SAXO-NORMAN POTTERY IN SOMERSET: SOME RECENT RESEARCH

JOHN ALLAN, MICHAEL J. HUGHES AND ROGER T. TAYLOR

Summary

Re-examination of samples of many of the county's principal collections of late-Saxon and Norman pottery, using a combination of petrological study and chemical analyses, has allowed progress to be made in identifying the production centres of this material. A major group of potteries operating on the fringes of the Upper Greensand in the south of the county supplied much of the pottery market of Somerset, and also sent their wares into much of Devon and west Dorset.

BACKGROUND

It was Professor Martyn Jope who first began the systematic study of the Saxo-Norman pottery of Somerset in his innovative papers published in the early 1960s (most notably Jope 1963). He showed that in different parts of Britain various stylistic features of medieval pottery showed distinctive regional distributions. In the case of Somerset and other parts of the West Country he noticed that specific forms of 12th- and 13th-century cooking pot could be found scattered over sites as much as 60 miles (*c*. 100km) or more apart (*ibid*., 329–33). Exactly what caused these patterns was not a subject that Jope pursued; he was inclined to believe that pottery production would have been localised, and regarded these patterns as markers of regional groupings within medieval society.

More than 35 years have now elapsed since Philip Rahtz offered the only published general overview of the early medieval pottery of Somerset (Rahtz 1974). Although Rahtz's detailed examination of fabrics broke new ground in the identification of medieval pottery in the county, this study was largely innocent of any petrological work. His subsequent publication of the ceramics from Cheddar Palace marked the first significant introduction of petrology into medieval pottery studies in the county: David Peacock contributed a petrological description of each of the main coarseware fabrics (Peacock 1979).

The 1970s also saw a great growth in the volume of ceramics available for study, especially for the period *c*. 900–1200, far exceeding that available to Rahtz. Much of the new material came from urban contexts, especially from major excavations in Ilchester and Taunton. A number of important publications arose from these projects, the pottery from Ilchester receiving detailed publication (Pearson 1982; Ellis 1994) whilst much of that from Taunton was consigned unworthily to microfiche (Pearson 1983). In the following years significant new finds have come from excavations in some of the smaller urban centres, of which the collection from Milborne Port is the largest (Blinkhorn 2002). There have also been publications of a number of key sites, such the short-lived burh of South Cadbury (Alcock 1995) and the early Norman castle of Castle Neroche (Davison 1972). Despite the growth in data that form the basis of any study, there has been little effort to produce new syntheses. Somerset lay on the fringe of the study area chosen by Alan Vince for his seminal thesis, presented in 1984, which centred upon the ceramics used in the Severn Valley. In a national context Vince's work exemplified a new generation of research, with a much more rigorous approach to the identification of fabrics and production sources.

In recent years the writers have collaborated in publishing a number studies of collections of medieval pottery in Dorset, Somerset, Devon and Cornwall, in which traditional formal study and thin-sectioning have been combined with very detailed petrological work, and with chemical analyses using Inductively Coupled Plasma-Atomic Emission Spectrometry analysis (Allan 1998, 2003; Allan and Blaylock 2005; Allan and Langman 2002; Hughes 1998, 2002, 2003, 2005; Taylor 1998, 2002, 2003, various papers in press). When used together, these three different approaches have allowed fresh progress to be made in defining the sources of ceramics. A particularly valuable development has been Dr Taylor's practice of making petrological descriptions of vessels from careful examination of their surfaces and broken edges under the microscope, alongside examination of the conventional thin-section. This approach has the advantage of allowing observations to be made about the surface appearance of common inclusions such as quartz (invisible when grains are thin-sectioned), and entails the examination of much larger areas of fabric, increasing the chances of encountering distinctive inclusions.

In 2003 the writers published a study of a large group of pottery, probably dating to *c.* 1200, from Sherborne Old Castle, Dorset (Allan 2003), close to the eastern border of Somerset. The coarse hand-made wares tempered with flint and chert which form the bulk of the collection there resemble visually the main class of coarse pottery at Ilchester, which had been the subject of a study by Terry Pearson (Pearson 1982). Although previous petrological work had identified the basic constituents of the temper at Sherborne (Harrison and Williams 1979), no specific source for these wares had been established. Dr Taylor's petrological study led to the conclusion that these wares display a characteristic temper derived from the Greensand facies of the Blackdown Hills. By contrast, Pearson had concluded that the Ilchester pottery had been made in the vicinity of the town, which he believed to be an important early medieval production centre, from which pottery was distributed to sites such as Castle Neroche, Taunton, Langport and North Petherton, and even as far afield as Exeter and Bristol (Pearson 1982, 169, 176–8) – a view which received quite wide acceptance amongst other researchers (Spoerry 1990, 14; Mepham 1992, 110; Ellis 1994, 149; Stevenson and Alcock 1995, 91–2).

RESEARCH AIMS

Our initial aim was to resolve some specific questions arising from our Sherborne report:

1 Was the Sherborne pottery really the same as that from Ilchester, and if so, which of the various Ilchester fabrics matched? If the Sherborne pottery came from the fringes of the Blackdown Hills, did the Ilchester collection also come from there?
2 Would chemical and petrological study of samples from a range of sites spread across the county support or refute the proposition that the Blackdown Hills were a major centre of ceramic production in the Saxo-Norman period? How widespread was the distribution of this kind of pottery, and when did it come into circulation?
3 Are there further distinct fabrics which indicate the presence of competing centres supplying the pottery market of late Saxon and Norman Somerset?

THE SITES CHOSEN FOR SAMPLING (Fig. 1)

Since we did not have the resources for chemical and petrological examination of a large number of vessels, we selected a range of places which might answer specific questions. For the reasons outlined, we first re-examined a large sample of the published Saxo-Norman pottery from Ilchester. We then selected a site lying in the likely source area of this pottery: Castle Neroche – almost certainly Norman. Three further sites with important dating evidence were then included: two with late Saxon pottery (South Cadbury and Wedmore), and one with a well-dated sequence spanning the late Saxon and Norman periods (Cheddar Palace). Finally, we included a scatter of sites yielding Saxo-Norman pottery which would fill out the distribution pattern emerging from the early stages of our work: Taunton, Middlezoy, Bawdrip, Burrow Mump and Glastonbury. The first two were selected simply because they had been the subject of unpublished work carried out for Exeter Archaeology by one of the writers (RT).

We emphasise that the present study is only a first step towards a general synthesis. We have not examined some important published material, notably that from Shapwick (Gutiérrez 2007), Milborne Port (Blinkhorn 2002), Stoke sub Hamdon (Montague *et al.* 1992) and Bickley (Ponsford 2002), and have only made a start in sampling the major collections at Glastonbury Abbey and Cheddar

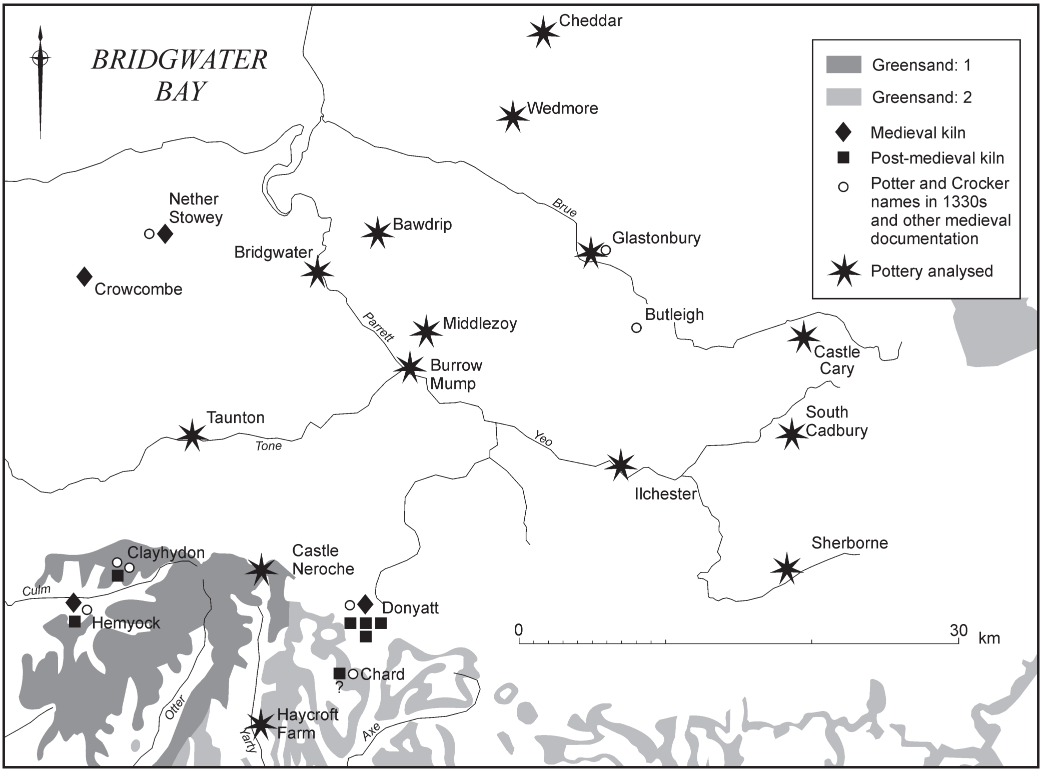

Fig. 1 Locations of sites of pottery examined in this study, with later medieval potteries and extent of the (1) Blackdown and (2) the facies of the Upper Greensand

Palace. No finds from Bristol or west Somerset have been included. We should also make it clear that at this stage the database of chemical analyses is small; more coherent patterns are likely to emerge as the number of sampled vessels increases.

