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INHALT – CONTENTS

Teil A: Troia − Aktuelle Ausgrabungen und Umfeld

POTTERY SERIATION DATING AT TROİA IN THE MIDDLE AND LATE BRONZE AGE BASED ON THE CINCINNATI CLASSIFICATION SYSTEM

Bernhard Weninger

ABSTRACT

In this paper a stratigraphically-referenced database capable of precise and accurate dating of pottery assemblages from the Late Bronze Age (LBA) at Troia (Periods VI–VII) is presented. The database is constructed from information provided in the excavation reports of Carl F. Blegen, Cedric G. Boulter, John L. Caskey, and Marion Rawson (Blegen *et al.* 1953; 1958). The paper is focussed on quantifying the dating accuracy and precision that can be achieved with the new pottery database, when statistical seriation procedures (Correspondence Analysis) are applied.

ZUSAMMENFASSUNG

In der vorliegenden Arbeit wird eine stratigraphisch-referenzierte Datenbank beschrieben, die sich zur genauen und präzisen Datierung von spätbronzeitlichen Keramikfunden in Troia (Perioden VI und VII) eignet. Die Datenbank wurde anhand von Angaben in den Grabungspublikationen von Carl F. Blegen, Cedric G. Boulter, John L. Caskey und Marion Rawson erstellt (Blegen *et al.* 1953; 1958). Die vorliegende Arbeit behandelt im Schwerpunkt die mit Hilfe einer Seriation (Korrespondenzanalyse) erreichbare Genauigkeit der Keramikdatierung. (Eine ausführliche deutsche Fassung findet sich am Ende des Artikels.)

Introduction

In the years 1932–1938 extensive excavations were undertaken at Troia* by a team of archaeologists from the University of Cincinnati, working under the direction of Carl F. Blegen. The results of the Bronze Age excavations were published soon after the Second World War in four volumes, two of which address the Early Bronze Age finds,[1] and two the Middle and Late Bronze Age finds.[2] Based on the pottery shape classification system established by the Cincinnati team during the 1932–1938 excavations and systematically applied in all publication volumes,[3] in a previous paper[4] I have reconstructed a numeric pottery database for the Early Bronze Age at Troia (Periods I–V). The present paper describes the construction and stratigraphic calibration of a new database, that covers the Middle and Late Bronze Age pottery. As in the previous paper, special attention is paid to evaluating the precision and accuracy that can be achieved at Troia for pottery dating based on the Cincinnati vessel shape classification.

One of the most remarkable aspects of the Cincinnati Troy excavations, performed under the direction of Carl F. Blegen in the years 1932–1938, is the detailed and systematic manner in which the results were published, some 60 years ago, and two decades even after the end of the excavations.[5] Beyond establishing a systematic architectural stratigraphy, with highly complete integration of the previously achieved stratigraphic subdivisions by Dörpfeld (1902), the American team were able to publish the majority of excavated pottery finds even on a sherd by sherd basis, at least for the most interesting objects. Although generally only a qualitative documentation (e. g., "very common") of the actual shape counts is given, the pottery description is based on a very extensive shape and fabric classification system, that covers altogether 141 Early Bronze Age and 152 Middle-Late Bronze Age shapes.

In a previous study,[6] a database containing the complete Cincinnati pottery inventary of EBA-Troia (settlement Periods Troia I–V) was presented. That database contains a total of 14,917 reconstructed pots, all classified according to the Cincinnati pottery shape system. Making use of Correspondence Analysis (CA) as seriation method, it was possible to use the pottery assemblages described in Volumes I and II of the Cincinnati excavations[7] for precise reconstruction of the Troia EBA architectural stratigraphy. In that paper[8] the dating accuracy achievable by pottery shape seriation is shown to be ± 1 phase (or c. ± 50 yrs) for the EBA. I have now extended this earlier work, and by similar methods have constructed a further, stratigraphically-calibrated pottery database, this time for the Middle-Late Bronze Age (settlement Periods Troia VI–VII).

In the following, a detailed description of all procedures used in the construction of the new Troia VI–VII pottery database is given, along with a brief characterisation of the supporting software written in Fortran 95. As in the previous study[9] the new Troia VI–VII pottery seriation is based on the method of Correspondence Analysis (CA). A short introduction to the CA-method is therefore given, along with a review of the present and previous pottery counting procedures.

Along the way, it will be interesting to compare the dating results, as achieved previously for the Early Bronze Age (c. 3000–1700 yrs BC [combined cal-^{14}C and historic ages]), with the results now obtained using essentially identical methods for the Middle and Late Bronze Age (c. 1700–1000 yrs BC [histBC]), especially in terms of dating accuracy.

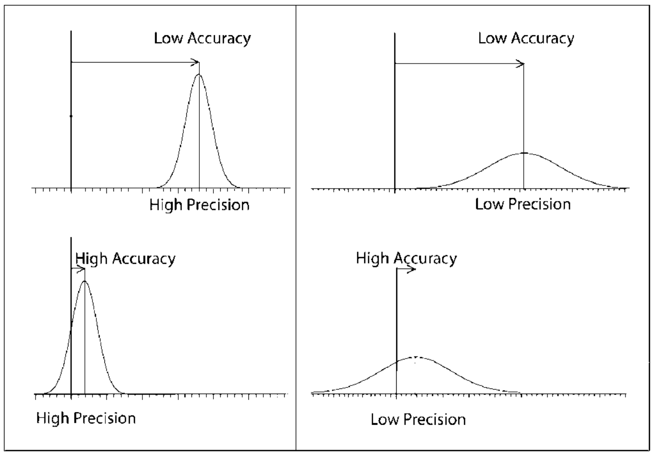

Fig.1 Pottery Dating. Basic Concepts for Precision and Accuracy.
Abb. 1 Grundlegende Konzepte der Keramikdatierung. Es wird zwischen Genauigkeit und Präzision unterschieden.

Dating Accuracy and Precision

In the present analysis, again, special efforts were undertaken to establish a pottery database with the highest possible timing resolution and, indeed, the pottery seriation dating results for Troia VI–VII Periods demonstrate such high resolution (cf. below) that further efforts towards measuring both the achieved dating accuracy and the precision appeared to be worthwhile. The differences between these two concepts are illustrated in Fig. 1, from a generalized view-point. Later, these concepts will be applied to the stratigraphic objects under study at Troia (i. e., architectural units, floating stratigraphies, graves). The main point hereby will be to evaluate the influence of the mixing and redeposition of the pottery finds, that is so characteristic for large multi-phase sites like Troia. We may expect such disturbances to have two major effects on pottery dating (i) spreading of the otherwise potentially sharper pottery ages, and (ii) distortion (shifting) of the pottery ages away from the targeted age. However, due to the complexity of 'on-site' conditions, it is best to avoid *a priori* assumptions. These effects are best studied from an experimental perspective.

In pottery dating, quite generally, we are interested in achieving the lowest overall spread of ages ("high precision") for all pottery assemblages. At the same time we request that the pottery ages should cluster as close as possible to the targeted age ("high accuracy"). To establish both parameters requires some quite substantial efforts, but this appears worthwhile since we will then have at our disposal a tested pottery-seriation, including numeric estimates for the dating errors. In these studies, clearly, special attention must be given to the question, to what extent the stratigraphic mixing of pottery finds leads to an offset in the pottery dating results.

Research Program

Our research goal, backed by such considerations, is to reconstruct the pottery 'age' of each excavation unit at Troia (idem: its position in the seriation), solely on the base of its pottery contents, with minimal uncertainties on a wide variety of different levels (e. g., accuracy, precision, absolute age calibration, sensitivity). To this aim we have performed a large number of comparisons between the results of the seriation, and the independent stratigraphic positioning of the same excavation units, as proposed by the Cincinnati team. These pottery-age intercalibration studies involve, (i) calibration of the overall seriation coordinate system, by comparison with 'certified' (known-age) stratigraphic units as given by the Cincinnati team, (ii) testing the seriation for the entire set of excavation units, one-by-one, as can be extracted from the Cincinnati publications, (iii) testing the seriation for extended stratigraphies, that are described in the Cincinnati publications, (iv) to supply a first practical test-study for the seriation under 'non-Cincinnati' conditions, for which purpose we have chosen to study the seriation-dating of the recently excavated Late Bronze Age 'Terracehouse'[10] and finally (v) to test the seriation in terms of its sensitivity for limited amounts of pottery.

At best, such programmatic testing of the seriation would involve a complete set of comparisons, to be performed between the factor scores of all excavation units and the known stratigraphic position of the same units. These may either be given by the Cincinnati excavators, or – indeed better – implemented directly into the computer-supported stratigraphic reconstruction of the modern excavations.[11] However, due to time-constraints in the present studies as well as the inherent limitations of the Cincinnati excavations, we will only manage to establish a small number of selected tests. Nevertheless, even these limited tests suffice in demonstrating the wide range of analytical possibilities that are offered by the CA pottery seriation. In this introduction we also mention that in conflicting cases – when unresolvable differences between the architectural and the pottery dating occur – we would naively assign greater weight to the architectural dating.

Stratigraphic Testing: Terminology

Due to given Cincinnati publication procedures the highest stratigraphic resolution achievable at Troia, for all Periods, is on the level of the architectural phases. These are shown in Fig. 2 for the Early, Middle and Late Bronze Age Periods. In the Cincinnati terminology the architectural phases (written with small letters e. g. a ,b, c, etc.) are defined as the smallest (and shortest) stratigraphic units that can be identified within the more widely defined cultural Period (written with Roman numerals e. g., I, II, III... VII). Whenever a secure reference of an excavation unit to one of these phases was not possible, the Cincinnati excavators assigned the assemblage to a Subperiod (e. g. Early, Middle, Late). This typically occurs in the case of extended stratigraphic sequences (called 'Trial Pit', 'deep stratified deposit', 'Trench', 'accumulation of debris', or the like) for which connecting architecture is not available, or not well-defined due to mixing. In consequence, the architectural phases represent the highest level of excavation and documentation we may sensibly aim at. We have accounted for this, both in the initial pottery data collection, and in testing the pottery seriation.

PERIODS	Phases / Subperiods	References
TROIA VIIb3	not defined by Blegen et al.	Korfmann (1995, 22)
TROIA VIIb2	could be defined as new Period	Blegen et al., 1958,142-143)
TROIA VIIb1	cultural continuation of Troia VIIa	Blegen et al., 1958,142-143)
TROIA VIIa	could be defined „"Phase VI i"	Blegen et al.,(1958, 8)
TROIA VI	a b c d e f g h Early Middle Late	Blegen et al.,(1953, 11)
TROIA V	a b c d Early Middle Late (Square F8)	Blegen et al.,(1951, 224)
TROIA IV	a b c d e Subperiods: not defined	Blegen et al.,(1951,104)
TROIA III	a b c d Subperiods: defined in different Squares	Blegen et al.,(1951,6)
TROIA II	a b c d e f g Subperiods: not defined	Blegen et al.,(1950,204)
TROIA I	a b c d e f g h i j (k) Early Middle Late	Blegen et al.,(1950, 36)

Fig. 2 Architectural and Cultural Periodisation for Bronze Age Troia according to Blegen et al., (1950; 1951; 1953; 1958).

Abb. 2 Architektonische und kulturelle Periodisierung der Bronzezeit in Troia nach Blegen *et al*. (1950; 1951; 1953; 1958).

Pottery Counting

As mentioned above, the procedures used in the present paper for quantitative pottery counting are largely identical to those used in the previous Early Bronze Age study.[12] These procedures involve (i) careful reading of all text components that contain descriptions of excavation units that have supplied pottery finds, and (ii) numeric recoding of the language used by the excavators to describe the amounts of pottery in these units. Since the Cincinnati excavators typically only give qualitative estimates of the recorded pottery amounts, for numeric counting we have devised a standardised language translation scheme, as shown in The Language Catalogue (Fig. 3).

Class A	Class B	Class C	Class D
Exceedingly numerous extremely common numerous very common almost all commonest dominant great numbers outnumbering all others most frequent	common fairly common most common after fairly numerous in abundance many a good many	several some a number of not very common different vessels a few regular	recognisable noted identifiable
N = 12	N = 6	N = 3	N = 1

Fig. 3 The Language Catalogue for Pottery Counting. Coding and Classification Procedures.

Abb. 3 Katalog der sprachlichen Begriffe, die zum Auszählen der Keramikfunde benutzt wurden. Verfahren zum Kodieren und Klassifizieren der Begriffe.

The coding and classification procedures covered by the Language Catalogue are based on the psychophysical Law of Fechner, whereby human estimates of increasing weights, distances and amounts, when reflected in language ("more & much more; long & longer; many & very many etc.") are known to follow a logarithmic scale. For ease in counting, the language quantification was simplified to contain only whole numbers. The counting then follows a simple scheme (12–6–3–1) which approxi-mates the requested logarithmic scaling (Fig. 3). We have applied this counting procedure, with minor exceptions, to all excavation units described in Vols. III and IV. The final database construction involves a certain amount of additional numeric guesswork, for example to account for semi-missing or intermediate language values. The actual counting procedures (and problems) are therefore best illustrated in an example, along with comments. In Volume III, on pages 130–133, the ceramics derived from excavations in Area 603 (Square F8), are described as follows:

Cincinnati Publication	Pottery Data Reconstruction
Area 603 (Square F8)	**[Database entry Nr. 3, Area 603 F8]**
... Few architectural remains came to light here, and undisturbed deposits were found only in small patches, but we could be fairly certain that the whole region had been occupied by private houses in Phase VIa. In this account only the “certified”material will be recorded.	**[Database entry: Phase VIa]** *[Note: only certified finds are given i. e. much of the original material was likely more mixed than we would like]*
... **Pottery** Two restorable pots and one-half basketful of sherds approximately 60% fine fabrics and 40% course ware.	**[Database entry: count of 0.5 baskets]**
Gray Minyan Ware This ware becomes progressively more plentiful even within the limits of the stratum assigned to Phase VIa. The fragments are too small to allow exact classification of all shapes.	**[Confirms our entry: Phase VIa]**
A56 One rim fragment	**[N=1 count for shape A56]**
A57 32.1215, Figs. 312, 426 Nr. 2, H. pres. = 0.118. d. rm, calculated 0.327. Repaired from four fragments, comprising one-third of rim and shoulder, with one handle. Light gray micaceous clay, slipped and burnished. Shoulder rises steeply to outturned rim. Six horizontal grooves on shoulder incised when pot was on the wheel, before the handle was attached.	**[N=1 count for shape A57]**
A61 Many fragments, with various profiles	**[N=6 counts for shape A61]**
A62 One rim fragment (fig. 425, Nr.15)	**[N=1 count for shape A62]**
A64 Several fragments of ringed stems	**[N=3 counts for shape A64]**
A94 Several fragments. Sherd F. 192 (fig. 356 Nr. 11), found in Bothros B, and Sherd F.233 (fig. 356 Nr. 12, fig. 426 Nr. 12) may be from cups of this shape.	**[N=3 counts for shape A94]**
A99 (?) One rim fragment (fig. 425 Nr. 16). Two goblet stems with spreading foot.	**[N=3 counts for shape A99]** *[Note: ambiguous counting]*

Parallel to pottery shape counting, along with each excavation unit we have documented the stratigraphic information supplied by the excavators, as completely as possible (cf. Appendix I). For each text unit, this stratigraphic information is included in the database (e. g., square, phase, stratum, level, and depth). There are some simple technical reasons to do this, since, as already observed in the previous EBA study,[13] the excavation units from many of the profiles (e. g., deep stratigraphic sections, houses, streets, fills etc.) are seldom published in stratigraphic sequence, but are instead widely spread around the publication text. This is entirely unproblematic and understandable, due to the publication style chosen by the Cincinnati excavators, who strictly adhere to the description of their results in all Troy Volumes in chronological order, from old to young, and phase by phase. Hence, quite seldom are the excavation units described in stratigraphic order, as we would require. Due to the highly translucent publication style, the collection and re-stratification of consecutive excavation units is a simple technical (although admittedly time-consuming) question. All we must do is to collect the necessary excavation units from different parts of the text, and re-assemble the profiles. This requires a systematic 'in-text excavation' along with some computer-intensive documentation. In no cases do we observe missing excavation units.

The Pottery Database

The reconstructed stratigraphically-referenced pottery database is presented in Appendix I. It covers a total of 136 text units, which we call 'excavation units' or 'pottery assemblages'. These units are arranged in chronological order (from old to young: Early Troia VI to end of Troia VII) following the same order of description as given in the Cincinnati Troy publications. The database contains a total of 6,237 vessels, all counted by shape according to the Blegen Classification System. To support the identification of individual excavation units in the seriation program (cf. below) each excavation unit (e. g., House 730) is associated a unique running number (e. g., Nr. 96). When using the seriation program, the position of each unit can then be marked on the screen, by tagging this running number. Each running number is connected to a stratigraphic unit (e. g., Nr. 96 = House 730), which can also be tagged by name.

Pottery Lifetimes and Secondary Stratigraphic Mixing

The problem we adress, and attempt to solve by pottery seriation, is that the large majority of excavation units have been disturbed, at some point in time. Some units may contain only a few intrusive sherds, but others will be thoroughly mixed, and the initial problem is to that we have no *a priori* knowledge as to which wares or shapes are genuine, and which are intrusive. This effects all pottery dates, for single vessels as much as for extended assemblages. Notably, it may be indeed possible to date certain units according to the youngest sherd, but these dates will often be meaningless, in cultural terms, since in this manner we cannot exclude dating the youngest sedimentation activity effecting the unit, and there are a lot of animal holes at Troia. A possible solution would be to excavate the entire site, then use stratigraphic criteria in combination with statistical pottery filtering (e. g., according to the size of associated animal bone finds) aimed at developing a scale on which to measure the degree of mixing. The degree of bone fragmentation, when calibrated against the degree of pottery fragmentation, may finally supply us with a useful measure for the stratigraphic 'disturbance' (or 'mixing') of different-age finds.[14] We would then apply a corresponding scaling to the individual excavation units, and subdivide the pottery assemblages according to this scale into groups such as 'mixed', 'less mixed', and 'unmixed' or 'pure', as requested. However, even if there would exist pottery assemblages that have retained their primary inventories (and I personally have no doubt that such assemblages really do exist, alas I do not know how to identify them), there remains the problem that even those units that really do contain 'unmixed' or 'pure' or 'certified' material (to use the language of the Cincinnati excavators) may finally not have the ideal timing characteristics we were hoping for.

