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LATE FIFTH AND EARLY FOURTH MILLENNIUM EXCHANGE SYSTEMS IN NORTHERN MESOPOTAMIA: CHEMICAL CHARACTERIZATION OF SPRIG AND IMPRESSED WARES[1)]

Mitchell S. ROTHMAN* and M. James BLACKMAN**

Introduction and Problem

The fourth millennium B.C. Uruk culture of the southern alluvium of modern Iraq and its Late Chalcolithic neighbors in northern Iraq, Syria, southeastern Turkey, and Western Iran are the topic of considerable fieldwork, research, and interpretation [Postgate, ed. 2002; Rothman, ed. 2001; Lupton 1996; Algaze 1993]. The generally accepted idea that this period saw the development of the first state-level societies and first true cities, as well as increased contact and outward migration from the south (the Uruk Expansion), is what has made it so interesting to scholars of culture change and evolution.

At the core of this research interest is the question of how the sorts of complex societies that we know today planted their first seeds five and half millennia ago in the alluvial plains and hills of Mesopotamia. By complexity, we mean that conditions made it impossible for members of a polity to organize themselves solely through extended kinship systems. Administrative forms of social organization with increasing levels of hierarchy and centralization replaced or complemented earlier modes of social and political organization [Rothman 1994; Wright and Johnson 1975; Johnson 1973; Flannery 1972; Wallace 1971]. In addition, complexity refers to changes in the economic life of people. It implies greater specialization, surplus production, and more geographically wide-ranging and formal exchange systems [Blanton *et al.* 1997].

The most dramatic of the developments toward complexity occurred from the middle to the end of the fourth millennium. At that time settlements or colonies of southerners were founded at places like Hacınebi [Stein, ed. 1999; Stein and Mısır 1994; Stein *et al.* 1996], Sheikh Hassan [Boese 1986/7; 1995], Jebel Aruda [van Driel *et al.* 1979, 1985], and Habuba Kabira [Strommenger 1980] on the Upper Euphrates. The most often cited theory to explain how and why this expansion occurred is that of Algaze [Algaze 1989; 1993]. In his theory he proposes that the development of southern city-states of the Uruk culture necessarily catalyzed an expansion from the alluvial south for purposes of trade in materials lacking there. The more highly organized south was able to dominate northern Late Chalcolithic societies, where the desired resources were available, either directly or through trade routes to source areas, because northern societies were more simply organized. Reaction to Algaze's theory, especially in regard to Algaze's claim that the north was organized at a low level of complexity prior to the Uruk Expansion, was quick and often contradictory [Stein 1990; Rothman 1993;

1) This project was begun by Joan Oates. On a lecturing trip to the University of Pennsylvania Museum, she brought some Brak sherds to compare with those from Tepe Gawra. Their similarity was striking. She left the sherds with the suggestion to Near Section curator Richard Zettler that these sherds be chemically analyzed. When Chris Edens was the Robert H. Dyson, Jr. Fellow at the University of Pennsylvania Museum, Richard Zettler asked him to take on the project. He asked Warwick Ball for comparative material. Edens' move to Yemen as the director of the AIYS ended his ability to complete the project. Near East Section Curator Richard Zettler then asked M. Rothman to take it over. Thanks to Jim Blackman for again working on a Museum project and to Joan Oates and Warwick Ball for information provided. Thanks also to Shannon White, Keeper of the Near East Section of the University of Pennsylvania Museum, for being always helpful, efficient, and cheerful in providing access to the Gawra collections.

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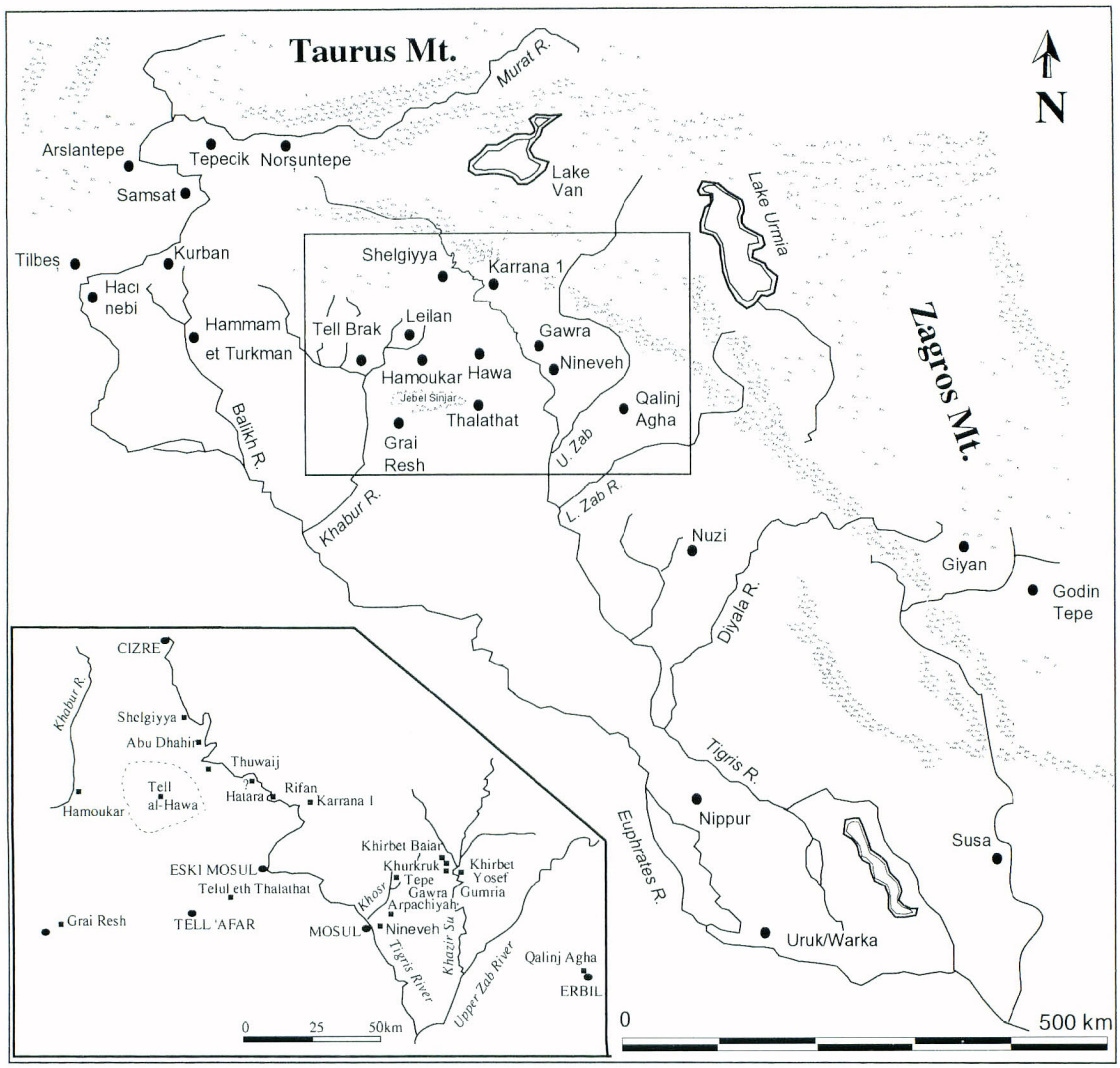

Fig. 1 Map of Mesopotamia with the area of sprig and impressed ware distribution.

Rothman and Blackman 1990; Lupton 1996]. Since publication of his initial theory, fieldwork on northern Late Chalcolithic societies has increased dramatically, in part to test Algaze's theory. New analyses of sites such as Arslantepe [Frangipane 2000; 2001; Frangipane and Palmieri 1983], Hacınebi [Stein, ed. 1999], Tepe Gawra [Rothman 2002a; 2002b], Tell Brak [J. and D. Oates 1994; 1997; Emberling *et al.*1999; Emberling and McDonald 2001], Tell al-Hawa [Ball and Wilkinson 1989], and Hamoukar [Gibson 2000] contradict the idea of politically and economically underdeveloped northern societies (see Fig. 1). Algaze himself now rejects that part of his theory [Algaze 2001], although he still sees exchange (trade)[2] as a key to explaining both increasing social complexity and intra- or interregional contact.

If these northern societies were not backwaters but developing societies, how were they organized economically and politically in the late fifth and early fourth millennia BC at the beginning of the process of developing complexity? What was the nature of their production and exchange systems? One key may be pottery production and exchange. Ball in 1997 proposed that a small site on the Tigris near the modern Iraqi-Turkish border, Shelgiyya, was the center of large-scale produc-

2) The theoretical issue of what constitutes a system of formal trade, as opposed to phenomena like local gift exchange or down-the-line exchange [Renfrew *et al.* 1977] is a complex one. The difference is not essential for the argument made here, but should be noted. Sloppy assignment of terms like trade or exchange can significantly alter the interpretation of ancient phenomena.

tion of fine pottery for exchange. At Shelgiyya crews uncovered dense deposits of a specialized, fine pottery type, sprig ware[3], typical of the LC1 (Terminal Ubaid) to early LC2 (Early Uruk) periods of late fifth into early fourth millennia B.C. (see Rothman 2001a for discussion of period terminology). The great numbers of such wares as well as the presence of many kiln wasters and much slag convinced Ball that Shelgiyya was a manufacturing center of this pottery. Few examples of this ware have been recovered in other nearby sites in the Eski Mosul [Ball 1997: 96]. If it were a manufacturing center, Shelgiyya's "market" would therefore have to be fairly extensive geographically given its small size and location. This would imply a significant exchange system existed much earlier than scholars believed, certainly than Algaze's initial theory asserted.

This project was started to determine whether the source(s) of clays from two types of pottery, sprig ware and another late fifth millennium fine pottery type, impressed, bubble or blister ware, imply the existence of such a central production and extensive exchange system. Sprig ware is usually finely tempered red or buff slipped ware with black painted designs that look like the sprigs of plants (Fig. 2). Ball [Ball 1997; n.d.] and Oates [J. Oates 1987] appear to use the term for many painted designs on a similarly tempered and fired clay base. Impressed ware is the other fine pottery ware, which was limited to the northeast Iraqi piedmont and Jazira of Iraq, northeastern Syria, and the highlands along the western Murat River in Eastern Turkey at this time period (see below). In fact, "impressed" ware includes sherds with impressed and applique designs and also with incised lines. Many of the impressed ware sherds are also bubble or blister ware, a very finely tempered, high fired, buff to white ceramic (Fig. 3). It is sometimes called bubble or blister ware, because it was slab constructed and very high fired, at times resulting in a separation or bubbling of the slabs (Fig. 4). Most of this bubble or blister ware is impressed or appliqued with a variety of designs of rosettes, triangles, straight lines, and divided lines which look like ladders or the impression of a comb (Fig. 3). Applique rope designs were also common. Some examples of bubble or blister ware were not decorated, but most were.

Instrumental neutron activation analysis (INAA), the technique used here, fingerprints the chemical composition of clays in pottery (or sealing clay: see Rothman and Blackman 1990). Because the percentages of trace elements of clays from various locales are different, an identical clay composi-

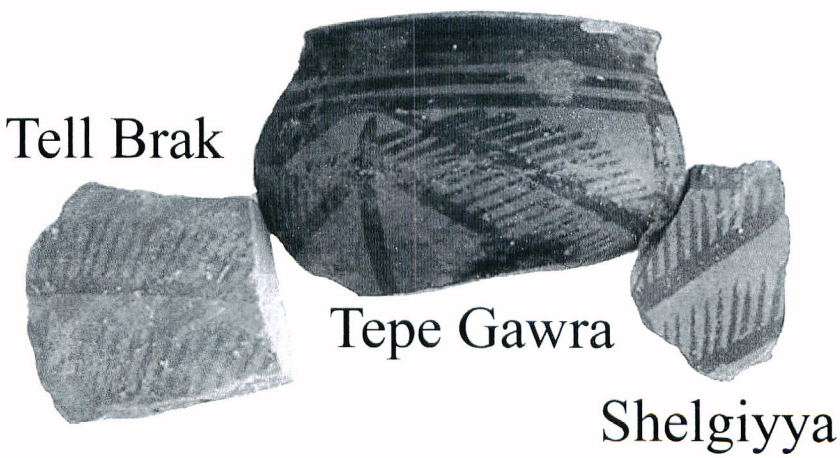

Fig. 2 Examples of sprig ware from Brak, Gawra and Shelgiyya.

3) Ball [n.d.] appears to include in his category of "sprig ware" many types of similarly tempered, formed, and fired pottery, with designs other than those traditionally considered sprig ware. Oates [Oates and Oates 1987] also use the term for LC1 painted wares. As these are apparently manufactured in the same way, they are appropriate for this analysis, although we would limit the term to a specific set of painted pottery.

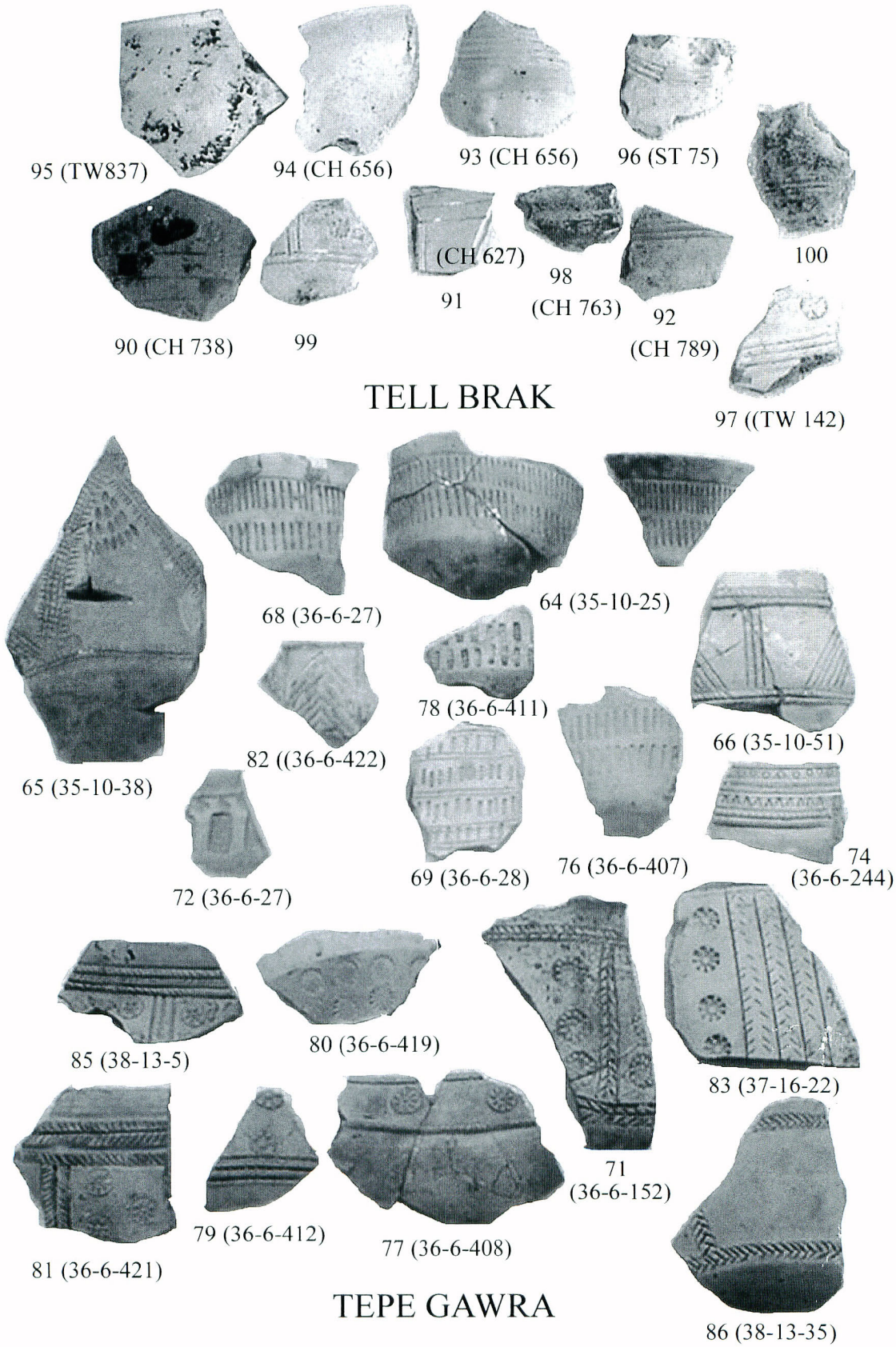

Fig. 3 Impressed ware sampled from Tepe Gawra and Tell Brak.

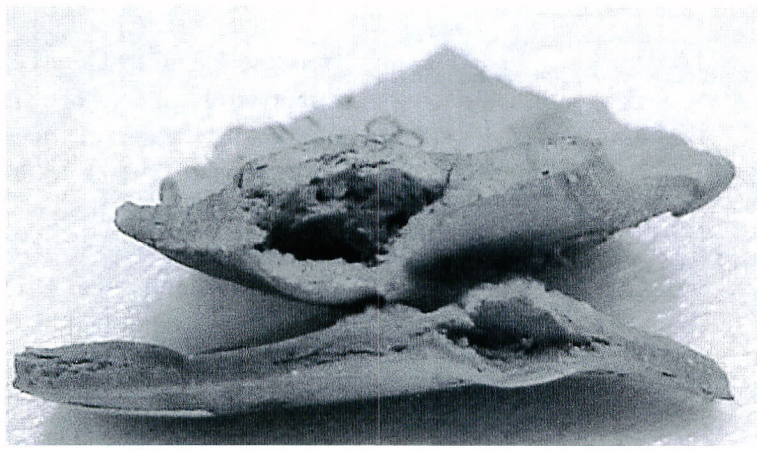

Fig. 4 Photograph of impressed ware showing bubbling of slabs.

tion found in various pots or other clay items at various sites over a significant geographical range should represent a single place of manufacture from which the product is exchanged. If, further, it can be established that the chemical composition is the same as clays from a particular place, that pinpoints the locale of manufacture. Therefore, samples of these pottery types were drawn from three sites in northern Mesopotamia: Tepe Gawra, Shelgiyya, and Tell Brak.

Gawra, Shelgiyya, and Brak in the Late Fifth and fourth Millennia

These three sites represent the gamut of social-economic organizations for the LC1 and early LC2 periods. Tell Brak became one of the largest and most complex northern centers of the fourth millennium, as large as 150 hectares in the LC3 or Northern Middle Uruk [J. and D. Oates 1997; J. Oates 2002]. Gawra appears to have functioned as a small center for the piedmont and hills [Rothman 2002a], but it never exceeded a hectare and a half in size. Shelgiyya reached as much as four hectares over two small mounds and their surroundings by the first millennium, but excavations at Shelgiyya revealed little late fifth or early fourth millennium architecture and few remains of any kind from the late fourth millennium [Ball, ed. n.d.].

Shelgiyya's functions remain unknown other than the theorized pottery and metal production (Fig. 5). "The deposits [at Shelgiyya] found with the vast amounts of sprig ware in trenches [H] and [J] on the northern slopes of Mound B below Trench [F] do not bear any resemblance to conventional occupation deposits" [Ball n.d.: 123]. In fact, "no evidence was found of large-scale Earlier Uruk [LC1-early LC2] occupation consistent with producing such prodigious amounts of waste sprig ware" [ibid.]. Excavators recovered no pottery kilns or firing pits. The question, then, of who the people who were producing such industrial amounts of pottery and over what period they did so remains unanswered. As Ball [n.d.] writes, the site sits in a very prodigious geographical position at the boundaries of the highland plateau and the eastern edge of the rainfall agriculture rich Jazira plains. This is a setting reminiscent of Gawra [Rothman 2002a: 7–8]. However, Gawra was continuously occupied from the Halaf Period or earlier, while Shelgiyya seems episodically occupied starting in 'Ubaid 4. In short, we know very little about Shelgiyya other than its great abundance of sprig ware, wasters, and slag re-deposited from somewhere on the mound.

Gawra is among the best understood sites of this period because of the wide horizontal exposures of the site excavated by teams under E. A. Speiser's and, more importantly, Charles Bache's direction [Speiser 1935; Tobler 1950; Rothman 2002a: chapter 2]. The 'Ubaid period ended at Gawra in level XIIA. Level XII is transitional between Ubaid and Uruk periods, but its pottery, as represented in whole pots[4], consisted mostly of unpainted plain wares. This is a marker of the Early Uruk or LC2 period. The exception to this plain ware trend was, of course, sprig ware.

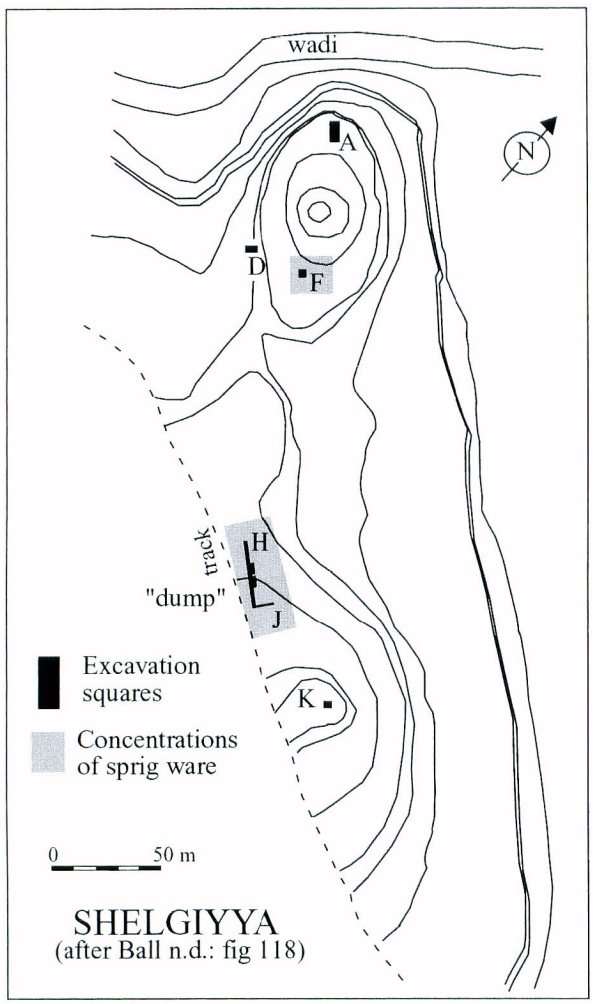

Fig. 5 Topographic map of Shelgiyya, showing areas of sprig ware concentrations.

Level XII (Fig. 6) illustrates the transition from the Ubaid to Uruk periods in more than just style of pottery. The site at this stratum is typified by a series of tripartite building along its southeastern flank. Analysis of their contents indicates that they were extended family domiciles with evidence of domestic life, craft production, and ritual [Rothman 2002a: 75-92]. Of these, the building with the so-called White (painted) Room was the largest, was located near the entry road and had signs of being the domicile of a prominent person. Two sets of buildings, however, indicate that some centralized functions were already found at Gawra in level XII. Near the center of the mound, excavators recovered a large, probably shared grain storage silo. Near the entrance road and the White Room building, a series of small, enclosed storerooms had been built. Behind those were open clay sorting bins and a building that had elements of domestic life but also had a series of Wide Flower pots (interpreted as ration type bowls), a stamp seal, macehead, and serving wares, including one of the sprig ware bowls sampled for this project. Another of the sampled sprig ware sherds was from the northernmost storage room. Those rooms and other parts of the site contained raw materials from distant sources: lapis lazuli from Badakshan, obsidian from Van [G. Wright 1969], gold from somewhere in the Taurus, marble, granite, chlorite (soapstone), and copper [Rothman 2002a: 81]. All of this indicates that Gawra was part of a far-flung exchange network. Indications of social and economic complexity in organizing this exchange were also evident. A study of the sources of clay sealings indicated that for much of the late fifth and early fourth millennia, sealing clay came from a homogeneous source [Rothman and Blackman 1990]. From levels XI/XA to IX all tested sealings were from this same source. In levels XII, XIAB, and VIII, however, sealed items came from a series of as yet unidentified "foreign" sources. Sprig ware was found throughout this level, although it did cluster in the store rooms and possible exchange processing area. Impressed ware seems to have clustered near the White Room building.

After the destruction of level XII, level XIAB[5] was quickly constructed. Level XIAB (Fig. 7) has evidence of houses of extended families in its earlier XIB phase and smaller clusters of houses in its later XIA phase. The most spectacular of the buildings of that later phase is the Round House [Rothman 2002a: 86–88, figures 5.22 and 5.23]. This thick-walled structure has been interpreted in

4) Because of the excavators' preference for saving "pretty sherds," many of the XII potsherds registered and stored at the University of Pennsylvania Museum are painted or impressed. Whole vessels, however, paint a completely different picture [Rothman 2002a].

5) Re-analysis of the stratigraphy of Tepe Gawra showed that there were two phases of the old level XIA [Rothman 2002a: 34-37]. Hence the new name XIAB. Phase XIB was made up mostly of multi-family houses, but by XIA a fortress (the Round House), a formal gateway, and other specialized buildings had been added.

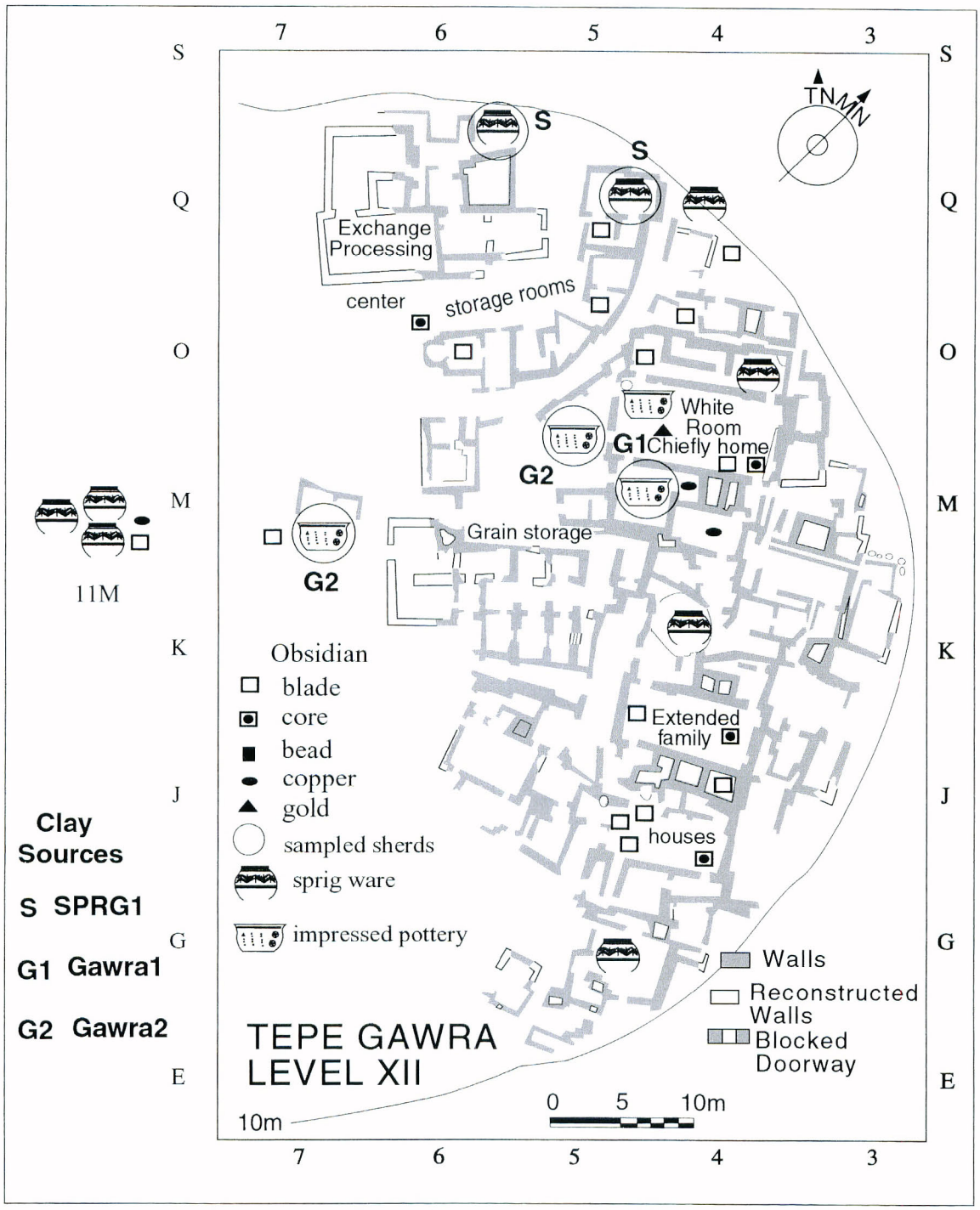

Fig. 6 Site plan of Gawra level XII with distributions of pottery and imports.

various ways. Trümpelmann [1989] believes it was a very large silo. Tobler in his final report saw it as a fort [Tobler 1950: 21–23]. Speiser [1936: 12] originally believed that it was a temple. Its contents, however, are consistent with Tobler's interpretation. The central room was too small, inaccessible, and without the other characteristics of contemporary temples [Rothman 2002a: 72–73] to attribute to it any religious functions. It had rooms with stored grain, but it would have been all but impossible to roof as a silo, as Trümpelmann suggests. Few domestic artifacts were found in it. However, finds of a macehead, gaming pieces, serving vessels, etc. would suggest people being

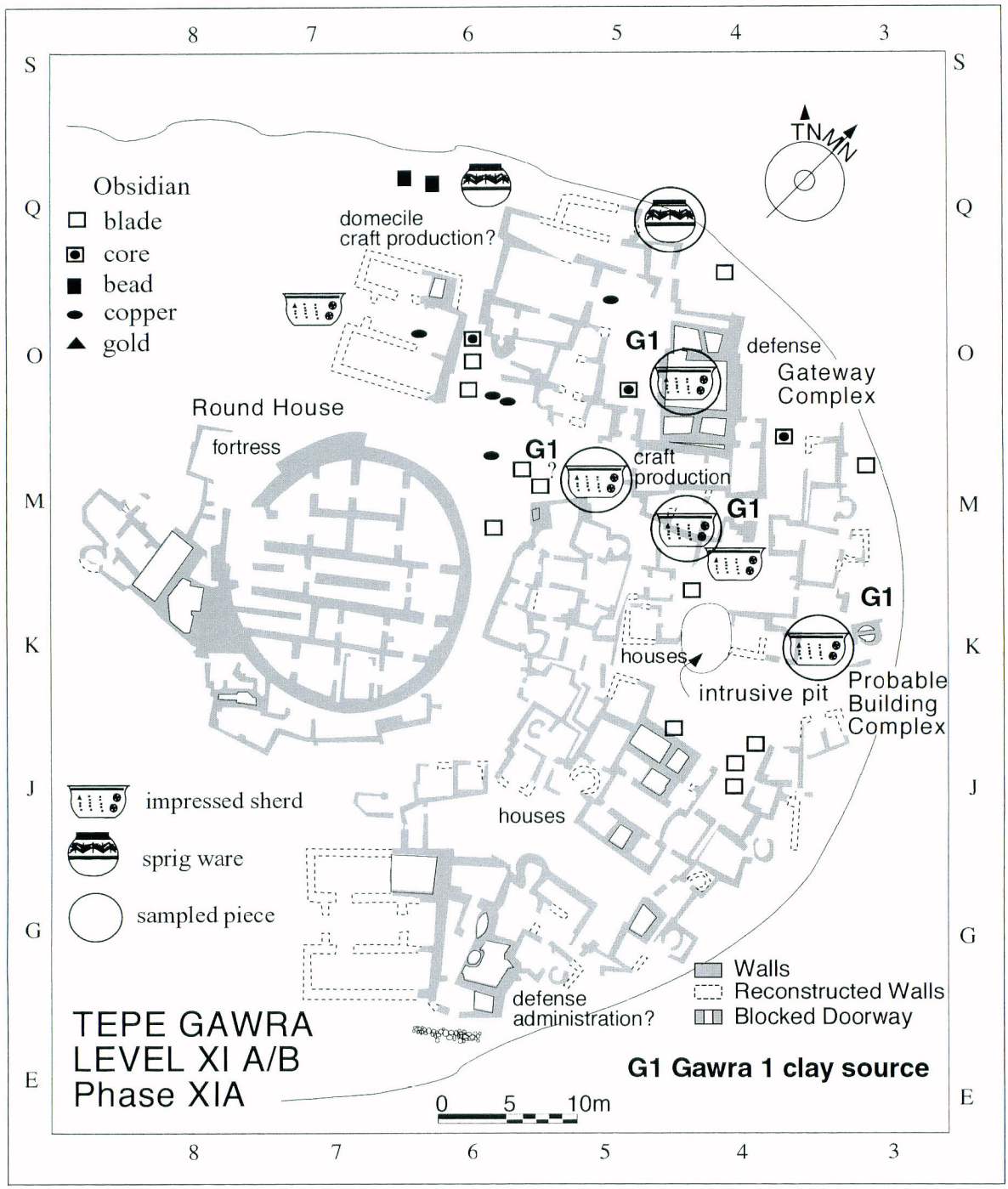

Fig. 7 Site plan of Gawra level XIAB with distributions of pottery and imports.

stationed inside a building prepared for a siege. Its extraordinarily thick walls, the formation of the North Gate, the fact that the buildings on southeastern flank of the mound appear to have been constructed to show a smooth wall to the edge of the mound, and evidence of large areas of burning that ended the Round House, all indicate a military function to the building. North of the Round House in the area where production and exchange were found in level XII, similar buildings and function may be attributed to craft and exchange activities [Rothman 2002a: 84–85, 91]. Cloth-making and pottery production left the clearest physical evidence. As in XII, evidence of goods from highland sources to the north and east were common. The sprig ware in this level is in poor context and may not be from

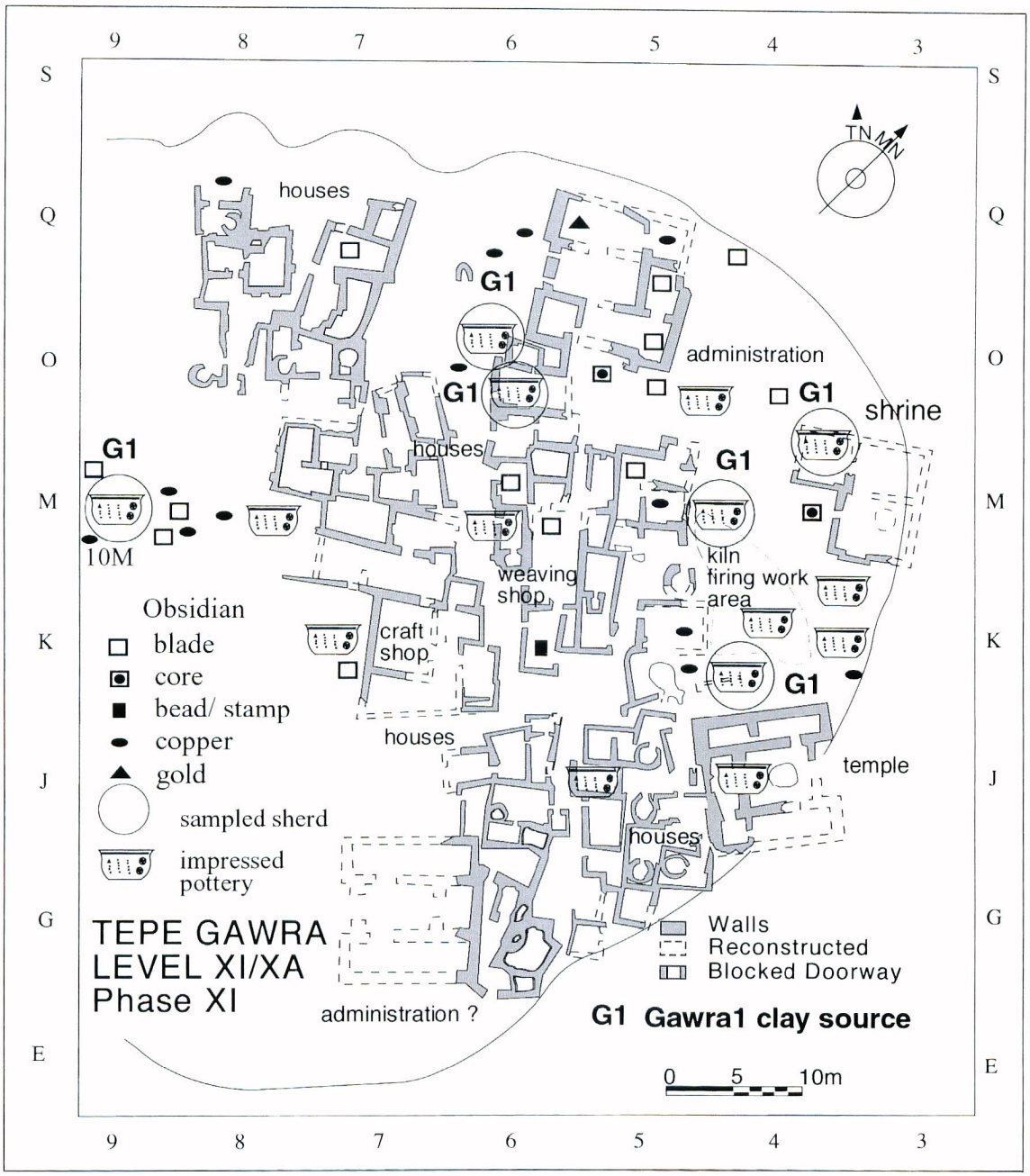

Fig. 8 Site plan of Gawra level XI/XA, phase XI with distributions of pottery and imports.

XIAB at all. The impressed ware was found northeast of the Round House in an area of probable craft production. This was the same area where a firing pit with stacked up pottery was recovered [Rothman 2002a: 85].

The two phases of level XI/XA, XI (Fig. 8) and XA (Fig. 9), have similar functional profiles. Residents built a temple in the southeastern quadrant with its entrance facing out onto the countryside. A now formal administrative or public building rose in the same quadrant as the White Room building of XII and the gate complex of XIAB. Tripartite extended family domiciles were absent. Private houses were small one or two room buildings. In addition to the site's religious and administrative functions, this level saw the functioning of specialized cloth-making, woodworking, and ceramic-firing facilities. Excavators encountered neither the defensive construction nor evidence of the military conflict that ended levels XII and XIAB. All of the same imported raw materials—these

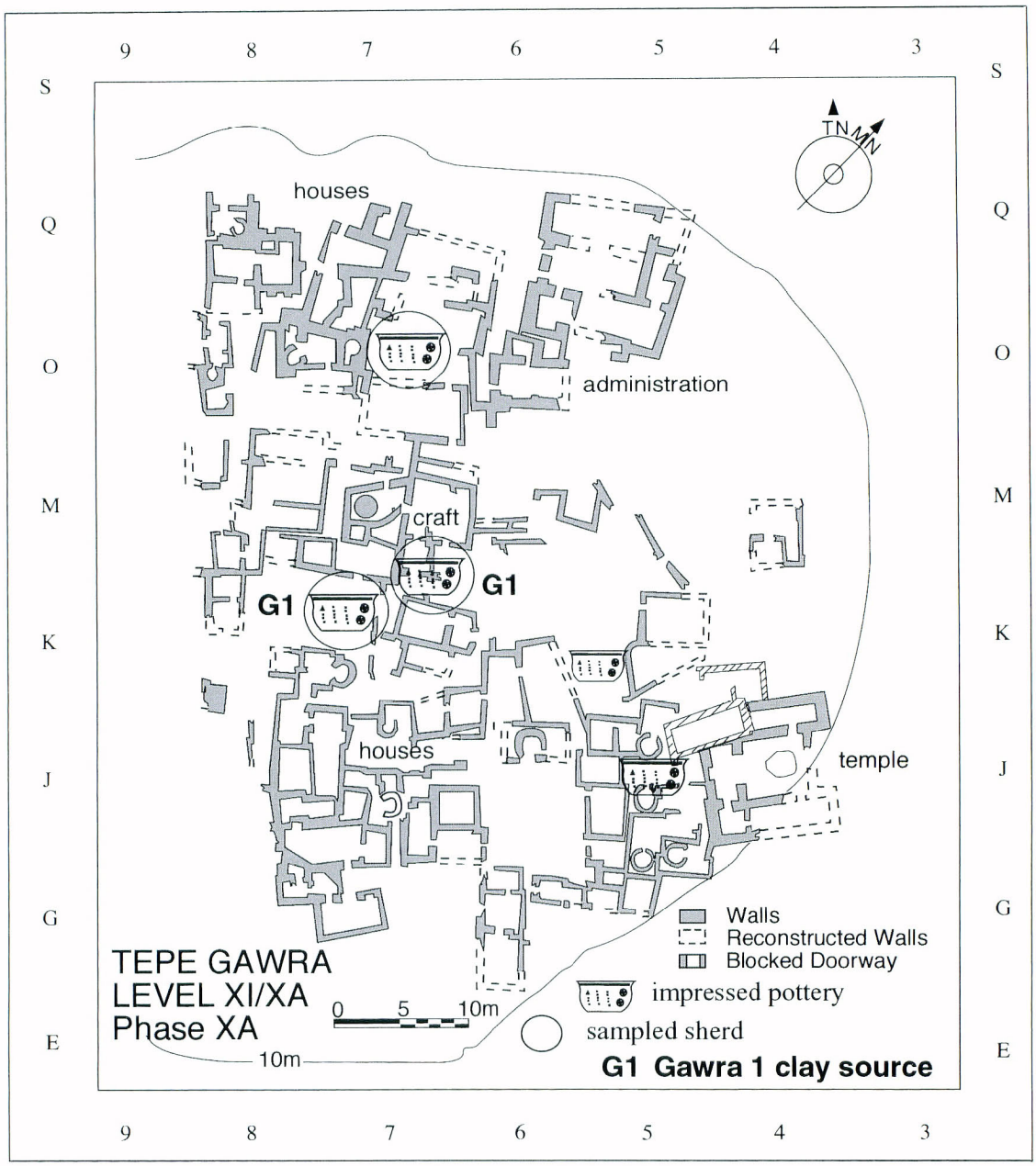

Fig. 9 Site plan of Gawra level XI/XA, phase XA with distributions of pottery and imports.

include gold, alabaster, lapis lazuli, and obsidian—found in levels XII and XIAB were evident in level XI/XA. However, despite signs of increasing social complexity, the chemical content of sealing clays [Rothman and Blackman 1990] and other evidence [Rothman 2002a: 105–6, 111–112] indicate that leaders at this small center were consolidating their hold on the local population and not reaching far beyond their area geographically. Excavators recovered no sprig ware in XI/XA. The impressed wares were scattered through much of the level in no particular pattern.

