14. ANALYSIS OF LOCAL COARSE WARE POTTERY

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14.1 Introduction

The analysis of the suggested Croy Hill local ware was carried out using a combination of chemical analysis (in this case Neutron Activation Analysis) and petrography, and was structured around an initial intra-site study followed by a broader inter-site analysis. The former sought to test the veracity of the local groupings that had been defined on the basis of visual, macroscopic analysis, in effect testing the initial assumption that a coherent ware group existed in the first place. The latter examined the extent of chemical and petrological overlap between the Croy Hill local ware and similar groups from the sites of Bar Hill, Bearsden, Cramond, Duntocher and Inveresk (see Gillings 1990). In practice a total of 15 thin sections and 19 NAA samples were taken from the suggested local coarse ware fabrics originally defined by Hird, alongside possible local mortaria identified by Hartley.

14.2 The analytical results – intra-site analysis

Chemical analysis of the group of 15 sherds of suggested local coarse ware revealed little in the way of overall chemical homogeneity; while a single chemically distinct group of eight sherds could be identified it was accompanied by seven samples displaying very different elemental compositions from this main group and one another (Table 14.1). Petrologically the sherds analysed could be seen to split into five fabric groupings defined principally upon changes in the quartz fraction (ie the sand to silt ratio), this being the most abundant mineral inclusion present in the sections.

Fabric 1: Sand-grade Quartz (S9, S10, S13, S14)
Fabric 1a: Less Coarse/Medium Sand (S6)
Fabric 1b: Medium Sand (S2)
Fabric 2: Fine Sand/Silty Fabric (S5, S15)
Fabric 2a: Less Coarse/Medium Sand (S1)
Fabric 3: Very Sandy/Silty Fabric (S4,11)
Fabric 3a: More Medium Sand (S3)
Fabric 4: Low-Quartz Fabric (S7, S8)
Fabric 5: Shale-free Silty Fabric (S12)

This reliance upon the frequency and character of the quartz fraction is a direct result of the paucity of any more diagnostic or exotic mineral inclusions present in the samples, with the notable exception of shale. Shale inclusions are common in all of the fabric groups with the exception of Fabrics 1b and 5, which comprise a single sherd each. Although sandstone and chert are also present, they seldom appear at more than the rare to occasional occurrence level in any given sherd and therefore their absence in an otherwise identical sherd may simply be down to sampling rather than true mineral composition.

The fabric can thus be characterised as shale-rich with a varying quartz fraction. The absence of shale in Fabrics 1b and 5 suggests strongly that these samples derive from a different clay source to the remaining fabric groupings. Looking in more detail at the quartz fraction, the ware samples can be split into two broad groups on the basis of the silt content, with Fabrics 2 and 3 containing abundant fine sand/silt, and Fabrics 1 and 4 a low silt content. This difference is interesting insofar as it is unlikely that silt-grade quartz would have been added as a deliberate temper, nor is silt easily removed from clay through sieving and levigation. We could be seeing evidence here for the exploitation of two distinct clay sources or, given the common shale characteristic, two inhomogeneous outcrops from the same basic clay source.

To investigate the quartz fraction further, a grain size distributional (ie textural) analysis was undertaken on the sections. In practice, a minimum of 150 grains were randomly selected and their maximum diameters recorded using a Kontron MOP Videoplan semi-automatic Image Analysis system, to generate a set of data known as the Grain Size Distribution (GSD). The modality and overall shape of the resultant GSD can not only indicate whether the quartz is natural as opposed to added as a temper, but the size frequency data can be transformed through the Logratic transformation proposed by Aitchison (1986) and analysed through complex multivariate statistical techniques in the same way as the chemical data (for details see Gillings 1990). This enables subtle differences in the quartz fraction to be identified, which can then be related to such factors as specialist production (linked to form-functional considerations) and/or between batch or seasonal variations.

The GSD was plotted for each of the Croy Hill sherds with none of the resultant curves revealing evidence of the bimodal distribution form that might have been expected if sand had been added as a deliberate temper (Rye 1981: 52). Instead there was a notable skew towards the fine sand/silt grades which could be indicative of some form of clay preparation (with the removal of the majority of the coarser grades) or deliberate potter preference for fine quartz clays. The question of whether the shale could have been added as a temper is answered by the roundness of the observed grains and their broad size range, with maximum diameters not exceeding 1mm. Together these suggest strongly that the shale is natural to the source clay. The statistical analysis of the Aitchison-transformed frequency data identified three groupings on the basis of quartz GSD (main, X and Y in Table 14.1), though it is interesting to note that this showed no agreement or correlation with either the chemical or petrological groupings.