Ilchester

In total, some 28 vessels (14 published by Pearson (1982), 14 by Ellis (1994)) were chosen to examine the range of Saxo-Norman pottery in the town; they represented eight of the Taunton fabric groups (details below). A series of samples of glazed tripod pitchers from Kingshams was also studied.

Castle Neroche

The pottery excavated by Davison in 1961–4 at this early Norman castle site was examined, both in hand specimen and under the binocular microscope. The fabric appears very consistent, although the forms show two traditions: typical local wares, and cooking pots and storage jars whose forms imitate North French vessels (the cooking pots having collared rims and rilled bodies, the storage jars with applied thumbed strips: Davison 1972). The sherds are datable to the period after the Norman Conquest of Somerset of 1068 and probably before *c.* 1140; the stratification of the pottery in North French style suggested to the excavator that this was the earliest material. Four vessels, selected to show the range of forms, were thin-sectioned and subjected to chemical analysis.

South Cadbury

The series of 27 drawn vessels published from the excavations of 1966–70 was examined. The collection is believed to derive solely from the temporary burh with a restricted date in the decade 1010–20 (Stevenson and Alcock 1995). Five vessels had already been thin-sectioned by David Williams, who demonstrated the presence of two distinct fabrics – one tempered with shelly limestone and individual shell fragments, the other with large chert grains (Williams 1995). Three vessels were thin-sectioned and two subjected to chemical analysis.

Wedmore

The Anglo-Saxon coin hoard bowl, found in 1853, and published by Rahtz (1974, 117, no. 66; SCM Accession 67/1977) appears not to have been examined petrologically. It was therefore thin-sectioned and analysed chemically. The dating of the coin hoard found inside the bowl to *c.* 1050 is described by Thompson (1956, 145) and Gunstone (1977, xxxi).

Cheddar Palace

The collection from Philip Rahtz's excavations of 1960–2 at Cheddar remains the best-dated and probably the best-excavated series of Anglo-Saxon and Norman pottery from the county, and therefore remains of fundamental importance (Rahtz 1979). Ten samples – one from each of the fabric groupings identified by the excavator – had already been the subject of thin-sectioning by David Peacock (Peacock 1979, 310–13), and Alan Vince was able to carry out some further petrological examination in the late 1970s (Vince 1984, *passim*).

In the present study the entire range of Cheddar fabrics was not examined; instead, the possibility that a major component in the collection is derived from the Upper Greensand was explored. Ten fresh samples were selected for detailed petrological examination, and new thin-sections of Rahtz's fabric groups B, C, EE/C, H and HH were prepared. Only two of these, representing the major fabric groups B (Rahtz 1979, 320, MP 20) and C (*ibid.*, MP 28), were then submitted for chemical analysis. We have avoided Cheddar fabric E, which Vince explored in his regional survey; he concluding that it was produced in south or central Wiltshire (Vince 1984, ch. 11, 12–16). The fabrics of the entire collection deserve a complete review, beyond the scope of the present project.

Taunton

A selection of sherds from stratified Saxo-Norman deposits from Exeter Archaeology's unpublished excavations in Market Place, Taunton, undertaken in 1996 (Weddell 1998), was examined. Petrological descriptions of ten sample vessels have been prepared for publication with the site report; the results are summarized briefly here.

Middlezoy

Exeter Archaeology's unpublished excavation at Main Road, Middlezoy, in 2000 recovered a significant collection of more than 1900 Saxo-Norman sherds (NGR ST 3768 3276; Exeter Archaeology project 3908). Seven sample vessels from a single context (SDM 2000: 654) were described; no thin-sectioning has been carried out.

Glastonbury Abbey

An initial examination of the major collection excavated at the abbey, recently described by Kent (1996), was undertaken. In the near future the collection will be the subject of more extensive study (Allan *et al.* forthcoming).

Burrow Mump, Burrowbridge

Sherds from the excavations of St George Gray in 1939 (Dunning 1939) were examined. They include coarsewares and tripod pitchers, probably of late 12th- or early 13th-century date. Six sherds were selected for detailed petrological examination; two were thin-sectioned and subjected to chemical analysis.

Bawdrip

Four sherds, chosen to represent the range of fabrics in the collection of Saxo-Norman ceramics deposited in Somerset County Museum in 2004 (SCM 30/2004.33) were selected for detailed petrological description, but none were thin-sectioned or analysed chemically.

A NOTE ON DATING AND FORMS

The dating of the fabrics discussed in this paper has been the subject of careful consideration by Rahtz (1974; 1979) and Vince (1984), and has recently been usefully drawn together by Gutiérrez (2007, 601–5; 2008, 112–14). All the types of pottery discussed here probably date after *c.* 930, and possibly after *c.* 950, but were probably in circulation by the late 10th century. Although the production of limestone-tempered wares seems to have ceased in the 11th century, the Upper Greensand-Derived wares were remarkably long-lived; coarse hand-made wares produced in the same manner as the Anglo-Saxon vessels were still being made in the early 14th century (eg Allan 1984, 82–9, fabric 20).

A range of forms is shown in Fig. 2. Plain cooking pots ('jars') are the most common type of vessel by far, but wide bowls, lids, lamps, spouted vessels and hand-made jugs were also produced (Fig. 2.1, 4–11).

RESULTS

Ilchester

The vessels whose petrology was studied by RT represent eleven samples of Pearson's Pottery Type B (the most common Saxo-Norman fabric in the town: Pearson 1982, nos 728, 810 and two not drawn; Ellis 1994, fig. 51, nos 2–7, 11), together with examples of his Types B/BB (two vessels: Pearson 1982, nos 937–8), BB (five samples: Pearson 1982, nos 1011, 1026; Ellis 1994, nos 17–19) and E (two including Pearson 1982, no. 1230). Six of these were then selected for thin-sectioning (details in Appendix 1). Representatives of Pottery Types B, B/BB, D E and G1, together with samples of glazed tripod pitchers, were also submitted for chemical analysis (details in Appendix 2).

Under the binocular microscope all these samples except two display a number of characteristics, notably rounded and polished quartz, sparse angular chert (much of it white), and soft red pellets which are distinctive of deposits around the Upper Greensand of the Blackdown Hills (details in Appendix 1).

There were two exceptions. First, a group of four limestone-tempered sherds forms a distinctive type, described by Pearson (1982, 171, Pottery Type A8). Second, a single vessel (Ellis 1994, fig. 51, no. 6) is also distinctive, being predominantly limestone-tempered but also containing typical Greensand-Derived inclusions (Appendix 1).

A key conclusion from this exercise is that, whilst the divisions between these fabrics may be recognisable in hand specimen, they reflect differences in the quantity of temper or variations in surface treatment rather than meaningful divisions between production centres. The way in which they represent gradations in a range, rather than distinct fabrics, is reflected in the classification of fabrics B, BB, B/B. We propose that these distinctions be abandoned in future studies.

Castle Neroche

The entire collection shows the typical Upper Greensand-Derived fabric. Four thin-sectioned vessels are described in detail in Appendix 1. The chemistry of two samples is discussed in Appendix 2; their close match to local coarsewares found at Dunkeswell and Membury on the Devon side of the Blackdown Hills may be noted.

South Cadbury

The two vessels identified as chert-tempered wares by David Williams (Williams 1995, 94, LS 5 and 8) were re-examined, both in hand specimen and in thin-section. Alongside the chert, they display the characteristic range of inclusions of Upper Greensand-Derived wares; detailed descriptions are presented in Appendix 1. The close match of the chemistry of LS 5 to samples from Ilchester, Sherborne and Donyatt is described in Appendix 2. Twelve examples of this general fabric type were distinguished by Stevenson and Alcock (1995, 92–7) among 25 late-Saxon coarse pots. Two further examples of these wares were examined in detail by RT. One (LS 2) is also described in Appendix 1; analysis of its chemistry showed a close match to pottery from Ilchester, Sherborne and Donyatt (Appendix 2). The other (LS 6) likewise displays the characteristic polished sand and chert of this fabric.

Williams also examined three limestone-tempered wares (Williams 1995, LS 12, 15, 22) and found convincing evidence that the inclusions in two of them were derived from the Jurassic. Shell was also noted within the limestone inclusions in another vessel examined by RT (LS 16), and shell, more rounded limestone and granular calcite in a further vessel (LS 18). Rather than containing sandy limestone (Stevenson and Alcock 1995, 97), the fabric of LS 25 contains granular (ie fossil) limestone.