The Household Pottery Age Spread

What would excavation units or pottery assemblages with such ideal timing characteristics look like? To this question let us run a 'Gedankenexperiment' aimed at evaluating the highest possible timing resolution achievable by pottery dating, under hypothetical ideal conditions. There are different ways of constructing such an ideal assemblage, but for our purposes let it suffice that the assemblage contains a number of intact (unfragmented) vessels, that have been found in an undisturbed and unmixed deposit. An example would be an (idealised) destruction layer due to a volcanic eruption with complete site coverage by tephra. We are now in a position to formulate the dating problem. First, let us assume that the deposit under study indeed contains the requested closed assemblage of intact vessels, found *in situ,* and not secondarily moved (e. g., as in Thera – Late Minoan phase LMIA – by the inhabitants warned by an earthquake preceding the eruption). In our 'Gedankenexperiment' all vessels have been deposited at the same time, and the deposit represents the last household use of these vessels prior to the hypothetical destruction. Even under these ideal conditions, and assuming that all vessels indeed remained undisturbed following their coverage by tephra (which is highly unlikely due to the sheer magnitude of animal activities everywhere in this world), we must nevertheless allow for finite age differences between the individual finds.

These age differences result from the many (and often large) variations in life-span, mobility, and breakability of the different pottery classes (e. g., large and small storage vessels, religious objects, eating and cooking vessels, fire distribution vessels, imports). My guess would be that all these age differences lead to an overall spread of pottery ages in the order of at least a few decades. For ease in statistical processing let us represent this age spread as a Gaussian value of ± 10 yrs (68 %). For practical purposes this value is identical to an interval of length 40 yrs (95 %). Since this age spread is closely related to the timespan of a typical Trojan household, we call it the 'household pottery age spread'. The assigned value of 40 yrs allows for the total time-life of the pottery found within a typical Bronze Age household at Troia, including realistic sedimentation and excavation conditions. *En passant*: such an idealization is well-adapted to the excavation procedures at Troia, both by the Blegen team and the modern excavators, where much effort is invested in distinguishing e. g., between contexts with pottery sealed in the lowest house floors, and pottery found in, or directly below the destruction fill. This is well-illustrated for the Terracehouse,[15] which we therefore use later in testing the reproducibilty of the pottery seriation.

The Classification Age Spread

Beyond this minimal household pottery age spread of 40 yrs (95 %), we must take into further account that the pottery classification process itself is responsible for some significant additional reduction in time resolution for single-vessel pottery dating. This reduction in dating resolution is caused by the morphological identity of all shape-classified objects. Once sorted into its respective class, there is no way we can assign a different age to any vessel of the specified class. Simply stated, the moment the classification is undertaken, all corresponding vessels look alike. All properties we have assigned to the pottery class are immediately valid for all class subcomponents, with no exceptions, and this includes all primary and secondary properties, such as function and age. The moment we have dated one object belonging to the class under study, this date is automatically valid for all other objects of the same class. If this were *not* the case, then the object at stake would have been wrongly assigned to this specific class. The other way around, once the contents of the class have been established, from then on we are never again able to tell the composing objects apart. In effect, by destroying the initial individuality of the objects under study, the classification itself puts an upper limit to the achievable single-vessel dating resolution.

For the Middle-Late Bronze Age at Troia a chart showing the lifespans of selected Blegen pottery shapes for Subperiods VI-Early, VI-Middle, VI-Late, VIIa, VIIb) has been assembled by Pavúk.[16] From this chart it becomes clear that these lifespans are typically in the range of one-two, but sometimes three (or even more) Subperiods. There are cases when a more detailed classification may support a more precise dating of single vessels. Even allowing for this, the *minimum* average age spread due to the inherent morphological properties of Troia VI–VII pottery shapes amounts to one or more Subperiods.

Since this value is closely related to the typological classification of a typical Trojan pottery shape, we call it the 'minimum classification age spread'. Its value can be measured in calendric yrs by comparison with the timespan of a typical Troia VI–VII Subperiod. Since each Subperiod contains an average of 3 architectural phases, the minimum classification age spread amounts to 3 x 40 = 120 yrs. A similar value is obtained by referencing the average Middle-Late Bronze architectural phase length to the total span of the Troia VI–VII Period (c.1700–1000 [histBC]). For convenience, and to allow for given variations in phase length, we will may assign a value of 100 yrs to the classification age spread.

The Limits of Single Vessel Dating

In generalizing these conclusions, now, there exists an ultimate limit to the achievable pottery dating resolution, and this limit has two components (i) 100 yrs (due to shape classification) and (ii) 40 yrs (due to household age spread). The first dating component concerns single-vessel dating alone. The second component concerns both single-vessels as well as entire pottery assemblages. In the language of modern particle physics, it appears that classifed single-vessels have inherent statistical properties that physicists would commonly attribute to objects known as Bosons. Bosons are objects we cannot tell apart from another. In their statistical dating properties, single-vessels react like Bosons. In contrast, the same vessels in larger pottery assemblages react as Fermions. They are objects we can tell apart, by applying statistical methods. In the case of classified single-vessels, because single-vessels react like Bosons, we must inevitably accept the associated extreme loss in dating resolution. As such, the real culprit in reducing the timing resolution for pottery is therefore maybe (in part) not so much the limited experience that some analysts have in shape or fabric identification, as is proposed.[17] Instead, we must allow that the classification itself introduces the major error component of the dating, and this error will occur *a priori*, however perfect the classification may have been established. The next question, whether the experience of the pottery analyst really plays a significant role in causing dating errors, *vis-a-vis* the existence of the many other dating errors, can only be solved (in a quantitative manner) on the base of experimental studies.

Ultimately, the problem is that – prior to the necessary classification – single vessels store no useable information, at least none by which it would be possible to reliably reconstruct their usage and sedimentation history. After the classification, however, there exist no visible differences between identically classified pottery types (fabrics/wares). Hence, the timespan we must attribute to individual vessels is identical to the entire time-span of all vessels. We abbreviate this by saying that classified 'single-vessels get lost in time'. The situation is slightly better for fragmented pottery, in which case the degree of fragmentation provides some minimal information we may use to study the past sedimentary movements.

Under such circumstances, that we have now described in sufficient detail, there exists a number of arguments that make the use of *statistical* pottery dating procedures appear attractive. Perhaps the most attractive argument is that statistical methods are capable of simultaneously analysing the pottery assemblages of an entire site. In the following we will focus, as in the previous study,[18] on the method of Correspondence Analysis that we simultaneously use for pottery seriation (pottery dating) and for pottery Periodisation (statistical grouping).

Correspondence Analysis

The method of pottery seriation used in the present paper, Correspondence Analysis (CA), was first established by Benzécri[19] and further developed by a number of authors, including our main reference.[20] The CA-method is conceptually similar to a Principal Component Analysis and can also be applied to contingency tables, with the important difference that the CA method treats both axes of the table equivalently. In our application the table contains horizontal pottery shape counts and vertical excavation units. The symmetric management of both axes by the CA method is of major advantage in the archaeological application, since the finally ordered table can be interpreted, simultaneously, in terms of an achieved optimal ordering both of the pottery shape variables in context of the given excavation units ("double seriation"), as well as in terms of an optimal clustering of the pottery shape and excavation unit variables ("double cluster analysis"). This is achieved by the CA-method by decomposing the table according to a Chi-square statistic, and then iteratively rearranging the table onto orthogonal factors.

Cluster Analysis and Pottery Periodisation

This symmetry of CA is a most advantageous spin-off result of statistical pottery dating procedures, perhaps most clearly notable in contrast to single-find dating methods, which are typically uni-directional. Due to the decomposition of the table into orthogonal factors, the CA method produces a one-to-one relation between pottery units and excavation units. This means that inferences in both directions are possible: we can not only use the pottery assemblages to derive a sequence "date" for the stratigraphic source, but *vice versa* use the CA-seriation to deduce a "typical" (theoretically expected) pottery assemblage for any specified excavation unit. The corresponding question towards the database would be "please tell me which pottery shapes would be most typical for a house dating to Troia phase VId". This opens up the possibility that we may objectively define pottery phases (or subphases), not based on the properties of single-vessels, but on recurring find combinations. A typical use of CA[21] is to analyse whether there exist recurring combinations of shapes in the pottery inventaries, that may be used for the definition of pottery phases. For many (but not all) applications the CA-method offers a more robust, more complete, and more objective method than does single-vessel analysis. It has the further advantage over single-vessel analysis that the results are mathematically *eineindeutig,* i. e., we may reliably relate any given single pottery shape to an architectural phase, but also the other way round. Under the assumption that statistically repetitive find combinations are most likely to occur for pottery types that have similar functions, and derive from the same kinds of deposits, be this in household, religious, or other spheres, we may also use the CA method with advantage for corresponding cultural research. In the present studies we have enhanced these multiple advantages of the CA-method, by writing a dedicated computer program.

Computer Program

To support the pottery seriation CA-application a computer program was developed, with special attention given to the graphic enhancement of the advantageous features provided by the CA-method in terms of (i) pottery Periodisation and (ii) stratigraphic pottery dating with reference to architectural phases. The software is written in the Fortran 95 language (Lahey® LF95 Fortran Compiler version 7.1) and runs under the Windows Operating

System. The algorithms used for CA are based on a program called KORAN, which was originally written in FORTRAN-77 in the 1980's by Peter Ihm (Marburg) and Andreas Zimmermann (Köln). Previous applications of KORAN, at that time in a stand-alone version, are described by Easton and Weninger[22] and Weninger[23]. For higher versatility, the KORAN program has now been equipped with a user-friendly graphic surface, as illustrated in Fig. 4 for one of the menus, to provide the user with support in e. g., data import, graphic export, and table editing. All menu functions are written in Fortran 95, and make use of the commercial Fortran 95 Graphic User Interface (GUI) Winteracter Toolset (version 8.0), that was developed by Interactive Software Services Ltd, GB-Huntingdon. For database management, the pottery shape database utilizes further commercial software (Microsoft Excel). The import of xls-formated data into the Fortran-routines requires recoding of the xls-formatted data into ASCII format. This is performed with Canaima® Fortran F90SQL libraries, which allow import of xls-formatted data into Fortran through the MS-windows ODBC-interface (Open Data Base Connectivity). The use of a commercial format in database management is helpful in the present application, as well as for the substantially larger sets of excavation units, we are planning to study in the future.

General Graphic Representation

The main task tackled by the new menu is to provide management facilities and visual support for the large number of input-output components that are necessary for pottery seriation by Correspondence Analysis. These components include data formatting and data import, seriation runs, screen/graphic output of seriation runs, and a variety of tabled output results. The seriation itself is supported by visual-graphic representation of the calculated numeric pottery shape and excavation units, in an XY-diagram (Factor 1–2) as shown in Fig. 4.

The seriation results are presented graphically in two windows, (i) the Upper Window shows the factor scores as an XY-scattergram (Fig. 4 upper) and (ii) the Lower

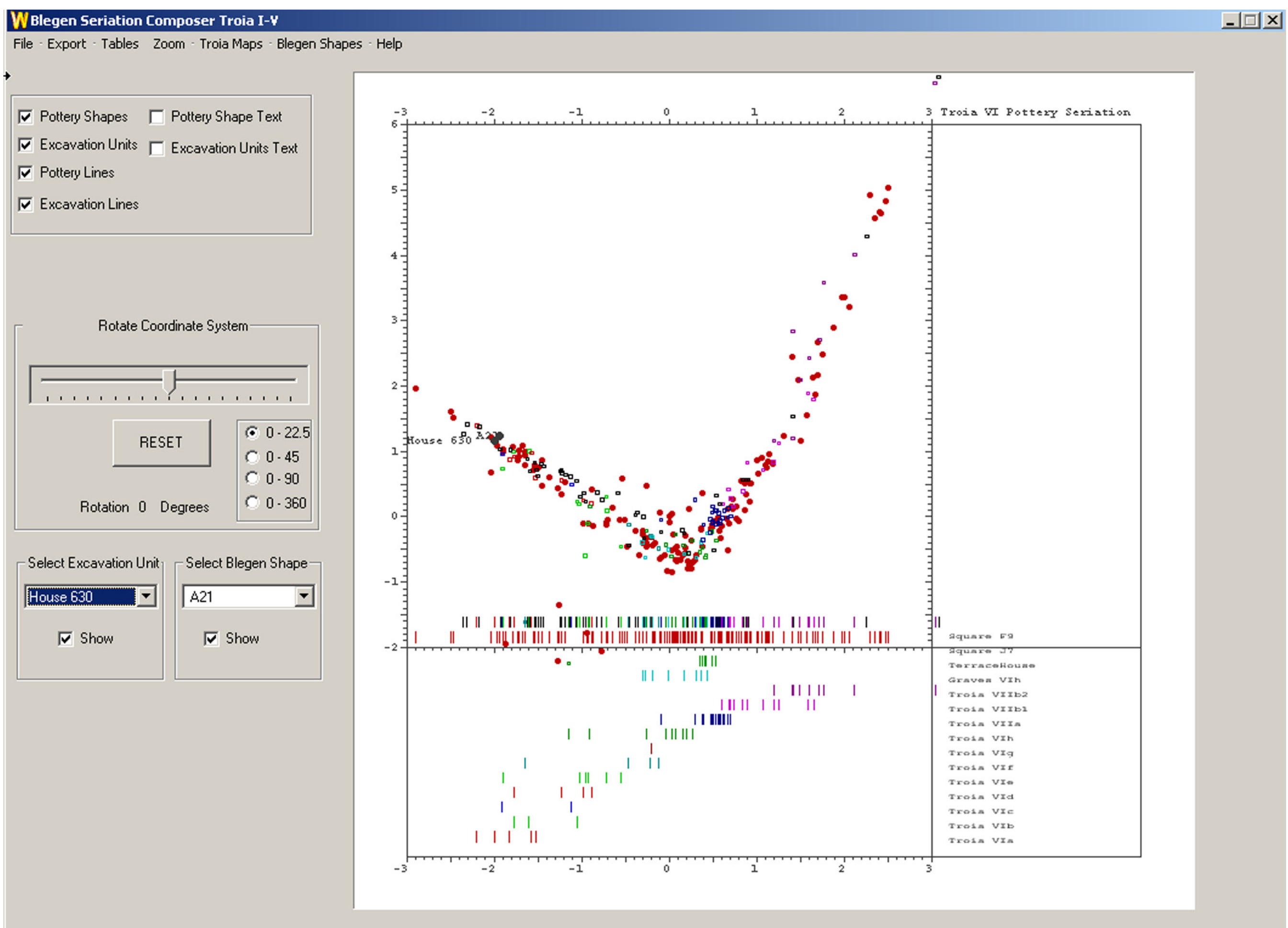

Fig. 4 Computer Program for Pottery Seriation.
Abb. 4 Computer-Programm zur Keramikseriation.

Window (Fig. 4 lower) shows the same scores, but projected onto the X-Axis. This double representation of the seriation results offers a wide variety of analytical possibilities, all of which are related to the fact that Factor 1 scores are apparently highly correlated to the sequence of Troia VI–VII phases (i. e., Factor 1 represents pottery time). This is advantageous since, first, the user can easily switch between graphs showing excavation units and pottery shapes. In each case an architectural (or stratigraphic) date is achieved, due to the allocation of the variable under study to one (or more) of the Troia VI–VII phases. Second, by using a drop-down-menu, the user can select any requested excavation unit, and study its properties in relation to Troia VI–VII phases. Third, the user can optionally rotate the coordinate system and study the corresponding variations in clustering of variables (shown in the Upper Window) in relation to the Troia phase system (shown in the Lower Window). All these options allow the user to rapidly visualize the seriation results, either by showing requested scores or by blending away unwanted variables.

General Results of the Pottery Seriation

As prime result, the CA-method produces two lists of numeric values, that contain the so-called factor scores. In our case, on entering the pottery database (Appendix I) with pottery shape counts and excavation units, the CA-result is a list of factor scores for the Blegen pottery shapes and a second list for the excavation units. These basic CA-results are documented in Appendix II (Blegen shapes) and Appendix III (excavation units). The data presentation is limited to the first two CA-factors. The higher factors were not analysed, due to the large amount of information that can already be extracted from the first two factors. For the factor scores achieved for the excavation units (Appendix III) the running number is identical to its counterpart in the database (Appendix I). The running numbers given for Blegen pottery shapes (Appendix II) have no counterparts in the database. They are used in the seriation program, as described above, for pottery shape bookkeeping purposes.

Seriation Results 1: Sequence of Pottery Shapes

Fig. 5 shows the CA-results for the Troia VI–VII pottery database (Appendix I), with focus on the Blegen pottery shapes. The same seriation, including the corresponding excavation units, is shown in Fig. 6. In both graphs the arrangement of CA-scores (small circles, upper graphs) has a nearly perfect parabola ('horse-shoe') shape. In both graphs the pottery 'time' of the seriation runs from left (old) to right (young) on factor 1. The correlation between pottery shapes and architectural phases is given by the proximity of the respective scores in the scattergram (Fig. 5, upper), and also – more directly – in the seperate window (lower graph). To construct the lower graph, we have undertaken a detailed calibration of the seriation results for all known-age ('certified') excavation units from the different phases.

