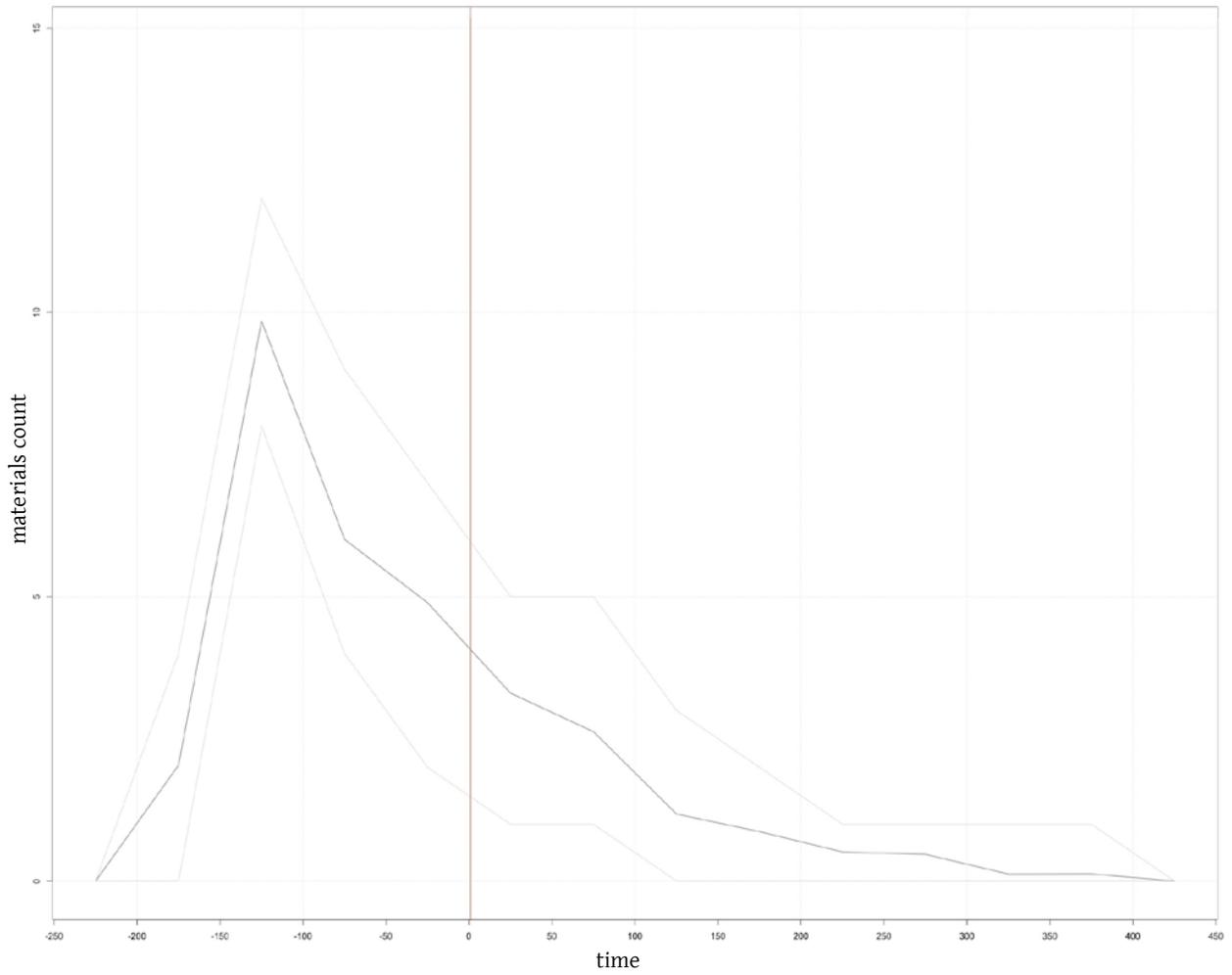


Figure 136: Fondi Cossar area, assemblage from the makeup of the eastern paved road: profile with 50-year brackets.

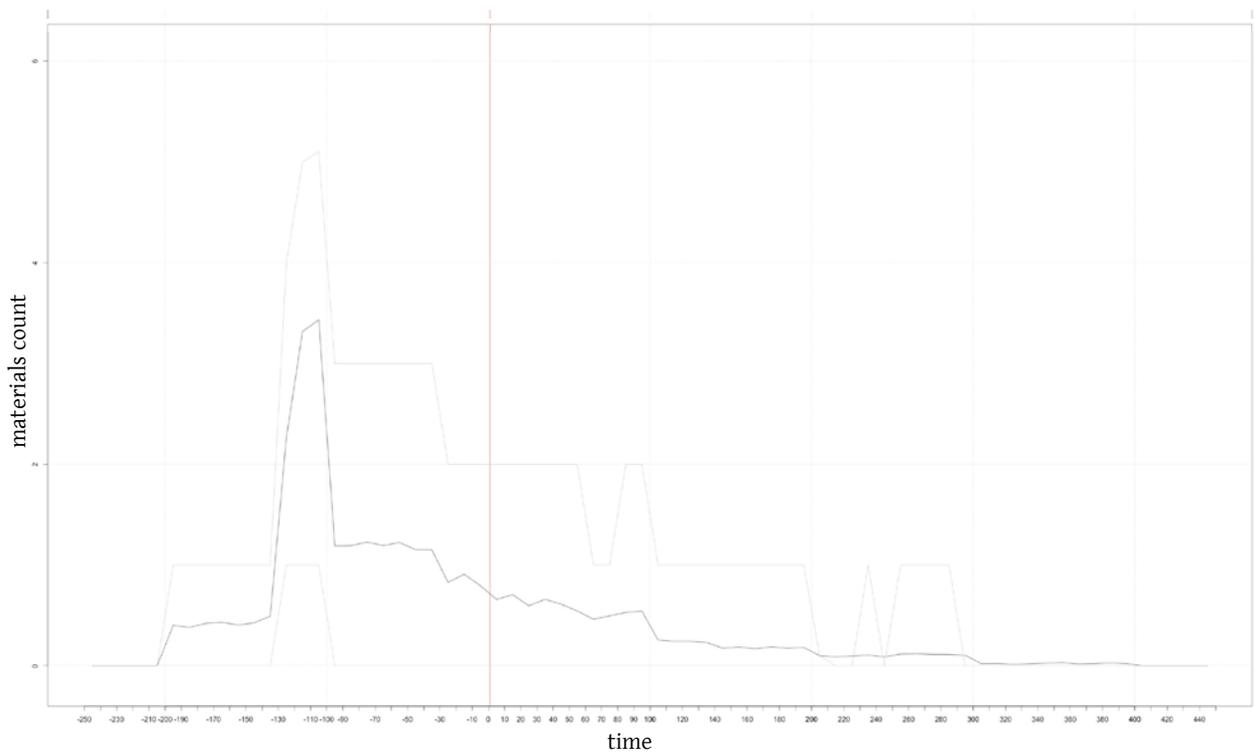


Figure 137: Fondi Cossar area, assemblage from the makeup of the eastern paved road: profile with 10-year brackets.

As with the previous case study, also here a problem of sample representativeness clearly emerges; indeed, it was only possible to investigate a very small part of the whole deposit linked to the construction of the paved road, even if we consider only the short section limiting this part of the *insula*. Although estimating the original volume of the deposit is somewhat difficult (we do not know if different sections – of different lengths? – were built in different periods), the possibility that more recent *tpqs* would emerge through further excavations seems probable.

Date proposed

Terminus post quem: beginning of the 1st century AD. Synchronisms with the sequence emerging during excavation of the nearby *insula* suggest that the road (second phase) was laid down in AD 25-75.

Duration

The time elapsed for the construction of the infrastructure as a whole is unknown. Building a section of the same length of the investigated *insula*, may have taken several weeks, months, or even more than a year, based primarily on the available manpower.

IV.6 Other deposits

IV.6.1 General observations

This provisional category groups all those deposits whose nature has to be evaluated case by case, or of which there is still insufficient knowledge; they may each be primary or secondary, according to their specific characteristics. In this sense, no general expectations can be expressed in advance, but each specific case, once studied, may sit in one of the other main categories, and, where applicable, new types or sub-types created.

For the moment two main examples are highlighted: (lime) mortar structures; and ditch fillings. In the first, specific knowledge is still lacking, while in the second extreme variability seems to be the key aspect.

0.1, Mortar structures

In general, it seems most probable that newly discarded vessels or sherds were recycled to obtain aggregate for mortars (see Chapter III.4.1). Conversely, with the *pisé* walls of the Punic buildings below the forum of Nora, it was possible to ascertain that they contained potsherds that were largely residuals (see Chapter IV.5.7). In general, studies here are still relatively poor. Over the last decades we have acquired considerable knowledge of ancient building techniques, but, to date, at least according to the personal knowledge of the present author, it is rarely investigated whether or not sherds used in these structures were residuals or systemic materials (apart from a few very obvious cases where complete or sub-complete vessels were used); however, variability from case to case may be very high.

Where freshly discarded materials were crushed to get aggregate for lime mortar, structures might be considered as primary deposits (or mixed at most); conversely, where residual pottery was used, structures should be considered as secondary deposits, as there is no safe link between the date(s) provided by the assemblage recovered and the construction of the structure.

The considerations made in Chapter III.4.1 about reuse and recycling are insufficient to demonstrate whether sherds are substantially systemic, and the tools suggested for the detection of the selection and the intentional addition of materials (Chapter III.4.3) can be used.

Ultimately, the chronological profile emerging from the examination of the assemblage should be compatible with that produced by a primary deposit.

Where all these prerequisites are satisfied, we may safely conclude that the structure examined can be dated *ad quem* through the use of the embedded assemblage (and we may obtain dates that are even more precise than those produced by employing scientific techniques, such as the dating of lime fragments – see Chapter III.2).

Clearly, as dismantling elements of archaeological structures may be legally and even ethically questionable, as well as hard work and possibly unrewarding, the chances of undertaking these types of analysis are restricted and of little attraction; poorly preserved structures, with no preserved decoration and particularly rich in sherds of sufficient size, may represent the ideal target.

Charcoal pieces contained in mortar structures present some similar issues; to assess their systemic nature we should have a sufficient number of dated samples. Their consistency would pinpoint a primary status, but the old-wood effect may create palimpsestic results, which would be much more difficult to read. A sufficiently wide and uniform assemblage of fragments within the mortar structure is also an important clue for determining their intentional addition; a few dispersed charcoals may become embedded totally accidentally and they may well be residuals.

The ideal opportunity to assess the primary nature of a given mortar structure through radiocarbon analysis seems to be where there are numerous, well-distributed charcoals and well-identifiable pieces from which to select samples likely to be closer to the external rings. If the dates provided are consistent, they may well provide good *ad quem* dating.

0.2, Ditch fills

A ditch, by itself, is simply a cutting, no different, *per se*, from many other interfaces detected in every excavation. Nevertheless, ditches have assumed through time some independent relevance, primarily because, along with ramparts, they are a key feature of Bronze and Iron age settlements, as well as of Roman military architecture.

Compared to other interfaces, they are particularly deep and wide linear features, therefore representing ideal depositional basins for the products of many natural and anthropic activities.

Some of the most common ways these can be filled or backfilled are presented here (or a combination of two or more of the processes):

- A ditch which turned out to be an obstacle to the development of a given area may have been simply backfilled with allochthonous material to restore a flat surface.
- A ditch commonly undergoes natural processes, such as its progressive filling due to the action of gravity and water, or the formation of soil on its surface; this is due mainly to its usually long exposition and to its own shape (see Chapter III.5.2).
- Ditches are ideal *loci* for dumping activities, which in turn may be occasional or well organised.
- Ditches may be the end line of urban sewage systems, and may thus accommodate the discarded products of city activities.

All these processes, and many others, once combined, may produce very different palimpsests that must be individually studied, before being attributed entirely, or partially, to one of the categories or types proposed.⁵⁵⁰

⁵⁵⁰ See Martens 2007.

IV.6.2 Case study 1: the mortar floor of the Pythion theatre orchestra, Gortyn (O.1)

*Topographic and archaeological background*⁵⁵¹

During the campaign of excavations carried out in 2013, it was possible to ascertain that the visible marble floor of the orchestra of the Pythion theatre, Gortyn, represented a late refurbishment (see Appendix 2). The more ancient floor, related to the early construction of the building, was detected thanks to a small trench, at a lower level, covered by the massive, loose, stone foundations of the upper one.

Later it was also possible to investigate the bedding of the more ancient floor, which was partially removed after accurate recording.

Deposit description

The earliest floor (US 610) was made of a layer of coarse *cocciopesto*, slightly inclined towards the centre of the theatre to allow rainwater to gradually flow off in a culvert. The layer presented a smooth surface and it was not possible to establish if it was originally covered with slabs or not; it was not very thick (about 2-4 cm), but it was hard and made of good lime. A bulk sample, having the volume of about half a basket of material, was collected in the field for further analyses; later it was possible to mechanically separate the aggregate from the binder to examine the embedded sherds.

Five other sherds had already been collected during the excavation.

The assemblage

After the sample was crushed, it was possible to retrieve 89 sherds, all obtained from broken pottery (Figure 138). In addition to these, only two pieces of recycled wall plaster and two brick fragments were recovered, thus suggesting that their presence was accidental.

Focusing on the potsherds (with a total amount of 94 pieces, including the fragments recovered during the excavation) many interesting traits emerge:

- They seem to have been sorted by size, as the vast majority presents a maximum length between 2 cm and 4 cm.
- They all present clear, neat fractures. This, and the former, observation seems to suggest that intentional breakage occurred.
- Only two small feet and two small rims (out of 94 sherds) were present (4.25%).
- Only three small fragments of glazed pottery were found (3.19%). The other pieces display fabrics and features typical of tableware.

Among the 94 finds, unfortunately, only two fragments were more specifically recognisable, namely two small pieces of eastern *sigillata*: one was datable but, unfortunately, it provided only a very wide time range (2nd century BC - 1st century AD).

Discussion

The characteristics of the assemblage seem to point to the fact that the sherds used for building the *cocciopesto* floor were selected by class and form, and then intentionally crushed to obtain regular sizes. This last point may be explained by the need for an homogeneous mixture, while the discard of feet, rims and glazed pottery may have occurred because they bind with mortar less effectively, therefore threatening the quality of the floor.

⁵⁵¹ The context have been very recently published in Bonetto *et al.* 2019.



Figure 138: The assemblage produced by the mortar floor of the orchestra of the Pythion theatre, Gortyn. Note the evident traces of lime mortar on the sherds.

In any event, all the operations carried out would have been much easier with materials recently discarded, or at least with items that had not already been buried. Nevertheless, the only well-datable item provides a date earlier than the period in which the theatre seems to have been built (AD 130-150). This may have been a residual or a false residual (potentially it may have had a systemic life, even being stored, for only 30 years), but unfortunately the absence of other data prevents us from further considerations.

Concluding, as a whole, the collected clues may suggest that the materials forming the assemblage could be used to give some, even though broad, *ad quem* dating. Unfortunately the shortage of well-datable finds (which are usually exactly those items that were apparently deliberately discarded!) does not allow us to reach a definitive and safe conclusion. The collection of one or more further samples may lead us, more luckily, to recover other datable pieces that could provide better support for a model, which, for the moment, can only be supposed.

Part V

Synthesis and conclusions

V.1 Towards a working method

V.1.1 Introduction

After examination of the theoretical and methodological tools available to date archaeological deposits, once having conveniently ‘taxonomised’ the infinite variety of products of stratification, and after having shown how the available tools can be used, more or less successfully, to deal with single deposits, it seems convenient to try to shape a more universal approach, a working method, into which all these fragments can be organically inserted. What is the work flow that extracts from excavations an organic sequence made of actions, episodes and processes that can, to some degree or other, be dated? How do we move from excavation to absolute dates? A sketch proposal is presented now, starting from what can be done before excavation even begins and concluding with what is to be published. The well-known steps, what is common practice, albeit fundamental, will be touched on briefly, but focusing most on the critical points, as well as the new and useful tools and approaches.

V.1.2 Before the excavation

Although before an excavation begins there is nothing to date, there are a few expedients that can be put into practice to help strengthen the successive conclusions drawn.

First, a generally explicit evaluation of the major local biological and non-biological factors affecting the issues of intrusions should be undertaken. Rodent and worm activity, the impact of roots, the depth at which the main archaeological deposits lie beneath the topsoil, the impact of heat and freezing on the cracking of clayish sediments, the effects of recent excavations, truncations, ploughing, etc. should be assessed and explicitly reported, to provide a basic framework for the context-by-context evaluation of intrusions that will be later performed.

Another factor to consider before excavation starts is, of course, the economic one. Resources should be set aside to perform later analyses: the scientific dating at least of the most crucial samples should be allowed for from the very beginning, together with other excavation and post-excavation analyses; for instance it has already been discussed how micromorphology, albeit not directly involved in dating, can provide fundamental clues on the formation of many difficult deposits, thus allowing for better understanding also of the way to date them (see Chapter III.4.4). This is common practice in many countries and for many excavations, but it is still far too often lacking, particularly in Italy.

In addition, any information (historical, epigraphical, etc.) that may turn out to be useful for specific dating or, more generally, to collocate the wider chronological framework of the excavation, should obviously be collected and critically evaluated.

V.1.3 During the excavation

Many more expedients can be applied when excavations begin, including:

- (1) a context-by-context evaluation of intrusions;
- (2) an assessment of the whole volume of a given deposit, when possible, where it can only be dug partially;
- (3) where structures are excavated, particularly with mortar, whenever possible samples should be collected to extract sherds potentially useful for dating;

- (4) where earthen floors are excavated, the top layer (2-3 cm) should be kept separate from the bottom one;
- (5) a broad evaluation of key contexts and the collection of more samples in these cases; documentation should also be maximised;
- (6) particular attention should be devoted to the presence of articulated bones, particularly where primary deposits are expected;
- (7) during subsequent laboratory/archival activities, collective photos of the assemblages recovered should be taken, possibly both before and after washing.