Tell Brak lies in the middle of the Upper Khabur basin. Throughout its existence Brak has been a key stop on routes across the open plains of northern Mesopotamia [J. Oates 2002: 119–120]. Stylistically, Chalcolithic artifacts at Brak exhibit styles from both the west and east [Lupton 1996; Lebeau 2001]. That the residents of Tell Brak were involved in exchange networks is evidenced by the large amounts of obsidian recovered from Late Chalcolithic deposits, as well as evidence of copper smelting, and probably of weaving [J. Oates 2002].

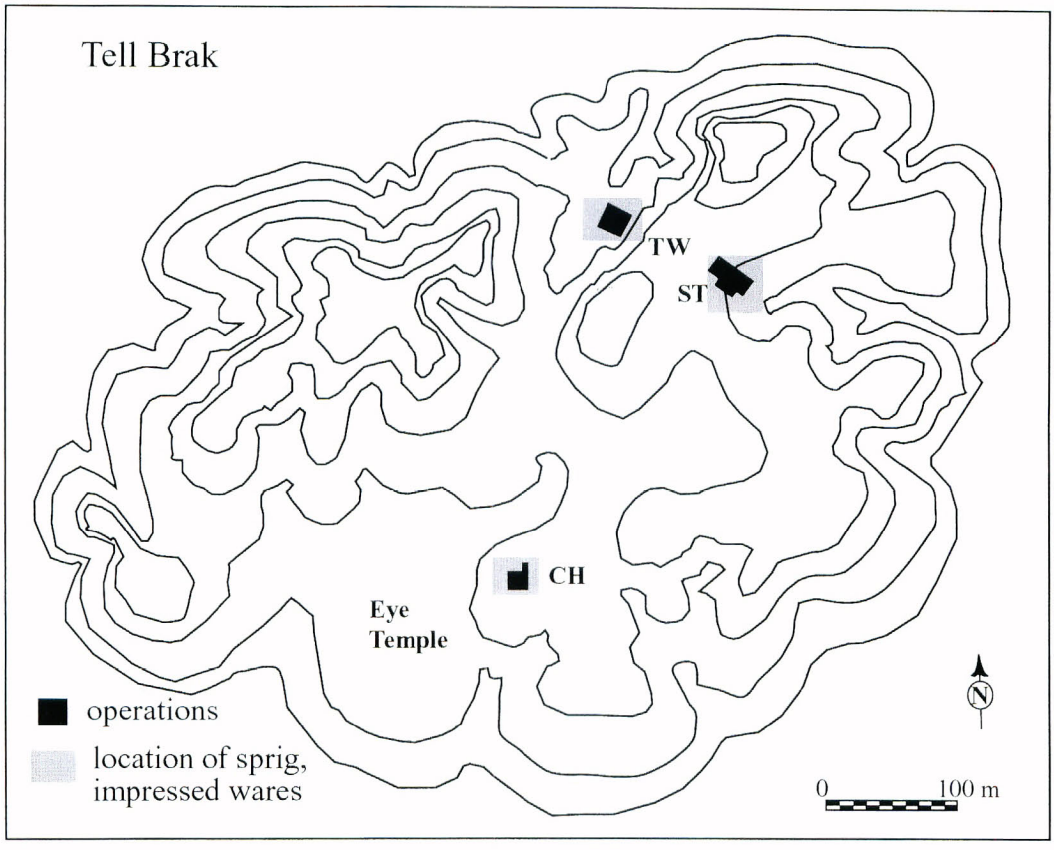

Fig. 10 Topographic map of Tell Brak showing areas from which sprig and impressed ware were excavated (after D. and J. Oates 1994, Fig. 1).

As already mentioned, Brak is estimated to have been as large as 150 hectares by the LC3 or Middle (Northern) Uruk period, and certainly 45 hectares before then in the LC2 or Early (Northern) Uruk period. This is middle-sized site compared to the 250 hectares of LC 5 or Late Uruk period Uruk-Warka, but with that one exception it is very large compared to most contemporary sites, including ones like the centers at Susa and Nineveh (12 hectares). This surprisingly early city growth, which would double in the LC3 or early Uruk Expansion, was mirrored by the large early fourth millennium occupation at Hamoukar in the eastern Upper Khabur area [Gibson 2000].

Excavators recovered material of the LC 1 and LC 2 periods at Brak in operations CH, TW, and ST (Fig. 10). CH has a very rich collection of the material analyzed in this article. In fact, its ceramics provide a complete set of the pottery types found at LC1 and LC 2 Tepe Gawra [J. Oates 2002]. Unfortunately, terracing in this area of the mound for large buildings above it mixed the relevant strata, pushing the finds out of their original context. TW is a very well preserved (and excavated) section through the northeast part of the mound. The LC2 is evidenced in levels 18–20. Above that in LC 3 level 17 excavators found a large niched building. The building was equipped with probable public spaces and numerous firing and cooking installations [Emberling and McDonald 2001]. Below the Niched Building was a massive gate, perhaps a town wall [J. and D. Oates 1997]. More than that we do not yet know about the contexts in which these pottery types were found at Brak.

Sprig and Impressed Ware: Characteristics, Proveniences, and Geographical Range

As mentioned in footnote 3, Ball includes in his category of sprig ware many painted types (Fig. 11) of the LC1 and LC2 periods. This expanded series of "sprig ware" types reflects a fairly long

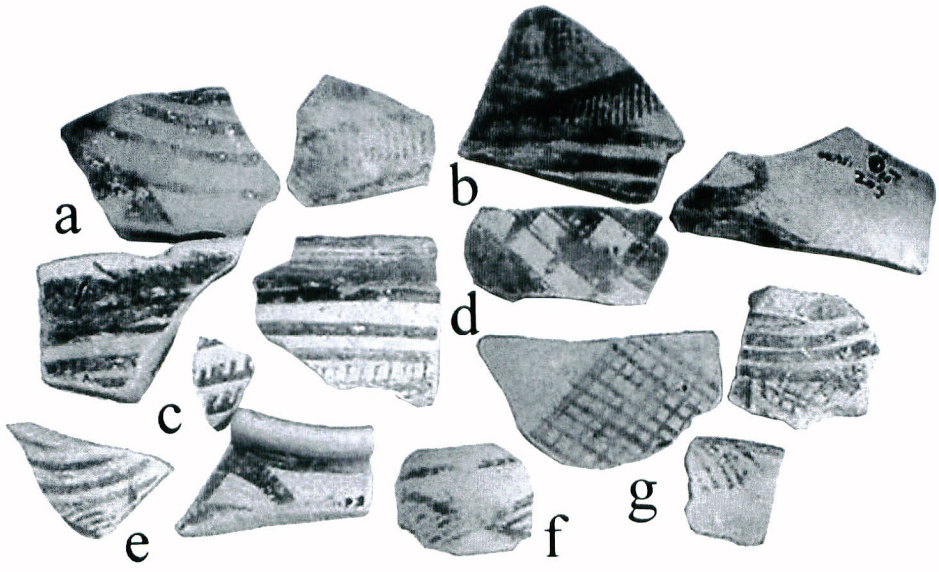

Fig. 11 Shelgiyya "sprig ware," showing variations in painted design variations.

period of time. At Gawra the classic sprig ware (Fig. 2; Fig. 12, 84; Shelgiyya Fig. 11, a, b, c, e) described below is limited to level XII to XIII, with a couple of sherds in questionable context from level XIAB. Late Ubaid level XIIA, often erroneously lumped with level XII, has some of the non-sprig painted wares (Fig. 12, 305, 285, and 288; Fig. 11 d. f, g). Initially, we thought we also saw a later type of ware with sprigs on them, one that appears in levels X and IX of the late LC2 (Fig. 12, 1942 and 1932; at Nineveh [Gut 1996: tafel 53, 795] and at Norşuntepe [Hauptmann 1982: pl. 38, 5]). Given the sample we saw, it is probably all latest Ubaid and LC1 (earliest early Uruk period). In any case, using Gawra as a measuring stick, the accumulation of "sprig ware" at Shelgiyya consists of a sequence of perhaps 100 years.

One hundred samples of sprig and impressed wares were sampled for this analysis (Table 1). All of the largest sample (64) from Shelgiyya were painted or unpainted sherds of the same wares. Three sherds from among the twenty-one (21) sampled from Tepe Gawra were sprig ware. Two of thirteen sherds available from Tell Brak were sprig ware, neither from very firm contexts. No impressed ware sherds are reported from Shelgiyya, and none were therefore included in our analysis. The great majority of sherds chosen from Gawra (18) and from Brak (11) were impressed wares, in line with the original project (see footnote 1).

All the sherds in our analysis were well-fired and would be considered fine wares. The tempering of all the sherds was fine grit, mostly sand, some with micaceous glitter, some with small amounts of basalt or identifiably quartz grit, a couple with some well ground chaff (see Ball, n.d.; Rothman 2002a: catalogue[6]). The majority of painted wares were coil made. Most of the impressed wares were slab constructed and hence "bubble" or "blister" ware. The surface color in the painted (including sprig) wares was either a dark buff or red. The impressed wares were cream, buff, or a gray-green color. A few sherds of a very different color, a dull or bricky red, were made using a coiling or molding technique and were not slab constructed.

The distribution of these specialized wares was quite limited. The painted ware types including classic sprig ware certainly were a continuation and modification of 'Ubaid period painted styles. The painted running triangles, lines with perpendicular lines off them, bow ties, checkerboard patterns can all be found in 'Ubaid styles throughout the Mesopotamian world of the fifth millennium [Perkins

6) See table 1 here for catalogue numbers for Rothman 2002a.

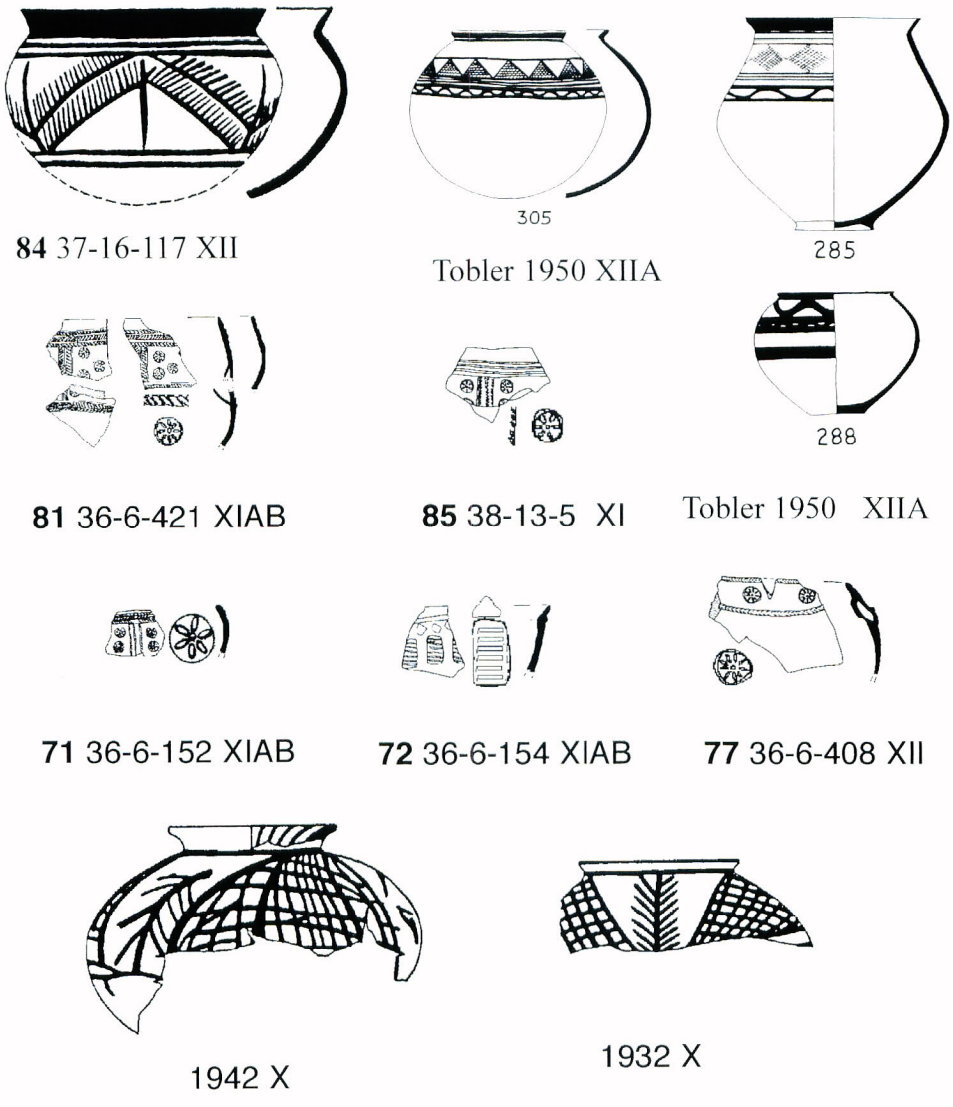

Fig. 12 Examples of painted and impressed wares from Tepe Gawra.

1949: figures 5 and 10]. Classic LC 1 and early LC2 sprig painted ware is found at Tell al-Hawa [Ball *et al.* 1989: fig. 18, 7], in the Sinjar [Lloyd 1940: figure 4, III 8, J;. Oates, e-mail 2002], at Brak [contrary to Ball 1997: 99], and at Umm Qseir in the lower Khabur [Tsuneki and Miyake 1998: fig 64, 7]. The late LC2 (Gawra B) "sprig" painted ware is found at Nineveh [Gut 1996: tafel 53, 795], Gawra (figure 12), and Norşuntepe [Hauptmann 1982: pl. 38, 5]. No LC1 or LC2 sprig ware was recovered on survey in Cizre, Turkey, just north of Shelgiyya [Algaze, e-mail 2002]. The impressed ware is found at Gawra and Brak (this article), Tell al Hawa [Ball *et al.* 1989: fig. 18, 19], and Norşuntepe [Hauptmann 1976: pl. 50, 1 & 3].

Analytical techniques

Chemical characterization of pottery by instrumental neutron activation analysis (INAA) involves taking a small sample of the ceramic body, usually by drilling with a tungsten carbide drill bit. These samples are dried, weighed, an irradiated in a nuclear reactor yielding radioisotopes of the various elements that breakdown by emitting gamma rays of characteristic energies. The elements are quantified by counting their gamma ray emissions (Table 2).

These raw data are then put through a series of mathematical clustering algorithms to find dis-

tinct chemical compositions, which as we wrote above define a clay source "fingerprint."[7]

Results

The results of chemical characterization by instrumental neutron activation analysis (INAA) support the idea that Shelgiyya was a manufacturing center for painted wares in the Ubaid 4-LC1. The chemical characterization of impressed wares also indicates that residents of Tepe Gawra and Tell Brak were parts of an LC2 (Northern Early Uruk, Gawra A) exchange network that extended over at least 200 kilometers.

All the samples from Shelgiyya were made from the same clay source, a cluster of elements called SPRIG-1 (Table 1 and 2). Two of the three sprig ware sherds from Gawra were made from this same clay. Unfortunately, the third Gawra sprig ware sample and the two Brak sprig ware samples could not be placed statistically into any cluster of clay elements. They were not, however, from SPRIG-1 clay. In addition, the impressed ware sherds from Gawra and Brak were clustered into three distinct chemical profiles, GAWRA -1, GAWRA-2, and BRAK-1. None were from the SPRIG-1 clay. Therefore, we are clearly looking at distinctly different clays. Because sand tempering was used for all these fine wares, we are not looking simply at different tempering formulas for the same clays. Therefore, the two sprig ware sherds (samples SPG075 and SPG084, see Fig. 3) from Gawra, both red-slipped sherds with micaceous grit, were most likely made at Shelgiyya. Because few sprig ware potsherds were sampled from Tepe Gawra and Tell Brak, this conclusion cannot be extended to all sprig ware. Again, however, the uniformity of the SPRIG-1 clay profile makes it highly likely that these pots did come physically from Shelgiyya.

Among the impressed wares, a pattern of clay sources and time also emerges. The three sherds made with GAWRA-2 clay are all from the LC1 or earliest LC2 (Terminal Ubaid to Early Uruk Period), that is Gawra level XII and possibly XIB (potsherd SPG076 was picked from the dump while XIAB was being excavated). One potsherd from level XII was made from the GAWRA-1 clay. All the other potsherds from Gawra were made from GAWRA-1 clays. Whether it is the white, slab formed SPG66, or the red-brown coiled SPG-65 from the same area of Gawra Phase XI, all are made of this clay. Tempering defines the differenece in look. Five of the impressed ware sherds from Tell Brak were made from a clay that was identified as BRAK-1. However, five others were made from the same GAWRA-1 clay as many of the Gawra sherds. Some potsherds like SPG096 and SPG097 (see Fig. 3) that appear to be stylistically the same as Gawra samples were made with GAWRA-1 clay, but others like SPG099 were made from BRAK-1 clay. There is also no correlation between whether designs were appliqued or impressed and the clay used, implying different potters or pottery design traditions.

This result does not confirm by itself where the GAWRA clays originated. However, there are a number of factors that suggest that Gawra itself may be the source. First, there was a large kiln associated with firing ceramics in phase XI [Rothman 2002a: 100, fig. 5.28]. Second, as Tobler [1950: 146–7] writes, "Peculiar to these strata [XII] are many vessels (of green ware, as a rule) with cracked or crumpled walls, or with distorted shapes. These are the result of imperfect firing and are invariably associated with graves." Tobler is not clear exactly which wares he is speaking of, but the description best fits bubble or blister ware. It would seem odd for producers to ship cracked and broken pottery. It would therefore seem possible that some, although not all, of the Brak impressed ware came from Gawra or its immediate area. Nineveh may not have been occupied early in this stage [Rothman 2002b].

7) For more details on the mathematical algorithms and analytical techniques see Rothman and Blackman [1990: 25-29], Blackman, Mercy and Wright [1989: 68-71].

Socio-economic Implications

The analysis just described demonstrates that these three sites, two on the Tigris, one the Upper Khabur River were engaged in exchange over a fairly large geographical area. The similar pottery styles in the Karababa area of Eastern Turkey at Norşuntepe [Hauptmann 1976; 1982] indicate that the area might be even larger, although the potsherds from Norşuntepe were not chemically tested.

The question of what the implication of this exchange is on the social and economic organization of these early societies, whether the exchange system had become institutionalized and if so, how it affected the overall development of social and economic complexity are yet to be explained.

A number of factors go into this determination. For example, what were the modes of transportation? What types of exchange systems were there? These factors affect the potential shaping of social and economic organization as they relate to economic exchange. If, for instance, transport is done by human portage, the distances and, even more importantly, the quantities of goods transported are limited. If transport is by waterways, the quantities and speed of transport should increase dramatically. If quantities were low, one would expect that a domestic mode of production, which requires little administrative organization, would be sufficient. If we are looking at high demand, specialized production, it may have had a different effect on the organization of the societies involved.

Certainly, exchange had been occurring throughout the Mesopotamian area since before the Neolithic period. The oldest kind of system is what Renfrew *et al.* [1969] called "down-the-line" exchange. People close to resource extraction points harvest raw materials and package them for transport. Sometimes, the extractors manufacture them into finished products. They then exchange some of the raw material or goods to a nearby group. Those to whom the resource extractors gave goods will then exchange some of the goods with another group, and so forth down the line. Each stop on this progression involves less and less of the good, because each exchange partner takes a portion of the original shipment for themselves before passing some on. G. Wright [1969: 45–47] suggests that early on obsidian was transported as finished blades. This possibility is supported by finds of small pots with Canaan blades from Tepecik [Esin 1976: plate 58,2]. Because human porters carried these goods, such a procedure makes sense. The porters might be pastoral nomads, although they, too, must have carried whatever they had with them on foot, at least before the domestication of the donkey, horse, and much later the camel. Very little organization is required for this type of exchange and very little productive activity needed to meet the demands of exchange partners. An ideological shift may, however, be required in order to create a society where production is for more than subsistence or use as gifts for tribal members [Appaduri 1986].

Another system of exchange is through state-run colonies or emplacements. Algaze [1993; 2001] argues that it was the very requirement of early states to expand for economic reasons that catalyzed his hypothesized Mesopotamian world system. In the Mesopotamian case Algaze and others propose that during the Uruk period of the fourth millennium B.C. expansion was a response to the lack of certain luxury goods and also logs for monumental buildings in the alluvial south. The more complexly organized southern Mesopotamian city-states dominated the resource extraction and exchange routes of simpler northern Mesopotamian societies, funneling the raw materials southward for manufacture into finished goods. In the sense of modern colonial regimes, southerners exported these and other higher cost products made in the large-scale, administered craft centers of the south with cheap northern raw materials to northern Mesopotamians at higher exchange rates. Certainly, the large-scale manufacture of cloth by corveé workers or slave labor is demonstrated in glyptic [Pittman 1993] and later texts. In organizing this formal system of trade and promoting craft jobs at home, this colonial system promoted increasing economic demand, sophistication, and concomitant administrative elaboration in the southern city-states at the expense of the socially and economically stagnant north. The whole system worked because of the ability of traders to float down the Euphrates and part of the Tigris and the domestication of the donkey as a pack animal, which began in the fourth millennium

B.C. [Wright 2001].

Some writers have questioned Algaze's theory on a few critical details. They have asked whether the southern city-states could possibly control emplacements two months walk away, even with donkeys [Stein 1999]. They have asked whether the emplacements in the north were not simply those of migrants [Johnson 1988/89; Rothman 1993]. They have inquired whether it was exchange (or trade) that catalyzed social change, or whether local re-organization made trade possible and demand greater [Rothman 2001; J. Oates 1993]. Alternatively, were the similarities noted between southern and northern Mesopotamian artifact styles simply the result of northerners emulating models of behavior and symbolic markers of status as social systems of rank and later stratification developed [J. Oates 1993: 414; Frangipane 2001]?

The quantity of exotic goods including obsidian blocks at sites like Gawra imply that the pre-state exchange system in the northeastern piedmont of Iraq and the Jazira we are discussing appears not to fit the idea of "down-the-line" exchange. At the same time, it is hard to argue that it is state-level administered trade, whether colonial or not. In the traditional nomenclature, therefore, we are speaking of chiefly society. As Service [1962: 143] writes, "Chiefdoms are particularly distinguished from tribes by the presence of centres which coordinate economic, social, and religious activities. . . . The great change at the chiefdom level is that specialization and redistribution are no longer merely adjunctive to a few particular endeavors, but continually characterize a larger part of the activity of the society." Wright [1994] takes Service's idea and expands on it, citing the great range of societies that fall within the chiefly type of society from simple to complex. He specifically directs scrutiny toward ranking in site size distributions, residential size, and mortuary symbolism as indicators of this level of complexity.

How can these factors and the theory that underlies them help us see the import of exchange systems in the late fifth and early fourth millennia? What is actually happening at these sites relating trade over a considerable geographic area to the social and political development of the area? For this we have to return to Tepe Gawra, the only site of the three that we have enough data on to begin theorizing about such issues.

There is no doubt that some of the exotic materials listed above from levels XII to XI/XA were imported into the site. At least one of these is sprig ware. Others include obsidian, copper, and gold. If the residents of level XII were organized around extended family dwellings and perhaps a higher ranked chiefly household represented by the White Room building, we should see a pattern typical of simpler chiefly society in the distribution of these exotic materials. The most common of these materials at this late fifth millennium date is obsidian. Figure 6 shows the distribution of obsidian cores, blades, flakes, and beads as well as sprig painted and impressed pottery. Not surprisingly, there is an obsidian core and various obsidian blades in the craft storage and processing area in the northwestern part of the excavated mound near the entry road. A similar distribution is evident associated with the White Room building. However, two of the other hypothesized extended family households in the southeastern part of the XII mound also had obsidian cores and blades. A generalized distribution of seals and sealings also implies generalized and mostly kin-based political organization [Rothman 2002a: 81-83, figure 5.13]. Similarly, although the White Room building is somewhat bigger than the other houses, it is not very different in size and layout from the others. In terms of Wright's three markers of chiefly development, in XII house size indicates little development of rank, at least within the site. Mortuary practices show little differentiation, either [Tobler 1950: 103 f.]. Although some coordination is evidenced in the common grain silo and exchange processing area, it is one of simple redistribution. The exchange of sprig ware had very little effect on social organization.

In level XIAB, the picture is somewhat different. The obsidian cores are limited to the areas associated with craft production, although blades were distributed elsewhere. The areas where obsidian cores were located overlaps the area where most impressed ware was also found. In graves, a

pattern of two distinct statuses is evident [Peasnall 2002: 228-9]. Aside from the Round House, buildings were either small and cramped or larger tripartite ones. The administrative system evident in seals and sealings was more complex than XII, although still generalized [Rothman 2002a: 92]. Whether it was causal or merely correlated with other changes, systems of economic exchange may have had some effect on the complexity of early LC2 society as reflected in Gawra level XIAB.

The pattern of XI/XA illustrates yet another variation on the chiefly pattern. Three obsidian cores were recovered from phase XI. The two that had good provenience were from the area of the northeastern administrative building and the other between the shrine and the craft area in square 4M. Excavators recovered obsidian blades from the northern part of the XI mound, especially in the area of the administrative building and the weaving shop and kiln area. One gold bead was found in the administrative building. At this level, there were very clear differences in building size and construction. Mortuary practice shows the same kind of rank differentiation as in XIAB, but graves contained more of the exotic goods that would mark the spectacular graves of levels X to VIII. Those LC2 and early LC3 graves show clear stratification of those buried in tombs and graves (Peasnall 2002: 229–30). Administrative hardware also showed real changes in the focus of control mechanisms from generalized in level XII and XIAB to specialized functions [Rothman 2002a: 106]. Those functions are marked for the first time by clearly distinct craft buildings and areas: a weaving shop, woodworking shop, and a kiln area. In addition, religious ritual became one of the functional foci of residents of the town. At the same time, as mentioned above, chemical characterization of sealing clays indicates that no seals with clays from foreign sources were utilized. In other words, although manufacturing appears to have increased dramatically and presumably exchange did so as well, the focus of administrative elaboration was local, not long-distance exchange even where it may have existed in producing impressed wares. Service's definition of chiefly society cited above applies precisely to this level XI/XA. Gawra was a center for coordination of economic and religious activity, and specialization and redistribution were key elements of its economic and political structure.

In general, then, there is some correlation between increasing production for exchange and the development of systems of administration and social status. It is less certain that this relationship is causal. To address issues of the correlation of exchange and social complexity, conditions and political orientation within a settlement system must be understood. As the saying goes, politics is always local.

Within that local system, two key variables appear to determine the correlation of economic exchange and social organization: the social value of things and the organization of political control. Renfrew [1986: 142–43] characterizes the first variable: " we cannot discuss commodities or the development of economy without considering such embedded social concepts as value and demand." As Pollock [1983] writes, goods or raw materials become imbued with value, because they carry social messages about the status of the individuals who own and display them, whether in life or death. In our case, more locally available flint may serve obsidian's use value almost as well as obsidian. The same can be said for the earliest use of copper. "In most cases early metallurgy appears to have been practiced primarily because the products had novel properties that made them attractive to use as symbols and as personal adornments and ornaments, in a manner that, by focusing attention, could attract or enhance prestige" [Renfrew 1986: 146–147]. Perhaps, what is most important about obsidian, copper, or gold is the very fact that they come from exotic sources. Part of the ideology of early kingship in Mesopotamia was the idea that like the gods, rulers were providers of what is valuable, often rare, and from a great distance away [Jacobsen 1976]. Similarly, especially fine wares like impressed ware or sprig ware take on social value because of their rarity. Hence, being buried with a misfired bubble or blister ware vessel conveys rank even if the actual product is far from perfect. Therefore, in this process of envaluation, demand for certain kinds of goods increases, at first slowly and then more rapidly as more and more people emulate the symbolic value of these same

goods. In order to obtain more and more of these exotic goods as a result of increasing demand for them, the need for increased production of goods for exchange becomes manifest. In other words, social stratification need not be catalyzed by trade *per se*, but follows or is concomitant with it. As Renfrew writes [1986: 163], "It is interesting to note here the relationship among three important variables: a developing system of production and exchange; the circulation of goods of prime value (especially in the early stages); and the emergence of prominent social ranking. . . . The obvious inference is that the three can most readily develop together through a kind of multiplier effect, where each mutually enhances the others."

Changes in administrative or generally ranked organization are catalyzed only when regulation of long-distance exchange (trade) and production is one of the primary needs served by administrative forms of social organization. Evidence from the late fifth and early fourth millennium, as described above, does not indicate the urgency of that need or as yet the key correlation of rank and exclusive use of exotic or rare goods.

In this article we have demonstrated that a more extensive geographic system of exchange in raw materials and fine ware pottery existed than would have been suspected in the LC1 and early LC2 periods. At the same time, although there appears some correlation of the way goods are re-distributed and changes in rank, at this time exchange *per se* does not seem to be the cause of those social organizational changes.

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Table 1

Sample no.	Chemical Group (inaa)	Site	Museum no.	Trench or Square	Layer Stratum	Ware	Type no.	Description
SPG001	UNA **	Shelgiyya		H3	5	Sprig ware	316	unpainted buff to buff red micaceous grit
SPG002	SPRIG-1	Shelgiyya		H2	2	Sprig ware	316	unpainted buff to buff red micaceous grit
SPG003	SPRIG-1	Shelgiyya		?	3a	Sprig ware	316	unpainted buff to buff red micaceous grit
SPG004	SPRIG-1	Shelgiyya		H–H2		Sprig ware	316	unpainted buff to buff red micaceous grit
SPG005	UNA	Shelgiyya		H2–H3		Sprig ware	316	unpainted buff to buff red micaceous grit
SPG006	SPRIG-1	Shelgiyya		H2	4	Sprig ware	316	unpainted buff to buff red micaceous grit
SPG007	SPRIG-1	Shelgiyya		Q		Sprig ware	316	unpainted buff to buff red micaceous grit
SPG008	SPRIG-1	Shelgiyya		H2	2	Sprig ware	316	unpainted buff to buff red micaceous grit
SPG009	SPRIG-1	Shelgiyya		H2		Sprig ware	316	unpainted buff to buff red micaceous grit
SPG010	SPRIG-1	Shelgiyya		H2	3	Sprig ware	316	unpainted buff to buff red micaceous grit
SPG011	??	Shelgiyya		?	?	Sprig ware	316	unpainted buff to buff red micaceous grit
SPG012	SPRIG-1	Shelgiyya		H2	3	Sprig ware	317	buff painted late LC2 designs medium density micaceous sand grit
SPG013	SPRIG-1	Shelgiyya		H3	4	Sprig ware	317	buff painted late LC2 designs medium density micaceous sand grit
SPG014	SPRIG-1	Shelgiyya		H3	2a	Sprig ware	317	buff painted late LC2 designs medium density micaceous sand grit
SPG015	SPRIG-1	Shelgiyya		H3	3	Sprig ware	317	buff painted late LC2 designs medium density micaceous sand grit
SPG016	SPRIG-1	Shelgiyya		H2	2	Sprig ware	317	buff painted late LC2 designs medium density micaceous sand grit
SPG017	SPRIG-1	Shelgiyya		H2	3	Sprig ware	317	buff painted late LC2 designs medium density micaceous sand grit
SPG018	SPRIG-1	Shelgiyya		H2	3	Sprig ware	317	buff painted late LC2 designs medium density micaceous sand grit
SPG019	SPRIG-1	Shelgiyya		H2	2	Sprig ware	317	buff painted late LC2 designs medium density micaceous sand grit
SPG020	SPRIG-1	Shelgiyya		H2	2	Sprig ware	317	buff painted late LC2 designs medium density micaceous sand grit
SPG021	SPRIG-1	Shelgiyya		H2–H3		Sprig ware	318	green-gray ware LC1 sprig ware designs medium density sand temper
SPG022	SPRIG-1	Shelgiyya		H2	3	Sprig ware	318	green-gray ware LC1 sprig ware designs medium density sand temper
SPG023	SPRIG-1	Shelgiyya		H2	2	Sprig ware	318	green-gray ware LC1 sprig ware designs medium density sand temper
SPG024	UNA	Shelgiyya		H2	3	Sprig ware	318	green-gray ware LC1 sprig ware designs medium density sand temper
SPG025	SPRIG-1	Shelgiyya		H2	3	Sprig ware	318	green-gray ware LC1 sprig ware designs medium density sand temper
SPG026	UNA	Shelgiyya		H2	3	Sprig ware	318	green-gray ware LC1 sprig ware designs medium density sand temper
SPG027	SPRIG-1	Shelgiyya		H2	2	Sprig ware	318	green-gray ware LC1 sprig ware designs medium density sand temper
SPG028	SPRIG-1	Shelgiyya		H2	3	Sprig ware	318	green-gray ware LC1 sprig ware designs medium density sand temper
SPG029	SPRIG-1	Shelgiyya		H2	2	Sprig ware	318	green-gray ware LC1 sprig ware designs medium density sand temper
SPG030	UNA	Shelgiyya		H2	4	Sprig ware	318	green-gray ware LC1 sprig ware designs medium density sand temper
SPG031	SPRIG-1	Shelgiyya		H2	4	Sprig ware	318	green-gray ware LC1 sprig ware designs medium density sand temper
SPG032	UNA	Shelgiyya		H2	2	Sprig ware	318	green-gray ware LC1 sprig ware designs medium density sand temper
SPG033	UNA	Shelgiyya		–	–	Sprig ware	318	green-gray ware LC1 sprig ware designs medium density sand temper
SPG034	SPRIG-1	Shelgiyya		H3	3	Sprig ware	319	red slip fine finer slipped version of type 316
SPG035	SPRIG-1	Shelgiyya		H2	2	Sprig ware	516	dark buff painted lines fine grit
SPG036	SPRIG-1	Shelgiyya		H–H2		Sprig ware	516	dark buff painted lines fine grit
SPG037	SPRIG-1	Shelgiyya		H2	4	Sprig ware	516	dark buff painted lines fine grit
SPG038	SPRIG-1	Shelgiyya		H2	2	Sprig ware	516	dark buff painted lines fine grit
SPG039	SPRIG-1	Shelgiyya		H2	2	Sprig ware	516	dark buff painted lines fine grit
SPG040	SPRIG-1	Shelgiyya		H2	2	Sprig ware	516	dark buff painted lines fine grit
SPG041	SPRIG-1	Shelgiyya		H2	2	Sprig ware	516	dark buff painted lines fine grit
SPG042	SPRIG-1	Shelgiyya		?	?	Sprig ware	516	dark buff painted lines fine grit
SPG043	SPRIG-1	Shelgiyya		H2	4	Sprig ware	541	buff to red LC1 sprig ware micaceous grit
SPG044	SPRIG-1	Shelgiyya		H2	4	Sprig ware	541	buff to red LC1 sprig ware micaceous grit
SPG045	UNA	Shelgiyya		H2	3	Sprig ware	541	buff to red LC1 sprig ware micaceous grit
SPG046	SPRIG-1	Shelgiyya		H2	3	Sprig ware	541	buff to red LC1 sprig ware micaceous grit
SPG047	SPRIG-1	Shelgiyya		?	3	Sprig ware	541	buff to red LC1 sprig ware micaceous grit
SPG048	SPRIG-1	Shelgiyya		?	2	Sprig ware	541	buff to red LC1 sprig ware micaceous grit
SPG049	SPRIG-1	Shelgiyya		H2	3	Sprig ware	541	buff to red LC1 sprig ware micaceous grit
SPG050	SPRIG-1	Shelgiyya		H2	2	Sprig ware	541	buff to red LC1 sprig ware micaceous grit
SPG051	SPRIG-1	Shelgiyya		H2	4	Sprig ware	542	buff to red slip, sand temper, early LC2 running triangles parallel to rim
SPG052	UNA	Shelgiyya		H2	2	Sprig ware	542	buff to red slip, early LC2 running triangles parallel to rim
SPG053	SPRIG-1	Shelgiyya		H2	4	Sprig ware	542	buff to red slip, early LC2 running triangles parallel to rim
SPG054	SPRIG-1	Shelgiyya		H2	2	Sprig ware	542	buff to red slip sand temper, early LC2 running triangles parallel to rim
SPG055	SPRIG-1	Shelgiyya		H2	4	Sprig ware	542	buff to red slip sand temper, early LC2 running triangles parallel to rim
SPG056	SPRIG-1	Shelgiyya		H2	2	Sprig ware	542	buff to red slip sand temper, early LC2 running triangles parallel to rim
SPG057	SPRIG-1	Shelgiyya		H2	3	Sprig ware	542	buff to red slip sand temper, early LC2 running triangles parallel to rim
SPG058	SPRIG-1	Shelgiyya		H2	4	Sprig ware	542	buff to red slip sand temper, early LC2 running triangles parallel to rim
SPG059	SPRIG-1	Shelgiyya		H-H2		Sprig ware	542	buff to red slip sand temper, early LC2 running triangles parallel to rim
SPG060	SPRIG-1	Shelgiyya		H2	3	Sprig ware	542	buff to red slip sand temper, early LC2 running triangles parallel to rim
SPG061	SPRIG-1	Shelgiyya		H2	4	Sprig ware	542	buff to red slip sand temper, early LC2 running triangles parallel to rim
SPG062	SPRIG-1	Shelgiyya		H3	3	Sprig ware	542	buff to red slip sand temper, early LC2 running triangles parallel to rim
SPG063	SPRIG-1	Shelgiyya		H2	2	Sprig ware	542	buff to red slip sand temper, early LC2 running triangles parallel to rim
SPG064	GAWRA1	Gawra	35-10-25	6O	XI	Impressed	1394*	impressed vertical comb lines, dark buff, sand temper
SPG065	GAWRA1	Gawra	35-10-38	6O	XI	Impressed	1329*	red-brown, incised railroad ties impressed ovals rosettes quartz temper
SPG066	GAWRA1	Gawra	35-10-51	4O	XI	Impressed	1331*	impressed ropes, incised lines green-buff sand temper bubble

