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Ceramic Vessels as Evidence for Trade Communication During the Early Bronze Age in Jordan

Introduction

Current archaeological literature has frequently focused on the theme of this conference, Trade communication and International Relations, as one of the most convenient approaches to explain the origin of civilizations or of states. Renfrew, for example, states that, 'the degree of organization and its evolution, and of the evolution of civilization itself, may be understood in the light of the exchanges within a civilization' (Renfrew 1984: 87). The idea is not new but in combination with recent geographical theories of spatial distribution such as settlement patterns and central place theory and mathematical and computer techniques, it has provoked a continuing flow of complex modules and models to explain the interaction and exchange of goods as well as information between social groups.

Most of these theoretical approaches, however, recognize that before the challenging goal of reconstructing the organization of exchange can take place two interrelated tasks must be accomplished: the sourcing of the commodities of exchange and a reliable description of the spatial patterning of the commodities (Ericson and Earle 1982: 3).

It is on these latter two tasks, illustrated by the problems and values of sourcing Early Bronze Age ceramics in Palestine, that this brief communication will focus. External trade relations of this period have been treated in the studies of Kantor (1942), Hennessy (1967) and most recently Stager (1986), among others. The intention here is to focus on possible *internal* trade relations, within the social or spatial units of Palestine, by presenting the results of several different approaches to 'sourcing' ceramic materials at the Early Bronze age sites of Bab edh-Dhra' and Numeira.

Before discussing these results some reflections on the term sourcing are necessary. The term has almost a dreamlike, magical flavor (like sorcery?), describing a process in which the archaeologist submits selected samples to the specialist and then confidently awaits the definitive report, which is expected to isolate the exact natural origin of a raw material. Anyone who has gone through this process and has come away disappointed by the myriad qualifications that most chemical analyses include, would benefit by a recent study in which archaeologists are instructed that 'in point of fact, with a very few exceptions, you cannot unequivocally source anything. The best one can usually hope for is to characterize the object, or better, groups of similar objects found in a site or archaeological zone by various chemical and minerological tests and also characterize the equivalent source materials, if they are available, and look for similarities to generate attributions' (Harbottle 1982: 15). In place of the dream of absolute proof of origin, a more modest goal is proposed of producing groupings of artifacts that make archaeological sense by using 'careful chemical characterisation, plus a little numerical taxonomy and some auxiliary archaeological and/or stylistic information.' (Harbottle 1982: 15.)

The attempts by the staff of the Expedition to the Dead Sea Plain (EDSP) to pursue this more realistic approach at Bab edh-Dhra' and Numeira have produced promising results, which have laid the groundwork for achieving the broader goal of reconstructing the organization of exchange in this region, and possible trade contacts with other Palestinian regions during the Early Bronze age culture of Palestine. Three separate approaches are briefly discussed here: petrographical analysis, spatial distribution of one specific type, and volume studies.

Petrographical analysis

The results of the analysis of the tempers of ceramic materials recovered by the EDSP has revealed basic changes in diachronic adaptation of tempers with increased specialization in use in various formal vessel types. Follow up analysis has focused on the determination of precise local sources for the temper with immediate implications for local trading patterns among the towns in the southeast Dead Sea region.

Over 300 sherds were selected for thin section analysis. The sherds chosen were complete enough so that vessel and ware type were known and a variety of vessel type and ware was selected. From Bab edh-Dhra' the examples represented all of the major phases of the Early Bronze age. For Numeira, the samples were restricted to EB III.

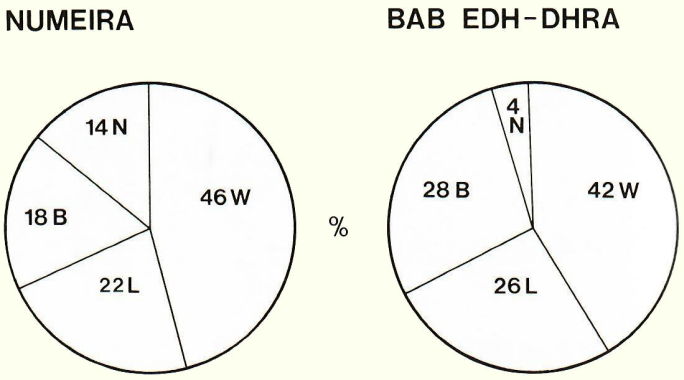
Petrographic analysis has identified five basic temper types: wadi sand, rounded limestone, crushed limestone, crushed