These points (1-7 above) can be examined more specifically:

1. Specific, context-by-context evaluation of intrusions can be performed in the field, evaluating those parameters suggested in Chapters II.2.10 and III.6; record keeping can be via the speedy method hypothesised for the standard Italian context sheet.
2. When only partially excavating some deposits, particularly secondary deposits with a great volume of material (e.g. sediments redeposited for building the floors of a given house), at least a rough evaluation of the proportion between the volume excavated and the total volume of the deposit should be performed, so as to quantify explicitly and evaluate the problem of sampling, which may arise when dealing with an assemblage that represents a small part of the actual one.
3. It is usually not easy to obtain authorisation for collecting large samples of archaeological structures; in any event, badly preserved floor beddings or walls, which at first sight seem to include large amounts of potsherds of sufficient size, may represent good targets and some sampling may be authorised. It is worthwhile to attempt this authorisation, as these deposits, which are not susceptible to intrusions, may turn out to be primary and thus provide extremely useful indications for building a complete chronological framework of the excavation. Furthermore, their own dating usually represents an important goal in itself; mortar dating or radiocarbon sampling may also be performed on this peculiar kind of deposit.
4. Where non-solid floors were detected, the top, loose layer should be kept separate from the bottom one, so as to have the chance (rarely a certainty) to distinguish any systemic materials (in relation to the activities carried out on the surface of the floor) that possibly happened to be included with the deposit. Sieving the top layer may also turn out to be useful.
5. Building theories and then forcing the data to fit them is never a good idea, but an excavation has to be made to 'talk'. Making provisional models and expectations during the practice of excavation, on the condition that we are flexible and ready to change, is unavoidable to a degree, and can be useful for directing the research. Where we suspect that some deposits are particularly informative, also from a chronological perspective, we can maximise our approach via *ad hoc* documentation and more sampling. Of course it does not mean that we should not have a minimum standard of digging, recording and sampling for all the other deposits. We would just be sure that in the following stage of analysis we have all the data we need, and also some extra information, to deal with the more promising deposits.
6. More attention should be devoted, at least according to the personal experience of this present author, to bones in urban Classical contexts. The presence of articulated ones should be recorded, and they should be collected – not just for archaeozoological investigations; they are primary targets for radiocarbon dating and some, much more routinely, should be sampled separately.
7. Recording the physical state of the assemblage piece by piece is, of course, very time consuming in any urban excavation, Classical or otherwise. Nevertheless, some useful information can be drawn from this in post-excavation analyses, to strengthen (or modify) our assumptions on the nature of a given deposit, and thus on the way we can date it. A photograph of the whole assemblage provided by each context, possibly taken before and after washing, and with the presence of a metric scale, represents a speedy and effective way to form an immediate idea of the physical state of the materials recovered. This could be useful also during the following, delicate operation of grouping: for instance, where we suspect two contexts represent two different parts of the same deposit, similar assemblages are also expected. Markedly different assemblages, on the contrary, would suggest more caution and in the end we may decide to keep the two contexts safely separated.

Some more general considerations about the practice of excavation and its relation to dating can be added. Of course, it is not the place here to discuss in detail excavation techniques and approaches, for which there are many detailed manuals and probably thousands of case studies; but a few relevant points are worth emphasising.

The 'old', unwritten rule, as we know, suggests that, in case of doubt, when dealing with the interface between two strata, it is safer to collect the ambiguous sherds as part of the upper context, without risking the 'contamination' of the underlying layer. This rule is a sound one, because, from a chronological perspective, it is much easier to deal with a few 'false residuals' than with a few 'false intrusions'. Of course, the perfect and clear separation of two different contexts along with their assemblages is the best option, but it should be acknowledged as well that things are not always so easy. An elastic approach is in any event possible, actively using contexts as operational tools; this means that, if in doubt, we can still create 'new, intermediate contexts' to deal with unclear, nuanced situations. Somehow, and provocatively, perhaps it can also be advanced that, in a micro-cosmos marked by sampling at so many levels, just like an excavation, even the discarding of a few pieces may well be acceptable, as one prefers fewer, safer data than more numerous, but possibly biased ones.

In general, more attention in the field should be devoted to the implications of our practice for dating and for the overall chronological framework of the excavation. In this sense a key point is without doubt represented by a constructive and mutual collaboration between find specialists and field supervisors.

V.1.4 After the excavation

The crux of our 'dating game' comes, of course, during the post-excavation phase; here the variability in the approaches preferred is the greatest. A coherent proposal can be sketched, moving from the very end of the excavation towards the final report.

When an excavation ends, two main branches of work often proceed in a somewhat parallel manner: that carried out by the find specialists, i.e. the slow processing of recovered finds (drawing, photographing, identifying, dating), and that carried out by those who followed the excavation in the field, and usually comprises the completion and revision of the Harris matrix produced and the crucial activity of grouping contexts (see Chapter II.2.3). Each activity presents particular, critical points.

Concerning finds processing, it can be strongly claimed that the dating of materials now should not be influenced by the information derived from the excavation.⁵⁵² Using the relative chronology of contexts for dating artefacts, which then should provide an absolute date for the same contexts, leads to a clear, but dangerous and circular argument. One example may clarify the issue: say we are handling a sherd which, by itself, can only be dated very broadly, say over a time-span of some centuries, ranging from the Early Imperial to Late Antiquity. Where this sherd was recovered from one of the latest contexts (those in the upper part of the matrix), we may not narrow its date to Late Antiquity, because the specimen may well be a residual. Moreover 'late' in relative chronology does not mean 'late' in an absolute one. In this case the contexts 'located' in the upper part of the matrix, which are later than those on the bottom, may be Early or mid Imperial (in fact we do not know yet). Similar considerations may be advanced where the sherd is recovered from a bottom layer. The point is that we cannot mix absolute and relative chronology, contexts and finds. The integration of the various data must wait, and must be as structured and explicit as possible.

Another form of strong influence that might affect the dating of finds is inherent in single contexts and consists of the association of finds recovered within them. Being influenced by the association of finds with a view to 'modelling' the date of one specimen is theoretically and methodologically wrong, and may lead to fundamental mistakes or steer the interpretation of the excavated data in the wrong direction. The point is that, at this stage, it is still unclear what the nature of the contexts is, and we do not know

⁵⁵² Even with well conducted and published excavations, this key point often remains somewhat unclear: see Argento, Di Giuseppe 2006: 36.

if the association of the materials embedded can be considered true/systemic, or false/depositional (see Chapter II.2.4). Even if it were considered true, the phenomenon of false residuality should be evaluated very carefully. Another example may be useful: say we have a sherd broadly dated to the Roman Imperial Age, recovered with some finds dated to the early 3rd century AD. Can we conclude that the sherd we are handling can be dated to the same period? Of course not, as the association between the artefacts may be false and the find we have may be a residual. It follows that its original, wide date should not be narrowed, but, if safe, should be used as it is.

It is much better to only date those materials that are already well known through previous literature and studies, and that do not need the information provided from excavations to be estimated. Ultimately, broad, safe dates should be preferred to narrower but tentative windows, possibly advanced, considering the relative status of contexts and the association of finds recovered within. The point may be summed up in this way: there are materials that date strata, and materials dated by strata. Here we need that date strata, because strata are what we want to date. Refining poorly known dates of some types, or classes of materials, is a game for later, once contexts are dated and their natures are clear, for instance through seriation techniques.

It follows that, for dating purposes, the main role must be played by artefacts such as coins, fine-wares, amphorae, small finds and whatever can be independently well dated (including samples dated through scientific techniques).

At this stage some specific evaluations about the systemic life of those specimens whose production is dated (namely coins and stamped *sigillata*) can be performed and the single windows can be widened according to the judgment of each finds specialist (see Chapter III.3.3).

Moving now to the other 'operative branch', i.e. grouping contexts, this is an activity so far uncodified and is as complicated and crucial as the dating of finds. What may be helpful is a progressive approach to this and the use of groups of different levels. It has to be stressed that what we are interested in here are those groups still undated: macro-groups or phases created to group contexts or sub-groups with the same date or with similar dates come later, as they already take for granted the single contexts or sub-group dates (*ad quem* or not), and they may also result from the use of some *termini ante quem*.

Here we are talking about contexts with the same formative history, whose dates refers to the same thing (see the definitions for deposits in Chapter II.2.3). One deposit means substantially one main process and one date. For instance a mortar floor and what was abandoned on its surface should be kept separate, while three superimposed layers of redeposited sediments for building purposes (e.g. they are the underlay for a mosaic) can be grouped together. What is important is that we can safely date the same event or process.

This means that, probably, groups of contexts may end up as fairly small, and many may consist of a single context. In any event, larger groups, based on different and wider criteria, may be created later. For the moment we must be content with the processing of numerous small groups, which, however frustrating at times, has to be considered necessary. We should also remember that pictures of the assemblages could also be used now as a further tool for assessing the equivalence of two or more contexts (see above). Some contexts may turn out to be also set aside at this very early stage, as their nature and reliability may be considered unclear and heavily biased from the beginning.

Once contexts have been grouped in deposits and the dates of recovered materials available, they can finally be evaluated together and the status of each deposit can be assessed, using both the information gained by the excavation and by the assemblages. Next, all the tools proposed can be brought into play to label each deposit into one of those taxa suggested here and then move to dating. Comparisons with other cases already studied in detail, may also turn out to be helpful.

In particular, quantitative and qualitative/formative approaches must proceed together and sustain each other, as only an overall examination of the aspects to be evaluated can lead to strong interpretive models and dates. How did the materials turn out to be embedded within the layer from which they were recovered? This is still the main question that has to guide our enquiry.

In a seminar held in March 2014, the present author proposed a first draft of the typology for deposits presented in Chapter IV.1.4, and tried to sketch a way of dealing with the deposits to be dated (Figure 139).

Although some differences in the typology proposed and the list of conceptual and operative tools used can be seen, as a whole the scheme shows well the core of the interpretive process that should lead to a date for the deposits excavated.

Moving to a higher level of detail, some tools are particularly helpful in assessing the affinity of a given deposit to one of the types proposed (or to a new 'taxon' created *ad hoc*):

- (1) chrono-profile. A Monte Carlo profile could be automatically produced, e.g. if the common output of the database in use were numerical. Much better results would be achieved if the dates of non-inventory numbered materials could also be loaded. This in turn could be performed automatically, applying by default dates to whole classes (e.g. 'African amphorae'). These dates are usually very broad but could turn out to be decisive in some cases;
- (2) a collective picture of the assemblage investigated (see above);
- (3) a complete excavation record (a well-filled context sheet and a Harris matrix) of the deposit, together with every topographical or archaeological observation that might suggest its status. The context sheet should also report in some form the risk of intrusions.

Together with these 'internal' tools, other external sources can be opted for to assess the deposit, how it was formed and how the materials found their way there. These include other archaeological notions in general (ranging from building techniques to waste management) and the comparison with ethnoarchaeological, experimental and literary sources.

Comparisons of the characteristics displayed by the deposit studied with the specific expectations of each type proposed in the taxonomy (and the more general expectations described for the macro-categories – primary abrupt, primary continuous, mixed, secondary, etc.) should lead to an appropriate label for the deposit, and, consequently, help date it.

Once this main activity has been carried out, we are left with a series of *termini post quem* or of *termini ad quem* dates, one for each deposit it was possible to examine with some safety. Indeed, again, deposits displaying high potential for consistent, and deposits with very obscure interpretations should be set aside: they may be checked later, and, hopefully, they will benefit from the overall chronological framework built.

After this phase, two main consistency checks should be performed – internal and external. For the former we should check the internal consistency of the chronological grid, particularly verifying any inconsistencies between the absolute grid and the relative sequence. Any other anomaly should also be examined and previous steps reassessed (grouping, artefact dates, deposits status, possibility that infiltrations occurred, etc.).

As for 'external' checking, the chronological framework emerging should be compared with other external available sources: the information gained from historical or epigraphic data may well fit with the framework and they may also allow more accuracy (conversely they may be inconsistent with the grid emerging from the excavation). Also in this case a step-by-step re-examination should be performed and the external sources also questioned. General archaeological knowledge may be used now as well, but it is important that all the considerations derived from these sources are kept explicitly separate from those deriving from the excavation and the study of its deposits and assemblages.

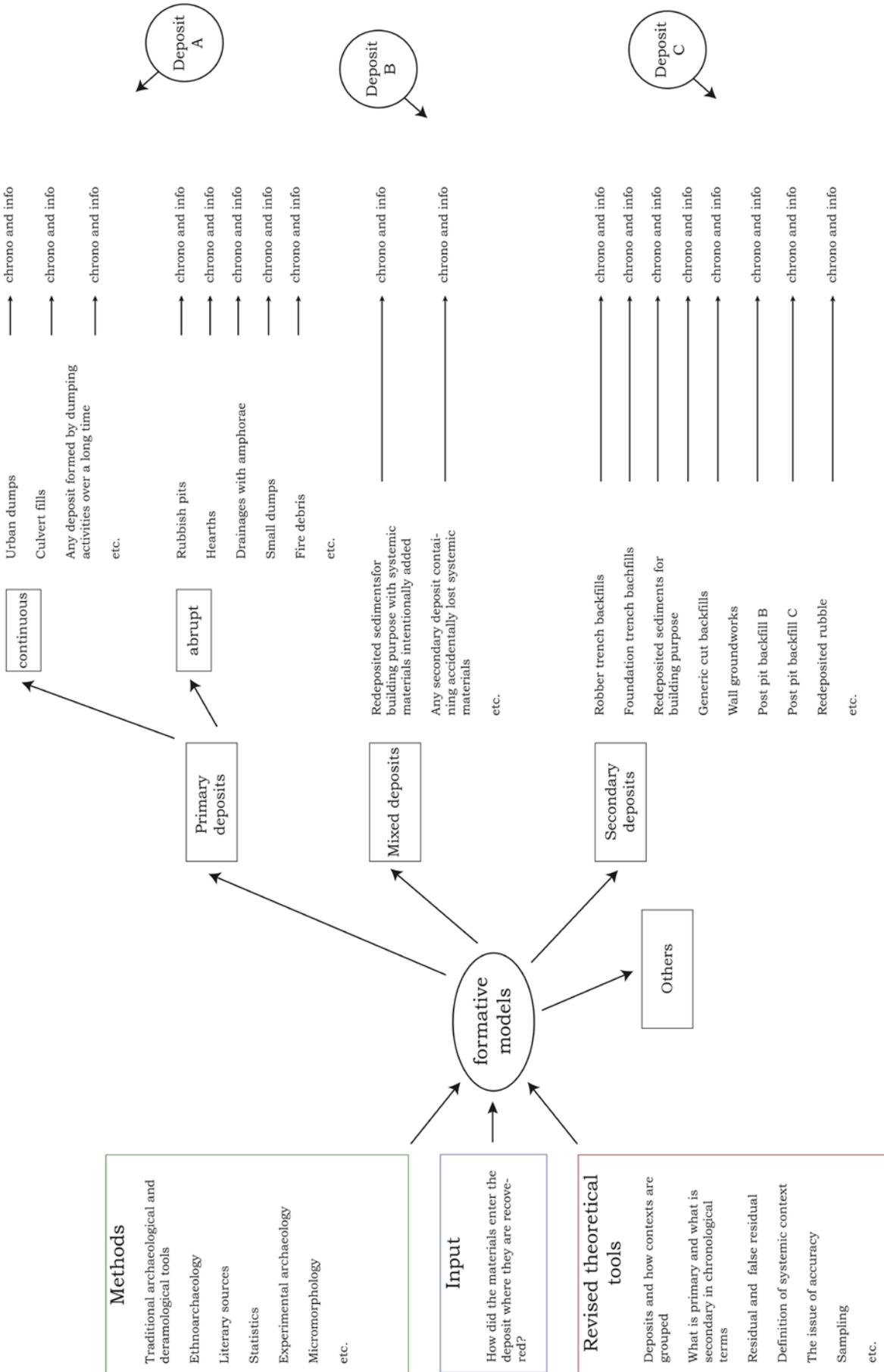


Figure 139: A provisional scheme linking theory, methods, models, taxonomy and specific case studies.

If the picture developing from this double check is consistent, then further investigations can be rigorously pursued when thought useful for narrowing some chronological windows. For instance, primary deposits may be targeted for additional scientific dating; even secondary deposits of particular importance (say, connected to the construction of important structures or infrastructures) may be targeted seeking a more recent *tpq*.

Here deposits dated *ad quem* (namely the most recent date provided by their window) can finally play the role of *termini ante quem* for the previous deposits.

Ultimately deposits can be pushed up and down within the matrix and macro-groups and chronological phases formed; this can be thought of as the last step in our lengthy process, i.e. moving from the relative chronology provided by the excavated sequence to absolute dates, which are arrived at through a combined study of both deposits and assemblages. The excavation, at last, becomes itself a tool for further archaeological, historical or anthropological research.

Once the circle is closed, the careful evaluation of the assemblages recovered in primary deposits, together with the clear awareness of the issue of false residuality and the palimpsestic nature of every systemic context, may lead to a review of those materials still in need of secure, narrow dates. The seriation of a good number of these kinds of deposits seems to be particularly recommended, but of course this is not the topic of the present work.

Secondary deposits can also provide useful information once they have been collocated within the absolute chronological grid emerging. For example, if one vessel type, whose date is considered uncertain, was not used for dating purposes, then its presence in a well-sealed secondary deposit (whose date is the result of all the work carried out) can suggest that the given type was diffused at least – but not exclusively – before that date.

The post-excavation phase can witness the integration of the data produced by the stratigraphic investigation, and by the study of the recovered assemblages, with the dates provided by radiocarbon analysis, through the powerful tool of Bayesian statistics. This practice is fortunately increasingly widespread, and it aims to provide sequences of high-definition radiocarbon dates. As widely discussed, dated samples, together with their specificities, largely share the same issues concerning ceramics or coins when it comes to their relation to the deposit they were recovered from. Again, taphonomy is the key: how did the sample reach the deposit containing it? This is still the main question to be answered and the pivotal point of a necessarily more holistic approach. Careful selection of contexts, and the evaluation of the processes bringing the samples into their deposits, represent the basis for picking the right samples to improve the accuracy of the chronological framework of the entire excavation. ‘Quantity’ also plays an important role: a good number of samples from structured sequences allows for better results than few scattered samples.

V.1.5 Publication⁵⁵³

A complete publication of the excavation is fundamental. If an excavation is not well published, in some form, it is as if it were never carried out: the scientific community will be unable to fully know and evaluate it. In this sense, brief reports cannot be considered sufficient, because they do not allow for adequate display of data and interpretive structure.

Large urban excavations, in particular, represent an invaluable source for archaeologists, anthropologists and historians, in terms of further and wider considerations in infinite ways. The lack of complete, exhaustive publications, particularly in the field of Classical urban sites, and with particular focus on the Italian panorama, has already been highlighted in the literature review (see Chapter I.2.7), and is critical when researching case studies published in sufficient detail.

⁵⁵³ The topic is, indeed, rarely discussed. Interesting prompts about the publication of finds catalogues are discussed in Allison 1997.

From a chronological perspective, to allow for a full evaluation of the grid of dates proposed and the possibility of undertaking further investigations, two points seem fundamental.

A complete data display is essential; this may be ‘simply’ a complete list of finds, together with dates, arranged context by context. A Harris matrix with the indication of deposits, macro-groups and phases is also needed. Certainly the full publication of these data represents a noteworthy effort, particularly in terms of time, editorial space and money. In this sense an on-line publication may well represent a good and cheaper alternative to a printed volume. Moreover the production of lists of finds, ordered by context and provided with other data, can be produced almost automatically by most databases used to manage post-excavation activity.