SPG068	GAWRA1	Gawra	36-6-27	7O	XA	Impressed	1808*	impressed comb line pattern sand temper dark buff
SPG069	GAWRA1	Gawra	36-6-28	7K	XA	Impressed	1776*	impressed comb line, incised lines buff slip sand and fine chaff temper
SPG071	GAWRA1	Gawra	36-6-152	4M?	XIAB	Impressed	725*	impressed rosette and rope orange-buff surface red core,
SPG072	GAWRA1	Gawra	36-6-154	3K	XIAB	Impressed	724*	impressed wide ladder & triangles, buff surface, quartz & chaff temper
SPG073	UNA	Gawra	36-6-156	5Q	XIAB	Sprig ware	726*	red painted, micaceous grit
SPG074	GAWRA1	Gawra	36-6-244	5M	XII	Impressed	195*	impressed triangle & circle, raised band, bubble ware green-buff, sand-tempered
SPG075	SPRIG-1	Gawra	36-6-245	6S	XII	Sprig ware	196*	red painted red, micaceous grit
SPG076	GAWRA2	Gawra	36-6-407	dump	XIA?	Impressed		impressed vertical dot line buff, sand temper
SPG077	GAWRA2	Gawra	36-6-408	5O	XII	Impressed	202*	raised rosette, rope, green-gray, cream slip, sand temper bubble ware
SPG078	GAWRA1	Gawra	36-6-411	5M	XI	Impressed	1375*	impressed wide combs dark buff surface sand & fine quartz grit
SPG079	GAWRA1	Gawra	36-6-412	5M	XIAB	Impressed	733*	raised rosettes incised line buff sand temper
SPG080	GAWRA1	Gawra	36-6-419	4K	XI	Impressed	1377*	impressed rosette buff sand temper
SPG081	GAWRA1	Gawra	36-6-421	5O	XIAB	Impressed	722*	raised rosette and rope, buff bubble ware mica sand temper
SPG082	GAWRA1	Gawra	36-6-422	dump	XIAB?	Impressed		raised lines buff sand temper bubble ware
SPG083	GAWRA1	Gawra	37-16-22	7K	XA	Impressed	1814*	impressed rosette buff sand temper
SPG084	SPRIG-1	Gawra	37-16-117	4S	XII	Sprig ware	322*	red-brown painted micaceous grit
SPG085	GAWRA1	Gawra	38-13-5	10M	XI	Impressed	1385*	raised rosette, over-fired greenish sand tempered bubble ware
SPG086	GAWRA2	Gawra	38-13-35	7M	XII	Impressed	333*	incised herringbone green-gray ware sand temper
SPG087	SPRIG-1	Shelgiyya		H2	2	Sprig ware	542	buff to red slip sprig designs, early LC2 running triangles parallel to rim
SPG088	?	Brak		TW balk		Sprig ware		red, painted red surface, gray reduced core fine quartz & basalt temper
SPG089	UNA	Brak		TB		Sprig ware		red, painted red surface fine quartz & basalt temper
SPG090	UNA	Brak	CH738	CH		Impressed		incised lines, impressed rosettes rose colored surface fine grit temper
SPG091	GAWRA1	Brak	CH627	CH		Impressed		incised lines buff surface fine basalt & sand temper
SPG092	GAWRA1	Brak	CH701	CH		Impressed		impressed light red surface fine basalt & sand temper
SPG093	BRAK-1	Brak	CH656	CH		Impressed		impressed lines buff sand temper bubble ware
SPG094	BRAK-1	Brak	CH656	CH		Impressed		no decoration buff sand temper bubble ware
SPG095	GAWRA1	Brak	TW837	TW		Impressed		no decoration buff sand temper bubble ware
SPG096	GAWRA1	Brak	ST75	ST		Impressed		impressed rosettes incised lines buff sand temper
SPG097	GAWRA1	Brak	TW142	TW		Impressed		impressed rosettes white sand & fine chaff temper bubble ware
SPG098	BRAK-1	Brak	CH763	CH		Impressed		no decoration buff sand temper bubble ware
SPG099	BRAK-1	Brak	?	?		Impressed		impressed rosettes parallel and perpendicular lines buff sand temper
SPG100	BRAK-1	Brak	?	?		Impressed		incised lines buff sand & fine basalt grit temper

* catalogue number (Rothman 2002) ** UNA = indeterminate

Table 2

Sprigware group

Sample ID	Na %	K %	Ca %	Sc ppm	Cr ppm	Fe %	Co Ppm	Zn ppm	Rb ppm	Cs ppm	Ba Ppm	La ppm	Ce ppm	Sm ppm	Eu ppm	Yb ppm	Lu ppm	Hf ppm	Ta ppm	Th ppm
SPG002	0.802	1.69	9.91	17.7	395.	4.97	33.9	97.3	57.4	2.37	649.	25.4	43.7	3.98	0.946	1.99	0.290	3.65	0.851	7.00
SPG003	0.548	1.17	9.59	18.7	632.	5.33	35.9	92.9	38.3	1.94	459.	18.8	34.0	3.12	0.782	1.55	0.330	3.49	0.774	5.33
SPG004	0.721	1.49	7.46	18.0	594.	5.05	42.7	110.	46.6	2.03	399.	20.4	35.9	3.21	0.824	2.03	0.302	3.11	1.08	5.75
SPG006	0.610	1.56	7.31	19.5	560.	5.36	44.1	98.9	55.6	2.87	649.	22.6	39.6	3.47	0.802	2.02	0.288	2.94	0.940	6.05
SPG007	0.724	1.91	8.49	17.3	451.	4.92	31.8	93.8	63.5	3.30	463.	24.1	44.5	3.77	0.946	2.25	0.349	4.36	0.883	6.85
SPG008	0.573	1.61	8.07	18.0	514.	4.99	37.3	97.5	49.8	2.52	547.	22.5	38.9	3.48	0.841	1.76	0.327	3.30	0.697	6.34
SPG009	0.759	1.44	10.6	16.6	455.	4.68	31.7	91.0	52.6	2.66	579.	24.6	41.9	3.90	0.918	2.00	0.327	3.88	0.871	6.47
SPG010	0.627	1.20	10.4	18.0	733.	5.25	35.2	94.8	59.2	2.77	565.	21.6	37.8	3.56	0.809	1.99	0.318	3.76	0.855	5.89
SPG012	0.617	1.26	12.0	15.0	349.	4.32	27.7	74.0	54.7	2.23	710.	22.7	41.2	3.46	0.875	2.28	0.248	3.69	0.759	6.49
SPG013	0.637	1.48	10.0	18.6	497.	5.25	37.5	85.3	79.4	3.16	541.	22.9	43.8	3.55	0.902	2.07	0.286	3.32	0.891	6.44
SPG014	0.622	1.68	11.5	18.9	728	4.84	32.7	97.5	65.2	2.77	662.	21.7	38.0	3.52	0.857	1.93	0.280	3.15	0.581	5.75
SPG015	0.408	1.30	12.4	16.9	573.	4.60	32.6	63.0	51.2	2.74	673.	19.4	33.4	3.16	0.753	1.87	0.277	2.30	0.597	5.28
SPG016	0.695	1.36	7.98	21.1	372.	5.92	38.6	103.	67.1	3.26	447.	29.6	50.0	4.72	1.08	2.42	0.344	3.82	0.948	7.94
SPG017	0.550	1.67	14.9	16.4	346.	4.57	34.9	84.1	82.4	4.08	787.	26.2	45.9	4.22	0.977	2.36	0.356	4.18	1010	7.48
SPG018	0.690	1.09	9.06	16.8	472.	4.81	30.5	76.0	64.4	2.79	738.	25.7	45.9	4.20	0.982	2.69	0.369	4.05	0.993	6.71
SPG019	02.785	1.10	11.1	14.0	321.	3.94	25.2	58.9	41.2	1.36	587.	17.0	30.8	2.82	0.713	1.74	0.229	3.05	0.571	5.00
SPG020	0.723	1.78	11.2	16.9	456.	4.82	31.3	68.4	68.5	3.44	682.	24.9	42.4	3.96	0.889	2.23	0.354	3.62	0.733	6.90
SPG021	0.745	0.95	12.6	14.5	347.	4.06	26.8	68.1	58.3	3.10	406.	21.0	37.8	3.42	0.789	1.98	0.254	3.10	0.767	5.78
SPG022	0.796	1.34	11.4	18.3	500.	5.05	35.0	71.9	78.5	3.36	164.	22.9	39.1	3.71	0.906	2.05	0.263	3.44	0.764	5.97
SPG023	0.767	1.63	12.2	18.0	597.	5.12	35.1	82.6	74.6	3.31	497.	26.3	45.4	4.23	0.951	2.40	0.321	4.06	0.889	7.29
SPG025	0.783	1.45	8.69	17.5	489.	4.71	36.3	74.5	62.8	2.74	263.	19.9	33.8	3.54	0.760	1.91	0.227	2.74	0.577	5.13
SPG027	0.815	1.59	10.6	16.7	603.	4.45	31.8	85.1	67.1	3.05	526.	20.8	34.7	3.69	0.798	1.94	0.296	3.17	0.658	5.35
SPG028	0.789	1.57	11.2	15.6	363.	4.24	28.6	83.8	72.1	3.59	n.d.	23.3	41.0	3.99	0.845	2.28	0.270	3.28	0.771	6.46
SPG029	0.634	1.55	10.6	18.5	390.	5.46	34.6	117.	76.6	3.81	366.	24.7	45.4	3.72	0.971	2.42	0.279	3.72	0.908	7.52
SPG031	0.834	1.35	10.8	18.5	480.	5.01	31.8	91.0	75.9	3.19	366.	24.6	45.9	4.22	0.975	2.12	0.212	3.77	0.881	6.93
SPG034	0.731	1.74	7.74	19.5	428.	5.25	36.3	92.9	71.6	3.01	608.	23.6	41.3	4.15	0.889	1.97	0.259	3.51	0.832	6.64
SPG035	0.789	1.64	10.1	16.2	581.	4.68	32.1	94.4	64.6	2.61	729.	22.7	39.5	3.71	0.867	2.25	0.310	3.95	0.979	6.17
SPG036	0.847	1.66	7.76	18.4	424.	5.07	32.3	97.7	75.5	3.21	679.	24.0	42.3	3.75	0.955	1.87	0.295	3.72	0.759	6.90
SPG037	0.977	1.79	6.53	18.7	532.	5.26	34.4	74.1	64.7	2.92	942.	36.4	48.5	4.03	1.03	2.06	0.290	5.04	1.05	7.03
SPG038	0.743	1.90	10.6	15.9	397.	4.43	34.0	8937	79.6	3.71	507.	21.6	37.7	3.41	0.828	1.71	0.311	3.16	1.01	6.21
SPG039	0.728	1.47	6.11	16.4	467.	4.80	33.1	89.7	65.6	2.90	655.	19.7	37.2	3.10	0.841	1.67	0.267	3.17	0.794	6.01

SPG040	0.713	1.60	7.50	19.3	625.	5.27	41.8	106.	67.5	2.93	367.	19.9	35.7	3.24	0.783	1.84	0.268	2.78	0.736	5.53
SPG041	0.764	1.55	8.71	14.1	428.	3.91	29.5	81.5	61.8	2.72	789.	20.8	36.0	3.43	0.743	2.04	0.279	3.13	1.01	5.75
SPG042	0.509	1.67	12.5	16.0	400.	4.42	33.9	94.0	63.1	3.20	627.	23.9	42.9	3.88	0.885	1.96	0.302	3.79	0.986	7.08
SPG043	0.847	1.46	9.86	15.9	447.	4.38	29.9	80.2	51.3	2.17	632.	21.6	39.2	3.55	0.841	1.99	0.315	3.13	0.692	6.27
SPG044	0.617	1.49	6.21	19.4	689.	5.57	40.4	79.3	58.6	2.29	427.	21.1	37.07	3.38	0.845	2.24	0.277	3.21	0.637	5.57
SPG046	0.778	1.61	7.67	19.2	638.	5.57	37.2	110.	62.5	3.02	498.	22.8	41.0	3.38	0.897	2.51	0.313	4.72	0.951	6.70
SPG047	0.703	1.27	8.55	18.5	479.	5.35	37.8	74.1	59.3	2.37	366.	23.4	41.7	3.95	0.916	2.21	0.305	3.82	0.7885	6.59
SPG048	0.611	1.49	12.1	16.3	380.	4.61	31.3	67.6	59.6	2.89	494.	21.6	38.5	3.58	0.817	2.46	0.382	3.09	0.865	6.30
SPG049	0.649	1.35	7.43	19.2	545.	5.36	41.3	77.3	57.5	2.72	492.	22.2	38.6	3.48	0.836	2.11	0.291	2.75	0.745	5.60
SPG050	0.743	1.29	9.06	19.2	658.	5.50	39.0	99.8	58.3	2.66	469.	22.1	38.3	3.77	0.867	2.07	0.314	3.83	0.789	6.18
SPG051	0.767	1.41	10.5	17.4	429.	4.99	30.7	71.4	68.4	2.82	681.	23.2	42.3	3.80	0.904	2.39	0.395	3.80	0.881	6.46
SPG053	0.753	1.66	14.1	17.5	569.	4.94	33.6	90.2	62.8	2.94	560.	22.4	40.4	3.81	0.902	2.37	0.348	4.17	0.748	6.43
SPG054	0.69992	1.50	9.91	16.6	417.	4.65	33.2	77.6	76.4	3.79	553.	24.2	42.8	3.85	0.873	2.05	0.290	3.33	0.783	6.73
SPG055	0.798	1.58	8.15	18.7	735.	5.30	39.5	79.8	59.0	3.04	417.	23.9	41.4	3.85	0.910	2.26	0.327	3.71	0.805	6.58
SPG056	0.716	1.36	13.6	15.1	440.	4.16	28.2	83.8	61.2	3.08	461.	22.6	39.3	3.64	0.830	2.14	0.394	3.12	0.719	6.41
SPG057	0.716	1.64	9.44	21.2	480.	5.93	38.9	103.	72.4	361	467.	25.0	44.9	4.08	0.982	2.47	0.328	3.63	0.923	7.21
SPG058	0.796	1.46	5.86	19.2	632.	5.51	40.2	79.3	70.6	2.69	429.	22.1	37.3	3.57	0.887	2.19	0.255	3.75	0.796	6.18
SPG059	0.748	1.34	7.24	18.9	509.	5.64	38.3	105.	76.2	3.27	438.	24.1	44.7	3.85	0.975	2.69	0.305	4.30	0.975	6.81
SPG060	0.553	1.50	12.4	16.9	431.	4.81	32.6	75.5	62.4	2.81	658.	23.2	38.5	3.60	0.843	1.98	0.259	2.92	0.785	6.22
SPG061	0.634	1.41	11.5	17.0	400.	4.79	30.8	83.6	79.3	3.65	706.	25.9	44.4	4.06	0.929	2.63	0.319	3.90	0.750	7.05
SPG062	0.849	1.34	7.60	19.9	622.	5.60	41.1	77.8	71.9	2.87	340.	22.5	39.4	3.66	0.920	2.06	0.248	3.48	0.782	6.27
SPG063	0.685	0.611	7.71	17.7	401.	5.02	33.9	80.2	67.9	2.99	506.	23.9	42.7	3.85	0.879	2.36	0.318	3.71	0.879	6.82
SPG075	0.834	1.43	11.8	16.1	387.	4.28	26.3	90.4	57.5	2.96	379.	25.2	46.7	4.23	0.962	2.27	0.336	3.81	0.889	6.82
SPG084	0.695	1.99	8.57	18.5	679.	5.13	35.7	105.	65.9	3.10	n.d.	20.0	36.8	3.33	0.826	1.67	0.283	3.51	0.640	5.65
SPG087	0.698	1.52	7.62	19.5	454.	5.48	38.9	94.2	78.7	3.27	485.	24.8	43.9	3.73	0.971	1.73	0.370	3.71	0.822	6.95
Mean	0.714	1.48	9.72	17.6	499.	4.95	34.5	86.9	64.6	2.94	539.	22.9	40.6	3.70	0.881	2.12	0.303	3.55	0.824	6.38
C.V.	13.9	16.0	22.0	9.2	22.1	9.8	12.6	14.7	15.3	16.8	27.1	9.7	9.9	9.4	8.5	12.4	13.6	14.1	15.5	10.0

Gawra Group

Sample ID	Na %	K %	Ca %	Sc ppm	Cr ppm	Fe %	Co Ppm	Zn ppm	Rb ppm	Cs ppm	Ba Ppm	La ppm	Ce ppm	Sm ppm	Eu ppm	Yb ppm	Lu ppm	Hf ppm	Ta ppm	Th ppm
SPG064	0.378	1.98	16.9	15.0	190.	4.15	24.4	119.	75.3	4.07	397.	26.2	47.3	4.49	0.923	2.31	0.437	3.63	0.813	7.43
SPG065	0.706	2.19	8.26	14.4	255.	4.03	23.0	78.0	91.8	4.27	n.d.	24.5	43.9	3.76	0.942	1.85	0.227	4.36	0.812	7.35
SPG066	0.640	1.58	15.2	18.7	259.	5015	29.1	64.1	84.1	4.76	369.	30.3	54.6	5.08	1.11	2.43	0.488	4.13	0.979	8.49
SPG068	0.3.6	2.02	16.0	15.0	202.	4.25	23.8	94.4	82.2	3.93	297.	25.5	48.4	4.41	0.946	2.31	0.384	3.72	0.881	7.52
SPG069	0.380	1.88	14.6	15.4	258.	4.19	2424	77.8	68.7	3.80	495.	27.7	50.2	4.83	0.993	2.94	0.391	4.65	0.927	7.87
SPG071	0.356	2.94	6.15	18.2	255.	4.51	28.2	108.	112.	6.12	401.	24.6	43.3	4.04	0.879	2.42	0.340	3.95	0.740	7.82
SPG072	0.596	1.67	13.5	15.4	367.	4.27	25.1	82.8	85.9	3.86	231.	31.0	55.7	5.28	1.14	2.71	0.432	5.53	1.02	8.61
SPG074	0.467	2.00	11.9	18.3	274.	5.09	28.4	93.3	93.5	4.93	252.	28.2	53.2	4.50	1.05	2.19	0.394	4.10	0.977	8.36
SPG078	0.425	2.08	17.8	15.2	239.	4.23	24.5	106.	67.1	3.32	281.	27.1	47.3	4.81	0.971	2.46	0.481	4.02	0.877	7.74
SPG079	0.518	1.64	13.0	18.1	401.	4.91	29.6	62.7	80.2	4.08	290.	28.2	48.6	4.74	1.04	2.58	0.467	4.33	0.855	9.10
SPG080	0.871	1.72	11.8	16.7	313.	4.57	26.4	59.8	88.9	4.82	146.	24.7	47.2	3.97	0.962	2.24	0.324	4.22	0.818	7.48
SPG081	0.332	1.85	12.6	19.1	271.	5.18	26.7	97.5	112.	6.25	434.	29.8	50.1	4.85	1.03	2.58	0.395	3.96	0.824	8.61
SPG-82	0.316	2.02	14.2	18.9	291.	5.16	26.5	99.3	113.	4.31	236.	30.3	49.8	4.82	0.998	2.54	0.445	3.95	0.944	8.79
SPG083	0.437	2.56	13.6	16.3	249.	4.59	22.8	104.	74.0	4.21	315.	27.7	53.5	4.58	1.02	2.27	0.482	4.15	0.959	8.07
SPG085	0.528	1.96	17.2	18.0	265.	5.06	30.4	80.2	106.	4.37	167.	29.7	52.5	5.36	1.04	2.15	0.378	3.92	0.993	8.38
SPG091	0.425	2.30	21.4	16.6	229.	4.90	24.3	89.7	79.6	3.82	332.	33.0	58.7	5.48	1.20	2.73	0.393	4.53	1.14	9.02
SPG092	0.565	2.22	19.9	15.0	235.	4.46	24.0	74.1	64.6	3.36	308.	30.8	56.5	5.16	1.11	2.67	0.479	4.61	1.01	8.73
SPG095	0.532	1.87	24.2	15.7	211.	4.66	22.9	97.9	69.0	4.40	314.	30.8	52.8	4.98	10.1	2.74	0.373	3.94	0.910	8.39
SPG096	0.598	n.d.	23.4	14.7	237.	4.37	26.2	92.5	72.6	3.60	733.	30.3	55.5	5.14	1.07	2.32	0.385	4.08	1.03	8.39
SPG097	0.700	2.19	15.9	15.8	298.	4.46	27.3	95.1	69.7	3.41	541.	26.9	49.4	4.47	0.993	2.24	0.260	4.078	0.824	7.55
Mean	0.507	2.04	15.4	16.5	267.	4.61	25.9	88.8	84.5	4.38	344.	28.4	50.9	4.74	1.02	2.43	0.398	4.19	0.917	8.18
C.V.	29.0	16.1	29.6	9.6	19.3	8.3	9.0	18.0	18.7	20.9	40.1	8.7	8.2	9.9	7.5	10.6	17.9	9.9	10.8	6.8

Brak Group

Sample ID	Na %	K %	Ca %	Sc ppm	Cr ppm	Fe %	Co Ppm	Zn ppm	Rb ppm	Cs ppm	Ba Ppm	La ppm	Ce ppm	Sm ppm	Eu ppm	Yb ppm	Lu ppm	Hf ppm	Ta ppm	Th ppm
SPG093	0.916	1.30	21.8	16.3	232.	4.79	23.7	70.6	45.2	4.46	n.d.	32.1	57.3	4.95	1.11	2.39	0.326	4.24	1.09	9.06
SPG094	0.948	n.d.	25.4	17.1	214.	4.93	24.4	61.8	45.2	4.60	240.	32.5	60.1	5.42	1.15	2.54	0.409	4.23	1.05	9.16
SPG098	1.21	n.d.	27.5	17.3	229.	5.07	26.5	73.5	42.7	4.81	277.	32.7	59.7	5.05	1.10	2.10	0.374	4.09	1.07	9.16
SPG099	0.841	n.d.	24.3	16.8	245.	4.96	23.5	56.5	48.8	4.73	318.	33.3	57.3	5.30	1.16	2.32	0.411	4.62	1.09	9.29
SPG100	0.889	n.d.	26.3	16.1	227.	4.74	23.2	60.8	42.0	4.76	308.	31.6	54.6	5.28	1.11	2.07	0.384	4.30	1.08	9.02
Mean	0.961	n.d.	25.1	16.7	229.	4.90	24.2	64.6	42.8	4.67	286.	32.5	57.8	5.20	1.13	2.28	0.381	4.29	1.08	9.14
C.V.	15.1		8.6	3.1	4.9	2.7	5.5	11.0	14.3	3.1	12.3	1.9	3.9	3.7	2.4	8.7	9.1	44.6	1.5	1.2

SAMARRA POTTERY IN THE NATIONAL MUSEUM OF ALEPPO, SYRIA

Takahiro ODAKA*

Introduction

Samarra pottery has recently taken on great importance in studies of Neolithic pottery in Syria. For example, excavations at Tell Sabi Abyad I suggested a close relationship between Samarra pottery and Halaf pottery [Akkermans 1989, 1993; Le Mière and Nieuwenhuyse 1996]. Subsequently, new data of Samarra or Samarra-related pottery in the Khabur region and the Rouj basin were reported [Nieuwenhuyse 2000; Nieuwenhuyse *et al.* 2002; Suleiman and Nieuwenhuyse 1999a, 1999b; Tsuneki *et al.* 1997, 1999, 2000]. However, it cannot yet be said that the relationship between Samarra pottery in Syria and that of central Mesopotamia—where 'classic' Samarra sites such as Tell Samarra and Tell es-Sawwan are located—is clearly understood. This is mostly due to the fact that there have been few recent investigations in the latter area and it is thus necessary to re-examine specimens from old excavations in the region.

Tell Baghouz is situated on the left bank of the Euphrates near Abu Kamal and was excavated in 1936 by the Yale University expedition. The materials from this site were divided almost equally into three and stored separately at the University of Chicago, the Louvre and the National Museum of Aleppo. The materials in Chicago have already been examined and reported [Braidwood *et al.* 1944], and a formal report of the excavations was published [du Mesnil du Buisson 1948] although little comparative material was available at that time. From these reports, Tell Baghouz was recognized as a typical Samarra site.

After these early works, no further information regarding Samarra pottery from Tell Baghouz had been published for a long time. Several new Samarra sites had, however, been excavated and the considerable volume of information from these sites has allowed further study. Recently, the pottery in the Louvre was investigated and compared at length with the new data from northern Syria in particular [Nieuwenhuyse 1999; Nieuwenhuyse *et al.* 2001]. Only the materials in the National Museum of Aleppo remained problematic because no-one had studied them in detail and for this reason I decided to study the Samarra pottery from Tell Baghouz housed there.

Tell Baghouz and Samarra pottery

Tell Baghouz is a small mound, less than a hectare in size, situated at the foot of the terrace of the left bank of the middle Euphrates near the Syro-Iraqi border. The number of Neolithic sites along the lower Syrian Euphrates is very limited, although there are a few examples such as Tell Bouqras and Tell es-Sin. For this reason, it has been argued that Neolithic occupations were either eroded or else covered with accumulations from changing stream patterns because they were generally found on the flood-plain near rivers [Akkermans *et al.* 1981: 495]. This view explains why Tell Baghouz, at the edge of the flood-plain and on a slightly higher elevation, had been preserved, as noted by Nieuwenhuyse and his colleagues [Nieuwenhuyse *et al.* 2001: 149].

Whereas a few layers with constructions were recognized by the Yale University expedition, they seem to have been formed in a short time and all of them belong to the Samarra period [du Mesnil du Buisson 1948: 15–16]. The materials from these layers, and also the painted potsherds collected from

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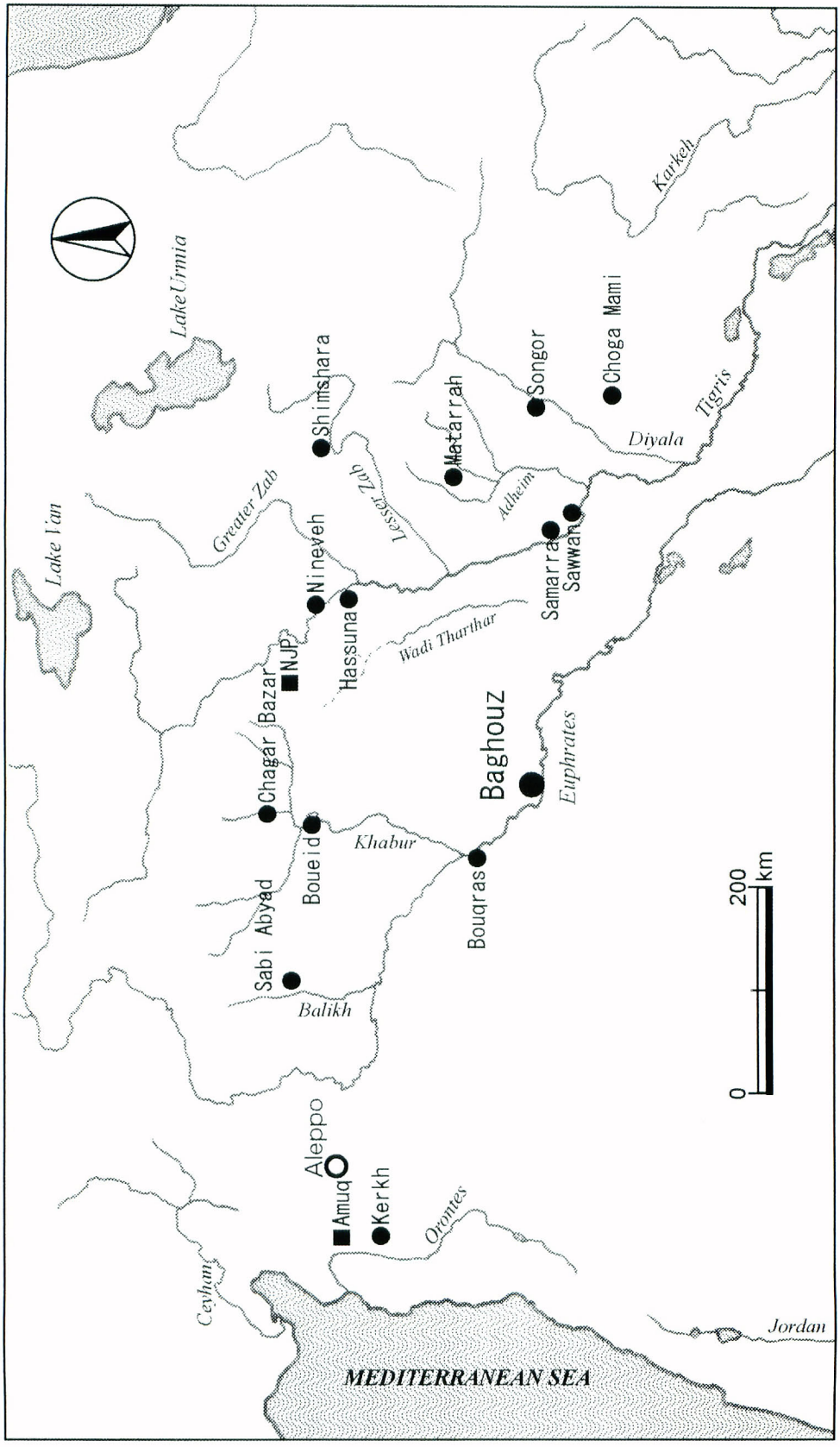

Fig. 1 Map of sites mentioned in the text

the surface, were stylistically quite homogenous [du Mesnil du Buisson 1948: 19].

The first study of the materials from Tell Baghouz by Braidwood and his colleagues included an examination of the ceramics, as well as the stone tools, stored in the University of Chicago. But this study did not use all kinds of ceramics from the excavations because originally no sherds of coarse unpainted pottery were kept. The examined ceramics were treated as an example of the 'Samarran' style of painted pottery; thus, the term 'Samarran' meant neither a 'culture' nor an assemblage [Braidwood *et al.* 1944: 50, 65].

From the 1940's, some excavations carried out at Iraqi sites, such as Tell Hassuna, Tell es-Sawwan, Choga Mami, Tell Shimshara and Tell Songor A, confirmed the view of Samarra as a culture. They revealed its main assemblage characteristics such as graceful stone vessels, rectangular or T-shaped buildings made of mud brick and, of course, a unique style of painted pottery. At the same time, it became possible to recognize the subdivisions of Samarra culture, such as the 'classic' Samarra and 'Choga Mami Transitional.' At this time, Tell Baghouz was seen as one of the 'classic' Samarra sites because its painted pottery seemed to be identical to that of the type sites, i.e. Tell Samarra and Tell es-Sawwan.

However, since the 1980's we have obtained further information regarding Samarra culture, especially its ceramics. In the light of this information, a recent study of the Louvre collection by Nieuwenhuyse suggested that the pottery of Tell Baghouz does not simply represent 'classic' Samarra [Nieuwenhuyse 1999]. Against the background of this argument, some consideration of northern Syria and northern Iraq cannot be ignored. Although many studies have already discussed the relationship between 'classic' Samarra sites in central Mesopotamia and standard Hassuna sites with Samarra pottery in northern Mesopotamia [eg. Lloyd and Safar 1945; Gut 1995], more recent excavations have stimulated further debate over relations with the west. For instance, at Tell Sabi Abyad I, an abundant source of information for Samarra pottery in the Balikh valley, it was noted that its Fine Painted Ware possibly represents a local, western variety of the Mesopotamian Samarra style [Le Mière and Nieuwenhuyse 1996: 173]. Nieuwenhuyse stressed that, "In terms of cultural affiliation, it can be argued that Tell Baghouz covers an intermediate position between the "northern" Samarra sites and the "classic" Samarra sites" [Nieuwenhuyse 1999: 14]. In this case, he kept an alternative classification in mind: 'northern' Samarra sites such as Nineveh, Tell Shimshara and Tell Sabi Abyad I and 'classic' Samarra sites such as Tell es-Sawwan and Tell Samarra.

It can be seen that the inter-relationships between the Samarra pottery subdivisions are very complicated. For this reason, the number of 'classic' Samarra sites is limited although these sites determine the basic assemblage of Samarra culture. Additionally, some sites yielded new information of Samarra pottery although they do not have the typical Samarra assemblage. Thus we have many topics to reconsider; for example, the traits, the nature of the assemblage and the boundary of each subdivision of the Samarra culture.

The study in the National Museum of Aleppo

As mentioned above, the main purpose of the work in the National Museum of Aleppo was an investigation of the Samarra pottery from Tell Baghouz. Unfortunately, the elapse of over half a century since excavation had influenced the storage conditions of this material. All I could do was identify boxes which contained many mixed sherds of prehistoric pottery, perhaps deriving from several very old excavations. Therefore, the first task was to select pieces which must have been Samarra pottery from Tell Baghouz. The following procedures were employed in the selection.

1) Firstly, I selected sherds with painted motifs which are peculiar to Samarra pottery: steps or pegs on narrow bands between horizontal lines, meanders, so-called 'dancing ladies' and so on. These motifs have been the most crucial for identifying Samarra pottery since its first recognition during the excavations at Tell Samarra.

2) Next, the specimens which had fine fabric like Halaf pottery were removed from the sherds selected in stage 1. Halaf pottery, especially early examples, often have similar painted motifs to those found on Samarra pottery. This fact implies a direct relationship between Samarra and Halaf pottery, but it made it harder to divide the two here.
3) In the third stage, specimens with fabrics similar to those selected in stages 1 and 2 were selected from the remaining materials.
4) Finally, the specimens with only general motifs such as cross-hatching or oblique lines were selected from the pieces selected in stage 3.

Consequently, the 44 sherds selected in stages 2 and 4 form the subject of this study. The procedures mentioned above were designed to select possible Samarra pottery, but the selected specimens were not necessarily recovered from Tell Baghouz. Nevertheless, I believe that there is a high probability that they derive from Baghouz because most other Samarra pottery in Syria, especially that found in recent investigations, has been managed appropriately and stored in proper locations. In my understanding, possible materials with Samarra pottery recovered from old excavations of which the precise locations might be unknown are those from Mallowan's surveys at Tell Brak and Tell Chagar

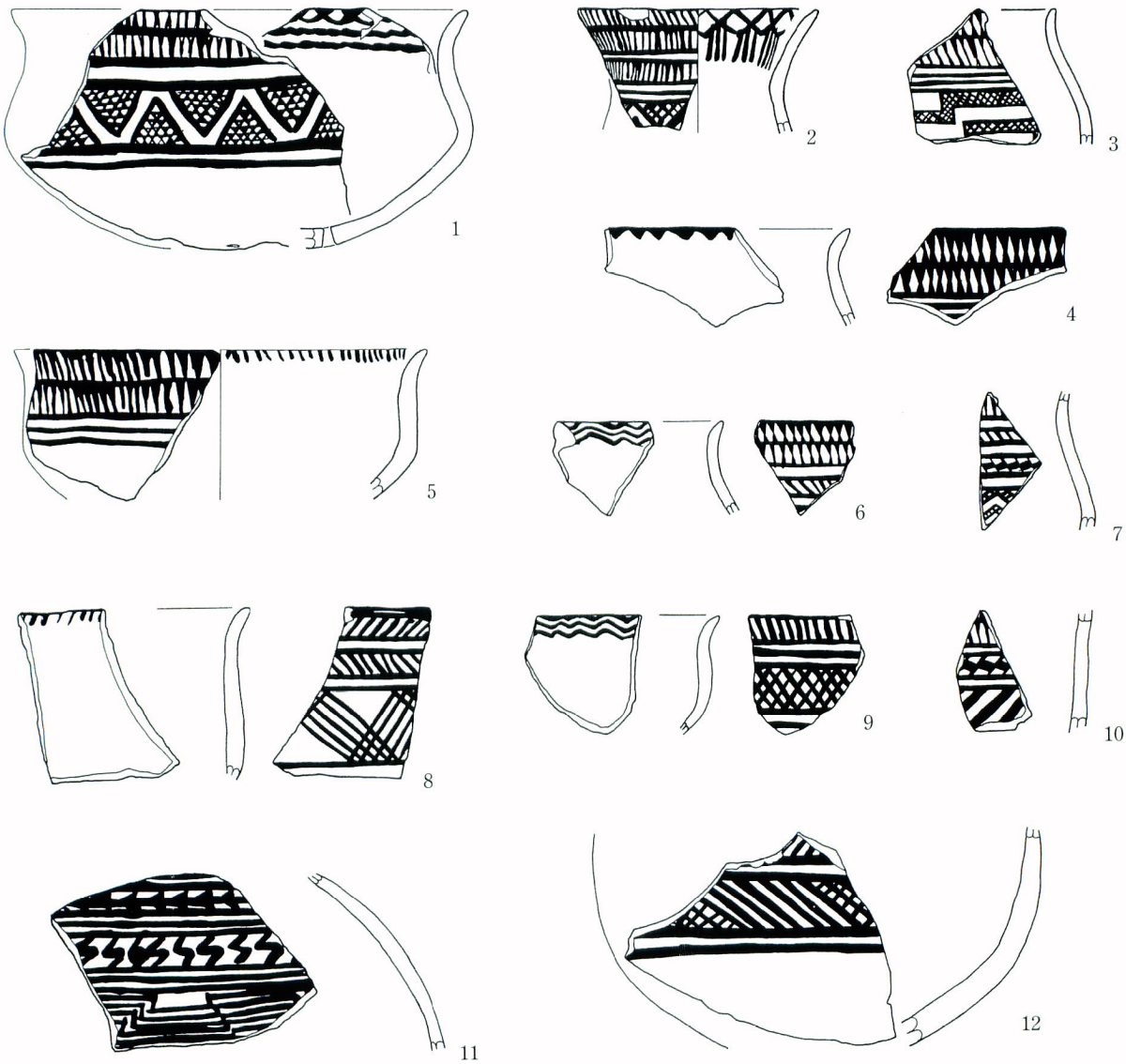

Fig. 2 Group 1 of Samarra pottery in the National Museum of Aleppo, S = 1/3

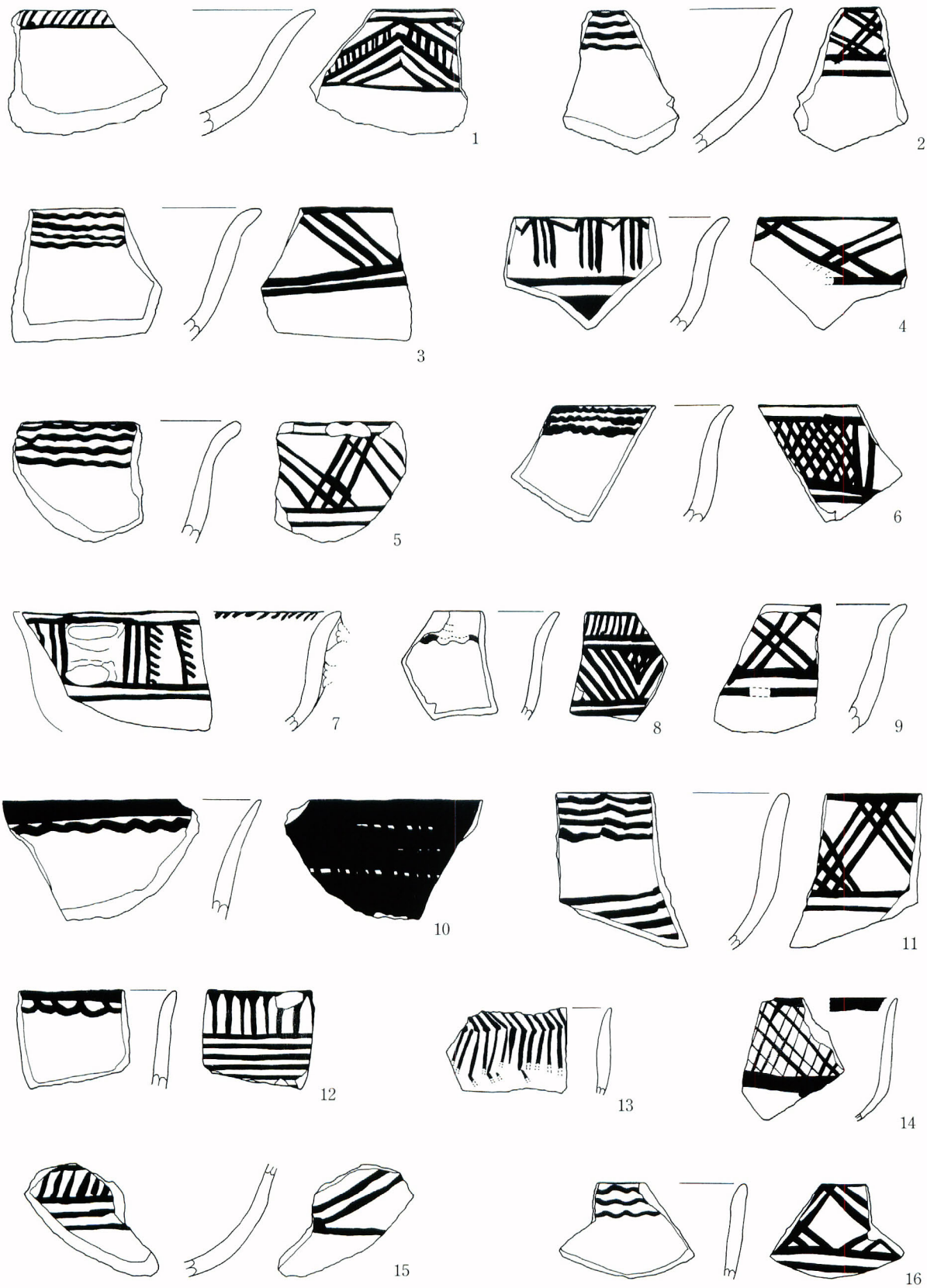

Fig. 3 Group 2 of Samarra pottery in the National Museum of Aleppo (1), S = 1/3

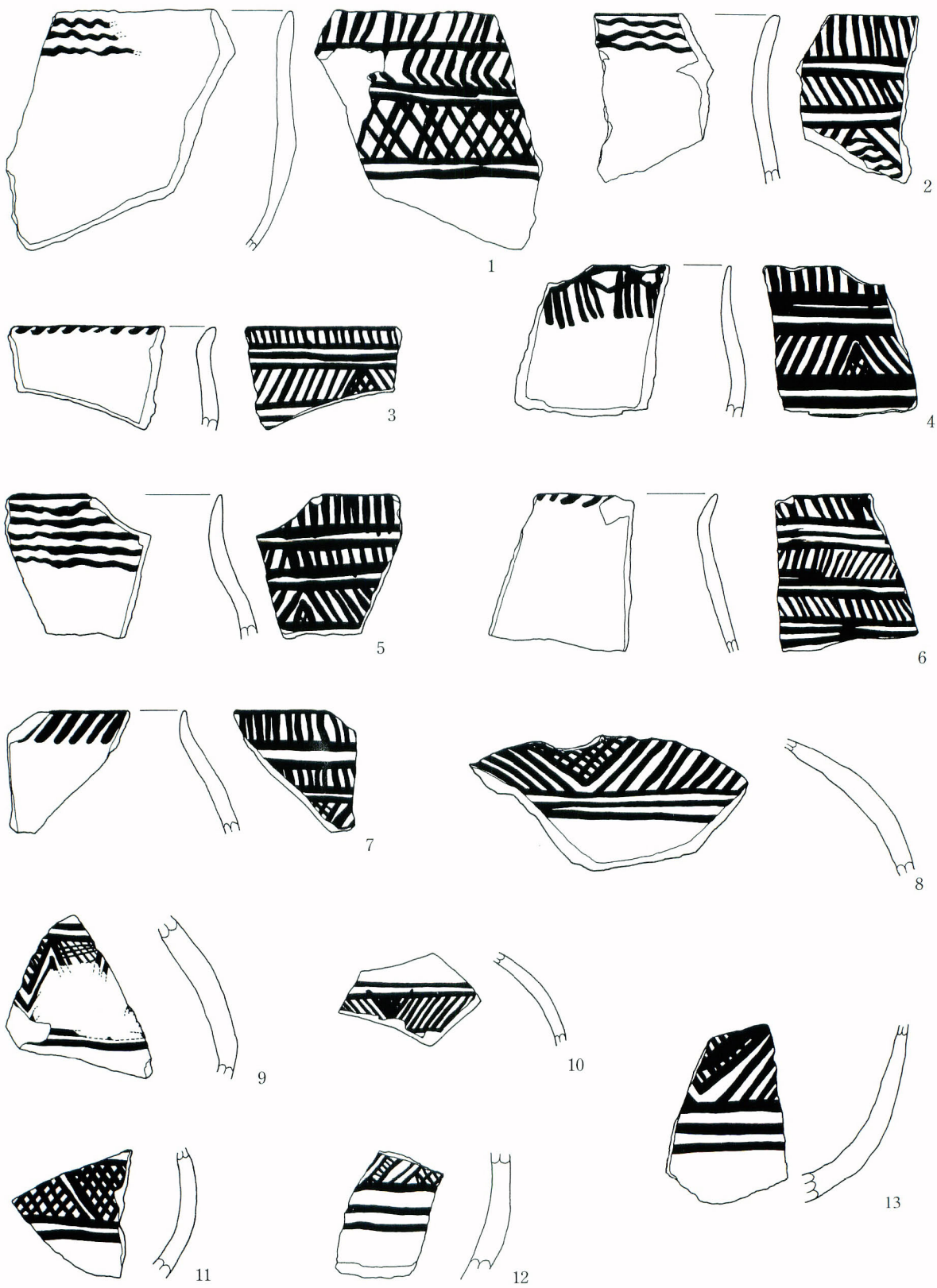

Fig. 4 Group 2 of Samarra pottery in the National Museum of Aleppo (2), S = 1/3

Bazar where a few Samarra potsherds were reported [Mallowan 1936, 1947], and those from Tell Baghouz. Moreover, some motifs of 'Samarra pottery' illustrated in Mallowan's reports rather should be those of Halaf pottery as pointed out by Tsuneki [1986]. The term 'Samarra pottery' in Mallowan's usage has now become slightly unsuitable, although his terminology was natural at the time considering the little information available. Bearing these points in mind, it is thus reasonable to suppose that the 44 pieces selected here must be a part of the Samarra pottery from Tell Baghouz.