As can be read from Fig. 5, the seriation shows a number of clusters and gaps for the Blegen pottery shapes. We have marked these shape clusters with A, B, C, D, E, F, and G. These clusters can be interpreted as representing natural pottery Subperiods, that are defined on the base of given shape combinations in the total pottery inventary. This result supports the proposal by Pavúk[24] that it may be possible to 'redefine' *pottery* sub-Periods of Troia VI–VIIa on the base of the Blegen pottery shapes. We refrain from discussing these groups here; they can be extracted from Appendix II. In the present paper we put focus on the chronological aspects of the CA-seriation. *En passant:* we note that although Blegen never under-

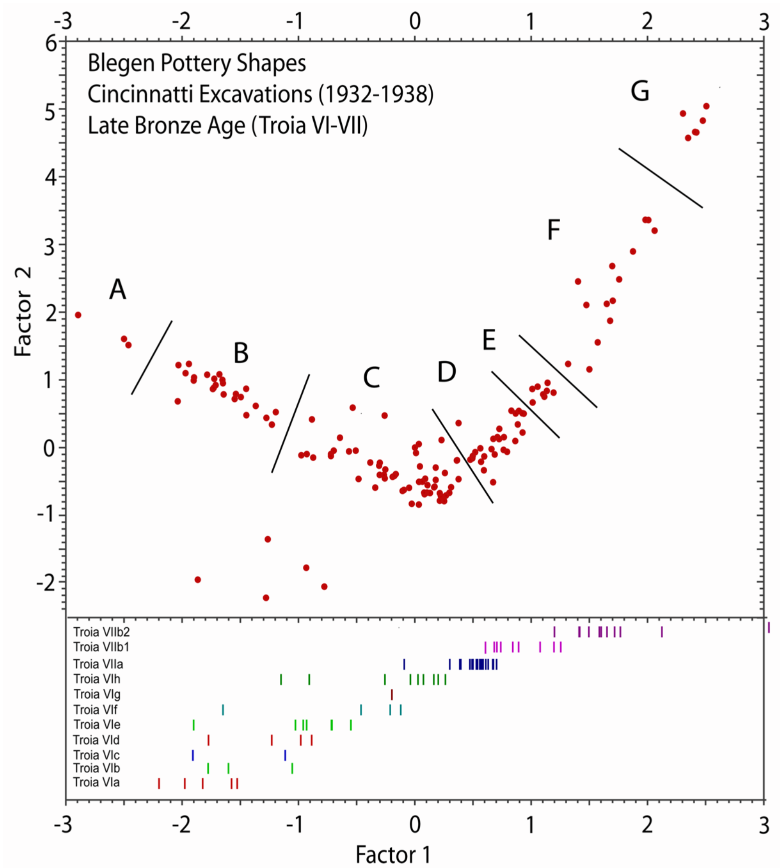

Fig. 5 Seriation Results (1): Troia VI–VII Blegen Pottery Shapes. Letters A–G indicate naturally clustering pottery shapes ('pottery Subperiods').

Abb. 5 Seriationsergebnisse (1): Troia VI–VII Blegen Gefäßformen. Die ‚Keramikzeit' läuft in dieser Graphik auf Faktor 1 von links (‚alt') nach rechts (‚jung'). Fenster oben: Buchstaben A–G zeigen die im Fundmaterial vorkommenden natürlichen ‚keramische Subperioden', wie sie in der Seriation als besonders häufige Gefäßform-Kombinationen ('cluster') erkannt werden.

took efforts to define Subperiods solely on the base of pottery finds, this is indeed possible (cf. Fig. 5).

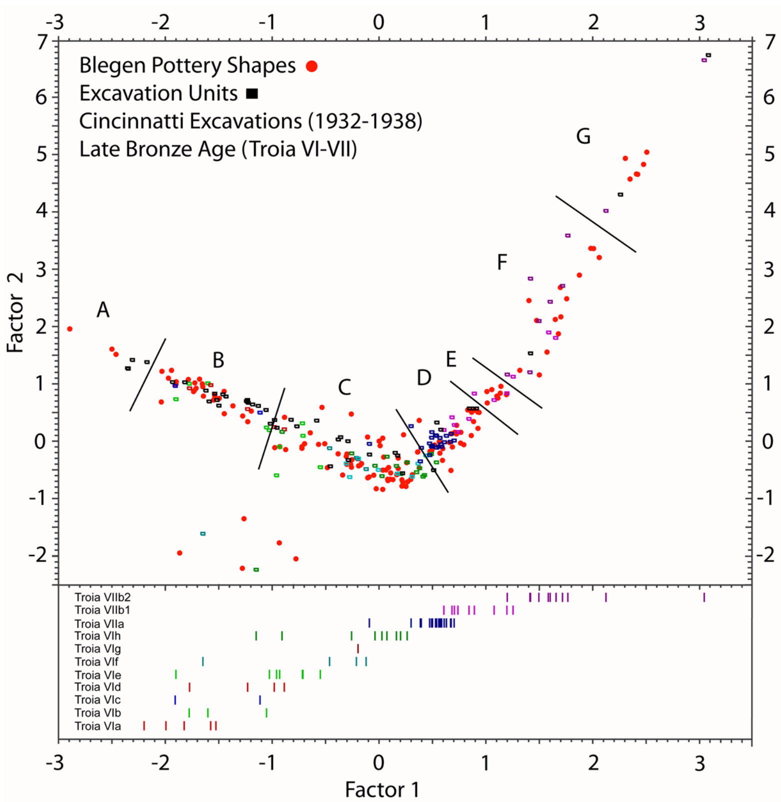

Fig. 6 Seriation Results (2): Troia VI–VII Blegen Pottery Shapes and Excavation Units. Letters A–G indicate naturally clustering pottery shapes (‘pottery Subperiods’ cf. Fig. 5)

Abb. 6 Seriationsergebnisse (2): Troia VI–VII Blegen Gefäßformen and Grabungseinheiten. Die ‚Keramikzeit' läuft in dieser Graphik auf Faktor 1 von links (‚alt') nach rechts (‚jung'). Fenster oben: wie Abb. 5, ergänzt mit den Schwerpunkten der Grabungseinheiten. Fenster unten: Zur stratigraphischen Eichung der Seriation werden die Seriations-Schwerpunkte von Grabungseinheiten, die sich (nach Blegen) sicher datierten Architekturphasen zuweisen lassen, auf Faktor 1 projiziert und in einem getrennten Fenster abgebildet.

Seriation Results 2: Sequence of Excavation Units

Fig. 6 shows the CA-results for the combined sequence of pottery shapes and excavation units. The seriation time again runs on Factor 1 (selected as x-axis) from left (old) to right (young). The factor scores for the excavation units are shown as small squares. The scores for the shapes are shown as small circles (Fig. 6, upper graph). The scores achieved for selected excavation units, known to represent certified phase-specific pottery assemblages, are depicted as short bars in the lower graph. As can be seen in this graph, the two most significant *combined* clusters of shapes and units at Troia, looking simultaneously at the entire Troia VI–VII pottery inventary, coincide (i) with a group of shapes and units clearly dating to Troia VIIb$_2$ (Fig. 6, letter F) and, (ii) an unexpected younger group of shapes and assemblages (Fig. 6, letter G). Let us first focus our attention on the curious properties of this Group G. It consists of Blegen shapes A104, A106, A107, B46, C84, and D45. According to Blegen,[25] with the exception of the everyday shape D45, all other shapes in this group make their first appearance in Knobbed Ware in Troia VIIb$_2$. Already a quick look at the sequence of ‘certified' Troia VIIb$_2$ units in Figs. 5/6, however, reveals that the scores for the majority of Troia VIIb$_2$ units already end at factor 1 values ~ 1.800. As such, it appears, the seriation is indicating the existence of a temporal gap (or a number of missing architectural phases) in – or following – Troia VIIb$_2$. We will come back to this question below. Let us first study the transition from Troia VIIa to Troia VIIb$_1$ in more detail.

Seriation Results 3: Evidence for Continuity between Troia VIIa and Troia VIIb$_1$

According to Blegen,[26] the material found in Troia VIIb$_1$ represents the natural end to pottery traditions that extend from Early through Middle to Late Troia VI, up to Troia VIIa. Then follows an apparently small but significant change in the shape inventary, that is the introduction of hand-made fabrics (‘Barbarian Wares'), and these are used by the American excavators to differentiate between Troia VIIa and Troia VIIb$_1$. In the seriation, the architectural transition from VIIa to VIIb$_1$ correspond to factor 1 scores ~ 1.700. At this position in the seriation, curiously, there is no marked transition in pottery groups. The next clear changes in pottery shape style occur in the transition from Group D to E, and more clearly between E and F (Fig. 5). To judge from the rather closed distribution both in shape and unit scores in the architectural transition from VIIa to VIIb$_1$ (Fig. 5 and Fig. 6), at this point there are only few, marked changes in the pottery shapes. A closer inspection of the pottery inventary shows that the transition VIIa–VIIb$_1$ is, furthermore, not necessarily best defined by the introduction of hand-made vessels, as is sometimes assumed in the literature. In this respect, the seriation results correspond entirely to the changes described by Blegen *et al.*:[27]

> *‘Altogether therefore Settlement VIIb has a good many characteristics peculiar to itself. At the outset it shows a direct continuity of the culture represented in Troy VIIa /Vol. III p.142/... In the first Subperiod which we call Troy VIIb1, we believe accordingly that we are dealing with an immediate reoccupation of the site by the survivors who somehow escaped the disaster that laid the citadel of*

> *Troy VIIa in smouldering ruins. The stumps of walls that were still standing were utilized as foundations or supports for the walls that were now erected ... /Vol. III, p.143/.'*

To the general question of continuity between Troia VIIa and Troia VIIb$_1$, *vis-a-vis* the introduction of the not necessarily intrusive (although new) handmade 'Barbarian Ware', the CA-results further agree well with Pavúk:[28]

> *'The change from VIIa to VIIb1 is marked again mostly by a change in architecture. Handmade 'Barbarian Ware' appears for the first time in VIIb1, but it only becomes common in the next phase, VIIb2. Wheel-made pottery retains the position of a fine ware and presents a continuation of VIIa in several respects... /Vol. III. 61/.'*

Seriation Results 4: Missing Subphases in Troia VIIb$_1$ and Troia VIIb$_2$

Perhaps the major result of the CA-seriation is the indication of gaps – that most likely correspond to missing architectural phases – in phases Troia VIIb$_1$ and Troia VIIb$_2$. In the transition from Group E to Group F there is a first major change in the density of the factor 1 scores both for the pottery shapes (Fig. 5) and the excavation units (Fig. 6). Then, in the transition from Group F to Group G, the seriation shows the largest jumps on both factors (1 and 2) anywhere in the entire seriation. Naively, we might simply associate this gap with the first appearance in VIIb$_2$ of the hand-made Buckelkeramik wares, and this reading is indeed correct. However, the seriation is telling us more. We should not overlook the fact that the seriation cannot recognize shapes in a qualitative (or aesthetic sense), but only their statistical combinations with other shapes. In consequence, the seriation can have no knowledge that the Buckelkeramik vessels may perhaps represent cultural 'intrusions', or be untypical in any other qualitative manner. Hence, we must conclude from the existence of clearly seperated pottery groups F and G, in the course of Troia VIb$_1$ and Troia VIIb$_2$ there exist significant changes in the functional, chronological, and/or sedimentational processes that have effected the pottery deposits. Further studies in this direction are beyond the scope of the present paper.

Seriation Dating Accuracy and Precision: General considerations

As mentioned in the introduction, it turns out the seriation results are sufficiently accurate to make an advanced analysis in terms of differentiating between the dating accuracy and precision appear worth-while. To this aim we now define these generalized concepts in terms of specific contexts at Troia. Clearly, the most sensitive tests for pottery seriation at Troia are given for extended stratigraphic sequences, in which case we may check on the seriation by using the known-order of the units under study. But, to test the seriation, it is also possible to use the large number of shorter stratigraphies. Indeed, we may accordingly generalize the testing requirements by searching in the database (Appendix I) for sets of excavation units that belong to the two extreme cases. This means focussing on the longest "long" and the shortest "short" stratigraphies. The longest stratigraphic sequences provide information as to the dating *accuracy* achieved in the seriation (cf. basic concepts, Fig. 1). The shortest stratigraphic sequences supply information as to the achieved dating *precision.* To evaluate the dating *accuracy* we require as many certified profiles as possible from the database, and the test-profiles should be as long as possible. The dating *precision* is best measured for excavations units that are known to date closely together in time. In search of such profiles and equal-age units, I have undertaken a systematic search in the pottery database (Appendix I), but due to the complexity of the site cannot claim completeness in the resulting collection.

Before describing the results, let us address the testing program from a more general point of view. Clearly, the more units we can enter into the test, the better. The more units we enter, the more confident we may be in the capabilities of the seriation to reproduce the correct order – if the order is indeed correct. We already know that the seriation produces inherently accurate dating results. We further know that the Cincinnati excavation team were rather pragmatic in their dating approach. They sometimes used the pottery to date the architecture, and sometimes used the architecture to date the pottery. This complicates our envisaged testing program to such an extent that, finally, I have concluded the seriation results may actually be more reliable than some of the pre-established dates. If this is indeed the case – but corresponding studies are beyond the scope of the present paper – the seriation may be applicable for refining the architectural stratigraphy at Troia. However, to be pragmatic, let us pretend that the seriation can be tested by the supposedly more accurate stratigraphic results of the Cincinnati team.

Long Stratigraphic Sequences: First Test of the Seriation Accuracy

Fig. 7 shows the CA-pottery dating for a sequence of stratified excavation units (Tab. 1) with given depth and phase reference to the 6 m deep profile in Square J7. On

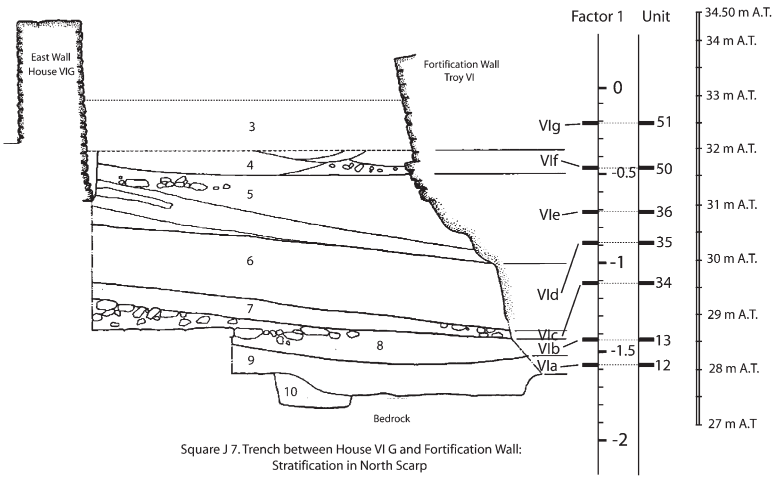

Fig. 7 Testing the Pottery Seriation: Troia VIa-VIg Stratigraphy . Redrawn and adapted from Blegen (1953, ebd. fig. 477).
Abb. 7 Test der Keramikseriation: Troia VIa–VIg Stratigraphie. Ergänzt nach Blegen (1953, ebd. fig. 477).

the right of this graph the metric depth [m] ranging from 33 m A. T. (top) to 27 m A. T. (bottom) is given. With reference to this depth-scale, the stratigraphic profile is drawn between the East Wall of House VIG (left) and the fortification wall of Troia VI (right). The seriation results are shown on their own scale (Factor 1) with unit numbering (12, 13, 34, 35, 36, 50, 51) given according to Appendix I. The CA-pottery seriation results are depicted as small horizontal lines connecting the stratigraphic deposits with the respective seriation scores. The overall result is that there exists a clear 1–1 relation between the stratigraphic sequence and the pottery dates. To conclude, simply by analysing the given combinations of pottery shapes, at least in this case, the CA-method is able to reproduce the known stratigraphic order of the excavated pottery assemblages. As shown in Fig. 8 this correct order is, in addition, correctly calibrated to the respective architectural phases. The excavation units under study are assembled in Tab. 1.

Long Stratigraphic Sequences: Second Test of the Seriation Accuracy

In a second case study on dating accuracy, with results shown in Fig. 9, the CA-method again demonstrates its high accuracy, although this time the results need some closer inspection to be apparent. The pottery assemblages under study are assembled in Tab. 2. They derive from a 6 m deep profile excavated by the Cincinnati team in Square F9, in a deep excavation called Trench 618 (Fig. 9).

In this profile, we have again connected the seriation results to the corresponding deposits, to facilitate comparisons. On the right hand, Fig. 9 shows the Metric Depth [m] of the profile, which ranges from 33 m A. T. (top) to 27 m A. T. (bottom). The stratigraphic profile is drawn between the fortification wall of Troia VI and a wall called 'Wall R-S', both of which are covered by architectural remains of Troia IX. The seriation units have database numbers 4, 9, 11, 31, and 32 (cf. Appendix I) and the CA-pottery seriation results are depicted by horizontal lines that connect these units with the stratigraphy. In this second case study, the CA-method does not in all cases correctly sequence the excavation units, nor does it alway discriminate correctly between the (assumed) different

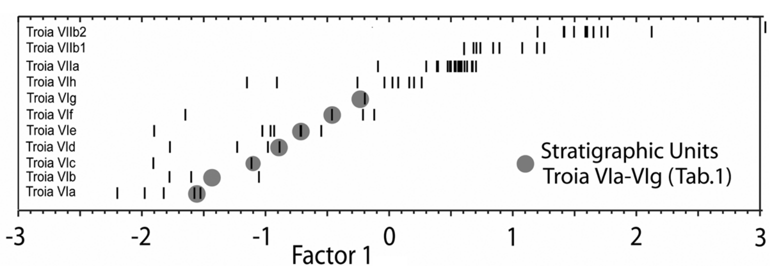

Fig. 8 Factor Scores (Appendix III) for Excavation Units from Square J7–8 (cf. Fig. 7) in comparison to Seriation Phase Calibration.
Abb. 8 Seriations-Schwerpunkte (Appendix III) der Befunde von Areal J7–8 (vergl. Abb. 7) im Vergleich zur Eichung der Seriation anhand von Fundeinheiten, die sich (nach Blegen) sicher datierten Architekturphasen zuweisen lassen.

