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Observations on the Distribution of the Technological and Typological Features of Glass and Vitreous Materials in Assyria During the Late Bronze Age. The Case of Assur, Nuzi, Tell Rimah and Tell Brak¹

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1.1 Introduction

Vitreous materials have long been known in the Near East. It is only in the course of the second millennium B.C., however, that they gain an outstanding importance in the archaeological record, further enhanced by fundamental technological achievements, such as the invention of glass and the various techniques related to its workmanship.

These materials, possibly also because of their aesthetic properties, have been, as a rule, amply published by archaeologists, so that statistical research seems suitable for investigating their distribution within a delimited geographic or cultural area. This is the case of Greater Assyria during the Late Bronze Age. Several sites excavated in this area have yielded a number of vitreous finds, from contexts of different nature which can be compared on the basis of their function and chronological setting. Hence, the aim of this paper is to investigate the distributional patterns of technological and typological traits of vitreous materials in the different sites and contexts, in order to bring to light any significant groupings of these attributes. According to this aim we have selected four sites which might furnish a comparable picture for the variety their contexts: Assur, Nuzi, Tell Rimah and Tell Brak. Such sites may be considered representative sample for the area and period chosen.

1.2 The contexts

The four centres surveyed exhibit different contexts, which could be grouped according to four broad categories: temple, palatial, burial, and domestic.

Assur Temple: materials from Ishtar Temple (Andrae 1935), mostly from rooms 5–6 of the *Ashuritu* Temple.

Assur Palace: few vitreous objects are published from the ruins of the Palace of Adad-Nirari I, all dated to Tukulti-Ninurta I (Andrae 1935: 90, 92, 98; Preusser 1955: 13–19).

Assur Houses: only a few entries come from houses, of which only scanty remains are to be dated to the Middle-Assyrian Period (Preusser 1954).

Nuzi Temple: abundant materials from Temple A, whose probable date (and of Nuzi II) is towards the end of the 15th century. Most of the entries come from *Cella* G29 and Court H14, with the Pit G50 (Starr 1937–1939: 87–122).

Nuzi Palace: only selected types (especially wall-nails and vessels) have been found in relative abundance in the palace, which probably encompassed a small shrine (Starr 1937–1939: 123–179).

Nuzi Houses: various objects were found in the houses around the palace and in the *villae* of Tekhip-Tilla, Shilwa-Teshub, Zigi (Starr 1937–1939: 180–347).

Nuzi Grave: one pot burial, among the five known, yielded vitreous objects (Starr 1937–1939: 350–351).

Rimah Temple: within the Late Bronze Age phase of the temple in area A, three subphases have been distinguished. The materials from the lowest date to the 15th century, while the two upper subphases are

¹ This paper was presented in poster form at the XXXIX^e RAI. We wish to thank our friend Stefano Savona, who set up, to a considerable extent, the statistical procedures. However, the responsibility for the results and the interpretations falls exclusively on the authors. N. Marchetti wrote §§ 3 and 5; L. Nigro §§ 2 and 4.

Middle Assyrian (Carter 1965: 44–57; Carter 1967: 284–287; Oates 1965: 69–75; Oates 1967: 90–91; Oates 1982: 96–97).

Rimah Palace: a building with several rooms and annexed shrine was exposed in Area C. Two main phases were identified and dated in the same way as the two main Late Bronze periods in the temple (Carter 1965: 61–65; Carter 1967: 287–289; Oates 1968: 134–135; Oates 1970: 2–4).

Rimah Grave: one vaulted mud-brick chamber in area D, with several phases of usage (Oates 1967: 92–93).

Brak Temple: materials from the temple annexed to the palace, found in the *cella* and in the back room (Oates 1987: 186–187). Very few entries.

Brak Palace: materials from the Mitannian palace in area HH (Oates 1987: 181–186), found in its latest phase, dated to the beginning of the 13th century. Most of the entries from Brak come from the palace.

Brak Houses: materials from the houses in area HH, in which six levels have been distinguished, dating from the 16th to the 13th century (level 1 is contemporary with the latest phase of the palace). Most of the few entries come from levels 3–1 (Mallowan 1939: 891; 1947: 77–78; Barag 1970: 146; Oates, Oates 1990: 77).

1.3 Method

Filing: all the published items of vitreous materials (i.e. glass, faience, frit, and glazed pottery) have been filed according to broad functional classes,² whereby in addition to the contextual information, the data about the technological traits has also been recorded.³ Within each functional class we have further arranged the objects into a hierarchical typology.⁴

Analysis: After the recording of the published information, we have proceeded to an aggregation of data into new composite classes by means of a series of cross-tabulations further summarized in tables 1–4.

Such a method consists in graphing the primary traits of different nature (functional, technological, and formal) into three-two ways tables in order to get all the existing combinations between the pairs of attributes considered. For instance, crossing the broad functional classes (vessels, beads etc.) by the broad technological features (glass, faience/frit and glazed pottery) we get all the different combinations of these attributes (glass vessels, faience vessels, glass beads, faience beads etc.) present in each of the contexts studied. As stated above, tables 1–4 show the number and the percentage of common classes – i.e. the broad functional classes (table 1) and the combined classes produced aggregating the primary attributes (tables 2–4) – between every possible pair of contexts. Observing the tables one should bear in mind that they have to be read according to columns; the second number indicates the number of classes singled out in the context, while the first represents the number of classes that the context considered shares with the context to the left (rows). The same ratio is expressed below by a percentage. For instance in table 1, Assur Temple has 19 broad functional classes and it shares 2 of these with the Assur Palace, i.e. 10% (cell A2). Blank cases indicate no sharing of classes.

² Beads, pendants, vessels, figurines, wall nails, gaming pieces, plaques, masks, cylinder seals, boxes, architectural decorative elements, buttons, rosettes, pins, scarabs and scaraboids, amulets, mosaic *tesserae*, lids, ingots, rods and various unfinished pieces, undefined fragments.

³ We have distinguished three very general techniques: glass, faience/frit and glaze on pottery (see § 5). At a more specific level other attributes have been taken into account within the two basic subdivisions monochrome/polychrome. As far as faience/frit is concerned, we have further distinguished according to the core which could be white or coloured; in the latter case we are dealing with the particular production usually called “Egyptian blue”; on the other hand, for glass we recorded the various techniques such as free-modeling, rod-formed, core-formed, moulding and casting, cold cutting, mosaic-glass and “millefiori”.

⁴ Although for reasons of space we cannot present our formal typology in detail, we would nonetheless like to offer a sample of it: for instance rosettes have been divided at a first level into “knobbed” and “not knobbed with plain petals”. The former is subdivided into “no veins on petals”, “two veins on petals”, “double disk and four holes”; the latter further presents the types “concave disk”, “flattened disk”. In the latter, we have distinguished “pointed petals”, “squared petals”, “rounded petals”, “circular outer profile”.