basalt and weathered Nubian sand (Beynon *et al.* 1986). Subsequent correlation of the vessel types and wares with the temper types revealed patterns of use both as to the function of the vessels and to chronological periods. During EB IA wadi sand was used in all of the vessel types, large and small bowls, jars and juglets. In EB IB vessels wadi sand continues in use but a new temper type, small rounded limestone particles, is more dominant especially in the distinctive orange ware of this period of smaller vessels, bowls, amphoriskoi, spoons and spouted bowls. In EB II more specialization occurs with the appearance of crushed limestone in hole mouth jars and cooking pots and crushed basalt in the lamps and platter bowls of burnished ware. Wadi sand continues in use in a limited group of vessels used for liquid. This pattern of crushed limestone, basalt and wadi sand continues through EB III complemented by a new temper type, Nubian sand, which occurs in a distinctive cream ware with typological forms of small bowls, jars and platter bowls. In EB IV wadi sand appears again as the most dominant type used in all vessel forms except the large jars which continue the pattern of crushed limestone.

Samples of possible temper sources from the regions of Bab edh-Dhra' and Numeira have been collected, thin sectioned and compared with the thin sections of the ceramic inclusions. The comparison has clearly shown the local source of four of the five tempers: wadi sand and limestone temper sources are found at both Bab edh-Dhra' and Numeira while basalt occurs at Bab edh-Dhra' and Nubian sand is found only at Numeira. The fifth temper, occurring in the EB IB pottery, has only been recently identified and its source still needs to be confirmed. It also appears to be from a wadi source, perhaps higher up in the wadis of Bab edh-Dhra' and/or Numeira or from other wadis in the region.

The occurrence of Nubian sand cream ware vessels at Bab edh-Dhra' and of basalt platter bowls at Numeira supports the hypothesis of trading exchanges between these two local sites which share many other common cultural features. Further confirmation is beginning to appear in a statistical analysis of the frequency of the various tempers at the two sites. We have extended the thin section results by identifying tempers with the use of a binocular microscope in over 4,500 sherds from Bab edh-Dhra' and Numeira.[1] The Numeira sample, at present, is small, but the recorded percentages of the use of the two tempers at the two sites (FIG. 1) supports the interpretation of a locally produced Nubian sand tempered ware at Numeira (N = Nubian sand) and of a basalt tempered tradition at Bab edh-Dhra' (B = Basalt) with exchange between the two sites. Limestone temper (L) and Wadi Sand (W) occur in equal frequency at both sites. Although it remains theoretically possible that it is the temper itself which is exchanged, the cream ware in which the Nubian sand most frequently occurs is distinctive enough in style and technique to confirm the interpretation of a local potter's tradition.

1. Percentages of sherds with distinctive tempers at Bab edh-Dhra' and Numeira. W = Wadi Sand, L = Limestone, B = Basalt, N = Nubian Sand.



Although our research on tempers has been limited to the two sites of Bab edh-Dhra' and Numeira the potential for extending the results in determining possible trade relations on a broader regional basis is obvious.[2] A small beginning has been made in relating the southern Ghor to sites on the Jordanian plateau by comparing the thin section of an EB IB form from the site of Umm Birgis near the source of the Wadi Ibn Hammad which revealed the same temper used in the EB IB wares from Bab edh-Dhra'. With expanded sampling in both the southern Ghor region and in the highlands we hope to capitalize on the potential of this type of analysis.

Spatial distribution

Stylistic analysis has established its value as a method for establishing exchange patterns but it is considerably enhanced when combined with the use of spatial distribution patterns. One case study from the EB IB period at Bab edh-Dhra' illustrates the combined use of these methods.

