

observe without any stratigraphical discontinuity the changes in settlement patterns and material culture brought about by changes in economy.

The value of such an approach is to make one aware of the complexity of present-day societies and to assist modelling of what may, to some extent, have been a similar situation in the past. Such a picture is impossible to gain from the evidence recovered from most archaeological sites alone. Such real complexity has often been ignored either through lack of knowledge or for simplicity's sake, or again because it renders the interpretation of archaeological sites so much more difficult, but also so much more challenging.

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POTTERY DISTRIBUTION SYSTEMS IN ROMAN NORTHWESTERN EUROPE AND ON CONTEMPORARY NEGROS, PHILIPPINES

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Introduction: Some Problems

Between the first and the fourth centuries AD, at the northern edge of the Roman Empire, there were rapid changes in ceramic manufacture and distribution. These took place in a context of acculturation between Romans and the native Germanic peoples of the region. Three major classes of ceramics were involved, if we exclude in this paper the military production of pottery.

The 'best', terra sigillata, spread widely over the whole of Gaul, Belgica and parts of Germania. The centres of manufacture of this kind of pottery moved northwards, from Italy (Arezzo) to Gaul (e.g. Lezoux) and Germania (e.g. Rheinabern). The pottery was increasingly mass-produced by a combination of moulding and throwing techniques. The very large quantities, the high degree of standardisation and efficiency and the close control over the raw materials involved (Picon, Vichy and Meille 1971) -- which were prepared to fulfill very special requirements -- lead us to assume that the pottery was made in very large (manu)factories (Peacock 1982) which have been termed the world's first multinationals (van der Plas, pers. comm.). In due time, as the volume of pottery produced grew, it lost some of its fine quality, both with regard to vessel composition and to the care taken in producing it.

The 'next best' class of pottery was also of Roman origin. It comprised the utility wares which were made on various kinds of wheels, without the use of a mould. Often, they are discussed in the literature as if they were technologically highly similar, all made on a 'kickwheel', an approach which is unjustified. In reality, we are dealing with a wide range of techniques which were applied to making essentially similar forms, the shape being dictated by the users rather than by the technique used by the potters. In addition to a kickwheel, various kinds of turntables and/or tournettes were used. The vessels were sometimes made in one throw, sometimes in two or three, for example by throwing the base and lower wall together from one lump of clay, the shoulder from another, and the neck from a third. In yet other cases, the vessels were made by adding coils to the finished part of the pot, from the base up, and throwing each coil into the desired shape before adding the next.

The tools used in making these vessels were less sophisticated than those found in the manufactories of sigillata, including knives, scrapers, spatulae, etc.. The pottery was fired in domed, updraught kilns of which a considerable number have been excavated, notably in the Rhineland and in Britain. Peacock presents a summary table of the different details of construction (1982:29). These vessels were also available in huge numbers. They covered a wide range of shapes

(amphorae, jars, jugs, mortaria, etc.). Some of them were used in the household, while others must have served industrial or trade purposes. They were, it seems, manufactured in individual workshops, which were often nucleated or organised on estates (cf. Peacock 1982). The degree of standardisation and quality control was less than that of sigillata, but nevertheless considerable.

The main area of marketing for many of these workshops was much smaller than in the case of terra sigillata, even though the vessels often occur far from their point of origin. I would suggest that often these vessels were marketed to a limited number of merchants in the direct surroundings of the workshop that made them. These merchants would then take them further afield, either as merchandise, or as containers for other products. Over the period concerned, there is a shift from production centres in the Mediterranean basin to centres situated in Gaul and the Rhineland, and later England, which parallels the shift we have seen for terra sigillata.