Tab. 1 Broad functional classes

	Assur Temple	Assur Palace	Assur Houses	Assur Graves	Nuzi Temple	Nuzi Palace	Nuzi Houses	Nuzi Graves	Rimah Temple	Rimah Palace	Rimah Graves	Brak Temple	Brak Palace	Brak Houses
Assur Temple	-	2/2 = 100%	2/2 = 100%	9/13 = 69%	9/12 = 75%	3/3 = 100%	7/10 = 70%	1/1 = 100%	11/17 = 64%	4/5 = 80%	2/3 = 66%	1/2 = 50%	4/7 = 57%	3/5 = 60%
Assur Palace	2/19 = 10%	-	1/2 = 50%	1/13 = 7%	1/12 = 8%		1/10 = 10%		1/17 = 5%					
Assur Houses	2/19 = 10%	1/2 = 50%	-	2/13 = 15%	2/12 = 16%		2/10 = 20%		2/17 = 11%					
Assur Graves	9/19 = 47%	1/2 = 50%	2/2 = 100%	-	8/12 = 66%	3/3 = 100%	7/10 = 70%	1/1 = 100%	9/17 = 52%	5/5 = 100%	3/3 = 100%	1/2 = 50%	5/7 = 70%	4/5 = 80%
Nuzi Temple	9/19 = 47%	1/2 = 50%	2/2 = 100%	8/13 = 61%	-	3/3 = 100%	8/10 = 80%	1/1 = 100%	10/17 = 58%	3/5 = 60%	2/3 = 66%	1/2 = 50%	4/7 = 57%	2/5 = 40%
Nuzi Palace	3/19 = 15%			3/13 = 23%	3/12 = 25%	-	3/10 = 30%	1/1 = 100%	3/17 = 17%	3/5 = 60%	2/3 = 66%	1/2 = 50%	2/7 = 28%	2/5 = 40%
Nuzi Houses	7/19 = 36%	1/2 = 50%	2/2 = 100%	7/13 = 53%	8/12 = 66%	3/3 = 100%	-	1/1 = 100%	8/17 = 47%	4/5 = 80%	3/3 = 100%	1/2 = 50%	3/7 = 42%	3/5 = 60%
Nuzi Graves	1/19 = 5%			1/13 = 7%	1/12 = 8%	1/3 = 33%	1/10 = 10%	-	1/17 = 5%	1/5 = 20%	1/3 = 33%	1/2 = 50%	1/7 = 14%	
Rimah Temple	11/19 = 57%	1/2 = 50%	2/2 = 100%	9/13 = 69%	10/12 = 83%	3/3 = 100%	8/10 = 80%	1/1 = 100%	-	4/5 = 80%	3/3 = 100%	1/2 = 50%	4/7 = 57%	3/5 = 60%
Rimah Palace	4/19 = 21%			5/13 = 38%	3/12 = 25%	3/3 = 100%	4/10 = 40%	1/1 = 100%	4/17 = 23%	-	3/3 = 100%	1/2 = 50%	2/7 = 28%	4/5 = 80%
Rimah Graves	2/19 = 10%			3/13 = 23%	2/12 = 16%	2/3 = 66%	3/10 = 30%	1/1 = 100%	3/17 = 17%	3/5 = 60%	-	1/2 = 50%	1/7 = 14%	2/5 = 40%
Brak Temple	1/19 = 5%			1/13 = 7%	1/12 = 8%	1/3 = 33%	1/10 = 10%	1/1 = 100%	1/17 = 5%	1/5 = 20%	1/3 = 33%	-	1/7 = 14%	
Brak Palace	4/19 = 21%			5/13 = 38%	4/12 = 33%	2/3 = 66%	3/10 = 30%	1/1 = 100%	4/17 = 23%	2/5 = 40%	1/3 = 33%	1/2 = 50%	-	1/5 = 20%
Brak Houses	3/19 = 15%			4/13 = 30%	2/12 = 16%	2/3 = 66%	3/10 = 30%		3/17 = 17%	4/5 = 80%	2/3 = 66%		1/7 = 14%	-

Tab. 2 Broad functional classes by broad technological features

	Assur Temple	Assur Palace	Assur Houses	Assur Graves	Nuzi Temple	Nuzi Palace	Nuzi Houses	Nuzi Graves	Rimah Temple	Rimah Palace	Rimah Graves	Brak Temple	Brak Palace	Brak Houses
Assur Temple	-	2/2 = 100%	2/2 = 100%	9/22 = 40%	9/22 = 40%	3/4 = 75%	5/16 = 31%	1/1 = 100%	11/26 = 42%	3/7 = 42%	1/4 = 25%	1/2 = 50%	3/7 = 42%	1/5 = 20%
Assur Palace	2/23 = 8%	-	1/2 = 50%	1/22 = 4%	1/22 = 4%		1/16 = 6%		1/26 = 3%					
Assur Houses	2/23 = 8%	1/2 = 50%	-	2/22 = 9%	1/22 = 4%		1/16 = 6%		2/26 = 7%					
Assur Graves	9/23 = 39%	1/2 = 50%	2/2 = 100%	-	14/22 = 63%	4/4 = 100%	9/16 = 56%	1/1 = 100%	10/26 = 38%	6/7 = 85%	3/4 = 75%	1/2 = 50%	4/7 = 57%	3/5 = 60%
Nuzi Temple	9/23 = 39%	1/2 = 50%	1/2 = 50%	14/22 = 63%	-	3/4 = 75%	13/16 = 81%	1/1 = 100%	12/26 = 46%	4/7 = 57%	2/4 = 50%	1/2 = 50%	4/7 = 57%	2/5 = 40%
Nuzi Palace	3/23 = 13%			4/22 = 18%	3/22 = 13%	-	3/16 = 23%	1/1 = 100%	3/26 = 11%	2/7 = 28%	1/4 = 25%		1/7 = 14%	2/5 = 40%
Nuzi Houses	5/23 = 21%	1/2 = 50%	1/2 = 50%	9/22 = 40%	13/22 = 59%	3/4 = 75%	-	1/1 = 100%	9/26 = 34%	5/7 = 71%	3/4 = 75%	1/2 = 50%	2/7 = 28%	3/5 = 60%
Nuzi Graves	1/23 = 4%			1/22 = 4%	1/22 = 4%	1/4 = 25%	1/16 = 6%	-	1/26 = 3%	1/7 = 14%				
Rimah Temple	11/23 = 47%	1/2 = 50%	2/2 = 100%	10/22 = 45%	12/22 = 54%	3/4 = 75%	9/16 = 56%	1/1 = 100%	-	5/7 = 71%	4/4 = 100%	1/2 = 50%	3/7 = 52%	3/5 = 60%
Rimah Palace	3/23 = 13%			6/22 = 27%	4/22 = 18%	2/4 = 50%	5/16 = 31%	1/1 = 100%	5/26 = 19%	-	3/4 = 75%	1/2 = 50%	2/7 = 28%	3/5 = 60%
Rimah Graves	1/23 = 4%			3/22 = 13%	2/22 = 9%	1/4 = 25%	3/16 = 18%		4/26 = 15%	3/7 = 42%	-		1/7 = 14%	2/5 = 40%
Brak Temple	1/23 = 4%			1/22 = 4%	1/22 = 4%		1/16 = 6%		1/26 = 3%	1/7 = 14%		-	1/7 = 14%	
Brak Palace	3/23 = 13%			4/22 = 18%	4/22 = 18%	1/4 = 25%	2/16 = 12%		3/26 = 11%	2/7 = 28%	1/4 = 25%	1/2 = 50%	-	1/5 = 20%
Brak Houses	1/23 = 4%			3/22 = 13%	2/22 = 9%	2/4 = 50%	3/16 = 18%		3/26 = 11%	3/7 = 42%	2/4 = 50%		1/7 = 14%	