Inspection of further limestone-tempered wares by RT found a third fabric which shows a mixture of inclusions derived from the Upper Greensand (with its characteristic polished sand) alongside foraminifera from the Lias, but no chert (vessel LS 17).

The Wedmore bowl

The bowl has been described by Alan Vince as a 'chert-tempered ware' (Brown *et al.* 2006, 282).

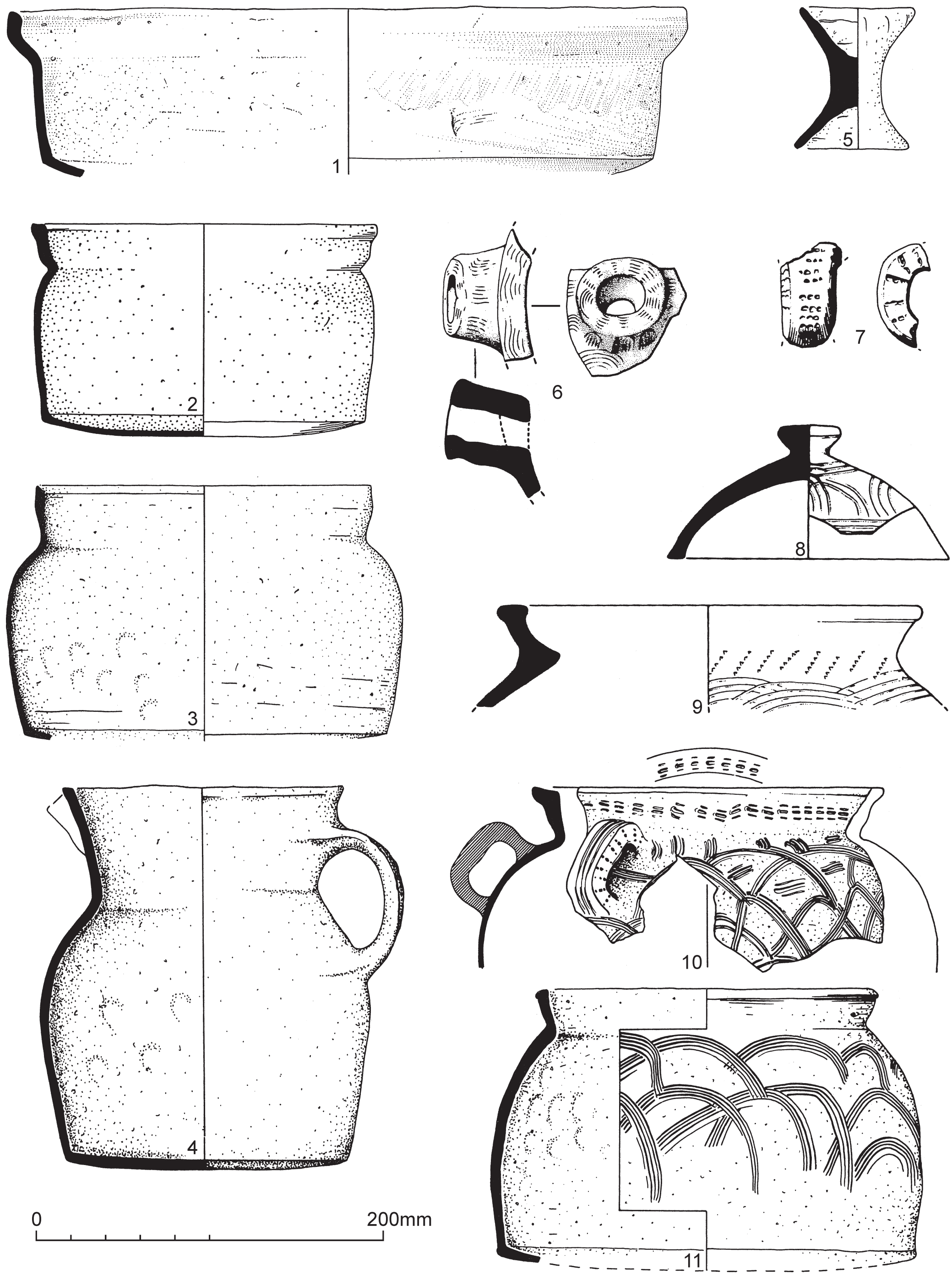

Fig. 2 Examples of Upper Greensand-Derived pottery from Somerset, Dorset and Devon. 1. Sherborne Old Castle; 2. Taunton; 3–5, 10–11 Exeter; 6–9 Ilchester. Scale 1:4

Upon thin-sectioning and further examination it does indeed display inclusions derived from the Upper Greensand but the vessel is predominantly limestone-tempered (details in Appendix 1). Analysis shows that its chemistry is close to that of two vessels from Cheddar and one from Burrow Mump (Appendix 2).

Cheddar

The principal fabric grouping which offers a visual match to the Upper Greensand-Derived wares is Rahtz's fabric C ('hard gritted, rough surface, late 10th- to early 11th-century': Rahtz 1979, 310, 312). However, good visual matches were also found among sherds of the variant CC (described as 'hard-gritted, soapy to the touch'), in his fabrics H ('hard, sandy, finely gritted, 11th- to 12th-century and later') and HH ('soft, friable, gritty, 11th- to 12th-century': *ibid.,* 310, 312), and among various sherds which did not seem to fall firmly within the categories described: fabrics C/G (*ibid.,*, MP 95), fabric C/M (*ibid.,* MP 45), fabric HGJ (*ibid.,* MP 105) and a tripod pitcher which, Rahtz suggested, was an import from a different region of England (*ibid.,* MP 58). Petrological examination confirmed their common origin (Appendix 1).

Glastonbury Abbey

Initial examination of Saxo-Norman coarsewares from the abbey in hand specimen showed that Upper Greensand-Derived sherds form the most common fabric group. Petrological study of ten vessels selected at random (seven jars and three glazed tripod pitchers) by RT showed that all the glazed wares and three jars are from this source; the others are limestone-tempered.

Taunton

Two fabrics are represented among the ten vessels studied: three are Upper Greensand-Derived wares with the typical features of polished quartz, chert and soft red inclusions, whilst the remaining vessels show a mixture of Upper Greensand-Derived inclusions with limestone, the latter predominating in some sherds. Important evidence regarding the source of the clay was found in two samples. One contained a grain of fibrous calcite and the tip of a tooth of a fossil fish (0.6mm long, 0.2mm wide at its base, with traces of the core in the base). The other displayed two impressions of juvenile ammonites (3–4mm), an echinoid spine and cavities of fibrous calcite. These inclusions are certainly derived from the Lias.

Burrow Mump

Five of the six vessels studied showed Upper Greensand-Derived temper; the exception is probably of later medieval date (Appendix 1). Chemical analysis of the published tripod pitcher (Dunning 1939, no. 4) showed close matches to sherds from Ilchester, and to previously analysed coarsewares from Sherborne (Dorset) and Membury (Devon) (Appendix 2).

Middlezoy

Four of the seven vessels studied in detail showed typical features of Upper Greensand-Derived wares, including the rounded, polished and angular quartz grains, with limonite and chert. The other three contain the same inclusions but the fabric is patchily calcareous. One of these (SDM 2000: 654) contained fine-grained irregular limestone fragments. These wares are unrelated to the Triassic marls local to the site, which is surrounded by Holocene peat. Detailed fabric descriptions of these seven vessels have been prepared for inclusion in a future site report.

Bawdrip

Of the four vessels examined in detail, two had Upper Greensand-Derived temper (predominantly quartz, but also chert, silicified shell, limonite, tourmaline and carbonate). The other two both displayed these inclusions, but also contained limestone (light grey, bioclastic and uniform very fine-grained rounded fragments in one, with cleaved and fibrous crystalline sub-angular fragments of calcite, 1–1.5mm in one; in the other off-white to light grey fine-grained, rounded to sub-rounded, 0.1–5mm, with fibrous and laminated tabular carbonate vein fillings, 1.0–2.5mm). The clay of both the latter vessels is probably from the Lias. A fuller report is deposited with the sherds.

DISCUSSION

Upper Greensand-Derived wares

On all the sites we examined in south and central Somerset, pottery containing temper derived from the Blackdown facies of the Upper Greensand proved to be the most common type. It formed the entire assemblage at Castle Neroche in the Blackdowns, was by far the most common ware at Ilchester and Taunton, and was also common on sites further north, such as Bawdrip, Glastonbury and Cheddar. Is this part of a larger picture?