14.3 Discussion

The table of combined results (Table 14.1) summarises the complex nature of the site material analysed. It is clear that there are samples showing unique chemical, petrological and textural features (eg S2 and S12 – the shale-free fabrics). Alongside these outliers we have sherds that are both chemically and petrologically distinct (eg S3) and others displaying only petrological idiosyncrasies (eg S1 and S6). In an attempt to interpret these results the samples were compared to the original fabric classifications (see Table 14.1). Given the broad, shale-rich character of the petrological fabrics, the groupings below have been established on the basis of the chemical data. In each case the 'F' number designates the original macroscopic fabric code and 'Misc' attributed to sherds that had originally been labelled only as Miscellaneous ?Local:

Core group: (Misc, F6ii, F7, F23, F23, F23, F35, F42)

Outlying samples: (Misc, Misc, Misc, F6i, F35, F35, F42)

On the basis of this we can make the following refinements to the original assumption of three distinct coarse ware fabrics originating from a single local production site. First, the samples analysed do not form a single, homogeneous ware group chemically, although petrologically there are broad similarities between the main fabric groups, principally due to an abundance of shale. Second, the samples do not respect the three identified fabric classifications originally established by Hird either chemically or petrologically.

What we have is a very mixed picture which serves to stress the complex nature of the data set; this is a problem that is further compounded by the small sample size, a reflection in turn of batch-size constraints imposed upon the chemical analysis element of the overall research programme.

Looking again at the quartz fraction, the textural changes could represent deliberate modifications to the basic source clay through: preparation; careful selection of specific clays for different purposes; casual, *ad hoc* or opportunist exploitation of whatever happened to be close to hand. Looking to vessel form, the clear outlier S2 and S12 correspond to a curved-wall platter (Type 55) and lid fragment respectively. The platter form in particular is interesting as this has been regarded as one of the most distinctively 'local' of suggested Scottish forms. Of the remaining chemically defined outliers the samples correspond to a segmental bowl (S7), upright-rimmed jar (3), large dish (10), plain jar (11) and a mortarium (13). Looking to the largest of the chemical groupings, the imitation samian vessel (1) along with an everted-rim beaker (6) and a platter (9) were marked by a subtle textural variation (textural group Y), and we might speculate as to whether this signature reflects the attempts of a potter to modify the clay mix so as to be better able to mimic mould-made forms with high surface detail. Crude samian imitation seems to be a notable feature of the local production at the sites of Bearsden and Inveresk with examples also being found at Cramond. The flat-rimmed bowls (S4 and S8) and the mortarium sample (S14) are of particular interest as they display texturally distinctive quartz fractions (textural group X) which suggests some form of modified production, though it should be countered that other samples of mortaria (eg S15) show no such modification despite mortaria production generally being assumed to have been a specialised branch of pot manufacture. Taking these results together we can propose two possible scenarios. The first sees a mortaria manufacturer diversifying the product range, hence the similarities

Table 14.1 Coarse ware pottery analysis: combined results

Sample code	Site context	Fabric code	Type code	Form	Chemical grouping	Petrological group	Textural group
1	LAA/LBT trackway ditch, *vicus*	F35	54	imitation samian (Drag 18)	main	2a	Y
2	LBR 2 trackway ditch, *vicus*	F35	55	Belgic platter	outlier	1b	X
3	LAH 4 trackway ditch, *vicus*	F35	48	upright-rimmed jar	outlier	3a	main
4	LBB 1 trackway ditch, *vicus*	F23	42	flat-rimmed bowl	main	3	X
5	LBL 1 trackway ditch, *vicus*	F23	40	in-turned rim jar	main	2	main
6	LAL 1 early linear gully, *vicus*	F23	41	everted-rim beaker	main	1a	Y
7	LAH 1 trackway ditch, *vicus*	F42	63	segmented bowl (Gillam 294)	outlier	4	X
8	QAA topsoil over fortlet	F42	64	flat-rimmed bowl with groove	main	4	X
9	LBL 1 trackway ditch, *vicus*	misc ?local	misc	platter	main	1	Y
10	QAA topsoil over fortlet	misc ?local	misc	large dish	outlier	1	main
11	LCQ trackway ditch, *vicus*	misc ?local	misc	plain jar	outlier	3	main
12	LBL 1 trackway ditch, *vicus*	misc ?local	misc	lid	outlier	5	X
13	BBB topsoil over pre-fort enclosure	F6i		mortarium	outlier	1	main
14	LBK 5 trackway ditch, *vicus*	F6ii		mortarium	main	1	X
15	L unstratified, Area L	F7		mortarium	main	2	main

between the mortarium and coarse ware fabric mix. The second scenario (and most plausible in light of the analytical results) is of potters aiming to provide the broadest possible spectrum of ceramic types – from mortaria through to fine ware copies with everything in between.

14.4 Were the samples locally produced?

In any provenance-based study, a comparative set of source material (eg kiln waste or an exhaustive set of clay samples) is required in order to ascertain the degree of similarity with the material under analysis. In the case of Croy Hill this was not available and as a result the decision was taken to use proxy material – in the form of a group of 12 excavated daub samples – on the assumption that they would be indicative of the kinds of clay being routinely exploited. The underlying assumption was that the daub is unlikely to have been imported over any considerable distance and thus is likely to be chemically and petrologically representative of the local clays exploited in antiquity. Further, the strength of using the daub in this way lies with the fact we know it came from a clay source that was exploited by the inhabitants of the fort and that had suffered the same groundwater post-depositional effects (at the macro or site level) as the pot sherds themselves. These effects are often ignored in raw clay analyses, though their importance in such work has long been known (Freeth 1967: 109–13).