Tab. 3 Formal types by broad technological features

	Assur Temple	Assur Palace	Assur Houses	Assur Graves	Nuzi Temple	Nuzi Palace	Nuzi Houses	Nuzi Graves	Rimah Temple	Rimah Palace	Rimah Graves	Brak Temple	Brak Palace	Brak Houses
Assur Temple	-	3/3 = 100%	2/2 = 100%	8/35 = 22%	10/71 = 14%	1/5 = 20%	4/35 = 11%	1/3 = 33%	6/38 = 15%	3/7 = 43%	1/4 = 25%		3/15 = 20%	1/5 = 20%
Assur Palace	3/59 = 5%		1/2 = 50%											
Assur Houses	2/59 = 3%	1/3 = 33%	-											
Assur Graves	8/59 = 13%			-	9/71 = 12%	1/5 = 20%	5/35 = 14%	1/3 = 33%	6/38 = 15%	4/7 = 57%	3/4 = 75%		3/15 = 20%	1/5 = 20%
Nuzi Temple	10/59 = 16%			9/35 = 25%	-	2/5 = 40%	12/35 = 34%	1/3 = 33%	7/38 = 18%	4/7 = 57%	1/4 = 25%		3/15 = 20%	2/5 = 40%
Nuzi Palace	1/59 = 2%			1/35 = 3%	2/71 = 3%	-	3/35 = 8%			1/7 = 14%			1/15 = 6%	1/5 = 20%
Nuzi Houses	4/59 = 6%			5/35 = 14%	12/71 = 17%	3/5 = 60%	-	2/3 = 66%	3/38 = 8%	4/7 = 57%	2/4 = 50%		4/15 = 26%	3/5 = 60%
Nuzi Graves	1/59 = 2%			1/35 = 3%	1/71 = 1%		2/35 = 5%	-	1/38 = 2%	1/7 = 14%				
Rimah Temple	6/59 = 10%			6/35 = 17%	7/71 = 10%		3/35 = 8%	1/3 = 33%	-	4/7 = 57%	4/4 = 100%		3/15 = 20%	1/5 = 20%
Rimah Palace	3/59 = 5%			4/35 = 11%	4/71 = 5%	1/5 = 20%	4/35 = 11%	1/3 = 33%	4/38 = 10%	-	3/4 = 75%		2/15 = 13%	2/5 = 40%
Rimah Graves	1/59 = 2%			3/35 = 8%	1/71 = 1%		2/35 = 5%		4/38 = 10%	3/7 = 43%	-		1/15 = 6%	1/5 = 20%
Brak Temple												-		
Brak Palace	3/59 = 5%			3/35 = 8%	3/71 = 4%	1/5 = 20%	4/35 = 11%		3/38 = 8%	2/7 = 28%	1/4 = 25%		-	1/5 = 20%
Brak Houses	1/59 = 2%			1/35 = 3%	2/71 = 3%	2/5 = 40%	3/35 = 8%		1/38 = 8%	2/7 = 28%	1/4 = 25%		1/15 = 6%	-

Tab. 4 Broad functional classes by specific technological features

	Assur Temple	Assur Palace	Assur Houses	Assur Graves	Nuzi Temple	Nuzi Palace	Nuzi Houses	Nuzi Graves	Rimah Temple	Rimah Palace	Rimah Graves	Brak Temple	Brak Palace	Brak Houses
Assur Temple	-	3/3 = 100%	3/3 = 100%	2/26 = 7%	4/32 = 12%		1/19 = 5%	1/2 = 50%	5/34 = 14%	2/7 = 28%			1/8 = 12%	
Assur Palace	3/40 = 7%	-												
Assur Houses	3/40 = 7%		-	1/26 = 4%										
Assur Graves	2/40 = 5%		1/3 = 33%	-	7/32 = 21%	2/4 = 50%	4/19 = 21%	1/2 = 50%	8/34 = 23%	4/7 = 57%	3/4 = 75%	1/2 = 50%	3/8 = 37%	3/5 = 60%
Nuzi Temple	4/40 = 10%			7/26 = 27%	-	3/4 = 75%	14/19 = 73%	2/2 = 100%	10/34 = 29%	1/7 = 14%	1/4 = 25%		2/8 = 25%	2/5 = 40%
Nuzi Palace				2/26 = 7%	3/32 = 9%	-	3/19 = 15%	1/2 = 50%	3/34 = 8%		1/4 = 25%		1/8 = 12%	2/5 = 40%
Nuzi Houses	1/40 = 2%			4/26 = 15%	14/32 = 43%	3/4 = 75%	-	2/2 = 100%	6/34 = 17%	1/7 = 14%	1/4 = 25%		1/8 = 12%	3/5 = 60%
Nuzi Graves	1/40 = 2%			1/26 = 4%	2/32 = 6%	1/4 = 25%	2/19 = 10%	-	2/34 = 5%	1/7 = 14%				
Rimah Temple	5/40 = 12%			8/26 = 30%	10/32 = 31%	3/4 = 75%	6/19 = 31%	2/2 = 100%	-	4/7 = 57%	4/4 = 100%	1/2 = 50%	2/8 = 25%	2/5 = 40%
Rimah Palace	2/40 = 5%			4/26 = 15%	1/32 = 3%		1/19 = 5%	1/2 = 50%	4/34 = 11%	-	3/4 = 75%	1/2 = 50%		1/5 = 20%
Rimah Graves				3/26 = 11%	1/32 = 3%	1/4 = 25%	1/19 = 5%		4/34 = 11%	3/7 = 42%	-	1/2 = 50%		1/5 = 20%
Brak Temple				1/26 = 4%					1/34 = 2%	1/7 = 14%	1/4 = 25%	-		
Brak Palace	1/40 = 2%			3/26 = 11%	2/32 = 6%	1/4 = 25%	1/19 = 5%		2/34 = 5%				-	1/5 = 20%
Brak Houses				3/26 = 11%	2/32 = 6%	2/4 = 50%	3/19 = 15%		2/34 = 5%	1/7 = 14%	1/4 = 25%		1/8 = 12%	-

Summing up the methods adopted so far, the work has been divided into three steps:

1. Filing of the published material according to find-spots, function, formal typology, and technological characteristics.
2. Regrouping of this material into new classes established by aggregating the functional, typological, and technological attributes.
3. Counting, on the base of the outcome of the cross-tabulations displayed in the tables, the occurrences of these classes in all the contexts in order to recognize the qualitative richness and the degree of similarity among the contexts.

2 Frequency of classes within contexts (tab. A, charts 1-2)

A summary of the frequency of classes within the contexts may be observed in table A, where each context is represented by the classes attested in it as a result of the cross-tabulations. In order to evaluate the actual consistency of the data the number of occurrences has also been furnished (the multiple entries were suggested by the nature of the publications). It is immediately evident that there is a proportional ratio between the number of occurrences and the number of classes, so that to evaluate the actual variety of each context we had to introduce a new figure that could be called "coefficient of variety" as the result of the ratio between the number of the classes attested within a context and the finds in it. Another aspect of this problem is represented by the quantitative difference of the assemblages of various contexts, because the classes are represented with acceptable reliability only when a certain number of occurrences is attained. This necessarily results in the selection of the five most reliable contexts. The classes obtained crossing the attributes at a more general level (tables 1-2) have been charted according only to their number (chart 1), since they are relatively independent from the number of pieces at this level of analysis. Instead of evaluating the variety with respect to the typological and specific technological features it seemed necessary to make use of the "coefficient of variety", because at such a specific stage of elaboration (i.e. with respect to typology there are in all about 160 entries organized on five hierarchical levels) it is more likely that the variation according to the effective number of occurrences.