Nr	Vol	Page	Square	Stratum	Phase	Factor1	Baskets	Nr Types	Counts
12	III	145	J7-8	9	VI-a	-1,576	1	10	31
13	III	146	J7-8	8	VI-b	-1,433	2	14	36
34	III	195	J7-8	7	VI-c	-1,114	1	8	9
35	III	195	J7-8	6	VI-d	-0,887	4	19	35
36	III	197	J7-8	5	VI-e	-0,712	4.5	18	49
50	III	266	J7-8	4	VI-f	-0,463	1.25	11	21
51	III	273	J7-8	3	VI-g	-0,212	25	23	230

Tab.1 Excavation Units from Trench in Square J7-8 (cf. Fig.7)
Tab. 1 Grabungseinheiten vom Tiefschnitt in Areal J7-8 (vergl. Fig.7)

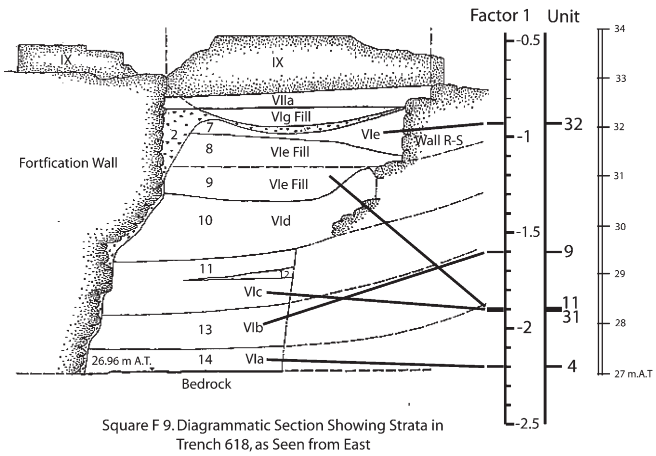

Fig. 9 Testing the Seriation: Troia VIa–VIe Stratigraphy. Redrawn and adapted from Blegen (1953, ebd. fig. 461).
Abb. 9 Test der Seriation: Troia VIa–VIe Stratigraphie. Ergänzt nach Blegen (1953, ebd. fig. 461).

ages of the deposits. First, a wrong order is reconstructed for database units Nr. 9 (Troia VIb) and 31 (Troia VIc), which appear inverted (Fig. 9). Second, the seriation supplies a too early age (~Early Troia VI) for database unit Nr. 11, which is supposed to contain Middle Troia VI material. However, looking closely at the context under study, it appears that this unit contains material that the Blegen team have lumped together from at least two different strata, designated as 'VIe fill' in Fig. 9. On the one hand, thus, in this case the seriation has surely produced dates that do not correspond to the stratigraphic analysis of the Cincinnati team. On the other side, in this case the testing itself does not appear sufficiently sensitive to warrant further conclusions. For example, although the seriation is able to confirm the age of the lowest deposits, that are assigned to Troia VIa, this may be trivially due to the fact that this deposit (Nr. 4) contains shapes (A16, A18, A21) typical of Troia V. As such, the seriation is not really supplying a reliable Troia VIa pottery age, as may appear, but is simply telling us that these deposits contain reworked old materials. I have provided a detailed description of Trench 618, nevertheless, to demonstrate the difficulties in using such deep profiles in seriation dating. These difficulties are identical to those appearing for single-vessel analysis. Further details of the excavated pottery for this section are given in Tab. 2.

Seriation Results 5: Problematic Cincinnati Date for House 761

In one case (Appendix Unit Nr. 116), the CA-results indicate a problematic phase assignment of the pottery assemblage from House 761 to Troia $VIIb_1$ by the Cincinnati team. The factor 1 score of this unit is 1.588 (Appendix III), which lies well within the bounds of $VIIb_2$. The material was found at 0.80 m above the floor of a building built in phase $VIIb_1$.[29] The excavators describe the pottery from Unit Nr. 116 (they also date to $VIIb_1$) as follows: '*Four or five other sherds show a burnished surface like that of Knobbed Ware but are perhaps rather to be classed with the course ware of Phase VIIb1'*. Judging from the pottery shapes, the CA-results indicate that these sherds *indeed* derive from Buckelkeramik vessels. The observations by Blegen therefore provide support for the CA-assignment of this pottery assemblage to phase $VIIb_2$ (cf. Appendix I). Since this redating only relates to the fill of House 761, it has little further effect e. g., on its architectural history. But this case study does demonstrate that the pottery seriation may be helpful in such doubtful cases.

Testing the Seriation Precision: The Terracehouse

To test the seriation dating precision, I have selected a large building called the Terracehouse (Fig. 10), which is situated immediately outside the Troia VI fortification walls, to the west of the Citadel. It represents one of the few nearly completely preserved buildings at Troia that were built in phase VIIa.[30] The Terracehouse was excavated by members of the modern excavation team, with detailed publication of the architectural and ceramic finds (ibid.). For testing purposes, this object has a number of qualities, (i) it contains different rooms, that have all experienced a similar history, (ii) the materials from these rooms were seperated during excavation in terms of construction, usage, destruction and fill, (iii) the pottery

Nr	Vol	Page	Square/ Trench	Stratum	Phase	Factor1	Baskets	Nr Types	Counts
4	III	134	F9/618	14	VI-a	-2,199	0.25	5	5
9	III	138	F9/618	13	VI-b	-1,602	1	3	3
11	III	141	F9/618	11	VI-c	-1,908	1.5	3	3
31	III	192	F9/618	8/9	VI-e	-1,901	2	4	14
32	III	192	F9/618	7	VI-e	0,930	nd	2	4

Tab. 2 Excavation Units from Trench 618 in Square F9 (cf. Fig. 9).
Tab. 2 Grabungseinheiten von Trench 618 in Areal F9 (vergl.Fig. 9).

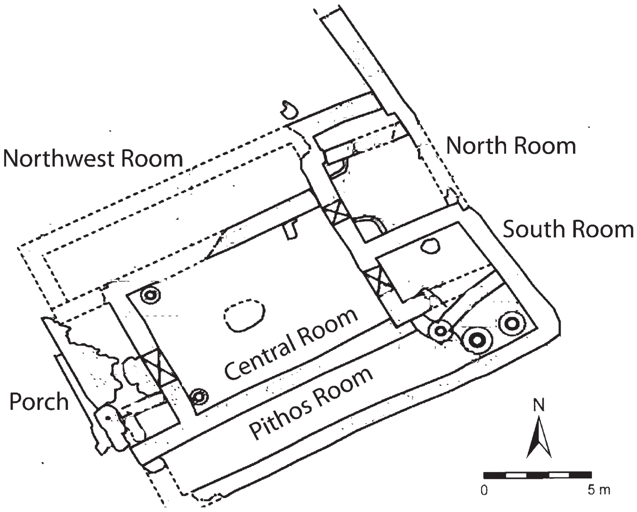

Fig. 10 Terracehouse. Plan redrawn and simplified from Becks – Rigter – Hnila (2006, ebd. Abb.1).
Abb. 10 Terrassenhaus. Plan nach Becks –Rigter – Hnila (2006, ebd. Abb.1), umgezeichnet und vereinfacht.

assemblages have been 'blegenised' by the Tübingen excavation team, and (iv) the pottery analysis was performed with no prior knowledge that their results would later be used as a test case for pottery seriation.

The Terracehouse (Fig. 10) is described as Megaron with central room, which has a porch on the West, two small siderooms on the East, and long siderooms each to the Northwest and Southeast. The Southeast 'pithos-room' contained at least a dozen large storage vessels. It is situated 13 m away from Gate VIU, which was closed at the beginning of Troia VIIa (ibid.). According to Becks,[31] the Terracehouse experienced repeated burning events, including a major burning at the end of Troia VIIa. Although some minor rebuilding actvities in Troia $VIIb_1$ are not excluded, and there are remaining questions as to the age of certain components of the Terracehouse, the Tübingen excavators conclude that its major use was in Troia VIIa.[32]

The seriation results for the Terracehouse are arranged in Fig. 11 according to the different rooms (All Rooms, Central Room, South Room, North Room) and corresponding contexts (cf. Tab. 3). Although the seriation does not go so far as to discern between the different contexts of the rooms (cf. Tab. 3: construction, use, destruction), the overall low spread of results and the equal pottery ages achieved for all rooms is nevertheless quite satisfactory. In particular, the seriation results are very clear in indicating that all contexts under study here provide dates in the early half of Troia VIIa (Fig. 11). This is in good agreement to the dating proposed by the modern excavators.[33] To complete this study, in Tab. 3 we have added the seriation results achieved for Blegen's 'House 749' (our database Nr. 106). As pointed out by the modern excavators,[34] Blegen's 'House 749' is identical to the SE-corner of the Terracehouse. During their excavations in this area, which is identical to what is now recognized as the SE-corridor of the Terracehouse (cf. Fig. 10), the Cincinnati excavators uncovered two large pithoi sunk into the house floor. The seriation factor 1 score of 0.495 achieved for 'House 749' corresponds well to the overall Tübingen seriation results achieved for the Terracehouse (Tab. 3).

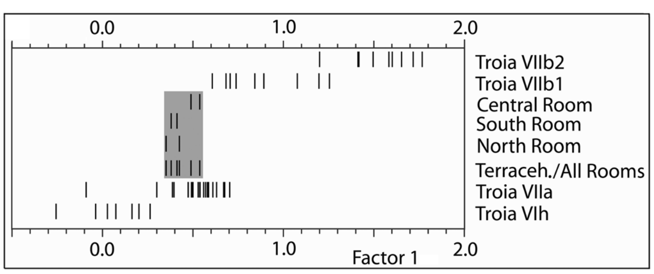

Fig. 11 Testing the Pottery Seriation: Terracehouse.
Abb. 11 Test der Keramikseriation: Das Terrassenhaus.

Nr	Source	Pages	Object	Stratum	Phase	Factor1
77	Studia Troica 16	64-65	Central Room	Destruction	VIIa	0.537
78	Studia Troica 16	63-64	Central Room	Use	VIIa	0.489
79	Studia Troica 16	65-66	South Room	Use	VIIa	0.379
80	Studia Troica 16	66	South Room	Destruction	VIIa	0.411
81	Studia Troica 16	66-67	North Room	Construction	VIIa	0.425
82	Studia Troica 16	67-69	North Room	Destruction	VIIa	0.351
106	Blegen 1958	131	House 749	nd	VIIa	0.495

Tab. 3 Seriation Results for the Terracehouse in Square zA7/8 (cf. Fig.10).
(Pottery analysis by Becks, Rigter, and Hnila, 2006 [Nr77-82]; Blegen [Nr.106]).
Tab. 3 Seriationsergebnisse für das Terrassenhaus in Areal zA7/8 (vergl. Fig.10).
(Keramikanalyse durch Becks, Rigter, and Hnila, 2006 [Nr77-82]; Blegen [Nr.106]).

Testing the Seriation Sensitivity: The Cemetery

Up to now, we have tested the seriation under different archaeological conditions, in terms of two statistical parameters, that is the precision and accuracy. In the following, a final testing of the seriation for an additional variable we call 'sensitivity' will be demonstrated. With 'sensitivity' we adress the question as to the properties of the seriation, if only small amounts of pottery are available.

Single Vessel Seriation Dating

Perhaps because statistical seriations are based on find combinations, it is sometimes wrongly concluded that a seriation requires at least two finds to produce a meaningful date. This is only partially correct, as follows. It is true that, in the initial construction of a pottery seriation table, there is no point in including single finds. But fact is that the CA-method can produce pottery ages, also for single finds. In the case of single finds, and we are discussing vessel shapes, the calculated seriation age is simply the score assigned to the respective shape. This may sound trivial but this is actually not the case, since the score assigned to each (individual) vessel shape is the result of an optimization. To achieve this score, the seriation has analysed all assemblages in which all shapes under study have occurred, and this includes the one shape we are especially interested in.

The seriation not only produces an age for the given single shape. It produces the *optimal* age for this shape, in terms of its combination (or 'correspondence') with all other shapes in all assemblages under study. For this reason we have included, in Appendix II, the complete list of factor 1 scores for all Blegen shapes. This list, in combination with (for example) Fig. 13, supplies the interested reader with a CA-seriation date for each Blegen shape. The problem with applying this dating method, alas, is that we are given no further information as to how accurate (and precise) the single-vessel date is. In principle, this accuracy is easy to define. It is equal to the lifespan of the shape under study. Although easy to define, the shape accuracy is less easy to measure. It can be measured, for example, with or without stratigraphic outliers, the study of which is a highly complicated matter. It can be measured locally, or in terms of its geographic distribution. Altogether, error analysis for (N=1) single-shape seriation dating is far beyond the scope of this paper, and probably best studied without applying the seriation. Fortunately, the next case (N=2) is more susceptible to experimental studies.

Two Vessel Seriation Dating

The next step is to study the seriation dating results achieved by adding one further vessel to the assemblage. Trivially, for the same two shapes, the seriation date is identical to the date already achieved for one vessel. But a non-trivial dating result, and – we may now hope – possibly including an enhanced dating accuracy may be achieved for two (different) vessel assemblages. With this hope let us turn to the set of Troia VIh burials, that are assembled in Tab. 4.

The finds from the (largely disturbed) Cemetery are described by the Cincinnati team as follows:

> *'The material is pure and unmixed and thus constitutes a closed chronological group that must be assigned to the concluding phase of the Sixth Settlement...not one sherd that can be attributed to the initial or even the middle stages of the Sixth Settlement; and on the other hand there is not a single piece of the characteristic fabrics of Troy VII.'*[35]

Nr	Source	Page	Object	Nr of Shapes	Phase	Factor 1	Blegen Shapes
68	Blegen 1953	372	Burial 1	4	VIh	-0.194	A51 A70 A83 D43
69	Blegen 1953	372	Burial 2	3	VIh	-0.306	A96 C68 C78
70	Blegen 1953	372	Burial 3	2	VIh	-0.007	A96 C68
71	Blegen 1953	372	Burial 4	2	VIh	0.438	A49 C68
72	Blegen 1953	372	Burial 5	2	VIh	0.310	A49 C76
73	Blegen 1953	373	Burial 11	2	VIh	0.438	A49 C68
74	Blegen 1958	373	Burial 12	2	VIh	0.366	A49 C70
75	Blegen 1953	374	Burial 18	4	VIh	-0.275	A85 A92 A96 C76
76	Blegen 1953	381	Cemetery	35	VIh	0.171	N=457 vessels

Tab. 4 Seriation Results for Burials from the Troia VI Cemetery (Blegen et al., 1953, p.372–381).
Tab. 4 Seriationsergebnisse für Bestattungen aus dem Troia VI Friedhof (Blegen et al., 1953, p.372–381).

On the other hand, we must allow for the fact the Cemetery has been looted, apparently at different times, and the contexts are therefore most often disturbed. As can be taken from Tab. 4, there are altogether 8 individual burials which can be studied by the CA-method due to the given combinations of at least 2 shapes (Tab. 4, cf. Appendix I, Nr. 68–75). In addition, due to the large amount of disturbances, Blegen has published *en bloc* a large set of sherds/vessels (Tab. 4, cf. Appendix I, Nr. 76) that contain some (reconstructed) 457 vessels belonging to 34 different shapes. These pottery finds apparently derive from fragmented cinerary urns and other kinds of funerary gear.[36] Among the 8 intact burials we observe that two of these (Nr. 71 and Nr. 73) contain the same combination of 2 vessels with Blegen shapes A49 and C68. These burials represent what we above call Bosons (we cannot tell them apart), and trivially they must have the same age in the shape seriation, (whether this is true or not, in reality). Allowing for this reduction, the given data allows us to test the seriation-sensitivity simultaneously for four different pottery shape doublets (Nr. 70, 71/73, 72, and Nr. 74), one triplet (Nr. 60), and for two burials (Nr. 68 and Nr. 75) with four different Blegen shapes.

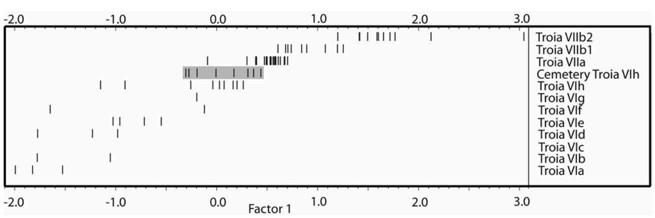

Fig. 12 CA-Seriation Dating of Burial Urns from the Cemetery, Troia VIh.
Abb. 12 CA-Seriationsdatierung von Graburnen aus dem Friedhof, Troia VIh.

The seriation results for these burials, that are all attributed to phase Troia VIh, are shown in Fig. 12. As can be discerned, the factor 1 scores for all burials lie (just) within the limits of the seriation dating achieved for the (domestic) Troia VIh excavation units. Looking closer, there is a slight overlap of the Troia VIh burials with the earliest (domestic) Troia VIIa excavation units, and we also recognize two clear 'old' outliers (or misdated units) among the domestic VIh units. Beyond this, this CA-method supplies us with a satisfactory Troia VIh date for the assemblage Nr. 76, which represents a large amount of bulked cemetery material.

To conclude, based on these results I would judge that the CA-method has finally also passed the sensitivity test. But let us remain aware of the fact that this high sensitivity, by itself, will not always represent a positive property. It may instead introduce some unexpected analytical difficulties. Most notably, the seriation does not relieve us of the responsibility – prior to its application – of performing a detailed pottery analysis on the single-vessel level. Further, the seriation does not relieve us of the necessity to understand the stratigraphy of the contexts under study, again prior to its application. But, assuming this is allowed for, the seriation can clearly offer some quite useful support in many dating applications.