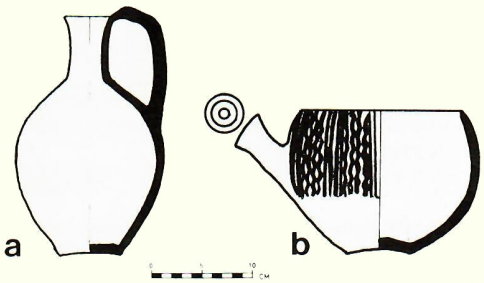
In his classic study on the Early Pottery of Palestine, Wright isolated a bowl with bell or trumpet spout (FIG. 2b), frequently with line group wash, as a fossil index type of the EB IB period (Wright 1937: 60). Other spouted vessels, particularly large ledge-handled bowls and necked vessels with upright or elongated narrow spouts occur frequently during this period at a large number of sites particularly in tomb groups. Statistical counts reveal that spouted vessels comprise 10 to 15 per cent

[1] The ware analysis of the EDSP ceramics is being undertaken by Ceramicist Pat Maloney of Washington and Jefferson College in cooperation with Jack Donahue of the University of Pittsburgh, Diane Beynon of Indiana University in Fort Wayne, Robert H. Johnston of Rochester Institute of Technology and the author.

[2] Petrographical analysis of ceramic materials at the site of Arad has yielded similar patterns in both the diachronic use of tempers and the use of tempers associated with specific types of vessels. Diachronically specific non-plastic inclusions have been associated with the three major cultural periods represented at Arad, Chalcolithic, EB IB, and EB II. In the type specific use of tempers there is increasing complexity across the cultural periods, which corresponds with the increase of similar formal types occurring at regional sites within Palestine as well as with the growth in organised social structure (J. Glass, in Amiran *et al.* 1978: 8–9, 43–44, 50–51).

The studies of the Arad material have been complemented by similar studies made on material found in the south Sinai peninsula at the sites of Nabi Salah and Sheik Muhasein. Although these sites have completely different geological settings with totally different clays and non-plastics available, a striking correlation has been found in the petrographic analysis of their ceramic materials and those of Arad (Amiran, Beit-Arieh and Glass 1973).

2. Ceramic vessels from Bab edh-Dhra'. 2a: Loop handled jug (Abydos ware) from Tomb A 4. 2b: Bowl with trumpet (bell) spout from Tomb A 53.

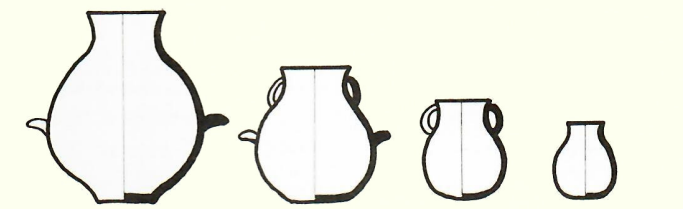


of the total vessels in tombs. However Wright's fossil index type of wide bowl with incurved walls and trumpet spout occurs infrequently—except at Bab edh-Dhra'.

At the latter site 32 examples have been excavated from 6 EB IB tombs with considerable range both in surface finish and in size (Schaub 1981: 74). Surface finish includes line group wash, red slip, and unslipped types. Among the comparatively rare examples of this specific type from other tomb groups excavated in Palestine of this period there are three from the Azor caves (Ben-Tor 1975: FIG. 5: 28–30), one from Jericho (Kenyon 1960: FIG. 17: 24), two from the Far'ah (N) tombs (de Vaux 1949: FIG. 13: 7; 1955: FIG. 3: 1), two at Assawir (Dothan 1970: FIG. 7: 19–20), one at Givaytim (Sussman & Ben-Arieh 1966: FIG. 9: 26), and three from Ai (Callaway 1964: Pl. IX: 12.852, 3.859, 825). At all of these other sites they occur in combination with a majority of necked spouted vessels, usually with long narrow spouts. No necked vessels with long narrow spouts have occurred at Bab edh-Dhra'.

A statistical count of the vessels occurring at these various sites reveals comparable totals of vessels dating to the EB IB period (241 at Azor, 252 at Jericho, including A 94 and A 114 A, 358 at Ai, and 283 at Bab edh-Dhra') but the spouted bowl with trumpet spout constitutes less than 1 per cent of the total at each of these sites while at Bab edh-Dhra' it consistently comprises 13 per cent in each of the EB IB tomb groups. Further it does appear in the occupation areas of EB IB at Bab edh-Dhra', but only very rare examples from other excavated sites and surveys have been published. Although the source of the temper type still needs to be locally identified, it appears likely on spatial distribution alone that this type of vessel may have its origin in the southern Ghor region.