Devon and east Cornwall

The evidence from Somerset corresponds to that emerging in Devon. Since the early 1970s, when Trevor Miles recognised sherds of this type at Barnstaple and Lydford, pottery of this same sort has been recognised as a distinct Saxo-Norman coarseware fabric throughout much of the county. The finest and best-dated material is the series from Exeter (Allan 1984); other significant collections are from the Norman castles of Okehampton and Totnes, Barnstaple and Lydford, with various finds from rural sites, especially in east Devon, although none has yet been recognised in outlying parts of north and west Devon. The presence of flint, chert and occasional limestone inclusions indicated a source or sources somewhere in south or east Devon or further east. Although programmes of thin-sectioning of finds from Exeter, Lydford and Okehampton Castle in the 1980s provided good petrological descriptions of these wares, they did not tie down their source more precisely (Vince and Brown 1981; 1982; Brown and Vince 1984; Williams 1984). More recently, fresh work by Dr Taylor has shown that the pottery of this type found on various sites in east Devon, in the Exeter collection, and elsewhere in Devon, also displays the characteristic features of the Upper Greensand-Derived petrology (Taylor 2002; 2003; unpublished work on Exeter). Vince's study of the chert-tempered wares from Launceston Castle has demonstrated that the pattern extends into Cornwall, and his thin-sectioning of a further range of Devon samples has had the valuable result of confirming that they display closely comparable petrological features (Brown *et al*. 2009). A cumulative picture emerges from these various pieces of work: throughout the Saxo-Norman period pottery was supplied in considerable quantities from potteries in the Blackdowns to communities as much as 90km to the west (Allan 1994).

Dorset

The picture in Dorset deserves fresh consideration in the light of this evidence, but we have already shown that Upper-Greensand-Derived wares form almost the entire assemblage in a context dating from *c*. 1200 at Sherborne Old Castle. This kind of pottery, named 'S4/C2' in Spoerry's study of the county's pottery (Spoerry 1990), was identified by him as the predominant fabric (forming more than 75% of the sherd total) at Kington Magna near the county's northern boundary, and formed about 60% of the assemblage at Compton Valence near Dorchester. He also noted a few rare examples of this ware as far away as Salisbury and Southampton (*ibid*., 7). We re-examined the collection from Milton Abbey, close to the middle of the county (Dorset County Museum acc. no. 1972.5). This confirmed the Upper Greensand-Derived character of the flint-tempered (S4/C2) wares, which as Spoerry showed make up about 20% of sherds at this site. Our investigation of Saxo-Norman sherds excavated in recent years at Channon's Garage, Dorchester and Foss Orchard, Chideock, also showed that the flint- and chert-tempered sherds from these sites derive from the Upper Greensand (unpublished excavations by Exeter Archaeology). We now need to check that in other instances our definitions correspond to those of Spoerry, but this suggests that our Upper Greensand-Derived wares dominated the Saxo-Norman ceramics market of the western half of Dorset and were distributed as a minor ware in east Dorset.

Since the Upper Greensand-Derived pottery used in Devon and Dorset can be shown to have originated in the same area, researchers may legitimately use parallels or dating evidence from these counties in dating or studying pottery of this type found in Somerset.

Limestone-tempered fabrics

Three limestone-tempered fabrics have been distinguished by earlier researchers of the county's late Saxon pottery: two at Cheddar and one at South Cadbury. At Cheddar Vince showed that the late Saxon fabric E contains a distinctive silicified sandstone and burnt-out limestone, and is an example of a widespread fabric type which probably has its origin in central or south Wiltshire (Vince 1984, chs 11, 13). By contrast, he concluded that the limestone in Cheddar fabric B was Carboniferous, and included an oolitic variety comparable to samples from the Mendip Hills immediately to the north (*ibid.,* ch. 11). At South Cadbury thin-sectioning by Williams demonstrated that some at least of the limestone-tempered wares contain fossil shell, bryozoa, ooliths and fossil echinoid fragments of Jurassic origin; such material could have been found in the immediate vicinity of the site (Williams 1995, 94).

The present study has identified a fabric type in which limestone temper is mixed with chert, rounded and polished quartz grains, and other inclusions typical of Upper Greensand-Derived wares. At Taunton, two sherds of this type were found to contain fragments of characteristic Jurassic fossils – one a tooth, the other a crinoid. The same kind of pottery was also seen by RT in his study of the Saxo-Norman pottery from Brent Knoll, where the possibility arose that the inclusions were taken from the Middle and Upper parts of the Lias formation around the Knoll (Taylor 2008). In fact, however, an ammonite fragment (probably *Asteroceras* sp.) found in one sherd indicates that the clay source represented was not local, since it came from the Lower Lias (*ibid*.). A situation in which such inclusions could be found together is in streams draining from the Blackdown Hills of the south of the county and running over the Lias to their north. Such pottery normally forms only a minority of the vessels in the collections we have examined, although it was more common in Taunton.

CONCLUSION

The central conclusion which emerges from this study is that in the late Saxon and Norman periods most of the pottery in everyday use in south and central Somerset was made with temper derived from streams draining from the Blackdown facies of the Upper Greensand. Presuming that the temper was collected near the potteries, this shows that there was a major pottery-making industry on the Blackdown Hills, which span the border of Somerset and Devon. Ceramics with the same petrological features were also distributed throughout much or all of Devon, and into east Cornwall; they also formed the most common class of Saxo-Norman pottery on some sites in west Dorset. This was clearly a major industry.

Elsewhere in Britain, the documented potters of the earlier Middle Ages were most commonly cottagers with smallholdings, sometimes on peasant assarts on the margins of waste (Le Patourel 1968, 106–7, 123). Production in the Blackdowns would correspond to this pattern; here was a thinly populated rural area, distant from urban centres, where the wood needed for fuel was abundant, and with other dispersed rural industries, notably ironworking. It seems likely that the kilns (no doubt bonfires rather than solidly built structures) were dispersed, and this may explain the different groupings which are starting to emerge among the chemical analyses described below.

A striking feature of many medieval potteries throughout England was their continued operation in the same area for many generations, and commonly for hundreds of years. In the later Middle Ages and for centuries afterwards the fringes of the Blackdowns supported a significant pottery industry at Donyatt and Wrangway in Somerset, and at Clayhydon, and Hemyock in Devon. The present study shows that this industry was established in the late Saxon period, and already dominated the pottery market of much of Somerset before the Norman Conquest.

APPENDIX 1: PETROLOGICAL DESCRIPTIONS OF SAMPLE SHERDS

by Roger T. Taylor

The following descriptions are based upon detailed examination of surfaces and broken edges of sherds under a binocular microscope, usually at X20 magnification, supplemented by examination in thin-section. Inclusions are listed in approximate order of abundance. EXTS refers to the regional thin-section collection held at Exeter City Museums, which can be viewed by appointment.

Ilchester

Specimens of four fabrics are described fully:

Pearson 1982, No. 810. Thin-sectioned (EXTS 71). Ilchester fabric B

Temper forms 10–15% of the fabric.

Quartz: colourless transparent and some amber and brown opaque grains. Angular to well rounded grains, many polished, 0.05–2.2mm.

Chert: white to light grey and brownish-grey, colourless to brown mottled in thin-section, angular fragments, 0.2–4mm.

Tourmaline: single grain in sherd, black polished, 0.5mm; grain in section pleochroic colourless to gold, angular, 0.1mm.

Shell: a rectangular silicified fragment possibly brachiopod in section, 0.5mm.

Limonite: soft reddish-brown grains, opaque to brownish-red in thin-section, rounded, 0.1–1.2mm.

Comment: An Upper Greensand-Derived temper.

Pearson 1982, No. 938. Thin-sectioned (EXTS 72). Ilchester fabric B/BB

Temper forms *c*. 25% of the fabric.

Quartz: colourless transparent, mainly angular, some well-rounded and polished, 0.05–0.75mm, mainly less than 0.3mm.

Chert: a scatter of brownish-grey angular to sub-rounded fragments, 0.2–2.5mm.

Carbonate: a few white fine-grained sub-rounded to angular fragments, possibly limestone, 0.1–2.5mm. Some irregular disseminated patches in the matrix.

Shell: an irregular silicified fragment, 0.75mm, and a calcareous fragment, 0.5mm, both in thin-section. Some calcareous shell fragments in the sherd, 0.2–0.25mm.

Comment: An Upper Greensand-Derived temper in which quartz sand is more abundant and generally of a finer grain size than is commonly found in these tempers.

Pearson 1982, No. 1011. Thin-sectioned (EXTS 73). Ilchester fabric BB

Temper forms 25–30% of the fabric.

Quartz: some translucent colourless, angular to well-rounded grains, many polished, 0.025–1.5mm, mainly less than 0.3mm.

Chert: white to mid-grey and brownish-grey, angular to sub-angular fragments, 0.4–2.0mm.

Shell: one small calcareous fragment in sherd, 1mm. Two silicified fragments in section, 0.3–0.4mm.

Carbonate: two sub-rounded fragments in the section, 0.4–0.6mm. Slight traces of carbonate in the matrix.

Limonite: dark brown to reddish-brown, opaque in thin-section, rounded grains, some enclosing quartz, 0.05–1.4mm.

Comment: An Upper Greensand-Derived temper with more abundant quartz sand; generally of a finer grain size similar to EXTS 72.