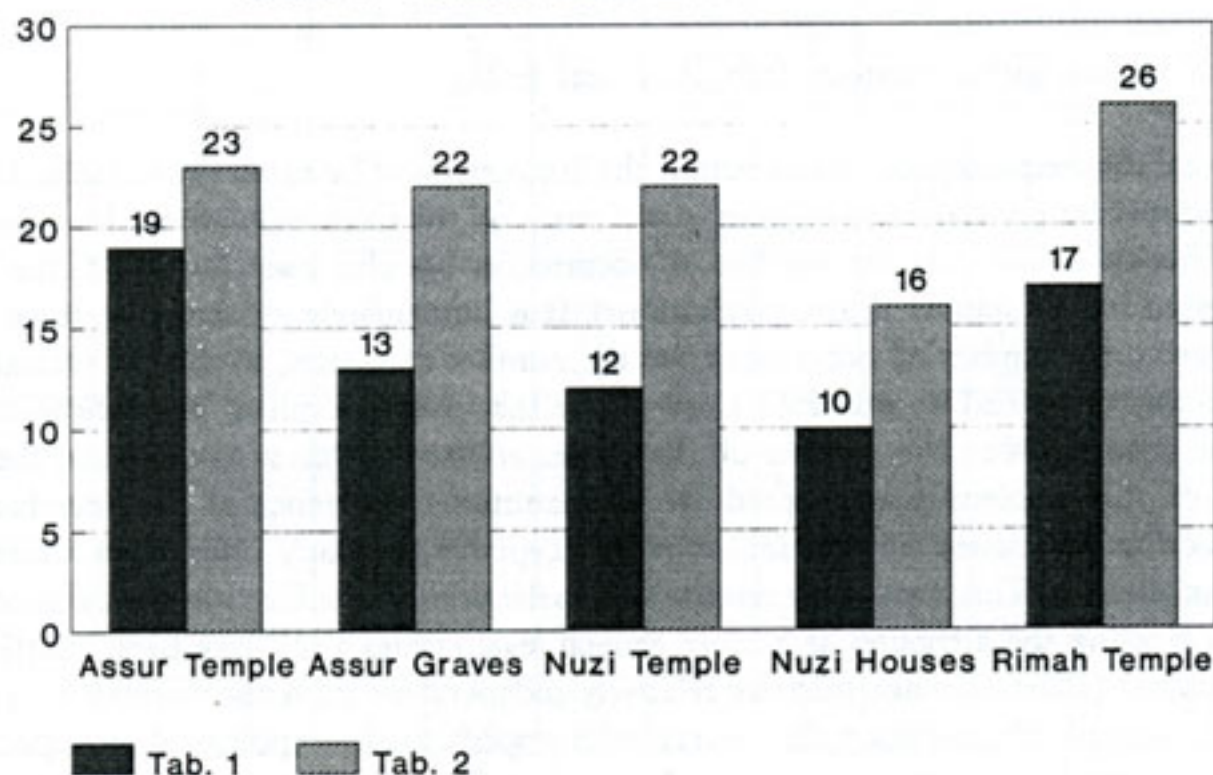
Tab. A Classes and occurrences

CONTEXTS	CLASSES				OCCURRENCES			
	Tab. 1	Tab. 2	Tab. 3	Tab. 4	Simple	Few	Several	Many
Assur Temple	19	23	59	40	161	-	9	-
Assur Palace*	2	2	3	3	3	-	-	-
Assur Graves	13	22	35	26	79	-	47	3
Assur Houses*	2	2	2	3	7	-	-	-
Nuzi Temple	12	22	71	32	152	5	-	26
Nuzi Palace	3	4	5	4	5	-	-	3
Nuzi Graves*	1	1	3	2	5	-	-	-
Nuzi Houses	10	16	35	19	93	2	6	10
Rimah Temple	17	26	38	34	45	-	6	35
Rimah Palace	5	7	7	7	13	4	1	11
Rimah Graves*	3	4	4	4	3	-	-	1
Brak Temple*	2	2	-	2	4	-	-	-
Brak Palace	7	7	15	8	34	-	2	2
Brak Houses	5	5	5	5	4	-	1	1

N.B. Contexts with bold outline are the most reliable; contexts with asterisk do not present sufficient data

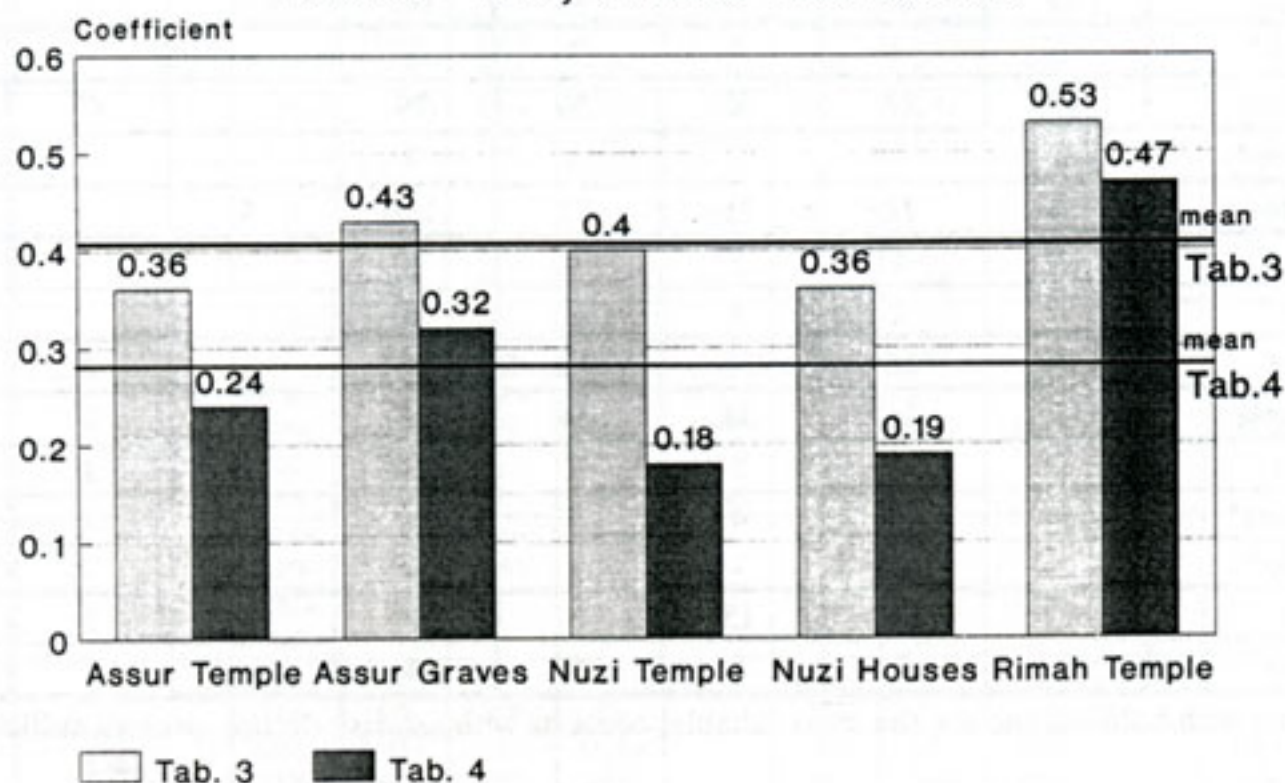
At a basic level of analysis (chart 1, table 1), represented by the surveying of the presence of broad functional classes (such as beads, pendants, vessels, etc.), it is quite interesting that in spite of the different number of occurrences, all of the five most reliable contexts show almost the same number of classes (mean 14; standard deviation 3). Also at the second level of analysis (chart 1, table 2), i.e. the crossing of the broad functional classes with the broad technological features (glass, faience-frit, glazed pottery), a certain homogeneity of the presences is attested, notwithstanding the numerical differences of the materials. With a mean of 21.8 the standard deviation is only 2.32.