3. Volume Ranges of Jar types from the EB IA tombs at Bab edh-Dhra'.



	Ledge	Ledge+Loop	Loop	No Handles
EXAMPLES	48	12	112	53
MEAN VOL	3602 cc	2538 cc	1273 cc	630 cc
	120 oz	86 oz	43 oz	21 oz

Volume studies

One area of research with implications for exchange patterns that has been generally neglected is volume analysis. It may be postulated that if an exchange system was developed over a period of time some standardization would have been required for the size and thus the content of vessels.

To explore the value of volume studies we have developed a program using a digitiser to compute volumes rapidly and accurately by tracing the drawings of vessels. The process plots x and y values and uses a calculus formula to compute the volume. Depending on the size of the vessel 60–80 volumes can be computed in one hour.[3]

A few examples should suffice to illustrate the value of this approach. In the EB IA period 280 jars from the Bab edh-Dhra' tombs were analyzed. The size patterns that emerged are shown in FIG. 3. Although the vessels are all hand made there are consistent size ranges associated with the different forms. The doubling of volumes ranges from type to type in a consistent pattern that appears in other vessel groups. Particularly intriguing is the small group of vessels with loop *and* ledge handles which falls in the mid-range between the loop handle type and the ledge handle types.[4]

Narrow neck vessels of EB II–III provide a more appropriate example for trade or exchange theory. The narrow necks could be easily stoppered to prevent spillage in transport. In addition vessels that have been definitely identified as exports—such as the Palestinian vessels found in Egyptian tombs—are predominately narrow neck vessels. Further it is in the EB II–III period that we have the best evidence for widespread shared town, if not urban, life.

Consistent volume patterns are reflected in the narrow necked jugs of EB II, flat based jugs with loop handle attached from shoulder to above the rim of metallic ware, frequently called Abydos ware because of their occurrence at that site in Egypt (FIG. 2a). Thirty five examples from Bab edh-Dhra' have yielded three specific size ranges for the larger jugs: one group from 600 to 1000 cc with a mean average of 880 cc, a second from 1230 cc to 1532 cc with a mean average of 1433 cc and a third range from 1739 to 2350 cc with a mean average of 1880 cc. A smaller sample from Arad, 22 vessels, shows similar ranges but with more consistency (less standard deviation), a small range of 762 cc, a medium range of 1369 cc, and a medium-large range of 2047 cc. The imported vessels in Egyptian tombs published by Hennessy, including 20 vessels, yielded very similar ranges and mean averages—813 cc,

[3] The computer program for the volume analysis has been developed by Rick McFerron of Indiana University of Pennsylvania.

[4] The statistical analysis of the Bab edh-Dhra' ceramics is being carried out in cooperation with Mark Staszkiewicz of Indiana University of Pennsylvania.

1418 cc and 1923 cc. If one considers the variations involved in drawing procedures, particularly for wall thickness, and scaling factors in publications, the similarities in volume ranges are striking.

Similar mean volumes address the question of functional use of the vessels more immediately, but this in turn should have input to the question of trade and exchange if these figures are maintained in more extensive statistical sampling.

Conclusion

The attempt to source raw materials and thus to provide evidence for trade communications calls for a creative integration of the results of petrographic analysis (and other chemical characterizations), numerical taxonomy and stylistic features. The archaeologist, who is most familiar with the context and diachronic stylistic features, must be responsible for the integration of these factors. A study of spatial distribution of the occurrence of artifacts also is needed before the major task of reconstructing the organization of exchange for a particular area in a defined time period can be undertaken. Comparative volume studies offer another technique of analysis that may be helpful. The results of the analysis of ceramics at Bab edh-Dhra' demonstrate the potential that a data bank of thin sections and classifications of ceramics based on numerical taxonomy offer as a foundation for reconstructing the trading patterns of the Early Bronze Age in Jordan. The ideal was expressed at the first Oxford conference that a center to store archaeological data should be established. The potential of sourcing archaeological materials would be greatly enhanced if this goal became a reality.

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