Absolute Age Calibration

In Fig. 13 an attempt towards an absolute age calibration of the pottery seriation is undertaken. This is not to establish a new chronology, but rather to obtain further insight into the seriation dating accuracy, on the calendric age scale. The calibration is based on two supporting point-ages, one for the beginning of Troia VI around ~

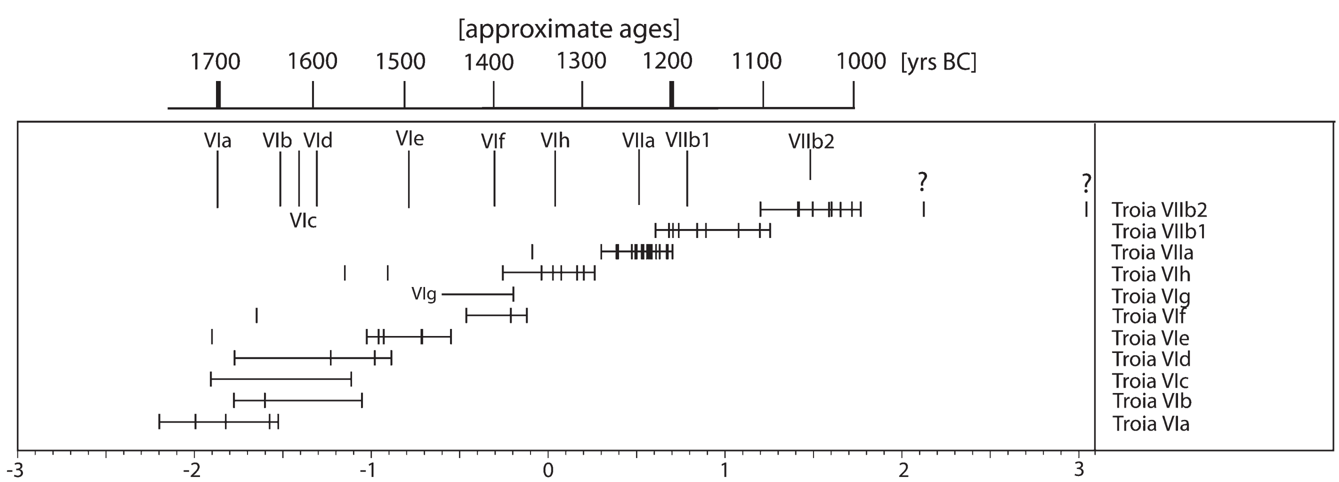

Fig. 13 Absolute Age-Error Calibration of the CA-Seriation.
Abb. 13 Bestimmung der absoluten Datierungsfehler der Korrespondenzanalyse.

1750 histBC,[37] the other for the end of Phase VIIa around ~ 1200 histBC.[38] By linear interpolation of intermediate seriation phases, with phase-lengths approximated from the spread of the Factor 1 scores for "certified" excavation units,[39] I have constructed a calendric time-scale for the seriation, as mentioned purely for the purposes of measuring the seriation accuracy in calendric years (i. e., not for dating purposes).

From this graph we can read an absolute dating accuracy of the seriation in the range of 100 calendric yrs (95 % probability) for pottery assemblages younger than Troia VIe. This translates into a numeric dating accuracy of ± 25 yrs (68 % probabilty) that will be achievable for any certified (unmixed) pottery assemblage from phases Troia VIe through to Troia $VIIb_2$. The pottery seriation dating of the newly defined youngest Late Bronze Age phases (including Troia $VIIb_3$) remains unclear, if only due to lack (or identification) of pottery finds from these phases in the database. The seriation dating of pottery assemblages from Early Troia VI phases VIa, b, c and Middle Troia VI phase VId is altogether much less accurate, with numeric accuracy values in the range of 200 yrs (95 % probability). That would translate into ± 50 yrs (68 % probability). However, as can be taken from Fig. 13, the reason for this more limited dating accuracy appears to be, not any restrictions of the pottery itself, but rather the general lack of certified pottery assemblages from these phases, in the present database. This can be deduced from the spread of scores for the phase VIa pottery units, which show a spread that is compatible to the spread of later units. Also to be read from this graph is the understandable property of many pottery assemblages that mixing more often occurs with older, and less often with younger materials.

Conclusion

Due to the high publication standards maintained throughout the Volumes III and IV of the Troy excavations,[40] it was possible to derive a substantial, stratigraphically-referenced pottery database for the Middle-Late Bronze Age. As in previous studies,[41] this database was constructed by careful reading and language analysis of Troy Volumes III and IV, followed by systematic pottery shape counting on the base of the Cincinnati classification system. To this purpose a special Language Classification Catalogue was applied (Fig. 3).

In the oldest Troia VI phases (Troia VI a–d), the pottery dating is rather blurred. To some large extent this is due to the small excavation scale, as already pointed out by Pavúk.[42] Although an increase in dating precision is gained for the larger amounts of material available for Troia VIf, the material from Troia VIg is again rather meagre. A significantly enhanced dating precision is available for the later phases of Troia VI (VIh and VIIa) and also for Troia VIIb ($VIIb_1$ and $VIIb_2$). In all essence, high-precision pottery seriation dates are possible for all architectural phases from Troia VIh through to Troia $VIIb_2$. However, this is not alone due to the material-based increase in chronological sensitivity for the younger Troia VI pottery shapes, but also the result of external factors.

These factors are (i) clearer stratigraphic subdivisions made possible due to the massive earthquake destruction of Troia VIh, followed by (ii) widespread burning encountered in Troia VIIa, and (iii) introduction of hand-made pottery classes in Troia VIIb. First, the earthquake at the end of Troia VIh enforced some large-scale rebuilding during Troia VIIa. This provides major support for stratigraphic interpretation. Then, the following widespread destruction due to burning at the end of Troia VIIa forced the inhabitants to replace the complete pottery inventary of the site, a second time. This second destruction, and corresponding replacement of the entire pottery inventory, in quick succession, produced the clearly noticeable sharp bend in the pottery seriation, that dates exactly to the transition from VIh to VIIa (Figs. 5, 6). At this point in pottery 'time', the innovation rate for introduction of new shapes is highly disturbed, or better: 'retarded': due to the destruction, the newly produced pottery assemblages have a stronger than normal preference towards already established ('older') shapes. Hence, the seriation turns back slightly in time. This produces the bend.

Then, second, with the introduction of the new hand-made pottery classes both in Troia $VIIb_1$ (Barbarian wares) and in Troia $VIIb_2$ (Buckelkeramik) the pottery itself gains further in chronological sensitivity. The *stratigraphic* sensitivity of deposits following Troia VIh, in combination with the enhanced *morphometric* (and consequently: *chronological)* sensitivity of the younger hand-made pottery classes in Troia $VIIb_{1-2}$, together, lead to a significantly enhanced precision and accuracy of pottery shape dating.

There are two major limiting factors that effect the ultimately achievable accuracy and precision of Troia VI pottery seriation dating, at least when based on the Blegen Shape Classification System. These factors are (i) secondary mixing and stratigraphic disturbance of pottery units, and (ii) intersubjective limits of the pottery classification. These critical factors arise, quite similarly, in single-vessel analysis.

The overall conclusion is that pottery seriation with Troia VI–VII Blegen shapes can supply highly accurate and precise dates, even to the level that pottery seriation analysis can be of help in further refining the architectural stratigraphy. The achieved dating accuracy is all the more interesting, since some of the Troia VI Grey Wares produced at Troia were apparently exported in large amounts to Cyprus and the Levant. This has been recently demonstrated by Neutron Activation Analysis.[433] The presence of Trojan pottery on Cypriote and Levantine sites provides welcome impetus to further studies on Bronze Age culture in the eastern Mediterranean, during the later stages of the Second Millenium BC.

Kurzfassung

Zur Bestimmung der chronologischen Empfindlichkeit der Blegen-Gefäßformen der Perioden Troia VI–VII wurde das Datenmaterial zunächst ausgezählt (Methoden: Abb. 3, Daten: Appendix I) und dann mit Hilfe der Korrespondenzanalyse (CA-Methode) einer Seriation unterworfen (Ergebnisse: Abb. 5, 6). Wegen der zahlreichen Bautätigkeiten, Zerstörungen und Umverlagerungen in einem so lange besiedelten Tell wie Troia hätte die chronologische Auflösung des keramischen Materials erwartungsgemäß für Einzelgefäße,[44] aber auch mit statistischen Auswerteverfahren,[45] eigentlich nur auf dem Niveau der Troia VI-Subperioden (Dauer jeweils ~ 120 Jahre) möglich sein sollen. Die Existenz einer solchen Begrenzung der chronologischen Aussagekraft der Keramik wurde bislang allerdings nur für die Gefäß-Einzelanalyse nachgewiesen.[46] Wie in der vorliegenden Arbeit ausgeführt wird, zeigte die statistische Seriation der Troia VI-Formen unerwartet eine signifikant höhere chronologische Empfindlichkeit, als etwa für die Troia I–V Formen[47] oder für die Troia-VI Waren[48] bekannt ist. Um diese Unterschiede zu quantifizieren: Die Genauigkeit der statistischen Seriation ist um eine ganze Größenordnung (Faktor 10) genauer als die Einzelgefäß-Analyse. Der Hauptteil der Arbeit befasst sich mit den möglichen Ursachen hierfür, die zuerst in der Theorie diskutiert und danach in verschiedenen archäologischen Fallstudien empirisch untersucht werden.

Zuerst mussten geeignete Verfahren entwickelt werden, die es erlauben, die Genauigkeit der Keramikdatierung überhaupt auf dem Niveau einzelner Troia VI–VII Architektur-Phasen (Abb. 2) studieren zu können. Dazu gehört eine zunächst in der statistischen Theorie begründete und dann für die Troiagrabungen umgesetzte Unterscheidung zwischen der erreichbaren *Genauigkeit* (accuracy), und der erzielten *Präzision* (precision) der Keramikdatierung (Abb. 1). Um die Vorteile der CA-Methode voll ausnutzen zu können, aber auch wegen der großen Datenfülle, wurde ein Computerprogramm entwickelt, das die CA-Ergebnisse in Graphiken umzusetzen erlaubt (Abb. 4). Wie an konkreten Beispielen aus den Blegengrabungen ausgeführt wird, lässt sich die Genauigkeit der Keramikdatierung am besten an langen Stratigraphien (bzw. an Profilen) studieren (Abb. 7, 8, 9). Die Präzision (Reproduzierbarkeit) der Datierung kann besser anhand von kurzen Stratigraphien, am besten aber an annähernd zeitgleichen Objekten überprüft werden (Abb. 10).

Als Ergebnis dieser Untersuchungen wurde nun klar, dass nicht einmal die Unterscheidung zwischen den beiden Variablen *Genauigkeit* und *Präzision* ausreichend ist, um die hohe Qualität der Troia VI–VII Keramikdatierung verstehen zu können. Deswegen wurde als dritte Variable der Begriff der *Empfindlichkeit* (sensitivity) der Keramikdatierung eingeführt. Damit soll untersucht werden, inwieweit die Ergebnisse der Keramikseriation vom Umfang der datierten Inventare abhängen. Wie in einer Fallstudie mit unterschiedlich großen Friedhofsinventaren empirisch festgestellt wurde, ist die hohe Empfindlichkeit der Seriation praktisch sofort vorhanden, wenn das Inventar mindestens zwei unterschiedliche Gefäßformen enthält (Abb. 12). Ist nur ein Gefäß vorhanden, so verliert die CA-Methode ihre Vorteile und erreicht nur eine der Einzelgefäß-Analyse vergleichbare Empfindlichkeit. Daraus wird ersichtlich, dass die hohe Genauigkeit-Präzision-Empfindlichkeit der CA-Keramikdatierung weniger mit den ästhetischen oder morphologischen Eigenschaften der Keramik zusammenhängt, auch wenn dies wichtige Parameter sind, als vielmehr mit den inhärenten Fähigkeiten der CA-Methode, anhand der Fundkombinationen die zum Teil stark vermischten und umgelagerten Funde als solche zu erkennen und die entsprechenden Befunde trotzdem (nach quantifizierten Maßen) weitgehend korrekt zu datieren.

Auf alle diese Ergebnisse aufbauend wurde im letzten Schritt eine absolute Eichung der Zeitskala der Keramikdatierung vorgenommen (Abb. 13), dies allerdings nicht zum Datieren selbst, nur zum Zwecke der Quantifizierung der Datierungsfehler. Auf der zuletzt nun doch absolut geeichten Zeitskala (Faktor 1) der Troia VI–VII-Formenseriation sind folgende Beobachtungen von Interesse: In den ältesten Phasen von Troia VI (VIa–d, VIg) scheint die Keramikseriation (d. h. unter Benutzung des Blegen'schen Formen-Klassifikationssystems) zunächst nur recht ungenaue Ergebnisse zu liefern. Ähnliche Beobachtungen stammen von Pavúk,[49] der diese Ungenauigkeiten auf die vergleichsweise kleinen Grabungsschnitte, auf die Vielzahl von Umlagerungen, und schließlich auch auf inhärente Schwächen des Blegen'schen Klassifikationssystems zurückführt. Was die Seriation angeht, so wird ersichtlich, dass sich die chronologische Empfindlichkeit der Blegenformen für diese älteren VI-Perioden tatsächlich kaum von der Empfindlichkeit in den jüngeren Perioden unterscheidet. So bestätigen auch diese Befunde die oben diskutierte Vermutung, wonach die Seriation (teilweise) in der Lage ist, auch umverlagertes Material stratigraphisch korrekt einzuordnen. Demnach wären die Datierungsschwächen der Einzelgefäßanalyse nicht auf diese selbst, sondern auf die inhärenten Probleme der häufigen Umlagerung des Materials zurückzuführen. Wir

sind daher dringend am besten beraten, die Vorteile beider Methoden zu nutzen, jedenfalls für die Zwecke der Datierung (es gibt ja auch andere Zwecke der Keramikanalyse) die von Pavúk[50] zu recht geforderte qualitative Verbesserung der Blegen-Formen-Klassifkation umgehend mit den Vorteilen der statistischen Seriation zu verbinden.

Für alle nachfolgenden Phasen, also durchgehend von Troia VIh bis $VIIb_2$, erhält man gegenüber Früh-VI eine deutliche Steigerung der Genauigkeit und Präzision der Keramikseriation. Wie erwähnt, konnte anhand ausgesuchter stratigraphischer Profile (Abb. 7, 8, 9), wie auch von Gebäuden (Abb. 11) und von Bestattungen mit Gefäßbeigaben (Abb. 12) demonstriert werden, dass die erreichte Genauigkeit der Seriation hier schon nahe beim theoretischen Optimum von ~ 40 Jahren liegt. Diese Zeitspanne entspricht – grob geeicht – der mitteren Umlaufzeit der einzelnen Gefäße in einem typischen (ausgegrabenen) troianischen Haushalt. Dies vorausgesetzt, wäre es allerdings nur schwer möglich, eine weitere Verfeinerung der Genauigkeit der Keramikdatierung überhaupt zu erzielen, jedenfalls was die geforderte Verbesserung der Formen- oder Warenansprache angeht. Eine abschließende Beurteilung dieser Frage ist aber wegen der Komplexität der Blegen-Grabungen und vor allem wegen der schließlich doch begrenzten Aussagemöglichkeiten des vorliegenden (semi-quantitativen) Datenmaterials noch nicht möglich. Zu den begrenzenden Faktoren der Keramikdatierung gehören eben nicht nur die ästhetischen, morphologischen und die weiteren kultur-taphonomischen Eigenschaften der Keramik (z. B. Laufzeiten, Funktion, Zerbrechlichkeit, Transport, Handel), sondern auch die ganz speziellen Umstände der Fundablagerung. In Troia gehören dazu vor allem die großflächigen Zerstörungen der Siedlungen am Ende von Troia VIh und Troia VIIa. Anscheinend haben gerade diese Faktoren den Cincinnati-Ausgräbern zugleich die Formenansprache (wegen der Verfügbarkeit von vollständigen Gefäßen) wesentlich erleichtert, wie sie auch eine ungewöhnlich sichere stratigraphische Zuweisung (wegen der Befundversiegelung) unterstützen.

Notes

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4 Weninger 2002.
5 Blegen *et al.* 1950; 1951; 1953; 1958.
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12 Weninger 2002.
13 Weninger 2002.
14 pers. comm. Hans-Peter Uerpmann.
15 Becks – Rigter – Hnila 2006.
16 Pavúk 2002; ebd. fig. 1.
17 Pavúk 2008.
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25 Blegen 1958, 164–165.
26 Blegen 1953, 142–143.
27 Blegen *et al.*1953, 142–143.
28 Pavúk 2002, 61.
29 Blegen 1958, 202.
30 Becks – Rigter – Hnila 2006, 27.
31 Becks – Rigter – Hnila 2006.
32 Becks – Rigter – Hnila 2006, 70.
33 Becks – Rigter – Hnila 2006.
34 Becks – Rigter – Hnila 2006, 80.
35 Blegen *et al.* 1953, 377.
36 Blegen *et al.* 1953, 377.
37 Pavúk 2002
38 Mountjoy 1999a, b.
39 Blegen *et al.* 1953; 1958.
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41 Weninger 2002.
42 Pavúk 2002.
43 Mommsen – Pavúk 2007.
44 Pavúk 2002.
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Appendix I. Pottery Database for Troia VI and VII

Data reconstructed from Ble gen et a l., 1953; 1958. T he Database contains 134 excavation units. There are 152 Blegen Troia VI--VII Pottery Shapes.The total potter y inventary is 6370 pots. For seriation testing an d calibration purposes the inventary includes six excavation units from excavations performed under the direction of Manfred Korfmann in the T erracehouse (Nr. 7--82), with pottery fi nds analysed according to t he Bl egen Classification system ('blegenised') by the modern excavators (Wendy Rigter, Ralf Becks and Pavul Hnila).

Note: Unit Nr. 116 was initally assigned to VIIb1 (Blegen, 1958, p.111), but we have accepted the CA-date of VIIb2 as correct.

Keramikdaten rekonstruiert a us Ble gen et al., 195 3; 1 958. Die D atenbank e nthält 1 34 Grabu ngseinheiten für insgesamt 15 2 verschi edene Bleg en T roia VI --VII Gefä ßformen. Das Gesamtinvent ar umfaß t 6370 (kod iert gezählte) Gefäße. Zum Testen und zur Eichung der Seriation wurden sechs Grabungseinheiten hinzugenommen, die von modernen Grabungen unter d er Leitung von Manfred Korfmann im Terrassenhaus (Nr. 77--82) stammen. Es handelt sich um Keramikfunde, die durch die modernen Ausgräber/Innen (Wendy Rigter, Ralf Becks und Pavul Hnila) entsprechend der Blegen'schen Gefäßform-Klassifikation aufgenommen ('blegenisiert') wurden.

