Characterisation Studies of the Anglo-Saxon Pottery from Heslington Hill, Heslington, North Yorkshire (YHS'02)

Alan Vince

Excavations at Heslington Hill, Heslington, North Yorkshire, by Field Archaeology Specialists revealed an occupation site of early Anglo-Saxon date. The site (site code YHS'02) is the first such settlement to have been discovered in the vicinity of York although settlement in the area in this period is attested by cremation cemeteries at The Mount and Heworth.

The pottery has been assessed by Dr A Mainman and a report on the assemblage is planned. In advance of that work, samples from four vessels identified by Dr Mainman were submitted for analysis and incorporation into the Northumbrian Kingdom Anglo-Saxon Pottery Project (NASP). The four samples (Table 1) were examined in thin section and by chemical analysis.

Table 1

TSNO	REFNO	Cname	Form
V2205	POT 1	SST	JAR
V2206	POT 2	SST	JAR
V2207	POT 3	SST	JAR
V2208	POT 4	SST	JAR

Petrological analysis

V2205

The following inclusions were noted:

- Abundant subangular quartz grains ranging from c.0.15mm to 1.5mm. The grains are a mixture of fresh and strained grains with some polycrystalline grains of metamorphic origin showing formation of minute new grains at crystal boundaries
- Sparse subangular chert up to 1.0mm
- Sparse fine-grained sandstone up to 0.5mm (well-sorted grains c.0.15mm across with a small amount of isotropic cement)
- Sparse subangular microcline feldspar up to 1.0mm across
- Sparse medium-grained sandstone fragments up to 1.5mm across (moderately-sorted grains of fresh and strained quartz c.0.3-0.7mm across and muscovite laths up to 0.3mm long. The grains are overgrown and there is no cement)

- Sparse laths of muscovite up to 0.3mm long

The groundmass consists of dark brown laminated anisotropic baked clay minerals with no visible inclusions. Some of the laminae are up to 0.3mm wide and are partially filled with clay and quartz (probably contamination during section production).

V2206

The following inclusions were noted:

- Abundant subangular quartz grains ranging from c.0.15mm to 1.5mm. The grains are mostly fresh with a few strained grains

- Sparse subangular chert up to 1.0mm

- Sparse rounded and subangular voids up to 0.4mm across surrounded by a blackened halo

- Sparse rounded dark red clay pellets up to 0.5mm across

- Sparse subangular microcline feldspar up to 1.0mm across

- Sparse medium-grained sandstone fragments up to 1.5mm across (moderately-sorted grains of fresh and strained quartz c.0.3-0.7mm across. The grains are overgrown and there is a small amount of kaolinitic cement)

The groundmass consists of light brown laminated anisotropic baked clay minerals with no visible inclusions. Some of the laminae are up to 0.3mm wide and are completely filled with a light brown phosphatic deposit. One of the larger laminae is filled with several distinct phosphatic zones, varying in colour.

V2207

The following inclusions were noted:

- Abundant subangular quartz grains ranging from c.0.15mm to 1.5mm. The grains are a mixture of fresh and strained grains with some polycrystalline grains of metamorphic origin showing formation of minute new grains at crystal boundaries

- Sparse subangular chert up to 1.0mm

- Sparse fine-grained sandstone up to 0.5mm (well-sorted grains c.0.15mm across with a small amount of isotropic cement)

- Sparse subangular microcline and perthitic feldspar up to 1.0mm across

- Sparse medium-grained sandstone fragments up to 1.5mm across (moderately-sorted grains of fresh and strained quartz c.0.3-0.7mm across and muscovite laths up to 0.3mm long. The grains are overgrown and there is some kaolinite cement)
- Sparse laths of muscovite up to 0.3mm long

The groundmass consists of dark brown laminated anisotropic baked clay minerals with no visible inclusions. Some of the laminae are up to 0.3mm wide and are partially filled with clay and quartz (probably contamination during section production).

V2208

The following inclusions were noted:

- Abundant subangular quartz grains ranging from c.0.15mm to 1.5mm. The grains are a mixture of fresh and strained grains with some polycrystalline grains of metamorphic origin showing formation of minute new grains at crystal boundaries
- Sparse subangular chert up to 1.0mm
- Sparse subangular microcline and plagioclase feldspar up to 1.0mm across
- Sparse medium-grained sandstone fragments up to 1.5mm across (moderately-sorted grains of fresh and strained quartz c.0.3-0.7mm across and muscovite laths up to 0.3mm long. The grains are overgrown and there is some kaolinite cement)
- Sparse laths of muscovite up to 0.3mm long

The groundmass consists of dark brown laminated anisotropic baked clay minerals with no visible inclusions. Some of the laminae are up to 0.3mm wide and are partially filled with clay and quartz (probably contamination during section production).