From observations of the selected specimens, the sherds can be divided into two groups: Group 1 with 12 sherds (Fig. 2) and Group 2 with 29 sherds (Figs. 3 and 4). The other three pieces are difficult to distinguish and may have been misclassified since they also look like Ubaid or later pottery (Fig. 5).

Group 1 was made of relatively fine fabrics including sand and would generally have been fired at a high temperature. As for its painted motifs, pegs on the outside rim and geometric designs, such as triangles or steps, filled with cross-hatching are remarkable. They are often very fine in their execution and elaborately designed in terms of complexity of motifs. Vessel shapes are mainly S-shaped bowls, that is to say, *Flache Töpfe*, *Tiefe Töpfe* and *Becher* in Herzfeld's classification [Herzfeld 1930] although a few specimens seem to be bodies of jars.

In contrast, the fabrics of Group 2 included a relatively high quantity of minerals and their degree of firing was irregular. Painted motifs were simple and roughly designed. Vessel shapes are various: shallow bowls (Herzfeld's *Schüsseln*), S-shaped bowls and jars (*Töpfe mit Kurzem Hals* and *Flaschen mit Hohem Hals*). Most of shallow bowls were painted with cross-hatching or parallel zigzags within a broad horizontal band on the outside. On S-shaped bowls and jars, parallel oblique lines, sometimes accompanied with triangles filled with cross-hatching, were very often applied in horizontal bands. Parallel horizontal wavy lines are remarkable motifs on the inside of every vessel shape. As a whole, Group 1 gives an impression of high quality, and by contrast, Group 2 looks somewhat rough.

This classification probably corresponds with that of Edna Tulane, a contributor to the University of Chicago report. She wrote that, "about one-third of our sherds from Baghouz are so like those of Samarra as to seem more imports than merely pots of similar design. The remaining two-thirds of the Baghouz sherds have motifs typical of the Samarran painted style but the execution of these motifs lacks the deliberation evinced at Samarra" [Braidwood *et al.* 1944: 64]. Group 2, also comprising about two-thirds of the Aleppo collection, shows a resemblance to the two-thirds of the Chicago collection since lack of deliberation in the execution is a trait shared by both. On the other hand, one third of the Chicago collection could be considered as the same category as Group 1 in terms of its superior execution.

As for the possibility of 'imports', the presence of some sherds having traits of both Groups 1 and 2 becomes a negative indication. For example, the specimen shown in Fig. 2: 2 was painted with a complicated design. However, its execution is as rough as the numbers of fringed lines of so-called 'dancing ladies' on the inside are irregular, i.e. three or four. Fig. 2: 5 and 11 also illustrate examples having roughly executed paintings, although the other traits fit Group 1 rather than Group 2. They were included with Group 1 here for convenience because the collection is small in number, but Group 1 should be divided into at least two categories if detailed classification becomes necessary.

Fig. 5 Unclassified pieces of Samarra pottery? in the National Museum of Aleppo, S = 1/3

It seems certain that Group 1 generally resembles the so-called 'classic' Samarra pottery from the middle Tigris sites such as Tell Samarra and Tell es-Sawwan. For instance, the assemblage of motifs in Fig. 2: 1 can be compared with an example from Tell es-Sawwan [Ippolitoni 1970-71: Fig. S. no. 7]. In contrast, Group 2 does not seem so similar to this 'classic' Samarra ware; rather, it seems to be unique. For example, Fig. 3: 7 illustrates a specimen with a looped handle. A broad horizontal band and vertical lines form panels which divide the outer surface of its painted design. Very few sherds with handles or paneled design painting are known in Samarra assemblages from other 'classic' Samarra sites. At Tell Baghouz, some similar specimens in the other collections were already reported [Braidwood *et al.* 1944: Pl. V. 1; du Mesnil du Buisson 1948: Pl. XXIII; Nieuwenhuyse 1999: Fig. 4: 8]. Additionally, a repeated arrangement of horizontal bands filled with parallel oblique lines, a dominant design of Group 2 painting, is not so common in the middle Tigris sites.

On the assumption that the specimens examined here came from Tell Baghouz as I believe, Group 2 urges us to reconsider the traditional view of Tell Baghouz as one of the 'classic' Samarra sites. This suggestion makes us remember Nieuwenhuyse's conclusions from his examination of the Louvre collection. Certainly, painted potsherds with a looped handle appear at Tell Sabi Abyad I, one of the major 'northern' Samarra sites [Nieuwenhuyse 1999: 14]. Paneled design painting seems to be a trait of Halaf pottery, and we could trace the transition of pottery style from Samarra to Halaf only at 'northern' Samarra sites, especially in the Balikh or north Jazirah [cf. Le Mière and Nieuwenhuyse 1996; Campbell 1997; Nieuwenhuyse 2000]. These facts would reinforce Nieuwenhuyse's view of the intermediate position of Tell Baghouz between the 'northern' and the 'classic' Samarra.

However, problems still remain. The remarkable painted design of repeated horizontal bands filled with parallel oblique lines is rarely dominant at 'northern' Samarra or at 'classic' Samarra sites. This trait seems to be unique to Tell Baghouz; in other words, we might need to consider another subdivision of Samarra in the middle Euphrates.

Ending Remarks

Although at first I expected to review 'classic' Samarra pottery, the study in the National Museum of Aleppo showed the possibility of a unique assemblage, whether or not it occupies an intermediate position between 'northern' and 'classic' Samarra. Its position should be considered further, especially because it is so far the only example of Samarra in the middle Euphrates.

For the spread of Samarra pottery, I suggest that there were roughly two stages. The first stage is the importation from the original home region, probably the middle or lower Tigris, and/or the manufacture of imitation wares. At upper Tigris sites, such as Tell Hassuna and Nineveh, and Zagros sites, such as Tell Shimshara and Mattarah, the Samarra pottery seems to represent this stage. At these sites, the possibility of importation had often been mentioned, for example at Tell Hassuna [Lloyd and Safar 1945: 281–283]. The evidence for these imported wares has not been sufficient, and we should study further both lower Mesopotamia and the north. However, whether we assume that Samarra pottery was made locally or not, it was certainly similar to that of the middle Tigris; it is therefore enough to imagine the existence of imitation wares.

In the second stage, Samarra pottery escaped the concept of imitation to become completely local artifacts; this stage thus saw deviation from typical 'classic' Samarra pottery. We would be able to trace the transition from the first stage to the second stage in the Sinjar or further west. For example, the Fine Painted Wares in the Transitional period of Tell Sabi Abyad I gradually showed traits of Halaf pottery, such as the 'cream bowl' vessel shape, and, as a result, the earliest Halaf pottery emerged in level 3.

As for the materials studied here, Group 1 would attest to the first stage characterized by imitation, and Group 2 would indicate the second stage of complete localization. These two groups might show the turning point where Samarra pottery became a unique form and changed variously in each

region, although it is hard to consider Group 2 as a prototype of Halaf pottery for the present. If this assumption is true, however, many questions still remain. For example, when, where, and for how long did each group occupy the middle Euphrates? Where were the other examples? And how did they relate to the ceramics in other regions or of other styles: coarse wares, Hassuna, Halaf, Ubaid and so on? With these problems in mind, I plan to carry out further investigations of Samarra pottery in the future.

Acknowledgements

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Catalogue

Fig. 2

1. S-shaped bowl. Dark brown painting on buff slip. Elaborately smoothed outer surface and smoothed inner surface after scraping on lower part. Buff-colored fabric. A hole for repairing near the base. Index: BG? 44.
2. Upper part of S-shaped bowl. Black painting on buff-colored smoothed surface. Buff fabric. Index: BG? 23.
3. Upper part of S-shaped bowl. Red painting on white slip. Smoothed surface. Orange buff fabric. Index: BG? 21.
4. Rim of S-shaped bowl. Dark red painting on buff-colored, elaborately smoothed surface. Buff fabric. Index: BG? 17.
5. S-shaped bowl. Red painting on white slip. Smoothed surface. Greenish-to-pinkish buff fabric. Index: BG? 38.
6. Rim of S-shaped bowl. Dark red painting on white slip. Elaborately smoothed surface. Orange buff fabric. Index: BG? 26.
7. Upper part of S-shaped bowl. Dark red painting on buff-colored, elaborately smoothed surface. Buff fabric. Index: BG? 14.
8. Upper part of S-shaped bowl. Dark red painting on brownish buff surface treated with elaborate smoothing. Brownish buff fabric. Index: BG? 20.
9. S-shaped bowl. Dark red painting on white slip. Elaborately smoothed surface. Light buff fabric. Index: BG? 29.
10. Vessel shape is unknown. Black painting on buff-colored, elaborately smoothed surface. Buff fabric. Index: BG? 2.
11. Upper part of body of jar (?). Dark red painting on white slip. Smoothed surface probably after scraping inside. Reddish brown fabric with lime inclusions. Index: BG? 1.
12. Lower part of jar. Black painting on grayish brown surface treated with smoothing. Grayish brown fabric. Index: BG? 43.

Fig. 3

1. Upper part of shallow bowl. Dark red painting on orange buff surface treated with smoothing. Orange buff fabric. Index: BG? 8.
2. Upper part of shallow bowl. Black painting on light gray surface treated with smoothing. Orange buff fabric. Index: BG? 12.
3. Upper part of shallow bowl. Dark red painting on light gray surface treated with smoothing. Buff fabric. Index: BG? 32.
4. Upper part of shallow bowl. Black painting on brownish buff surface treated with smoothing. Light brown fabric. Index: BG? 15.
5. Upper part of shallow bowl or S-shaped bowl. Dark red painting on buff-colored smoothed surface. Orange buff fabric. Index: BG? 34.
6. Upper part of shallow bowl or S-shaped bowl. Black painting on brownish buff surface treated with smoothing. Brownish buff fabric. Index: BG? 33.
7. Upper part of S-shaped bowl with handle. Black painting on brownish buff surface treated with smoothing. Orange buff fabric. Index: BG? 42.
8. Upper part of S-shaped bowl. Black painting on orange buff surface treated with smoothing. Orange buff fabric. Index: BG? 11.
9. Upper part of S-shaped bowl or shallow bowl. Black painting on light gray fabric treated with smoothing. Buff

fabric. Index: BG? 13.
10. Neck of jar (?). Black painting on grayish buff surface treated with smoothing. Grayish buff fabric. Index: BG? 10.
11. Upper part of shallow bowl or S-shaped bowl. Black painting on brownish buff surface treated with smoothing. Orange buff fabric. Index: BG? 41.
12. Vessel shape is unknown. Black painting on buff-colored smoothed surface. Buff fabric. Index: BG? 3.
13. Rim of bowl. Black painting on orange buff surface treated with smoothing. Orange buff fabric with lime inclusions. Index: BG? 30.
14. Upper part of bowl. Red painting on white slip. Smoothed surface. Reddish brown fabric with lime inclusions. Index: BG? 24.
15. Upper part of shallow bowl. Dark red painting on white slip. Smoothed surface. Orange buff fabric. Index: BG? 31.
16. Upper part of bowl (?). Dark brown painting on buff slip. Smoothed surface. Orange buff fabric. Index: BG? 7.

Fig. 4

1. Upper part of S-shaped bowl. Dark brown painting on brownish gray surface treated with smoothing. Brownish gray fabric. Index: BG? 6.
2. Upper part of S-shaped bowl. Dark brown painting on buff slip. Smoothed surface. Light brown fabric with lime inclusions. Index: BG? 39.
3. Upper part of S-shaped bowl. Black painting on brownish buff surface treated with smoothing. Brownish buff fabric with lime inclusions. Index: BG? 16.
4. Upper part of S-shaped bowl. Dark red painting on white slip. Roughly smoothed surface. Orange fabric. Index: BG? 40.
5. Upper part of S-shaped bowl. Black painting on buff-colored smoothed surface. Buff fabric with lime inclusions. Index: BG? 18.
6. Upper part of S-shaped bowl. Black painting on buff-colored smoothed surface. Orange buff fabric. Index: BG? 19.
7. Upper part of S-shaped bowl. Black painting on orange buff surface treated with smoothing. Orange buff fabric. Index: BG? 27.
8. Upper part of body of jar. Black painting on brownish gray surface treated with smoothing. Orange fabric with lime inclusions. Index: BG? 37.
9. Upper part of body of jar. Dark red painting on white slip. Smoothed surface. Orange fabric. Index: BG? 35.
10. Upper part of body of jar. Dark brown painting on buff colored smoothed surface. Buff fabric. Index: BG? 4.
11. Body of jar. Black painting on orange buff surface treated with smoothing. Orange buff fabric. Index: BG? 22.
12. Lower part of body of jar. Dark brown painting on reddish brown surface treated with smoothing. Reddish brown fabric. Index: BG? 28.
13. Lower part of body of jar. Black painting on brownish gray surface treated with smoothing. Orange fabric with lime inclusions. Index: BG? 36.

Fig. 5

1. Upper part of body of jar. Dark brown painting on white slip. Smoothed surface. Orange buff fabric with plant inclusions. Index: BG? 25.
2. Upper part of body of jar (?). Dark brown painting on white slip. Smoothed surface. Buff fabric. Index: BG? 9.
3. Body of jar (?). Dark brown painting on buff-colored smoothed surface. Buff fabric. Index: BG? 5.

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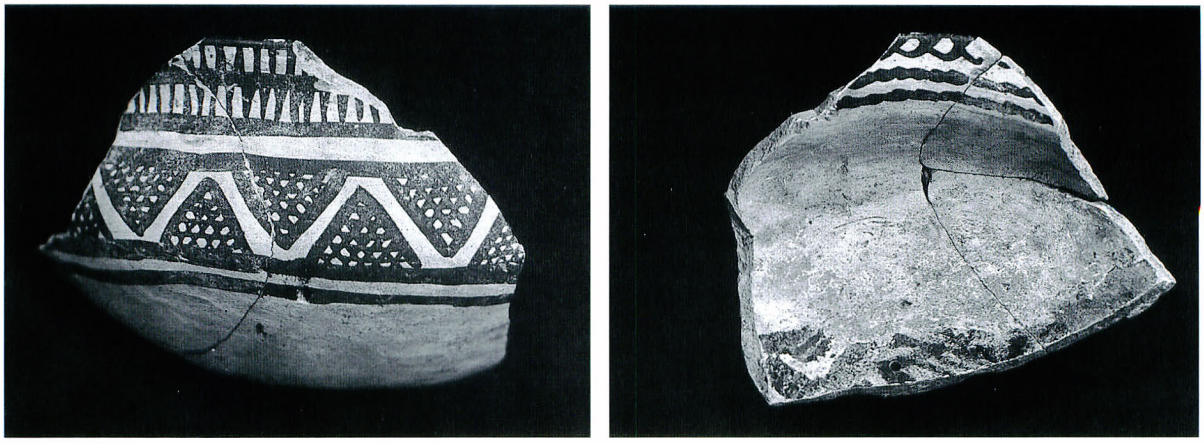
Pl. 1



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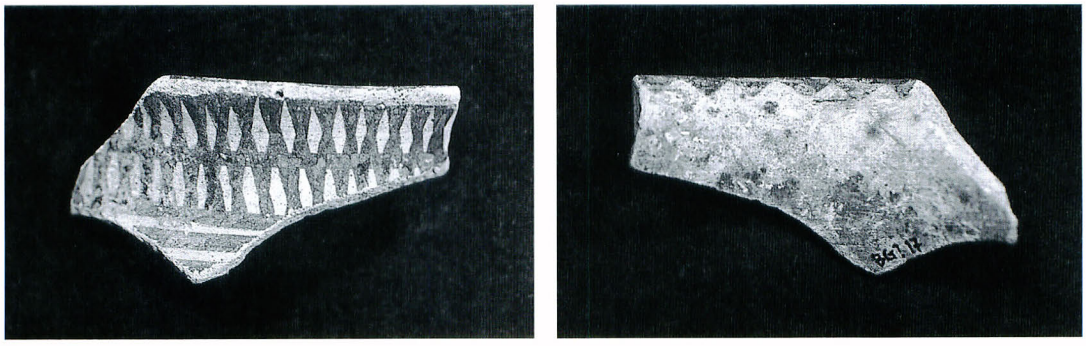

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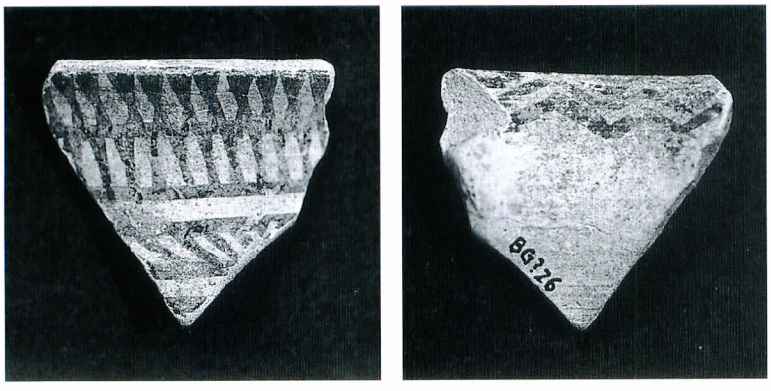

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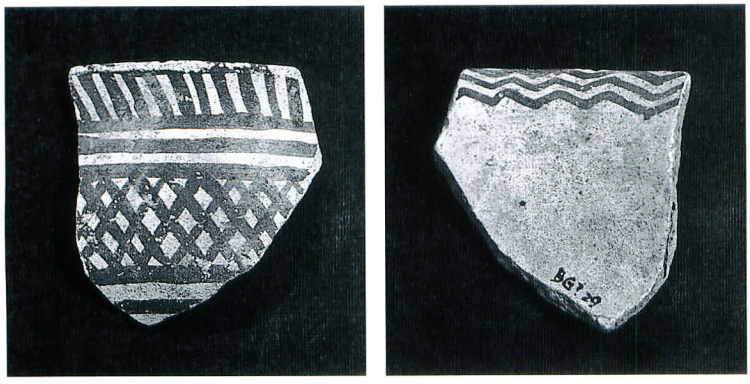

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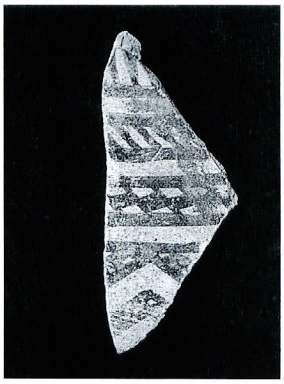

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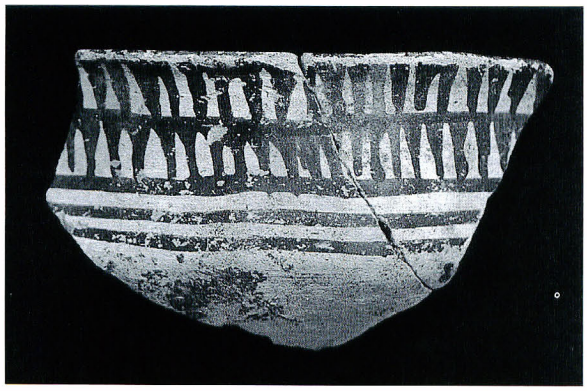

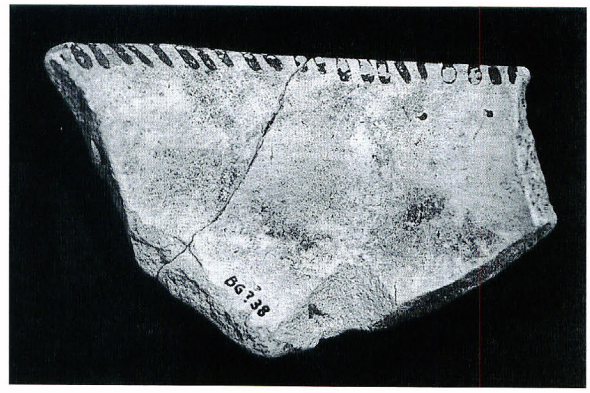

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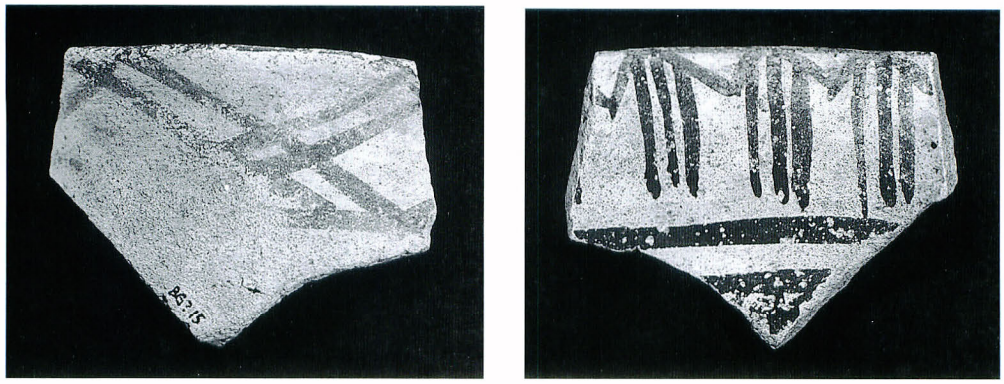
Pl. 3



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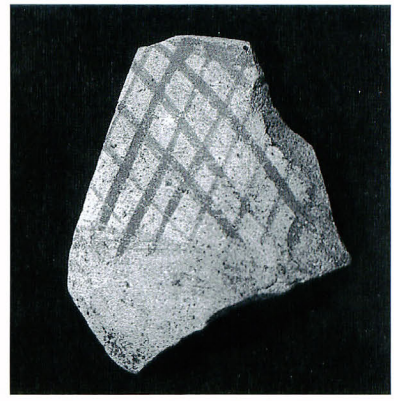

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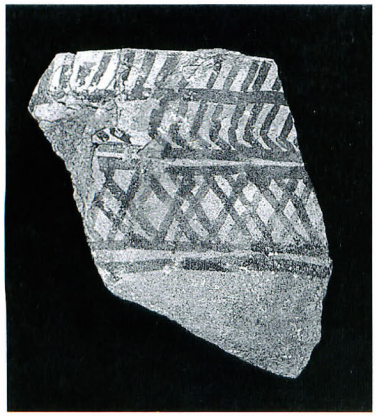

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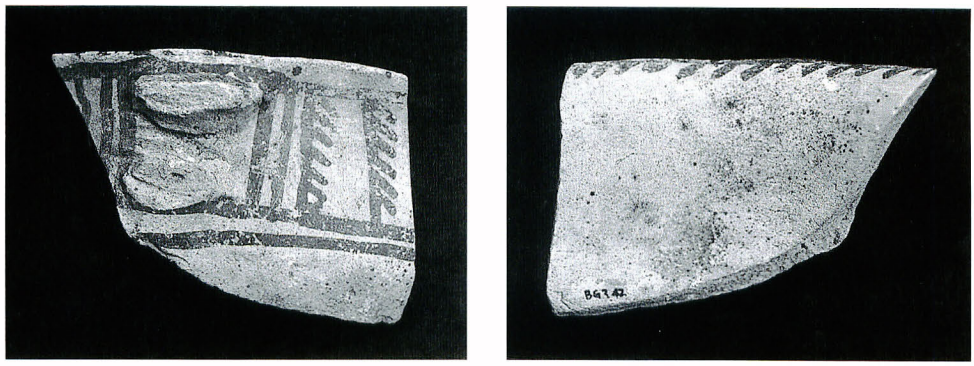

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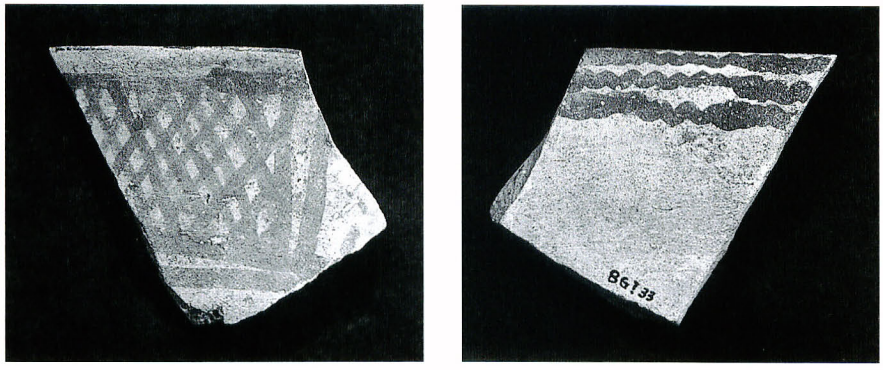

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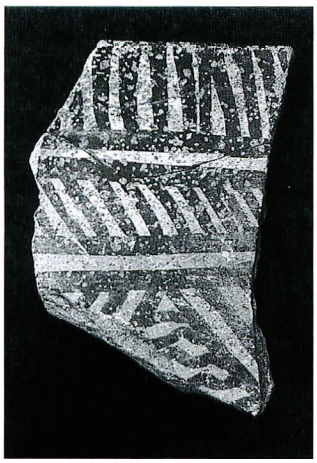

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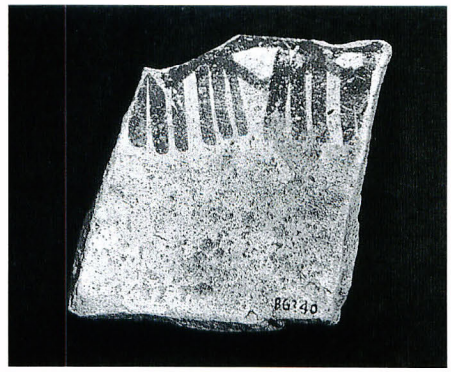

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AN APPROACH TO THE EVOLUTION OF EARTHEN BUILDING CULTURES IN ORIENT AND MEDITERRANEAN REGIONS —WHAT FUTURE FOR SUCH AN EXCEPTIONAL LEGACY? —

Hubert GUILLAUD*

Introduction and summary

Among the immediately available building materials, earth was undoubtedly the elected material of mankind as soon as prehistoric ages. At that time, it was often associated with wood and plants. Its common use asserted itself during the protohistory in several regions of the world offering propitious conditions for the settlement of human communities. It played an essential part all along history, up today. All archaeological excavations which have been carried out since the XIXth century, on territories having given birth to ancient great civilisations, and the numerous studies covering the field of vernacular architectures existing worldwide, are proving this privileged use of the earth for building human settlements the size of which ranges from simple clusters of dwellings, as hamlets or villages, up to towns.

The use of earth in construction seems having been independently developed in the main well-known cradles of ancient civilizations: in both Tigris and Euphrates valleys, in Mesopotamia; in Egypt, along the banks of the Nile river, from Nubia to the delta; in actual Pakistan, on the tablelands of Baluchistan and then along the banks of Hakra and Indus valleys; in China, along the Huang-ho. But also on other continents: in Latin America, on the border desert lands of the Pacific Ocean which are drained by "*Rios*" (rivers) coming down from the Andes, and in Central America. Of course in Africa which gave birth to humankind in the Rift Valley. Simultaneously or successively, with most of times great gaps in history, the fertile regions which were propitious to the development of the Neolithic Agricultural Revolution, soon invited people to build their original settlements in earth. The alluvial soils, rich in sand, silt and clay, mixed with the straw of the farmed crops, have given birth to the first solid and durable building material: the earthen bricks dried under the sun or unbaked bricks now commonly called "adobes". Whatever the isolation of these different ancient civilisations was, whatever the relationships between them were, the art of building with earth rapidly flourished with the much more generalised use of the unbaked earth brick.

This article, in form of a synthesis, is based on a research carried out for presenting a 3rd cycle thesis in the "D.P.E.A.-Terre" driven by CRATerre–EAG, at the School of Architecture of Grenoble, France. It was prolonged by the presentation of a DEA equivalence, at the "Ecole Pratique des Hautes Etudes", Paris, IVth Section of "Sciences Historiques et Philologiques", under the direction of Professor Jean-Claude Margueron. In a first part, the article focuses on the evolutionary process of earthen building cultures in Near Orient and Mediterranean regions from ancient times and then points out the permanence of a large range of practices up to recent times as numerous living vernacular traditions are showing. In a second part, considering the importance of this building and architectural legacy, it is worth to question the major problem of the maintenance of a building techno-diversity for the future, according two directions: the architectural heritage conservation, and the relevant potential of the earthen building practices for a sustainable development.

As architect I am particularly indebted to all the community of scientists in archaeology of the

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world who has conducted patient works, passing on to humanity all the memory of the building cultures of humankind and this so exceptional and valuable scientific knowledge. Concerning the history of the vaulting construction in Orient, I want specifically thank Dr. Roland Besenval who has conducted his reference research on the "Technology of the vault in Ancient Orient" [Besenval 1984a: p. 74 and Besenval 1984b: Pls. 60 and 102].

Main features of earthen building cultures in Ancient Orient

"From the village to the town"

The organised production of what we now commonly call "adobe" has extended during the VIIth millennium to be widely confirmed during the VIth millennium. In Anatolia, the site of Çatal Hüyük (Turkey), a Neolithic settlement which was inhabited between 6500 and 5700 B.C., shows an advanced degree of the adobe construction where the bricks, laid with mortar, fill up bearing structures made of wooden pillars and beams. The builders were already mastering the technology of lime plastering [Mellaart 1967: p. 232]. In Mesopotamia, the culture of the unbaked brick which was gifted with a great flexibility of use and of excellent structural performances characterising the masonry in small elements, would be progressively mastered during The Ages of Hassuna (mid-VIth millennium) and then during the Ages of Samara (from the Vth millennium). These ages correspond to the coming out and progressive extension of bigger structures with thick walls strengthened by big pillars and buttresses (see Tell Hassuna Fig. 1). Some nice examples of such structures have been found at Chogha Mami, in the middle Tigris valley, or at Tell es Sawwan (Iraq). These massive farming constructions and other dwellings presenting some characters of ostentation are archaeologically

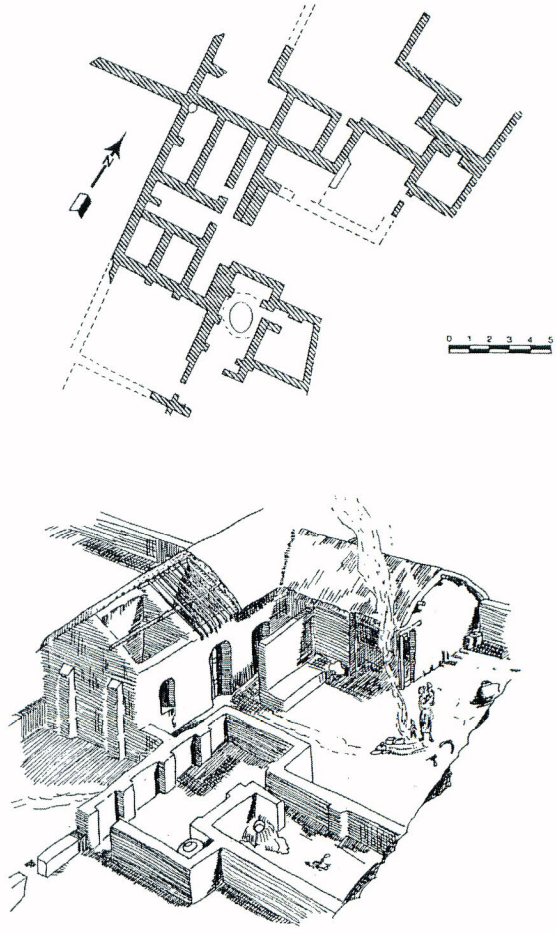


Fig. 1 Adobe people's housing of the 6th Millenium B.C. at Hassuna, IVth Level. Drawing from Nagel, see Gullini, Giorgio, 1970,71, in *Struttura e Spazio nell'Architettura Mesopotamica Arcaica, da Eridu alle soglie del Protodinastico*, Università di Torino, ed. Giappichelli, Torino, Italia, p. 187. Comments: we can already observe the structural consolidation of the earthen construction with outdoor and indoor buttresses. The roof should have been still thatched on a basic carpentry covering short spans with girders and rafters.

foreshadowing what Olivier Aurenche has defined as being the "*signs of the town*" [Aurenche 1985]. During the IVth millennium, the phenomenon of a town planning process was growing and extending with a transfer of patterns from regions to regions, channelled by a colonisation of new territories that are sometimes very far from the founding sites. This mobility of building, architectural and town-planning models follow people's migrations moved by the searching of new settling sites, or pushed away by economical stakes or warlike events. On these considerations, Jean-Claude Margueron has made the hypothesis of such a transfer of cultural patterns from south Mesopotamia (Ur, Uruk) up to the North, in the territories of the Euphrates loop, with the founding of Mari [Margueron 1991].

The coming out of a monumental architecture and vaulting structures

The middle times of the IVth millennium seem to confirm a new step of evolution of people's building ability with the coming out of the vault and cupolas. The first known examples show a corbelling building system. These vaults are not erected on top of bearing walls but directly on the ground. Some remains which have been excavated at Tell Arpachiyah, north of Iraq, conserved at a height of 80 to 85 cm, describe this building process of corbelling vaults and so is doing the famous Tholos 42 of Yarim Tepe in the same regions [Besenval *op. cit.*, see also Merpert *et al.* 1973]. By the beginning of the IVth millennium, with the Ubeidian period, a new type of monumental earthen architecture emerged defining its typological and spatial characters on the use of the symmetry where the rooms, similar in size and equal in number, were laid around a central rectangular or "T" shaped space. Several buildings present typical layouts organised in three parts. Chiefs of villager communities may have lived in the most elaborated of them, as they seem to have sheltered meeting or reception rooms. Such edifices have been excavated at Tell el'Oueili, near Larsa, at Eridu, southern Iraq, or at Tepe Gawra, northern Iraq. The birth of the Civilisation of Sumer and then of Elam, on the plateaux of Khuzestan, actual south-west of Iran, from the mid-IVth millennium, confirms the settling of the first religious centres which foreshadow the temples-towns. During the period of Uruk, the famous temples of Eanna and the White Temple of Uruk, the Temple of Enki, at Eridu, are built up on high earthen brick platforms. The aesthetic composition of their elevations affirms the principle of successive recessed and projected facings that would be dominant in the Mesopotamian architecture. By the entry in the IIIrd millennium, the VIIIth level of Tepe Gawra [Speiser 1935] (room 846) testifies of the construction of the barrel vault with quite impressive structural performances (a span of 3,25 m and 8,50 m long). Roland Besenval quoted: "*It seems that it should be one of the first arched or barrel vault used for covering some important structure and presenting a radiating building process.*" At Yanik Tepe, structures erected on circular layouts have been found. They could be inherited from the Chalcolithic Transcaucasian building culture if we refer to the sites of Shulaveri and Shangavit. The external diameter of such structures could reach the impressive size of 6,20 meters. But the excavators prefer to hold the hypothesis of some wooden and thatched roofing system and not earthen bricks cupolas [Burney 1961].