Besonderheit: Grabungseinheit Nr.116 wurde zunächst mit Zuweisung nach Phase VIIb1 (Blegen, 1958, S. 111) erfaßt, aber in der Datenbank wird das Seriationsergebnis (Troia VIIb2) für diesen Befund als korrekt akzeptiert.

```
Nr.1 Vol.III, p.125, Square F-G/7-8, House 630, Earliest VI, 8 Baskets, T=19 N=56 Tot=0.88 %
     A18 A21 A47 A56 A58 A61 A62 A64 A70 A91 A92 A94 A95 A96 A99 B25 C64 C65 C66
       1   1   1  11   1   3   6  12   1   1   2   2   1   1   3   3   1   4   1
Nr.2 Vol.III, p.129, Square F8, Room 601, VIa, 0.5 Basket, T=7 N=13 Tot=0.20 %
     A16 A18 A56 A61 A64 A92 C60
       1   1   1   1   2   5   2
Nr.3 Vol.III, p.132, Square F8, Area 603, VIa, O.5 Basket, T=13 N=27 Tot=0.42 %
     A56 A61 A62 A64 A94 A99 C48 C60 C61 C62 C65 C68 C77
       3   6   1   4   3   3   1   1   1   1   1   1   1
Nr.4 Vol.III, p.134, Square F9, Trench 618, VIa, 0.25 Basket, T=5 N=5 Tot=0.08 %
     A16 A18 A21 A61 A94
       1   1   1   1   1
Nr.5 Vol.III, p.134, Square E-F 8, Pit 611, VI-a-b-c, 0 Basket, T=5 N=6 Tot=0.09 %
     A16 A56 A58 A61 A63
       2   1   1   1   1
Nr.6 Vol.III, p.135, Square F8, Area 603, VIb, 1 Basket, T=6 N=9 Tot=0.14 %
     A64 A92 A99 C60 C65 C68
       1   3   1   1   1   2
Nr.7 Vol.III, p.136, Square F8, Area 608, VI-b-c, 1 Basket, T=8 N=8 Tot=0.13 %
     A47 A49 A62 A64 A69 A70 A92 C79
       1   1   1   1   1   1   1   1
Nr.8 Vol.III, p.137, Square F8, Area K, VIb, 1 Basket, T=7 N=14 Tot=0.22 %
     A56 A58 A61 A64 A73 A92 A94
       1   1   3   1   1   1   6
Nr.9 Vol.III, p.138, Square F9, Trench 618, VIb, 1 Basket, T=3 N=3 Tot=0.05 %
     A61 A62 B25
       1   1   1
Nr.10 Vol.III, p.139, Square F8-9, Area K, IV-b-c-d, 2 Baskets, T=16 N=30 Tot=0.47 %
      A12 A16 A58 A61 A62 A63 A64 A69 A91 A94A100 B25 B26 B35 C48 C79
        1   1   2   4   4   3   1   1   1   6   1   1   1   1   1   1
Nr.11 Vol.III, p.141, Square F9, Trench 618, VIc, 1.5 Baskets, T=3 N=3 Tot=0.05 %
      A61 A62 A92
        1   1   1
Nr.12 Vol.III, p.145, Square J7-8, Stratum 9, VIa, 1 Basket, T=10 N=31 Tot=0.49 %
      A18 A21 A56 A58 A64 A94 A96 A99 B25 C68
        3   4   2   2   9   2   1   1   6   1
Nr.13 Vol.III, p.146, Square ?, Stratum 8 , Phase=?, 2 Baskets, T=14 N=36 Tot=0.57 %
      A18 A21 A56 A61 A64 A92 A94 B25 B35 B37 B38 B40 C68 C79
        7   4   1   3   2   3   2   5   1   1   1   1   2   3
Nr.14 Vol.III, p.151, Square J7-8, Tower VI-h, VI-a-b-c, 1 Basket, T=12 N=24 Tot=0.38 %
      A12 A18 A19 A21 A56 A61 A64 A92 B25 B35 C65 C68
        1   1   1   1   5   1   5   4   2   1   1   1
Nr.15 Vol.III, p.151, Square J7-8, Tower VI-h, VI-a-b-c, 2 Baskets, T=10 N=37 Tot=0.58 %
      A56 A61 A64 A73 A92 A94 A95 A96 B25 B35
        2   1   8   1   3   4   1   1  10   6
Nr.16 Vol.III, p.154, Square K7, Tower VI-h, VI-a-b-c, 0.75 Basket, T=15 N=29 Tot=0.46 %
      A18 A21 A23 A48 A49 A56 A58 A61 A63 A64 A92 A94 B25 B35 C68
        1   1   1   1   1   2   1   3   1   4   2   1   5   1   4
Nr.17 Vol.III, p.155, Square K7, Sounding, VI-a-b-c, 0.25 Basket, T=6 N=22 Tot=0.35 %
      A48 A49 A58 A64 A96 B25
        1   1   2  11   2   5
Nr.18 Vol.III, p.157, Square K6,Trench, VI-a-b-c, 2 Baskets, T=15 N=42 Tot=0.66 %
      A16 A18 A21 A23 A61 A64 A92 A94 A99A100 B25 B35 C48 C65 C68
        1   1   1   1   6   7   3   2   1   1   9   3   2   1   3
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Nr.19 Vol.III, p.159, Square G3, Trench, VI-a-b-c, 1100 sherds, T=24 N=62 Tot=0.97 %
      A16 A18 A47 A56 A58 A61 A62 A64 A83 A84 A91 A94 A96 A99 B35 C39 C58 C60 C61 C62 C76 C77
        1   1   1   4   3  12   6   3   2   2   3   3   6   3   1   3   1   1   1   1   1   1
      C78 D38
        1   1
Nr.20 Vol.III, p.160, Square G 2-3, Stratum 9, VI-a-b-c,0 count, T=11 N=21 Tot=0.33 %
      A16 A18 A21 A41 A56 A61 A62 A63 A64 A91 A94
        1   1   1   1   2   6   2   1   2   1   3
Nr.21 Vol.III, p.161, Square G 2-3, Stratum 8, VI-b-c, 0 count, T=10 N=37 Tot=0.58 %
      A47 A58 A61 A62 A89 A94 A96 A99 B37 C79
        2   1   5   5   1  10  10   1   1   1
Nr.22 Vol.III, p.163, Square A5-6, Room, VI-b-c-d, 0.25 Basket, T=2 N=4 Tot=0.06 %
      A64 B35
        1   3
Nr.23 Vol.III, p.165, Square A7, Sounding, VI-a-b-c, 2 Baskets, T=9 N=22 Tot=0.35 %
      A56 A61 A62 A64 A94 A99 B25 C65 D45
        2   1   2   2   3   1   6   2   3
Nr.24 Vol.III, p.170, Square J7, Stratum K, VI-d-e, nd, T=19 N=83 Tot=1.30 %
      A12 A16 A47 A56 A60 A61 A62 A69 A92 A94 A95 A96 A99 B25 B35 C39 C60 C68 C79
        1   1   1   4   1  15   6   1   3  12   6   2   5  17   1   2   1   1   3
Nr.25 Vol.III no page, Square E6, Deposit, VI-a-b-c, 1 Basket, T=22 N=67 Tot=1.05 %
      A47 A56 A57 A58 A60 A61 A62 A64 A84 A92 A94 A96 A99 B25 B35 B40 C60 C61 C67 C79 C82 D33
        3   3   1   3   1   2   2  10   1   3  16   6   3   3   1   1   1   1   1   3   1   1
Nr.26 Vol.III, p.183, Square F8-9, Area K, VId, 2 Baskets, T=25 N=55 Tot=0.86 %
      A48 A51 A56 A57 A58 A61 A62 A73 A75 A85 A92 A94 A96 A99A100 B25 B35 C61 C65 C67 C68 C76
        1   1   5   1   1   3   1   3   1   1   3   3   1   1   1   4   6   1   3   2   3   4
      C77 C79 C81
        1   3   1
Nr.27 Vol.III, p.183, Square E-F 8-9, Pit 611, VI-d-e, nd, T=3 N=5 Tot=0.08 %
      A61 A91 C79
        3   1   1
Nr.28 Vol.III, p.186, Square E-F 8-9, Pit 615, VId, 0.5 Baskets, T=7 N=14 Tot=0.22 %
      A61 A92 A94 A99 B25 C65 C68
        2   3   1   1   3   3   1
Nr.29 Vol.III, p.187, Square F8, Area 603, VIe, nd, T=8 N=10 Tot=0.16 %
      A84 A92 A99A100 B41 C40 C41 D45
        1   3   1   1   1   1   1   1
Nr.30 Vol.III, p.189, Square F8-9, Area K, VIe, 2 Baskets, T=17 N=49 Tot=0.77 %
      A16 A47 A49 A51 A56 A58 A60 A63 A83 A84 A85 A94 B25 B35 C68 C79 D45
        3   1   1   1   3   1   1   3   1   3   1   3  15   4   4   3   1
Nr.31 Vol.III, p.192, Square F9, Trench 618, VIe, 2 Baskets, T=4 N=14 Tot=0.22 %
      A57 A61 C60 C77
        6   6   1   1
Nr.32 Vol.III, p.192, Square F9, Trench 618, VIe, nd, T=2 N=4 Tot=0.06 %
      A92 D46
        3   1
Nr.33 Vol.III, p.193, Square E-F9, Pit 615, VIe, nd, T=7 N=8 Tot=0.13 %
      A83 A84 A92 A94A100 B35 C65
        1   1   1   1   1   1   2
Nr.34 Vol.III, p.195, Square J7-8, Stratum 7, VIc, 1 Basket, T=8 N=9 Tot=0.14 %
      A56 A57 A60 A92 A94 A99 B25 C67
        1   1   1   1   1   1   1   2
Nr.35 Vol.III, p.195, Square J7-8, Stratum 6, VId, 4 Baskets, T=19 N=35 Tot=0.55 %
      A12 A18 A47 A48 A57 A58 A61 A92 A94 A96 A99A100 B25 B35 C60 C61 C62 C68 C72
        1   1   1   1   1   1   1   8   2   1   3   1   7   1   1   1   1   1   1
Nr.36 Vol.III, p.197, Square J7-8, Stratum 5, VIe, 4.5 Baskets, T=18 N=49 Tot=0.77 %
      A18 A60 A61 A83 A84 A92 A94 A96 A99A100 B25 B35 C48 C60 C61 C62 C68 C72
        1   1   1   1   1   4   5   2   7   1   8   3   1   1   1   1   5   5
Nr.37 Vol.III, p.199, Square H-J 7-8, Deposit, VI-d-e-f, 1 Basket, T=9 N=18 Tot=0.28 %
      A61 A64 A84 A92 A94 A99A100 B25 B35
        2   1   2   2   3   1   1   5   1
Nr.38 Vol.III, p.201, Square J-K 6, Deposit, VI-d-e-f, 3.5 Baskets, T=21 N=40 Tot=0.63 %
      A16 A18 A21 A47 A48 A49 A56 A58 A60 A61 A64 A85 A92 A94 A99A100 B25 B35 B40 C68 D45
        1   2   1   1   1   2   2   1   3   1   2   1   1   2   2   3   2   3   2   6   1
Nr.39 Vol.III, p.203, Square J 7-8, Stratum 8, VI-d-e-f, 1 Basket, T=8 N=21 Tot=0.33 %
      A18 A61 A64 A92 A94 A95 A96 B25
        2   3   3   2   1   2   2   6
Nr.40 Vol.III, p.204, Square J 7-8, Stratum 7, VI-d-e-f, 1 Basket, T=10 N=25 Tot=0.39 %
      A16 A18 A60 A61 A92 A94 A95 A99A100 B25
        1   2   1   1   1   1   1   1   1  15
Nr.41 Vol.III, p.204, Square K7, Trench, VI-d-e-f, 0.75 Basket, T=8 N=15 Tot=0.24 %
      A48 A49 A56 A61 A95 A96 B25 C68
        1   1   1   1   1   2   5   3
Nr.42 Vol.III, p.205, Square K6, Trench, VI-d-e-f, 1 Basket, T=7 N=16 Tot=0.25 %
      A60 A73 A84 A94 A96A100 B25
        3   2   4   1   2   1   3
Nr.43 Vol.III, p.206, Square G 2-3, Stratum 7, VId, T=12 N=25 Tot=0.39 %
      A58 A60 A61 A63 A64 A69 A81 A91 A94 A99 C79 D45
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       3   1   2   2   1   2   1   1   6   3   2   1
Nr.44 Vol.III, p.208, Square G 2-3, Stratum 6, VIe, T=22 N=45 Tot=0.71 %
      A49 A60 A83 A84 A85 A91 A92 A94 A98 A99A100 B33 B34 B35 B36 C40 C41 C54 C57 C79 D38 D46
       1   1   1   2   2   1   6   1   1   6   1   1   6   4   1   1   1   2   3   1   1   1
Nr.45 Vol.III, p.211, Square Z5, Stratum 3, VI-d-e-f, T=12 N=25 Tot=0.39 %
      A12 A56 A60 A81 A94 A99A100 B25 B35 C54 C67 D46
       3   1   1   1   3   1   1   6   3   1   3   1
Nr.46 Vol.III, p.212, Square Z5, Trench, VI-d-e-f, 9 Baskets, T=11 N=39 Tot=0.61 %
      A49 A56 A61 A92 A94 A95 A99 C66 C67 C68 D46
       1   1  20   3   3   1   6   1   1   1   1
Nr.47 Vol.III, p.237, Square F-G 8-9, Pillar House, VIh, 14 Baskets , T=41 N=271 Tot=4.25 %
      A48 A49 A50 A51 A54 A59 A60 A65 A68 A71 A73 A75 A83 A84 A85 A89 A92 A94 A96 B25 B26 B28
       23  23   1   2   1   1   4   1   1   2   7   1  19  31  34   1   5   1   3  10   9   3
      B33 B34 B35 B40 B41 C41 C60 C61 C68 C70 C72 C73 C76 C77 C82 D38 D41 D42 D45
       1   1   2   1   5   2   2   2  17   7   9   7   9   3   7   3   4   4   2
Nr.48 Vol.III, p.244, Square E-F-G 8-9, Deposit, VI f-g, 0.5 Basket, T=7 N=7 Tot=0.11 %
      A61 A70 A71 A84 A92 A99 C68
       1   1   1   1   1   1   1
Nr.49 Vol.III, p.262, Square H-J-K 5-6-7 , Floor Level, VIh, 10 Baskets, T=20 N=84 Tot=1.32 %
      A49 A50 A51 A53 A59 A73 A85 A94A100 B25 B35 B41 C40 C52 C72 C82 D40 D41 D42 D46
       4   4   1   1   1   7   2   1   8  18   3   1   1   1  18   8   2   1   1   1
Nr.50 Vol.III, p.266, Square J7-8, Stratum 4, VIf, 1.25 Baskets, T=11 N=21 Tot=0.33 %
      A18 A56 A60 A84 A92 A99A100 B25 B35 C68 C72
       1   1   1   6   1   1   1   3   2   3   1
Nr.51 Vol.III, p.273, Square J 7-8, Stratum 3, VIf, 25 Baskets, T=23 N=230 Tot=3.61 %
      A49 A59 A61 A73 A78 A81 A83 A84 A92 A96 A98A100 B25 B35 B38 B40 B41 C40 C72 C82 D39 D40
       10   1   2   7   1  13   1   9  23   4   1  53  54   6   1   1   1   2  24   7   1   2
      D45
       6
Nr.52 Vol.III, p.299, Square H-J 6-7, House VIF, VIh, 6 Baskets, T=23 N=50 Tot=0.78 %
      A48 A49 A50 A57 A60 A61 A62 A69 A70 A73 A81 A84 A85 A92 A98 A99A100 B25 B35 B36 B41 C67
       1   1   1   6   1   1   1   3   1   1   1   4   1   2   3   6   3   3   3   1   1   4
      D45
       1
Nr.53 Vol.III, p.301, Square H-J 6-7, House VIF, VIh, T=9 N=41 Tot=0.64 %
      A85 B34 C40 C54 C60 C62 C76 C77 D41
       1  11   8   1   1   1   6   6   6
Nr.54 Vol.III, p.308, Square H-J 6-7, House VIF, VIh, 16 Baskets, T=35 N=164 Tot=2.57 %
      A48 A49 A50 A51 A53 A54 A56 A58 A59 A60 A61 A62 A64 A73 A83 A84 A85 A87 A89 A91 A92 A94
       4   4   4   4   3   3   6   3   3   3   2   2   3  18   6  10  18   1   1   1   1   3
      A96 A99 A100 B25 B26 B35 B41 C67 C68 C80 C82 D42 D45
       3   6   15   6   3   3   2   2   6   1   1   1  12
Nr.55 Vol.III, p.314, Square J7-8, Stratum 29, VIf, 2 Baskets, T=9 N=21 Tot=0.33 %
      A51 A85 A91 A92 A99A100 B35 C54 C82
       1   1   1   1   1   1   2  12   1
Nr.56 Vol.III, p.316, Square J7-8, Strata 19, VIf, 4 Baskets, T=20 N=32 Tot=0.50 %
      A48 A49 A50 A51 A60 A84 A85 A96A100 B25 B35 B40 B41 B42 C40 C41 C76 C79 D38 D45
       1   1   1   1   1   1   1   1   3   3   3   1   1   1   1   3   3   1   2   2
Nr.57 Vol.III, p.318, Square J7, Stratum 27, VIg, 0.5 Basket, T=9 N=9 Tot=0.14 %
      A48 A49 A50 A51 A64 A65A100 B25 B35
       1   1   1   1   1   1   1   1   1