The second point refers to an explicit description of the criteria used and the workflow followed to move from relative to absolute chronology. The workflow relating to both the excavation and post-excavation analysis, of whatever form, should be explicitly discussed, from grouping to phasing, along with the criteria used. How contexts were grouped, for instance, is far from being obvious. Some choices in some critical deposits should also be explained. Ultimately, the publishing of chrono-profiles, at least for some key deposits, but even for whole phases, represent a useful platform for assessing chronological patterns.

Concluding, it has to be strongly underlined that publishing is still part of the activities linked with any excavation, and should thus be planned (also in terms of costs) and managed from the very beginning.

V.2 Conclusions

V.2.1 What before? How we currently deal with dating

Together with fundamental pieces of work, tackling more or less specific issues (i.e. the considerable efforts made in the fields of residuality, scientific techniques, rubbish disposal, context management, etc.), the panorama concerning the issue of dating deposits is populated by only a few attempts to organically build up a working method to approach the issue; the handbooks usually treat the topic in a very general (and sometimes generic) way. Sadly, the status quo has also resulted in very poor practical consequences, and the equation that ‘a lot of material from a given period = a deposit formed in that period’ is still all too common, albeit that this impression is somewhat difficult to check, as the number of complete editions of excavation projects, particularly in Italy, is far too low compared to the number of fieldwork projects actually carried out. Even among the complete editions, only a very small fraction of the whole explicitly provide the data necessary to evaluate the quality of the dates proposed, the way in which they were achieved, and, ultimately, to allow one to criticise or agree with them.

From a theoretical point of view, the main ‘original sin’ is not having created *ad hoc* conceptual tools, preferring to borrow them from snatches of theoretical debate not explicitly aimed at dating. This applies to the concepts of ‘primary’ and ‘secondary’, which were developed to solve spatial and functional issues, but whose use has been ‘imported’ to deal with chronological issues without serious revision.

In general, a lack of codification and sharing seems to be the most striking trait emerging from the theoretical review. Among many other factors, too deep a detachment between the branch of material studies and studies revolving around the interpretation of stratigraphy may well represent one of the main reasons for the current state of affairs.

Turning to methodological issues (How? With what operative tools?), the overall picture is even darker. The homogeneity of the dates provided by a given assemblage, rarely quantified⁵⁵⁴ or made somehow explicit (thus, how can these data be evaluated?), seems to be the only criterion for assessing the primary status of a given deposit, while for deposits that are clearly secondary, the *terminus post quem* offered

⁵⁵⁴ It has already been stressed that a considerable body of literature exists on quantitative techniques for dealing with ceramics, but large part of this literature targets economic issues or comparisons between two or more assemblages; a few notable exceptions are cited in Chapter III.4.

by the most recent artefact is used far too often to date *ad quem*. Occasionally, fragmentation is used as a tool to distinguish primary and secondary deposits (but primary and secondary in which sense?), yet how it was produced is rarely evaluated; the study of rubbish disposal practices in Classical times, although well developed, is conversely rarely considered in terms of its impact on the record we dig. The use of micromorphology also is still underestimated in Classical Archaeology, even if it could well answer specific questions about the formation of single contexts or whole deposits.

In the end, the presence of intrusions is usually claimed only *ex post*, whenever some specimens provide dates that disagree with expectations and chronological frameworks, and that are often the product of considerations deriving from general (or, again, generic) archaeological or historical considerations. This means that too often the data coming from the analysis of the excavated assemblages are stretched, with little, or no, theoretical and methodological attention, to fit chronological conclusions that we have already explicitly, or implicitly, formed in our minds.

More generally, a formative and qualitative approach (What is this stratum? How was it formed? How did the materials become embedded within it?) is very rarely combined with quantitative observations on the chronology provided by the recovered finds, raising questions such as: Are the dates consistent or clustered in different periods? What is the period – or periods – represented most? Is there consistency or not between the main peak of evidence and the *terminus post quem*?

Analogical and comparative devices seem also to be grossly underestimated; the use of ethnoarchaeological and experimental analogy is rarely favoured in Classical Archaeology and is almost unknown in the field of dating.

During the seminar cited in the previous chapter, the present author showed an illustration (Figure 141), realised through transforming a famous drawing previously edited by M. Johnson (Figure 140), expressing the necessity for Classical Archaeologists to make much more use of these instruments (and other ‘ancillary’ disciplines) in the future. Up to the present it has to be (sadly) acknowledged that the situation is still much more similar to the one depicted in M. Johnson’s original figure.

Literary sources are traditionally taken more notice of, but rarely is their potential exploited to investigate formation processes and dating.

Turning to the last comparative device that can be used to date deposits, i.e. existing case studies, this is greatly biased by the very lack of complete editions of excavations, contexts and deposits just cited.

As suggested in the introduction to this work (Chapter I.1) and the literature review (Chapter I.2), the picture emerging from an examination of the status quo is anything but organic, with specific topics analysed by considerable bodies of work and other issues remaining almost totally unexplored.

V.2.2 What’s new?

Given this current state of affairs, and approaching the end of this current work, it is necessary to ask if and how this present study answers the critical points highlighted.

In the introduction (Chapter I.1.3), the aim given was to improve, if only in a small manner, the quality of the way in which we date deposits. To do this both theoretical and methodological tools were devised, and shape was given, hopefully, to a taxonomy of deposits and a working method. What follows, point by point, is a guide to the elements considered most representative in terms of dating deposits on more solid bases.

Theory

In Part II, dedicated to theory, the main concepts involved in dating deposits were looked at. To label the selected key concepts, it was decided not to adopt new terms (there are already too many), but, conversely,

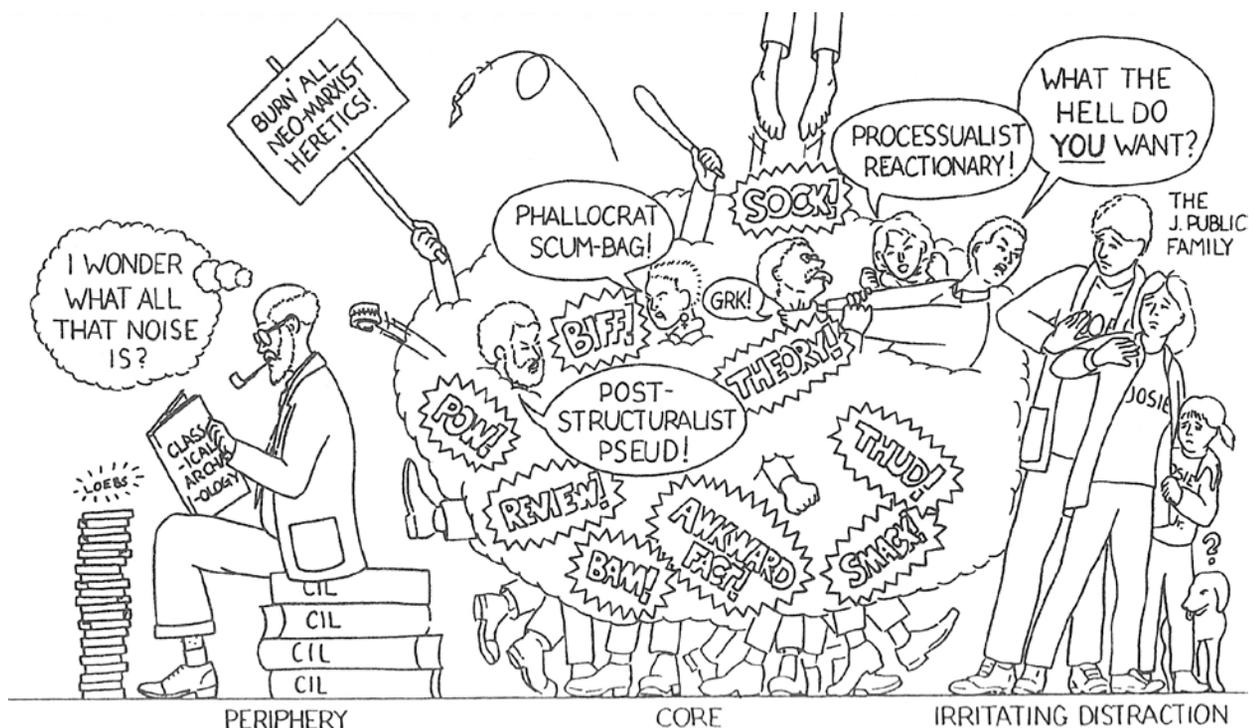


Figure 140: The theoretical debate at the end of the 1980s according to M. Johnson (Johnson 2010).

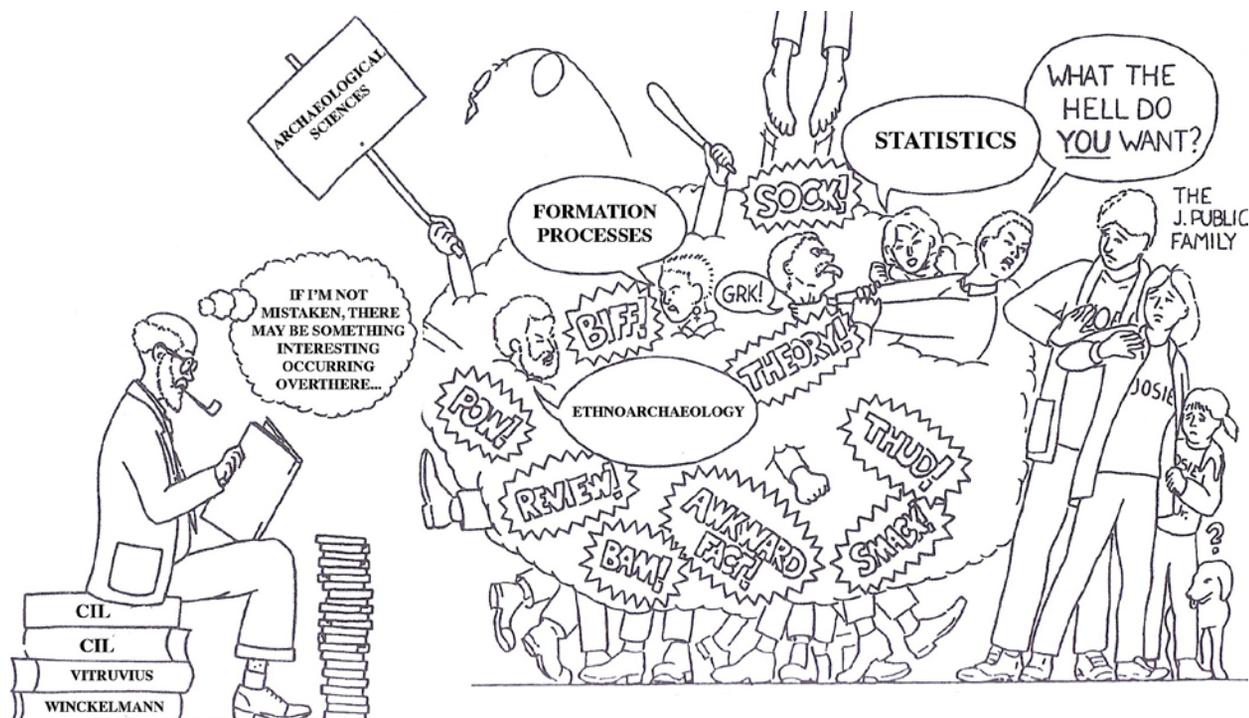


Figure 141: Archaeological methods and theory in the future? (modified from Johnson 2010).

to produce new definitions that seem better to fit the field of study selected. In particular, there was shift proposed from a spatial/functional (or simply ambiguous) perspective (see the terms ‘primary’ and ‘secondary’, as well as ‘residual’ or ‘systemic context’) to a more markedly temporal point of view, which represents a prerequisite when dealing with dating. An attempt was also made to link many of the advanced definitions with the main issue of accuracy/uncertainty, which seems to represent the key point in being able to fully understand and define phenomena such as residuality and false residuality, or to distinguish what is primary and what is secondary.

A further goal was to try and also be very explicit about other concepts, which, albeit not closely confined to the topic of dating, often used throughout the work, such as 'analogy', 'model', or 'process'.

This necessity to define the concepts used originated from the will to be very clear and explicit, from the very beginning, particularly in a field which is poorly codified.

Methods

Among the methods proposed it may be possible to detect some innovative points, the most important of which, probably, is represented by the use of Monte Carlo simulations to produce profiles representing the 'chronological content' of each deposit, and showing those periods that are more or less represented by the finds recovered. This method allows for a good management of uncertainty and is quick and easy to read, thus having some advantages compared to other methods, such as the weighted mean sum. It has also to be stressed that even this last methodology, although it has been used for dealing with assemblages, has never been preferred as a tool to investigate the way in which a given deposit was formed, and to establish its status and date it.

Some useful prompts are also represented by the observations made on the finds that provide the dates used for simulations. Far too often we handle dates in a somewhat simplistic way, as if they all referred to the same thing, while they actually may regard the production of a given item, its diffusion, the diffusion of its typology, etc.; even more complicated issues concern radiocarbon dated samples. Given the necessity of handling the entirety of the chronological information available, the necessity follows of evening out, somehow, the quality of the dates we have. This is an important point to stress and one that adds additional variability to the palimpsests offered by assemblages we study. In particular it emerges relatively clearly, and somehow paradoxically, that the more precisely dated the items we usually have from Classical urban environments (coins and fine-wares) are, the more reasonable it is that they are affected by phenomena of curation much more than other items (coarse-ware above all); the latter, on the contrary, usually live a short life, but they are also very poorly dated. Given the impossibility of ascertaining when many items were produced, through suggesting the extension of the typical systemic life of coins and fine-wares whose dates refers to the production, the implication is basically to imply replacing a form of false certainty with a higher degree of 'true' uncertainty.

The observations made on tendencies in the production and diffusion of ancient items are obviously based on current knowledge and, therefore, may be substantially reviewed by future studies. For the moment, what emerges is a panorama of either considerable variability, or a substantial lack of data; therefore, it seems that the use of uniform distributions still has to be preferred to the use of normal ones.

What was also stressed was the importance of processing assemblages as populations or samples, also according to the percentage investigated of the whole deposit. It has also been demonstrated that the representativeness of the sample also depends on the quality, or status, of the deposit itself.

Moving to the evaluation of the physical characteristics of the assemblage, it has to be advanced that, in this particular field, a much larger body of literature exists, ranging from the evaluation of wear to the study of fragmentation, conjoinability, blackening, etc. The point is how to interpret these data to gain information on the formation of the deposit and its dating. This still remains a controversial point that has to be evaluated case by case. Restricting the discussion here to the proposal of a quick way to record large parts of the data needed, one solution was simply to take photograph of the assemblage as a whole, possibly before and after washing. Given the speed required by an urban excavation, it was considered that the adoption of multiple ways of recording, piece by piece, different aspects was both time consuming and difficult to organise in terms of reconstructing an entire picture of the assemblage. By means of a simple image we can have a quick, entire, visual impression of the characteristics of a whole assemblage, and we can easily build up a large collection, useful for comparative studies. Of course this approach does not allow any form of quantification, but it seems to display a good degree of effectiveness, practicality

and speed. Usually some notes about the dimensions (rarely about other characteristics) of the recovered finds are reported in the context sheets, but they are often too vague or incomplete and are more time consuming; indeed, pictures of whole assemblages are also sometimes taken, but it is not a systematic practice. This practice should arguably become part of the routine excavation laboratory activity and be used in particular for assessing the nature of the deposit yielding the assemblage.

Emphasis has been placed on the role of secondary use, recycling and discard practices in shaping the assemblages that we recover, not only in terms of physical state, or in terms of presence/absence of artefacts, but also in making freshly discarded items (that can potentially provide good *ad quem* dates) circulate.

The crucial role which can be played by micromorphology and, more in general, by the investigation of the matrix of the deposit, to gain information on its formation and status, is fortunately covered by many important works.

Other methods helpful for assessing the status of a given deposit and for understanding how to employ the embedded materials so as to propose a date of formation are not 'internal' or analytic, but comparative. In this case, analogy has to be used as the main conceptual link between what we observe and the terms for comparison that have been chosen. Four main comparative tools were cited that can be used, namely ethnological, experimental, literary, and archaeological. Archaeological comparisons would be guaranteed by large bodies of fully published data and their shortage represents a topic already discussed. Literary sources have been examined somewhat briefly; they are a branch from which Classical Archaeology draws a great body of information, but they are rarely used in connection with the studied deposits' formation processes. A few examples were outlined that show how this powerful tool could be adopted more effectively in this way, but, as a whole, this is a huge field of studies and deserves much wider and more detailed work in the future. Ethnoarchaeology and experimental archaeology, as discussed above, are still too neglected by Classical archaeologists. It was tried to demonstrate that both can be helpful in strengthening some models developed about the formation of deposits, according to what was observed in the field. Even these topics have been taken on only partially, but one or two useful, practical indications were included, relating to earthen floors and the dynamics of *in situ* assemblages beneath collapse debris. In these fields, as well as in direct dating of mortar and sediments, there is still much work to do.

Among the wide range of issues to do with dating, intrusions is possibly the most transversal and critical. It was attempted to list what are the main causes of intrusions and 'false' intrusions (wrong grouping, for instance). This seems to be a problem that is difficult to solve once and for all, so some suggestions and instruments were proposed to limit it. Apart from the necessary care to be taken in the field and after, our focus was mainly on instruments to evaluate the issue *a priori*, and to limit its indiscriminate *ex post* use (see above). A general environmental evaluation seems to represent a necessary basis to start with, but it must follow a form of more specific context by context evaluation. In this sense it was proposed to slightly modify the common context sheets adopted. The point is that the presence of some finds can well be explained (in terms of intrusions) if we are dealing with a context of soft matrix that has been exposed for a long period and then later cut or truncated, or that seems to have suffered heavy bioturbation. But we cannot claim that intrusions occurred when dealing with the preparatory layers of mortar floors that have laid untouched after construction. Perhaps, in this case, we would do better to find other ways to explain why a given find was recovered in a given context, and possibly then reconsider some chronological assumptions made too hastily.

Taxonomy/typology

Classifications of archaeological contexts or deposits have already been proposed in the past (see the subdivision in class I and class II deposits proposed by P. Crummy and R. Terry in 1979). The one proposed here is explicitly oriented to dating. The aim of the sort of typology proposed consists not only of giving shape, according to some criteria, to the galaxy of archaeological deposits; it also represents an instrument

to attribute a given deposit to a specific formative model and then lead to its own way of dating. As a classifying device, the taxonomy proposed can be read from the most general categories (primary, mixed, secondary) to the more specific (rubbish pit, robber trench backfills, etc.). As an operative and comparative tool the same taxonomy can be read in the opposite way, from the specific formative model, to which our specific case can be assimilated, to the more general categories, which lead to a way of dating the deposit.