Chart 1 Classes within most reliable contexts



As far as the frequency of the typological classes is concerned (chart 2, table 3), it is possible to stress the high values of the temple of Rimah that displays almost one type for every two occurrences. This is also apparent from the consistent deviation (0.12) of Rimah with respect to the mean of 0.41. The different contexts of other sites show a lower typological variety and a relative homogeneity. The latter point is of some significance because it bears out of the remarkable variability in the number of occurrences. The occurrences of the specific technological features (chart 2, table 4), displayed by means of

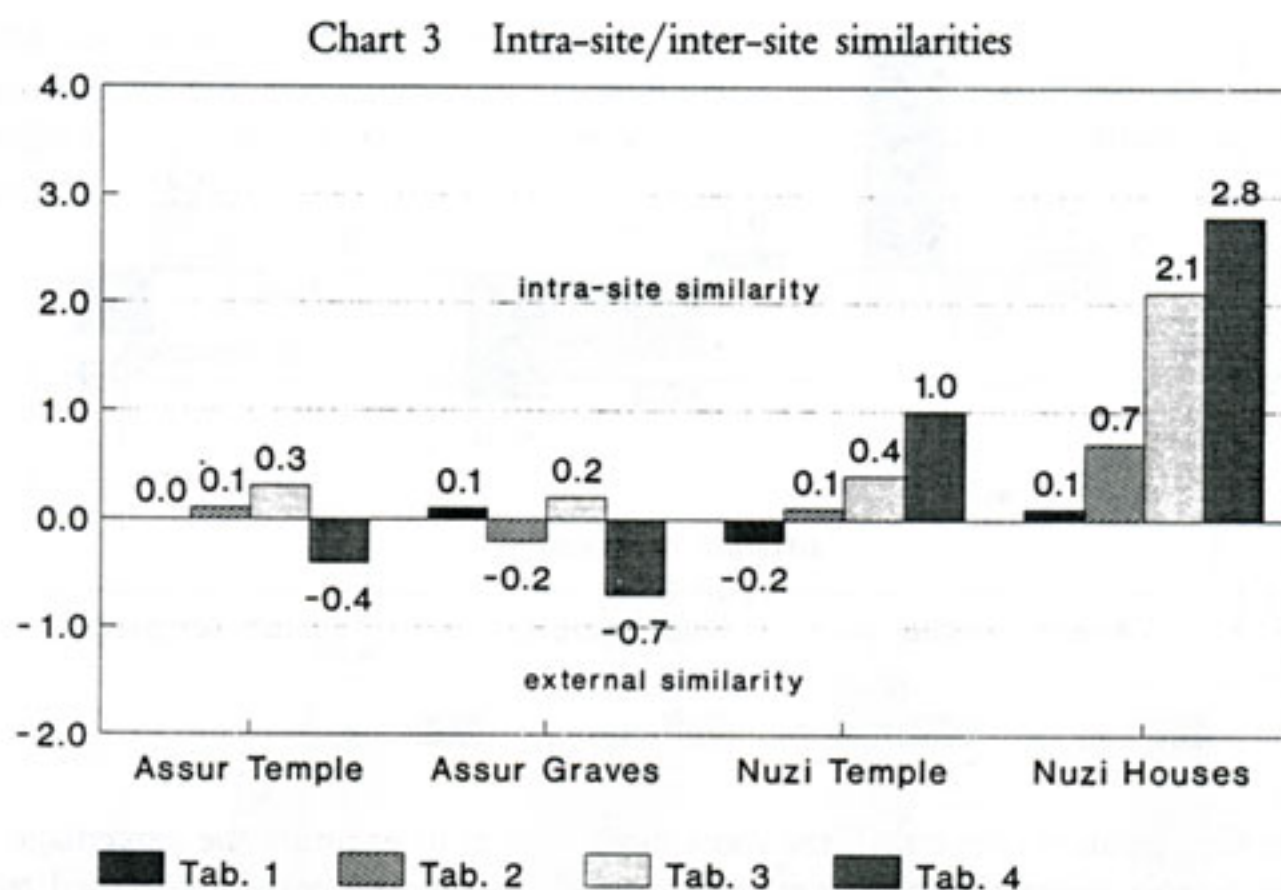
Chart 2 Variety of classes within contexts



the coefficient of variety, are more or less regular in the most reliable contexts, the only noteworthy deviation being again represented by the temple of Tell Rimah. In this case the difference is even more significant than in the preceding case, because it doubles the mean of the other contexts. The graves of Assur hold an intermediate position between Tell Rimah and the rest, showing a certain variability with respect to specific technological features as well as to the typological ones.

3 Rate of similarity of each context with respect to those in its own site versus the other external contexts

In order to analyse the relationships between the materials found at one site and those retrieved from the others, we have tried to define the degree of internal similarity of each context. This value can be established by observing the frequency of the classes previously illustrated (§ 1.3). The percentage of classes shared by different contexts indicates a higher or lower degree of similarity. Since our objective is to consider the similarity of a context with respect to its site and to the other contexts of different sites, it deemed suitable to utilize the ratio of the average of classes common to a context with the others in the same site *versus* the average of common classes of that same context with those in other sites. If such a ratio equals 1,⁵ it means that the intra-site and the external similarities of the context are equivalent. If the ratio is more than 1, it means that intra-site similarities are greater than the external ones, i.e. that the typological and technological features shared by the contexts within the site are more homogeneous than those exhibited by external contexts. Conversely, if the ratio is less than 1, the internal similarities are fewer than the external ones. The results for tables 1–4 have been plotted in chart 3 only for the most reliable contexts (s. § 2). The temple of Tell Rimah, however, had to be excluded because it has no reliable context within the same site to be compared with, although it has been considered among the external contexts.