B2/541. Thin-sectioned (EXTS 74). Ilchester fabric E

Bodysherd. Temper forms *c.* 20% of the fabric.

Quartz: colourless transparent to white opaque and some amber coloured, angular to well-rounded grains, some polished, 0.05–2.0mm.

Chert: sparse white in sherd, light brown in thin-section, angular to sub-angular fragments, 0.2–2.5mm.

Carbonate: sparse, white sub-angular to rounded, 1.5–2mm.

Shell: white silicified, tabular curved, 4mm, and white calcareous 1.3mm and 1mm in sherd; silicified shell 1.0 and 1.5mm in section. Calcareous shell, 1.5mm in section.

Limonite: soft, brown to reddish brown rounded grains, 0.3-2.5mm.

Zircon: a single grain 0.02mm.

Comment: An Upper Greensand-Derived temper, predominantly of quartz with a few carbonate fragments and calcareous and silicified shell.

The following vessels, described here in more summary form, contain Upper Greensand-Derived inclusions:

Vessels published in Pearson 1982

937 (Type B/BB, form possibly 13th/14th-century): typical polished chert and sand.

1025–6 (Type BB): sparser temper but polished quartz grains, sparse chert.

1230 (Type E) and a second sample of this fabric from G1: polished grains, sparse chert.

Not drawn: Type F, from B56 and B11: sparsely tempered, with polished grains, odd fragment of chert.

Not drawn: Series of pitchers from Kingshams R2/5/B27: some rounded and polished quartz, sparse angular chert (much white), soft red pellets (possibly iron pyrites oxidised by firing).

Vessels published in Ellis 1994

2 (Fabric B): thin-sectioned (EXTS 75). Quartz (many polished), chert, sandstone, limonite.

3 (Fabric B): rounded polished quartz, chert.

4 (Fabric B): thin-sectioned (EXTS 76). Quartz (some polished), chert, hornfels, tourmaline, limonite, zircon.

5 (Fabric B): chert, silicified sandstone, polished quartz.

7 (Fabric B): chert, veined quartz, chalcedonic silica.

18 (Fabric BB): many polished quartz grains, fibrous calcite, chert, silicified sandstone.

21 (Fabric D): rounded quartz sand, chert.

23 (Fabric E): chert, rounded and polished quartz sand, shell.

24 (Fabric E): no chert; sparser polished grains.

25 (Fabric E). Very fine quartz sand, some white chert: refined Upper Greensand.

A single vessel displayed a mix of Upper Greensand-Derived and calcareous inclusions:

6 (Stamped vessel, fabric B): rounded polished quartz; chert, but very vesicular with numerous limestone/calcareous inclusions, also gypsum moulds and silicified shell.

Castle Neroche

Thin-section EXTS 77

N. French rim, Site G, Period II. Oxidised, orange throughout. Temper forms 5–10% of the fabric.

Quartz: Colourless to white transparent to translucent angular to well rounded, some composite and strained, many grains polished, 0.1–2.0mm. Angular grains less than 0.05mm in thin-section.

Chert: off-white to grey in sherd, brownish mottled in thin-section, angular to sub-angular grains 1.2–2.5mm in sherd, many smaller angular grains in thin-section.

Sandstone: buff to white angular, fine-grained quartz with siliceous cement, 0.3–2.5mm seen in sherd. One grain in thin-section with greenish glauconite grains, 3.25mm.

Tourmaline: dark bluish to brown in thin-section, sub-angular, 0.1mm.

Comment: An Upper Greensand-Derived temper.

Thin-section EXTS 78

Bodysherd of a large, thick vessel with applied cordon. Site G, Period II. Temper forms 5–10% of the fabric.

Quartz: colourless to white, transparent to translucent, angular to well rounded, many grains polished, 0.1–3mm.

Chert: white angular grains, 0.1–1.5mm.

Sandstone: off-white to buff angular irregular grains with fine-grained quartz and siliceous cement, 0.75mm. Some derived fine-grained quartzitic sandstone grains seen in thin-section, 0.2–2.0mm.

Feldspar: probably orthoclase. Colourless cloudy iron-stained, sub-angular cleaved grains, untwinned in thin-section, 1.75mm.

Limonite: dark reddish-brown, rounded to sub-rounded, opaque in thin-section, 0.1–0.6mm.

Comment: A typical Upper Greensand-Derived temper.

Davison 1972, no. 16, thin-sectioned (EXTS 79)

Local rim form, Site H, on barbican bank, Period III. Temper forms 10–15% of the fabric.

Quartz: mainly transparent colourless, angular to well rounded, some rounded grains composite, 0.2–1.1mm, up to 3.5mm in sherd.

Chert: light grey in sherd, light brown mottled in thin-section, angular to sub-angular grains, 0.2–1.7mm.

Sandstone: a single grey angular grain with fine-grained quartz and siliceous matrix, 3mm.

Tourmaline: colourless to gold and bluish pleochroic in thin section, angular a single grain, 0.15mm.

Limonite: sparse opaque rounded grains in thin-section, 0.1–0.5mm.

Comment: A typical Upper Greensand-Derived temper.

Thin-section EXTS 80

Handle with impressed comb decoration, Site H, Period III. Temper forms *c.* 15% of the fabric.

Quartz: mainly transparent some white translucent, angular to well rounded many polished. Some rounded grains composite and strained, 0.1-1.2mm up to 3mm in sherd.

Chert: light grey in sherd, pale brown mottled in thin-section, angular grains, 0.1–3mm.

Shell: white curved silicified fragment in sherd, 2mm.

Tourmaline: colourless to yellowish gold, pleochroic, angular, a single grain in thin section, 0.2mm.

Limonite: dark brown, opaque to dark brown in thin-section, rounded grains, some enclosing fine-grained quartz, 0.2–1.5mm.

Comment: A typical Upper Greensand-Derived temper.

Wedmore

The Anglo-Saxon coin hoard bowl, deposited *c.* 1050. Thin-sectioned (*EXTS 70*). Temper forms about 20% of the fabric.

Limestone/calcite: white angular to rounded, some fragments with traces of fossils, also fine-textured pale brownish fragments and some single-crystal calcite fragments seen in thin-section, 0.2–1.7mm.

Quartz: colourless to white, some pale brownish, translucent to transparent, angular to well rounded and polished grains, 0.2–1.0mm. One sutured composite grain, 0.75mm.

Limonite: dark brown soft rounded fragments, opaque in thin-section; some particles contain grains of quartz, 0.2–2.5mm.

Chert: pale buff; one angular microcrystalline grain and fossil fragment, 1mm, seen in thin-section.

Sandstone: angular fine-grained fragment with ferruginous cement, 1.25mm.

Fossil shell: white planar calcareous ornamented bivalve fragment in sherd; other fragments seen in thin-section, 2.5mm.

Comment: A limestone-tempered ware with an Upper Greensand-Derived quartz and chert component, cf vessels from Brent Knoll (Taylor 2008, 118–19, fabric 3).

South Cadbury

LS 8. Thin-sectioned (EXTS 87)

Jar. Temper forms *c.* 25% of the fabric.

Chert: light grey to white mottled and dark grey in sherd, pale brown mottled in section, angular fragments, often tabular, 0.1–8.0mm.

Quartz: colourless transparent to white and amber, angular to well rounded grains, many polished, 0.05–1.0mm.

Shell: silicified shell fragments in thin-section, three fragments, 1.4–1.5mm.

Limonite: brownish-red soft in sherd, dark brown to opaque in section, rounded fragments, 0.1–2mm.

Comment: Chert-rich Upper Greensand-Derived temper.

LS 2. Thin-sectioned (EXTS 88)

Jar. Temper forms *c.* 15% of the fabric.

Quartz: transparent colourless to white translucent with some reddish and amber grains, angular to well-rounded, many polished, 0.05–1.2mm.

Chert: white to brownish-grey, light brownish mottled in thin-section, angular fragments, 0.1–4mm.

Shell: silicified fragments in thin-section, 1–1.6mm.

Limonite: soft brownish-red rounded, 0.2–2.5mm.

Comment: Upper Greensand-Derived temper.

LS 5. Thin-sectioned (EXTS 89)

Jar. Temper forms *c.*15% of the fabric.

Quartz: transparent to translucent colourless to white, angular to well rounded grains, some rounded grains polished some composite, 0.05–2.4mm.

Chert: white mottled in sherd pale brownish in thin section, angular fragments 0.1–1.5mm.

?Tourmaline: one dark brown translucent polished grain, 1.0mm.

Limonite: brownish-red to dark brown, nearly opaque, some grains enclosing fine quartz, 2.5mm.

Comment: Upper Greensand-Derived temper.

Burrow Mump

1 'Found at Bottom of Pit 2, sherd P4'. Thin-sectioned (EXTS 85)

Bodysherd of a green-glazed tripod pitcher with combed decoration (Dunning 1939, 124, P4). Temper forms 15–20% of the fabric.

