The Potential for Characterising Anglo-Saxon and Medieval Pottery from Cambridgeshire

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Geological Background

A large proportion of Cambridgeshire lies within the fens. Solid geology is present below the silts and peats which form most of the fenland but these strata would not have been available to Anglo-Saxon and medieval potters. Therefore, with the exception of extremely silty, possibly micaceous and calcareous wares made from fenland silts and clays, all of the pottery used in the county will have been made either from discrete outcrops within the fens (such as Ely) or in the surrounding fen edge, or outside of the county altogether.

Jurassic strata

The earliest strata to outcrop in the county date to the Jurassic period and consist of limestones and clays, with minor quantities of fine-grained sandstones. The earliest Jurassic strata outcrop to the west of the county and include the Inferior Oolite and the Cornbrash and Great Oolite series. The earliest within the county consists of the Oxford Clay, which occurs to the southwest of the fens, around Ramsey and St Ives, as well as forming isolated inliers in the western part of the fens. Corallian strata are next and outcrop along the fen edge northwest of Cambridge as well as forming inliers, such as that on which March is located. Finally, the Kimmeridge clay outcrops as a thin band along the east side of the fens, from the east of Kings Lynn to Downham Market. It then widens out to form an area about 10 miles in diameter around Ely and then again narrows to form a tapering band running southwest from the fen edge towards Potton, although it is occluded after about 10-15 miles.

Two distinctive inclusion types occur in these strata: oolitic limestone and bioclastic sand whilst there are also three distinctive clay facies, both identifiable in thin section.

Oolitic limestones

In thin section only small fragments of limestone are found, perhaps no more than 4.0mm across. It is therefore simply impossible to characterize the Jurassic limestones with the precision possible for building stone. Nevertheless, there are several useful criteria which can allow different limestones to be distinguished: the size range and sorting of the ooliths; the nature of the oolith core; subsequent micritisation of the limestone coatings; the presence of other clasts; and the nature of the cement. The Ketton limestone, for example, is only loosely cemented whereas some facies have a hard, sparry cement which can be more resistant to erosion than the ooliths themselves. The incidence of ferroan to non-ferroan calcite in the limestone is also potentially a diagnostic feature.

Brown ooliths occur in the Oakley Beds, which are the earliest part of the Corallian in Bedfordshire, but does not occur in the county. Within Cambridgeshire, however, the Corallian Elsworth Rock, which outcrops at Upware, also contains brown ooliths, but in a shelly limestone.

Bioclastic sands

A distinctive feature of the Jurassic strata are the mixed calcareous sands, composed of a mixture of bivalve shell, brachiopod shell, echinoid shell and spines, corals and sometimes fish or other bone fragments. These sands occur within uncemented clays and can be distinguished from detrital limestone sands by the lack of calcite cement. This is particularly clear if the thin section is stained.

Jurassic non-calcareous clays

These clays are characteristically highly birefringent and contain virtually no quartz silt. They can contain variable quantities of muscovite and micaceous clay minerals. They tend to have a relatively low iron content, although iron concretions can occur. A distinctive feature of some Jurassic clays is the presence of silt-sized opaque grains, thought to be bacterial or faecal in origin.

Jurassic calcareous clays

These clays are strictly speaking marls and can have an extremely high calcareous content. In most cases the nature of the calcareous matter is impossible to determine, mainly because in fired clays it is often completely altered by reaction with the surrounding clay minerals. The clays fire to a yellowish or creamy colour.

Thin sections of Kimmeridge clay from Ely are of this type, as is a section of an object presumably made from Oxford clay from Thorney (although this could conceivably be redeposited Kimmeridge clay from a local boulder clay since the thin section also included quartzose sand of Triassic origin). The geological memoir for East Anglia suggests that some of the Lower Cretaceous Gault clay in Cambridgeshire and Norfolk is also highly calcareous.

Jurassic organic clays

Some Jurassic clays had a high organic content and this is often recognisable either by the black core of the fired vessel or by a reduced light grey core, often with a sharp boundary between the margins and core. The organic clays tend to be hard and to occur as shale or mudstone relicts in the potting clay. Some of these can be black or reduced even if the surrounding groundmass is oxidised.