Nr.58 Vol.III, p.318, Square J7, Strata 25, VIh, 0.5 Baskets, T=10 N=14 Tot=0.22 %
      A48 A49 A50 A51 A60 A73 A85A100 B25 B40
       1   2   1   1   2   2   1   1   2   1
Nr.59 Vol.III, p.336, Square J6, Area, VIh, 15 Baskets, T=32 N=581 Tot=9.12 %
      A48 A49 A50 A51 A60 A71 A73 A75 A76 A83 A85 A87 A92 A96A100 B25 B26 B28 B35 B37 B38 B40
       22  28  41  60  38   4  34   3   2  50   5   1   3 104   5  32  32  32  10   2   1   2
       B41 C68 C70 C71 C76 C80 C82 D39 D42 D45
        5  28   2   2   5  10   2   2   3  11
Nr.60 Vol.III, p.344, Square J7-8, Trench, VI-f-g-h, 0.5 Baskets, T=7 N=22 Tot=0.35 %
      A49 A83 A85 A92 B25 B41 C68
       3   2   2   1   7   1   6
Nr.61 Vol.III, p.345, Square K7, Trench L, VI-f-g-h, nd, T=7 N=31 Tot=0.49 %
      A49 A83 A94 B25 B35 C68 D45
       5   1   1   7   1  15   1
Nr.62 Vol.III, p.345, Square K6, Trench L, VIh, 3 Baskets, T=18 N=64 Tot=1.00 %
      A47 A49 A50 A53 A60 A73 A81 A83 A84 A85 A92A100 B25 C68 C70 C80 C82 D45
       3   9   1   1   2   3   3   5   3   4   4   1  11   7   1   3   1   2
Nr.63 Vol.III, p.354, Square K6-7 J8, Area, VI-h-VII-a, 30 Baskets, T=32 N=336 Tot=5.27 %
      A49 A50 A51 A53 A54 A60 A71 A73 A81 A83 A85 A92 A96A100 B25 B26 B28 B35 B37 B38 B40 B41
       25  46  12   6   4   1   8   6   6  12   6   9   6   3  26  26  26   9   2   1   2   5
      C68 C70 C71 C76 C80 C82 D40 D42 D45 D46
       32   6   1  23   3   6   1  11   5   1
Nr.64 Vol.III, p.362, Square K7, Trench, VIh, 1 Basket, T=9 N=12 Tot=0.19 %
      A49 A50 A51 A60 A83 A85 B25 B35 C68
       1   1   1   1   1   2   2   1   2
Nr.65 Vol.III, p.365, Square Z5, Pit, VI g-h, 4 Baskets, T=13 N=23 Tot=0.36 %
      A48 A49 A50 A60 A61 A73 A94 A96 A99 B25 B35 C68 D38
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        1   1   1   1   1   1   3   1   1   6   2   3   1
Nr.66 Vol.III, p.368, Square Z5, House 661, VI-g-h, 1 Basket, T=12 N=20 Tot=0.31 %
      A48 A49 A57 A58 A73 A85 A92 A94 A96 B25 B35 C40
        2   2   1   1   1   2   2   1   1   3   1   3
Nr.67 Vol.III, p.369, Square C8, Trench, VI-f-g-h, 3 Baskets, T=10 N=56 Tot=0.88 %
      A47 A49 A85 A94A100 B25 B35 C68 C70 C72
        3  14   5   8   1   6  10   3   3   3
Nr.68 Vol.III, p.372, Plateau, Burial Urn 1, VIh, T=4 N=4 Tot=0.06 %
      A51 A70 A83 D43
        1   1   1   1
Nr.69 Vol.III, p.372, Plateau, Burial Urn 2, VIh, T=3 N=3 Tot=0.05 %
      A96 C68 C78
        1   1   1
Nr.70 Vol.III, p.372, Plateau, Burial Urn 3, VIh, T=2 N=2 Tot=0.03 %
      A96 C68
        1   1
Nr.71 Vol.III, p.372, Plateau, Burial Urn 4, VIh, T=2 N=2 Tot=0.03 %
      A49 C68
        1   1
Nr.72 Vol.III, p.372, Plateau, Burial Urn 5, VIh, T=2 N=2 Tot=0.03 %
      A49 C76
        1   1
Nr.73 Vol.III, p.373, Plateau, Burial Urn 11, VIh, T=2 N=2 Tot=0.03 %
      A49 C68
        1   1
Nr.74 Vol.III, p.373, Plateau, Burial Urn 12, VIh, T=2 N=2 Tot=0.03 %
      A49 C70
        1   1
Nr.75 Vol.III, p.374, Plateau, Burial Urn 18, VIh, T=4 N=4 Tot=0.06 %
      A85 A92 A96 C76
        1   1   1   1
Nr.76 Vol.III, p.381 , Plateau, Cemetery, VIh, T=35 N=457 Tot=7.17 %
      A48 A49 A50 A51 A54 A60 A73 A75 A81 A83 A85 A92 A96A100 B25 B26 B28 B33 B35 B36 B41 C39
       32  32  32  32   5  34  27   2   3   7  14  24  18   7  19  18  18   1   7   3   1   1
      C41 C52 C59 C60 C68 C70 C71 C76 C78 C80 D42 D43 D45
       14   1   1   6  44   1  24  20   1   3   3   1   1
Nr.77 Studia Troica 16, 2006 p64-65, Central Room, Terracehouse , Destruction, T=17 N=31
Tot=0.49 %
      A48 A49 A50 A51 A52 A60 A71 A72 A73 A77 A83 B30 C44 C69 C70 C72 C80
        3   4   4   3   1   1   1   1   5   1   1   1   1   1   1   1   1
Nr.78 Studia Troica 16, 2006 p63-64, Central Room, Terracehouse, Use, T=4 N=9 Tot=0.14 %
      A73 A77 B25 B26
        3   2   2   2
Nr.79 Studia Troica 16, 2006 p65-66, South Room, Terracehouse, Use, T=9 N=25 Tot=0.39 %
      A48 A49 A50 A51 A73 A77 B25 B26 B37
        3   4   3   3   3   2   3   3   1
Nr.80 Studia Troica 16, 2006 p66, South Room, Terracehouse, Destruction, T=5 N=5 Tot=0.08 %
      A48 A49 A50 A51 A73
        1   1   1   1   1
Nr.81 Studia Troica 16, 2006 p66-67,North Room, Terracehouse, Construction T=5 N=16 Tot=0.25 %
        A48 A49 A50 A51 A73
          3   3   3   3   4
Nr.82 Studia Troica 16, 2006 p67-69,North Room, Terracehouse, Destruction ,T=7 N=47 Tot=0.74 %
      A48 A49 A50 A51 A73 A77 A92
        8  10   8   8   9   1   3
Nr.83 Vol.III, p.392, Plateau, Crematory, VI-g-h, 4 Baskets, T=2 N=2 Tot=0.03 %
      A49 A50
        1   1
Nr.84 Vol.III, p.395, Plateau, Crematory, VI-g-h, 2 Baskets, T=18 N=67 Tot=1.05 %
      A48 A49 A58 A59 A60 A61 A84 A85 A92 A94 A96A100 B25 C70 C71 C72 C73 D46
        2   2   1   3   3   3   4   5   3   3   3   2   8   9   3   6   6   1
Nr.85 Vol.IV, p.51, Square G 8-9, Street 710, VIIa, 25 Baskets, T=35 N=409 Tot=6.42 %
      A49 A51 A52 A54 A57 A60 A64 A71 A72 A73 A77 A83 A84 A85 A86 A90 A93A100 B25 B26 B29 B35
       26   3  21   3   2  11   1  15   3  43  27   2   5   9   3   1   1   3  90   2   3   1
      B39 B41 B42 C41 C56 C67 C68 C70 C71 C74 C80 C82 D45
        2  12   4   1   1   1  95   1   1   1   9   2   4
Nr.86 Vol.IV, p.58, Square F-G 9, Street 711 , VIIa, 6 Baskets, T=11 N=40 Tot=0.63 %
      A49 A52 A60 A71 A73 B25 B26 B41 C68 C70 C80
        3   6   3   3   6   6   4   3   1   1   4
Nr.87 Vol.IV, p.60, Square F9, Street 711, VIIa, T=21 N=55 Tot=0.86 %
      A49 A52 A55 A60 A71 A72 A73 A75 A77 A85 A86 A88 B25 B26 B41 B42 C43 C56 D37 D40 D45
        5   3   1   4   4   3  12   1   3   1   1   3   3   3   1   1   1   1   1   1   2
Nr.88 Vol.IV, p.67, Square G 8-9, House 700, VIIa, 3.5 Baskets, T=15 N=68 Tot=1.07 %
      A49 A52 A60 A71 A73 A85 B25 B39 B40 B41 B42 C46 C68 C80 C82
       10   8   1   3  15   2   8   1   1   3   1   1   7   6   1
Nr.89 Vol.IV, p.71, Square G 8-9, House 703, VIIa, T=12 N=59 Tot=0.93 %
      A49 A52 A60 A71 A73 A83 A85 A86 B25 B42 C68 C80
        9  12   3   2   6   5   2   2   9   1   4   4
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Nr.90 Vol.IV, p.73, Square G9, House 701, VIIa, 3 Baskets, T=9 N=63 Tot=0.99 %
      A49 A52 A60 A71 A73 B25 B41 C44 C80
        8   6   3   9  12  18   4   1   2
Nr.91 Vol.IV, p.76, Square F-G 9, House 705, VIIa, 2 Baskets, T=14 N=52 Tot= 0.82 %
      A49 A52 A60 A73 A77 A85 A86 A88 A93 B25 B29 C44 C50 C63
        9   6   3   6   1   1   2   1   1  18   1   1   1   1
Nr.92 Vol.IV, p.79, Square F9, House 722, VIIa, 3 Baskets, T=27 N=121 Tot=1.90 %
      A48 A49 A52 A57 A60 A71 A72 A73 A77 A83 A84 A85 A86 A88 B25 B29 B32 B35 B42 C41 C45 C56
        1  27  12   1   6   5   4  13   6   4   1   2   1   1   6   1   2   1   4   1   6   1
      C68 C69 C75 C80 D42
        3   1   1   8   2
Nr.93 Vol.IV, p.82, Square E-F 9, House 721, Fl, VIIa, 2 Baskets, T=18 N=53 Tot=0.83 %
      A49 A52 A55 A60 A63 A71 A73 A77 A83 A88 A93A100 B25 B32 B41 C43 C80 D42
        6   7   1   3   1   6   6   3   1   1   3   1   6   1   2   1   3   1
Nr.94 Vol.IV, p.85, Square F8, House 725, VIIa, 2 Baskets, T=13 N=26 Tot=0.41 %
      A49 A51 A52 A73 A85 B25 C51 C61 C62 C68 C69 C76 C80
        2   1   1   1   1   2   1   6   6   2   1   1   1
Nr.95 Vol.IV, p.87, Square F8, Area 726, VIIa, T=11 N=14 Tot=0.22 %
      A49 A52 A60 A73 A85 A86 B25 B41 B42 C68 C69
        2   1   1   1   1   1   2   2   1   1   1
Nr.96 Vol.IV, p.92, Square H-J 7-8, House 730, VIIa, 3 Baskets, T=14 N=89 Tot=1.40 %
      A49 A52 A60 A71 A73 A77 A87 A93 A94 B25 C46 C68 C75 C80
       19   6   9   6   6   3   1   3   3  18   1   7   1   6
Nr.97 Vol.IV, p.100, Square H-J 7-8, House 731, VIIa, 2 Baskets, T=20 N=66 Tot=1.04 %
      A49 A52 A60 A71 A73 A84 A85 A88A100 B25 B41 B42 C41 C68 C72 C73 C80 D42 D43 D45
       12   7   3   4   6   1   1   1   1  12   2   1   1   1   3   1   6   1   1   1
Nr.98 Vol.IV, p.103, Square H7, House 732, VIIa, 1.5 Baskets, T=10 N=34 Tot=0.53 %
      A49 A60 A71 A73 A77 A79 A85 B25 C68 D45
        6   3   3   6   3   1   1   6   3   2
Nr.99 Vol.IV, p.105, Square H-J 6-7, Area 733, VIIa, T=22 N=30 Tot=0.47 %
      A48 A49 A50 A51 A52 A60 A71 A72 A73 A77 A83 A84 A85 A87 A88A100 B25 B41 C68 C80 C82 D45
        1   2   2   2   1   2   1   1   1   1   1   1   2   1   1   1   2   2   2   1   1   1
Nr.100 Vol.IV, p.106, Square J7, Pavement, VIIa, 0.75 Basket, T=11 N=22 Tot=0.35 %
       A49 A52 A60 A71 A73 A77 A96 B25 B41 C62 C80
         6   1   2   1   6   1   1   1   1   1   1
Nr.101 Vol.IV, p.112, Square J-K 6-7, House, VIIa, 1 Basket, T=5 N=9 Tot=0.14 %
       A49 A71 A73 B41 C48
         4   1   2   1   1
Nr.102 Vol.IV, p.114, Square J-K 6-7, House, VIIa, N=800 sherds, T=10 N=21 Tot=0.33 %
       A49 A53 A60 A73 A74 A83 A85 A92 B25 B27
         3   3   2   4   3   1   1   1   2   1
Nr.103 Vol.IV, p.118, Square J-K 5, House, VIIa, 1.5 Baskets, T=25 N=42 Tot=0.66 %
       A49 A52 A60 A71 A72 A73 A77 A93 B25 B28 B31 B32 B35 B39 B41 B42 C39 C56 C61 C62 C67 C68
         1   1   2   3   2   1   1   1   2   2   1   1   1   1   1   2  11   1   1   1   1   1
       C70 C76 C80
         1   1   1
Nr.104 Vol.IV, p.125, Square K 6-7, Extension, VIIa, 30 Baskets, T=20 N=222 Tot=3.49 %
       A49 A50 A52 A60 A71 A73 B25 B26 B35 B39 B41 C41 C45 C48 C49 C57 C68 C80 D42 D45
        43  23   6   9   7  18  18   1   1   1   6   1   2  10  10   1  30  26   1   8
Nr.105 Vol.IV, p.129, Square A7, Area, VIIa, 6 Baskets, T=15 N=36 Tot=0.57 %
       A49 A52 A60 A61 A71 A72 A73 A81 A85 B25 B35 B39 C50 C56 C57
         7   6   3   1   1   3   4   1   2   3   1   1   1   1   1
Nr.106 Vol.IV, p.131, Square A7, House 749, VIIa, 2 Baskets, T=6 N=13 Tot=0.20 %
       A49 A52 B25 B39 C39 C51
         3   3   4   1   1   1
Nr.107 Vol.IV, p.184, Square G 8-9, Street 750,VIIb1, 1 Basket, T=12 N=30 Tot=0.47 %
       A49 A52 A60 A71 A93 B25 B26 C68 C69 C74 C75 C80
         6   2   3   1   2   9   1   1   1   1   1   2
Nr.108 Vol.IV, p.187, Square F-G 8-9, Street 751, VIIb1, 1.5 Baskets, T=11 N=43 Tot=0.68 %
       A49 A52 A73 A93 B25 C56 C57 C69 C74 C75 D43
         1   3   9   6  15   1   1   2   2   2   1
Nr.109 Vol.IV, p.187, Square F-G 8-9, Street 751, VIIb2, T=2 N=2 Tot=0.03 %
       A71 A93
         1   1
Nr.110 Vol.IV, p.188, Square E-F 9, Street 751, VIIb1, 2 Baskets, T=10 N=22 Tot=0.35 %
       A52 A60 A67 A71 A93 B25 B26 B42 C71 D36
          3   1   1   6   6   1   1   1   1   1
Nr.111 Vol.IV, p.188, Square E-F 9, Street 751, VIIb2, 1 Basket, T=5 N=7 Tot=0.11 %
       A71 A93A107 B25 C84
         1   1   1   1   3
Nr.112 Vol.IV, p.193, Square F-G 9, House 771, VIIb, 3 Baskets, T=22 N=83 Tot=1.30 %
       A49 A50 A52 A60 A71 A73 A74 A92 A93A105A106A107 B25 B35 C68 C69 C74 C75 C80 C85 C86 D45
        12   1   6   4   9  12   1   1   9   1   1   1  12   1   2   2   2   2   1   1   1   1
Nr.113 Vol.IV, p.197, Square F8, House 762, VIIb1, 1 Basket, T=10 N=16 Tot=0.25 %
       A49 A51 A60 A71 A93 B25 B26 B29 C68 C69
         1   1   1   3   3   2   2   1   1   1
Nr.114 Vol.IV, p.197, Square F8, House 762, VIIb2, T=2 N=2 Tot=0.03 %
      A106 A107
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         1    1
Nr.115 Vol.IV, p.199, Square E-F 9, House 761, VIIb1, 3.25 Baskets, T=22 N=68 Tot=1.07 %
       A49 A52 A67 A71 A86 A92 A93A100A102 B25 B26 B41 B42 C51 C57 C67 C75 C76 C85 C86 D35 D45
         2   2   4  15   4   1  20   1   1   1   1   2   2   1   1   1   4   1   1   1   1   1
Nr.116 Vol.IV, p.202, Square E-F 9, House 761, VIIb1, 2.3 Baskets, T=12 N=26 Tot=0.41 %
       A67 A73 A86 A93A100A106A107 B25 B26 B42 C85 C86
         3   1   2  12   1   1   1   1   1   1   1   1