Quartz: colourless, translucent to transparent and amber translucent, angular to well-rounded and polished grains, 0.1–1.5mm, mainly less than 0.5mm.

Limonite: soft dark brown and reddish-brown, sub-angular to rounded grains, 0.1–2.5mm.

Chert: white to pale brownish angular fragments, buff in thin-section, 0.5–3.0mm.

Carbonate: white in sherd and pinkish-buff in thin-section, rounded grains, 0.2–1.2mm. A carbonate fossil section 0.5mm across, possibly foraminifera.

Silicified shell: laminated elongated fragments, 0.5–1.5mm, typically *c.* 0.2mm across.

Tourmaline: a single bluish-green rounded grain, 0.1mm across.

Comment: Upper Greensand-Derived temper with patchily calcareous clay body and limestone grains, probably Lias clay. The limonite derives from the weathering process of the clay.

2 'CIII, top of Pit 2.' Thin-sectioned (EXTS 86)

Rim of a large vessel – probably Dunning 1939, pl. vii, P2. Temper forms *c.* 20% of the fabric.

Quartz: transparent colourless to translucent white, angular to sub-rounded, less than 0.1–1.5mm.

Sandstone: angular, mainly fine-grained (up to 1mm) fragments, 0.2–2mm.

Slate/shale: grey to buff (in sherd), sub-rounded tabular fragments, 0.5–1.5mm.

Siltstone/silty slate: unfoliated and foliated fragments with fine-grained quartz as angular to sub-rounded fragments, 0.5–1.5mm.

Comment: This vessel is exceptional among the sherds examined, having a temper likely to have come from stream sediments derived from the Devonian rock of the Quantocks or from the area of Exmoor. This kind of fabric is known from later medieval pottery, for example from Bridgwater. It is probably significant, therefore, that the context also produced glazed ridge tiles and Saintonge ware of the late 13th century or later.

Four further sherds from different unglazed coarseware cooking pots were examined (Dunning 1939, 121, pl. VII, no. 7; one marked CIII, pit 2, the others unmarked: samples 31–4). All showed the range of typical Upper Greensand-Derived temper.

Cheddar Palace

Sherd MP20. Thin-sectioned (EXTS 82), Rahtz fabric B

Rim. Temper forms 5–10% of the fabric.

Limestone: white and off-white sub-rounded fragments with fine crystalline calcite and pelleted structure in thin-section, 1.00mm.

Calcite: white to translucent, angular cleaved fragments visible in sherd, typical crystalline calcite in thin-section, 0.2–2.5mm.

Quartz: colourless to white, transparent to translucent with some light brown translucent grains, many polished, 0.2–0.8mm. Much angular quartz, less than 0.1mm in thin-section.

Chert: light grey to off-white, buff in thin-section, angular to sub-angular fragments, 0.3–1.5mm.

Red particles: probably the result of firing limonite particles.

Mica: sparse muscovite laths up to 0.2mm.

Zircon and anatase: tiny grains of each seen in thin-section.

Tourmaline: one 2mm yellow grain seen in thin-section.

Comment: A limestone/calcite-tempered ware with components derived from the Upper Greensand. The calcite is probably derived from veins and segregations in limestone.

Sherd MP 28. Thin-sectioned (EXTS 83), Rahtz fabric C

Rim. Temper forms 10–15% of the fabric.

Limestone: white to off-white, irregular angular and sub-rounded grains, 0.5–2.0mm.

Calcite: white to off-white, angular and cleaved fragments, 0.2–2.75mm.

Quartz: transparent to translucent, colourless to white, angular to well-rounded with some polished grains. Some grains sutured and fine-grained quartzite, 0.1–2.75mm.

Chert: white to pale grey, pale buff in thin-section, angular fragments, 0.2–2.5mm.

Silicified shell: two fragments, colourless elongated with laminated structure in thin-section, 0.5–1.5mm.

Sandstone: colourless to light mottled, fine- and very fine-grained quartzose sandstone, some silicified, seen in thin-section, 0.5–1.5mm.

Comment: A limestone/calcite-tempered ware with components derived from the Upper Greensand. The calcite is probably derived from veins and segregations in limestone.

Sherd MP120. Thin-sectioned (EXTS 84), Rahtz fabric EE/H

From chapel, period 3+, late 10th- to 11th-century or later. Rim sherd. Temper forms *c.* 5% of the fabric.

Quartz: colourless translucent white, with some golden-brown grains, angular to well rounded with many polished grains. Some sutured metamorphic quartzitic grains seen in thin-section, 1.0–2.0mm.

Chert: grey to light grey, mottled with some white angular fragments, buff to brownish in thin-section. Some fragments contain small sand grains.

Composite: quartz/tourmaline, rounded with yellow-gold pleochroic tourmaline, 0.6mm.

Tourmaline: a single golden-yellow grain, 0.1mm.

Red particles: sparse soft, terracotta red, opaque in thin-section, rounded, 1mm. Probably the result of firing limonite particles.

Sandstone: buff to white fine-grained silicified angular fragments, 2mm.

Mica: rare muscovite laths, 0.2mm.

Comment: Upper Greensand-Derived temper.

Sherd MP105. Thin-sectioned (EXTS 81), Rahtz fabric HGJ

Base of the handle of a tripod pitcher with devitrified brown glaze. Temper forms *c.* 25% of the fabric.

Quartz: colourless transparent to white translucent and some brown opaque grains, angular to well rounded and some well polished grains, 0.1–2.0mm.

Chert: light grey to off-white, buff in thin-section, angular to sub-angular, some spicular and mottled fragments, 0.3–3.0mm.

Red particles: soft terracotta red, opaque in thin-section, rounded, 0.3–3.0mm, probably the result of firing limonite particles.

Silicified shell: white to of-white, platy fragments with characteristic laminated appearance in thin-section, 1.0–2.5mm.

Tourmaline: rare black glossy and polished rounded grains of schorl, 0.2–0.3mm. One yellow-gold rounded grain seen in thin-section, 0.2mm.

Sandstone: off-white, angular, fine-grained silicified fragment.

Comment: Typical Upper Greensand-Derived temper.

APPENDIX 2: THE ANALYSIS BY INDUCTIVELY COUPLED PLASMA-ATOMIC EMISSION ANALYSIS (ICP-AES) AND MASS SPECTROMETRY ANALYSIS (ICP-MS) OF SAXO-NORMAN POTTERY FROM SOMERSET

by Michael J. Hughes

Introduction

Chemical analysis of the fabric of pottery provides a means of finding ceramics which were made from the same clays, and probably at the same location, by looking for very similar patterns of chemical composition of the clay fabric. Only in recent years have systematic analyses of West Country medieval wares been made: particularly relevant here are those of pottery from Haycroft Farm, Membury, east Devon (Hughes 2002) and Sherborne Old Castle (Hughes 2003), which petrological study indicates to be not local products but wares derived from the Upper Greensand of the Blackdown Hills, some 35km or so west of Sherborne.

The questions being investigated by chemical analysis of the Saxo-Norman pottery were Research Aims 1 and 2 noted at the outset of this paper.

While inductively-coupled plasma atomic emission analysis (ICP-AES) was used for chemical analysis of the pottery fabrics in the previous studies cited above, the laboratory concerned now additionally analyses the same material by inductively-coupled plasma mass spectrometry analysis (ICP-MS). This adds a large range of extra trace elements, and the resulting very detailed analytical profile of an individual pottery sherd makes significant improvements to the uniqueness of each analysis. We have begun to use the additional ICP-MS elements to study West Country pottery (Hughes 2005).

Chemical analysis

Powdered samples were obtained from each sherd using a hand-held 12 volt drill fitted with a 2mm diameter solid tungsten carbide drill bit. The powders were analysed by ICP-AES and ICP-MS at the Department of Geology, Royal Holloway, University of London, by Dr J.N. Walsh using their routine technique (Thompson and Walsh 1989). The ICP-AES and ICP-MS combined techniques measured 45 elements in each sherd and the analysis results are listed in Table 1.

Statistical interpretation of the chemical analyses

Full interpretation of the analyses of Table 1 requires multivariate statistical techniques, which examine many elements simultaneously. A variety of such computer programs are used in archaeology (Baxter 1994; Orton 1980), and as the numbers of analyses in this study were relatively few, principal components and cluster analysis were applied using the computer program SPSS version 10. These programs extract the main features of chemical differences among the whole set of analyses, which provide a chemical 'fingerprint' for each sherd. As is customary, the analyses were first converted to logs before using the programs. This reduces the undue influence on the outcome by elements whose concentrations have significantly larger absolute numbers than others. From the 45 elements we selected for the statistical tests 30 well-measured elements from across the Periodic Table to represent the chemistry of the pottery. These were: aluminium, iron, magnesium, calcium, sodium, potassium, titanium, manganese, chromium, lithium, nickel, scandium, vanadium, yttrium, and zinc and uranium, thorium, rubidium, caesium, lanthanum, cerium, praseodymium, neodymium, samarium, europium, gadolinium, holmium, ytterbium and lutetium. Elements were omitted which had poor analytical precision or which may be subject to leaching from the pottery fabric by the groundwater in the soil. Cobalt was also omitted because the drill bit contains significant amounts of the element. Note that calcium and magnesium were omitted to avoid their dominating the analysis because of the wide concentration range encountered among the Saxo-Norman sherds.