Several Jurassic clays have highly organic facies. They include the Ampthill Clay (Corallian), the Oxford Clay and the Kimmeridge Clay (especially the highest beds, 1961, 15).

Cretaceous strata

Lower Cretaceous strata lie unconformably on top of the Kimmeridge clay and form three discrete outcrops: to the west of the fens, from Snettisham to just south of Downham Market; as scattered patches around Ely and Soham and from the Cam Valley at Upware southwest to Bedfordshire. They are divisible into two groups, the earliest of which is the Lower Greensand and Neocomian deposits, and further to their south-east, the Gault.

Finally, the chalk outcrops along the eastern and southeastern edge of the county. Four distinctive inclusion types derive from these strata whilst two facies are identifiable in the clays.

Lower Greensand Chert

This rock is usually porous and composed of chalcedonic silica. It is not uncommon to find quartz, glauconite or spherulitic chalcedony grains in the chert, which is easily distinguished from earlier, Carboniferous, chert and from upper Cretaceous flint.

Lower Greensand Polished Quartz

One of the most distinctive inclusion types in the Cambridgeshire region is the polished quartz grains which occur in the lower Cretaceous sands and sandstones. In some cases, as with the Tealby sandstone, the sandstones had an iron-rich cement and this not only adheres to the surface of the grains but is present in thin cracks and veins within the grain. Most of these grains are inclusionless and monocrystalline quartz and there is very little feldspar.

The two facies - iron-cemented sandstone and uncemented silver sands – occur throughout the outcrop in Cambridgeshire and in West Norfolk are given the names Carstone and the Sandringham Sands. The polished quartz grains occur in the later Gault clay, especially in phosphatic nodules.

Chalk

Chalk can be distinguished from other micrites by the presence of spherical microfossils and by its high uptake of red dye in Dickson’s method of staining. It is possible to characterise chalk through microfossil analysis but this is not possible for the pieces one is likely to find as pottery inclusions, nor in most cases would there be any great advantage to knowing the specific origin of the chalk.

Fresh Flint

Fresh flint can be recognised in thin section by the extremely angular outline of the grains and the lack of staining. It can either be clear (core) or milky (cortex) and in the freshest pieces can have pores filled with chalk.

Glauconitic Clay

Glauconitic clay is distinguishable from clay containing detrital glauconite grains partly by the fresh appearance of the glauconite grains.

It is likely that the Gault clay which outcrops along the eastern side of the county is glauconitic since a small proportion of the pottery found at Ely Forehill was made from such a clay as was the pottery produced at Blackborough End, south of King’s Lynn.

Micaceous, Silty Clay

Silty, micaceous clay is a characteristic feature of the Gault in Bedfordshire and further south and west. However, it is not certain that this facies continues into Cambridgeshire. A distinction between this clay and the fenland silt is that the latter includes a high biotite content, visible at x20 magnification.

Recent and Pleistocene

No Tertiary deposits occur within the county and the relatively simple geological succession of the Jurassic and Cretaceous periods gives way to a highly complex series of Pleistocene and recent deposits, which can overlie any of the earlier outcrops and are only absent in the fens, where they probably underlie the fen peats and silts.

Ice was responsible for the movement of blocks of earlier strata from the north, northwest and west of the county and because in those instances there is no mixture of these blocks with material derived from elsewhere it can be impossible to determine the origin of a ceramic made from such an outcrop. In the main, however, the boulder clays contain a mixture of unsorted rock and mineral fragments whose nature is sufficient to identify the clay and its temper as fluvio-glacial in origin. Perhaps because of the unpredictability of their composition and the need to remove large amounts of coarse material, the boulder clays were not favoured in the mid Saxon, late Saxon and medieval periods but they were used extensively in the early Anglo-Saxon period.

At least two phases of boulder clay are present in Cambridgeshire. The earlier, includes clays classified as chalky drift and Chalky-Jurassic drift. The composition of these clays is variable and will depend not only on the nature of the strata over which the ice passed, but the ratio of local to erratic material and whether or not the clay is decalcified. Of particular importance is the fact that Charnian erratics can occur in the latter drift, together with other northern erratics such as Permo-Triassic sands, and Millstone Grit.