In doing this, we tried to be explicit about the criteria (filters) used to group deposits: at the bottom the filter is formative (what is the deposit we are dealing with and how was it formed?), while at the top the filter is theoretical as it answers a specific question, in this case simply 'when?'. The answer relies on the relation between artefacts and deposits. In the middle, we chose to set one more filter that allowed us to distinguish those deposits whose date of formation it was possible split by start and end dates, and those deposits whose formation was datable only as a whole (abrupt vs continuous). This filter, defined as qualitative, depends on the length of the formative process and the quality of the dates of the single artefacts embedded.

This typology may well be extended and modified in the future, but it seems to offer, at least, a good starting point. The case studies, which represent just a small selection, may also be infinitely extended so as to create what would become a database for future comparisons.

Working method

At the very end of this present study, a proposal of a working method was suggested to deal explicitly with dating from the early stages of a field project until its final publication. Of course it is just a subjective proposal, which does not claim to be dogmatic, and is structured mainly keeping in mind the procedures most favoured by the present author. It avails itself of the tools proposed and discussed and sets them in the wider framework of excavation practice and post-excavation analysis.

Among the critical points debated, two have been stressed with particular emphasis: the one of grouping; and the necessity of avoiding the dangerous circular procedure that employs contextual data to date materials, which are in turn used to date contexts. These two key points may be the most 'indigestible', on the one hand by field archaeologists and on the other by finds specialists.

Conclusive remarks

Given what was observed above, it may be argued that the aims of this book have been at least partially achieved. To what extent is a matter of points of view, but at least a few prompts have emerged for future research and for a much needed debate.

Five key points, which emerged more or less explicitly, are worth being stressed one final time:

1. Archaeological research can have different targets. The one discussed here, and which has to be kept in mind, is that of dating deposits. It is somewhat obvious, but when dealing with such a transversal issue this has to be often recalled, as mixing tools, concepts or models with different objectives (say detecting functional, spatial or economic patterns) can be far too easy. We already stressed that mixing different perspectives has led to unclear and uncodified conceptual tools, which are often misleading or useless.
2. For investigating when a deposit was formed using the finds recovered within it, it is unavoidable to try and understand how the deposit was formed and how the materials were embedded in it. This is surely something worth being repeated.
3. Dates are not raw data. They display a highly interpretive content. It follows that we must use, as much as possible, a structured and explicit workflow to acquire them, and this workflow should be made explicit also to other scholars, to allow for an evaluation of the reliability of what was proposed.

4. Quantitative approaches and qualitative/formative studies must proceed hand-in-hand. No solid conclusion can be drawn about dating if we proceed down one avenue only.
5. There is a direct relationship between the quantity and quality of the available data and the quantity and quality of the conclusions that can be drawn from those same data. This applies also in the field of dating. If we have a few, poorly dated artefacts, we cannot think of dating the deposit containing them *ad annum*. If narrow chronological windows are needed or wanted, their definition will have to rely on sources others than the artefacts.

V.2.3 Critical points

In the end, it is also fair to have a look at those critical points and deficiencies that emerged. Two seem evident: one concerning the case studies discussed; and one concerning the overall layout of the book.

Starting with the case studies, one first objection may concern the way in which they have been chosen. They were deliberately ‘cherry picked’ for their clarity from the deposits excavated by the present author. One may fairly say that they obviously fit the framework identified, as they were chosen exactly to do that. What about other cases? What about other cases that do not fit the expectations? This is a justifiable question that, for the moment, can be answered in this way: the role of the presented case studies is explicative and has no statistical value. Indeed, some ‘types’ of deposits are not provided with a case study (see rubbish pits) just because those examples studied turned out to be somewhat less informative, as well as poor in material (see below). Of course, there may be infinite exceptions that do not fit the framework proposed. However, a wider collection of case studies (see below) may represent in the future both a useful comparative device and a way to strengthen or reject the theoretical and methodological frameworks proposed. But we had to start somewhere.

Another main issue that emerges when examining the case studies proposed concerns the data. Some of the case studies clearly display a low number of dated artefacts. In general, this is due to a general shortage of well-published and easily accessible deposits (together with their assemblages provided with quantitative data). Thus we were obliged to opt for contexts whose dynamics were clear, and could be treated confidently, even though, unfortunately, sometimes their assemblages were limited. In addition, when this work began, some of the assemblages presented were still being studied and could only be analysed in part. Useful case studies, *per se*, are infinite, therefore this aspect can be improved on in the future.

A further issue is that occasionally qualitative data concerning the assemblages are not well detailed. The usefulness of the main tool proposed to record the physical state of the assemblages (a simple photograph!) is something that became clear after the three main excavations from which the case studies were selected (Aquileia, Fondi Cossar; Gortyn, Pythion theatre; Nora, forum) were over.⁵⁵⁵

Moving to the second critical point, the overall structure of the book, some objections may be raised. The introductory section of the present study explained why it was decided to choose an apparently non-traditional layout, starting from theory and not data. One may say that although it started with theory, that theory clearly draws on past experience and uses data at the very least to explain and demonstrate some concepts. The answer is simply ‘Yes, of course’. Theory does not grow in an empty environment. Even theory and methods elaborated to categorise and analyse data moving from general principles and research aims, actually draw from a certain knowledge of the data and from the general problems they raise.⁵⁵⁶ Deductive and inductive methods should not be seen as antithetical,⁵⁵⁷ separate approaches, but

⁵⁵⁵ This practice was put to use in the very next excavations carried on by the teams joined later by the present author.

⁵⁵⁶ The relationship between inductive reasoning and theory has been analysed in the 20th century by the two major philosophers B. Russell and K. Popper. Popper, in particular, developing thoughts rooted in Kant’s philosophy, stressed that observations are always soaked with theory. See, in particular, Popper 1972: 76-105, 312-313. The issue has been addressed also by anthropologists; B. Malinowski, at the beginning of the 20th century, drew similar conclusions (2011, 18-19, 23).

⁵⁵⁷ The pragmatist philosopher C. S. Peirce developed the original concept of abduction. Although he did not propose a univocal and clear definition, abduction can be seen as the process of formulating hypotheses using both data and imagination, induction and deduction. See, e.g., Burks 1946; Frankfurt 1958; Scheff 2011: 266.

as part of a circle of continuous elaboration and test. Many approaches proposed in this book still need to be fully tested (see what was discussed above in relation to the case studies). Empirical and statistical future investigations will allow us to accept or reject the models proposed, to raise new questions, and to lead research in new directions. In brief, what is presented here is just one part of a deductive/inductive cycle that it is hoped will continue developing in the future.

V.2.4 Perspectives: what's next?

Some future lines of research that could grow from the present work have already been suggested, while others remain somewhat more implicit: it follows a random list of future researches that may be worth approaching to continue refining the way in which we date strata. Certain general topics have deliberately been avoided here; their development will undoubtedly also contribute, in the near future, to an improvement in our ways of dating deposits:

1. Substantial extension of the case studies examined, possibly until the body of data collected and processed have also some statistical weight; this collection would also represent an invaluable comparative tool. Once the main ways of proceeding have been defined, the collection of good amounts of new fresh data may well occur relatively quickly; and, with some reversal of the approach, deposits already firmly dated could be investigated, seeking recurrent patterns.
2. *Ad hoc* ethnoarchaeological or historical archaeology studies investigating the internal patterning of both primary and secondary deposits. Abandoned dwellings and infrastructures whose construction dates are known may represent excellent targets;
3. Experimental studies, particularly concerning ceramic breakage patterns or the replica of ancient practices involved in the formation of common archaeological deposits.
4. Studies concerning reuse and recycling in the Classical world.
5. Analyses of mortar-structure assemblages to verify some of the models proposed.
6. Extensive radiocarbon analyses of wooden finds (furniture, small finds, and even architectural timber) in contexts of known dates, so as to understand how patterns of old-wood effect, curation, secondary use, and recycling affect the dates of the samples collected in primary deposits (e.g. the Herculaneum assemblages may be ideal for this).
7. Improvement of our chrono-typologies for those classes of finds that are more common and less likely to have suffered episodes of curation, or whose systemic life is usually short (see coarse-ware); in this sense the application of absolute dating techniques together with Bayesian approaches could turn out to be very helpful. A more general, explicit review of the ways in which materials are currently dated, from both theoretical and methodological perspectives, would also be of great benefit.
8. Archaeometric analyses for ceramics and burial environments, to assess if redeposition occurred.
9. Improvements in absolute dating techniques, i.e. mortar dating and OSL.

Apart from the final, *in toto* appraisal of what has been achieved by this book and what has not, at the very least, the revitalisation of the current debate on the crucial topic of dating deposits, which is somehow languishing, would be a great achievement in itself.

Appendices

1. Self-archaeology compiled forms

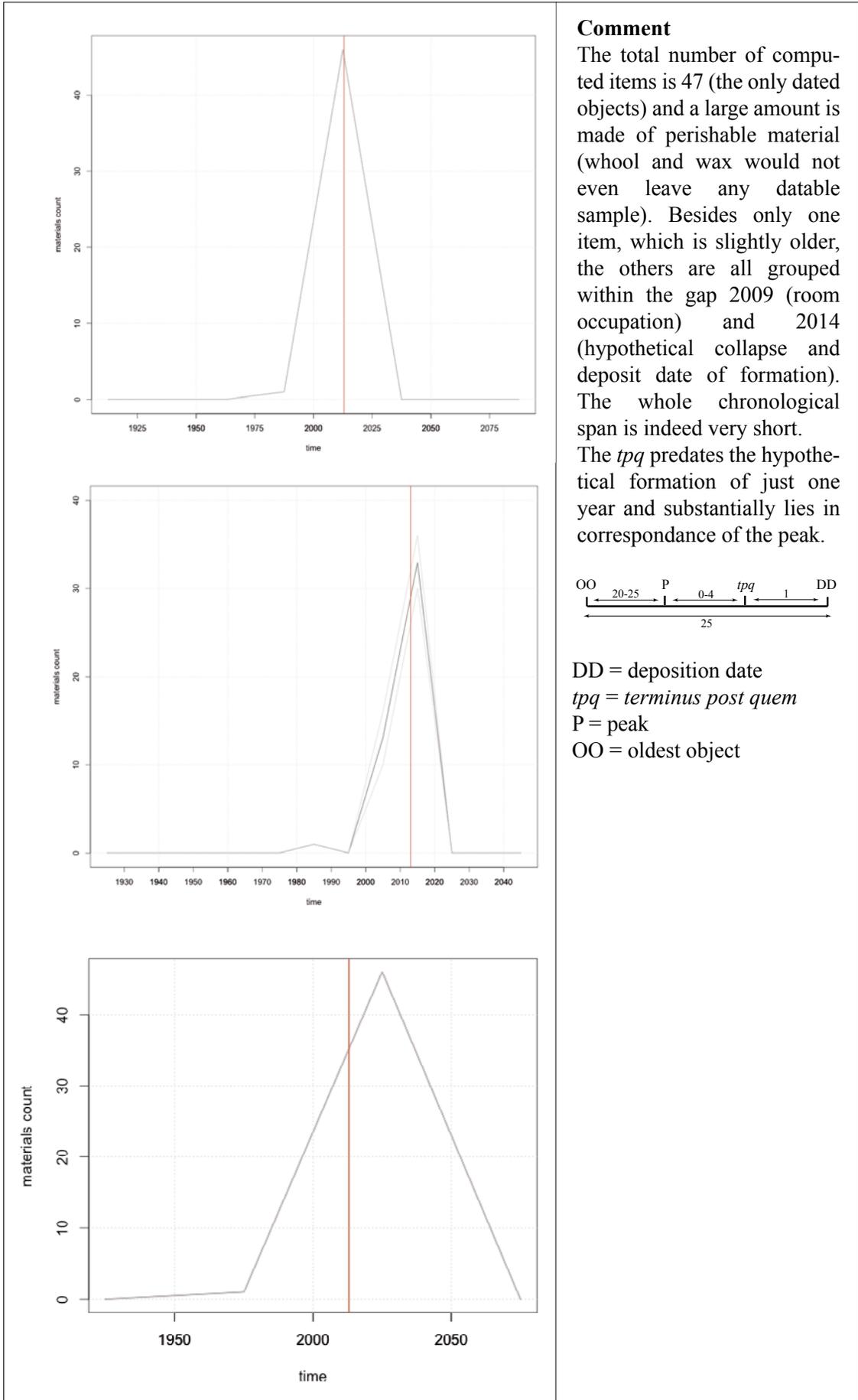
Case 1

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 Tipo di edificio (abitazione, luogo di lavoro, magazzino, altro): **ABITAZIONE**
 Stanza ambiente (Cucina, salotto, studio ecc.): **CUCINA**
 Completare finalizzato (se volete cocenate anche i mobili):

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LAMPADE	8		TRA IL 2007 E IL 2009		TRASLOCO	
VASI DI CERAMICA	7	ARGILLA				REAU TAVOLI (MINO)
DIVANO	1	SPUNTA IN LEGNO	2009		TRASLOCO	
LIBRERIA	1	LEGNO	?		EREDITA'	
LIBRERIA	1	LEGNO	?			
SPRITTE	25	LEGNO	TRA IL 2007 E IL 2014			SONO SPATTOLE AFFICANE E BUONNA
PERCHIA A SACCO	1	LEGNO	2010		TRASLOCO	
SPECCHI	3	LEGNO	?		EREDITA' e TRASLOCO	
QUADRO	1	LEGNO	1989		EREDITA'	REAU TAVOLI DA EREDITA' SINECRONIZATI
TAVOLI	2	LEGNO e ALLUMINIO	?			
SEDIE	6	METALLO	?			
FORNATE	2	PELLE e ACCIAIO	?			
VASI	7	VETRO	?			
TELEVISIONE	1		2009		TRASLOCO	
VASI	2	CERA	2009		TRASLOCO	

Osservazioni:



Località:
 Tipo di edificio (abitazione, luogo di lavoro, magazzino, altro):
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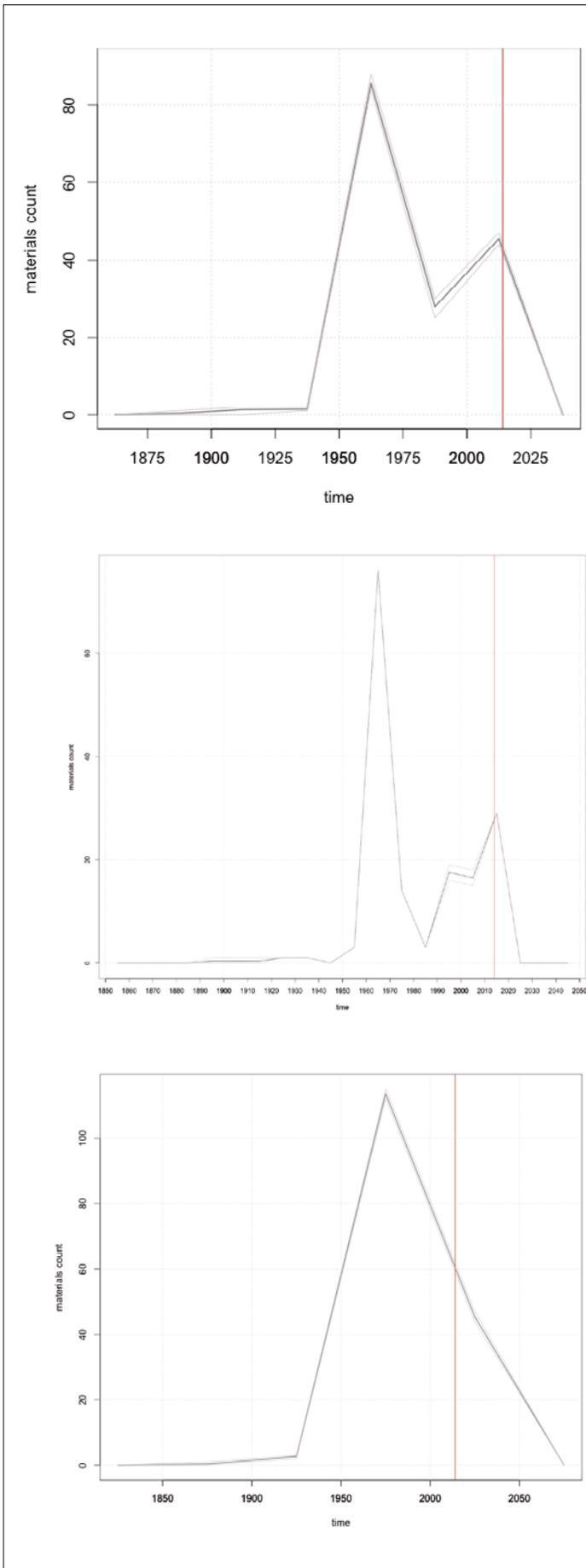
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- circa tre quarti
- circa metà
- meno di un quarto

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PIRELLA	1	"	"		"
BRACCIALE IN ARGENTO	1	"	"		"
BISCOTTI BINGA BINGO	2	"	"		"
CONFEZIONE DI BISCOTTI	8	"	"		"
FORTE GASPINI	1	"	"		"
PIATTO CERAMICA NICO BELLA	1	"	2012		SOSTITUZIONE
FRANGIBEVERI	1	"	2014		"
FORTE GASPINI	1	"	ANNI '60		"
FORNACINA	5	"	"		EREDITÀ
PIATTO CERAMICA NICO BELLA	1	"	ANNI '50		"
FORTE GASPINI	1	"	ANNI '40		DONO
FORTE GASPINI	1	"	"		"
TOMAGLIA	1	TELA	ANNI '70		EREDITÀ
TOMAGLIA + TOMAGLIOLI	1	TELA	"		"
TOMAGLIA	1	TELA	ANNI '80		"
CESTO	1	VITINI	"		DONO

ARCO BELLA
 ROTO 2 VOLTE
 (2 VETTERI CONTRARIO IDENTICO)
 2 A 3 BRACCI
 3 A 1 BRACCIO

CHIAVIE	ZO	VERA	RECENTE	ACQUISTO (RECENTE)	ALLIGNE (RECENTE)
LUMINI	24	"	"	"	"
CHIAMI	8	METALLO			CHIAMI DI RIF. INTERIENE NEI CALCI
GOVERNORE	1	PLASTICA		PRESENTE IN CASA ALL'INDIRIZZO	IN CASA ALL'INDIRIZZO
TOMAGLIA	2	TESSUTO			TOMAGLIE SIDA
PIATTO CERAMICA	2	CERAMICA	ANNI '60	IN FAMIGLIA	TOMAGLIOLI ALBIVANTI
MASCIARELLI	6	CERAMICA + VETRO	RECENTE		PRISCILLA MARZEMME + SCHA
LAMPADINE	7	VETRO	"		
LAMPADINO	1	VETRO + TESSUTO		PRESENTE IN CASA ALL'INDIRIZZO	
MULTIPLI/REDUTTORI	4	PLASTICA + METALLO	ANNI 2000		
STIPER	1	PIRELLA	2014		
BATTERIE	22	PIRELLA + TESSUTO	RECENTE		VARI FORNITI

Osservazioni:

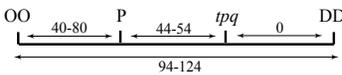


Comment

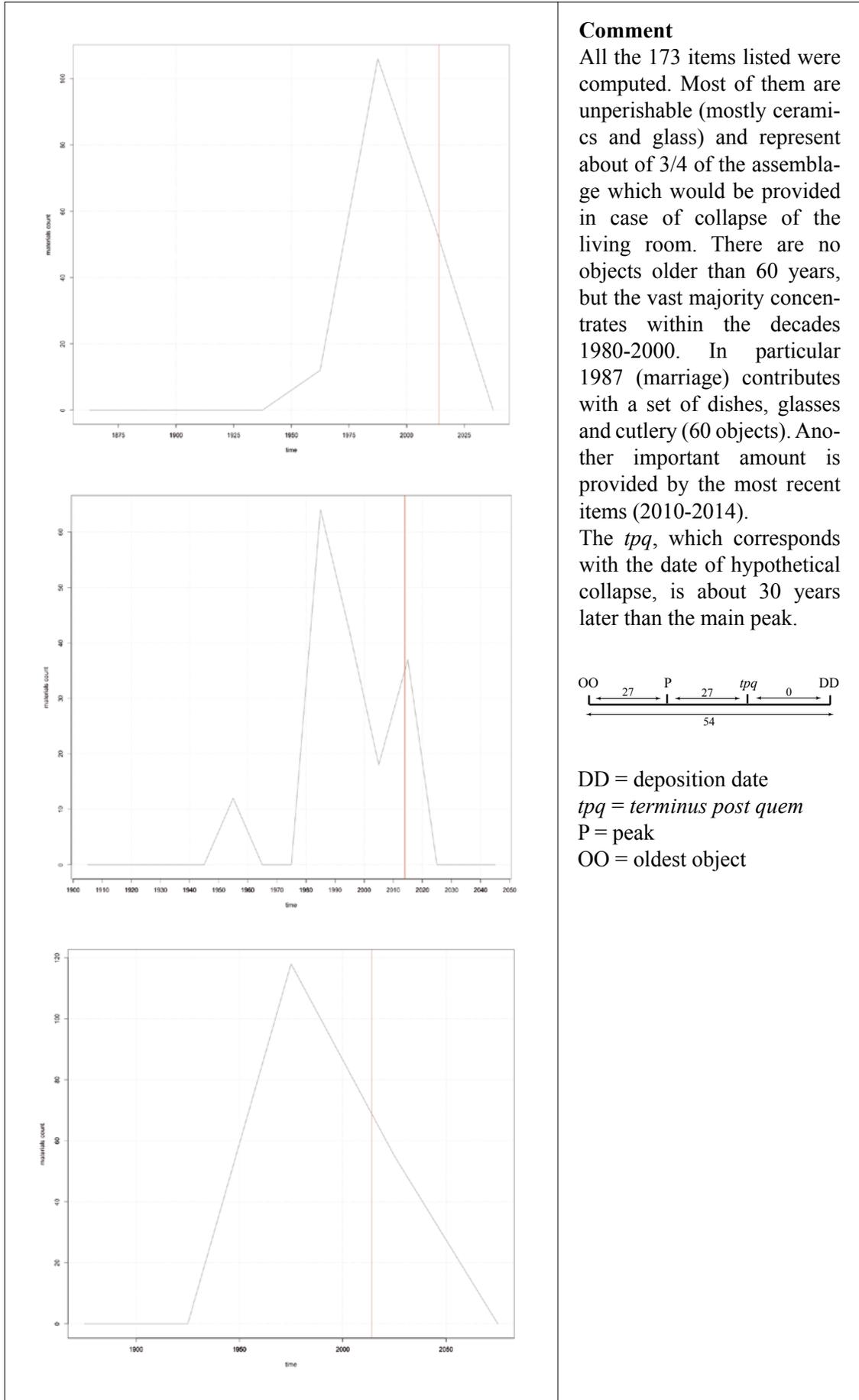
The 162 computed items represent about the whole assemblage provided by a living room (only few objects of uncertain date were not computed). Most of the materials are not perishable: the bulk is provided by mid 60s ware whereas another important contribution comes from the more recent items (1990-2014) and it is made up mainly by electrical ware and plastic/glass objects. The amount of objects older than 60/70 years is certainly negligible.

It is worth noting the abundance of inherited materials (mid 60s), substantially pre-dating the occupation of the room.

The *tpq* corresponds to the date of formation, it is about 50 years later than the main peak and substantially corresponds to the second peak.



- DD = deposition date
- tpq* = terminus post quem
- P = peak
- OO = oldest object



USI E SOPRANNOMI	SO CUCO	GERANICA, VETRO	1976 - 2014	1976 - 2014	1976 - 2014	1976 - 2014
BICCHIERI	48	VETRO	1962			
TASSE E TASSENE	20	CERAMICA	1949		X MULTIMONDO	
PIATTI	36	CERAMICA	1962			
POSATE	48	METALLO	1962			
CONFEZIONI DI CIBO	11	CARTA, CASTONE, PIASTRA	2014			
FRUTTE	1	VETRO	1949		X MULTIMONDO	
STRASCIE STOFFE	11	TESSUTO	?			
CARTE E DOCUMENTI	11	CARTA	? - 2014			
GIOCATTOLI	40	PLASTICA	2000 - 2014			

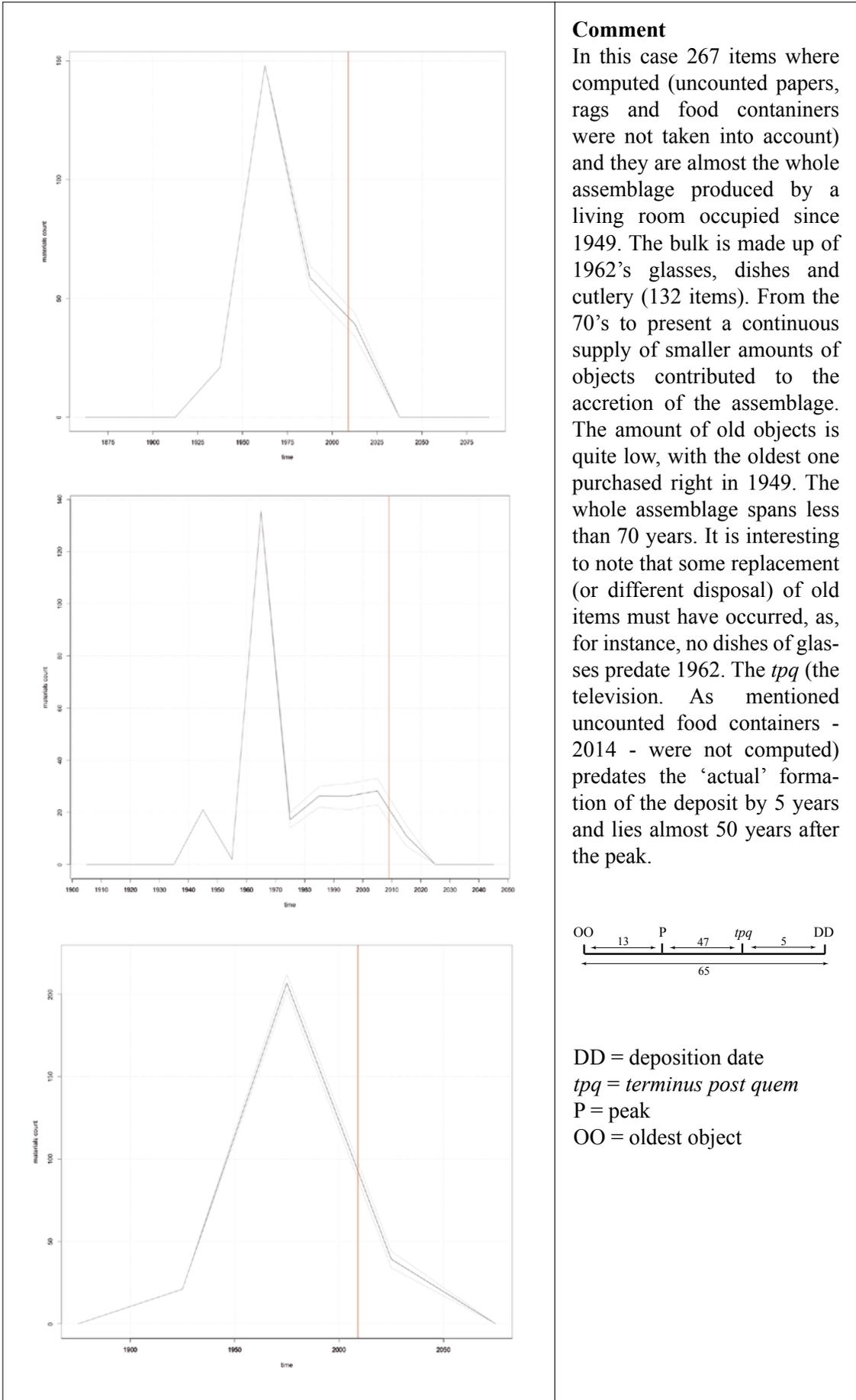
Osservazioni:

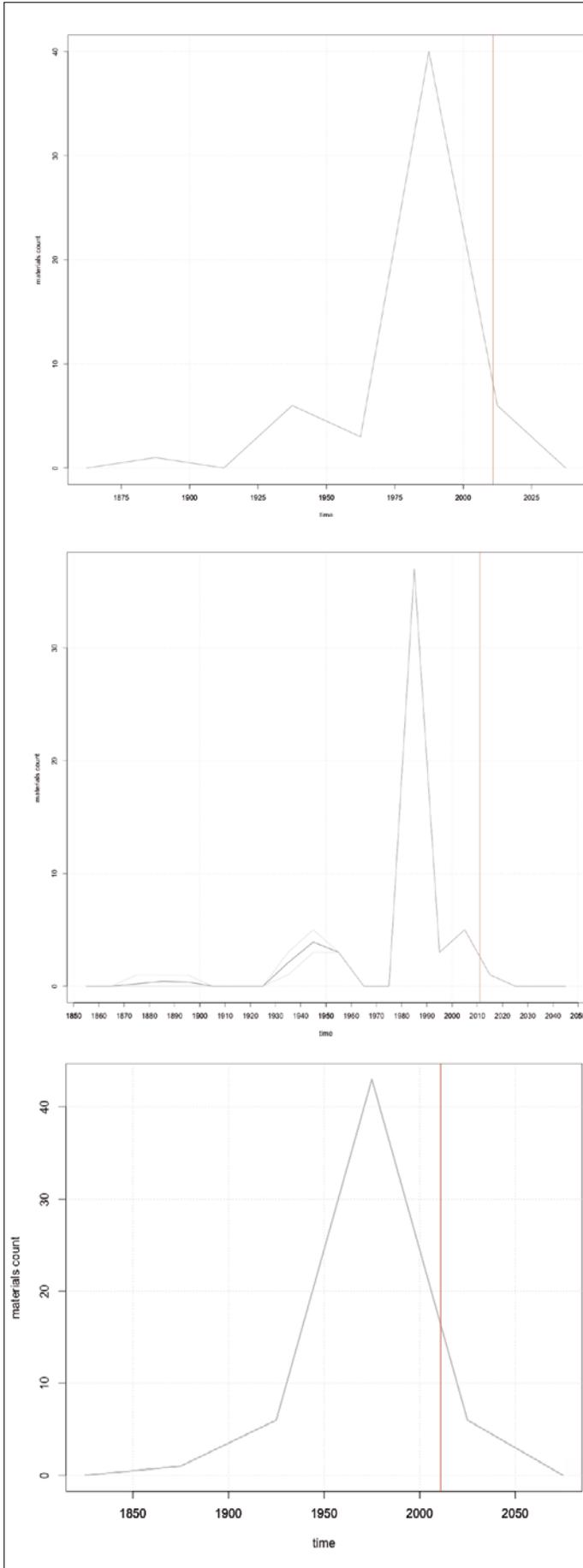
Località: CERCA - Frazione di Spilva
 Tipo di edificio (abitazione, luogo di lavoro, magazzino, altro): ABITAZIONE
 Stanza/ambiente (cucina, salotto, studio etc.): 3066/01/02
 Occupato dal: 1949
 Campione analizzato (se volete contare anche i mobili):

tutti o quasi tutti gli oggetti
 circa tre quarti
 circa metà
 circa un quarto
 meno di un quarto

Oggetto	Quantità	Materiale	Data di acquisto	Data di produzione presumibilmente molto precedente rispetto alla data di acquisto (buono se è il caso)	Note
TAVOLO	1	LEGNO	1973		
SEDIE	6	LEGNO, PAGLIA	1973		
OPRENDA	1	LEGNO	1973		
DIVANO	1	LEGNO, TESSUTO, SOPRASTOFFA	1990		
CUSCINI	12	TESSUTO, PIUMA	1990		
MACCHINA DA CUCIRE	1	LEGNO, METALLO	1975		
CESTO DI VIMINI	1	VIMINI	1979		
MOBILE	1	LEGNO, VETRO	1952		
RADIO	1		1952		
TELEVISORE	1		2009		
RADIOTELI	2	METALLO, VETRO	1970		
LAMPADARIO	1	METALLO, VETRO	1974		
TERMOBILICO/ BISCOTTIERO	1	PLASTICA, METALLO	1968		
QUADRI	17	LEGNO, VETRO, TESSUTO	1990 - 2014		
TENDE	6	TESSUTO	2000		
CEGGIFISSO	1	LEGNO, PLASTICA	1962		X

TEMA COMUNICAZIONE DI
PIU' PAPA'

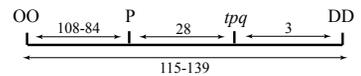




Comment

About 2/3 of the 56 materials listed (which in turn are about 1/2 of the total assemblage), consist in a set of dishes given as a marriage present in 1983. A mix of inherited and vintage items, dated to the dacades 1930-40, represents the majority of the older objects. It is also worth noting that they are pieces of furniture made of wood, thus perishable. Other items cover the period 2000-2014. The latest piece dates to 2011 and the oldest one (wooden piece of furniture) to the end of the 19th century, bringing the total time span to more than a century.

The *tpq* is 3 years earlier than the hypothetical formation date and almost 30 years later than the peak.



DD = deposition date
tpq = *terminus post quem*
 P = peak
 OO = oldest object

Località: MASSA (PARMA)
 Tipo di edificio (abitazione, luogo di lavoro, magazzino, altro): ABITAZIONE
 Stanza/ambiente (cucina, salotto, studio etc.): SALE DA TAVOLA
 Numero cal.: 147
 Campione analizzato (se vi è stato sottile anche i mobili):

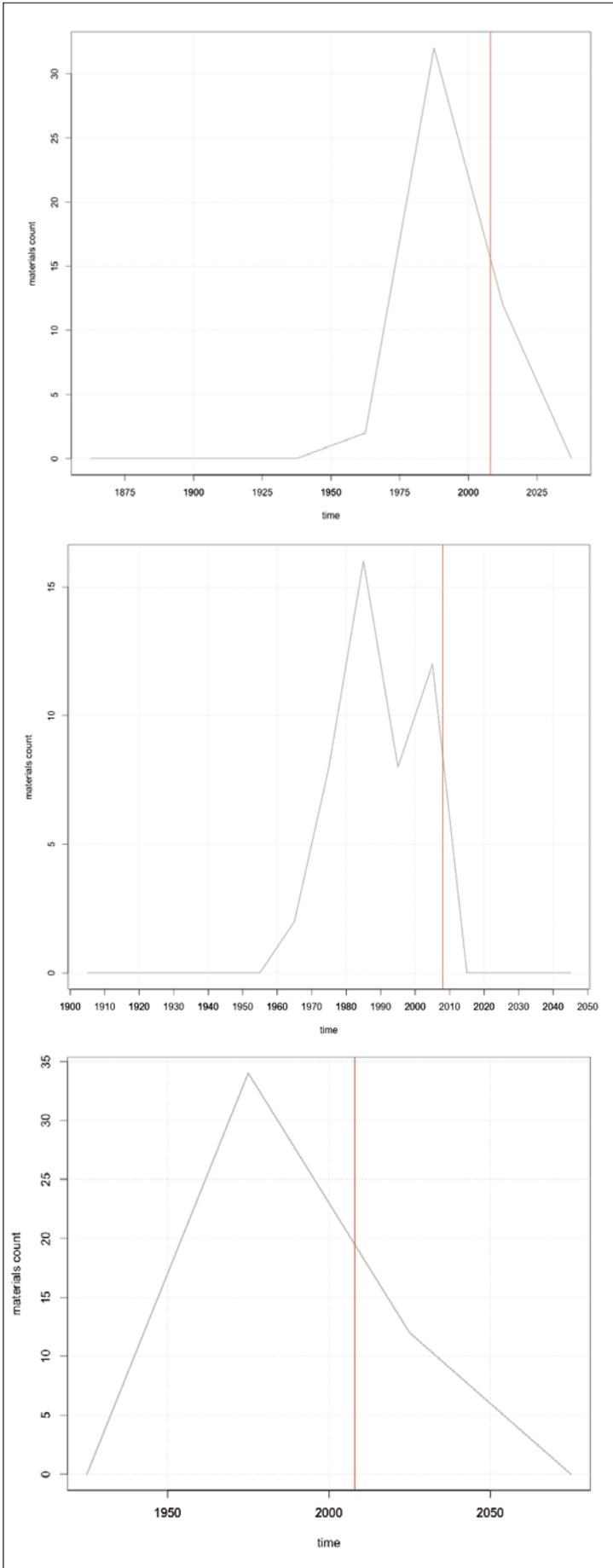
tutti o quasi tutti gli oggetti:
 circa tre quarti
 circa metà
 meno di un quinto

Oggetto	Quantità	Stagione	Data di acquisto	Data di produzione presumibile (rispetto alla data di nascita del fabbricante o del sito)	Un'osservazione è stata fatta (frasi, note, iscrizioni, crederi etc.)	Note
CENTRO TAVOLA	1	DECEMBRE	1950		REGALO AMICHE ROMA	
SALE TAVOLA	2	VERO	2002			
CORNICI	10	AGOSTO	2009			
VASO DI VETRO	2	DECEMBRE	1994		REGALO	
SETA CUSCINE	1	VERO	1977			
BUCHERER BA	1	AGOSTO	1967		REGALO MATEMATICO	
UMILIATO	1	AGOSTO	1967		REGALO MATEMATICO	
VASETTI	2	DECEMBRE	1999			
VASO DI VETRO	1	VERO	1988			
CELESTIO ALMOLO	1	AGOSTO	2015			
LIBRO DI LETTERE	1	VERO	1930			
BIGLIETTI	15	CRISTALLO	1957	X (1910)	VERBA DA TAVOLA	
SECURETO SALTIRE	8	DECEMBRE	1962			
SCURLO D'ARTE	10	DECEMBRE	2002			
BIGLIETTI	20	VERO	1990			
VASSOIO	2	AGOSTO	1967			