As far as table 1 is concerned, we can note that the pattern of distribution of the functional classes is — also in this case considering similarities — homogeneous and does not show any particular grouping. Looking at the broad functional classes by broad technological features (table 2) the most indicative de-

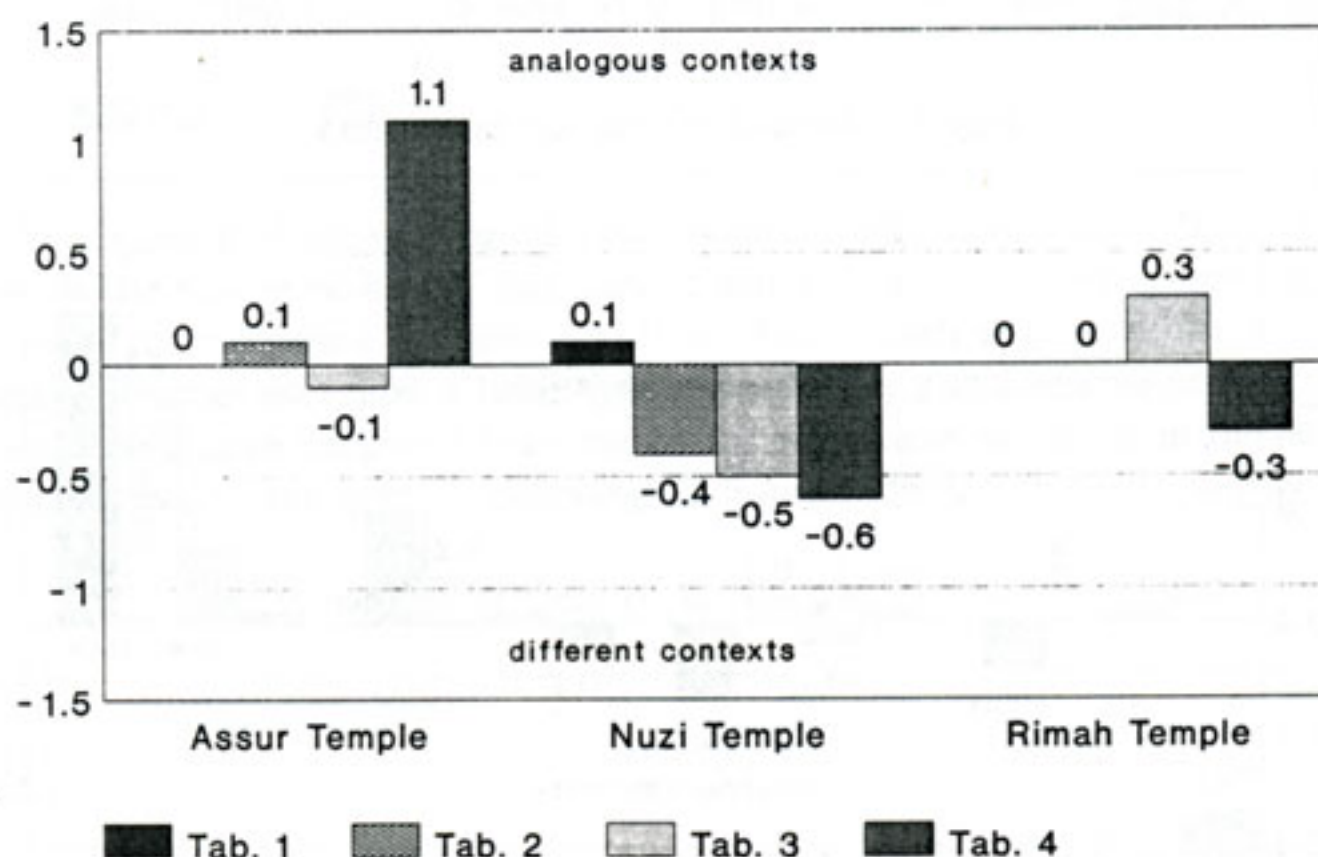
⁵ For the sake of clearness in charts 3–4, however, the quantity 1 has been subtracted so that the value 0 (corresponding to a ratio of 1) may be seen as the point where the context taken into account has the same number of *intrasite* and *intersite* contacts.

parture towards the intra-site similarities is that of the houses of Nuzi, which share most of the classes (81%) with the temple of the same town. The same datum, but with much higher figures, can be observed in tables 3–4, where the typological and technological features of the Nuzi houses indicate a high internal similarity of this context, probably determined by the functional nature of the domestic assemblages. This pattern is attested, though with values proportionally lower, also in the temple of the same city. The latter exhibits an interesting behaviour especially if compared to the analogous temple context of Assur. With respect to the specific technological features the temple of Nuzi turns out to be – as stated above – much more coherent with respect to the site assemblages (i.e. the houses), while that of Assur shares more classes with the external contexts. In this same site the graves tally with the evidence of the temple. After this review of the data the characterization of Nuzi emerges under the technological and, partly, typological features; Assur on the contrary shares a large percentage of its classes with other sites.

4 Rate of similarity between analogous types of contexts

Only for a specific kind of context, namely the temple, it is possible to analyse the relationships between the materials found in it and those retrieved in the other different kinds of contexts (chart 4). In fact, due to the paucity of data, we had to exclude a similar analysis for the domestic and burial contexts (the only reliable percentages being obtained from Assur-graves and Nuzi-houses) and for the palatial context we had to confine ourselves to a comparison based on the internal frequency of the classes.

Chart 4 Specialization of temple contexts



As far as the first point is concerned, the most direct way is to examine the percentage of common classes shared by temple contexts with respect to those non-analogous contexts deemed reliable on the basis of the number of occurrences and the frequency of the classes (i.e. Assur graves and Nuzi houses). Although this caused the exclusion of a quantity of contexts, it seemed anyway preferable to limit the crossing of the relevant features to safe contexts.

Temple: Only the temples of Nuzi, Assur and Tell Rimah may be considered reliable both with respect to the number of pieces and of classes. To better evaluate the eventual outcomes of chart 4 it is necessary to take into account that Nuzi is the context with the greatest number of occurrences, while at Assur about one half of the Nuzi figures is attested and at Tell Rimah a quarter. The general picture hints towards a non-specialized nature of the temple assemblages. The significant case of the temple of Assur with respect to the technological features may anyhow signify that, at least for this site, there was a

greater sharing with analogous contexts than with the different ones, although the overall figure remains low.

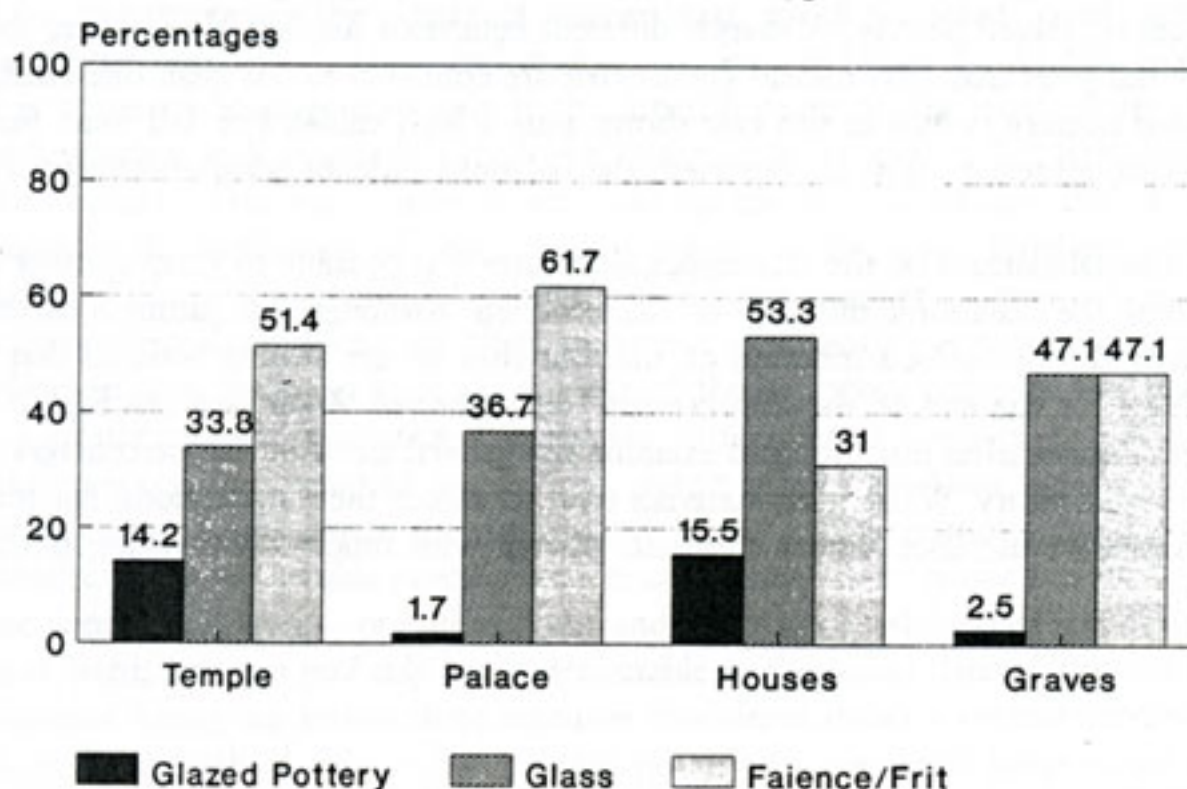
Palace: The most suitable palatial contexts are those of Tell Brak, Tell Rimah and also Nuzi, which, in spite of a considerable number of occurrences, show a limited number of classes. While the general pattern of the distribution of classes is coherent, there is only one case that emerges with respect to the typological features, namely Tell Brak. In fact in the Brak sample the figure of table 3 doubles the number of classes of the other sites.