The 'local' wares, very poorly researched, were made by the non-Roman inhabitants of the provinces, and thus they comprise a very varied set. Celtic thin-walled, corrugated vessels are one extreme in craftsmanship, the Germanic thick-walled, coiled and irregular pottery the other. Most of these ceramics were made without the use of a wheel of any kind. All were made without the benefit of a kickwheel, as far as we now know. Simple coiling and working on a turntable, as well as with certain kinds of moulds, were common. In many cases, firing will have been done in the open, in a pit or on the ground in a pyre. The vessels vary in thickness, are often lopsided, and have no standard paste composition. They were generally distributed in smaller areas than the utility wares, but there were exceptions, especially when there were reasons why the potters economically depended more on their craft than is usual among non-specialist or semi-specialist craftsmen.

During the period discussed, it is in this latter category that we find very rapid developments. There was a proliferation of workshops, at least in the area I am most familiar with, the Rhine-Meuse delta in Holland. There were concomitant changes in technology. In Roman territory, new workshops occurred which attempted to imitate Roman shapes as well as Roman-style vessels. With time, such potters became quite proficient at using Roman technology. The resultant pottery is found in both Roman and indigenous contexts (e.g. Willems 1977). One suspects that technological changes co-occurred with organisational ones. North of the border, in 'free' Germania, the indigenous tradition persisted but also underwent changes. There was the beginning of specialisation, increased control over the raw materials used, increased standardisation of shapes, ever more different kinds of vessels, etc. (van der Leeuw, Shelton-Bunn and Spruyt, in press).

Clearly, the known data set is representative of complex changes. In this paper, I would like to focus on one (and, I think, a 'core') element among these: the changes occurring in the distribution and

marketing of the pottery. Other aspects seem to fit together around this focus. Some of the relevant questions have already been summarised by Peacock (1982:4):

1. To what extent was Roman pottery made in the home? (Or, in other words, what part of the total demand for pottery was satisfied entirely outside the market or exchange systems involved?)
2. How did the (production and) distribution systems of the more widely distributed fine wares differ from those of the utilitarian wares?
3. Under what economic circumstances can an industry based on primitive open firing (and more primitive methods of manufacture) co-exist with one based on a kiln (and more sophisticated manufacturing technology, such as the wheel)?
4. What are the ecological and economic conditions that determine where and how major industries develop? (Or, in other words, which variables are responsible for changes in the organisation of pottery manufacture and trading?)

Ceramic Research in Archaeology

In order to understand why the above questions have drawn relatively little research, and why some of this research has been rather ineffective, we must briefly consider the state of the art in ceramic research, with particular reference to questions of marketing and distribution and the changes occurring in the system states involved. Four major fields of study have contributed to ceramic research:

1. The natural sciences and ceramic engineering, which have concerned themselves with the properties of the raw materials involved, the transformations which these undergo during manufacture, and the technologies involved in achieving these transformations (in the past and in the present).
2. Experimental studies aimed at isolating the variables involved in specific (ancient) manufacturing methods.
3. Studies of excavated sherds which often show traces of the transformations they have undergone during manufacture, and/or which are spatially patterned in a way which is significant in reconstructing aspects of ancient exchange and trade in pottery.
4. The study of ethnographic data which involve non-factory-made ceramics, and which permit the observation of the manufacturing and distribution processes, and the use pattern which underlies these in a 'live' situation.

The first two of these areas of study have mainly contributed to our understanding of the technology of ancient pottery. They are the most advanced, but do not primarily concern us here (cf. Franken and Kalsbeek 1975; van der Leeuw 1976; Rye 1981). The last two concern us more directly, and are more interesting, because less of their potential information value has been realised. The main problem seems to be, that a solid and coherent model from which to interpret these data and to account for the variables involved is lacking.

Such models should take non-physicochemical variables into account and are therefore difficult to design unless one has adequate ethnographic data at one's disposal. Peacock's recent study is the only one which attempts to generate such a model for pottery in the Roman world (1982). In an inspiring study, he uses a multitude of published ethnographic data from different areas of the world, and applies these to the major categories of Roman pottery.