SEMPRO GIANTE	6	DECEMBRE	2011			
VERO	6	VERO	1977			
BIGLIETTI	6	VERO	1970			
BIGLIETTI	6	VERO	2003			
CALZATI	1	VERO	1970			
SORAN MOLELLI	12	DECEMBRE	1995			
PENTOLE	4	AGOSTO	1975			
BUCHERER BA	1	AGOSTO	1967		REGALO MATEMATICO	
PIATTI	34	DECEMBRE	1965			
PIATTI	24	DECEMBRE	1970			
SCODOLE	6	DECEMBRE	2004			
PIRELLA	2	VERO	1970			
PIATTI	12	DECEMBRE	2004			
TEREINA	3	DECEMBRE	1972			
TURCOIA DIRO	1	GHISA	1970			
CENTRO TAVOLA	1	DECEMBRE	2001			
BIGLIETTI	2	VERO	1996			

Osservazioni:

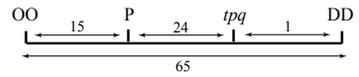
Quantità	Tipo	Anni b.p. (26-06-09)	Anni d.C.
1	Piastra per bistecche	30	1979
1	Pentola alta	30	1979
1	Pentola bassa	30	1979
1	Pentola alta	30	1979
3	Pentole antiaderenti	4	2005
1	Padella in rame e alluminio	3 o 4	2005-2006
1	Pentolino in acciaio	3	2006
1	Pentola a pressione	3	2006
1	Pentola a pressione casseruola	20	1989
1	Scolapasta in acciaio	25	1984
1	Pentola alta	25	1984
2	Pentole basse	25	1984
3	Padelle in acciaio	25	1984
1	Paio in rame per polenta	20	1989
1	Padella in ferro per frittura	1	2008
2	Teglie in alluminio	40	1969
2	Teglie piccole in acciaio	15	1994
1	Teglia piccola antiaderente	1	2008
1	Colino in acciaio	4 o 5	2004-2005
1	Colino in acciaio	25	1984
1	Pentola bassa in acciaio	10	1999
1	Bollitore	25	1984
1	Pentola alta in acciaio	10	1999
1	Cestello per cottura al vapore	10	1999
3	Vassoi in acciaio	30	1979
1	Batticarne in acciaio	30	1979
1	Passalegumi in alluminio	10	1999
1	Bollitore piccolo	20	1989
1	Bollitore medio	4 o 5	2004-2005
1	Padellone antiaderente	10	1999
1	Affettaverdure in plastica e acciaio	10	1999
1	Schiacciapatate	4 o 5	2004-2005
4	Stampi per budini in acciaio	25	1984
1	Casseruola ovale in alluminio	8	2001



Comment

The 46 items listed and computed belong to a kitchen examined in 2009 and occupied since 2002. They represented the whole set of pots and pans and about 1/4 of the total assemblage. It is indeed all metalware spanning about 40 years, but substantially concentrated between the late 70s and the early 2000s. Among them, were purchased or received in the mid 80's form a peak and it is ascribable to marriage and related activities.

The *tpq* is one year earlier than the supposed abandonment/collapse of the kitchen and about 20 years later than the main peak.



- DD = deposition date
- tpq* = *terminus post quem*
- P = peak
- OO = oldest object

2. The main sites

Introduction

For the sake of simplicity, presented below is a brief overview of the three main sites (Figure 142) that provided the majority of the case studies discussed. The choice of these three sites responds primarily to the necessity of accessing as directly as possible the body of data required, and, if necessary, to quickly gain further information. In the light of this, those sites were focused on that were known directly by the present author and research team involved through research and excavations over the last years.

Of course, the cases provided by the three sites do not cover all possible types of deposit of urban strata. Thus, for the main exceptions, and when it seemed appropriate, examples from the literature were also drawn. Although the sites chosen had post-excavation documentation available, some data remained substantially unavailable, simply because they were not gathered at the time.

It has also to be stressed that although the three selected sites correspond to three ‘ancient cities’, nowadays they would not be considered as such. Nora (Sardinia) has been almost entirely abandoned during the Early Medieval period and now falls within an archaeological park. Gortyn (Crete) has witnessed a similar fate, but is now largely buried beneath olive groves, while just a small part of the ancient city is occupied by the contemporary villages of Mitropolis and Aghioi Deka. Aquileia, one of the largest cities of the Roman Empire, although not completely abandoned, continued its life in smaller forms, and is nowadays a little town with a population of around 3300 inhabitants. Of the three sites, only Aquileia displays some of the problems and features typical of urban archaeology as understood in relation to today’s cities.



Figure 142: Location of the three main sites discussed.

Aquileia⁵⁵⁸

The place where the future colony of Aquileia was founded is strategically located at the end of the Adriatic Gulf, where *Veneti* and *Histri* border on it. Few archaeological data attest the presence, approximately near to where the colony was established, of a Late Iron Age settlement,⁵⁵⁹ but its nature and extension are, to date, unknown.

The genesis of the colony is related to the Roman expansion towards the Po Valley, which took place at the turn of the period that Pierre Grimal named ‘le siècle des Scipions’,⁵⁶⁰ just after the end of the second Punic war.

The main political and military events of those years, related to the Roman expansion northwards, may be listed as follows:

- 197 BC: campaigns of the Consuls *Q. Minucius Rufus* and *C. Cornelius Cetego* against *Insubres*, *Boii* and *Cenomani*;
- 196 BC: Consul *M. Claudius Marcellus* defeats Gallic tribes near *Comum*;
- 194 BC: Consul *L. Valerius Flaccus* defeats *Insubres* and *Boii* near *Mediolanum*;
- 191 BC: Consul *P. Cornelius Scipio Nasica* defeats the *Boii*;
- 189 BC: foundation of the Latin colony of *Bononia* and the beginning of the realisation of the *via Aemilia*, eventually completed in 187 BC;
- 183 BC: constitution of the two Roman colonies of *Parma* and *Placentia*;
- 181 BC: defeat of the *Ligures*.

Within this framework, in 186 BC, a Celtic tribe, probably coming from today’s Slovenia, crossed the Alps and established an *oppidum* in the lower Friuli Plain. The people of *Veneti*, traditionally allied with Rome, called for help and the senate sent an embassy, which produced no result.

Three years later, Consul *M. Claudius Marcellus* was appointed to eliminate the Gallic presence down the Alps and the senate resolved to found a new colony. This was finally established in 181 BC.⁵⁶¹

The location selected for the settlement was the western bank of a modest meander of the river *Natiso*; the position has, indeed, important consequences for the geomorphological and hydraulic structure of the city.

The area nowadays reaches a maximum height of only about four metres above sea level, but large parts of the city lie below it; moreover the territory is affected by both bradyseism and eustasy (respectively the lowering of ground level and rising of sea level), with the former resulting in a lowering of the level by 0.8-1.4 cm every 10 years.⁵⁶²

The ground water table is fairly high, thus making the supply of water relatively easy, but also giving rise to drainage problems, which, in turn, heavily affect the extent of the groundworks necessary for building.

Moving from east to west, from the riverbank to the lower areas, hydraulic problems are even more pressing (the western area of the ancient city today is called ‘Marignane’, a term evoking the presence of marshes)

The initial layout of the colony is not well known, apart from the possible subdivision of the *intra moenia* space into regular *insulae*, which has been object of many different studies.⁵⁶³ For some years, life in the

⁵⁵⁸ The most recent and complete historical and archaeological overview of Aquileia is Ghedini *et al.* 2009.

⁵⁵⁹ Maselli Scotti 2009; Chiabà 2009: 10.

⁵⁶⁰ Grimal 1953. See also Bandelli 2001 and 2003 for Rome and the Adriatic in the previous decades.

⁵⁶¹ See Bandelli 1987: 63-67 for a complete overview of the events which led to the foundation of the colony.

⁵⁶² Consorzio di Bonifica Bassa Friulana.

⁵⁶³ Strazzulla 1989; Medri 2000; 2004; Muzzioli 2004; Ghiotto 2013.



Figure 143: Aquileia: plan of the main archaeological features; the Fondi Cossar area is marked in orange (modified from Bertacchi 2003).

city must have been relatively precarious, obliging the civic authorities to ask for more settlers and a *supplementum* of 1500 families; this was granted by the senate in 169 BC.

Unfortunately, we still know little of the following years, except for the fact that during the *bellum sociale* Aquileia affirmed her alliance with Rome, thus gaining the status of a *municipium optimo iure* in 90 BC.

From the last years of the 1st century BC, the available archaeological data becomes much greater (Figure 143), well integrating with the available historical sources. The city, now provided not only with its own forum and markets, but also with a theatre and amphitheatre, is now a major metropolis. An articulated river port makes it a cornerstone of east–west and north–south (iron from *Noricum*) trade for the Empire. However, the strategic location ensured the city’s involvement in many political and military events. A Weisenau helmet displayed at the National Museum of Aquileia bears witness to the transit of Vitellio’s troops in AD 69,⁵⁶⁴ while during the reigns of Lucius Verus and Marcus Aurelius Aquileia experiences its first siege, from tribes of the Quadi and Marcomanni, and also the plague brought by the Roman soldiers.

In AD 238 the city is besieged once more. The events are known in detail thanks to the text of the historian Herodian. On this occasion, Roman troops loyal to the emperor Maximinus tried to capture the city, loyal to the senate; however the strength and length of the defence led Maximinus’ troops to mutiny and kill him, together with his son. Herodian’s lines describe a city (a true market for goods entering Italy) with a large population and farmlands with substantial viticulture.⁵⁶⁵

With the tetrarchy, Aquileia gains an official political role, being the headquarters of the *Venetia et Histria*⁵⁶⁶ governor; from AD 294 its own mint started producing coinage. The 4th century witnesses the rise of Christianity, which quickly finds in Aquileia a major focus (see the famous halls built under the aegis of Bishop Theodore). In AD 340 Constantine II and Constans confront each other for supremacy over the *pars occidentis* in the territory of the city; the town itself is involved in further dynastic issues about 20 years later, when Julian besieged the newly built city walls (AD 361). This time the city surrenders only after having learnt of the death of the legitimate emperor.

In general, although the 4th century sees the rise of the city of Ravenna, in this period the prestige of Aquileia is still very high; indeed, in this century archaeological data testify the restoration of several public and private buildings, along with new constructions.

The 5th century has a substantially different character: in AD 425 Aquileia is involved in yet another dynastic conflict, which culminates in the decapitation of Joannes Primicerius in the circus. But the most dramatic event takes place about 30 years later; in AD 452 the city faces a final siege. This time, after three months of resistance, the city is taken by Attila’s Huns. This episode still produces active archaeological and historical debate about its consequences: for a long time the event has been connected with the end of urban life in Aquileia. More recent excavations and the re-examination of previous data led to a more balanced view: if on the one hand the destructive and destabilising impact of Attila’s passage is acknowledged, on the other the traces of some continuity of the urban life of the city can also be traced, in both the archaeological and historical record.

In any event, Aquileia slowly disappears from the written records of the following years: the rise of Ravenna and the fragmentation of the Empire itself surely contributed to the crisis of a town whose strength was based on Mediterranean trade. Land routes also seem to have changed, with the northern ones now preferred to those of the low plain. The Byzantine presence seems to be marked by a new circuit of walls, characterised by deep salients, but the new circuit surrounds only the southern half of the ancient city, with its famous basilica and episcopium.

⁵⁶⁴ Bertacchi 1968: columns 39-41; Bertacchi 1982: 88-89.

⁵⁶⁵ Herodianus, 8.2.3.

⁵⁶⁶ Former *X Regio*. See Zaccaria 1986: 74.

The end of ancient Aquileia is usually linked to the AD 568 invasion of the Lombards, when patriarch Paul seeks refuge in Grado.⁵⁶⁷

After a long period that left little in the way of monumental and historical traces, some renovation took place in the 11th century, when the patriarchs returned to the town. The patriarchal state lasted until the 15th century, when a large area of Friuli became part of the Serenissima Republic, and Aquileia became subject to Austrian jurisdiction. During the patriarchal period the town minted its own coins and re-established some of the political and cultural centrality that it had experienced in the past. Eventually, new walls were erected as well. Nevertheless, the image of the centre was now that of a small town more than that of an important city. This aspect remained substantially unchanged during the following centuries. After the events of the Great War, Aquileia became part of Italy, while after the Second World War the town witnessed some urban expansion, which indeed caused those political and social contrasts and dynamics that typically involve urban archaeology. Archaeological researches in Aquileia go back at least to the second half of the 19th century, but it is during the post-war period that the necessities of urban development and those of archaeological excavations and cultural heritage began to collide. Nowadays, large archaeological areas exist within the town, although the full integration of the two is in many ways still yet to come.

The Fondi Cossar area and the ‘House of Titus Macer’

The plot named Fondi Cossar is located just a few meters north of the famous Basilica and is encircled by the most ancient (Republican) city walls. It occupies the south-eastern corner of the Republican city, close to the River Natissa (ancient *Natiso*).

The area has witnessed several archaeological campaigns over the last 150 years.⁵⁶⁸ In 1859 or 1860 two important mosaics (a famous *asarotos oikos* and one portraying a Nereid) were uncovered; at the turn of the century the discovery was made of the ancient road defining on the west an ancient *insula* extending throughout the area.



Figure 144: The effects of mole activity in the Fondi Cossar area.

⁵⁶⁷ Marano 2009: 33.

⁵⁶⁸ For a complete review of the state of the area, see Bonetto *et al.* 2012: 138-140, Centola *et al.* 2012: 110-113.

Most of the archaeological activity concentrates on the decades from the 1920s to the 1960s. Within this time interval, G. B. Brusin and L. Bertacchi brought to light large parts of at least three different rich *domus* and the eastern road enclosing the *insula* where they are located. Extensive restoration of mosaics and structures took place in the following decade,⁵⁶⁹ heavily affecting the possibility of new archaeological investigations at many points. The eastern part of the *insula* was exposed to the depth of the majority of the recovered floors, it was affected by restoration works and then left visible. This, in turn, meant that biological activity over the last 40 years directly affected also deeper archaeological strata and features.

The western part of the area, only partially affected by past excavations, and then returned to a private ownership, witnessed ploughing and biological activity which cut into the upper strata only and left the lower ones relatively untouched. Indeed, beneath the soil profile, a thick layer of rubble (most likely produced by post-ancient destructions and levelling practices) shielded the lower stratification from the activity of animals such as moles (Figure 144, see Chapter III.6) and the effective impact of roots, worms, etc.

New excavations began in 2009 and were conducted by the University of Padua until 2015;⁵⁷⁰ the new investigations involved the central part of the *insula*, which was brought to light and re-examined street by street.

The surface was largely occupied by a great *domus* arranged around an *atrium* (west) and a *cryptoporticus* (east), whereas a row of shops fronted the eastern road.⁵⁷¹ This large dwelling was named the ‘House of Titus Macer’ after the name inscribed on a *pondus* recovered in the area (Figure 145).

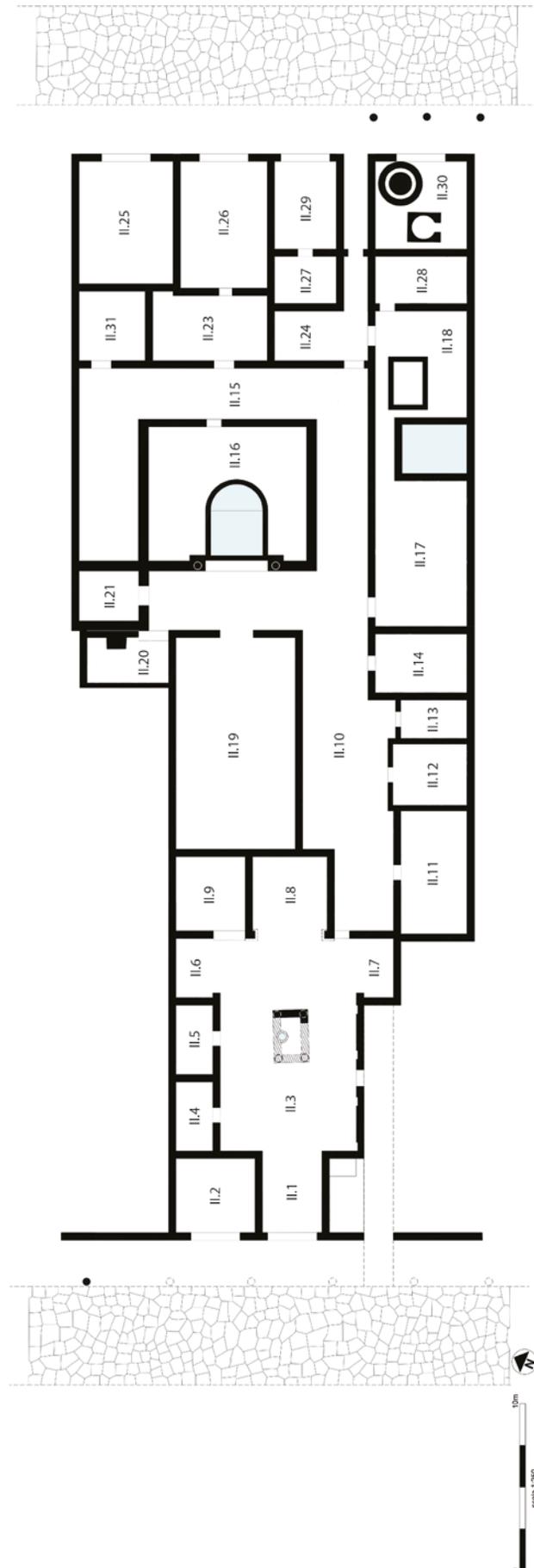


Figure 145: Aquileia, ‘House of Titus Macer’ in AD 25-75.

⁵⁶⁹ Madrigali 2012.

⁵⁷⁰ Thus far the published reports are Bonetto *et al.* 2012; Centola *et al.* 2012; Bonetto *et al.* 2009g; Bonetto, Ghiotto 2011; 2012; 2013.

⁵⁷¹ The architectural layout of the *domus* is discussed in Furlan 2011; Bonetto, Ghedini 2014; Bonetto, Furlan 2019; Centola *et al.* 2014.

Three different parts of this area presented some peculiarities: the western part (*atrium* house) lay beneath the thick layer of rubble cited above, thus it was possible to fully investigate it, starting with the most recent layers. The central part of the house was basically left untouched, because of the presence of widespread concrete restoration works, preventing any excavation. The eastern part, although affected by previous work of excavation and restoration, lacked preserved mosaic floors, enabling the investigation of the strata that had not been removed during the 20th-century campaigns.

The new investigations produced an articulated structural and stratigraphic sequence that is now being published along with the finds recovered; the core of the sequence extends from Late Republican times (*domus* building) to the Renaissance (robber trenches). The complete publishing of the excavation is now being edited. Unfortunately, although the post-excavation process proceeded quickly, the study of the material was still incomplete when this work began.