Later boulder clays originated from further north and east and include a Chalky-Jurassic drift which includes Lower Cretaceous rocks but no Charnian erratics and a Chalky drift which includes only Upper Cretaceous rocks (and a variable quantity of North Sea erratics, including fragments of basic igneous rock, perhaps from the dolerite sills of northeastern England and more exotic igneous and metamorphic rocks of Scottish and Scandinavian origin. The frequency of these erratics is probably less in Cambridgeshire than in the boulder clays found along the north Norfolk coast, however.

Existing Thin-Section Analyses

In the mid 1990s the UK Ceramic Thin-Section database survey took place and could find 146 thin sections of pottery and other ceramics from sites in Cambridgeshire. The largest collections are of Romano-British pottery from Stanground (62 sections, held at Leicester University, Cooper 1985;Cooper 1989) and Stonea (49 sections, held at the British Museum). All of the remainder were much smaller, of which the largest collection is from Godmanchester (12 sections, held at the University of Southampton, Williams 1981b).

The sections include one sample of a local clay from Godmanchester (housed at Southampton University, Williams 1981b), Romano-British pottery from five sites (in addition to those named above): Orton Hall Farm and Stibbington (both housed at the University of Leicester), Bury Hill, Godmanchester (Williams 1981b) and Sibson cum Stibbington (Williams 1986). All three are housed at Southampton University.

There are no sections of Anglo-Saxon pottery in the database and only three sections of mid Saxon pottery, all Ipswich ware (from Castor, housed at the University of Southampton, Williams 1985) and five sections of Late Saxon and medieval vessels. The latter comprise two sections of St Neots-type ware from St Neots (Williams 1977;Williams 1980), a sample of a knight jug from Cambridge (taken for comparison with material from Scarborough and Nottingham, Williams 1982) and two sections of late medieval distilling vessels from Wisbech Castle (Williams 1981a). All five of these sections are housed at the University of Southampton. Six thin sections of post-medieval bricks from a brick kiln at Wisbech are held in the City of Lincoln Archaeology Unit collection, housed in Lincoln City and County Museum (Vince 1995).

One hundred and thirty two thin sections created since the UKTS survey are held by the Alan Vince Archaeology Consultancy. They range from a Bronze Age clay object from Thorney (Vince 2002), Iron Age shell-tempered wares from a variety of consumer sites (Great Gidding, Hamerton, Old Weston and Stow Longar, Vince 1997), Romano-British shell-tempered ware from a kiln at Haddon (Vince 2003a), four sections of early Anglo-Saxon pottery from Cambridge (Vince 2003b) and sections produced as part of the on-going study of pottery production and distribution at Ely, for David Hall (the sections were produced for four separate reports, some of which will be combined for publication).

Existing Chemical Analyses

One hundred and twenty eight chemical analyses of archaeological ceramics from Cambridgeshire are known to the author (A Vince). All were carried out using Inductively Coupled Plasma Spectroscopy (ICP-AES) and consequently have a limited overlap with data collected using Neutron Activation Analysis. However, as far as Cambridgeshire is concerned this is of little consequence since there is no large body of NAA data available for the county.

It is proposed that future analyses will be carried out using ICP Mass Spectroscopy (ICP-MS) which not only produces data on the frequency of a wider range of elements, making the results more comparable with NAA, but also provides a greater precision for some of the elements measured using ICP-AES.

Table 1

locality	cambs shelly	CCC - ELY WARE	ely	ely white	ely2	fas	Ely BS 2	Grand Total
Cambridge							1	1
Ely		11	22	12	28		2	75
Great Gidding						4		4
Haddon	10							10
Hamerton						10		10
Huntingdon		5						5
Old Weston						1		1
Orton Longueville		3						3
Peterborough		3						3
Ramsey		5						5
Stow Longar						1		1
Swavesey		5						5
Wisbech		5						5
Grand Total	10	37	22	12	28	16	3	128

Reports on all these projects have all been prepared and are archived on the AVAC website. The sample from which the analyses were obtained have been returned to the commissioning bodies (Cambridgeshire Archaeology Unit, the Cambridge Archaeology Unit, and Field Archaeology Specialists Ltd).