But such published ethnographic data are generally not really adequate. Quite a few of the ethnographic studies of pottery have not been undertaken by ceramicists, so that often the technology is only partially understood, even if described to the best of the researcher's ability. Many studies, moreover, concern themselves with the simplest kinds of pottery, in simple contexts. In so far as they are applicable to the Roman situation, most of the studies comprise either country- or region-wide surveys (which are based on short visits to the manufacturing centres, which focus on production, and which have little or no time depth), or in-depth studies of one or two centres of production (so that there is no comparative coverage of larger areas, which would be essential to tackle distribution variables). Examples of the former are found in Rye and Evans (1975), Wulff (1965), Saraswathi and Behura (1964). Examples of the latter are Papousek (1982), Foster (1948), Lisse and Louis (1956), Centlivres (1971).

Much more promising are ethnoarchaeological studies, as they have generally been more aware of the kinds of problems involved, the questions asked and the data required by archaeologists. Individual studies have attempted to use ethnographic information concerning such variables as wear, life-expectancy (David 1972; DeBoer 1974) and breakage patterns, the value which decoration instils into pottery above and beyond its basic value as a household tool (Wobst 1977), etc.. Others have studied demand-related questions such as the number of vessels in use at any one time in a household. On the other hand, spatial patterning should allow us to reconstruct patterns of trade, but such patterning has rarely been used to that effect in well-documented ethnographic studies. The fragmentation of effort is considerable; the studies are variable in quality and scope, and they are all qualitative. As far as I know, none are quantitative. We have no time-depth to our ethnoarchaeological studies, nor do we have any inkling of what causes change in pottery-making systems (Nicklin 1971). We have only very few adequate descriptions of the trade in pottery in the context of trade in other objects (e.g. Sahlins 1972; Allen, in press). What is needed is an in-depth study of a pottery-making tradition on a regional scale which includes the technological, the economic and the social aspects, and which focusses on manufacture, distribution and use from one and the same point of view.

Modern pottery manufacture and distribution: a pilot study on Negros, Philippines

A pilot study sheds, perhaps, some light on ways to answer some of the questions which were asked by Peacock, without pretending to answer them satisfactorily. The basic pottery tradition in the area chosen is one of hammer-and-anvil manufacture combined with coiling. It is practised in four different manufacturing situations. All these situations show different adaptations of the manufacturing technology and the trading and exchange organisation involved, as well as of a number of other (mainly social) aspects of life. Thus, it is possible to study in this region a number of different states of the same manufacturing and distribution system which in most situations occur one after the other with considerable time intervals. The temporal dimension may, as it were, be collapsed. In the spatial dimension it is at the same time possible to study the interaction, in an economic and organisational sense, of a number of pottery-making systems of different degrees of complexity: an interaction essentially similar to what went on along the border in Roman times. Last of all, the Negros case is strongly influenced by acculturation, through a rapid and forced adaptation to Western civilisation.

A brief sketch of the main traits of the four different manufacturing situations is in order.

A. Household Production:

clay:	own rice paddy
temper:	none
tools:	turntable, knife, paddle-and-anvil, polishing pebble, water-bowl
technique:	hand-modelling on turntable; hammer-and-anvil
range:	six products
firing:	open-air, level ground, ca. 30 minutes
production:	batches of ca. 6-20 vessels once a month
time/batch:	five mornings plus final drying
market:	family and friends, barter; commercial production only to order
distribution:	potter or her sister, e.g. daughter
transportation:	foot
sex:	female
specialisation:	none
dependency:	none
part/full-time:	occasional
seasonality:	October-December

B. Household Industry:

clay:	bartered with owner at some distance
temper:	none
tools:	unpivoted mould (old pot upside down, coconut

technique: palm stump), knife, cloth, paddle-and-anvil,
 water bowl, polishing stone
 range: shaping in coils over mould, hammer-and-anvil
 14 products
 firing: open air, level ground, in organised rectangular
 set-up, several hours
 batches: ca. 100
 time/batch: two days plus final drying
 market: local market, cash, orders and own initiative
 distribution: middleman
 transportation: motorised tricycle
 sex: female
 specialisation: none
 dependency: part to considerable
 part/full-time: full-time for some members or part-time for all
 seasonality: all year