The main traits of the sequence are presented in Table 8.

Table 8: Phasing of the sequence emerging during the excavations carried out in the Fondi Cossar area (2009-2015).

Period I	181 - 100 BC	Construction of the Republican walls
Period II	100 BC - AD 25	Construction and use of an <i>atrium</i> house in the western part of the plot
Phase IIa	100 - 90 BC	
Phase IIb	90 BC - AD 25	
Period III	AD 25 - 250	Substantial enlargement of the dwelling eastwards: the house is provided with a new large <i>oecus</i> and a <i>cryptoporticus</i> ; a row of <i>tabernae</i> is built on the eastern side the <i>domus</i> .
Phase IIIa	AD 25 - 75	
Phase IIIb	AD 75 - 175	
Phase IIIc	AD 175 - 250	
Period IV	AD 250 - 550	During the first part of Period IV the area is normally maintained, restored and slightly modified. Phase IVc entails important refurbishments, but soon dumping episodes occur in different rooms. Traces of occupation are attested until not later than the mid 6th century AD.
Phase IVa	AD 250 - 300	
Phase IVb	AD 300 - 400	
Phase IVc	AD 400 - 425	
Phase IVd	AD 425 - 475	
Phase IVe	AD 475 - 550	
Period V	AD 550 - 1860	Phase Va is also extremely poorly documented by artefacts and strata. Phase Vb entails major robbing activities.
Phase Va	AD 550 - 1200	
Phase Vb	1200 - 1860	
Period VI	1860 - 2009	This period sees archaeological excavations and restoration programs.
Phase VIa	1860 -1960	
Phase VIb	1960 - 2009	

Nora⁵⁷²

In contrast with Aquileia, historical and epigraphic sources concerning the ancient city of Nora (Sardinia) are much rarer. Indeed, the ancient town never reached the size and economic and political importance of the north-Adriatic colony. Consequently the history of the site is much more indebted to the archaeological data which gathered over time.

The origins of the town are still a matter of a debate, which, in turn, has to be placed within the much wider framework of the status itself of the first western Phoenician settlements.⁵⁷³ Both Nuragic⁵⁷⁴ and early Phoenician⁵⁷⁵ traces (8th-7th centuries BC) in the area of the peninsula of Nora are extremely

⁵⁷² In general, see Tronchetti 2001; Pesce 1957; 1972.

⁵⁷³ See Bondi 2012 and Bernardini, Perra 2012.

⁵⁷⁴ A *nuraghe* may have been located not far from the peninsula, on the top of a modest elevation named Sa Guardia Mongiasa.

⁵⁷⁵ See Bonetto 2009b and Bonetto 2013.



Figure 146: Aerial view of the Nora peninsula (Bonetto 2009a).

ephemeral and seem to suggest precarious forms of settlement, probably in relationship with the trade of goods.

In fact, the location where the future town will develop responds fairly clearly to a sort of ‘Phoenician prototype’ for marketplaces/emporia that is not uncommon in Sicily⁵⁷⁶ and Sardinia (Tharros, S. Antioco): Phoenician settlers/traders, indeed, seemed to favour peninsulas or small islands located near the mainland, well positioned along strategic naval routes, easily defensible and provided with natural anchorages. Nora clearly responds to all these requisites: it is located on a small peninsula in the western part of the Gulf of Cagliari and is connected to the mainland through a narrow isthmus (Figure 146). It also features three main bays, one of which (the western one) is particularly protected and suitable for the location of a port. Importantly, freshwater is available at reasonable depths throughout the area.

⁵⁷⁶ Thucydides, *Ἱστορίαι*, 6, 2.

Recent studies of the sea level of the ancient Mediterranean, and concerning Nora in particular, have demonstrated that the peninsula was noticeably wider during the archaic period and also in Roman times;⁵⁷⁷ however, the maritime nature of the site has not been questioned.

The change in sea level and maritime erosion resulted in important archaeological consequences, as they have truncated large portions of ancient stratifications and represent today a serious danger for the preservation of the site.⁵⁷⁸ It is also worth remembering that the coastline plays the same role of rivers or town walls in urban waste disposal strategies (see Chapter III.4.1), therefore potentially attracting the presence of small or large dumps and, in general, the discard of any non-recycled item.

The hinterland of the city also includes land suitable for large-scale agriculture, which seem to have been fully exploited from the Punic period.

As discussed previously, although some artefacts and possibly a few tombs suggest an earlier inhabitation, structures in perishable materials are attested in Nora not before the 6th century BC. At this time, some worship places seem to have existed, along with a cemetery and a *tofet*.

During the Punic period, Nora takes the form of a true urban centre and seems to have flourished during the 5th and 4th centuries BC.

In 238 BC, Punic mercenaries in Sardinia mutinied and called to Rome for help. Consul *T. Sempronius Gracchus* quickly occupies the main cities of the island and in 227 BC Sardinia becomes, with Corsica, a new *provincia*. Politically, this date ushers in the beginning of the Roman period, but strong Punic culture traits will remain visible in major material expressions for a long time.⁵⁷⁹

It has been suggested that, in these first years of Roman government, Nora itself hosted the governor's headquarters, before Karalis (Cagliari) became the provincial capital. The architectural and infrastructural arrangement of the city does not seem to witness substantial changes in the next century, while an important urban development takes place during the years of Caesar and Octavianus, probably in conjunction with the achievement of the status of *municipium*.⁵⁸⁰ The city, now provided with a forum, is enriched by a theatre during the early Imperial age; it is not possible to ascertain when the small suburban amphitheatre was built.

A period of noteworthy monumental development is seen during the Severan period⁵⁸¹ (AD 193 - 235), when the road system was completely refurbished and three new baths, served by an aqueduct, were constructed. The so-called 'Tempio Romano' gained its definitive aspect, the forum was modified, and private architecture also witnessed some important episodes of renewal.

Epigraphic data and artefacts attest occupational continuity, at least until the mid 5th century AD. The arrival of the Vandals does not seem to have left particular traces in the archaeological record; in this period the trade routes with North Africa are apparently still active (see the presence of large amounts African red-slip ware). In AD 534 Sardinia is retaken by Justinian, thus shaking off Byzantine control of the island. The status of the settlement seems to decline and the *Ravenna Cosmography* names Nora as a *praesidium*, suggesting that the settlement had already lost its urban status.⁵⁸² The beginning of the Arab raids in the Western Mediterranean probably brought about the end of a city that had made sea trade its particular strength; indeed, the more recent artefacts recovered in the urban area date back to the 8th century AD.

⁵⁷⁷ Roppa 2009.

⁵⁷⁸ Di Gregorio *et al.* 2009. See also Bonetto *et al.* 2008 and Bonetto *et al.* 2015.

⁵⁷⁹ See Bonetto, Falezza 2009.

⁵⁸⁰ Bonetto 2002. See also Bejor 1992; 1994.

⁵⁸¹ Ghiotto 2004: 185-186.

⁵⁸² *Ravennatis anonymi Cosmographia et Guidonis Geographica*, 412-3 and G500-14.

Life in the area continued somehow around a suburban church dedicated to the Christian martyr *Ephysius*, who had probably been killed in Nora in AD 303. The first architectural phases of the church date at least to the 10th century AD; at this time the ancient city was probably reduced to a mere quarry for the extraction of reusable building materials.

The area of the peninsula remained substantially abandoned until the 16th century, when pirate raids forced the Spanish authorities to provide the coasts of the island with garrisons and defences: a tower was built in 1607 on the eastern promontory of the peninsula of Nora ('Torre del Coltellazzo') and it was guarded until the 19th century. The rest of the peninsula witnessed some agricultural activity, documented by the first photographs taken in the area.

The first archaeological investigations took place at the turn of the 19th century, but they involved mostly the isthmus and the early cemeteries, whereas the core of the ancient town remained substantially undisturbed. Some remains of military structures attest the presence of Italian soldiers in the forum area during the Second World War, but it was during the 1950s, with the activity of the archaeologist G. Pesce, that most of the ancient city was brought to light through extensive digging. These large excavations were carried out with no stratigraphic methodology and were never fully published. They exposed large parts of the ancient city in a relatively short time, but, unfortunately, the excavators destroyed large parts of the evidence of the latest phases of the occupation of the city. Minor works of refurbishment were also carried out using concrete structures, further compromising the possibility of future stratigraphic recording in some areas. These activities produced a sort of areal truncation that had to be considered when new investigations began. These were resumed, starting from the 1990s, and they are currently being carried on by a joint mission of the Universities of Genova, Padua, Milano and Cagliari. As mentioned, most of the city occupies today an archaeological complex, attracting around 55000 visitors annually.⁵⁸³

*The forum area*⁵⁸⁴

Together with large part of the ancient city, the forum was already investigated during the campaigns of the 1950s, which investigated most of the fundamental structures of the public spaces (Figure 147). A building, most probably a temple, defined the northern side of the square, enhanced by two arches that gave entry to the paved square. Two porticoes limited the space on the eastern and western sides of the complex and these were flanked by two rows of small rooms; the southern side of the forum was eroded away by the sea.

New excavations were carried out by the University of Padua from 1997 to 2006, targeting both the Roman structures and a large, central sector, where the square paving was not preserved. These works provided fundamental evidence of the pre-forum Nora.

The sequence that emerged from the excavations covered a time period lasting from the late 7th/early 6th century BC to Late Antiquity, with later spots of evidence reaching the period of the Second World War, and, lastly, the previous archaeological activities. The two extremes of the sequence are represented by the first anthropic traces, which were detected directly on the surface of the geological substrate, and by the above-mentioned areal truncation.

In particular, the new investigations brought to light a series of timber structures (documented by post holes and thin shreds of strata) attesting the first forms of occupation in the area during the archaic period. They also unearthed conspicuous parts of a Punic and later Roman Republican district, most probably occupied by warehouses (Figure 148). A previous Punic religious site was detected below the Roman temple, and further evidence documented the destruction of the Punic district and the way in which the forum was built.

⁵⁸³ Ministero dei Beni e delle Attività Culturali e del Turismo.

⁵⁸⁴ Bonetto *et al.* 2009e.



Figure 147: The forum of Nora in its urban context (Ghiotto 2009).

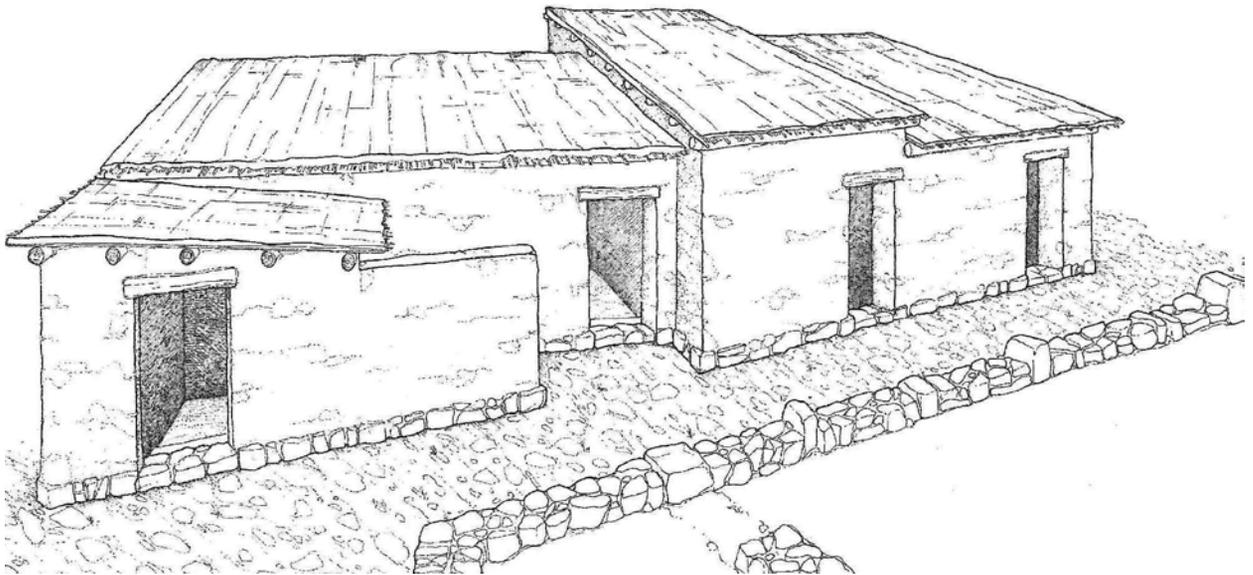


Figure 148: Reconstructive view of the Punic buildings recovered beneath the forum square (Bonetto 2009b).

Important data was also gathered for dating the forum construction (40-20 BC) and for sketching its layout and architectural evolution (in particular it was possible to recognise the most probable location of the *basilica* in the south-eastern corner of the forum (Figure 149).

Although large areas of stratification had been lost with the 1950s excavations, recent work has succeeded in documenting glimpses of later activities and the results of the excavations were fully published in 2009.

Gortyn⁵⁸⁵

The ancient city of Gortyn is located in central Crete, close to the slopes defining the north side of the very fertile Messara Plain. Although human presence is attested since the Neolithic age, the syncyclic process which led to the foundation of the city, most probably took place in the middle of the 7th century BC, and lasted for some decades.

The process entailed that the older villages located on the hilltops north of the plain came together to form a new community occupying the southern plain. The new city maintained a presence on the hilltop of Hagios Ioannis, which became the acropolis, but mostly extended south, from the Mitropolianos river (west) to a modest stream (east), which was later covered during the Roman Age. The western part of the city was subject to the floods of the river; moreover, in general, the area presents high seismicity and, as already discussed, many seismic episodes are evident in antiquity and played an important role in the story of the local community.⁵⁸⁶

The most ancient phase of occupation of the city, as well as its monumental and infrastructural arrangement, is not well known. The agora must have been located on the eastern bank of the Mitropolianos river, in the very north-western corner of the lower city, but also the Temple of Apollo, located in the middle of the settlement, seems to have played an important political role.

The most important juridical and political source for archaic Gortyn is a substantial *corpus* of epigraphic data, among which the 'Great Inscription' represents undoubtedly the most important single document.

⁵⁸⁵ A large historical and archaeological synthesis is provided in Di Vita 2010.

⁵⁸⁶ Di Vita 1995.

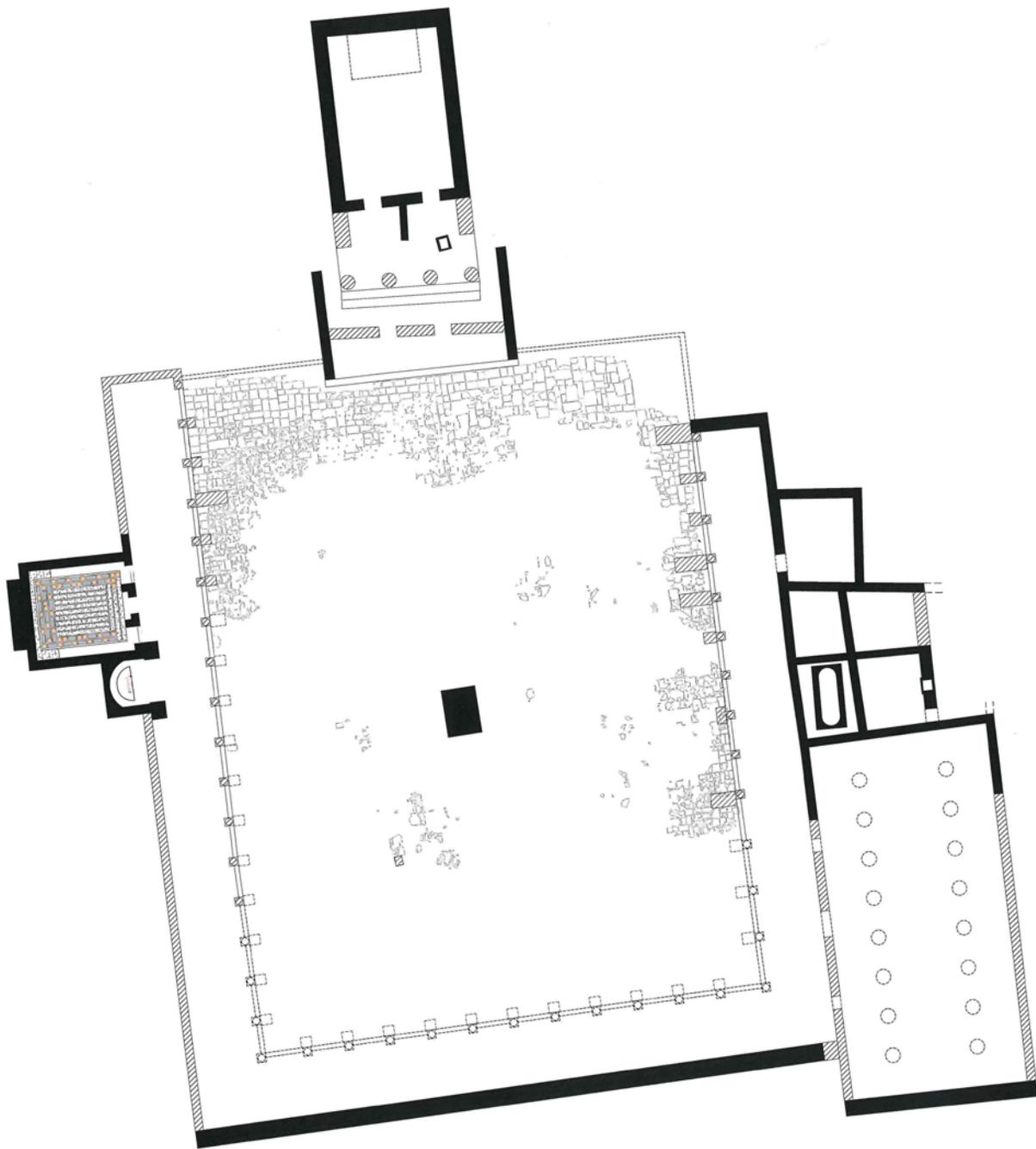


Figure 149: The forum of Nora in 40-20 BC (Ghiotto 2009).

This was engraved on a series of blocks later re-used within the Roman odeon and it remains the longest juridical epigraph from ancient Greece known, concerning, mainly, individuals' rights, bequests, and the relationship between individuals and property.

From the end of the 6th century BC, Gortyn widened its trade with the Aegean *poleis* and strengthened its own position in the Messara Plain. This led to the inevitable clash with the other major power on Crete – Knossos. What followed was a period of discontinuous, but persistent, local wars that only the Roman invasion would end.

The major Hellenistic archaeological evidence includes the stadium and the city walls. When, in 27 BC, Octavian establishes the arrangement of the embryonic Empire, Gortyn is ultimately chosen as the capital of the senatorial province of Crete and Cyrenaica.