The proto-dynastic Ages (2700–2500 B.C.) generalised the development of religious towns around temples. At Khafajah, mid-valley of Tigris, the tombs settled around the famous Oval Temple are exhibiting earthen bricks vaulting systems. The bricks are plano-convex. These vaults are built up in successive inclined arches, placed side by side, with a generating broken section. The average dimension of the tombs is about 3,40 m × 1,20 m. These roofing solutions were also adopted for the dwellings as the site of Tell Asmar (Central Iraq), with its "arch houses", shows [Delougaz 1967]. Wooley has made similar findings at Ur, on the Royal Tombs [Wooley 1934]. On the Iranian Plateau, at Shahr-i Sokhta, rural people's houses of mid IIIrd Millennium (circa 2400 B.C.) developed a clustering design which confirms the evolution to an urban design (see Fig. 2). At Mari, east of Syria, the Presargonic period (2500 B.C.) shows an evidence of small houses which are organised around a

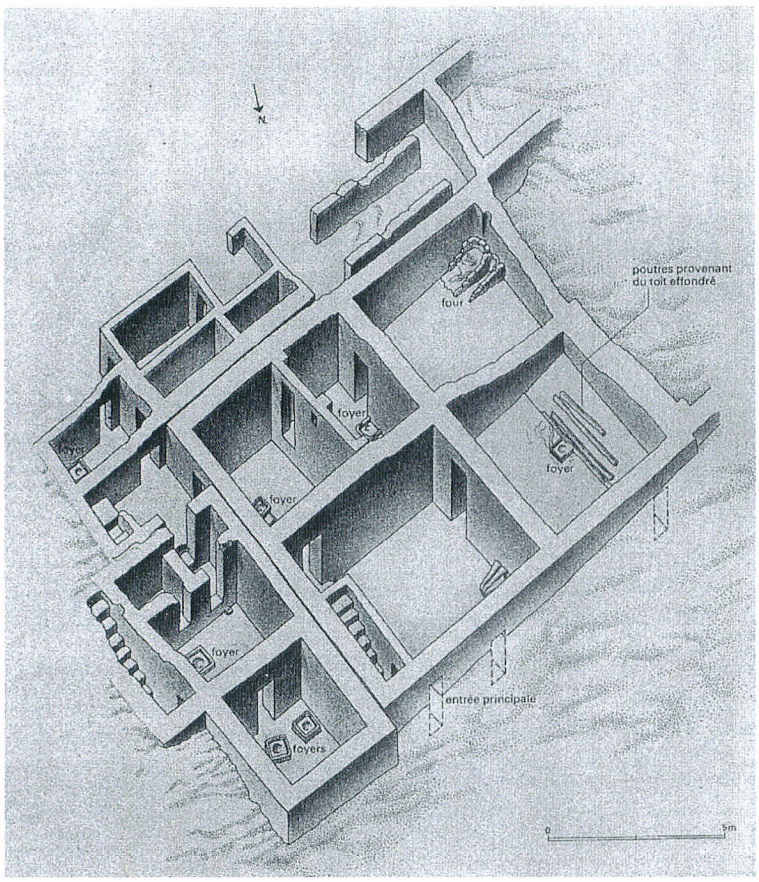
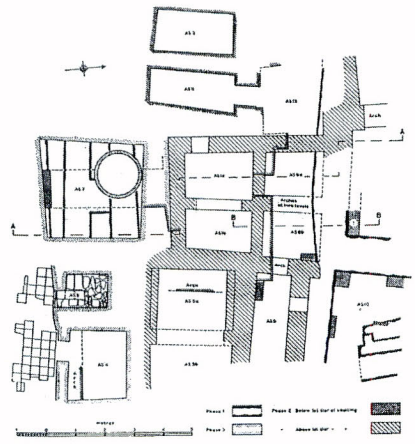


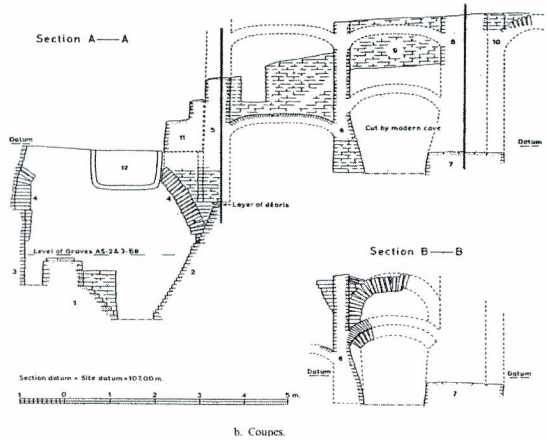
Fig. 2 Adobe people's housing of the 3rd Millenium B.C. (around 2400) at Shahr-i Sokhta, Iranian Plateau. From Cleuziou, Serge, 1981, "Les villes du plateau iranien au III° millénaire", in *Le Grand Atlas de l'Architecture Mondiale*, ed. Universalis, Paris, 1981, p. 185. Comments: we can observe the clustering process of the people's housing of those ancient times clearly associating three housing units each of them having their own fire places. The presence of staircases confirms the previous existence of one storey or one accessible flat terrace. Entrance doors should have given on narrow streets.

raised central space as is showing the famous miniature of the "Red House". The great "*cella*" of the Ninni-Zaza and Ishtar Temples could have been covered by terraced wooden and earthen structures (see hypothesis of restitution by Jean-Claude Margueron and Olivier Callot [Margueron 1984a]). By the IInd millennium the Mesopotamian skyline was progressively marked out by prominent structures, the ziggurats, built up in successive platforms of unbaked bricks that would be then protected and adorned by burnt and glazed bricks facings. This architectural and religious tradition (these ziggurats were crowned by temples at their summits) which had been initiated on such sites as Ur, Eridu and Uruk, in southern Iraq, would extend and spread all over the Mesopotamian territories. Chogha Zanbil or «*Dur-Untash*», in Iran, south of Susa, exhibits one of the most famous examples of such tradition known today (see Pl. 1a). This site which was created by the Elamite King Untash Napirisa, around 1200 B.C., discovered by René de Mecquenem, and then excavated by Roman Ghirshman during the fifties to the sixties of the XXth century, shows an original building system the design of which is explained by the successive steps of construction of the structure. As the result of this construction history, the ziggurat is not commonly built in successive piled up platforms but in a way of encased levels, as a "Russian doll". This building principle is attested by a gallery that has been dug by the excavator from the north-west side up to the core of the ziggurat. The first and the second levels shelter in their thickness several chambers and temples (the Temple of the god Inshushinak, located at the first level, right site of the south-east elevation), which have been roofed with vaults. Located at the south-east part of this large site, beyond the second wall, the exceptional remains of the tombs of the Hypogeum Palace undoubtedly exhibit among the nicest barrel vault of those ancient times in the Mesopotamian space. All these structures are by now under a process of conservation and "*mise en valeur*", thanks to the ICHO-RCCCR-UNESCO-Japan Trust Fund and CRA Terre-EAG Chogha Zanbil Project carried out since 1998.

The period of Isin-Larsa corresponds to the apogee of a very elaborated town planning, particularly in southern Iraq, around Larsa and Ur. At that time was confirmed the patterning of an earthen urban habitat organised around indoor open yards. The famous two-storied house of Ur shows this principle of an introverted layout with a patio distributing the rooms all around, by direct access at the ground floor, and by a staircase leading to a gallery at the second floor. The typical pattern of the earthen oriental house had already been totally accomplished and would stay without any major changes, from that time up to now. At Tell Al Rimah [Oates 1964, 65, 66, 67, 68, 71 and Besenval *op. cit.*] (Zone AS 1, a & b, see Fig. 3), north of Iraq, the beginning of this period of Isin Larsa has passed on the mastery of the lowered brick vaults erected in inclined arches and defining two typical building patterns: either one progression from the four angles of the top walls of the rooms, or from the two short sides of the room. Both these patterns are now still used by contemporary Iranian builders. Beyond this time, there will be a generalisation of the radiating barrel vault and the civil as well as the monumental architecture will both build in unbaked and burnt bricks, these last ones being much more used. This is a typical feature of the building culture of the Medio-Assyrian period which will conclude by the unification of Sumer and Akkad Kingdoms by King Hammurabi, founder of the Babylonian Empire (1750 BC). Around 1200 B.C., in Syria, a period corresponding to a large extension of the Hittite Empire, new towns were settled around worshipping centres, still all built in earth bricks. Such is the city of Meskene-Emar, erected along the banks of middle Euphrates River, and its "Neighbourhood of the Soothsayer" with both temples of Baal and Astarte. All around, the people's dwellings are erected in dense clustered structures, following the natural slopes of the



a. Plan.



b. Coupes.

Fig. 3 The excavations of the AS Zone, at Tell Al Rimah (Period of Isin-Larsa, II[nd] Millenium B.C.), North of Iraq, have revealed the existence of vaulting systems covering narrowspanned spaces (1 to 1,5 m.). From Oates, D., "The Excavations at Tell Al Rimah", 1970, *Iraq*, vol. XXXII, pp. 1–26, in Besenval, Roland, 1984, *Technologie de la voûte dans l'Orient Ancien 2*, éd. Recherche sur les Civilisations, Paris, 1984, Pl. 114. Comments: These vaults are flattened and should have been built without casing but directly on the ground or filling up materials after having erected the walls in adobe.

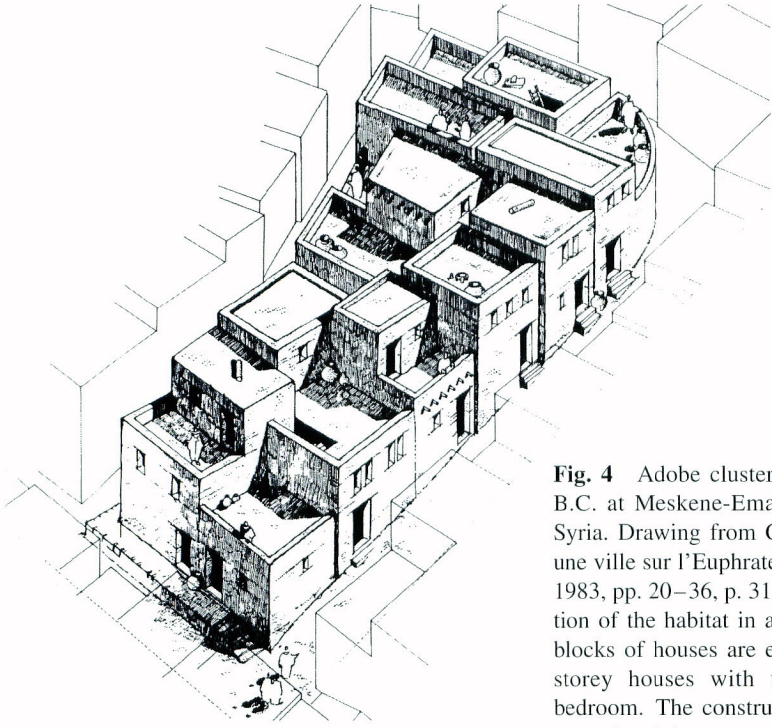


Fig. 4 Adobe clustered people's housing of the XIIIth Century B.C. at Meskene-Emar, block D (North-West part of the tell), Syria. Drawing from Callot, Olivier, in Margueron, Jean, "Emar une ville sur l'Euphrate", in magazine *Archaeologia*, n° 176, mars 1983, pp. 20–36, p. 31. Comments: we can observe the densification of the habitat in an urban planning design where successive blocks of houses are encircled by narrow streets. They are two-storey houses with upper terraces accessible from a high bedroom. The construction is following the slope of the natural ground and the terraces are enlightened by the sun all the day when the streets are more under shadowed. This architectural and urban design is totally actual in numerous traditional Syrian villages.

ground, and roofed with terraces (see Fig. 4). This town planning testifies of an accomplished urban earthen building culture that is fully adapted to the physical and climatic environment. The construction principle of vaulted roofs, in unbaked or baked bricks, will be permanently used up to the Neo-Assyrian periods (1000–600 B.C.). In between, during the Neo-Hittite Period (900 B.C.), some nice examples have been excavated at Tell Halaf, north of Syria in the sector of the Temple-Palace, with a wide variety of generating sections, from the lower, the barrel, to the raised up and broken design. During his reign, Sargon the IInd (729–705 B.C.) built Khorsabad, or "*Dur-Sharukkin*", which was fenced by a high quadrangular enclosure sheltering the citadel whose palaces and religious structures exhibited very nice examples of barrel vaults in unbaked bricks which also covered the main gates of the city. Then, under the reign of Sennacherib, the superb city of Niniveh, settled on the eastern banks of Tigris, would develop this system of fortifications with impressive entrance vaulted gates. There should have been 15 of such monumental gates. There are no very readable remains of the people's earthen habitat of that time but some dimensional graffitis, or reliefs, which have been found on the site, seem to evoke modest rural structures, roofed with over raised vaults. Their design can remind the conical corbelling cupolas that can be still observed, but more and more rare, in the region of Aleppo, in Syria.

A very clever earthen structural element for covering spaces

During the dominating period of the Medes, appeared an original earthen building element that was used for covering spaces and being mainly used over the Iranian space. It is known as the "*strut*". It is a kind of precast element, made of earth and straw, reinforced by wooden pieces, shaped in portions of arches. Several of such elements are jointly laid, end to end, in order to configure a plain arch. This clever technology is replacing the use of bricks in the construction of arches and also for building vaults, resulting in an easier as faster building process, and saving of working labour and time. According the size of the spaces to be roofed, three to five or six struts are enough to achieve

the shaping of an arch. The site of Nush-I Jan Tepe, in Luristan (Iran), with its Central Temple, its West Temple, its Fort and its southern Street, releases this revolutionary technology for the first time in History [Stronach 1969 and Roaf & Stronach 1970]. Under the Neo-Babylonian epochs and under the reign of King Nebuchadnezzar, the new city of Babylon is flourishing. The unbaked brick will stay the main building material, but mainly used for popular structures, as the construction in baked bricks is going to be generalised for the palaces and monumental public buildings. These edifices are commonly faced with glazed bricks (Gate of Ishtar giving access to the sanctuary of Marduk). Much more trapezoidal bricks are used for building arches and vaults. The famous ziggurat Etemenanki, made of successive high terraces, still built in unbaked bricks, has testified of the reinforced masonry as the layers of building materials are embedding strong interlaced cables of twisted reeds [Koldewey 1918 and Reuther 1926]. Earthen builders have become structural engineers.

The blooming of the earthen vaulting technology

With the conquests of Cyrus the IInd and the extension of the Achemenid Empire, with the assimilation of the Ionic influences, the use of stone extended but would not push out the ancient earthen building culture. The sites of the Fars valley (Pasargadae and then Persepolis), and then the Palace of King Darius at Susa, confirm the principle of the Apadana and the invention of the Hypostyle room, giving an ostentatious character to the palatial edifices. Nevertheless, the thickness of the outer bearing walls protected by a veneering of stones was still made of unbaked bricks. The use of the strut technology has been still attested at Persepolis for covering staircases and corridors embedded in the ramparts closing the access to the Apadana at the eastern side. At Susa we can also observe footing systems in rammed earth ("*pisé*"), or gravelled earth which is tampered in layers, between thick facings of burnt bricks. The use of "*pisé*", and of the strut too, have been also testified by excavations made at Dahan-i Ghulaman (Iran, Seistan), on Building n° 3 [Scerrato 1966]. All these building systems and particularly the brick vaulting technology, were commonly adopted by the Persian vernacular architecture and spread all over Orient, up to the far eastern territories of the Achemenid Empire which was conquered by Alexander the Great. We can see such vaulted constructions in oriental Bactria, in Afghanistan (the mausoleum of Ai-Khanoum [Bernard 1972]), in Uzbekistan-Khorezm (mausoleum-fort of Koj Krylgan-Kala [Tolstov 1967]) where the vaults exhibit a parabolic generating section, either lowered or raised up, and with a high degree of mastery and sophistication at the site of Balandy II (400–200 B.C.) in Kazakhstan-Khorezm, where the vault adopts a toric shaping. Here too, the earthen brick masonry is erected on a basement made of rammed earth.

Then, during the Kushan period, in Afghanistan, the builders commonly developed the construction of vaults erected on square and rectangular layouts. This is the technology of lowered vaults and cupolas, built on squinches, also called "*balkhi*" vault, which is marvellously exhibited by the cistern ("*Sardoba*") of Dilberjin Tepe [Kruglikova 1974], in Bactria. The Parthian Arsacids went on building vaults in struts as show the site of Shahr-I Qumis (Damghan) where several staircases and small rooms in short span (from 80 cm to 3 meters) have been excavated (Sites IV, VI, VII, see Fig. 5) [Hansmann and Stronach 1970]. Beyond these Parthian periods, the Sassanid reached the summits of the vaulting technology when they erected the first iwans, generalising the previous exceptional model of Ctesiphon (King Khosrau the Ist, banks of mid-Euphrates, central Iraq, not far from the actual Baghdad). This is on such cultural footings having reached to a great mastery of the brick masonry and the vaulted technology that would flourish the building and architectural tradition of the Muslim Persia growing with the extension of Islam in this region.

The legacy of the earthen building culture in Iran (see Pls .1b, 1c, 2a and 2b)

The first great mosques erected during the Caliphates, under the Ommiad dynasty, and then under the Great Abbasids, have chiselled the legacy of the Persian builders that would be raised at its highest level of brightening up by the beginning of the XVIth Century under the Dynasty of the

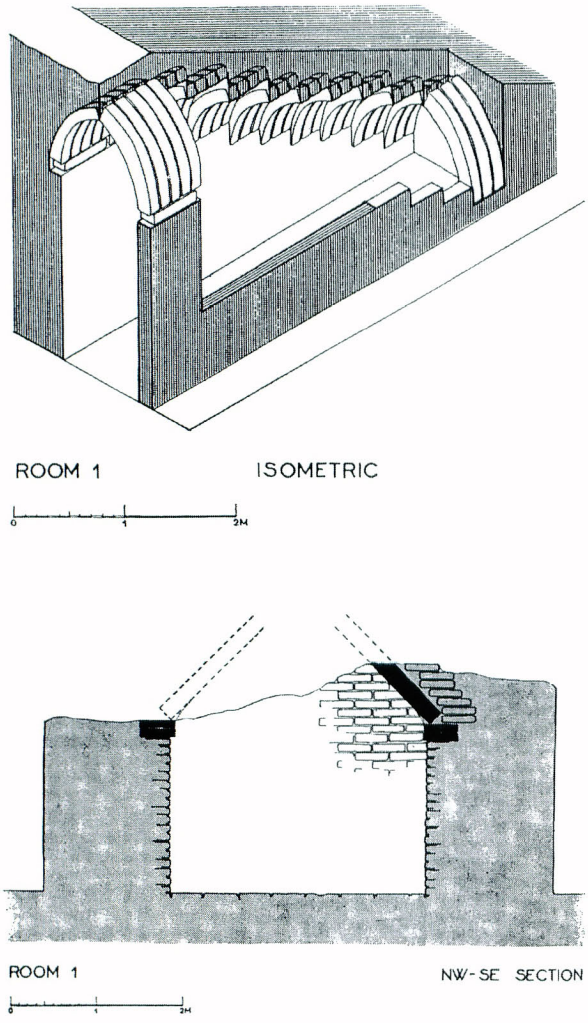


Fig. 5 On the Site of Shahr-i Qumis, Iran, Damghan, Parthian Period, 1st – 2nd Century A.D., sites IV and VI. During those times, the Iranian earthen builders have invented a new way for covering the housing spaces, including the staircases: the "strut". From Hansman, J. and Stronach, D., 1970, "Excavations at Shahr-i Qumis," *1967*, pp. 29–62, in Besenval, Roland, 1984, *Technologie de la voûte dans l'Orient Ancien 2*, éd. Recherche sur les Civilisations, Paris, 1984, Pl. 64. Comments: As we can observe on these isometric perspective on room IV and section on room VI, the technology of the strut has proposed different types of covering elements that have been adapted for vaulting or two-slopes roofing. On the same site of Shahr-i Qumis, Hansmann has also excavated larger rooms covered with three struts (site IV, room 3, site VII, room 5) as well as Stronach (1969) who has found such covering structures at Tepe Nush-i Jan with the vault on the room 2A. This roofing technology using light long elements made of earth and straw directly shaped and moulded on the building site have been used up to the Persian times as several corridors in the fortifications of Persepolis have shown. The abandon of this very clever building process is still a mystery.

Safavids. Isfahan, capital town of Shah Abbas, is one of the most spectacular demonstrations also renewed in many other Iranian towns as Shiraz, Seojan, Tabriz, and Kerman. How more beautiful is this superb Meidan-é Imam Square, with its architectural composition opposing from one side the Great Mosque (oriented at 45°) to a central iwan giving access to the Bazaar on the opposite side, and from both long sides of the square, the facing of the smaller Sheikh Lotfallah Mosque and the Ali Kapu Palace? All around this wonderful square, so many examples of structures in arches and cupolas covering the Bazaar are still observed. In the city, the old houses made of earthen bricks seem to be much more rare, having been destroyed and replaced by steel structures filled up with burnt bricks or by concrete structures of our modern time. But visiting the periphery of Isfahan and leaving the city, many earthen vaulted caravanserais and villages are still existing. At Gavart, a small village located between the airport of Isfahan and the city, the surrounding landscape and the skyline is still marked out by the famous pigeon towers exhibiting one of the best examples of such exceptional rural building traditions in the world.

Undoubtedly, Iran is one of the Central Asian countries still testifying today of the greatest diversity of the earthen architectures. We can meet the tradition of wattle and daub on the piedmonts and in the bordering plain of the Caspian Sea, as well as on the arid slopes of the Elbourz Mountains. They are half-timbering houses filled up with daub ("*torchis*") made of clayey soil mixed with rice blades (locally called "*kula*") and chaff. But the tradition of the earthen brick is undoubtedly the predominating building culture in Iran where the popular architectural heritage is essentially built with it, as in

regions of plateaux (Baghestan), or in mountains (where it is associated to the stone and the wood) or in central desert (Yazd) and southern semi-desert regions. There is also a mixed building technology associating the earthen brick with the "cob" as we can observe around Isfahan and in Khuzestan. The traditional techniques of plastering are also calling for the use of earth mixed with straw. The white clay or "*gel-é sefid*" is used on the border of the Caspian Sea, when the yellow clay or "*gel-é zardi*" is used in the region of Elbourz, as well as the "*khâ-gel*", also mixing a clayey soil with chops of straw, is the tradition of Khuzestan. The tradition of flat roofs predominates in most regions of piedmonts and valleys. Here, the wooden girders are covered with woven matting of straw or reed, then covered by small branches of local trees which are recovered by a layer of compacted earth, or "*gelenazok*", then protected by a finishing layer of "*khâ-gel*". On the other side, the vernacular tradition of Iranian roofs is more directly inherited from the ancient culture of arches, vaults and cupolas made of bricks. Most of the time, the arches are built up on forms made of gypsum reinforced by straw that are directly moulded on the ground. This technology is undoubtedly a survival of the ancient Parthian "strut". Considering the actual typology of vaults, it appears to be very diverse. We can observe the simple barrel vault or "*taq-o-chechmeh*" which is declined in other types called "*bangui*" or "*chamchiri*" in mountain regions, the shuttle vault which is progressing simultaneously from both short sides of the rooms, probably inherited from the ancient vault "*balkhi*" of the ancient times and today called "*lili pouch*". And there are also much more complex vaults as crossed vaults, edging vaults and vaults on squinches ("*lengeh pouch*"). Other mixed solutions associate arches erected in the spanning direction that then bears portions of vaults (oblong cupolas)). And surely the very common tradition of vaults on pendentives, or "*dorshin*", when the most spectacular are the vaults built with a network of ribs then filled up with bricks creating different decorative patterns. This is the famous "*yazdi-bandi*" bonding tradition or that of the ribbed cupolas called "*torkine*".

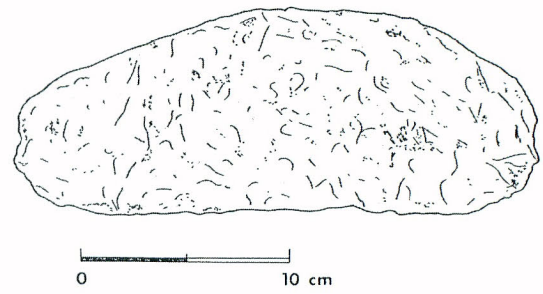
Beyond these exceptional earthen building know-how, the Iranian builders have also passed on other extraordinary traditions as this one of the wind tower, or "*badguîrs*", that are a typical feature of the vernacular architecture in the bordering plains of southern Iran where the hot and humid climate imposes the air conditioning of spaces. The same clever device can be observed in the semi-desert or desert regions of Central Iran, in and around Yazd, where sometimes these wind towers are separated from the houses but bound to them by a tunnel conveying the fresh air. This tradition of the "*badguîrs*" was still used for conditioning the houses during the recent Khajar Period as we can see in the very nice and famous burgess houses of Kashan. What impressive lesson of architecture!

In most of other oriental countries (Sultanate of Oman, see Pls. 3a, 3b and 4a, or in Saudi Arabia, see Pls. 4b and 4c), as well as in Central Asian countries (Afghanistan, see Pl. 5a, or in Turkmenistan, see Pls. 5b and 6a), this wonderful vernacular tradition of the earthen architecture constitutes an exceptional legacy.

The Levant and the Mediterranean Region

The primitive periods

The regions of the Mediterranean Levant and of the Taurus-Zagros Arch, today including Lebanon, Syria, Palestinian territories, Israel, Jordan, extended to the actual regions of Iran and Iraq, were the founding territories of the greatest ancient cultures and civilisations which have excelled in the earthen building art. The unbaked brick was the vector of a fantastic urban development during the IVth and IIIrd millennium B.C. despite this building culture has been emerging since the VIIIth millennium as the famous site of Jericho has testified. At that time, the habitat is settled on hill slopes, both embedded in the thickness of the soil and partially aerial. It is basically oval and round shaped. The walls are erected with a kind of small hand-shaped earthen "breads" (see Figs. 6 and 7) which seem to have been built at their plastic state, without any mortar. This technique could be compared to what is called "*cob*" in England, or "*bauge*" in France, consisting in piling up plastic earth balls or packs, in order to



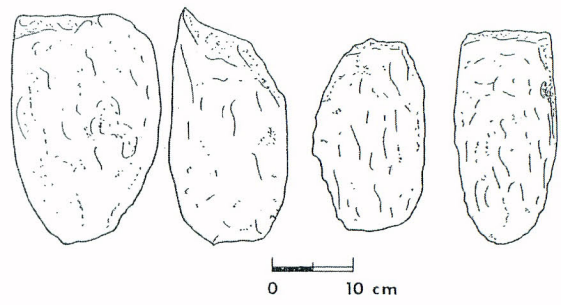
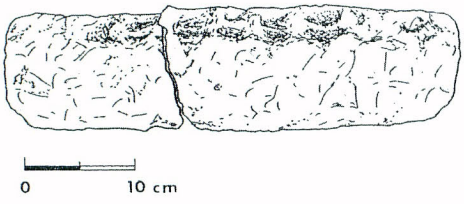


Fig. 6 Moulded adobe bricks at Jericho PPNA. From Kenyon, K.M. and Holland, T.A., 1981, Pl. 152a (upper) and Pl. 44a (lower), in Aurenche, Olivier, 1993, "L'origine de la brique crue dans le Proche-Orient Ancien", in *Between the rivers and over the mountains*, Rome, 1993, p. 73. Comments: these unbaked earthen bricks are shaped as small breads and should not have been very regular. We can suppose that they have been used at a plastic state (not dry) and built without mortar, just packed on together for erecting successive layers.



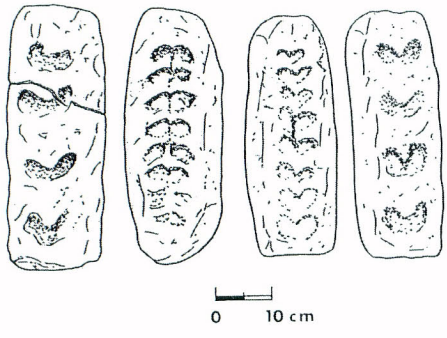


Fig. 7 Moulded adobe bricks at Jericho PPNA. From Kenyon, K.M. and Holland, T.A., 1981, Pl. 138b (upper) and Pl. 138c) in Aurenche, Olivier, 1993, "L'origine de la brique crue dans le Proche-Orient Ancien", in *Between the rivers and over the mountains,* Rome, 1993, p. 77. Comments: these unbaked earthen bricks are much more regularly shaped and we can observe systematic marks made by the brick maker's fingers. This might indicate that such bricks should have been possibly built at dry state with mortar, the marks facilitating the sticking between each brick.

realise successive layers of walling material. But compared to this technique, at Jericho, the walls are thinner and could be assimilated to a kind of direct shaping. This technology has been also observed on the site of Mureybet, Syria, where the common people's houses of the VIIth Millenium B.C. are round-shaped, partially embedded in the slopes of the tell, exhibiting small indoor spaces typically organised around a central space (see Fig. 8). This design is a permanent feature of numerous people's houses across the following ages, with variations in the dimensions of the living spaces, but still common at the Early Bronze Age (*circa* 3200 B.C.) as we can observe on the tell of Bet She'an, in Israel (see Pl. 6b). Should it be a primitive design of what would become later the common patio of the oriental house? Later on, the influence of the earthen building know-how of Mesopotamia and also the influences coming from Egypt, in the art of using the common unbaked brick for building with arches extended in the territories of Near-Orient. Among representative examples of such evolution is

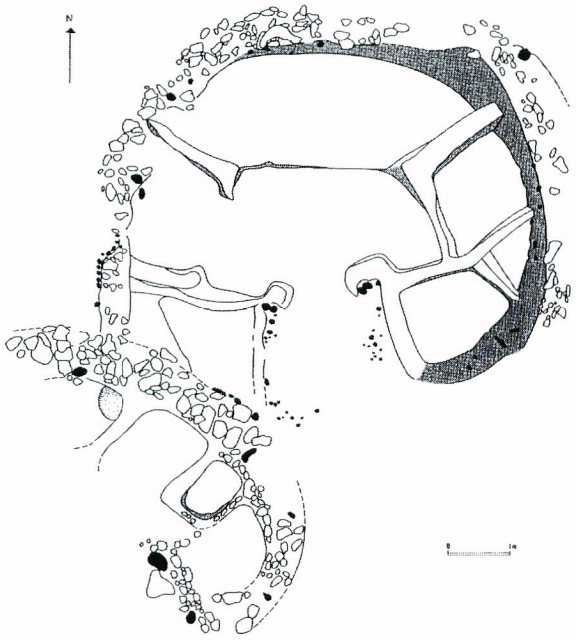


Fig. 8 Round shaped houses with indoor partitions at Mureybet, Syria, by the VIIth Millenium B.C. Drawing from Cauvin, J., in Huot, Jean-Louis, "Le Proche-Orient", in *Le Grand Atlas de l'Architecture Mondiale*, ed. Universalis, 1981, p. 104. Comments: the structure of these people's houses is partly embedded in the slope of the ground, back side and opened to the air at its front side with a small entrance door and space. The central room should have been the main living space with over small sleeping and storage rooms around. As we can see the structural design and position of the indoor partitions are playing a decisive play in the stability of the whole walling system and for bearing the wooden structure (probably made of jointed rafters) of a flat terraced roof. The central space seems to prefigure what will progressively evolve to the typical central patio or indoor yard of the further stage of the oriental houses. Such model from Mureybet will stay very common during the protohistory of Near Orient as well as the famous site of Mari, still in Syria, as revealed the same similar design of the famous "red house" (see Margueron, Jean, 1984).

the famous triple arched gate of the Canaanite city of Laish, at Tel Dan, northern Israel (see Pl. 6c) during the Middle Bronze Age (XVIIIIth Century B.C.). Apart from archaeological sites which are exhibiting remains of entrance gates covered with arches and barrel or inclined vaults built in unbaked bricks, the excavations carried out in the territories of Near-Orient have given few examples of the use of vaults or cupolas for the common roofing of vernacular people's houses of ancient times. Some clues of the possible design of these people's houses, during the Assyrian Times, have been given by graffitis which have been observed on the site of Niniveh. It seems that the conical-shaped vault, or corbelled cupola, might have been used and we could compare the morphology of this design to the shaping of vernacular houses in some Syrian villages, in the region of Aleppo (see Pl. 7a) which are today much more rare.

In Thessaly, Greece, primitive human settlements of the Mediterranean Europe are dated from the mid-VIIth millennium (around 6500 B.C.), tracing back to the protoneolithic phase, so before the apparition of the ceramic. This primitive habitat settled on the border of the Aegean Sea, in the deep layers of Sesklo, shows huts presenting variable layouts, lightly buried in the soil. They are constructions made of wooden poles probably supporting walls in wattle and daub ("*torchis*"). The VIth millennium confirms the inputs of the Anatolian and Levantine building cultures up to Thessaly, Crete and Cyprus. Within its deep layers, the site of Nea Nicomedia (in Macedonia), exhibits a more advanced habitat but still made of wooden poles and wattle an daub. However, the houses have mainly one square room of a greater size (8 × 8 m). The soils are in compacted earth on top of an insulating layer of leaves and tree branches. In a post time of occupancy, we can observe the existence of an inside partition also made of wattle and daub. At the apogee of Sesklo [see Holtzmann 1985], during the mid-Vth millennium (5500–4400 B.C.), the dwellings of the upper levels are both built in wattle and daub and unbaked bricks. They look much more structured and they adopt the rectangular layout. These houses should have been two slopes roofed and some of them should have been two-storied. Earthen walls are insulated from the humidity by stone basements, as the stone is also used for the defending walls and for some outdoor terraces of the site. However, these houses are still settled as independent farms and they are not really showing a social villager organisation. But, at that time, the basic layout of the habitat evolved to the "megaron" typology which would predominate

in the Ancient Greek architecture: one main room with a hearth slightly embedded in the soil, preceded by an open hall without frontage except a portico supported by one or two massive poles[1]. The same type of habitat has been found at Dimini (South of Sesklo) and would predominate during the Recent Neolithic Ages (4400–3000 B.C.), even if there is an evidence of a hierarchical society which is testified by the existence of some more important dwellings, settled on top of the hills of Sesklo and Dimini. These houses have also the typical opened entrance hall, but two rooms, the first one being larger and with the hearth. We have now a village structure protected by concentric surrounded walls, same devices which have been observed in the deep layers of Troy I (3000–2500 B.C.). Beyond these reference bordering sites of the Aegean Sea, in the inward and southern regions of Greece, the habitat looks much more precarious and invariably made of wattle and daub, a building tradition that might be connected with the Danubian building cultures (ribboned ceramic) covering the Central Europe.

The Aegean World and the continental Greece

In the Aegean world, the Ancient Bronze Ages (3000–2000 B.C.) which corresponds to the first civilisation of the Cyclades all over the islands, is marked by the development of the construction adopting the apsidal megaron type of layout, mainly built in stone and protected by thick defending walls including oval shaped towers (acropolis of Kalandriani, at Syros, sites of Paros and Melos). This protected habitat foreshadows the typical gathered town planning of the Cyclades that reaches up to our times. On Crete, during the Ancient Minoan (2700 B.C.), at Vasikili, the "house on the hill", with its irregularly designed rooms, seems to announce the future palatial complexes. The earth might have been used, according the "*cob*" technology, piled up in casings at its plastic state [Sinos 1971]. The larger use of the unbaked brick seems to have colonised the Peloponnese just before the IInd millennium. In the deep layers of Lerne III, the "house with tiles" is erected within a fortified perimeter in the centre of which the American excavators have found this large building (25 × 12 m) showing a row of 4 rooms (among three of them present corridors). The starting of a stair confirms the existence of a second floor. All the thick walls of this house are erected in unbaked bricks and put up on a stone basement. These walls are plastered with stucco[2].

During the Middle Bronze Age (2000-1500 B.C.), a very clear fracture can be observed between the continental Greece, which is submitted to Indo-European invasions and a cultural regression, and the Cyclades which seem to face a sudden rise of civilisation. In fact, in the Peloponnese, the Mycenaenan fortifications increased. These fortified positions (Mycenae, Tyrinth, and Pylos) protected a rural habitat of shepherds, which was settled all around them. This habitat is not well known but seems to have been very precarious and maybe built in both wattle and daub (for inside partitions), and unbaked bricks (for main walling). The "house of the wine merchant", and the "house of the oil merchant", so called by the excavators, describe the characteristic megaron in three parts, inherited from the Thessalian Neolithic, with the "*prothyron*", or portico with two columns *in antes*, the "*prodomos*", or small anteroom, and the "*domos*", or larger room organised around the hearth. But there is no many remains of such habitat, except some smaller villages that are conserving their fortifications built up in unbaked bricks[3]. After the brightening up inputs of the IInd millennium, some have spoken of a "coming back to the degree zero of the architecture". At the same time, the insular context of the Crete favoured the harmonious development of the Minoan Civilisation. The superb "lighting palaces" of Knossos, Phaistos and Mallia, invested by the environmental nature, offered a very refined decoration. An omnipresent light comes in the rooms and cheers up the building materi-

1) See "*The beginnings of agriculture in Near-Orient and Europe*", in Encyclopedia of Cambridge, 1981, pp. 110-111 with a drawing revealing the typical house in Sesklo.

2) According J. L. Caskey, quoted by Bernard Holtzmann, 1985, note 19.

3) According a description written by May Veber, Mycènes, creuset tumultueux de l'Hellade in *Les Grandes Civilisations Disparues*, 1980, pp. 70–79.

als: the tuff, the gypsum, the schist and the marble which are used for the main walls, the unbaked brick for the partitions or the wood used for the carpentry, the columns and their capitals, the porticos, the door and window frameworks. The wall facings are painted in dark red, deep blue, ochres, the sacred palette of the "*Minos*" residences, these kings-priests who are sharing the sovereignty of the Isle of Crete. Excavations that were made at Acrotiri de Thera (by 1967) have revealed what has been called the "Minoan Pompeï". The famous miniatures which are exhibited in the Museum of Herakleion, dated from the Mid-Minoan (1900–1600 B.C.) are representing the façades of typical houses and seem to confirm the post and beam building principle which might have been filled up with a blocking masonry of rubble-stones, as well as with unbaked bricks. But we know how this achieved scale of the civil Minoan town planning, and the splendour of the palatial architecture have been dramatically destroyed by a succession of violent seisms (Recent Minoan I a and b, around 1500 and 1470 B.C.) and the volcanic eruption of Santorin associated to a rain of ashes and petrified lava, and to a devastating tidal wave.

On the Greek peninsula, at the Mid-Xth century, in Eubia, the city of Lefkandi seems to have played an important part since the IInd millennium. It has come to light an important structure of monumental character. This is a *Herôon*, an edifice that is consecrated to the cult of a Hero, which might foreshadow the first Greek temples. This apsidal-shaped building of 45 m long, the original walls of which are partially conserved at a height of 1,50 m for some parts, exhibits an unbaked bricks walling put up on a stone basement. The earth was used as bonding mortar. The inside facings were plastered with gypsum. The roof was supported by an axial bearing system of wooden columns in line erected on stone slabs and the pavement was in clay. This elaborated earthen architecture corresponds to a time that someone have called "the second starting of the Greek architecture" [Holtzmann ibid]. In fact the political context of that times (IXth and VIIIth centuries), testifying of a reorganisation in regional states gifted with a relative stability, is favourable to such architectural fulfilment. At Smyrna, architectural restitutions which have been proposed by R.V. Nichols, shows a typology of habitat, also apsidal-shaped and protected by a thick fortification in unbaked bricks and stony material which is built up behind a cyclopean stone facing. The unbaked bricks are quite big (51 × 30 × 13 cm). Within this protected area of more or less 35000 m^2, oval houses of about 3 × 5 m are settled without any specific order and also built with unbaked bricks of the same size, but not put up on a stone basement nor footings. Their outdoor facings are plastered. During the VIIIth century, the apsidal megaron evolved to the rectangular shaping and Hellenic settlements extended up to Sicilia and South Italy (see Incoronato, near Metaponto). The walling building system in unbaked bricks, put up on a basement made of stone or big pebbles bonded with clay mortar, is widely used in the new Italic settlements (Sibari, Amendolara, Heraklea, Velia, Morgantina, Himere) and up to the Iberian peninsula as are testifying the Valencian sites of Vinnaragell and Pena Negra. It is undoubtedly from these coastline sites that the unbaked brick penetrated up to Catalonia and then to Aragon. At the same time, the Greek architecture started a petrifying process, particularly for its religious architecture and the unbaked brick would be more reserved for the megaron-type housing. The Greek domestic architecture developed later and stayed small, obscure and uncomfortable for a long time. This is only with the coming of Democracy (508–507 B.C., at Athens), that the civil and domestic architecture presented more elaborated principles as like the "*stoa*" (open portico with columns), the Hypostyle room, as the organisation of the rooms around an indoor peristyle. But during the blooming period of Pericles (453–429 B.C.), at the feet of the brightening up Acropolis of Phidias, the popular city was lying down in dense housing neighbourhoods mainly built in unbaked bricks or in post and beam structures filled up with such materials which were thatch-roofed and Athens looked like a great township. For the best living conditions, these houses are plastered with stucco or painted

in bright colours[4]. Then the War of the Peloponnese (431–404 B.C.), between Sparta and Athens, and the subsequent instability for the villages and small townships of the rural areas, leaded to a regression in the use of the unbaked brick and a comeback to a temporary and precarious habitat built in wattle and daub and protected by defensive acropolis. However, all over the Greek world, the use of both "*Pentadoron*" and "*Tetradoron*" unbaked bricks has gone on until the 1st century A. D., as it was observed by Vitruvius during the Augustean Ages [Vitruvius 1674].