Only a limited number of wares have been examined. They include white-firing bichrome wares made in a kiln at Broad Street, Ely (BICH), a sample of Bourne or Baston ware from Peterborough (BOU), silty allluvial clay from the Broad Street, Ely, kiln (BSJ clay), shell-tempered pottery from a Romano-British kiln at Haddon (Haddon kiln), Iron Age shell-tempered wares from consumer sites in Cambridge (IASH), samples of Kimmeridge clay from Ely, Medieval Ely wares (MEL) from kiln sites at Forehill and Potters Lane and from consumer sites throughout the county, a Roman oxidized ware and a sample of yellow Cambridge brick.

Factor analysis of this dataset indicates that the bichrome vessels have three distinct fabrics, only one of which is likely to have been made from Ely Kimmeridge clay. The alluvial clay from Broad Street, Ely, is clearly not used in the medieval Ely pottery industry, whilst the Kimmeridge clay compares well. The Iron Age and Haddon shelly wares have similar chemical signatures and the single Bourne/Baston ware sherd is chemically distinct from the medieval Ely wares (Fig 1).

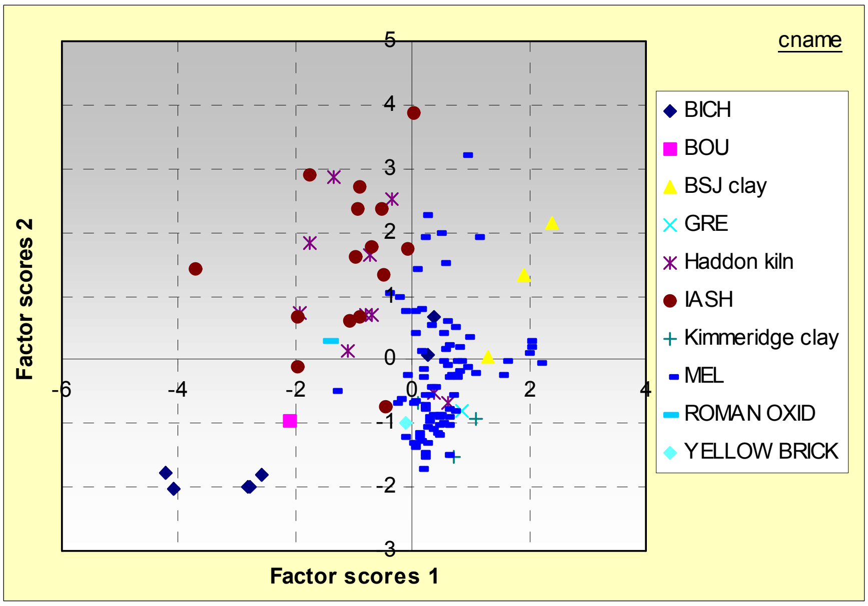

Figure 1

The factor analysis suggests that the incidence of shell is itself a contributing factor to the separation shown in Fig 1. A second analysis using only the major elements, excluding both CaO and P2O5 indicated a single significant factor, whose main contributing weightings were for MnO and MgO. A plot of these two elements for the same dataset (Fig 2) separates the yellow brick and the Kimmeridge clay analyses from the medieval Ely wares and indicates a difference in composition between the Haddon and Iron Age shelly wares.