Discussion

The thin sections indicate that there are two groups within the samples, the first contains samples V2205 and V2207-8 whilst the second consists of sample V2206. The ground mass of the two groups is similar in texture but in V2206 it is oxidized whereas in the other samples it contains a large amount of unburnt carbon which both darkens the colour and makes it difficult to observe the birefringence of the clay. Nevertheless, they could have originated in the same clay body. The gravel temper present in the samples is probably of mixed origins and includes material which is probably of lower Carboniferous origin (the medium-grained sandstone in V2206 and the chert grains found in all four samples), the Coal Measures (or further lower Carboniferous sandstone, found in samples V2205 and V2207-8), and Permo-Triassic sandstone (in V2205). All of these characteristics are typical of the glacial sands and gravels of the York area although they can also be found in the northern part of the Vale of York, around Catterick. The inclusionless clay matrix has been observed in some mid Saxon York samples as well as in early Anglo-Saxon samples from sites in the Catterick area.

Thin section analysis therefore suggests a local origin for the four samples but does not discount an origin to the north, but still within the Vale of York.

Chemical Analysis

Samples of each vessel were prepared and sent to Royal Holloway College, London, for analysis using Inductively-Coupled Plasma Spectroscopy (ICP-AES). A range of major elements was measured as percent oxides and a range of minor and trace elements was measured as parts per million. An estimate of the amount of silica present in the sample was calculated by subtracting the sum of the major elements from 100%. The estimates ranged from 72.2% to 75% (74.0 +/- 1.3%). In comparison with other early to mid Anglo-Saxon sandstone-sand tempered vessels in North Yorkshire the Heslington samples are within the range found at all sites but it is notable that the York samples, all from Fishergate and presumably mainly of early 8th-century date, have a much lower mean, with 8 out of 13 samples having a lower silica content that that of any of the Heslington samples (Table 2).

Table 2

SiO2	Catterick	Heslington	Scorton	West Heslerton	West Lilling	Whitby	York	Grand Total
58-59				1				1
66-67							1	1
67-68							1	1
68-69							1	1
69-70				1			3	4
70-71			1				1	2
71-72	2			1	1		1	5
72-73		1		5			1	7
73-74		1		2			1	4
74-75	1	1	1	3	1	2	1	10
75-76	3	1	1	6	1		1	13
76-77	2		1	4	4	1		12
77-78	3		2	2				7
78-79	1		1		1			3
79-80	1		3	2	2		1	9
80-81				1	1			2
81-82	2		1	1				4

83-84				1				1
Grand Total	15	4	11	30	11	3	13	87

The data were then normalised by dividing each measured element value by that of Aluminium to remove the dilution effect of extra quartzose temper and the data were then analysed using factor analysis ({Fitch 2001 #44933}). Five principal factors were found in the data, with Factor 1 (F1) being responsible for the most variation in the data, followed in order by factors 2 to 5.