In petrographic terms, the range of daub and pottery inclusions was essentially the same, with the exception of coarse angular fragments of rock in the former which appear to have been deliberately added to the material, and mica, which although moderately common in the pottery is often absent in the daubs. Chemically the daub samples split into two distinct groups, a low-sodium group comprising the samples without rock inclusions and a high-sodium group of samples with abundant rock inclusions. This could be the result of the exploitation of a single very inhomogeneous clay source, or could suggest that a number of clay sources around the site were being exploited. Looking with respect to the pottery, the low-sodium sample group fell neatly within the concentration range of the core group of pottery samples and would therefore support the assumption that the pottery was manufactured from the same or a very similar clay to this daub and is, therefore, local to the site. However, it should be noted that, due to the loss of a batch of NAA samples during a reactor run, only six samples of daub were analysed; a very small sample.

14.5 Summary of intra-site analysis

To conclude the intra-site study, we have no evidence for a clearly defined, homogeneous ware group. With the exception of two samples, the petrological results reveal a shale-rich fabric with a varying quartz fraction that could be taken to represent the exploitation of different portions of a single source or series of closely related clay outcrops. This is not reflected in the chemical result set where there are a large number of discrete chemical outliers to the main group of samples, suggesting very different clays. This apparent disparity could be interpreted in terms of the exploitation of a single, chemically inhomogeneous clay outcrop, or a group of related outcrops. Only a programme of extensive clay sampling and analysis will shed light on this problem.

In textural terms the analysis revealed subtle levels of variation which are best interpreted as resulting from batch differences as opposed to deliberate (ie conscious) modifications. In saying this, there are hints of possible modifications in the manufacturing process in the case of the imitation samian, the flat-rimmed bowl and one mortarium, but the low number of samples makes any interpretation speculative at best. That the core chemical group and one of the daub groups showed strong levels of overlap can be argued to support the assumption that at least some of the material was made from locally occurring clays. However, to allow reliable conclusions to be drawn concerning the local (or otherwise) character of the coarse ware far more targeted analytical work is needed.

14.6 Inter-site analysis

In petrological terms, with the notable exceptions of Croy Hill with its characteristic shale inclusions and Bar Hill with its clay pellets, there was little in the way of diagnostic mineral inclusions to set the ware groups apart. In each case the range of mineral inclusions overlapped considerably between the sites analysed. A textural analysis undertaken on the quartz fractions of the entire assemblage of site samples identified two main groups. The first comprised Bearsden and Cramond, the second Duntocher, Croy Hill and Inveresk, with samples from the site of Bar Hill spread evenly between them. There is clearly no single well-defined site grouping on the basis of the quartz GSD alone, though this is perhaps not surprising in that none of the site ware distributions showed any evidence for quartz having been added as a deliberate temper. This suggests that what we are seeing is the natural (or preparation-modified natural) quartz fraction of the source clays which should not perhaps be expected to show marked difference across the relatively tightly defined Wall zone.

Chemically the sites once again showed little evidence for autonomy, although Croy Hill and Duntocher were clearly defined with respect to the other site groups and each other. The Bearsden and Bar Hill samples were chemically indistinguishable, as were the Inveresk and Cramond samples. In the case of the Bearsden and Bar Hill material, the noted variations in the petrology (ie presence of clay pellets at Bar Hill) suggest that this should not be taken to indicate shared manufacture, reflecting instead the very homogeneous nature of much of the clay that appears to have been exploited across the Wall zone. The latter is a phenomenon that is argued by the generally homogeneous nature of the petrological result sets. This is in contrast to the Inveresk and Cramond situation, where strong chemical and petrographic overlap does support the argument for a shared manufacturing source. One last stage of the analysis was to look at the Croy Hill chemical outliers to see whether they could be attributed to one of the other potential Scottish sources. The samples were treated as unknowns and were compared to all of the site wares through a Discriminant analysis procedure to see whether they showed a high probability of membership of any of the defined groupings, and thus evidence for a possible Scottish production source. The resulting probabilities were very low, suggesting that the sherds derived from an as yet undefined source.

14.7 Conclusions

The evidence for a distinct, locally produced coarse ware fabric is equivocal. There is no distinctive fabric, either chemically or petrologically, to support the visual sense that we are dealing with a single ware group. This may not be surprising if we are dealing essentially with piecemeal, *ad hoc* production dictated by lulls in the supply, unexpected short-term requirements or some combination of the two factors, that may well have involved different individuals at different times drawing upon different raw materials and traditions of making. Although some samples overlapped chemically with the local clay proxy data – supporting the assumption of local production – the number of samples was very small and a much larger programme of chemical analysis is needed.

In conclusion the analysis has shown that the samples comprising the ware group, while being petrologically homogeneous, are chemically very spread, and do not respect the initial visually assigned fabric classification. Approximately half of the samples formed a core group that was chemically and petrologically distinct from the wares produced at other sites in the Wall zone and identical to a small sample of daub fragments from the site.