Phoenicians and Carthaginians

With the apogee of the Phoenician stone construction in the urban context (Sidon, Tyr, Ugarit), the unbaked brick which has been a very common building material since ancient times in the Levant, was reserved for the construction of indoor building systems, as partitions of the rooms, and for the flat terraces where the material was compacted in several layers on top of a wooden ceiling. Out of the Phoenician cities, in rural areas, the unbaked brick still remains the main building material. Was the technology of rammed earth ("*pisé*") that can be observed today in Lebanon and Syria developed during the Phoenician Ages? We have no conclusive findings on this subject. But, when the "People of the Sea", pushed away by Assyrian attacks, had to transfer its civilisation to the littoral of North Africa, it has call for this technology of the compacted earth in wooden casings, associating it to the unbaked brick, for building the new Punic settlements. The birth of Carthage is taking place around 814–813 B.C. Its founding by Tyrians led by the Queen Elissa (or Didon according Virgil) is a legendary history. The original settlement that was originally a modest colony called *Qart Hadasht* (*Karchedôn* for the Greek and *Karthago* for the Roman), or "new town", became a powerful Mediterranean capital with an exceptional destiny. At its *acme*, by the IInd century B.C., its population should have reached about 700 000 inhabitants. During its first stage of development the original township was settled on the slopes of the Hill of Byrsa, configuring a modest acropolis. At its blooming stage, the city was covering about 2000 hectares, including several commercial and military harbours. This Great Carhage laying down in a perimeter of 32 kilometres was protected against threats that should come from the back inside land with an advanced line of fortifications. A twin rampart encircled the city itself. The French campaigns of excavations carried out on the Hill of Byrsa, by 1974–76, directed by Serge Lancel [Lancel 1979 and 1982], clearly show that Carthaginians have firstly use the slopes in order to establish a necropolis, the tombs of which being dated from the VIIIth up to the VIth centuries. Then, this necropolis has been embanked to settle a neighbourhood of metalworkers with their forges and workshops. It is only by the beginning of the IInd century that this site has welcomed planned people's housing units, the famous "Hannibal's neighbourhood" and its housing blocks A, C and E (see Fig. 9) which can be visited today. These housing units exhibit a standard layout organising the rooms around a small indoor yard that is accessible by an entrance corridor. As confined spaces for the starting of staircases (probably in wood) are visible, these units might have been two or three-storied high. They have been settled according an orthogonal urban design which looks typically Hellenistic; Serge Lancel and Jean-Paul Thuillier have compared it to the urban design of Olynthus, Priene and Solunte (Vth to IVth centuries B.C.). According Gilbert Charles-Picard [Charles-Picard 1980: p.14], the construction of this residential area should have been realised for some wealthy people, insofar as the housing units have been provided with a high level of comfort and luxury which could be allowed at that time. The cemented pavements were encrusted with marble, walls were faced with stucco, and very elegant thin columns summited with Ionic style capitals were ornamenting the façades. Bathrooms were satisfying exigencies of hygiene. Today, looking at the houses walling remains of the famous Blocks B and C, along Street II, one can clearly see the eclecticism of the Punic building culture were, the use of the blocking stone masonry cohabits with unbaked brick and "*pisé*"

4) According the historian, geographer and philosopher Dicearque (347–285 BC), quoted by Lewis Mumford in his *La Cité à travers l'Histoire*, ed. le Seuil, Paris, 1964.

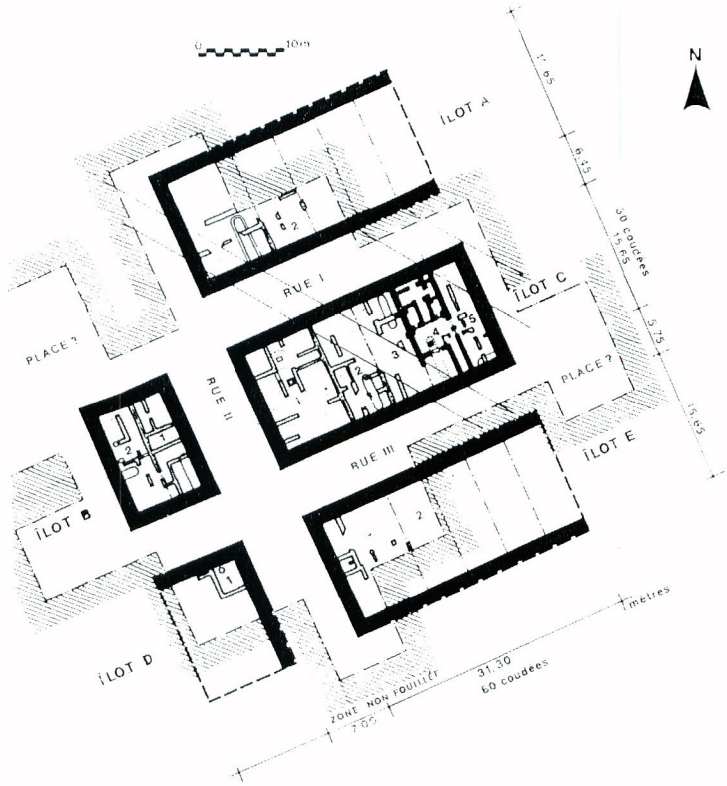


Fig. 9 The famous Hannibal's neighbourhood which has been excavated on the hill of Byrsa testifying of the typical people's housing of Carthage during the 2nd Century B.C. some years before the last Punic War against the Roman. From Lancel, Serge, 1982, in "*Byrsa II*", Fig. 603, p. 369. These famous blocks A, C and E and particularly the block C located between Streets I and III, are showing the typical layout of the Punic houses or "flats" gathering five to six housing units in one urban block. Each unit is similarly designed with and entrance corridor giving to an indoor yard enlightening the back living rooms. Narrow staircases, probably built in wood, were giving access to a first and evenly to a second storey. The building culture of those times, in Carthage, was very eclectic associating the stone, the burnt brick and the unbaked earth used in adobe as well as "*pisé*" (or rammed earth). The bearing structure was made of stone pillars filled up with those eclectic building materials in between.

masonry, burn brick elements (see Pl. 7b). This is the typical "*opus mixtum*" or "*opus africanum*" (masonry within structural pillars in stone or burnt bricks) which has been related by the Roman. Only the main façades on the street were built with stones, put up in great bonding. These stones were coming from the Cap Bon, extracted in the quarries of El-Haouaria. The Hill of Byrsa, which had conserved its original topography all over the Punic periods of occupancy, was then totally embanked by the Roman. This was done late after the Victory of Scipion Emilian that has concluded with the total destruction of Carthage. This huge work was carried out to redesign and level the hill in order to settle the post Roman edifices, including the new Basilica and Forum. For that purpose, to warrant the stability of the new development ground and fond the edifices, the Roman have erected in compacted earth numerous thick footing columns some of them reaching a height of 9 m. These impressive footings in "*pisé*" are still visible (see Pl. 7c).

Italy and southern Gaul

The site of Rome was already occupied during the Bronze Age as the findings of the *Forum Boarium*, dated from 1500–1400 B.C., are testifying. Later, at the beginning of the Iron Age (VIIIth century B.C.), several of the famous seven hills were inhabited as are confirming two Villanovian hamlets which have been excavated on the Palatine. These hamlets seem to have been unified around a kind of common civic centre settled on the actual Forum area. At that time, the habitat was still very primitive. It gathers huts or wooden shanties, rectangular or oval shaped, supported by a central wooden pole and perimetric smaller poles. It is slightly embedded in the soil. The roof might have been in thatch and walls in wattle and daub. In that way, Rome, at the beginning of the VIth century, was just an agricultural township when it was influenced by Hellenic inputs which had been previously introduced by Greek colonists settling in Campania by 750 B.C., and then transmitted by the Etruscan domination. By that time Central Italy knows a real metamorphosis. The wooden huts, plastered with earth and thatch-roofed of the primitive Rome (see Fig. 10), were gradually giving place

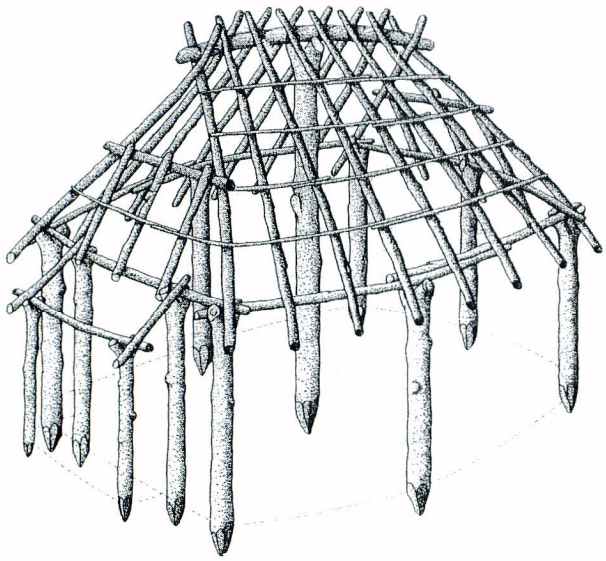


Fig. 10 The primitive house of the earlier republican times of Rome, during the Villanovian Culture, VIIIth Century B.C. From Davico, A., in Holtzmann, Bernard, 1981, "Rome primitive et l'architecture étrusque", in *Le Grand Atlas de l'Architecture Mondiale*, ed. Universalis, Paris, 1981, p. 156. During those times, the roman construction is still very primitive and houses are wooden huts made of large posts bearing a thatched roof on heavy rafters. The shape of such huts is rather oval than rectangular but we can note the specific design of a sheltered entrance door. Such huts have disappeared during the VIIth Century.

to rectangular houses built in unbaked bricks. Similarly to the first Etrurian temples, the first sacred and public monuments of the Republic (IVth and IIIrd centuries) should have been erected with unbaked bricks and tile roofings gradually replaced the thatched roofs. An orthogonal town planning took the place of the previous modest and disordered settlement. Great rectangular housing blocks, sometimes fortified by an embankment of earth, the "*agger*", preceded by a large ditch, were erected (see Marzabotto, near Bologna). By the Vth century, Rome extended its domination from the Latium all over the Italian peninsula. New colonies were settled on the base of the fortified camps of the military legions, adopting a regular town planning (*Decumanus* and *Cardo*). In Rome of the IVth century, high blocks of flats (*insulae*) edge the streets where an important rural exodus, attracted by the commercial activity of the city, crowded. At this epoch of great change, the unbaked brick that had been previously the main building material was much more used for the construction of modest people's housing, for indoor partitions and most of the time for filled up post and beam structures. This popular technique of wood and earth construction was used up to the period of Nero (37–68 A.D.) and a lot of housing units were destroyed during the dramatic fire of the year 64. The same building process had been commonly employed for the construction of numerous new settlements of the Roman colonists when the Empire extended in actual Europe, particularly in Gaul. So many remains of such building practices have been found on French Gallo-Roman sites, in Lyon, Vienne or Vaison-la-Romaine, in Nîmes, Lattes or Arles. The recent works of the French archaeology carried out on the Mediterranean regions are confirming a large use on the unbaked brick, but also of the "*pisé*" during these periods (IIIth to IInd centuries B.C.)[5]. The dimensions of the unbaked bricks have been very varied, some of them being very large (45 × 15/18 × 10 cm, in Arles) and other reminding the module described by Vitruvius (30/32 × 15/16 × 12/14 cm, in Vaison-la-Romaine). The unbaked brick seems to have been also frequently used for putting up indoor pavements (in Lattes).

On the Celto-Gallic territories, the Iron Age had develops a habitat settled in *oppida* gathering small wattle and daub or cob houses. In southern Gaul, on actual territories of Provence, from Languedoc to Roussillon, Hellenic influences were introduced with the creation of the first Greek trad-

5) See Desbat, Armand, "La région de Lyon et de Vienne", in DAF (Documentation of the French Archaeology) n° 2: *Architectures de terre et de bois*, 1985. This document concerns the excavations made at Lyon, Rue des Farges and at the Verbe incarné (Hill of Fourvière); but also at Saint-Romain-en-Gal (facing Vienne). See also De Chazelles, Claire-Anne, and Poupet, Pierre, in "L'emploi de la terre en milieu urbain: Nîmes," in *Revue Archéologique de Narbonnaise*, Tome XVII, 1984, ed CNRS, Paris, 1985. Concerns the excavations carried out on the site of "*Propriété Solignac*".

ing settlements, as *Phocea* (Marseille), *Antipolis* (Antibes), *Agathe* (Agde), *Nikaia* (Nice), and also on the Iberian territories with *Emporion* (Ampurias). This took place between the VIth and the Vth centuries B.C. By that time, the "civilisation of *oppida*" of the southern Gaul[6] rapidly adopted the Hellenic inputs and particularly the use of the unbaked brick which would substitute for the wattle and daub construction all over the indigenous settlements of the Gulf of Lion coastline. The evidence of such a change in the building practices is visible on sites as Ruscino, Enserune, La Lagaste or Entremont. Simultaneously, there is a gap between the coastline and inland settlements where the wattle and daub and cob building technology are still predominating. Then a slipping between the earth and stone construction gradually extended in numerous *oppida* during the IVth and IIIrd centuries [Fiches 1979].

During the Final Iron Age, the open rivalry between Rome and Carthage leads to the first Punic War (264–241 B.C.) which gives the support of *Emporion* to the Roman and allows the conquest of Sicilia. In southern Gaul, the legacy of successive Greek influences maintains the predominating use of the unbaked brick in construction. In his "*De Agricultura*" (14,4), Caton gives advises for building a farm, either in raw stones and lime mortar or in unbaked bricks put up on stone footings (*parietes ex lateres*). During the Second Punic War, inhabitants of Massalia (Marseille) give their support to Rome. Hannibal's troops pass through the Alps and reach Italy. This period of great brightening up of Carthage might have contributed to a wider dissemination of the building technology in *opus mixtum* and blocking masonry of rubble-stones, "*pisé*" and unbaked bricks walling put up in between stone or burnt brick toothings, particularly on the Iberian peninsula, but also up to Sardinia (see the site of Tharros) and Sicilia. The ancestor of the Sardinian "*ladriri*" (in southern "*Campidani*") might be searched into these old cumulated influences of Greece and Carthage.

When Caesar began the conquest of Gaul (59–51 B.C.), he observed a local construction where the use of rudimentary building materials was very common. The "*vici*" (rural townships) and the "*aedificia*" that he describes in his "*De Bello Gallico*" might have been undoubtedly built in wattle and daub or cob, evenly in unbaked bricks. In his "*De Bello Civili*", Cesar gives an other description of the "*murus gallicus*" which is made of earth, stone and wood. At the end of the Ist century, and up to the imperial Ages (in 31 B.C., after the victory of Actium), Rome was in its major part built in unbaked bricks or in post and beam structures filled up with this material. In his "Roman History" (XXXIX, 61), Dion Cassius evokes a rising of the river Tiber that over flooded all low neighbourhoods of Rome and notes that "the houses made of bricks took water from everywhere and collapsed". Nevertheless, the "*lidio*", "*crudi lateres*" or "*latericus paries*" still remained the building material for the popular housing, beyond the Augustean Ages. As previously observed, Vitruvius [Vitruvius, op. cit.] was taking the unbaked brick into great consideration, recognising "its greatest utility so long as it does not load the walls too much". He willingly calls for its use "so long as someone building with it should take the necessary care for putting it up correctly". He precises that to build with several floors, the unbaked brick construction should be twin layers bonded ("*paries biplinthius*") or even three layers bonded ("*paries triplinthius*"). However, after this dramatic flooding of the river Tiber, the use of the unbaked brick was pushed away from the city as soon as building rules were promulgated which prohibited the construction of thick walls, obliging to respect a maximum thickness of one foot and a half (44,3 cm) for all party walls. By that time, for erecting high buildings, the Roman civil builders prefer to use post and beam structures filled up with a blocking masonry of mixed rubble stones and fragments of tiles, reinforced by stone bond beams. By the same time, in his "*Res Rusticae*" (I, 14,4), Varron evokes the "*pisé*" construction as regards as rural fencing walls ("*maceria*") protecting an agricultural farm located on the Sabine territory. He describes the

6) 277 units of *oppida* have been identified in the Var, more then 300 in the Alps of High Provence and more than 200 in the Gard, all actual territories of Southern France.

technique as "a mixing of earth and gravel which is agglomerated in casings". He also observes the common use of the unbaked brick ("*lateribus crudis*") for the construction of such rural fencing walls ("*pars agraria*"). During the I[st] century, in his "*De Re Rustica*" (X, 1,2 and XI, 3,2), on the subject of a hunting reserve construction, Columelle quotes that "if the cost of the stone and manpower allows it, the park could be fenced by a wall put up with raw stones and lime mortar, if not it should be erected with unbaked bricks".

With the coming of the Julio-Claudian Dynasty (Tiberius, Caligula, Claudius and Nero), the tuff, baked bricks and blocking stone rubble-masonry with bonded cut stones or bunt bricks facings, became the main Roman public construction techniques. By 120 A.D., in his "*Augustus*", evoking the Emperor Augustus, Suetone writes that he has embellished Rome and preserved it from the flooding and firing danger. He writes that Augustus praised himself to have received a town made of unbaked bricks and having left it in marble ("*marmoream se relinquere, quam latericiam accepisset*"). But the popular urban and the rural architecture, as the construction in numerous far-west provinces of the Roman Empire, went on using the unbaked bricks. In Gaul, the "*pax romana*" favoured an urbanisation pressure around the "*vici*" and other rural townships as well as the construction of numerous "*villae*". As Strabon observed in his "*Geographia*" (IV, 4,3, and XII, 1, 67), "*Gallics are building large round houses with wooden planks and wattle walling that they are covering with thick thatched roofs*". So, Tacitus in "*Germania*" (XVI, 3), on the subject of the German housing was noting that "*they do not make use of stones nor tiles; for every building purpose they use raw materials* ("*materia informi*") *without taking care to any beauty or attractiveness; some parts are more carefully plastered with a so pure and so brightening earth that it imitates the painting and colouring strikes*". Numerous settling sites of the Gallo-Romans "*villae*", as far as over the actual northern territories of France, in Picardy, that have been identified by the famous aerial archaeology works carried out by Roger Agache and Bruno Bréart [Agache and Bréart 1983/84], are confirming the existence of basements put up in blocking stone rubble-masonry ("*caementicius paries*") that should have been heightened with earthen building materials, unbaked bricks, or wood and earth walling whose falling in debris are clearly visible thanks to the colouring variety of the soils showing darken spots attesting of the ancient presence of buildings. The more elaborated "*villae*" have often made a distinction between the use of the earthen building technique, mainly reserved for the "*pars agraria*" (agricultural outbuildings), and stone or burnt brickwork technique for the residential building or "*pars urbana*". Roger Agache and Bruno Bréart are precising that "*for the numerous large "villae" the quasi totality of employed materials are collected nearby the constructions: here as on the whole Gaul. But of course, earth is the most local easily available material for lacking of other building materials. (...) From plane, we can observe, nearby the constructions, one or several ancient quarries that have been transformed in ponds*". Such characters of the Roman "*villae*" mainly built in unbaked bricks with a typical association of the burnt brick during the late Roman Times used as well as for structural reasons (consolidation) and aesthetic purposes are common in European countries where numerous sites have been excavated. The south-west of France (region of Aquitaine) and the northern territories of Spain (Castilla) are testifying of the blooming of this building art as, among several examples, that one of the Roman villa of La Olmedia, in Pedrosa de la Vega, a great residence of the IV[th] century A.D. is still showing (see Pl. 8a)

In North African countries, or "Maghreb"

The collect of the raw earth nearby the working site has been commonly used since ancient times and has been still adopted by vernacular earthen builders up to the recent times as we can still observe it in many countries where the earthen construction is still alive. This is actually the case in South Morocco, in the Drâa and Dades valleys (beyond Ouarzazate), when the "*m,alems*" (master masons) are still building houses and fencing walls in "*leuh*" (*pisé*). Effectively, earthen building traditions that

are still actual over northern African territories, in Libya, Tunisia, Algeria and Morocco, are originated from these ancient Carthaginian, Greek and then Roman successive influences that have been perpetuated, improved by further civilisations, up to the coming of the Arabic domination, and much further with the vernacular building practices which have passed on this ancient legacy by the channel of generations and generations of anonymous builders. This is really this "architecture without architects"[7], or this "spectacular architecture"[8], mainly built with earth, that goes up to us now and offers to see so diverse applications of elaborated building cultures tracing back to millenniums. The Hellenic and then Roman influences all over northern African territories are evident on numerous grounds of excavations. In Tunisia, from the beginning of the Ist century to the IIIrd century A.D., the unbaked brick or "*pisé*" construction was very common in the Province of Byzacena as are testifying excavated dwellings in Acholla, the famous "*House with red columns*", "*Asinius Rufinus' House*" or "*Neptune's House*", which are dated from the reign of Marc-Aurele, or by 170–180 A.D. In "*Neptune's House*", the "*pisé*" is used for buttressing the pressure of a cistern located in the "*viridarium*". In Uzitta, near Souss, several houses have been excavated showing a common use of earthen structures put up on top of stone basements. It might have been the same in the near Province of Tripolitania. The city of Thysdrus has passed on among the best-conserved testimonies of the public and domestic architecture of those times. In the "*Lucius Verus' House*" and in the "*House with frescos*", a great number of unbaked brick (50 × 35 × 9 cm) walling, put up on of stone basements built according the "*opus Africanum*" type have been observed. These remains of earthen walls are plastered with a 2 cm thick lime mortar. Again in Thysdrus, the "*House of the death masks*", which is of Punic type, is built in "*pisé*" with 50 cm thick walls erected on top of a 70 cm high basement made of blocking stony masonry. During the period of Roman occupancy, in Tingitania (Morocco), the construction in earth has been attested on the site of Volubilis, particularly in the "*House with the cistern*" located nearby the North of the triumphal arch. This large dwelling, dated from the IInd century A.D., covered a private bath of about 150 m^2 from the Ist century where "all walls present a stone basement at a variable height, when the elevation was in "*pisé*" or unbaked bricks" [Slim 1985]. The southern neighbourhood of Volubilis, called in other words the "craftsmen's neighbourhood", or "indigenous neighbourhood", has revealed numerous findings of fit in together houses, gathered in a very dense cluster, all built in unbaked bricks laid on with a clayey mortar on top of 80 cm high basements in stone blocking. The size of the common bricks is 44 × 28 × 8 cm.

The common ancient earthen building cultures legacy in the Mediterranean region

The coming of the Antonine Dynasty (Nerva, Trajan, Hadrian, Antonin the Pious, Marc-Aurele, Comode), by the IInd century A.D., extended the "*pax romana*" over the fareast dimensions of a Roman Empire reaching its apogee at the end of this century. On purpose of the building culture, this brightening up of the Empire corresponds to the development of a burnt brick civil construction, particularly for the blocks of flats ("*insulae*") which increased in number in most of the Roman cities (the "*insulae*" of Ostia are among the best examples of such a urban domestic architecture). But the construction in earth, in unbaked bricks or "*pisé*", still predominated in most regions for the popular and rural architecture. Beyond the Fall of the Roman Empire, these buildings practices quasi definitively marked the rural and a great part of the urban people's housing construction, particularly over the Mediterranean regions, up to the modern times. This cultural legacy has resisted to the coming back to the dark times of the High Middle Ages (from the Vth to the Xth centuries) that have known a regression to more common and simple building practices. In Italy, where various rural traditions can be still observed; that one of the "*casoni*", in the "*Friouli*", or that of the "*pinciaie*" of Abruzzi. But

7) Expression borrowed from Bernard Rudovsky, *Architecture Without Architects*, 1987.

8) Referring to Jean-Louis Bourgeois and Carrolle Pelos, *Spectacular vernacular*, 1989.

also the "*ladriri*" of the Sardinian "*Campidani*" (from Cagliari to Oristano) which could be certainly connected to the ancient Carthaginian influences (see Pl. 8b). Equally for the Iberian Peninsula. In Spain, region of Catalonia (around Barcelona), where people was still building in "adobe" and in "*pisé*" ("*tapia*"), only just twenty years ago (see Pl. 8c). Also in "*Tierra de Campos*" (Castilla and Leon, North of Valladolid and Palencia), where a very nice tradition of pigeon towers can be still observed (Pls. 9a and 9b); In Portugal with the similar building culture of "*taipa*", in the region of Algarve where, closely to the border of Spain, can be still observed the legacy of the typical "*Al Andalus*" earthen building process which is inherited from the period of occupancy of the Moors: the thick walling built up in "*tapial*" are faced with a raw stonework masonry put up with a lime mortar (see Pls. 10a and 10b). In France, the vernacular earthen architectures are a typical feature of the rural landscape in almost all regions of the country. The northern territories are typically concerned by the tradition of the construction in posts and beams ("*colombage*") filled up with wattle and daub or "*torchis*" as we can observe in Champagne, around the city of Reims (see Pl. 11a) where a local tradition of the unbaked brick was also developed along the Marne River valley (see Pl. 11b). In the south, the Mediterranean legacy of Ancient Greece and Rome, the Carthaginian inputs and more recently the Arabic influences, are particularly evident: "adobe" (unbaked brick) all over the southern territories, from Aquitania (see Pl. 11c) to Provence, "*pisé*", all along the Rhone and Saone River valleys up to the Forez (Auvergne, Central Massif), and in Dauphiné (North of Isere); (see Pls. 12a, 12b and 12c).

Everyone travelling in Morocco can observe the "*ma,lems*" (traditional master masons) still building houses, or fencing walls, in "*leuh*" ("pisé"), nearby the townships settled in the Dra, and Dades river valleys, from Ourzazate to Zagora (border of Mauritania), or to Boulmane. Effectively, in South Morocco, as in the Atlas mountains, the tradition of the "*Kasbah*" and "*Ksour*" (fortified farms and rural villages), is undoubtedly one of the most brightening up "*pisé*" building culture in the world. Was this tradition influenced by the Ancient Mediterranean earthen building cultures (Carthaginian and then Roman), or by cultural inputs coming from much far away (Arabic peninsula), with the penetration of Islam across central Africa (the Art of the Mosques in the "*Sahil*", Delta of Niger in Mali that has been occupied by Moroccans several centuries ago)? Both hypotheses are still under discussion. Recent projects have been launched, during the eighties of the last century that have contributed to a fashionable revival of the "*pisé*" construction in Morocco. In the generation of new architects, Elie Mouyal and Charles Boccara were — and still are — the developer of such a post-modern "*pisé*" and "adobe" architecture which is reinterpreting the legacy of an historical tradition tracing back to ancient times and promoting a local syncretism between the Greek, Roman and Islamic styles. And who can ignore the importance of the work done by the great Hassan Fathy, in Egypt, who has reactualized the adobe architecture in vaults and cupolas taking roots in the vernacular Nubian tradition (beyond Aswan)?

The earthen architecture is existing! Toward a revival

If, in so-called industrialised countries, the earthen construction has been regressing since the Second World War, it is still existing in most developing countries. On the one hand, the industrialisation of the construction was pushing out traditional building cultures that were considered as obsolete and not adapted to a general euphoric aspiration to the technical progress. A new set of modern building technologies (reinforced concrete, steel, glass, plastic and polymers), imposing much more professional specialisation and division of labour, was rejecting ancient practices founded on the mutual aid of the communities. On the other hand, in developing regions, the lacking of industrialised building materials, very costly in imported currencies and energy, the brutalist transfer of the occidental technologies, by now much more culturally, socially and economically contested, are inviting to consider again the relevance of the local resources and cultural know-how. In the "North", we observe a much more

shared caring taken to the heritages (their preservation, conservation and rehabilitation), the coming out of a qualitative questioning reacting against the making of architectural landscapes a commonplace and exhibiting an international style, a world-wide "transculturation". The threats faced by our natural environment are mobilising larger sections of our developed societies. In this context, a new cultural, social and economical attention given to the earthen architectures can emerge. In the "South", the earthen building cultures are still living practices, as well as in urban contexts (peripheries), as in rural areas. Most of the time, the earth is still the main accessible (financially) material for the major part of people who has no other choice to use it for sheltering with dignity. Here, the coming back to the earthen construction is not only circumstantial. It is also voluntary and bears a "vision" of what could be a self-centred development that could be founded on different and local political, social and economical strategies that are closely connecting "culture & development".

"*A material is not so interesting in itself but for what it can do for society*" as was saying the architect John F.C. Turner, thirty years ago. Since these seventies, dramatically affected by the so-called "Energy Crisis", industrialised countries are searching for alternatives to the building industry practices which are accounting in an overexploitation of not renewable resources (wood, sand, river-side aggregates,...), in a continuous increase of the energetic bill (oil, nuclear energy) for the production of the building materials, their use in construction and for the comfort management (heating and air conditioning). On the other hand, the injuries which are generated by the construction industry — esthetical and visual (open air quarries), health damages (materials with secondary pathogen effects as asbestos) — the growing of urban violences much more associated to what we call now the "dictatorship of the concrete", are more and more publicly criticised. This socio-cultural critic is raised and carried up by an environmentalist tendency that is becoming an anti-internationalisation movement the width of which is now reaching, with similar commitments, the developing countries (India as spearhead[9]). The global approach is now clearly opposed to the local one, and a new concept is raising: this of "*glocal*". Some are declaring that is it the time now "to dismantle the development for remaking the world[10]"? Based of such considerations, the earthen construction, as numerous other traditional techniques, might be one of the answers for a "post-development".

Just a glance at the mobilisations in Mediterranean countries

All over the occidental Mediterranean countries, the earthen architecture rebirthing movement is in progress. After having welcomed the "*7th International Conference on the Conservation and Restoration of Earthen Architecture*", "*Terra 93*", in Silves, Algarve, the "*Dirección Geral de Edificios y Monumentos Nacionais*" (DGEMN, Ministry of Housing) of Portugal has created the "*Escola Nacional de Artes e Oficios Tradicionais*", institutionalising a "*Programa Pedagogico, Curso de Construçâo Civil Tradicional Construçâo de Terra*"[11]. In this school that is training future craftsbuilders and contractors, located in Serpa (Southeast of the country), young people can learn the adobe and "*taipa*" ("*pisé*") building techniques to use them for the restoration of the national earthen architectural heritage, or for developing a contemporary architecture. Spain begins to worried about the conservation, maintenance and revival of its so nice "*tapial*" heritage located in "*Tierra de Campos*" now exposed to great threats of destruction because of an endemic exodus of the local population to big towns, pushed away by the searching of employment and better living conditions (the agricultural regulations of the European Community have contributed to a radical change of the structure of the local rural economy). Italy has created its ICOMOS Sub-Committee for Earthen Architecture

9) Considering the position of leaders of such commitments in India, as Dr. Vandana Shiva (See Biopiracy, *The Plunder of Nature and Knowledge*, ed. South End Press, Boston, Mass. USA), or Arundhati Roy (see her struggle against nuclear weapons and also against the construction of giant weirs in the Narmada Valley).

10) As the recent issue of the magazine, *The Ecologist*, was suggesting.

11) National School of Arts and Traditional Craft including a Pedagogical Programme; Traditional Civil Construction Course on Earthen Construction.

(AICAT), has multiplied venues and conferences on this subject in order to promote a national network of specialists. This country counts now on 9 studying groups with university settings, which are dedicated to the research and education covering the field of earthen architecture[12]. In Sardinia, an important programme for the conservation of the traditional architecture of the "*Campidani*", built in "*ladriri*" ("adobe"), has been launched some 10 years ago, which is supported by the regional authorities. France has already invested in this movement since the last 25 years contributing to activate co-operation programmes with African countries, in order to mobilise, update and modernise vernacular earthen building traditions for answering to a fantastic demand of low-cost social housing where the majority of people can not access to wealthy modern materials. The UNESCO Chair "Earthen Architecture, building cultures and sustainable development" which has been set in the School of Architecture of Grenoble, in the year 1998, has already contributed to develop specialised teaching programmes in the official curricula of several African universities: in Uganda, Nigeria, South Africa. In France several regional groups gathering professionals (architects, building contractors, scientists), now attempting to federate their efforts in a national network called "*Ecobâtir*" (Ecological construction), are developing studies and projects aiming at promoting the conservation of our national earthen architectural heritage and the new construction in earth. Recently, a "Global Contract for Development", supported by the main regional and local territorial communities of the Rhone-Alps Region (Southeast of France), has included in its economical and cultural objectives of development an action entitled "valorisation of the *pisé*". This programme that concerns 46 communes of North Isere has been launched last year and will run up to the year 2005. This movement for a revival of the earthen architectures that took place in the previous quoted countries is now enlarging its impacts and inputs to many other parts of Europe. So were recently created in England (Devon) the "*Out of Earth*" movement, and in Germany (in the "*Die Grünen*" motion), the "*Lehmbau*" network, which are already both very active. Who will stay more out of concern of such an international Renaissance of the Earthen Architecture?

The recent international mobilisation for the safeguarding of the earthen architectural heritage. During the year 1987, the "*5th International experts meeting on the Conservation of Earthen Architecture*"[13] that has been held in Rome, jointly organised by ICCROM and CRATerre, was finally recommended to push on the development of a specific set of institutional activities in this field. These activities should mainly focus on a specialised education and should support the setting up of specialised teaching programmes in academic institutions. The educational dimension of this project was justified by an evident statement shared by several international organisations: the dramatic lack of professional competencies that should be necessary for conserving a world-wide earthen architectural heritage (archaeological sites and historical buildings) threatened of destruction. In 1989, following this recommendation, a specific project is inaugurated, jointly defined by CRATerre and ICCROM, the "*Project Gaia*", adopting as main objectives: i) the development of professional training courses; ii) scientific investigations; iii) co-operation projects and, iv) the dissemination of the knowledge. From this time, four international courses on "The Preservation of the Earthen Architectural Heritage" ("PAT" Courses) were successively organised in the School of Architecture of Grenoble (France), in 1989, 1990, 1992 and 1994. Supported by a reflection on the didactics, the pedagogy and the teaching methodologies, this initiative is growing and leads in 1994 to the creation of the "*Project TERRA*" that enlarges the initial partnership of ICCCROM and CRATerre to the Getty

12) These groups are set in the universities of Torino, Milano, Genova, Udine, Venecia, Firenze, Macerata, Pescara and Cagliari.

13) This meeting was following previous scientific events covering the topic: in November 1972, Yazd, Iran, "*First International Conference on the Conservation of Monuments built in Unbaked bricks*"; in March 1976, still in Yazd, "*Second International Symposium on the Conservation of Monuments built in Unbaked bricks*"; in October 1977, Santa Fe, USA, "*Working Session on the Adobe Preservation*"; in September-October 1980, Ankara, Turkey, "*Third International Symposium on the Earthen brick (adobe) Preservation*".

Conservation Institute (GCI, Los Angeles, USA). Considering the importance of the strengthening of specialised regional centres, this remodelled project has already organised two "*Pan-American Courses on the Conservation and the Management of Earthen Archaeological and Historical Earthen Architecture*" that have taken place in Peru, in 1996 and 1999. They have been organised in partnership with the "*Instituto Nacional de la Cultura*" and its regional office "*La Libertad*", located in Trujillo. These courses have directly gained from the facilities of the site museum of Chan Chan, from the archaeological site itself (Chim˙ period, 9th–11th centuries A.D.), and from other sites of the Moche and Chicama Valleys, "*Huaca de la Luna*" y "*Huaca del Sol*", "*El Brujo*". These two courses have strongly contributed to the setting up of a regional specialised centre, based in the site museum of Chan Chan, and to the definition and editing of the "Chan Chan Management Plan". They have also given an impulse to the exchanges of experiences among a larger international network of professionals (historians, archaeologists, architectural conservators, architects, cultural site managers) that has been initiated since 1989 with the previous "PAT" Courses organised in France. Since that time, this international network has had several opportunities to be gathered, thanks to successive international conferences that have been hold in USA ("*Adobe'90*", in Las Cruces), in Portugal ("*Terra'93*", in Silves) and in England ("*Terra 2000*", in Torquay). Simultaneously, over the past few years, the "*Project TERRA*", has given its support to the organisation of several other national conferences or events: in England, Italy, Germany, Czech Republic, favouring the creation of several ICOMOS "*Sub-Committees on the Study and Conservation of the Earthen Architecture*". The "*Project TERRA*" has also launched and supported several scientific research activities. Among them can be raised up the publication of a first specialised bibliography covering the field, a "Research Index", a "Literature Review", a preliminary reflection aiming at "structuring the discipline of the earthen architecture conservation", and more recently, a fundamental scientific research on the cohesion and the loss of cohesion of the earth material[14].

In this favourable context that has enlarged the awareness for the conservation of earthen architectures, that has allowed the emerging recognition of a specialised disciplinary field, other several important projects are now carried out. They are confirming the commitment of much more international and national organisations in charge of the cultural heritage conservation. In this direction, such organisations as the World Heritage Centre and the Division of the Cultural Heritage of UNESCO, the Japan Trust Fund, the Getty Grant Programme, the World Monument Watch, numerous national institutions, and much more specialised experts as well as professionals, all over the world, are playing an essential part. This is resulting, among other important facts, in the entering of precious earthen archaeological sites and historical buildings on national lists of monuments, or on the prestigious World Heritage List. This dynamic process is notably worth reading in Africa, with the commitment of numerous African Cultural Ministries, museums and professionals participating to the development of the Programme "*Africa 2009*"[15]. Other exemplary projects have been launched. Among them it is

14) See : "projet Gaia project", *Bibliography on the Preservation Restoration and Rehabilitation of Earthen Architecture*, ed. CRATerre-EAG-ICCROM, Rome, Italy, 1993, 136 p. (900 documentary references). The « Research Index » has been published by the "*Project TERRA*". Based on a wide survey carried out close to architectural conservation professionals, it precises the main scientific research directions for the next years, according the professionals' needs and expectations. The "Literature Review", prepared and draftly written by CRATerre-EAG (Arch. H. Guillaud), and then revised by a corpus of North American and European scientists covering various fields of research, will be published by the GCI late 2002. The research on the cohesion and loss of cohesion of the earth material is driven by CRATerre-EAG (Eng. Hugo Houben), in partnership with GCI and ICCROM Research Units and several other Research laboratories and Units of French universities-UMR-CNRS.

15) The Programme "*Africa 2009*" has been launched in 1998. It is carried out by African cultural institutions, in partnership with the World Heritage Centre of UNESCO, ICCROM and CRATerre-EAG. It has already contributed to : i) the realisation of three "*Regional Courses on the Conservation and Management of the African Earthen Architectural Heritage*" in Nairobi, Kenya (1999 and 2001) and in Porto Novo, Benin (2000), for professionals working in Sub-Saharan countries ; ii) the realisation of seminars gathering the directors of African museums ; iii) the launching of research activities resulting in publications ; iv) the raising up of an African professional network editing now is own Newsletter ; v) the carrying out of much more experts'missions resulting in the classification

worth to raise up the "Chogha Zanbil Conservation Project", which has been launched in 1998, carried out by the Iranian Cultural Heritage Organisation (ICHO) and the Research Centre for the Conservation of Cultural Relics (RCCCR), in partnership with UNESCO and Japan Trust Fund[16]. But, so many other examples could be quoted here that are very encouraging for the future of the earthen architecture conservation and "mise en valeur".

CONCLUSION

Preserve the techno-diversity: an essential option for tomorrow

For warranting this so-called "sustainable development" — or maybe "post-development"—, the new paradigm of the III[rd] millennium founded on a global alliance aiming at protecting the biodiversity, haven't we the obligation to preserve and pass on the cultural memory which conveys intangible sense and values that are so indispensable to every living society? Is not there any alternative for conserving our architectural heritages expressing shared universal values? On such a point of view, the earthen architectures — existing over all continents — should not be essential to this protection and passing on of our inherited cultural, bio and techno-diversity? Might not they offer an alternative to this homogenising building and architectural transculturation that could be devastating? In this way, it should be upon the indissociable triptych "conservation — sustainable development — modernity" that could raise a "vision" for a recreated future of the earthen architectures useful for the coming out of more viable societies generating new specific as diverse equilibriums between "men", their environments and their cultures.

Effectively, today, there are great threats for evacuating the techno-diversity, for imposing more, and much more, uniformity. Conserving the earthen architectures and the memory of the building cultures, might be a way to found concrete hopes for the transmission of the techno-diversity to present and future generations. To safeguard an evolutionary balance between nature and culture, between "*oikos*" and "*tecné*". Without any nostalgic feeling, is not there an evidence of harmony between natural (physical) and cultural (fitted-on) landscapes? An evidence of alliance between biodiversity and techno-diversity which is so often characterised by the world-wide vernacular architectures? Is not there an evident fantastic creativity of numerous traditional builders in this clever use of local cultures, know-how and resources, and a so exact respectful attitude of the environment? In too sacrificing to the modernism, Promethean attitude, is not Man committed on the path to a scheduled tragedy? That of a break-up between nature and culture? The maintenance of the techno-diversity might not bring answers to a wide set of crisis now faced by humankind? Energy crisis (exhaustion of fossil energies[17]); crisis in the production of manufactured materials (more and more costly and inaccessible for a great part of the world population); development and employment crisis (how to create more jobs when the technological progress is suppressing them every day for more and more people?); crisis of cultural identity (architectural and landscaping transculturation); housing crisis (according

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of remarkable African sites on national lists of monuments and on the List of the World Heritage, with the definition of correlated management plans.