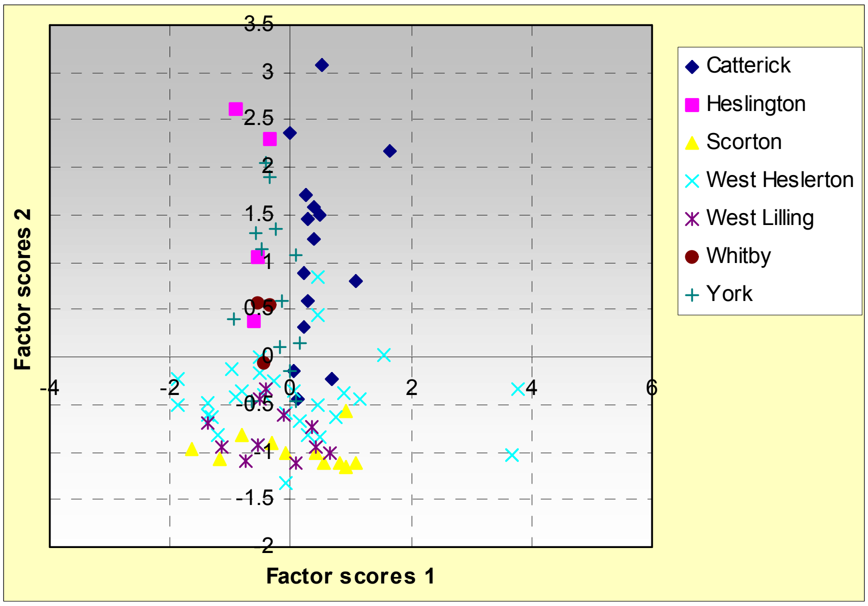

Figure 1

A plot of F1 against F2 (Fig 1), shows that although all the samples have a generally similar composition those from Heslington, York and Catterick tend to have higher F2 scores than the remainder and in particular the Heslington samples are clearly distinct in composition from those from Scorton and West Lilling. The F1 scores separate the Catterick samples from the York and Heslington samples whilst the York and Heslington samples are indistinguishable using these two factors. Further study indicates that it is the titanium, chromium and vanadium values which distinguish the Scorton/West Lilling samples from the York/Heslington/Catterick ones whilst it is probably the potassium and vanadium values which distinguish the Catterick from the York and Heslington ones. None of these elements is particularly mobile in groundwater and it is likely that they indicate differences in the composition of the samples before burial.

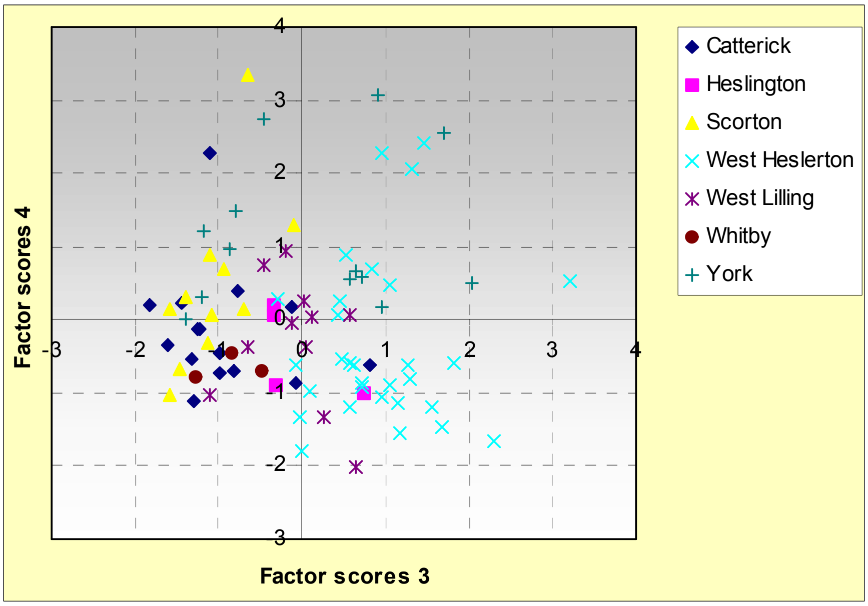

Figure 2

A plot of F3 against F4 shows that the Catterick and Scorton samples have negative F3 scores whilst the West Heslerton samples have neutral or positive scores. The York and Heslington samples, however, have both negative and positive F3 scores (although the Heslington samples can be distinguished from those from Catterick and Scorton). F4, however, distinguishes the York (Fishergate) and Heslington samples. High Factor 4 scores are mostly due to high magnesium and potassium values. It is possible that the magnesium is present in the Fishergate samples as a result of the survival of detrital Magnesian Limestone fragments which have leached out of the Heslington samples but there is no such explanation possible for the potassium, which is probably mostly present in plagioclase feldspar and/or muscovite inclusions.

Factor 5 does not distinguish any of the groups but the Heslington samples do have a higher mean score than those from Fishergate. Factor 5 weightings are contributed to by a number of elements but in particular by variations in the rare earth elements Ytterbium (Yb) and Lanthanum (La).