5 Distribution of the technological features

In this last paragraph we have tried to consider the distribution of the technological features. To achieve an acceptable degree of validity it was advisable to keep the enquiry at a very general level, so that it has been possible to include all the contexts. Vitreous materials can be distinguished into four main productions: glass, faience/frit, and glazed pottery, all more or less obtained from almost the same basic components. This produced a considerable confusion in scientific literature; nevertheless a general *consensus* has arisen in defining these matters (see e.g. Bimson, Freestone 1987). Glass is obtained through the complete fusion into a liquid melt of the basic components with the addition of oxides and carbonites, reaching a non-crystalline structure and thus differentiating itself from faience and frit (Moorey 1985: 194). Faience is constituted by a core of sintered quartz externally glazed, whereas frit, which has to be distinguished from the latter, presents almost the same body of sintered quartz without the external glaze.⁶ Because of the intimate technical similarity of these two materials, and in order to avoid an excessive scattering of the data, we have considered them together in cross-tabulations (and resulting tables) and charts. Finally, glazed pottery consists of pottery or terracotta covered with a particular kind of glaze, partly obtained with the addition of varying quantities of lead to adhere better to the surface of the objects or to determine the colour (Moorey 1985: 165–166).

Three charts have thus been produced displaying the distribution according to the contexts (chart 5a), then within each site (chart 5b), and finally dividing the material in accordance to the chronological development (chart 5c).

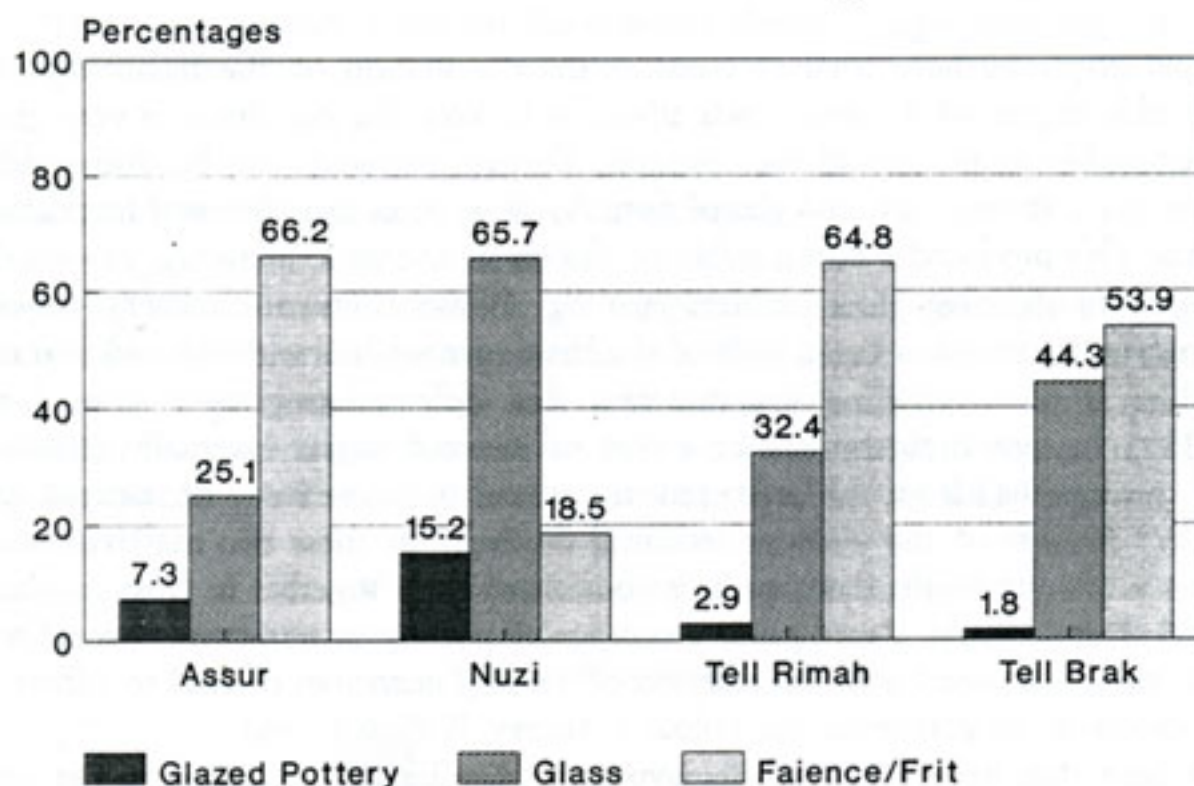
Chart 5a Distribution within each type of context



⁶ In some cases, the vitrified external surface of faience may have decayed. As a particular kind of frit can be considered the so-called "Egyptian Blue", which consists of a mixture of powdered quartz, calcite and copper silicate, the latter being responsible for its characteristic colour (Moorey 1985: 188–189).

5.1 Observing how the three technological groups are distributed within each type of context,⁷ we may stress that faience/frit are the materials with larger attestations in temple and palatial (public) contexts, in the former representing one half of the total occurrences, in the latter almost two thirds. This trend is reversed in the domestic contexts, where faience/frit constitute only one third of the overall material. Finally, in the graves, faience/frit reach almost one half of the total, exactly balanced by the value of glass; glazed pottery being in fact scarcely present. Considering glass presence, it comprises one half in houses and graves, while it represents almost one third in public contexts. Glazed pottery is the material which shows the lower attestations in the archaeological record.