16) The first phase of this project (1998–2002), has already given valuable outputs : i) the carrying out of a preventive conservation programme on the main architectural structures of the site, the prestigious Ziggurat, the Hypogeum Palace, the Water-Tank ; ii) the development of a spectacular experimental and scientific research programme on the local building materials (geology, unbaked brick, earthen and traditional "*kh,-gel*" mortars, baked bricks), the reactivating of archaeological researches on the site of Chogha Zanbil and at Haft Tappeh ; iii) the setting up of a specialised centre at Haft Tappeh around a team of young architetural conservators and scientists coming from three Iranian universities preparing their diploma in architectural conservation and Ph. D. thesis ; iv) the holding, in February 2000 of a "*First national course on the conservation and management of earthen structures*" for Iranian profesionnals and students in architectural conservation, the holding, in February-March 2002, of a "*First Regional Course on the Conservation of Earthen Structures*" that have been opened to professional coming from Central Asian countries. Project ICHO-RCCCR, Cultural Division of UNESCO, Japan Trust Fund and CRATerre-EAG.

17) In some countries, the reserve of oil will be exhausted during the next 50 years. We already see the development of such a war for oil conducted by consuming countries !

PROJECT TERRA

The Project TERRA guiding principles

CONSERVATION OF THE EARTHEN ARCHITECTURAL HERITAGE
Institutional involvement

EDUCATION	RESEARCH	APPLICATION	AWARENESS
University Embedment	Systematic Assemblage	Integrated Methodologies	Value Driven

INFORMATION
Knowledge management

The Project TERRA aims

CONSERVATION OF THE EARTHEN ARCHITECTURAL HERITAGE
Establish a recognized discipline

EDUCATION	RESEARCH	APPLICATION	AWARENESS
Build a field Study	Elaborate a specific science	Promote A professional practice	Stimulate A social endeavor

INFORMATION
Initiate a structured knowledge basis

UNO, about 50% of the world population is badly housed or without shelter); housing production crisis (the formal production systems are only answering to the solvable demand of the middle and upper classes; self-construction and informal forces attempt to alleviate the deficiencies of the formal system); environmental crisis (in several regions, it is now impossible to build with wood: African Sahelian regions, Niger, Burkina Faso, Mali, North Nigeria); industrial pollutions (how many industries are classified in the range of the "Seveso risk"?); physical discomfort (much more people yearn for living in healthier dwellings and leaves the towns for buying private houses in new fashionable compounds, or prefer to restore traditional houses; and this is a luxury for developed regions !); crisis of History (the cultural values of the architectural heritage are cared with unprecedented attention; we classify, conserve, enhance, we "manage" the heritages that contribut to maintain a presence and a sense of History and identity).

The erosion of the techno-diversity comes under a cultural amnesia, the consequences of which could be dramatic for the worldwide socio-economical system. The preservation and the revival of this techno-diversity are becoming a factor of vitality for the future of the planet. But, considering the challenge for the coming out of a sustainable development, we have to produce a huge effort for taking stoke of our techno-diversity, for a better knowledge and more understanding of this "building intelligence" (see Jean Prouvé[18]), and go on updating, enriching our cultural legacy by a more appropriate use of the potential of our technologies[19]. But, there is another danger: to be frozen in an "illusion of the permanence", that is also an untenable "reactionary" attitude. Based on such considerations, the conservation of the earthen architectural heritages, the sustainable development of a scientific research and specialised education in this field, today, are undoubtedly a decisive contribution for tomorrow; this is part of a shared effort — to be developed at the world scale — aiming at reconcile Man and History, and with its cultural diversity that we have now to consider as a paramount option and vector for a "local" development to be balanced with a "global" development. This is a possibility for opening new paths to a "post-development" which could not be only based on the omnipotence of money (profit) and macro-techniques which are generating much more cultural, social and material impoverishment, too much more unacceptable human poverty.

This article is integrating contributions of other researchers of CRATerre-EAG, particularly for the last part dealing with the presentation of the « *Project TERRA* » and other considerations on the sustainable conservation and development issues. We particularly raise up here, as main contributors : Eng. Hugo HOUBEN and Arch. Eng. Marina TRAPPENIERS. But also from Arch. Alejandro ALVA, co-director of the "*Project-TERRA*" at ICCROM, Rome, Italia.

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18) Jean Prouvé is a French engineer who specialised in steel construction and who defined this concept of "building intelligence" when he was searching for the best appropriate use of building materials.

19) See for instance the stabilisation of earthen building materials that has given birth to the actual roadway technology or to the stabilised compressed earth block. See also the researches and experimentations which have been developed in chemical consolidation

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Pl. 4c: Arch. Patrice DOAT

Pl. 7a: Arch. Mohmoud BENDAKIR

Pl. 10a: Arch. Mariana CORREIA

Pl. 12a: CRATerre-EAG's archives.

a: The Ziggurat of Chogha Zanbil, Khuzestan, Iran, Elamite site of the XIIth Century B.C. On this site, the unbaked earthen brick or "*Khesht*" in Persian, still has been the main building material for the construction of the core of the structures, not only for the Ziggurat itself but also for other main significant structures as the temples located in the *Temenos* area or the Hypogeum palace and other royal palaces and massive gates. But on the Ziggurat, the structural components have been protected with burnt bricks while all plastering devices for the outside protection have been made in "*khâ-gel*" or clayey mortar amended with chops of straw.

b: One of the most famous earthen architectural site of Iran, Arg-é Bam, located south-east of the country, after Kerman and not too far from the border of Afghanistan, while totally abandoned today and suffering of impressive decays, still testifies of the excellence of the Persian earthen building cultures. The origins of the fortress should trace back to the Sassanian times but the major part of the city as expended during the Mongol invasions. Despite an appearance of important destruction, Arg-é Bam still testifies of the excellence of the Persian earthen construction, particularly for numerous examples of roofing systems in vaults and cupolas, and also for the technology of the "*pisé*". An important work of conservation and restoration is now carried out which has already contributed to the restoration of the fortress, caravanserais and Koranic schools..

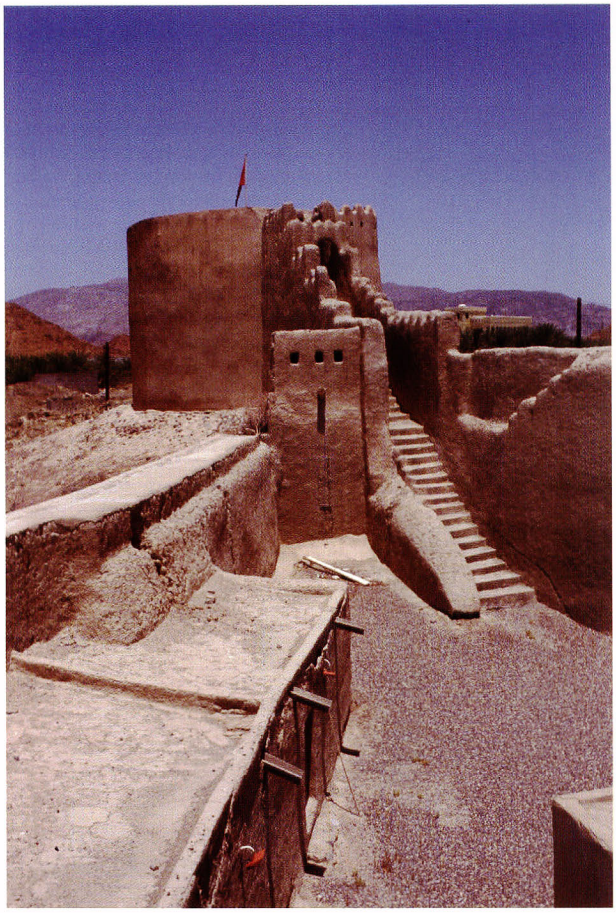
c: Still impressive is the famous tradition of the pigeons towers built in adobe and burnt bricks on the plateau of Isfahan, Iran. Here, by a locality called Gavart (between Isfahan and the airport), and all around, most of the traditional villages are mainly built in "*khest*" (unbaked brick), plastered in "*khâ-gel*" and exhibit the blooming of the Persian traditional know-how that have produced an earthen architecture in vaults and cupolas.

Near Orient

Pl. 2

a: Typical feature of the traditional people's housing in earth valorising the technology of the "*cob*" (thick walls in stacked packs of mud) on the Plateau of Khuzestan. Here, the roofs are terraced and particularly adapted to a dry climate.

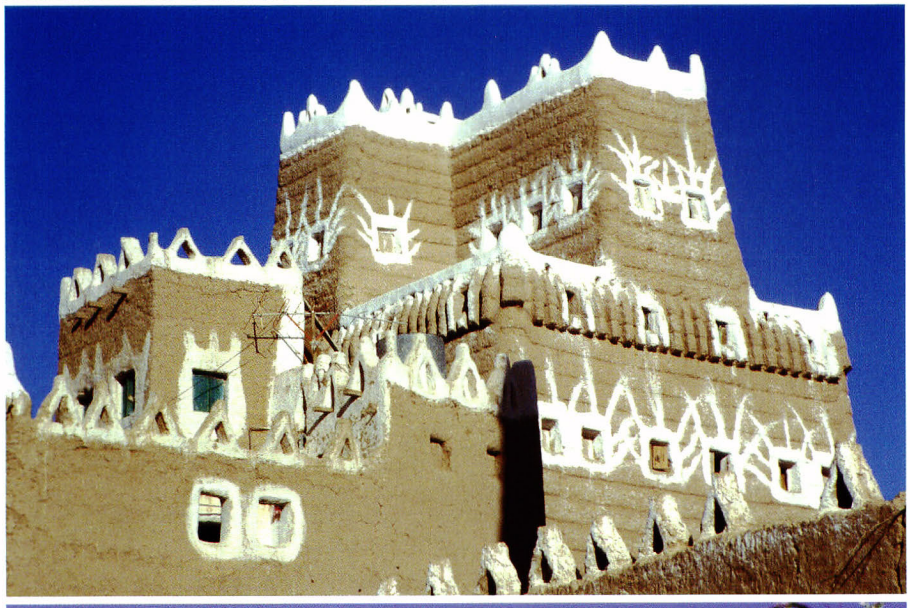
b: The climatic adaptation of the earthen architecture in Iran has produced the famous tradition of the wind towers or "*badguîrs*" which can be still observed in the desertic region of Yazd (Central Iran) and in numerous other regions suffering of a very hot climate in summer. Here, such bioclimatic devices are observed on the roofs of the "*Brugerdiha house*", located in Kashan, one of the jewels of the Kajar architecture (end of the XIXth Century and beginning of the XXth Century).



a: The Sultanate of Oman testifies of a very nice earthen architecture built in unbaked earthen bricks which have been traditionally conical-shaped and recently evolving to the common rectangular shape. This traditional earthen architecture of the Sultanate covers numerous examples of Forts with massive outer defensive walls and towers, or "*borjs*", and a nice tradition of outdoor and indoor plastering in "*sarooj*" (natural lime) or "*juss*" (gypsum) as well as earth and straw. Here the Fort of Bid Bid, on the road from Muscat to Nizwa. The Fort of Bid Bid has been restored during the 80's of the last XXth Century by the Ministry of National Heritage of Culture which has recently conducted new restoration works valorising the aesthetic of the traditional renderings.

b: Still in the Sultanate of Oman, the Fort of Bahla, located at 25 km after Nizwa, with its "*Qela'a*" (the whole fortress) and "*Qasabah*" (the Fort itself), as well as the full dimension of the oasis including pure examples of the Omani people's housing, numerous mosques and a precinct wall of about 12 km long, with massive entrance gates, has been entered on the List of the World Heritage of UNESCO, in 1987. An important project of conservation, including interventions of restoration and revitalisation has been initiated in 1995 and still now running on where the traditional Omani earthen traditional building know-how is fully valorised. A Management Plan is actually defined.

a: An aspect of a recent intervention of restoration which has been recently conducted on the Fort of Bahla, Sultanate of Oman, under the site guidance of Arch. Enrico d'Errico within the project carried out by the Ministry of National Heritage and Culture and the expertise of UNESCO. Here we can observe the partial restoration and reconstruction of the "*Borj ar-Rîh*", or "Wind tower", according the architectural evidence given by a documentation coming from photographs taken at the end of the XIXth Century by a British explorer, Colonel Miles. All outer plasters have been made in traditional "*sarooj*" and earth and straw.

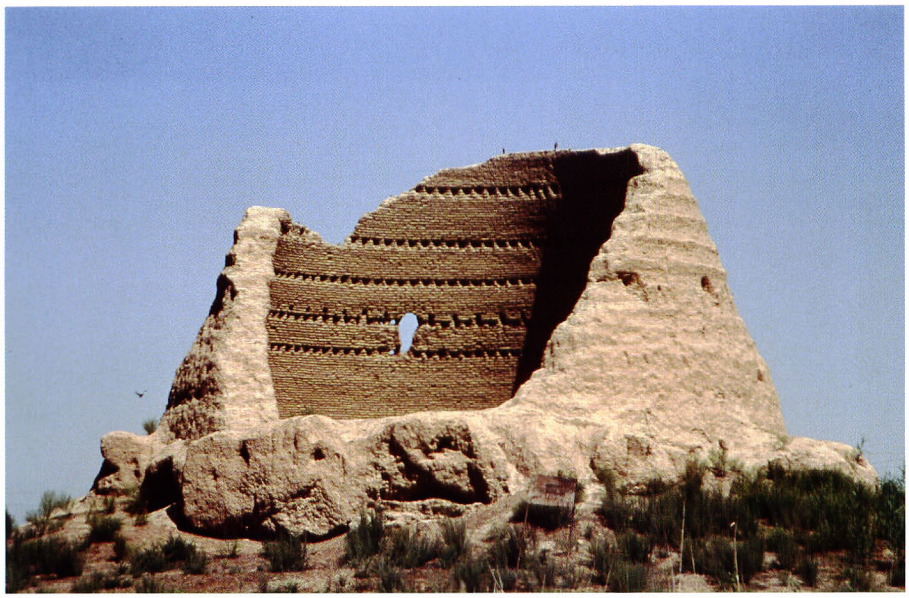


b: Typical earthen people's housing in the South of Saudi Arabia, region of Najran. These constructions are made of successive "*cob*" layers (stacked packs of plastic earth). The desert climate of this region authorizes a basic protection of the more exposed parts of the structures, the top of the walls and the outer reveals of the bays that are generally plastered with natural white lime which are regularly maintained.

c: An other typical and nice tradition of earthen architecture in Saudi Arabia, here built in unbaked bricks. In this region the climate is not only dry but also humid with some hard and very devastating rains and flooding. To protect their houses, traditional builders have included in the façades of the houses layers of salient stones which are pushing out the rain water. On the other side, during the hot season, these stones are also maintaining a projected shadow which contributes to the cooling of the walls and the bioclimatic conditioning of the houses.

a: In Afghanistan, close to the border of Pakistan, an example of local typical fortified rural houses, or farms, build in "*cob*". This building culture, in numerous regions of Afghanistan, is much more present than the adobe construction and locally called "*parsha*".

b: In Turkmenistan, the famous medieval site of Ancient Merv which has been entered on the List of the World Heritage of UNESCO in 1998. The original architectural design of the outer walls of the "*Great Kyz Kala*", built in unbaked bricks during the XIth and the XIIth Centuries A.D. is today known as a "*corrugated*" structure the shape of which having been compared with other structures of a similar type existing in Iraq.



a: On the same site of Ancient Merv, visitors can observe an impressive structure built in unbaked earthen bricks, a ice house. This tradition of such big structures used for storing the snow, the ice and the cold water in big tanks deeply embedded in the ground is one of the permanent feature of the vernacular architecture of the Central Asian region.

b: On the slopes of the Tell of Bet She'an, Northern Israel. A particularly well preserved and wonderful example of a people's housing in unbaked earthern bricks tracing back to the Bronze Age (circa 3200 B.C.) which has been excavated by Professor, archaeologist, Amihai Mazar. We can clearly observe the typical structure of this house organised around a central circular space.

c: View of the eastern façade of XVIIIth Century B.C. (Middle Bronze Age) gate of the Canaanite city of Laish at Tel Dan, northern Israel. This famous triple arched gate in unbaked bricks of Tel Dan (built in three radial courses) the span of which is about 2.30 m, has been excavated by Professor, archaeologist, Avraham Biran. It is part of a defence system which consisted of sloping ramparts and glacis. Stone constructions have been found, built against and close to the mud structures whose successive layers are made with brown and grey coloured bricks.

a: A traditional village in the region of Aleppo, Syria. Here, the earthen building culture testifies of a traditional roofing system in corbelled conical cupolas. Such structures are now very rare but this know how is tracing back to very old times as it has been confirmed by some graffitis which have been found in Niniveh (Assyrian times) evocating the rural people's of this period.

b: On the hill of Byrsa, Tunis, North Africa, the remains of the famous Hannibal's neighbourhood of the 2nd Century B.C. which has been excavated by the French mission under the Direction of Serge Lancel. The housing blocks A, C and E which have been surveyed by G. Robine, exhibit the typical Punic building culture, very eclectic in the use of the materials including stone, burnt and unbaked earthen bricks as well as "*pisé*". On the outer walls of these houses (in fact urban flats) which were sheltering metallurgist's families and their workshops, lime plasters can be still observed.

c: Detailed view of the columns in "*pisé*" erected by the Roman, when, some years after the destruction of Carthage, they have refilled the slopes of the hill of Byrsa for levelling a new platform which will bear the new Forum and Basilica of the Roman Carthage (1st Century A.D.). This structural performance consisting in building earthen columns for realising new footings is in fact common in the Roman engineering practices. Other similar traditions are existing in the history as this can be observed at Susa, Khuzistan, on the Darius' Palace.

Mediterranean Region

a: North of Spain, Province of Palencia, in Pedrosa de la Vega. The Roman Villa of La Olmedia, one of the greatest residence (33 rooms) dated from the IVth Century A.D. (late Roman Period) which have been found in Spain. The remains are exhibiting basements of walls made of unbaked earthen bricks and of stacked earth ("*cob*"). This view is also showing the remains of the heating system or hypocaust.

b: Typical house in unbaked earthen bricks, "*ladriri*" or "*mattoni*", in southern Sardinia, region of the "*Campidani*", village of Riola Sardo. In this region, numerous villages are built in earth and a programme for their conservation, restoration, rehabilitation and maintenance, associated to a revival of the earthen building technology has been recently launched under the guidance of the University of Cagliari in close collaboration with the municipalities. This tradition of the unbaked earthen brick traces back to Greek, then Punic (site of Tharros) and Roman times.

c: Eastern Mediterranean seaside of Spain, inland region of Catalonia, around Barcelona. Numerous villages are built in rammed earth or "*tapial*" which is no more a living building culture.

a: North of Spain, Province of Palencia, in a land called "Tierra de Campos". The village of Medina de Rio Seco is part of a very nice vernacular earthen architectural heritage gathering numerous other villages where Christian churches are also built in "*pisé*".

b: The presence of numerous pigeon towers, or "palomares" is one of the typical feature of the traditional rural landscape of the region of "Tierra de Campos", Northern Spain. This tradition of round-shaped pigeon towers in "*pisé*" ("*tapial*") is one of the most achieved in Europe where some other nice examples can be still observed in France, in the Saone River Valley (North of Lyon) or in the region of Aquitaine (South-West of France), where these "*pigeonniers*" are built in adobe.

a: The remains of the Castle of Silves, Province of Algarve, South of Portugal. The tradition of fortified castles tracing back to the period of "*Al-Andalus*" (Moore times) testifying of the construction in "*pisé*" ("*taipa*") is quite common in this region of Portugal where several projects of conservation have been launched.

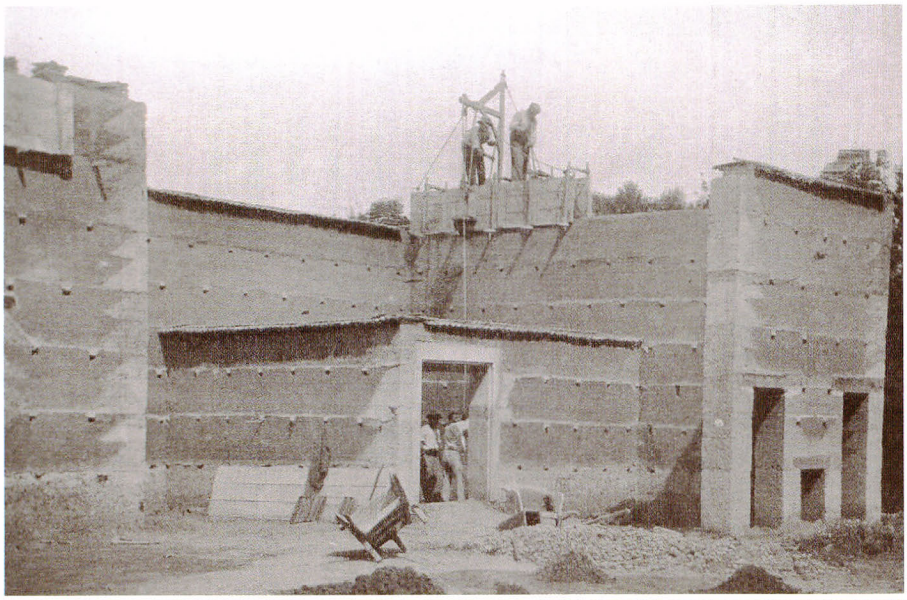
b: The construction in "*pisé*" ("*taipa*") is a permanent feature of the history of architecture in Portugal. Here the palace of the ducal City of Villa Viçosa.

a: France is gifted with a very important, rich and diverse earthen architectural heritage covering circa 15% of its full rural and urban heritage in almost all regions of the territory. Here, a typical village in Champagne, Outines, classified on the list of the National Heritage, where houses in "*colombages*" (posts and beams structures) filled up with wattle and daub ("*torchis*"), and a nice Christian church have been restored.

b: Still in Champagne, near the cities of Ay and Epernay, well known for their excellent vineyards, numerous villages and rural houses are built in unbaked earthen blocks locally called "carreaux de terre". This tradition is notably visible in villages located along the Marne River Valley but is not still living.

c: In the Region of Aquitaine, South-West of France, where exists a very nice tradition of vernacular adobe architecture. Here, the building culture, inherited from ancient Gallo-Roman times, prolonged under the Moore influences coming from the Iberian peninsula during the Middle Ages and then coming up to recent times, is associating the use of the adobe to the burnt brick which is commonly used for strengthening the reveals of the bays, the angle chains of the buildings and for the design of very nice elements of architectonic outlining.

Mediterranean Region



a: This photograph taken at the beginning of the XXth Century, circa 1914-20, is showing the common practice of the "*pisé*" construction (rammed earth) in the Province of Dauphiné, region of Isere, northern of Grenoble (South-East of France). At that time, a typical evolution was introduced in the practice of "*pisé*" with the use of the concrete, replacing the traditional corner-stone, the quoins in burnt brick-work or in lime mortar, or for consolidating the reveals of the bays.

b: A typical village house in "*pisé*", built at the beginning of the XXth Century, with reveals in concrete, located in the northern part of Dauphiné, region of Isere, South-East of France. Most of these houses are not plastered though the local climate is very rainy in Spring and Autumn. The main front façades of wealthier houses are sometimes decorated with layers of burnt bricks and river pebbles.

c: A rare and nice example of a Christian church built in "*pisé*", plastered with a thin lime distemper, in Isere, village of Charancieu located around 30 km north Grenoble. This church has been built at the middle of the XIXth Century. All walls, excepted those of the bell tower are in "*pisé*".

20TH CENTURY B.C. NORTH MESOPOTAMIA: AN ARCHAEOLOGICAL DILEMMA

Hiromichi OGUCHI*

An elusive period in north Mesopotamia is the first century of the 2nd millennium B.C., which, in other words marked as the period between the occurrence of so-called late 3rd millennium pottery and the appearance of Khabur ware, still remains to be fully explained from an archaeological point of view. In fact, the archaeological explanation for this century of the north is very difficult to give at the moment: there is no adequate comparative material obviously representing 20th century B.C. north Mesopotamia. In particular, ceramic evidence for this period of the north is considerably obscure, which indeed causes theoretical problems in ceramic chronology.

For explaining the period in question of the north, however, we have now three alternatives, which are of (1) setting up a hiatus in chronology, (2) applying limited evidence out of a specific site to the whole of north Mesopotamia, or (3) raising the upper date of Khabur ware or lowering the terminal date of so-called late 3rd millennium pottery.

The theory of chronologically setting up a hiatus is now represented by the setting of so-called "Ḫabur hiatus 1"[1], proposed by Harvey Weiss who has, through investigation at Tell Leilan and in its vicinities, the view that an abrupt climatic change, caused by a volcanic eruption[2], brought north Mesopotamia the extensive abandonment of settlements during the 22nd to the 20th century B.C. after such Akkadian domination in the north as is represented by Naram-Sin's palace at Tell Brak [*e.g.* Weiss *et al.* 1993][3]. In contrast with this theory of Weiss's, David and Joan Oates's excavations at Brak have provided important specific evidence indicating the continuity of occupation at the site in the period of Weiss's "Ḫabur hiatus 1" [Oates, Oates & McDonald 2001]. Before the adduction of Weiss's theory, there was a tendency to draw at 1900 B.C. a boundary line between the Khabur ware and 3rd millennium ceramic tradition horizons, with question marks added to the detailed periodizations of areas excavated at a site, rather than to set up a hiatus/gap, especially when a chronological table was shown [*e.g.* Weiss 1983a: Fig.6 on p.44, *idem* 1983b: p.49 or *idem* 1985: p.20]: the upper date of Khabur ware was considered 1900 B.C. for the theoretical reason that Khabur ware was absent from Kültepe *Karum* II despite the discovery of it in *Karum* Ib dated to the reign of Šamši-Adad I (*ca.* 1813–1781 B.C.), which would naturally suggest a date of its earlier appearance in north Mesopotamia than in Anatolia [Hamlin 1971: pp.302–303][4].

In fact, these are first particularly relevant to the problem of the chronological subdivision of the sequence of so-called late 3rd millennium pottery prevalent in north Mesopotamia after Ninevite 5 pottery, and further to the problem of whether diagnostic types are recognizable for such subdivisions. They are also closely connected with the problem of reconstructing a historical picture of late 3rd mil-

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1) This assumed occupational "hiatus" in north Mesopotamian chronology, dated 2200–1900 B.C. by Weiss, is said to be divided into three phases, 1–3, from depositional conditions observed at Tell Leilan [Weiss *et al.* 1993: p.999ff.].

2) However, the attribution of the abrupt climatic change, *i.e.*, the cause of "aridification" assumable in the north, to an explosive volcanic eruption in Anatolia, as shown in Weiss *et al.* 1993: p.1001, which is based on the presence of wind-borne volcanic glass sherds in soil at Tell Leilan and adjacent sites, has now been considered improbable [Courty & Weiss 1997: p.143; or now see Courty 2001: p.367].

3) For Weiss's theory further unfolded, occasionally with historical considerations, see Weiss & Courty 1993: pp.141–146 for stage 4, and further see Weiss 1994: p.127 with Table 1, *idem* 1997: p.711ff. and *idem* 2000.

4) For the interpretative problem of the upper date of Khabur ware, *cf.* Oguchi 1997: p.198ff.

lennium north Mesopotamia. The most recent view on solving these problems has been put forward by D. and J. Oates, who have clarified, on the basis of evidence from Tell Brak, the facts that there is a period of Hurrian control after the Akkadian domination in the north, as now known from the names of Hurrian rulers attested not only at Tell Brak(-Nagar) but also at Tell Mozan-Urkiš[5], and that although there is continuation of a number of late 3rd millennium types throughout the periods of Akkadian domination and later Hurrian control[6], there are distinctive types found only in "post-Akkadian" contexts[7], contemporary with the Gutian and Ur III periods in south Mesopotamian terms, which makes it possible to distinguish between "post-Akkadian" and "Akkadian" occupation levels at a site, and to identify sites of "post-Akkadian" date among those as yet unrecognizable as "post-Akkadian"[8] [Oates, Oates & McDonald 2001]. This convincing view of D. and J. Oates's, shedding a new light upon north Mesopotamian archaeology[9], necessitates modifying Weiss's theory of "Ḫabur hiatus 1"[10], in particular perhaps its phases 1–2[11], without denying the possibility of an unusual climatic change[12].

Thus we have now stood in turning our eyes towards what still remains a problem, *i.e.*, giving archaeological explanation for a century immediately after 2000 B.C., which may perhaps be described as "Ḫabur hiatus 1" phase 3 in Weiss's terminology and which probably corresponds to a "barren" layer at Tell Taya (Taya level V[13]). This is, needless to say, most particularly relevant to the subject of the present article, the main part of which is concerned with a reassessment of some pieces of archaeological evidence from Tell Jigan, a site excavated by the Japanese Archaeological Expedition in 1984–85 in the Saddam (Eski Mosul) Dam Salvage Project of Iraq.

New evidence from Tell Brak and its availability

Important evidence for filling out a gap in chronology between late 3rd millennium pottery and Khabur ware has also come from Tell Brak, at which areas FS and SS have yielded 20th century B.C. materials including southern early Isin-Larsa types [Oates & Oates 1994: p.171]. The uppermost material, removed by M.E.L. Mallowan in the past, of area CH at Brak is said to include also some which are of Isin-Larsa date [Oates & Oates 1994: p.167]. It goes without saying that this evidence from Brak is of significance, no doubt making a contribution to north Mesopotamian archaeology if material recovered of this date is very small in quantity.

The Brak evidence, shown in some reports, seems to suggest that some of the diagnostic ceramics for 20th century B.C. north Mesopotamia are of southern Mesopotamian types of Isin-Larsa date. In this respect, in her reports on pottery from the site, J. Oates illustrates such types with some

5) Oates & Oates 2001a: p.386; *idem* 2001b: p.379 and p.393.

6) Oates & Oates 2001a: p.386; J. Oates 2001: p.170 and pp.193–194.

7) J. Oates 2001: p.170; Oates & Oates 2001a: p.386ff. As for such periodization at Brak, the important point is that the late Akkadian tablets from area FS level 4 at the site provide a *terminus post quem* for the so-called "post-Akkadian" pottery [J. Oates 2001: p.170]. On this evidence, D. and J. Oates further point out the possibility, at some sites so far excavated, of the mis-dating of ceramic types identified at Brak now as "post-Akkadian" [2001b: p.393].

8) J. Oates 2001: p.194.

9) In addition, as at Brak, "post-Akkadian" pottery is said to have been found at Tell Hamoukar in pits cut into a building, confirmed in area C, of "Akkadian" date [Gibson 2001]. For information on the "post-Akkadian" period at Hamoukar, see also Ur 2002: p.23.

10) Oates & Oates 2001a: p.386 and p.388; *idem* 2001b: p.393. Such a modification seems to be seen in the table of Weiss 1990: p.388; but on the other hand, it appears that Weiss himself, taking some reports on Brak and some epigraphic data on Urkiš and Nagar into consideration, has proceeded with his discussion on such a "hiatus" [*e.g.* Weiss 1997: p.712 referring to Matthews, Matthews & McDonald 1994 and Matthews 1994, and p.714 with the claim that "a post-Akkadian, pre-Habur ware ceramic assemblage has yet to be identified upon the Habur Plains in either surface survey or excavated contexts" in order to prove that there was occupation in the period in question].

11) See note 1 above in the present article.

12) Oates & Oates 2001a: p.388 and *idem* 2001b: p.393 for a view on an unusual climatic change, the possibility of which lies, at Brak, before the end of the "Akkadian" period of the north.

13) Reade 1968: pp.256–257 and *idem* 1982: p.74 for the Taya level.

comparative examples[14] from the Sin-kašid palace of Uruk, known today as Warka [1997: p.62; 2001: pp.173–174]. Furthermore, at late 3rd millennium Brak, southern Mesopotamian types are said to occur in the "post-Akkadian" period rather than in the "Akkadian" period, which indeed provides us with an interesting problem [J. Oates 2001: p.176 and p.194][15]. In fact, the Brak ceramic evidence indicates that such contact between the south and the north (or at least Brak/Nagar) as is corroborated by the occurrences at the site of southern Mesopotamian types continued into the 20th century B.C. However, what must be taken into consideration here is the fact that Brak, lying at a crossing of routes linking the Khabur basin with southern Mesopotamia, is a specific site constantly providing evidence of southern connections, which leads us to the assumption that southern Mesopotamian ceramic types do not necessarily occur at every site in north Mesopotamia even though such types occur at a specific site like Brak[16].

Assuming that as just mentioned above, not all the sites of the north produce southern Mesopotamian types, what can we now find as chronologically significant ceramic types for 20th century B.C. north Mesopotamia, in particular in the indigenous ceramic repertoire that was ascertained at Brak? Actually J. Oates reports that among the Brak 20th century B.C. ceramics are an orange-burnished bowl the shape of which is said to be characteristic of "post-Akkadian" pottery[17], a beaker resembling a "post-Akkadian" one[18], an open plate[19], small bowls[20], *etc.*, in addition to Isin-Larsa types[21] found at the site itself [2001: pp.173–174]. Furthermore, J. Oates adduces examples from subsoil contexts of areas SS and DH as types which may be of early 2nd millennium date; the examples[22] are large bowls with slashed-rib and herring-bone decorations [2001: p.171 and p.174]. Most interesting among the types suggested by J. Oates as those which may be of early 2nd millennium date is a jar decorated with a combination of horizontal straight combing, diagonally impressed comb marks and two rows of black-painted circles[23] [J. Oates 2001: p.166 and p.174], the decorative elements of which are, however, certainly characteristic of late 3rd millennium pottery[24]. In sum, this and the other examples in general give us a vague impression that they are

14) The Isin-Larsa-type examples illustrated by J. Oates are Lenzen 1962: Taf.21:e and Taf.23:a,f.

15) See also Oates & Oates 1994: p.167, *idem* 2001a: p.387 and *idem* 2001b: p.393.

16) See also Oguchi 2001: n.1 on p.71.

17) Oates, Oates & McDonald 2001: Fig.401:270, for which see also J. Oates 2001: p.162.

18) Illustrated with Oates, Oates & McDonald 2001: Fig.422:740.

19) Oates, Oates & McDonald 2001: Fig.416:559.

20) Oates, Oates & McDonald 2001: Fig.417:570,571.

21) Oates, Oates & McDonald 2001: Fig.416:556,560 for the Isin-Larsa types from Brak.

22) Oates, Oates & McDonald 2001: Fig.416:566,567.

23) Oates, Oates & McDonald 2001: Fig.404:309.

24) With regard to black-painted circles applied to vessels in combination with comb-incised and/or comb-impressed decorations, it is noted that at Brak itself, there have been found earlier combed examples with black-painted dots, which, though rare, come from "late Akkadian" contexts and "post-Akkadian" levels contemporary with the Gutian and Ur III periods [J. Oates 2001: pp.165–166; and see Oates, Oates & McDonald 2001: Fig.403:294–297 for such examples from Brak]. This paint application, if rarely made, can no doubt be a feature of late 3rd millennium ceramic tradition: in the late 3rd millennium ceramic corpus of north Mesopotamia, there are examples sometimes decorated with simple painted or bituminous dots. Such examples were known a long time ago at Aššur [Andrae 1970: Taf.23], and are now known at Nineveh [McMahon 1998: Fig.8:8; Gut, Reade & Boehmer 2001: Abb.11:144]. At Aššur, pottery with painted dots, circles or their combinations occurs in Ištar temple level G, and such decorations are said to continue through F-E into D [Andrae 1970: p.115]. Further, with regard to late 3rd millennium pottery from stratum 5 at Tell Billa, E.A. Speiser notes that bituminous black dots are sometimes interposed between incised triangles filled with incised lines [1933: p.254, illustrating it with Pl.LV:4, and see also p.257]. In stratum VI at Tepe Gawra, there occurs pottery with crude black dots [Speiser 1935: Pl.LXVIII:118 and Pl.LXIX:134 (black dots combined with incised triangles filled with incised lines), and see p.51 (Dorothy Cross's description)]. At Tell Taya in level IX, there is also some pottery with a row of black dots [Reade 1968: p.244; see also *idem* 1982: one sherd with diagonally comb-impressed dots and painted dots in Pl.5, from Taya level VIII or VII]. At Tell al-Rimah, one fine ware bowl, from the lower fill of phase 2 (now described as level A5) of area AS, has a row of bituminous black dots [J. Oates 1970: p.19]. Moreover, at Tell eth-Thalathat, pottery with one row or two rows of painted dots occurs in level III of Tell I [Fukai & Matsutani 1977: p.63]; there is also one sherd of a jar decorated with two rows of black dots and two rows of diagonally comb-impressed dots forming a herring-bone pattern, which came from the fill of Khabur ware level II of Tell I but which would be an out-of-context sherd [Fukai &

under late 3rd millennium ceramic tradition, thus suggesting that it is still hard to distinguish between such 20th century B.C. indigenous pottery as can be confirmed at Brak and the late 3rd millennium ceramic corpus of the north[25], the latter of which should be now here described as the "post-Akkadian" pottery that has been attested at Brak as contemporary with the Gutian and Ur III periods[26]. Thus we are again confronted with the problem of how to distinguish between them, particularly in the case where we, when excavating at a site in the north, cannot find southern Mesopotamian types in an occupation level which may be of 20th century B.C. date.

Further in addition, what may perhaps be interesting is the fact that there are some cases where Isin-Larsa or its related types are found associated with Khabur ware. For example, Isin-Larsa-related types occur at Chagar Bazar in the early phase of Khabur ware level 1, which came from the tablet room 106 of area T.D., dated to the reign of Šamši-Adad I [Mallowan 1947: Pl.LXXXII:13,16; *cf.* Ayoub 1982: type 27:3,4]. Also at Dinka Tepe occurs a typical Isin-Larsa type, which was found in the phase b context that also yielded Khabur ware [Hamlin 1971: Pl.I:5a or *idem* 1974: Fig.I:5a; *cf.* Ayoub 1982: type 26]. These imply that ceramically recognizable connections with the south persisted if intermittently. Hence it follows that at the moment, the identification of 20th century B.C. levels at sites requires not only the discovery of Isin-Larsa ceramic types but also the attestation of the absence of Khabur ware. This is no doubt an effective means of identifying occupation levels of 20th century B.C. date, in particular at specific sites lying on main routes connecting with the south[27]. But at sites which are some way off the main routes, the strong possibility lies that such identification is unfeasible.

Reassessment of evidence from Trench G-4 Levels 3a-b at Tell Jigan

In the second season of Japanese work at Tell Jigan, in 1984–85, the expedition carried out soundings in five 4-by-4 m square trenches set on the southeastern slope of the mound, the area of which was designated by the expedition itself as Area C[28]. One of the five trenches, G-4, produced interesting evidence in the stage where the third level was reached below Khabur ware levels, 1a-b and 2a-b. The third level, subdivided into 3a and 3b as a result of investigation, was that which has been now marked as yielding the earliest examples of Khabur ware[29]. Furthermore, immediately below Level 3b, there were confirmed levels yielding what is called late 3rd millennium pottery (Levels 4a-b). Between Levels 4a-b and 3a-b, the first significant point is that it was confirmed that a stone foundation, constructed in Level 4a probably for a mud-brick wall, had been retained in use in Level 3b: this may give a suggestion when a time gap between 4a and 3b is considered.

What is especially noted here is the fact that in Levels 3a-b, Khabur ware sherds were found

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Matsutani 1977: Fig.6:3, and *cf.* the description of Fig.6:3 on p.63].

Interestingly, the occurrence, on late 3rd millennium-20th century B.C. vessels, of simple painted decoration like dots or circles leads us to speculate that the decoration itself may have been retained in the succeeding period, *i.e.*, on Khabur ware as dots interposed between geometric motifs of paint; in this connection, see one of the earliest examples of Khabur ware from Tell Jigan [Oguchi 2001: Fig.8:4].

25) But it is a fact that the Brak 20th century B.C. pottery is said to differ from late 3rd millennium pottery types [J. Oates, personal communication in 1995]. The reader should keep this in mind till the final page of discussion of the present article.

26) Here we must pay attention to the term "post-Akkadian", which appears to be used at Brak, including 20th century B.C., a century preceding the introduction of Khabur ware [For the terminology, see the introduction of Oates, Oates & McDonald 2001: *inter alia*, p.xxxi and Table 1 (phase N)].