C. Workshop Industry:

clay: bought from owner at some distance
 temper: none
 tools: turntable, mould (wooden) specially manufac-
 tured, paddle-and-anvil, knife, cloth
 technique: more rationalised version of B
 range: 17 products
 firing: same as B
 batches: not counted
 time/batch: unknown, well over 400 per month
 market: regional, cash, initiative and orders from
 merchants
 distribution: personal contacts
 transportation: motorised tricycle, truck, bus
 sex: male
 specialisation: in workshop
 dependency: owner: full; hired helpers: part
 part/full-time: owner: full; helpers: part
 seasonality: all year

D. Village Industry:

clay: bought for cash by middlemen from distant
 source
 temper: sand, 1:1
 tools: pivoted moulds with momentum; unpivoted moulds,
 paddle-and-anvil, knife, cloth, water bowl,
 cement brush, paintbrush
 technique: shaping from coils on mould, smoothing by rota-
 tion or paddle-and-anvil
 range: 30 or more
 firing: open-air, level, in rectangles on base of bam-
 boos or in government-made, updraught kiln;

both in collective batches of several hundred
 continuous process
 batches: exceeds 800 per month, possibly greatly
 time/batch: regional and supra-regional, cash and account
 market: chain of middlemen; cooperative
 distribution: motorised tricycle, truck, bus, ship
 transportation: mainly female
 sex: in workshop, transportation of raw material,
 specialisation: marketing
 dependency: full
 part/full-time: full
 seasonality: all year

Before we try to answer some of the questions posed, it may be
 useful to look at these data and note some striking and/or important
 facts. First, the data demonstrate that it is not necessarily the case
 that men take over potting when production is aimed at the market. In
 this specific situation, that may have to do with the Polynesian kinship
 structure and the consequent status of women in society.

The first major step-up in production is not so much achieved by
 the introduction of new technology, as by different scheduling of
 activities: larger batches are made at the same time, so that the time
 spent is more productive. This is corroborated by evidence from
 obsidian and flint industries (Torrence, pers. comm.).

It is questionable whether the next major increase in production is
 entirely one of technology either. An important aspect is the special-
 isation which occurs within the workshop, and the shedding of activities
 such as obtaining clay and marketing. Activities become better organ-
 ised, more routinised as a result, while conflicts in scheduling
 inherent in the technology of the different parts of the manufacturing
 process are avoided by assigning specialists to each. Last of all, this
 enables the workshop to have activities run parallel in time. The end
 result is non-batch, continuous manufacture.

In another area, one sees changes in the pattern of dependencies.
 In the simplest situation, the potter is not dependent upon anyone, nor
 is she dependent upon her potting for her livelihood, but she works upon
 request. In more complex states of the system, the potter takes the
 production initiative. At the same time, she becomes more dependent on
 her potting for subsistence. The workers in a workshop become more and
 more dependent upon one another as they divide the work into specialised
 activities, instead of each doing all the work involved in making each
 pot. The system states increase in coherence, and although the initia-
 tive changes, so does the dependency between the workshop and the out-
 side world.

In the Negros case, growth of the manufacturing system is related
 to growth of output in absolute numbers, as well as growth in diversity
 of products. Individual potters may, however, reduce the number of

different kinds of artefacts they make in order to compete better with the ones they are best at making.

Although not mentioned in the above overview of pottery making on Negros, there are various acculturation aspects to the situation. Thus, there is the case of the potter who saw a film of potting on a kickwheel, made one himself (in the only all-male workshop found), but only uses it as a turntable. As to products, there are plenty of examples where the existing technology is used to make products which fit modern Western culture. The hand-made backings of electric hot-plates are the most striking example. Modern technology may be used in the workshop, for example where cement is used to close cracks and paint the whole vessel, so that cracked third-choice water vessels may nevertheless be sold.