Principal components and cluster analysis applied to the chemical analyses

The analytical data for many elements is conveniently summarised by a plot of the first two principal components arising from the computer program. Such a plot is a type of chemical map, so that sherds with very similar chemical analyses will plot close together – such close groupings will therefore suggest a common clay origin, and may be used to suggest the origin of sherds analysed which are of unknown origin, by their position on such a plot.

Initial review of the analyses indicates their general similarity across many elements suggesting a similar origin for all the sherds. A principal components analysis of the Saxo-Norman pottery alone showed a general similarity between all of them, with a tripod pitcher sherd from Burrow Mump (SA12) having notably higher iron and lower aluminium.

To try to establish the origin of the Saxo-Norman pottery, their analyses were compared in a further principal components analysis to previous analyses of pottery of the region of various periods, including a group of Bronze Age pottery from a kiln at Sherborne (Hughes forthcoming b) – representing the chemistry of the local clays. It is distinctly different from the present analyses in being highly calcareous (calcium oxide content in excess of 20%), but even discounting this, a principal components analysis showed that it was different from the Saxo-Norman pottery in many other chemical elements. This indicates that the 13th-century pottery from Sherborne Old Castle, like the other Saxo-Norman pottery analysed in this project, does not show the chemistry of local Sherborne clays.

In contrast, comparison of the Saxo-Norman pottery with analyses of ceramics from the Blackdown Hills area did show many similarities and chemical overlaps. For example, both principal components and cluster analysis confirmed the close association between it and previously-published analyses of pottery made around the Blackdown Hills (Hughes 2003). In the latter paper, it was established that the Sherborne Old Castle pottery was derived from the Blackdown Hills Upper Greensand. The groups of pottery which were closest chemically to most of the Saxo-Norman pottery were those of Haycroft Farm, Membury, Dunkeswell fabric B (Upper Greensand fabric) and Sherborne Old Castle.

The principal component analysis seemed to indicate four chemical groups among the Saxo-Norman pottery. Figure 3 shows a 'snapshot' three-dimensional graph of the first three principal components. Two sherds from Ilchester (SA6 and 7) are closely associated with five sherds from Sherborne Old Castle; a single sherd from Burrow Mump (SA12, extreme right point on Figure 3) is rather different chemically from the other Saxo-Norman pottery but close to a sherd from Haycroft Farm; a third group consists of the Wedmore bowl, the two sherds from Cheddar Palace and one from

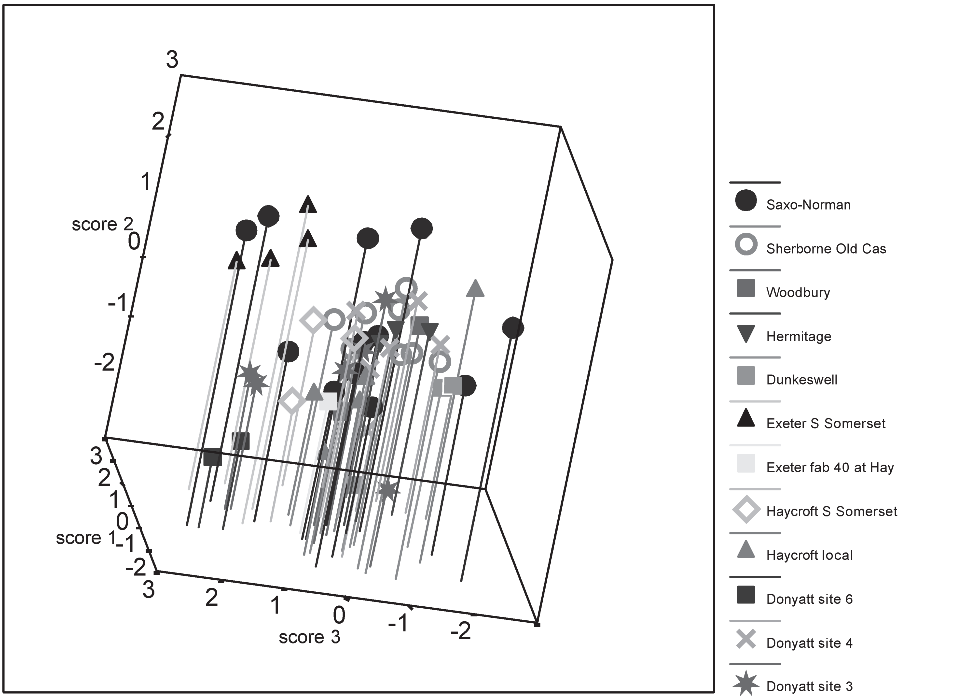

Fig. 3 Plot of the first three principal components arising from ICP analyses of the Saxo-Norman pottery and selected comparative material. The Saxo-Norman sherds are symbolised by the circles; the four with similar chemistry to Exeter fabrics 40 and 42 are spread across the top of the figure. Note how the fourth group of Saxo-Norman pottery which clusters in the densely-populated centre intermingles with sherds from Sherborne Old Castle. Many elements contribute significantly to the first component so that sherds with generally higher concentrations of elements plot towards the back of the figure (ie with higher values of the first principal component). Sodium and iron do not follow this pattern (weakly associated with the first principal component). The second component (the vertical axis of Fig. 3) has major contributions from potassium, manganese and the rare earths: items with high amounts of these elements tend towards the top of the figure whereas high amounts of chromium, aluminium, titanium and vanadium plot towards the bottom. The third component (left to right) has sherds with high amounts of sodium and potassium towards the right, while those richer in the transition metals iron, vanadium and nickel are towards the left

Burrow Mump (SA11) and is chemically similar to previously-analysed sherds in Exeter fabrics 40 and 42. This third group forms the spread of points at the top of Figure 3. A fourth group includes five Saxo-Norman sherds from different sites including those from South Cadbury and Castle Neroche and one from Ilchester (SA8), in a fairly dense cluster of points in the centre of the figure. Since Castle Neroche seems to have been supplied with pottery in North French style, made specifically for the castle's occupants, and presumably close to the site, the vessels in this cluster may have been made in the hills around Castle Neroche.

The mingling of Sherborne Old Castle and Ilchester sherds in these groups indicates their close chemical similarity and supports the conclusion from visual examination of their fabrics that they have a common source (Allan 2003, 73). The two sherds from Castle Neroche are similar in analysis to each other, and have the highest uranium concentrations of all the Saxo-Norman pottery. Their production source is likely to be close to the Castle (Davison 1972), with temper derived from the Upper Greensand and Lias. One sherd from Castle Neroche (SA5 79, site H) is very close to a Dunkeswell fabric B sherd and the other (SA4 77

TABLE 1: ANALYSES BY INDUCTIVELY-COUPLED PLASMA ATOMIC EMISSION SPECTROMETRY (ICP-AES) AND INDUCTIVELY-COUPLED PLASMA MASS SPECTROMETRY (ICP-MS) ON SAXO-NORMAN POTTERY, GROUPED ACCORDING TO THE STATISTICAL RESULTS

site	*cat*	*Al_2O_3*	*Fe_2O_3*	*MgO*	*CaO*	*Na_2O*	*K_2O*	*TiO_2*	*P_2O_5*
Ilchester	SA6 72	11.69	4.66	0.99	1.73	0.24	2.01	0.60	0.24
Ilchester	SA7 1230	12.94	5.54	1.08	2.78	0.22	2.42	0.55	0.29
Burrow Mump	SA12 85 NO.4	9.99	13.58	0.93	3.01	0.18	1.97	0.47	0.47
South Cadbury	SA2 89	14.61	7.11	1.18	1.33	0.45	1.82	0.68	0.38
South Cadbury	SA1 88	16.66	7.19	1.07	0.54	0.27	2.11	0.76	0.21
Ilchester	SA8 FIG.51.2 FAB B 75	16.15	5.87	1.50	1.01	0.50	2.40	0.72	0.43
Castle Neroche	SA4 77 site G	18.44	6.54	1.15	0.66	0.10	2.10	0.80	0.07
Castle Neroche	SA5 79 site H	15.41	5.90	0.63	0.19	0.08	1.50	0.68	1.04
Wedmore bowl	SA3 70 61/1997	14.18	7.64	1.90	9.88	0.41	3.06	0.64	0.38
Cheddar Palace	SA9 83 MP28	13.27	5.20	1.85	6.40	0.24	3.53	0.57	0.44
Cheddar Palace	SA10 82 MP20	13.35	4.15	2.15	5.00	0.20	4.58	0.60	0.51
Burrow Mump	SA11 86 PIT 2	15.81	6.62	4.36	0.32	0.38	4.45	0.71	0.10