27) At Aššur, there are vessels from Ištar temple level D, assigned to the Isin-Larsa period on the basis of a building inscription of Ilušuma/Ilušumma, which are most briefly reported by Walter Andrae without illustrations, and therefore hardly permit reassessment [see Andrae 1970: p.115]. However, recent excavations at Aššur, carried out in an area near the Nabu temple, have confirmed level IIIa phases 1-4 yielding Khabur ware and level IIIb yielding the pottery of Isin-Larsa and terminal Ur III [Dittmann 1990: p.164; Matthews & Wilkinson 1991: p.173]. Ištar temple D vessels may be represented by the level IIIb ceramic material [*cf.* Matthews & Wilkinson 1989: p.253]. This may become an example illustrative of the issue under discussion.

28) For this Japanese work at Jigan, see Fujii 1987: pp.62–67.

29) See Oguchi 2001: Fig.8 on p.83.

mixed with sherds of the so-called late 3rd millennium pottery that is, in rough terms, known at Tell Taya in levels IX–VI, which should be however now subdivided into three chronological categories, such as "pre-Akkadian", "Akkadian" and "post-Akkadian", as attested at Tell Brak[30]. Further, of importance is the fact that the material recovered from Levels 3a-b included, as noted above, significant Khabur ware types for defining the earliest phase of Khabur ware, described as "Khabur Ware Period 1" (*ca.* 1900–1814 B.C.) in the present writer's terms[31]. The place in which an outstanding mixture of Khabur ware and late 3rd millennium sherds was detected lay in the northeast quarter of the trench, G-4. In the overlying level, 3a, such a mixture lay on the floor surface that consisted of whitish substances and was associated with stone features found there. On the other hand, in the underlying level, 3b, the same place formed some surfaces also consisting of whitish substances, which also yielded both Khabur ware and late 3rd millennium sherds; the lowest surface was a floor associated with a mud-brick wall and a wall-like row aligned with large stones, both found in Level 3b; on and above the surfaces, many potsherds and animal bones were found scattered, which showed that the place itself had been a rubbish tip continuing to be used till the period of Level 3a.

According to archaeological theory, in this case it is usual that, late 3rd millennium sherds being treated as "residual" sherds and being excluded from consideration, these levels are dated by the presence of Khabur ware. Nonetheless, the fact that late 3rd millennium sherds recovered from there are larger than Khabur ware sherds in quantity, of which the details are referred to below, leads the present writer into some speculation about 20th century B.C. north Mesopotamia. However, we must bear it in mind that in the case where we cannot but rely on material from fill for dating because no material is found on a floor *in situ* or in occupation deposits, it is possible that the dating of a level is determined by two or three sherds found near the bottom of fill containing in the great majority such sherds as are recognizable as earlier than the two or three. Needless to say, such speculation therefore needs carefulness. With these in mind, we now proceed to the next discussion.

Quantitative analysis

All the sherds that were recovered from Levels 3a and 3b of the Jigan trench relevant at the moment were recorded in the field for a quantitative analysis. The total number of the sherds recovered amounts to 727, including 9 sherds of Ninevite 5 pottery which are obviously stray finds from earlier levels; accordingly, 718 sherds are available for the analysis. Naturally, these available sherds include not only diagnostic sherds but also undecorated body sherds. To put it concretely, they consist of rim (33.4%), body (58.6%) and base (7.7%) sherds, and two sherds with a vessel portion of rim to base (0.3%), which are also comprised of sherds, plain (49.0%), painted (15.0%), both painted and incised (3.0%), and incised (32.9%), and a sherd with snake appliqué (0.1%), as shown in the tables of Fig.1.

All the painted sherds are of Khabur ware, excluding three sherds of red-burnished ware, noted below as late 3rd millennium pottery. The Khabur ware sherds include band-painted ones. Strictly

30) In the ceramic data on record from Jigan Area C Trench G-4 Levels 3a-b, we now can find few sherds of such distinctive types as are attested at Tell Brak as "post-Akkadain", with the exception of the presence of a number of sherds decorated with very regular wavy combing or with the simple combination of wavy and straight combing (*e.g.* Fig.4:4), indicated as characteristic of "post-Akkadian" pottery in Oates & Oates 2001a: p.387 and J. Oates 2001: pp.164–165. In particular, sherds of bowls and beakers of the so-called "step- or recess-beaded rim" type that is marked as one of the most reliable "post-Akkadian" features [Oates & Oates 2001a: p.388; J. Oates 2001: p.171 and p.173] cannot be found in the Jigan ceramic data now on record. Such "post-Akkadian" fine ware bowls as are radially pattern-burnished, which have been found not only at Tell Brak but also at Tell Taya and Tell Rimah [Oates & Oates 2001a: p.387; J. Oates 2001: p.171; see also Oates & Oates 1994: p.167 and p.171], also cannot be found in the Jigan data. However, at Brak, it is suggested that there is continuation of a number of late 3rd millennium types from the "Akkadian" to the "post-Akkadian" period, as referred to elsewhere in the text of this article. When we know what types show such continuation, we can proceed to the next discussion; but that seems still unclear. From here in this article, therefore, the term "late 3rd millennium", rather than the term "post-Akkadian" or "Akkadian", is consistently used unless the need of using other terms arises, which is also for convenience of discussion as well as for avoiding confusion.

31) See Oguchi 1997: pp.196–197.

Vessel portions

Level	Rim-to-base[1]	Rim	Body	Base
3a		177 (L3 *103*) (KH *55*)	351 (L3 *147*) (KH *103*)	42 (L3 *27*) (KH *10*)
3b	2 (L3 *2*)	63 (L3 *39*) (KH *16*)	70 (L3 *37*) (KH *21*)	13 (L3 *7*)
Total	2 (L3 *2*)	240 (L3 *142*) (KH *71*)	421 (L3 *184*) (KH *124*)	55 (L3 *34*) (KH *10*)

(Total number of sherds = 718)

Decoration

Level	Plain[2]	Incision[3]	Appliqué[4]	Incision & Paint[5]	Paint[6]
3a	271 (L3 *109*) (KH *43*)	184 (L3 *163*) (KH *15*)	1 (L3 *1*)	16 (KH *16*)	98 (L3 *3*) (KH *95*)
3b	78 (L3 *40*) (KH *13*)	52 (L3 *45*) (KH *6*)		8 (KH *8*)	10 (KH *10*)
Total	349 (L3 *149*) (KH *56*)	236 (L3 *208*) (KH *21*)	1 (L3 *1*)	24 (KH *24*)	108 (L3 *3*) (KH *105*)

(Total number of sherds = 718)

Categorization

Level	Indistinguishable[7]	Khabur ware[8]	Late 3rd millennium pottery	*Total*	Strays (Ninevite 5 sherds)
3a	125	169	276	570	(5)
3b	26	37	85	148	(4)
Total	151	206	361	718	(9)

Fig. 1 Sherd count of Khabur ware and "late 3rd millennium" pottery from Trench G-4 levels 3a and 3b of Area C at Tell Jigan.

Notes on Fig.1

The figures in small parentheses indicate the number of sherds of "late 3rd millennium" pottery (L3) or of Khabur ware and associated pottery (KH) in each item. "L3" is an abbreviation for "late 3rd millennium" pottery, and "KH" for Khabur ware and associated pottery.

1) Sherds with vessel portions of rim to base.
2) Undecorated rim, body and base sherds.
3) This includes sherds which bear not only incised motifs but other plastic decorations such as combing, comb-impressed dots, grooves, unraised bands with slashes, and raised bands with slashes or depressions (*cf.* Fig.2). Sherds bearing their decorative combinations, as shown in Fig.2, are also included here.
4) Merely indicating sherds with zoomorphic appliqué. There is only one sherd bearing a part of snake appliqué with impressed dots and a part of a grooved triangle filled with oblique grooves (a hatched triangle or a concentric triangle separated by one vertical center line or a concentric triangle?). Raised bands with slashes or depressions, which may be described as clay-applied decoration, are excluded from here and added to the item "incision"; in fact there are many cases where it is difficult to know whether such a raised band was applied to the vessel surface or was created from the vessel surface clay.
5) Indicating painted sherds with grooves, combing or raised bands with depressions (*cf.* Fig.3).
6) Only painted sherds with no other plastic decoration. Three red-burnished ware sherds (L3) are included here.
7) Sherds on which the distinction between "late 3rd millennium" pottery and 'Khabur ware' including associated pottery cannot be drawn. The majority are undecorated body sherds.
8) Including undecorated rim, body and base sherds which are considered to be either of pottery associated with Khabur ware or of Khabur ware itself. Grooved body-sherds (see note 4 of Fig.2) and a comb-incised sherd of a Khabur ware shape in profile are also included here.

Level	①Incised motifs[1]	②Unraised, slashed band(s)[2]	③Raised band(s)[3] with slashes or depressions	④Combing (wavy and/or straight,*etc.*) ⑤Comb-impressed dots	⑥Groove(s)[4] (horizontal)	*Combinations* ①+②	①+③	①+④	②/③+④	②+⑤ ④+⑤
3a	50	1	6	94 (KH *1*) 0	20 (KH *14*)	2	3	0	5	2 1
3b	8	1	4	20 1	8 (L3 *1*) (KH *6*)	0	1	2	3	1 3
Total	58	2	10	115 (KH *1*)	28 (L3 *1*)[5] (KH *20*)	2	4	2	8	7

Fig. 2 Sherd count in the item "incision" (236 sherds) of Fig.1.

Notes on Fig.2

1) They are such as are described in the text.
2) A single band or a double band. One sherd, from 3a, has a double band forming a herring-bone pattern, and another sherd, from 3b, has a single band.
3) A single band or a double band.
4) A single groove or multiple grooves. As for single-grooved sherds, it is in fact difficult to distinguish between "late 3rd millennium" pottery and 'Khabur ware' including associated pottery; they are thus treated as indistinguishable sherds. As for multiple-grooved sherds, the distinction is possible in comparison with sherds with "paint & incision" (Fig.3); they are thus considered to be of Khabur ware or associated pottery, with the exception of an example (Fig.4:16) which has a late 3rd millennium shape.
5) As noted above, excepting one late 3rd millennium sherd, 20 sherds with multiple grooves are considered to be of Khabur ware or associated pottery. The remainder (7), single-grooved sherds, are indistinguishable sherds.

Level	*Combinations* (horizontal) Paint + Grooves	(wavy + straight) Paint + Combing	Paint + Raised bands with depressions
3a	15	1	
3b	7		1
Total	22	1	1

Fig. 3 Sherd count in the item "paint & incision" (24 Khabur ware sherds) of Fig.1.

speaking, the incision of the painted and incised sherds is either grooving or combing; one painted sherd with raised bands with depressions is, for convenience of producing a table of Fig.1, included in the category of "incision and paint". The painted and incised sherds are also of Khabur ware, marked as distinctive types for "Khabur Ware Period 1". The incised sherds, including either wavily or straight, or both wavily and straight, comb-incised ones (Fig.4:2–4), are regarded as being of late 3rd millennium pottery, with the exception of one rim-to-shoulder sherd, with a straight comb-incised horizontal band, of a typical Khabur ware shape. Comb-incised vertical bands occur on some late 3rd millennium sherds, which are combined with straight comb-incised horizontal bands or raised bands with slashes (Fig.4:8,9). Some late 3rd millennium sherds have lattice patterns of comb-incised bands. Incised motifs on late 3rd millennium sherds found in these levels are hatched triangles, triangles with lines radiating from the top corner, empty triangles, zigzags, cross-hatching, and diagonal slashes whose sets form a horizontal row (see Fig.4). Combinations of these incised motifs are found on several sherds; incised horizontal lines also occur there. There are two sherds with incised wavy lines, which are also regarded as being of late 3rd millennium pottery. Unraised, slashed bands or raised bands with slashes or depressions are found combined with incised motifs or comb-incised decorations; in this respect, sherds only with such bands are classified as late 3rd millennium, which are included here in the category of "incision" for convenience of producing tables. The use of a series of comb-impressed dots which are often arranged diagonally is a characteristic of late 3rd millennium pottery (*e.g.* Fig.4:10–13). Comb-impressed dots occur, combined with comb-incised bands or unraised, slashed bands; such comb impression is, however, included in the category of "incision" in here, also for convenience of producing tables. On the other hand, multiple-grooved sherds, also included in the category of "incision", are regarded as being of pottery associated with Khabur ware, with the exception of an example (Fig.4:16) which has a late 3rd millennium shape. As noted above, there are three sherds of red-burnished ware considered to be of late 3rd millennium date [For intact vessel examples of red-burnished ware, see Ii & Kawamata 1984–85: *e.g.* Fig.10:151–155, from Grave 6 in Area A at Jigan], which are included in the category of "paint" in Fig.1 of this article. Two of these are a body sherd and a rim sherd, possibly of jars, both of which are burnished after painting in red on the outer surfaces and around the rims, and the other is a rim sherd of a bowl, which is burnished after painting in red on the whole surface. Further, there is one rim sherd of a vessel decorated with snake appliqué[32](Fig.4:7), which is here put provisionally in the category of late 3rd millennium pottery in consideration of its vessel shape inferable[33]. Among the undecorated sherds are channel-base sherds, which can be regarded as a characteristic of Khabur ware or associated pottery, and flat-base sherds with regular, horizontal and smooth turning marks on the outer surfaces, *i.e.*, with those which are marked as a finishing technique characteristic of late 3rd millennium pottery (*e.g.* Fig.4:22–24). Regular, horizontal marks of turning (known as trimming or shaving by modern potters) are considered a distinctive feature of late 3rd millennium pottery. Thus channel-base sherds are classified here as associated with Khabur ware, and flat-base sherds with such turning marks, as late 3rd millennium pottery. Moreover, there are body sherds with vertical burnish marks, some of which may be

32) It goes without saying that snake appliqé vessels, to which scorpion appliqé is occasionally added, have a long history of use, continuing from the second half of the 3rd millennium into the early 2nd millennium B.C. There is a case where this kind of vessel is found associated with Khabur ware. For example, at Tell Rijim, a site in the Eski Mosul Dam Salvage area, a snake appliqé vessel, also decorated with scorpion appliqué, occurs in trench C layer 6 yielding Khabur ware [Koliński 2000: pp.63–64 with Fig.28, or see Pl.40:a].

33) However, the problem is that this rim sherd has not only snake appliqué but also such grooved decoration as a triangle filled with oblique grooves: grooved decoration is a feature of Khabur ware and associated pottery. The shape itself inferable is similar to that of "late 3rd millennium" pottery decorated with very regular wavy and straight combing (compare Fig.4:7 with Fig.4:4, in the present article); but problematical is the fact that it is also similar to that which one of the earliest Khabur ware examples from Jigan Area C has [*cf.* Oguchi 2001: Fig.8:1]. The Jigan example is a Khabur ware jar decorated with irregular bands of paint and horizontal grooves [*ibid.*]. The similarity in shape between these may become a clue to conceptualizing 20th century B.C. local pottery.

parts of necks, however; they are also regarded as being of late 3rd millennium pottery [*e.g.*, *cf.* Ii & Kawamata 1984–85: Fig.20:8,10 (for which see p.186) and Fig.22:4,5 (for which see p.189), from graves in Area B at Jigan]. Furthermore, undecorated body sherds of well-fired, fine and relatively hard green ware[34](*e.g.* Fig.4:20,24) are classified as late 3rd millennium, while undecorated body sherds identical in ware-fabric with painted sherds of Khabur ware are regarded as being either of Khabur ware or of associated pottery. In addition, rim profiles of undecorated sherds also allow of classification under the two categories of pottery.

The result of the quantitative analysis proves that late 3rd millennium sherds account for 50.3% of the total sherdage from both the levels, 3a and 3b, and that Khabur ware sherds and associated potsherds comprise 28.7%; and the remainder, 21.0% of the total sherdage, is the count of indistinguishable sherds (which are chiefly of undecorated bodies). Further, the frequency of their occurrence in the respective levels is as follows:

Level	Khabur ware sherds & associated potsherds	Late 3rd millennium sherds	Indistinguishable sherds
3a	29.7%	48.4%	21.9%
3b	25.0%	57.4%	17.6%

In the case where the indistinguishable sherds are excluded, the ratio of late 3rd millennium sherds to Khabur ware sherds and associated potsherds is 64% to 36% in lumping the sherds of 3a with those of 3b. On the other hand, the ratio in the respective levels is as follows:

Level	Khabur ware sherds & associated potsherds	Late 3rd millennium sherds
3a	38%	62%
3b	30%	70%

Needless to say, these percentages show that the sherd-sample of late 3rd millennium pottery is quantitatively much larger than the sherd-sample of Khabur ware and associated pottery.

Contemplation

The late 3rd millennium sherds from these levels are to be usually treated as "residual" sherds. The so-called "residual" sherds are often explained as those deriving from bricks or levelling fill. To take another example, Julian Reade mentions that at Tell Taya, it is appreciated that late 3rd millennium sherds frequently intrude into Khabur ware level IV and all subsequent levels [1968: p.257]; they are indeed "residual" sherds. However, the Jigan late 3rd millennium sherd-sample, mixed with the Khabur ware sherd-sample, chiefly came from the 3a–b rubbish tip of the northern part of the trench, G-4, which did not include mud-brick fragments. In fact, this situation is that which is called "transposed primary context" [for this term, see Sharer & Ashmore 1979: p.87]. At any rate, the Jigan situation first precludes the possibility that the late 3rd millennium sample may derive from mud-bricks containing sherds of an earlier period. Nor can the tip deposits themselves be a sort of levelling fill. But such a mixture usually proves that the sherd material itself is not *in situ*. What is illustrated here is the fact that at Tell al-Hawa in one trench of area D, Warwick Ball confirmed that some layers covering structures contained a mixture of Khabur ware and late 3rd millennium sherds, but he interpreted the late 3rd millennium sherds as having been washed out or redeposited from a higher level outside of the trench [Ball 1990: p.88]. The Jigan trench G-4 situation, however, does

34) This appears to be a sort of ware which should be discussed in connection with later "stone ware", *i.e.*, "'post-Akkadian' stone ware", a term given at Brak by J. Oates [for this "stone ware", see J. Oates 2001: p.154 and pp.171–173].

not conform to such a case as lay at Hawa. What is the best explanation in the case of Jigan? The assumption, which we can now draw at least, is that when the use of Khabur ware began, a large quantity of late 3rd millennium sherds, together with Khabur ware sherds and animal bones, were thrown away into the tip. Why?

At any rate, however, it may be needed here to remember that we postulate that such a ceramic tradition as can be described as late 3rd millennium pottery is dated literally before 2000 B.C. If this postulation does not stand up, we will be able to grope for possibilities concerning 20th century B.C. north Mesopotamia now in question. Although the Jigan material is not that which was found *in situ*, such a mixture at Jigan tempts the present writer to assume that pottery retaining late 3rd millennium ceramic tradition may have continued in use until a date when Khabur ware first appeared or the beginnings of the period in which Khabur ware was in use. Further, if this assumption is to be warranted, such a mixture may be considered a phenomenon representing the co-occurrence, in a period, of Khabur ware and pottery retaining late 3rd millennium ceramic tradition; this may be supported by an unusual Khabur ware sherd decorated with wavy and straight horizontal combing in addition to painted horizontal bands[35](Fig.4:28), which came from the Level 3a tip of the Jigan trench (see Fig.3). In the result, the problem lying there is that the north Mesopotamian indigenous pottery of the period immediately after the end of late 3rd millennium B.C. is less clear than we might wish[36], although Brak may possibly be marked as an exceptional site. In fact, there appears to be a theoretical problem in north Mesopotamian ceramic chronology, in particular with respect of a period between *ca.* 2000 B.C. and *ca.* 1900 B.C.: when hypothesizing the continuation of late 3rd millennium ceramic tradition into the 2nd millennium B.C., we may come up with any ideas for a solution.

If this hypothesis is not invalid, can we find similar cases like Jigan[37] among other sites so far excavated? A mixture of late 3rd millennium pottery and Khabur ware types is said to have been found at Tell Abu Dhahir, a site in the Eski Mosul Dam Salvage Project area. As for this, Warwick Ball reports that distinctive Khabur ware and late 3rd millennium types occurred together at Abu Dhahir, and that there were also transitional types between them [1987: p.79, the description of period 4 "Taya"]; but his later revised report mentions that "a closer examination revealed that they were in fact two separate contexts, with the Khabur material belonging to a destruction level that had collapsed onto the Akkadian 〔*i.e.* late 3rd millennium〕, thus forming an apparent juxtaposition" [Ball n.d.: p.34]. Also at Tell Hamad Agha as-Saghir in the North Jazira Project area of Iraq, Peter Z. Spanos encountered a mixture of late 3rd millennium and Khabur ware sherds [personal communication in 1988]. It seems that in his report, Spanos treats late 3rd millennium sherds found in Khabur ware lev-

35) This tempts me to suggest that J. Oates's earlier view on the band-painted and comb-incised pottery from Tell al-Rimah area AS [J. Oates 1970: Pl.IX:2] remains validity. Her view is that it is considered transitional between late 3rd millennium pottery and Khabur ware [J. Oates 1970: p.17]. Given the continuation of combed decoration into the 20th century B.C., this view has a different implication, deserving reconsideration. In this connection, it might be a consideration that Julian Reade reports that at Tell Taya, Khabur ware level IV produced "some pots with both incised and painted decoration" [1982: p.74], while he also reports that among the pottery vessels recovered from Khabur ware level IV at Taya, there were one painted sherd with cross-hatched incisions and another painted sherd with scorpion appliqé [1968: p.257].

36) However, all things considered, the possibility that combed decoration, which is also a distinctive feature of late 3rd millennium pottery, continued into the 20th century B.C. seems strong.

37) For Jigan itself, see and *cf.* M. Katia Gesuato's discussion on ceramic materials from the Khabur ware levels, 4–3, and the late 3rd millennium levels, 2-1, of the northmost part of the site of Jigan, excavated by the German-Italian joint expedition [Gesuato 1993: p.269ff., *inter alia* p.273]. Although the discussion seems somewhat problematical, it is interesting that Gesuato suggests the presence of "uncommon incised Khabur ware" on the basis of the recovery, from the Khabur ware levels, of two incised sherds, one "with incised triangles and oblique lines" and the other "with incised straight and oblique lines" [Gesuato 1993: p.270 with n.10 (? reference to Mallowan 1936)]. They are, however, most likely to be what is called late 3rd millennium pottery. Whether this can be marked as nearly the same phenomenon that was observed in Japanese Area C is a matter for consideration and argument. Further, Gesuato treats an unpainted, carinated open bowl from either level 2 (?) or level 1 (?) as a type of late 3rd millennium pottery, although it is of a Khabur ware shape, thus suggesting the continuity in ceramic production from the late 3rd to the early 2nd millennium B.C. [1933: p.271, Fig.LXVIII:21 and p.273 with n.43]. In this area at Jigan, a moot question is also raised.

els as out-of-context sherds, except for level 11 in the north enlarged area of trench II [1990: pp.121–123, *inter alia* "*Nordergänzung Schnitt* II" in Table I on p.122]; the level 11 is the lowest Khabur ware level in which there occur sherds of small burnished bowls of well-levigated grey ware, regarded certainly as being of late 3rd millennium pottery [Spanos 1990: p.106]; it is further noted here that a late 3rd millennium fine gray ware sherd decorated with cross-hatched triangles of brown paint was also found in the level 11 [Spanos 1990: p.170, Abb.20:3]. In sum, Spanos considers that late 3rd millennium pottery overlaps with Khabur ware at Hamad Agha as-Saghir in the level 11. On the other hand, the late 3rd millennium sherds that came from Khabur ware levels 8–9 in an enlarged long trench set from the summit of the mound to trench II, as shown in the concluding table of his report [Spanos 1990: Table I], should be first excluded from consideration, certainly as out-of-context sherds, although the presence, in the level 8, of a late 3rd millennium sherd decorated with a row of diagonally comb-impressed dots and an unraised, slashed double-band is interesting[38)][Spanos 1990: Abb.18:9]. In addition as an interesting fact at the site, levels 2–3 in the west enlarged area of trench II yielded sherds of well-levigated reddish brown ware with horizontal reserved-slip decoration, which Spanos termed "Tell Hamad Agha as-Saghir ware" [Spanos 1990: Abb.20:8,9, and see p.123]. This shows that when it is taken into consideration that in the same area, levels 1–2 yielded Khabur ware sherds, and level 3, late 3rd millennium sherds [Spanos 1990: pp.107–108], the level 2 can be regarded as having also contained a mixture of late 3rd millennium and Khabur ware sherds: in the present writer's opinion, the so-called "Tell Hamad Agha as-Saghir ware" is considered as belonging to the category of late 3rd millennium pottery in respect of its shape and slip technique. In this case, however, the "Tell Hamad Agha as-Saghir ware" sherds should be also regarded as out-of-context sherds. At any rate, at Hamad Agha as-Saghir, the level 11 of the north enlarged area of trench II leaves room for interpretation.

Whether such a mixture of late 3rd millennium and Khabur ware types/sherds as was found at each one of these sites exists in good stratified context is always problematical and questionable. Nevertheless the present writer is inclined to believe the continuation of late 3rd millennium ceramic tradition into the 2nd millennium B.C., *i.e.*, into the 20th century B.C. and possibly the beginnings of the period in which Khabur ware was in use.

Speculative attempts

If such a hypothesis stands up, what conclusion can we reach or what picture we give for 20th century B.C. north Mesopotamia ? The period in question is, according to Weiss's theory, the final phase of the period in which almost all cities, towns and villages in north Mesopotamia were abandoned, which is also represented by Taya level V, a "barren" layer. However, such a view seems illogical in consideration of various circumstances: for instance, it is rather considered that there cannot have been no cities, towns and villages in an extensive area during a hundred years, and conversely, one may assert that they, if small in number, must have existed. Their certain existence has been now in fact corroborated at least by the evidence from Brak as noted above. The Brak evidence is, needless to say, very significant, but appears insufficient for identifying 20th century B.C. occupation at other sites, in particular at sites remote from the main routes connecting the north and the south.

What we can now suggest may be the juxtaposition of three possibilities, (1)–(3). Thereby we can draw a conjecture, which may be outlined as below. During the 20th century B.C., in north Mesopotamia, (1) some cities, towns and villages would have been abandoned for some reason or other, as always seen in each period in Mesopotamian history, while (2) cities like Brak lying at an important position on main routes linking the north to the south must have continued to exist together

38) Here, it should be remembered that there is a suggestion that at Brak, an example with diagonally impressed comb marks may be assigned to the 20th century B.C. [J. Oates 2001: p.166 and p.174 for Fig.404:309]. Diagonally impressed comb dot decoration may be a consideration for 20th century B.C. pottery in terms of the continuation of late 3rd millennium ceramic tradition into the 2nd millennium B.C.

with their satellite towns and villages. When excavating sites, we are to find a true gap (*i.e.* hiatus) in occupation at the former sites, and at the latter sites, to find early Isin-Larsa ceramic types, to which indigenous pottery retaining late 3rd millennium ceramic tradition may be added assumably though without certainty[39]. On the other hand, (3) some other contemporary towns and villages remote from such main routes would have continued to exist, which are sites marked as only producing the pottery that, though dating to the 20th century B.C., retains late 3rd millennium ceramic tradition. Such a phenomenon may be seen particularly at local sites. If so, the Jigan evidence takes on a meaning; and we can claim that it is possible that at a local site like Jigan, pottery retaining late 3rd millennium ceramic tradition was still in use after 2000 B.C., further overlapping with the first appearance of Khabur ware including band-painted and comb-incised pottery[40]. In this case, however, the problem of how to distinguish such 20th century B.C. indigenous pottery from late 3rd millennium pottery remains unsolvable. Future excavations at some sites may resolve this particular problem.

In conclusion, it may be pertinent that David Tucker's mention seen in a report on his surface survey at Tell al-Hawa is cited. He writes:

> "*When the detailed breakdown of late 3rd millennium and Khabur types is complete and the extent of their overlap is realized, perhaps a different picture will emerge.*" [Tucker 1989: p.35].

Catalogue of pottery

Fig.4. Selected sherds of the "late 3rd millennium" pottery in question (nos.1–27, except no.28, an unusual example of Khabur ware) from Area C Trench G-4 Levels 3a and 3b at Tell Jigan. Scale 1:5.
[Colour indices in parentheses are according to *Revised Standard Soil Color Charts* (1988 edition), by M. Oyama and H. Takehara (copyright 1967), which, needless to say, correspond to those of *Munsell Soil Colour Charts*.]

1. Jigan Area C G-4 Level 3b (JC P693). Rim sherd.
Light green ware (10Y 7/2,8/1), medium vegetable- and medium grit-tempered in medium density. Incision.

2. Jigan Area C G-4 Level 3b (JC P694). Rim sherd.
Light greenish buff ware (7.5Y 8/2), medium vegetable- and medium grit-tempered in medium density. Straight horizontal combing, made with a seven-pronged tool.

3. Jigan Area C G-4 Level 3b (JC P695). Rim sherd.
Light greenish buff (7.5Y 8/2) to yellowish green (7.5Y 7/2,7/3) ware, medium vegetable- and medium grit-tempered in medium density. Wavy and straight horizontal combing, made with a three-pronged tool.

4. Jigan Area C G-4 Level 3a (JC P778). Rim sherd.
Pinkish buff ware (7.5YR 8/2,8/3,8/4), slipped in pale buff (2.5Y 8/4, 5Y 8/3). Fine vegetable and medium grit temper in medium density. Wavy and straight horizontal combing, made with a three-pronged tool.

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39) *Cf.* note 25 in the present article.

40) The attestation is, however, difficult at present, although there are several considerations for this possibility. For some considerations, see notes 35, 36 and 38 in the present article. Finally, the present writer should come to the important point for inferring 20th century B.C. pottery, suggesting that grooved decoration may become a clue to conceptualizing north Mesopotamian indigenous pottery of 20th century B.C. date. The fact that there is a similarity in shape between three categories in style of pottery from Jigan Area C Trench G-4 Levels 3a and 3b has already been mentioned in note 33 of the present article; one is a jar decorated with very regular wavy and straight combing (Fig.4:4), another is a jar with snake appliqué and grooved triangles filled with oblique grooves (Fig.4:7), and the other is a Khabur ware jar decorated with horizontal grooves and irregular bands of paint [Oguchi 2001: Fig.8:1]. Also at Tell Hamad Agha as-Sagir, there is a similar type, decorated with grooved, hatched triangles and impressed circles interposed between the triangles, below which is an unraised, slashed double-band forming a herring-bone pattern [Spanos 1990: Abb.21:1]. This Hamad Agha as-Sagir example is a sherd found, though not *in situ*, in a Khabur ware level in the east enlarged area of trench II of the site [Spanos 1990: p.108], which may be of importance when the possible presence, at some local sites, of earlier 2nd millennium pottery retaining 3rd millennium ceramic tradition is hypothesized. Grooved decoration, in particular such as hatched triangles, triangles with lines radiating from the top corner, *etc.*, may perhaps be a distinctive feature of 20th century B.C. local pottery in north Mesopotamia.

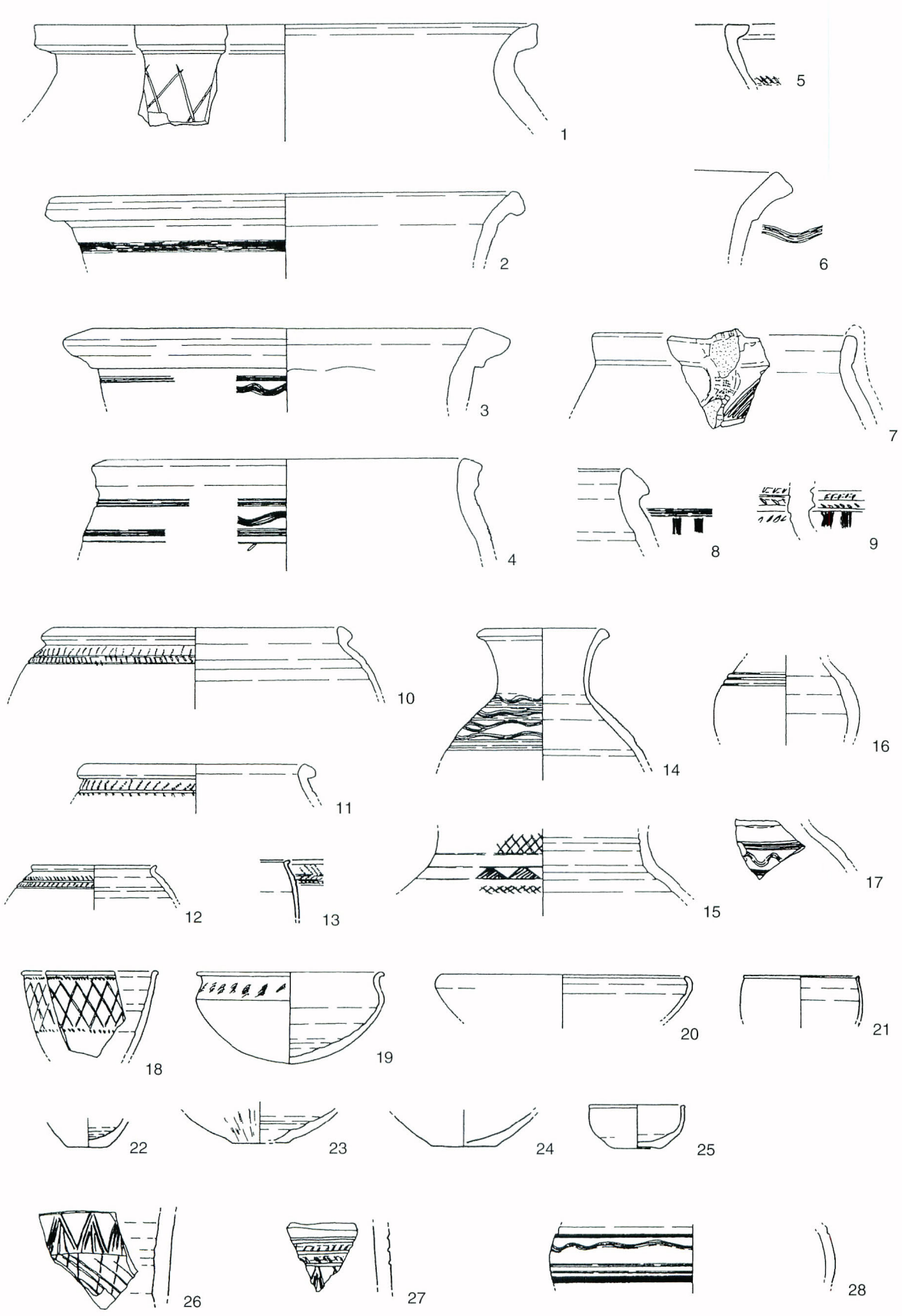

Fig. 4 Selected sherds of the "late 3rd millennium" pottery in question (nos.1–27, except no.28, an unusual example of Khabur ware) from Area C Trench G-4 Levels 3a and 3b at Tell Jigan. Scale 1:5.

5. Jigan Area C G-4 Level 3a (JC P831). Rim sherd.
Light greenish buff ware (7.5Y 8/2) with a pinkish buff core (7.5YR, 8/2,8/3,8/4). Medium vegetable and medium grit temper in medium density. Slashed decoration.

6. Jigan Area C G-4 Level 3a (JC P776). Rim sherd.
Light greenish buff ware (7.5Y 8/2), densely medium vegetable-tempered and medium grit-tempered in medium density. Wavy combing, made with a three-pronged tool.

7. Jigan Area C G-4 Level 3a (JC P820). Rim sherd.
Light greenish buff (7.5Y 8/2) to light green (10Y 7/2,8/1) ware, medium vegetable-tempered in medium density and densely medium grit-tempered. Snake appliqé and grooving.

8. Jigan Area C G-4 Level 3a (JC P365). Rim sherd.
Pinkish buff ware (7.7YR 8/2,8/3,8/4), slipped in creamy buff (2.5Y 8/4, 5Y 8/3). Medium vegetable and medium grit temper in medium density. Wavy and straight horizontal combing, made with a six-pronged tool.

9. Jigan Area C G-4 Level 3a (JC P783). Body sherd.
Light greenish buff ware (7.5Y 8/2), medium vegetable- and medium grit-tempered in medium density. Slashed band decoration and four-pronged, vertical, wavy and straight combing.

10. Jigan Area C G-4 Level 3b (JC P691). Rim sherd.
Yellowish green ware (7.5Y 7/2,7/3), fine vegetable- and fine grit-tempered in medium density. Slashed band decoration and impressed dots made with a six-pronged comb-like tool.

11. Jigan Area C G-4 Level 3a (JC P419). Rim sherd.
Light greenish buff ware (7.5Y 8/2), medium vegetable- and medium grit-tempered in medium density. Very short slashes, above which are impressed dots made with a five-pronged comb-like tool.

12. Jigan Area C G-4 Level 3a (JC P759). Rim sherd.
Light green ware (10Y 7/2,8/1), very fine grit-tempered in medium density. Slashed band decoration and impressed dots made with a six-pronged comb-like tool.

13. Jigan Area C G-4 Level 3a (JC P459). Rim sherd.
Light green (10Y 7/2,8/1) to green (10Y 6/1,6/2) ware, with a sooty surface on the interior. Very fine grit temper. The inclusions are sparse. Slashed band decoration and impressed dots made with a nine-pronged comb-like tool.

14. Jigan Area C G-4 Level 3a (JC P786). Rim-to-body sherd.
Reddish pink ware (5YR 7/4,8/3,8/4), slipped in pinkish buff (7.5YR 8/2,8/3,8/4). Medium vegetable and medium grit temper in medium density. Wavy and straight horizontal combing, made with three- and four-pronged tools.

15. Jigan Area C G-4 Level 3a (JC P775). Neck-to-body sherd.
Pinkish buff ware (7.5YR 8/2,8/3,8/4), pale buff-slipped on the exterior (2.5Y 8/4, 5Y 8/3) and refired on the interior. Medium vegetable and medium grit temper in medium density. Incision.

16. Jigan Area C G-4 Level 3b (JC P543). Body sherd.
Yellowish green ware (7.5Y 7/2,7/3), pale green-slipped on the exterior (7.5Y 7/2,7/3). Medium vegetable and medium grit temper in medium density. Grooving.

17. Jigan Area C G-4 Level 3a (JC P784). Body sherd.
Light greenish buff ware (7.5Y 8/2), medium vegetable- and medium grit-tempered in medium density. Wavy and straight horizontal combing, made with two- and three-pronged tools.

18. Jigan Area C G-4 Level 3b (JC P640). Rim-to-body sherd.
Pinkish buff ware (7.5YR 8/2,8/3,8/4), medium grit-tempered in medium density. Incision.

19. Jigan Area C G-4 Level 3b (JC P601). Rim-to-base sherd.
Pinkish buff ware (7.5YR 8/2,8/3,8/4), medium vegetable- and medium grit-tempered in medium density. Diagonally slashed decoration consisiting of groups of three, four, five and seven short strokes, respectively.

20. Jigan Area C G-4 Level 3a (JC P803). Rim sherd.
Light greenish buff ware (7.5Y 8/2), sparsely very fine grit-tempered (very fine ware).

21. Jigan Area C G-4 Level 3a (JC P585). Rim sherd.
Light green ware (10Y 7/2,8/1), very fine grit-tempered in medium density. Regular horizontal turning marks below on the exterior.

22. Jigan Area C G-4 Level 3b (JC P602). Base sherd.
Light greenish buff ware (7.5Y 8/2), very fine grit-tempered in medium density. Regular horizontal turning marks on the exterior.

23. Jigan Area C G-4 Level 3b (JC P699). Base sherd.
Light green ware (10Y 6/1,6/2), fine grit-tempered in medium density. Regular horizontal turning marks on the exterior.

24. Jigan Area C G-4 Level 3a (JC P747). Base sherd.
Light green ware (10Y 6/1,6/2), sparsely very fine grit-tempered (very fine ware). Regular horizontal turning marks on the exterior.

25. Jigan Area C G-4 Level 3b (JC P608). Rim-to-base sherd.
Pinkish buff ware (7.5YR 8/2,8/3,8/4), medium vegetable- and medium grit-tempered in medium density.

26. Jigan Area C G-4 Level 3a (JC P773). Body sherd.
Pinkish buff ware (7.5YR 8/2,8/3,8/4), medium vegetable- and medium grit-tempered in medium density. Incision.

27. Jigan Area C G-4 Level 3b (JC P677). Body sherd.
Pinkish buff ware (7.5YR 8/2,8/3,8/4), slipped in pale buff (2.5Y 8/4, 5Y 8/3). Medium vegetable and medium grit temper in medium density. Incision with slashed band decoration.

28. Jigan Area C G-4 Level 3a (JC P537). Body sherd. **Painted and combed Khabur ware.**
Light greenish buff ware (7.5Y 8/2), medium vegetable- and medium grit-tempered in medium density. Two- and three-pronged wavy and straight horizontal combing between two painted horizontal bands.

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