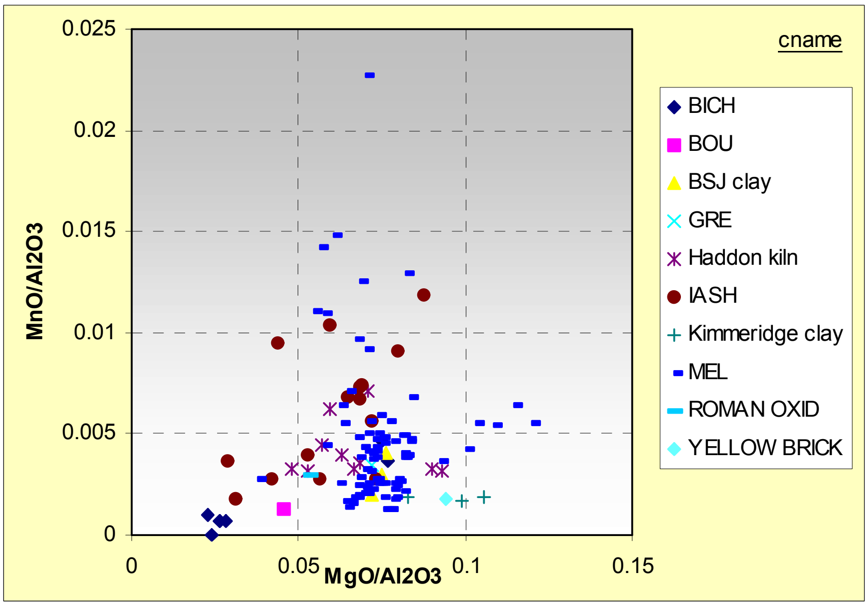

Figure 2

Finally, a factor analysis of the minor and trace elements (Fig 3), omitting Strontium, which is strongly correlated with Calcium, separates the Broad Street Ely clay samples from the remainder, indicates a difference in composition of the yellow brick and the Kimmeridge clay samples, confirms the distinct nature of the Bourne/Baston sherd and separates most of the Haddon and Iron Age shelly wares from the Ely products.

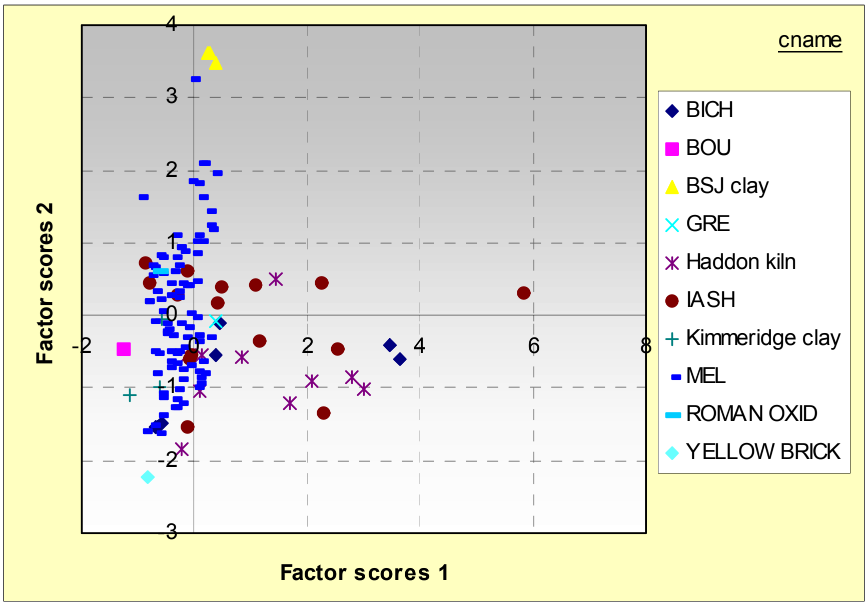

Figure 3

The chemical data therefore suggest that there is indeed potential to distinguish different production sites in the county, especially in cases where there is no clear visual or petrological distinction between wares suspected of coming from different sources.

Proposed methodology for future work

On the basis of this assessment of the geological potential and of existing thin sections and chemical data, it is proposed that all thin sections produced for this project should be stained using Dickson's method, as this will greatly assist the interpretation of calcareous fabrics. The thin sections should ideally be retained in a central collection in the county, alongside samples of the sectioned vessels (if not the complete vessel) and with easy access to a petrological microscope.

The chemical analyses should be undertaken using a combination of atomic emission spectroscopy (ICP-AES) and mass spectrometry (ICP-MS) as this combination includes the major elements which have proved successful in distinguishing many groups of pottery and many of the minor and trace elements which have been measured in previous NAA characterisation projects in the UK and Western Europe. This may prove crucial should imported vessels be included in this study or in following studies since a large body of NAA data exists for medieval and post-medieval maiolicas and stonewares.

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