site	*cat*	*Rb*	*Nb*	*Cs*	*Y*	*La*	*Ce*	*Pr*	*Nd*
Ilchester	SA6 72	88	15.1	7.21	12	30.5	59.9	7.0	28.7
Ilchester	SA7 1230	115	13.6	8.69	16	34.8	67.9	7.8	32.5
Burrow Mump	SA12 85 NO.4	78	11.1	5.70	16	31.8	64.0	7.6	32.9
South Cadbury	SA2 89	71	10.2	5.20	19	28.8	51.5	7.0	28.2
South Cadbury	SA1 88	131	17.7	11.52	17	41.5	100.2	9.5	37.8
Ilchester	SA8 FIG.51.2 FAB B 75	88	11.4	7.18	20	32.8	65.4	7.5	31.1
Castle Neroche	SA4 77 site G	86	14.4	7.35	21	38.5	67.3	8.8	34.5
Castle Neroche	SA5 79 site H	60	11.9	6.07	27	36.3	84.0	8.4	34.2
Wedmore bowl	SA3 70 61/1997	99	11.6	8.78	30	45.1	95.5	9.4	40.0
Cheddar Palace	SA9 83 MP28	120	10.8	13.16	26	43.6	79.7	10.0	41.9
Cheddar Palace	SA10 82 MP20	100	11.3	13.17	21	32.7	58.0	7.3	31.8
Burrow Mump	SA11 86 PIT 2	138	13.2	27.19	26	42.8	82.9	9.9	41.5

Key: Al_2O_3 aluminium; Fe_2O_3 iron; MgO magnesium; CaO calcium; Na_2O sodium; K_2O potassium; TiO_2 titanium; P_2O_5 phosphorus; MnO manganese; Ba barium; Co cobalt; Cr chromium; Cu copper; Li lithium; Ni nickel; Sc scandium; Sr strontium; V vanadium; Y yttrium; Zn zinc; Zr zirconium; U uranium; Th thorium; Rb rubidium; Nb niobium; Cs caesium; Y yttrium.
Rare earth elements: La lanthanum; Ce cerium; Pr praesodymium;Nd neodymium; Sm samarium; Eu europium; Gd gadolinium; Dy dysprosium; Ho holmium; Er erbium;Yb ytterbium; and Lu lutetium
As arsenic; Pb lead; Cd cadmium; Tl thallium; Mo molybdenum; Sb antimony; Bi bismuth

TABLE 1 (continued)

MnO	*Ba*	*Co*	*Cr*	*Cu*	*Li*	*Ni*	*Sc*	*Sr*	*V*	*Zn*	*Zr**	*U*	*Th*
0.019	251	39	85	14	45	43	11	104	108	68	79	1.79	8.99
0.035	278	28	92	18	52	37	12	184	112	71	76	1.98	9.03
0.054	276	22	75	18	31	48	10	111	114	115	84	1.76	7.79
0.039	346	45	112	28	87	68	15	128	129	114	95	2.37	9.63
0.142	316	66	114	19	104	41	18	92	155	101	81	2.47	11.60
0.049	366	66	110	38	127	73	16	167	133	130	95	2.66	11.10
0.026	255	25	122	45	77	72	17	50	147	94	94	4.71	12.11
0.033	350	35	107	43	44	72	15	36	132	83	75	6.66	10.42
0.202	3022	29	93	35	64	64	14	247	97	64	87	2.21	9.72
0.064	635	29	89	26	56	40	13	110	86	94	79	2.22	9.45
0.034	1007	15	78	34	100	34	12	81	87	463	78	2.58	9.48
0.098	553	55	100	19	150	57	15	51	99	403	92	2.88	12.14

Sm	*Eu*	*Gd*	*Dy*	*Ho*	*Er*	*Yb*	*Lu*	*As*	*Pb*	*Cd*	*Tl*	*Mo*	*Sb*	*Bi*
4.93	1.00	4.21	2.49	0.46	1.37	1.29	0.19	8.1	18	0.1	0.5	0.8	0.7	0.3
5.77	1.15	4.92	2.98	0.55	1.76	1.51	0.22	9.2	25	0.1	0.5	0.7	0.5	0.4
6.09	1.20	5.05	2.90	0.54	1.55	1.31	0.19	18.6	1104	0.2	0.6	1.4	0.7	10.1
5.54	1.20	4.94	3.47	0.70	2.11	1.90	0.28	11.9	20	0.1	0.4	0.8	0.7	0.5
7.05	1.42	6.14	3.42	0.65	2.11	1.63	0.25	11.4	31	0.1	0.8	1.3	0.7	0.5
5.94	1.22	5.43	3.80	0.73	2.16	1.93	0.29	5.6	28	0.1	0.5	0.6	0.7	0.3
6.53	1.25	5.59	3.80	0.76	2.20	2.08	0.30	12.1	20	0.4	1.4	26.7	1.0	0.5
6.58	1.35	6.18	4.75	0.95	2.82	2.50	0.36	9.5	23	0.8	1.1	28.2	1.3	0.5
7.51	2.59	7.37	4.77	0.99	2.77	2.35	0.33	12.3	37	0.7	1.1	2.3	0.7	0.5
7.47	1.64	6.56	4.49	0.84	2.49	2.17	0.29	9.0	37	0.5	2.6	3.5	0.5	0.5
6.00	1.48	5.08	3.44	0.72	2.01	1.87	0.28	11.2	125	1.5	1.0	1.1	0.6	1.5
7.90	1.64	6.91	4.44	0.85	2.65	2.19	0.31	7.3	36	0.1	0.7	1.0	2.1	0.7

The results from Al_2O_3 to MnO inclusive are given as the oxide, in weight percent; all the rest are given as the element, in parts per million site G) is very similar in chemistry to a sherd from Haycroft Farm.

The third group seemed chemically to form pairs (SA3, 9 and 10, 11), with the first pair close to the Exeter sherds but the other pair (perhaps from an unrecognized source?) seeming less like the Exeter sherds in chemistry. Table 1 shows them all to be slightly richer in the rare earths, and the alkalis potassium, rubidium and caesium which probably indicate the presence of significant potash feldspars. Glauconite is normally present in the Upper Greensands and is rich in alkalis, and often rich in magnesium – features of these sherds. Three of the four also contain significant lime (5–10% calcium oxide), whereas none of the other Saxo-Norman sherds have more than 3% lime. To the south and east of the Blackdown Hills is an area of Upper Greensand calcareous facies. Lime is a ubiquitous material, but the lime content of these sherds may point to an origin in this calcareous facies. This however contrasts with the chemical similarity to the Exeter sherds which are thought to be locally made. The four comparison sherds in Exeter fabrics 40 and 42 also contained high alkalis, but they differ slightly from three of the Saxo-Norman sherds by being low in lime. Only Burrow Mump sherd SA11 is particularly close in chemistry across most elements to Exeter sherd 1430 (Hughes 2002, 70, table 2).

To try to gain more information on the chemical links between the sherds, cluster analysis was applied to the same analyses, and produced results which were in substantial agreement with those from principal components. For example, seven ceramics formed a cluster with very similar clay chemistry:

Ilchester (SA6, fabric B/BB) and (SA7, fabric E)
Sherborne Old Castle (sherds B, H, J and I)
Burrow Mump (SA12, tripod pitcher)

Another cluster of sherds could be recognised from:

South Cadbury (SA2)
Ilchester (SA8 Leach 1994 fig. 51.2, Fabric B)
Sherborne Old Castle (C)
Donyatt (A3: site 3) and (A7 and A13: site 4)

Conclusions

The chemical analysis of a large number of elements measured in each pottery sherd included in this study has been possible through the combined use of two types of plasma spectrometry, ICP-AES and ICP-MS. The addition of elements obtained by plasma mass spectrometry is a recent innovation and has been especially useful for widening notably the range of elements measured and increasing the accuracy for the rare earth elements. The analyses have been interpreted with principal components and cluster analysis.

The results of the statistical interpretation showed that even with the small selection of material analysed here, the Sherborne Old Castle pottery is chemically the same as that from Ilchester. Both show chemically significant differences from local pottery produced at Sherborne – albeit of a much earlier period. The close similarity in analyses between the Sherborne pottery, that from Ilchester, and that from several other Saxo-Norman pottery vessels from South Cadbury, Castle Neroche and Cheddar Palace, and pottery from the Blackdown Hills, supports the conclusion that the latter region was a major source of Saxo-Norman pottery. It does not support the proposition that any of the Saxo-Norman sherds were produced at Ilchester. The analyses have however picked out four sherds of Saxo-Norman pottery which are different from the others, and appear to show similarities in chemistry to sherds of Exeter fabrics 40, which may have been made in the Exe Valley, Devon, and 42, which may have been made on the Devon side of the Blackdown Hills.

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AUTHOR CONTACT: JA: Exeter Archaeology, The Custom House, The Quay, Exeter, EX2 4AN (john.allan@exeter.gov.uk)

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