Nr.117 Vol.IV, p.203, Square E-F 8, House 768, VIIb2, 1 Basket, T=3 N=3 Tot=0.05 %
       A71 A93 C85
         1   1   1
Nr.118 Vol.IV, p.205, Square E-F 8, House 768, VIIb2, 14 Baskets , T=21 N=25 Tot=0.39 %
       A49 A52 A60 A67 A71 A73A103A104A105A106A107 B25 B26 B28 B29 B45 B47 B48 C74 C80 C84
         1   1   1   1   3   1   1   1   1   2   1   2   1   1   1   1   1   1   1   1   1
Nr.119 Vol.IV, p.208, Square E-F 8, House 768, VIIb2, 4 Baskets, T=8 N=8 Tot=0.13 %
       A49 A60A101A106A107 B25 B35 B46
         1   1   1   1   1   1   1   1
Nr.120 Vol.IV, p.211, Square F8, House 769, VIIb1, T=7 N=13 Tot=0.20 %
       A49 A52 A66 A73 C45 C51 C58
         4   4   1   1   1   1   1
Nr.121 Vol.IV, p.213, Square F8, House 769, VIIb2, 1 Basket, T=16 N=17 Tot=0.27 %
       A49 A52 A60 A73 A93A104A106 B25 B33 B41 B44 C50 C69 C84 C85 C86
         1   1   1   1   2   1   1   1   1   1   1   1   1   1   1
Nr.122 Vol.IV, p.215, Square F8, House 769, VIIb2, 3 Baskets, T=13 N=26 Tot=0.41 %
       A49 A71 A72 A73 A93A101A103A105A106A107 B41 C56 D37
        12   1   1   1   3   1   1   1   1   1   1   1   1
Nr.123 Vol.IV, p.218, Square F8, Area 77, VII-a-b, T=8 N=8 Tot=0.13 %
       A49 A60 A71 A73 A93A102 C85 C86
         1   1   1   1   1   1   1   1
Nr.124 Vol.IV, p.219, Square H-J 7, Street 780, VII-a-b, 1 Basket, T=7 N=9 Tot=0.14 %
        A49 A52 A58 A60 A71 A73 A93
          2   1   1   1   1   2   1
Nr.125 Vol.IV, p.221, Square H7, House 781, VIIb, 1 Basket, T=3 N=4 Tot=0.06 %
       A104 A106 A107
          1    2    1
Nr.126 Vol.IV, p.223, Square H-J 7-8, House 784, VIIb, 2 Baskets, T=11 N=39 Tot=0.61 %
       A49 A52 A71 A73 A93A107 B25 B48 C42 C75 D45
        12   3   6   3   2   1   6   1   1   3   1
Nr.127 Vol.IV, p.225, Square H7, Area 779, VIIb1, 0.75 Basket, T=4 N=7 Tot=0.11 %
       A49 B25 C85 C86
         3   2   1   1
Nr.128 Vol.IV, p.227, Square H-J 6-7, Area 786, VIIb 2, 1.5 Baskets, T=22 N=56 Tot=0.88 %
       A49 A64 A71 A73 A79 A83 A86 A93A101A107 B25 B41 B42 C50 C51 C56 C68 C69 C70 C72 C75 D42
        16   1   9   3   1   1   2   6   1   1   1   1   1   2   1   2   2   1   1   1   1   1
Nr.129 Vol.IV, p.230, Square J-K 6-7, House, VIIb1, 1200 Sherds, T=8 N=40 Tot=0.63 %
       A49 A52 A60 A71 A72 A73 A93 B25
         6   3   6   3   1   6   6   9
Nr.130 Vol.IV, p.231, Square J-K 5, Area 789, VIIb1, 7 Baskets, T=16 N=62 Tot=0.97 %
       A49 A52 A60 A67 A71 A73 A86 A93 B25 B26 B42 C50 C56 C69 C74 C75
         3   3   1   2  12   3   3  12   6   6   6   1   1   1   1   1
Nr.131 Vol.IV, p.234, Square J-K 5, Area 789, VIIb2, 1.5 Baskets, T=12 N=13 Tot=0.20 %
       A49 A71 A72 A73 A93 A104 A106 A107 B25 C84 C85 C86
         2   1   1   1   1    1    1    1   1   1   1   1
Nr.132 Vol.IV, p.235, Square J-K 5, Area 789, VIIb2, 0.5 Basket, T=6 N=6 Tot=0.09 %
       A105 A106 A107 B27 B35 C69
          1    1    1   1   1   1
Nr.133 Vol.IV, p.236, Square J8, House 787, VIIb, 1 Basket, T=11 N=51 Tot=0.80 %
       A49 A50 A52 A60 A73 A83 A85 A93 B25 C47 C69
        13   1   2   2   5   1   1   7  17   1   1
Nr.134 Vol.IV, p.240, Square A7, Area , VIIb, 7 Baskets, T=14 N=26 Tot=0.41 %
       A49 A60 A71 A72 A73 A93 A102 A106 A107 B42 B45 B46 B48 C84
         2   1   1   1   2   1    1    6    6   1   1   1   1   1
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Appendix II. Results of Correspondence Analysis
Factor Scores for Troia VI--VII Blegen Shapes
Ergebnisse der Korrespondenzanalyse
Schwerpunkte (Faktor 1 und 2) für Troia VI--VII Blegen Gefäßformen

Blegen Shape	Nr.	Factor1/2		Blegen Shape	Nr	Factor1/2		Blegen Shape	Nr	Factor1/2	
A12	NR 1	-1.549	-0.717	B25	NR 68	0.035	-0.053	C58	NR 111	-0.534	-0.591
A16	NR 2	-1.785	-1.075	B26	NR 69	0.376	0.464	C59	NR 112	0.214	0.783
A18	NR 3	-1.649	-0.949	B27	NR 70	1.404	-2.451	C60	NR 113	-0.928	0.095
A19	NR 4	-2.031	-1.220	B28	NR 71	0.268	0.707	C61	NR 114	-0.643	-0.147
A21	NR 5	-1.942	-1.235	B29	NR 72	0.866	-0.505	C62	NR 115	-0.566	0.054
A23	NR 6	-1.451	-0.868	B30	NR 73	0.673	0.511	C63	NR 116	0.674	-0.129
A33	NR 7	0.000	0.000	B31	NR 74	0.376	-0.363	C64	NR 117	-2.500	-1.606
A41	NR 8	-2.894	-1.959	B32	NR 75	0.725	-0.128	C65	NR 118	-1.729	-0.881
A47	NR 9	-1.195	-0.526	B33	NR 76	0.230	-0.112	C66	NR 119	-2.461	-1.515
A48	NR 10	0.104	0.663	B34	NR 77	-1.280	2.217	C67	NR 120	-0.884	-0.417
A49	NR 11	0.520	0.066	B35	NR 78	-0.507	0.046	C68	NR 121	0.180	0.296
A50	NR 12	0.296	0.667	B36	NR 79	-0.339	0.590	C69	NR 122	1.010	-0.865
A51	NR 13	0.224	0.717	B37	NR 80	-0.306	0.264	C70	NR 123	0.064	0.502
A52	NR 14	0.767	-0.153	B38	NR 81	-0.383	0.223	C71	NR 124	0.214	0.673
A53	NR 15	0.179	0.476	B39	NR 82	0.563	0.009	C72	NR 125	-0.176	0.417
A54	NR 16	0.170	0.576	B40	NR 83	-0.302	0.224	C73	NR 126	-0.093	0.626
A55	NR 17	0.864	-0.096	B41	NR 84	0.476	0.178	C74	NR 127	1.056	-0.898
A56	NR 18	-1.712	-0.922	B42	NR 85	1.013	-0.669	C75	NR 128	1.134	-0.839
A57	NR 19	-1.275	-0.439	B43	NR 86	0.000	0.000	C76	NR 129	-0.026	0.831
A58	NR 20	-1.537	-0.791	B44	NR 87	1.875	-2.898	C77	NR 130	-1.264	1.355
A59	NR 21	-0.258	0.455	B45	NR 88	2.420	-4.653	C78	NR 131	-0.721	0.122
A60	NR 22	0.364	0.186	B46	NR 89	2.304	-4.932	C79	NR 132	-1.644	-0.788
A61	NR 23	-1.898	-1.038	B47	NR 90	2.008	-3.361	C80	NR 133	0.569	0.211
A62	NR 24	-1.970	-1.097	B48	NR 91	1.981	-3.364	C81	NR 134	-1.229	-0.339
A63	NR 25	-1.680	-1.083	B25	NR 68	0.035	-0.053	C82	NR 135	-0.049	0.593
A64	NR 26	-1.723	-1.017	B26	NR 69	0.376	0.464	C83	NR 136	0.000	0.000
A65	NR 27	-0.106	0.639	B27	NR 70	1.404	-2.451	C84	NR 137	2.407	-4.658
A66	NR 28	0.926	-0.224	B28	NR 71	0.268	0.707	C85	NR 138	1.702	-2.170
A67	NR 29	1.679	-1.871	B29	NR 72	0.866	-0.505	C86	NR 139	1.649	-2.124
A68	NR 30	0.034	0.843	B30	NR 73	0.673	0.511	D33	NR 140	-1.901	-0.992
A69	NR 31	-1.737	-0.864	B31	NR 74	0.376	-0.363	D35	NR 141	1.572	-1.554
A70	NR 32	-1.368	-0.614	B32	NR 75	0.725	-0.128	D36	NR 142	1.500	-1.157
A71	NR 33	0.936	-0.503	B33	NR 76	0.230	-0.112	D37	NR 143	1.192	-0.811
A72	NR 34	0.893	-0.540	B34	NR 77	-1.280	2.217	D38	NR 144	-0.484	0.463
A73	NR 35	0.498	0.125	B35	NR 78	-0.507	0.046	D39	NR 145	0.080	0.663
A74	NR 36	0.710	-0.155	B36	NR 79	-0.339	0.590	D40	NR 146	0.088	0.459
A75	NR 37	0.109	0.554	B37	NR 80	-0.306	0.264	D41	NR 147	-0.778	2.052
A76	NR 38	0.252	0.792	B38	NR 81	-0.383	0.223	D42	NR 148	0.313	0.587
A77	NR 39	0.597	0.132	B39	NR 82	0.563	0.009	D43	NR 149	0.361	0.190
A78	NR 40	-0.265	0.404	B40	NR 83	-0.302	0.224	D44	NR 150	0.000	0.000
A79	NR 41	0.884	-0.341	B41	NR 84	0.476	0.178	D45	NR 151	0.043	0.279
A80	NR 42	0.000	0.000	B42	NR 85	1.013	-0.669	D46	NR 152	-0.874	0.148
A81	NR 43	-0.165	0.393	B43	NR 86	0.000	0.000				
A83	NR 44	0.165	0.586	B44	NR 87	1.875	-2.898				
A84	NR 45	-0.302	0.404	B45	NR 88	2.420	-4.653				
A85	NR 46	0.036	0.504	B46	NR 89	2.304	-4.932				
A86	NR 47	1.114	-0.751	B47	NR 90	2.008	-3.361				
A87	NR 48	0.258	0.373	B48	NR 91	1.981	-3.364				
A88	NR 49	0.763	0.035	C39	NR 92	-0.260	-0.475				
A89	NR 50	-0.722	0.094	C40	NR 93	-0.933	1.774				
A90	NR 51	0.495	0.160	C41	NR 94	0.131	0.671				
A91	NR 52	-2.038	-0.685	C42	NR 95	1.103	-0.787				
A92	NR 53	-0.698	0.047	C43	NR 96	0.864	-0.096				
A93	NR 54	1.317	-1.235	C44	NR 97	0.687	0.101				
A94	NR 55	-1.496	-0.746	C45	NR 98	0.794	0.060				
A95	NR 56	-1.653	-0.999	C46	NR 99	0.659	0.024				
A96	NR 57	-0.190	0.430	C47	NR 100	0.725	-0.277				
A98	NR 58	-0.976	0.111	C48	NR 101	-0.108	-0.072				
A99	NR 59	-1.448	-0.478	C49	NR 102	0.594	0.336				
A100	NR 60	-0.253	0.321	C50	NR 103	1.141	-0.956				
A101	NR 61	1.474	-2.105	C51	NR 104	0.829	-0.544				
A102	NR 62	2.060	-3.205	C52	NR 105	0.083	0.688				
A103	NR 63	1.756	-2.484	C53	NR 106	0.000	0.000				
A104	NR 64	2.475	-4.828	C54	NR 107	-1.865	1.951				
A105	NR 65	1.697	-2.678	C55	NR 108	0.000	0.000				
A106	NR 66	2.507	-5.041	C56	NR 109	0.925	-0.509				

Appendix III. Results of Correspondence Analysis
Factor Scores for Troia VI--VII Excavation Units
Ergebnisse der Korrespondenzanalyse
Schwerpunkte (Faktor 1 und 2) für Troia VI--VII Grabungseinheiten

Excavation Unit	Nr	Factor1	Factor2	Excavation Unit	Nr	Factor1	Factor2
Earliest VI	NR 1	-1.994	-1.162	VI-h	NR 68	-0.194	0.304
VI-a	NR 2	-1.527	-0.595	VI-h	NR 69	-0.306	0.391
VI-a	NR 3	-1.824	-0.877	VI-h	NR 70	-0.007	0.502
VI-a	NR 4	-2.199	-1.394	VI-h	NR 71	0.438	0.250
VI-a-b-c	NR 5	-2.172	-1.379	VI-h	NR 72	0.310	0.620
VI-b	NR 6	-1.053	-0.238	VI-h	NR 73	0.438	0.250
VI-b-c	NR 7	-1.538	-0.829	VI-h	NR 74	0.366	0.393
VI-b	NR 8	-1.777	-1.002	VI-h	NR 75	-0.275	0.626
VI-b	NR 9	-1.602	-1.008	VI-h	NR 76	0.171	0.566
IV-b-c-d	NR 10	-1.818	-1.027	Destruction	NR 77	0.537	0.369
VI-c	NR 11	-1.908	-0.962	Nutzung	NR 78	0.489	0.225
VI-a	NR 12	-1.576	-0.978	Nutzung	NR 79	0.379	0.472
?	NR 13	-1.433	-0.779	Destruction	NR 80	0.411	0.619
VI-a-b-c	NR 14	-1.620	-0.882	Constructio	NR 81	0.425	0.591
VI-a-b-c	NR 15	-1.058	-0.544	Destruction	NR 82	0.351	0.542
VI-a-b-c	NR 16	-1.130	-0.615	VI-g-h	NR 83	0.511	0.507
VI-a-b-c	NR 17	-1.232	-0.719	VI-g-h	NR 84	-0.287	0.330
VI-a-b-c	NR 18	-1.184	-0.640	VII-a	NR 85	0.395	0.116
VI-a-b-c	NR 19	-1.590	-0.693	VII-a	NR 86	0.586	0.097
VI-a-b-c	NR 20	-2.309	-1.417	VII-a	NR 87	0.703	-0.011
VI-b-c	NR 21	-1.499	-0.619	VII-a	NR 88	0.559	0.094
VI-b-c-d	NR 22	-1.017	-0.304	VII-a	NR 89	0.580	0.056
VI-a-b-c	NR 23	-1.240	-0.695	VIIa	NR 90	0.569	-0.056
VI-d-e	NR 24	-1.461	-0.815	VIIa	NR 91	0.537	-0.094
VI-a-b-c	NR 25	-1.517	-0.717	VIIa	NR 92	0.669	0.011
VI-d	NR 26	-0.981	-0.245	VIIa	NR 93	0.675	-0.128
VI-d-e	NR 27	-2.350	-1.268	VIIa	NR 94	-0.091	0.047
VI-d	NR 28	-1.230	-0.559	VIIa	NR 95	0.630	-0.093
VI-e	NR 29	-0.549	0.455	VIIa	NR 96	0.492	-0.060
VI-e	NR 30	-0.717	-0.311	VIIa	NR 97	0.491	0.094
VI-e	NR 31	-1.901	-0.732	VII-a	NR 98	0.500	0.077
VI-e	NR 32	-0.930	0.100	VII-a	NR 99	0.386	0.353
VI-e	NR 33	-1.026	-0.191	VII-a	NR 100	0.539	0.114
VI-c	NR 34	-1.114	-0.498	VII-a	NR 101	0.610	0.018
VI-d	NR 35	-0.887	-0.206	VII-a	NR 102	0.473	0.040
VI-e	NR 36	-0.712	-0.093	VII-a	NR 103	0.300	-0.262
VI-d-e-f	NR 37	-0.978	-0.369	VII-a	NR 104	0.474	0.243
VI-d-e-f	NR 38	-0.769	-0.259	VII-a	NR 105	0.529	-0.102
VI-d-e-f	NR 39	-1.226	-0.669	VII-a	NR 106	0.495	-0.158
VI-d-e-f	NR 40	-0.584	-0.358	VII-b1	NR 107	0.607	-0.195
VI-d-e-f	NR 41	-0.360	-0.069	VII-b1	NR 108	0.683	-0.415
VI-d-e-f	NR 42	-0.090	0.234	VII-b2	NR 109	1.412	-1.201
VI-d	NR 43	-1.773	-0.922	VII-b1	NR 110	1.196	-0.837
VI-e	NR 44	-0.959	0.597	VII-b2	NR 111	2.124	-4.017
VI-d-e-f	NR 45	-0.955	-0.233	VII-b	NR 112	0.846	-0.571
VI-d-e-f	NR 46	-1.932	-1.030	VII-b1	NR 113	0.842	-0.388
VI-h	NR 47	0.027	0.609	VII-b2	NR 114	3.043	-6.645
VI f-g	NR 48	-0.823	-0.372	VII-b1	NR 115	1.254	-1.124
VI-h	NR 49	-0.038	0.429	VII-b2	NR 116	1.588	-1.896
VI-f	NR 50	-0.463	0.123	VII-b2	NR 117	1.653	-1.801
VI-f	NR 51	-0.212	0.292	VII-b2	NR 118	1.602	-2.431
VI-h	NR 52	-0.908	-0.162	VII-b2	NR 119	1.417	-2.835
VI-h	NR 53	-1.150	2.243	VII-b1	NR 120	0.738	-0.162
VI-h	NR 54	-0.257	0.213	VII-b2	NR 121	1.496	-2.096
VI-f	NR 55	-1.649	1.615	VII-b2	NR 122	1.200	-1.162
VI-f	NR 56	-0.121	0.488	VII-a-b	NR 123	1.418	-1.531
VI-g	NR 57	-0.197	0.315	VII-a-b	NR 124	0.541	-0.325
VI-h	NR 58	0.263	0.370	VIIb	NR 125	3.083	-6.733
VI-h	NR 59	0.201	0.573	VIIb	NR 126	0.880	-0.569
VI-f-g-h	NR 60	0.174	0.252	VIIb1	NR 127	0.892	-0.830
VI-f-g-h	NR 61	0.151	0.204	VIIb 2	NR 128	0.911	-0.570
VI-h	NR 62	0.074	0.271	VIIb 1	NR 129	0.705	-0.281
VI-h-VII-a	NR 63	0.219	0.559	VIIb 1	NR 130	1.077	-0.717
VI-h	NR 64	0.163	0.434	VIIb 2	NR 131	1.717	-2.708
VI g-h	NR 65	-0.381	-0.029	VIIb 2	NR 132	1.767	-3.586
VI-g-h	NR 66	-0.456	0.439	VIIb	NR 133	0.579	-0.200
VI-f-g-h	NR 67	-0.291	0.000	VIIb	NR 134	2.259	-4.300