Chart 5b Site-distribution of technological features

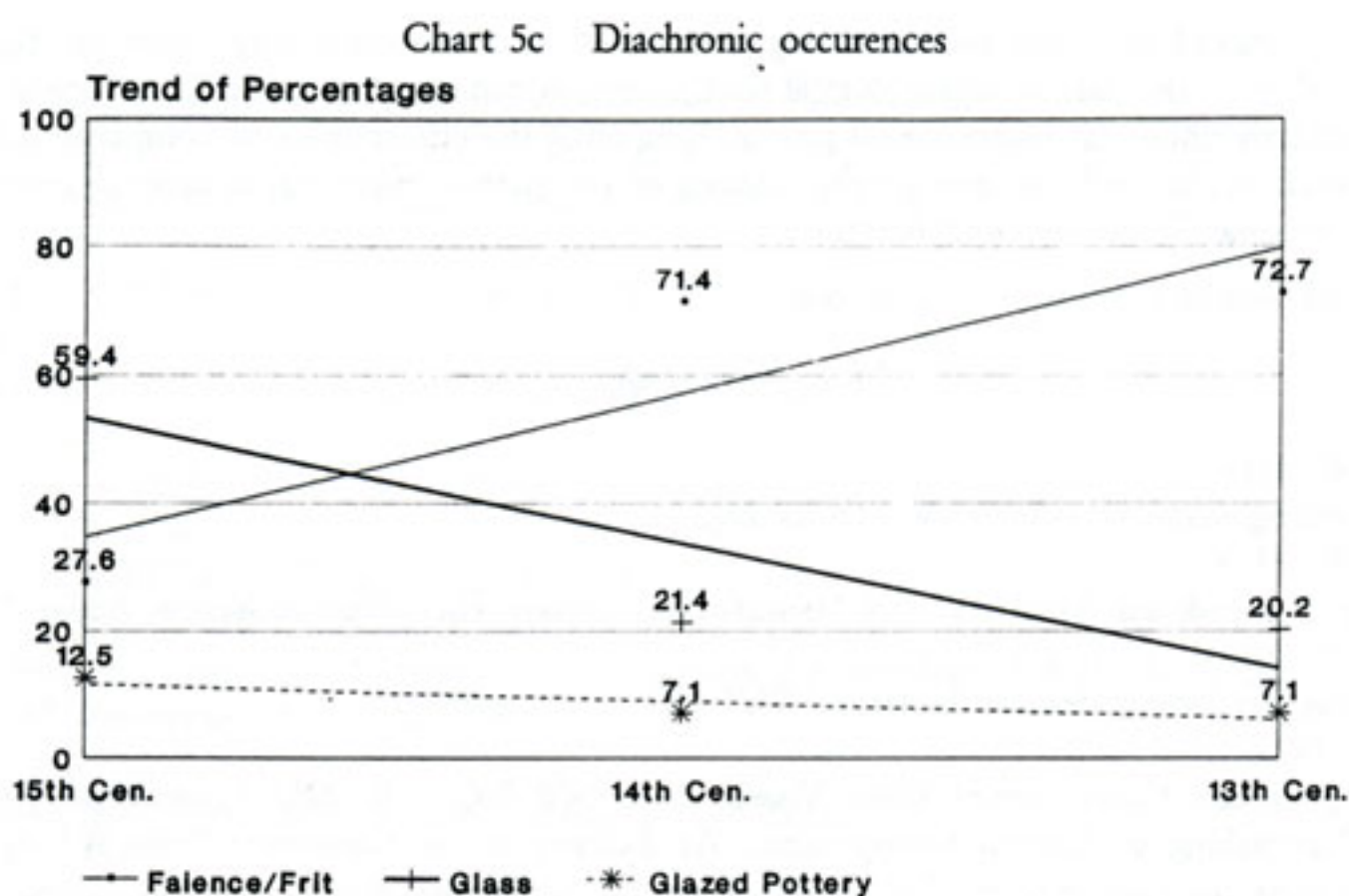


5.2 The distribution of the three broad technological variables considered within each site is examined in chart 5b. At Assur faience/frit represent two thirds of the total, while glass is only one quarter. A similar pattern is attested at Tell Rimah, which only differs for a slightly higher percentage of glass and for fewer occurrences of glazed pottery. A sharply different behaviour displays Nuzi, where the glass attestations constitute the great majority; instead faience/frit are confined to less than one fifth, being almost equaled by glazed pottery (which in this case shows quite a high value). For Tell Brak, from which only few occurrences of glazed pottery are reported, the balanced ratio of glass and faience/frit is remarkable.

5.3 From the cross-tabulations of the technological features it is possible to grasp another kind of information concerning the diachronic diffusion of the materials. Although this datum is partially dependent from the different chronological attribution of the four sites we are dealing with, so that it reflects the behaviour of Nuzi for the end of the 15th century⁸ and those of Assur and Tell Rimah for the subsequent period, it is nonetheless interesting to examine the general trend of the percentages of the materials in the 15th–13th century. While glass materials tend to reduce their attestations, faience/frit exhibit a regular and progressive increase; almost constant, though with much lower values, is the presence of glazed pottery.

⁷ A general sketch of the distribution of the different materials within the contexts has been put forward by Moorey (1985: tab. II).

⁸ Stein has proposed to date the destruction of Nuzi II to the middle of the 14th century (Stein 1989:60).



6. Conclusions

The principal aim of this study was to investigate the distribution of vitreous materials in four quite general types of contexts (temple, palace, houses, graves) of four Late Bronze Age cities (Assur, Nuzi, Tell Rimah, Tell Brak). This analysis has been carried out taking into account the various attributes of materials, thus defining "classes", based on the crossing of the functional, the typological, and the technological traits. Instead of studying only the distribution of pieces, we focused our attention on the distribution of such classes, examining their occurrences and groupings. Therefore classes attestations have been drawn from overall cross-tabulations by contexts represented in tables 1–4.

First, we have confronted contexts according to the simple internal occurrences of the different kinds of classes, both with their rough value (chart 1) — as far as more general classes were concerned — and introducing a figure representing the variety of each context, which we called "coefficient of variety" as the ratio between the number of classes and that of occurrences (chart 2). At this level of the simple variety, there is a general homogeneity only if the broad features of the material are examined, while considering technological and, especially, typological features, the temple of Tell Rimah holds apart from the rest of the contexts. This may partly depend also on the cultural background of this site.

When evaluating the similarities of one site with respect to the other, Nuzi emerges for its greater internal similarity; Assur instead shares its features with a larger number of external contexts. This may well reflect a chronological anteriority of Nuzi, in respect of the other contexts considered. A possibly interesting indication may be drawn from the analysis of the analogous contexts: the temple assemblages do not show a greater internal coherency if compared with different kinds of contexts, i.e. the former do not constitute a specialized group of material, the datum offered by Assur for the technological traits being difficult to assess. Dealing with the distribution of the broad technological classes, the principal outcome is constituted by remarkable major presences of faience/frit in public contexts. The same materials — at a site comparison level — prevail at Assur and Tell Rimah, while glass represents the most diffused material at Nuzi, a datum probably again attributable to the earlier date of this city, for the general trend of attestations during the almost three centuries considered shows a gradual decrease of glass diffusion balanced by the growth of faience/frit. Glazed pottery reaches much lower values with respect to the other materials, but, diachronically, it exhibits an almost constant presence. One aspect which comes out from these results lies in the particular behaviour of Nuzi, which emerges in those cases in which the analysis is conducted according to parameters quite sensitive to the diachronical developments, on the other hand Assur is characterized by a large sharing of features with other sites.

Finally, it should be recognized the strong dependance of these preliminary results on the quantity and the quality of the data in archaeological publications, which often do not offer sufficient information, particularly under the technological profile, hampering the effectiveness of comparisons. We hope that our work will be useful to appraise the contexts of the vitreous materials, in order to grasp, eventually, their original distribution and function.

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⁹ Page numbers repeated more than once refer to different entries.

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