In the market, pottery now competes with plastics and aluminium vessels. Thus, the modern inventions are sold in town, to townsfolk who are familiar with them and who can afford to make the slightly higher but longer-term investment. The only other group of people among whom modern substitutes have become important are the most isolated mountain people. They reduce the risk of breaking vessels on their long trips up the mountain (all by foot) by investing in aluminium vessels. Clearly, acceptance of innovations is not only a question of communication!

Conclusion: Some Tentative Answers

In relation to the questions posed by Peacock, and presented above, there are some interesting conclusions to be drawn from the Negros material:

1. The extent to which pottery seems to be made in the home is, on Negros, directly related to the distance from the main centres of production. Under pressure from a major production centre, home production disappears rapidly, first in areas which are in better communication with the manufacturing centre, unless specific requirements (mountain living) create a more than normal demand. This is corroborated by evidence from colonial Virginia, where colonists used indigenous cooking pots. The home production of pottery finds an outlet outside the market system, through kinship or friendship channels. This should result in erratic patterns of distribution.

2. Some of the differences between more and less complex states of pottery-making systems are clear from the above presentation. What has not been stressed is that the larger the production of a workshop or manufacturing centre, the larger the batches which the potters trade with the middlemen. Essentially, it seems that there are qualitative differences between the distribution systems. The nature of these seems not so much determined by the nature of the pottery, as by the numbers of vessels to be distributed, and the distances over which distribution takes place. It might be worth finding out whether there are certain volume thresholds which require changes in organisation of the distribu-

tion system. One might find that these thresholds are related to distance and the capacity of the means of transportation. Hierarchy theory might be of some help (e.g. Pattee 1973).

3. It seems from the data at our disposal that there is not much difference in efficiency between kiln firing and open surface firing. Actually, the potters on Negros hold the quality of open-fired pots in higher esteem. They have begun to use the kiln only under pressure. Whether more complex system states may exist alongside less complex ones depends, it would seem, on a complex set of margins of efficiency, flexibility, dependency of the workshop on the external world, etc.. These require more research and are only mentioned here because such research is badly needed. The simpler, part-time workshops *per se* are less vulnerable than the more highly organised ones (c.f. the second law of thermodynamics). The more complex workshops overcome this handicap only when they exceed the efficiency of the less complex ones by a certain margin. This efficiency gain is only achieved at the cost of a loss in flexibility. If that loss, in turn, exceeds certain margins, this makes the system more vulnerable to external disturbances. Here, then, the margin is between adaptability of the output to market circumstances on the one hand, and dependency of the potters on pottery making for their subsistence on the other.

4. It is noteworthy that changes in organisation and technology are not innovation-constrained. In an interactive situation like this one, that would mean that all innovations would be used everywhere. They are related to demand, but demand is also constrained by offer. An 'external' explanation will not do, not even 'population growth'. It has been argued elsewhere that growth in interactiveness and information-flow and information-processing capacity is the core mechanism (van der Leeuw 1981). As interactivity grows, so does dependency of each subsystem on the next. As we have seen, this causes the margins to narrow and the productivity to grow. Such growth is only achieved by changes in organisation and technology. On the other hand, this growth in turn increases the dependency of the subsystem and its components on each other and the system at large, narrowing the margins even further. Output needs to grow, so demand needs to grow. Population growth, growth of the interactive group and diversification of products, but also aggressive marketing, promote this. It is this, truly vicious, circle which leads to change, to increasing complexity, but also to increasing poverty and misery for the potters. In our case, in the nucleated village industry, they work during lunch in order to keep up their quota. The middlemen have them completely in their grasp.

This paper has presented issues, data and conclusions in a much abbreviated format, which does not do justice to any of them, least of all to the potters themselves or the literature involved. I do hope that, nevertheless, it may contribute some thoughts for further discussion, and show how ethnoarchaeology has a very fundamental contribution to make to archaeology and anthropology. A more encompassing presentation of the data and the research design which might lead to collection

of data which are relevant to the questions asked here is in press (van der Leeuw, in press).

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