Most of the visible monuments of Gortyn belong to the Roman period (Figure 150). In particular, as well as the above-mentioned odeon, located near the agora, the Romans provide the capital with two more theatres (a previous one was located on the southern slopes of Hagios Ioannis), an amphitheatre, a circus, and the so-called 'Megali Porta' baths. In this period, the city expands mainly southwards and eastwards, but the residential districts of the city are very poorly known. In general, as observed for Nora, Gortyn benefits from the important monumental development that accompanied the age of the Severii.

After the edict of Milan, the Christian community chooses, as is frequently seen elsewhere, a peripheric district of the city on which to focus its activity: in this case it is the western part of the town, where, in a short time, at least five churches are built.

On the 21 July, AD 365, a major earthquake destroyed large areas of the city: the recovery of the urban centre is supported economically by successive emperors, but it seems to have been somewhat slow. During the years AD 382-383, one final, significant effort is attested by the construction of a new justice hall by the *praeses* of the province, but a fresh series of earthquakes heavily damages the city once again. Seismic activity is further documented in the middle of the 5th century AD, again sometime after the middle of the 6th century AD, between AD 618 and 621, and AD 668 and 670. In between, some minor

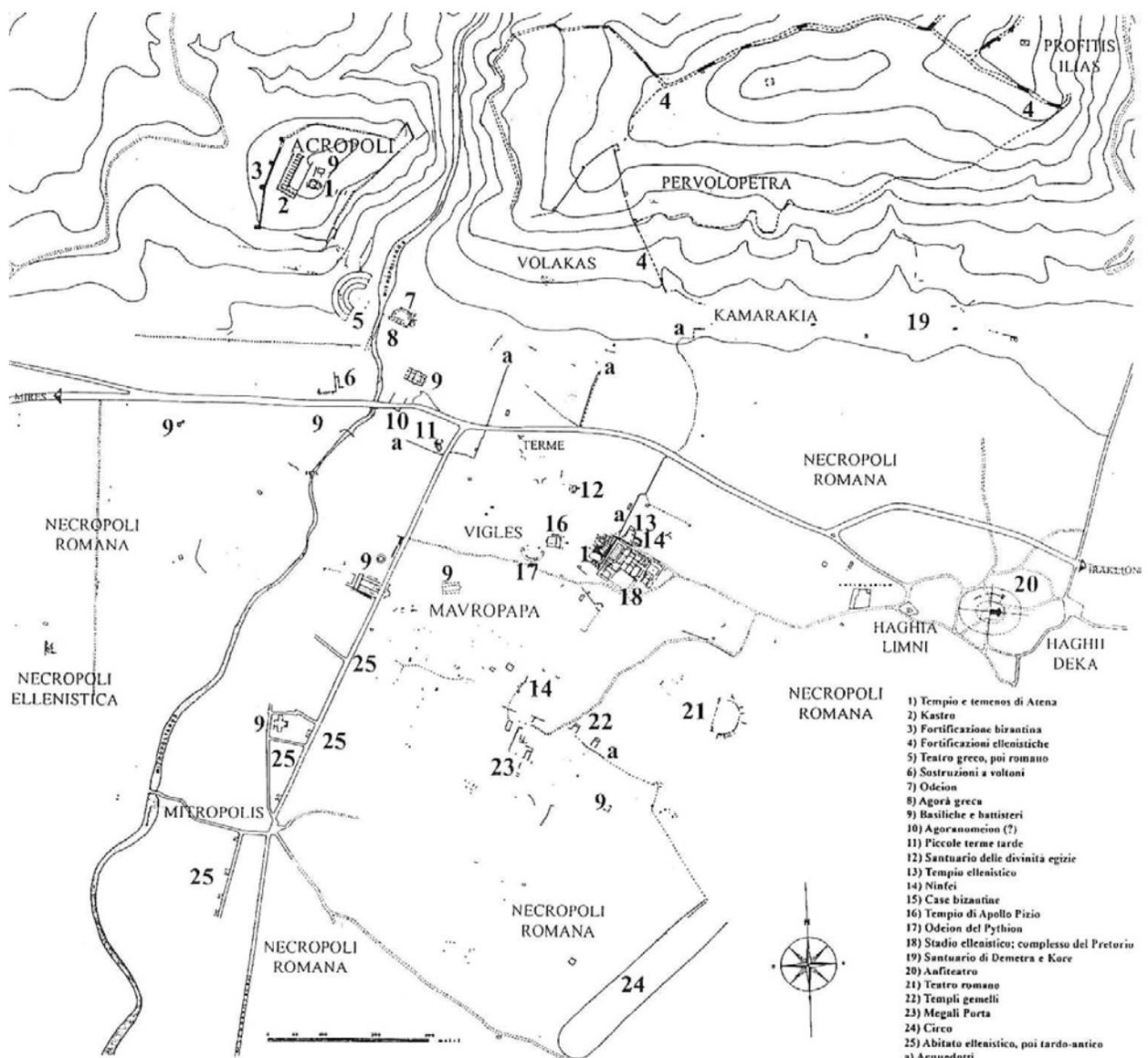


Figure 150: monumental evidence of ancient Gortyn (Di Vita 2010).

building activity is seen, particularly under the reign of Heraclius, but after AD 670 the central authority in Constantinople can no longer provide sufficient financial resources and the city sub-divides into smaller areas, apparently surrounded by ruins. Some more organised activities survive on the ancient acropolis, but the lower city substantially comes to an end. Occupation continues in smaller settlements also during the 7th century AD, and probably, close to the acropolis, until the 8th century AD. In this period the area of the ancient city witnesses a phenomenon of progressive ruralisation.

During the 9th century AD, Crete falls to Arab conquest, which lasted until the second half of the next century, when the island was reconquered by Constantinople. Officially it remained a Byzantine possession until 1204, when it became part of the territories of Venice. Starting from this period, we have the first precious reports and drawings describing the standing ruins of ancient Gortyn. The drawings, in particular, record the state of the major monuments before further robbing activities occurred and before another earthquake occurred in 1856. Meanwhile, two small villages developed on the two far extremes of the ancient city, Mitropolis (west) and Aghioi Deka (east).

At the turn of the 19th century, Federico Halbherr began the first archaeological investigations in the area of the ancient city, bringing to light the ‘Great Inscription’ and generating a wide interest in the town. Halbherr himself carried out excavations in the agora, the Roman odeon, and the temple of Apollo. In 1909 the *Scuola Archeologica Italiana in Atene* was founded, which carried out investigations at Gortyn over subsequent years, particularly focusing on the acropolis hilltop, the *Praetorium*, and the temple of Egyptian deities. From 2001, several Italian universities are still involved with the excavations.

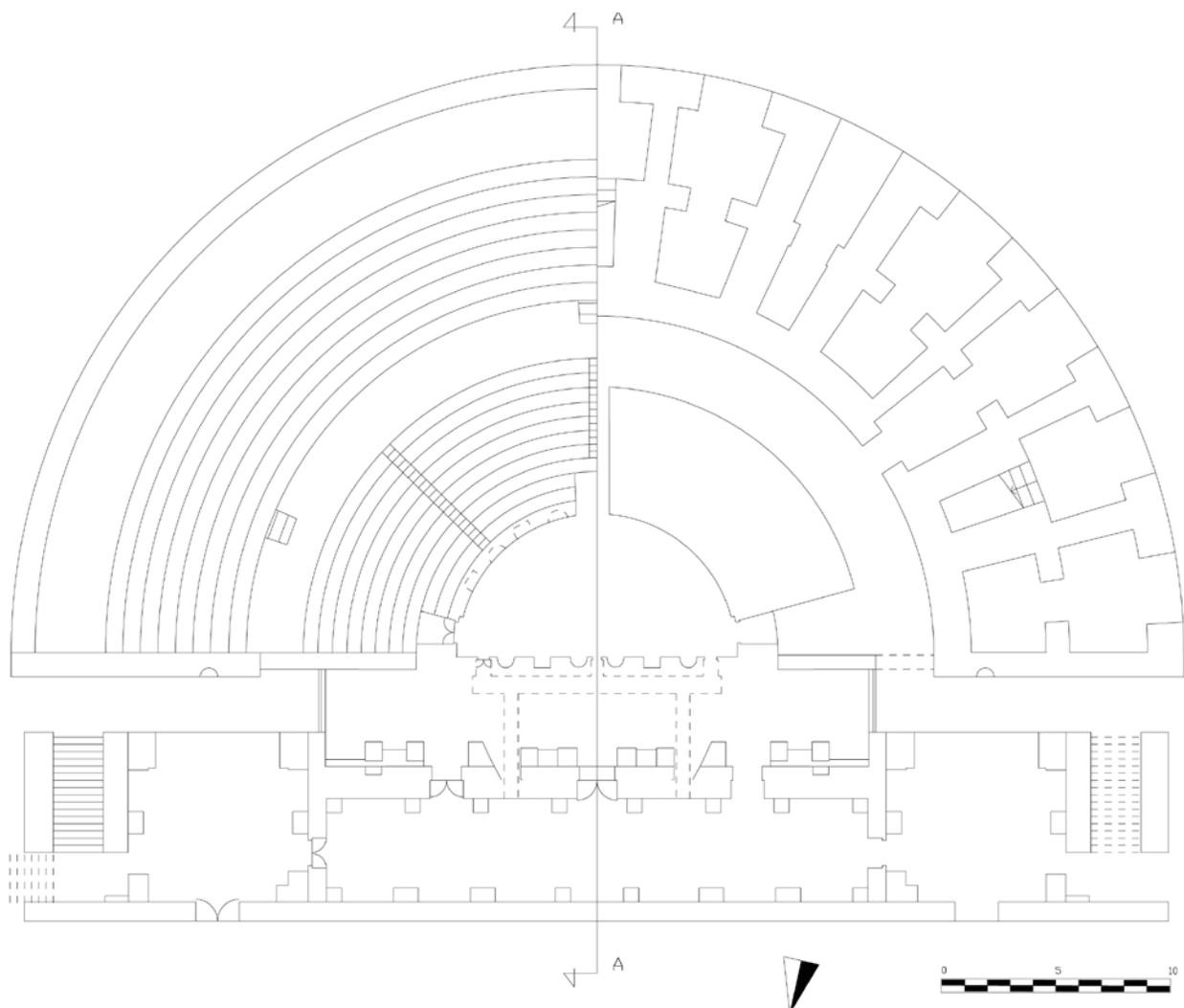


Figure 151: Reconstructive plan of the Pythion theatre, Gortyn (courtesy of J. Bonetto and D. Francisci).

Archaeological investigations in the city today are managed by various institutions. A small central area of the lower settlement, with the temple of Apollo and the praetorium, has been unearthed; it is enclosed and visible and overseen by the SAIA. The north-western part of the city, with the church of S. Titus and the agora, has been partially excavated and it fully open to the public, directly run by the local Ephoria. Some remains near the Mitropolis (the Christian basilica) are still visible, whereas the older core of the village of Aghioi Deka, which developed in the area of the old amphitheatre, still recalls by its shape the presence of the ancient building. Among these areas is a large, cultivated, non-excavated area, characterised by some standing remains and its hundreds of olive trees. Most of the ancient site waits to be uncovered, and thus our knowledge of the urban layout is hypothetical to a large extent. In particular, private architecture is poorly known, with the major exception of the Byzantine district, located between the praetorium and the temple of Apollo.

The Pythion theatre⁵⁸⁷

The Pythion theatre is named after the district occupied by the temple of Apollo Pythius, located just east of the theatre and which was investigated by F. Halbherr between 1885 and 1887. The two buildings may have been functionally related, as theatrical representations were an important part of the celebrations of the deity.

The upper structures of the theatre emerged before the new investigations began and its presence is attested by modern drawings. According to the building technique, the structure was provisionally ascribed to the 2nd century AD, most probably to the Antonine period.⁵⁸⁸

New excavations began in 2001, conducted by the University of Padua until 2013. This team fully brought to light the eastern half of the structures, revealing the sequence shown in Table 9.

Table 9: Phasing of the sequence emerging during the excavations carried out in the Pythion theatre, Gortyn (courtesy of J. Bonetto and D. Francisci).

Phase I		
Sub-phase Ia	AD 130/150 - 175/225	Construction and use of the theatre (Figure 151)
Sub-phase Ib	AD 175/225 - 275/325	Refurbishment and use of the theatre
Phase II		
Sub-phase IIa	AD 275/300 - 325/350	Abandonment and first dismantlement
Sub-phase IIb	AD 325/350 - 365	Reuse of the theatre
Phase III		
Sub-phase IIIa	21 July AD 365	First collapse of the theatre
Sub-phase IIIb	AD 365 - beginning of the 5th century AD	Occupation among the debris
Sub-phase IIIc	AD 400/450	Second collapse of the theatre (Figure 152)
Phase IV	AD 450 - end of the 6th century	Occupation after the collapse of the theatre (Figure 153)
Phase V	End of the 6th century AD - 7th century AD	Decay of the collapsed structures and accretion
Phase VI	End of the 6th/7th century AD - 19th/20th century	Backfills of Medieval to contemporary age

The excavations at the theatre ended in 2013 and the full edition, although not available when this work began, has been very recently published⁵⁸⁹.

⁵⁸⁷ Preliminary reports on the activity carried out at the Pythion theatre are available in Bonetto 2001; Bonetto *et al.* 2005; Bonetto *et al.* 2009f; Bonetto Francisci 2014.

⁵⁸⁸ Livadiotti 2004: 746.

⁵⁸⁹ Bonetto *et al.* 2019.



Figure 152: View of the collapsed structures of the Pythion theatre, Gortyn (courtesy of J. Bonetto and D. Francisci).

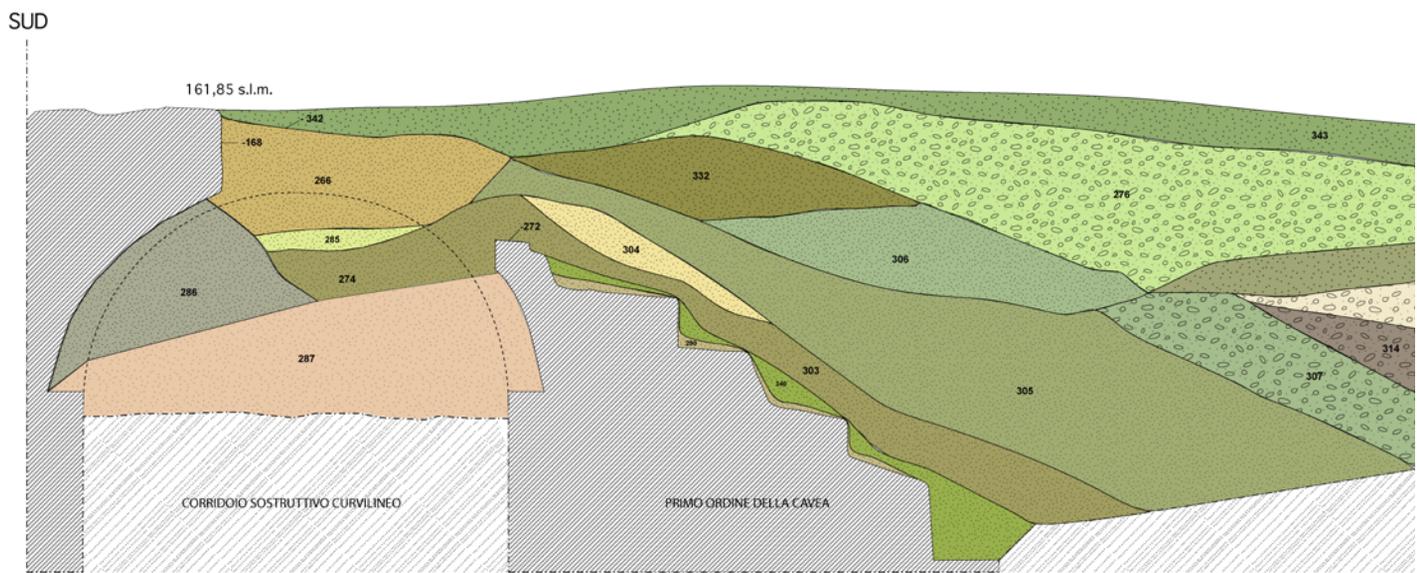
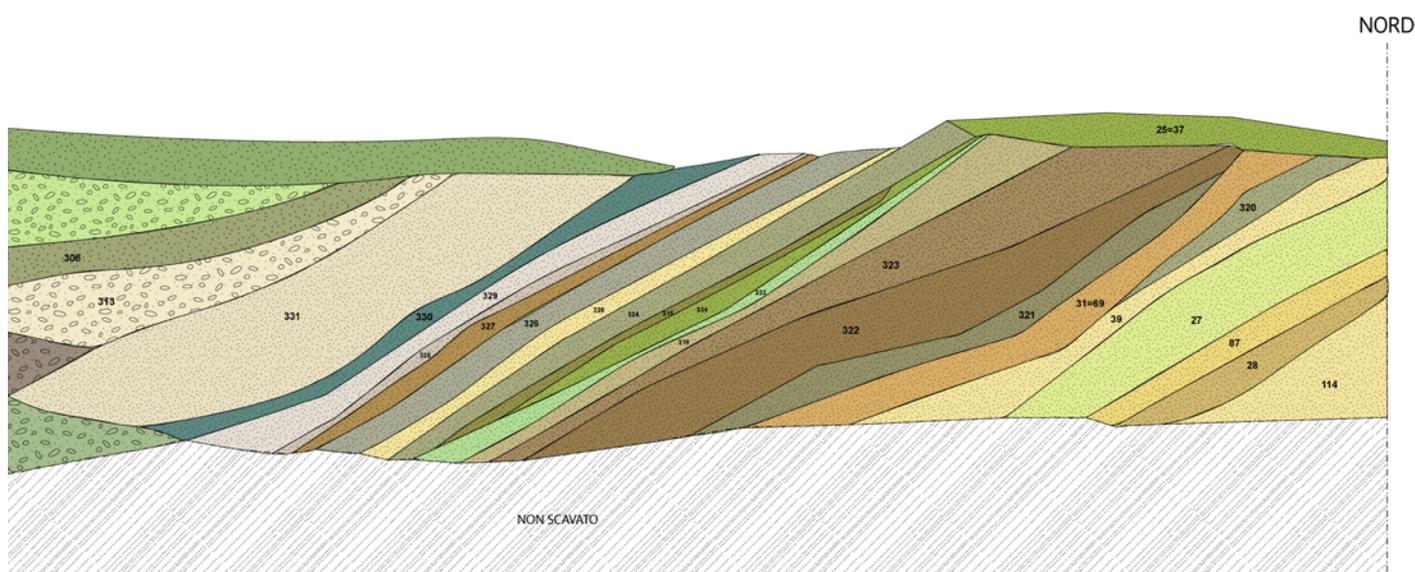


Figure 153: Cross-section of the backfill of the cavea of the Pythion

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theatre, Gortyn (courtesy of J. Bonetto and D. Francisci).

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