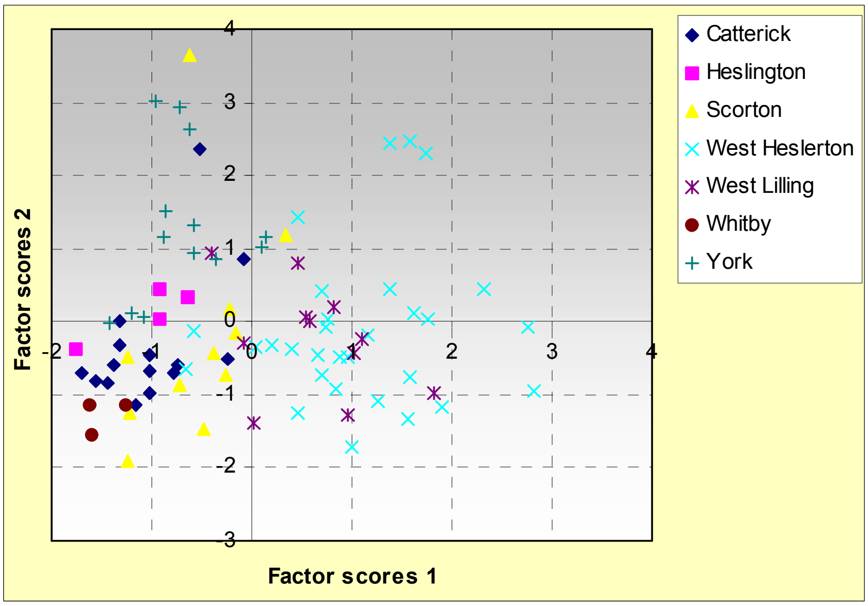

Figure 3

As a result of this factor analysis of the dataset, a second analysis was carried out using only those elements which had proved to be diagnostic in separating the samples by site. Only two significant factors were found and Fig 3 shows a plot of F1 against F2. The Heslington samples plot together along with three Fishergate samples. The remaining Fishergate samples have higher F2 scores (mainly due to magnesium and potassium values). The West Heslerton and West Lilling samples all have higher F1 scores, due to their chromium and vanadium values whilst the Scorton, Whitby and Catterick samples are distinguished mainly by lower F1 and F2 scores.

Discussion

The chemical composition of the Heslington samples suggests that they are different in composition from those found at any other sampled site, including most of the samples analysed from Fishergate.

Conclusion

All four samples from Heslington Hill have a similar fabric which is reflected in their petrology and their chemical composition. The chemical analysis suggests that of the various sites from which similar pottery has been analysed in North Yorkshire the Heslington samples are most similar to those from Fishergate. However, there are even differences between the Fishergate and Heslington samples, of which the most obvious is the higher quantity of silica found in the latter. Since the clay groundmass contains little quartz silt, whereas some, but not all, of the Fishergate samples are more silty, this difference must be due to the presence of more sand temper in the Heslington samples. Furthermore, despite the presence of more tempering it is the Fishergate samples which have higher potassium and magnesium values, both of which elements are likely to be present in clasts rather than the clay matrix.

Because the Heslington Hill samples are of early Anglo-Saxon date and the comparative material from Fishergate is of Mid Saxon date we cannot say whether these observed differences are due to a chronological change in fabric or to the use of slightly different clay and temper sources by the potters supplying the two settlements. However, the results do show that even these seemingly undiagnostic sandstone-sand tempered fabrics are capable of being characterised using a combination of thin section and chemical analysis.

Table 3. ICPS Analysis. Major elements (percent oxides)

TSNO	Al2O3	Fe2O3	MgO	CaO	Na2O	K2O	TiO2	P2O5	MnO
V2205	13.67	4.26	0.78	1.72	0.25	1.76	0.45	3.17	0.058
V2206	14.42	4.6	0.93	1.97	0.25	1.82	0.51	3.12	0.116
V2207	13.67	4.97	0.91	1.09	0.44	1.87	0.53	1.39	0.052
V2208	13.75	4.38	0.91	1.09	0.43	2	0.51	1.87	0.072

Table 4. ICPS Analysis. Minor and Trace Elements (ppm)

TSNO	Ba	Cr	Cu	Li	Ni	Sc	Sr	V	Y	Zr*	La	Ce	Nd	Sm	Eu	Dy	Yb	Pb	Zn	Co
V2205	1136	73	29	74	38	10	320	61	18	48	36	66	37.13	5.54	1.60	3.5	1.7	52.8	197	9
V2206	1723	81	19	72	42	11	315	83	16	63	31	68	32.14	5.08	1.48	3.2	1.7	47.7	279	11
V2207	843	76	16	79	39	10	161	82	14	54	28	62	28.95	5.20	1.44	2.8	1.6	45.1	101	13
V2208	992	75	18	74	39	11	194	80	14	52	31	66	31.96	4.92	1.41	3	1.6	40.8	199	11

Acknowledgements

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