Recent recognition of a building stone, now named Lavant stone, has led to investigations of the quarry site, its history and the use of the stone. Lavant stone is a distinctive phosphatic chalk with fossils, particularly sharks’ teeth. It was used in the later Roman period and extensive medieval use ranged from Chichester Cathedral and Boxgrove Priory to parish churches. The historical use of Lavant stone is considered, and the social and economic influences upon its distribution pattern and opportunities for further research are discussed.

INTRODUCTION

Given the large numbers of studies of parish churches and other ecclesiastical buildings, it is perhaps surprising that traditional building stones in Sussex have been relatively little studied. However, in other areas of England, substantial historical and archaeological information has been revealed by the study of building stones (e.g. Raunds in Northamptonshire: Cadman 1990; Hildenley limestone in Yorkshire: Senior 1990). The well-known traditional building stones used in western Sussex include flint, Bembridge or Quarr stone (imported from the Isle of Wight), Caen stone (from Normandy), Purbeck marble (from Dorset) and Greensand (from both the Upper and Lower Greensand horizons of the Weald). Chalk was never extensively used in external walls because of its susceptibility to weathering and frost damage but this study reports on the use of an unusual phosphatic chalk, named Lavant stone.

The recent story of Lavant stone starts with a geology exhibition in 1979 at the Guildhall Museum in Chichester, when a visitor pointed out to one of the authors (David Bone) that there was a fossil shark’s tooth protruding from a stone in the wall by the west door. This stone was recognized as being identical to fragments of a distinctive form of chalk from a ploughed-out quarry site in the Chilgrove valley, near the village of Lavant, north-west of Chichester. Fossil material from this site, including a large number of sharks’ teeth, is included in the Dixon Hewitt Collection at Chichester District Museum. The Guildhall is the 13th-century chancel of the Franciscan Friars (McCann & McCann 1996), but nothing further was thought about the potential significance of this stone at the time.

During the mid-1980s, Tim Tatton-Brown, then consultant archaeologist to Chichester Cathedral, began a project of recording building stones and architectural features at the Cathedral in advance of repairs that involved considerable replacement of the original stonework. Tatton-Brown and geologist Bernard Worssam were able to identify and date almost all the stone sources that had supplied the Cathedral. The notable exception was an unusual form of chalk with frequent fossil sharks’ teeth, which was marked as ‘phosphatic chalk’ on their drawings of this time (e.g. Tatton-Brown 1996, fig. 5.2). In 1991 the authors prepared an exhibition at Chichester District Museum (of which Anne Bone was then curator) on chalk and flint that included sharks’ teeth and a sample of stone from the quarry site. Tatton-Brown recognized this stone as the ‘phosphatic chalk’ used in the construction of the Cathedral. In discussions with the authors he recognized the possibilities of further research to discover the places where this stone was used, the dates at which it was used, the distribution pattern of its use and the history of the quarry.

The quarry site lies within the south-east/north-west trending dry valley to the north-west of Lavant, often called the Chilgrove valley (the exact site is not published as it lies on private land) (Fig. 1). Early in the study of the stone the authors determined that the material should be named ‘Lavant stone’ (Bone & Bone 1993). This name was chosen because of the proximity of the quarry site to the village of Lavant and its location within the medieval manor of Lavant. In addition, no earlier name for the stone is known because documentary evidence has not survived (see below). Ordnance Survey maps show the site as a series of almost interconnecting horseshoe shapes and associated raised areas. This is typical of medieval quarry activity where a number of pits have been
worked — possibly indicating different phases of use or, alternatively, the opening up of a new working floor by each new tenant of the quarry site.

To find out more about the history and use of Lavant stone, the authors visited several hundred medieval buildings in southern West Sussex, recording both the geological aspects and historical contexts of this phosphatic chalk. The geological aspects are published in detail elsewhere (Bone & Bone 2000). A standardized form was used to record associated stone types, where in the structure Lavant stone was used, whether it was used as dressed stone or as rubble fill and whether it appeared to be original or reused. It was hoped that this would show how the medieval masons chose to use Lavant stone and whether it was used for particular purposes. The number of pieces was recorded to establish the volume of stone and whether there was variation in the frequency of Lavant stone use. Where all three faces of the stone could be seen they were measured, thus allowing estimates to be made on the amount of stone worked from the quarry (see below).

**GEOLOGY AND MORPHOLOGY OF LAVANT STONE**

Lavant stone is a white or pale buff-coloured, medium-grained stone with microscopic needle-like spicules of the siliceous skeletons of sponges, brown shiny phosphatic grains and fossil material, particularly sharks’ teeth. Sometimes there is a range of larger fossils, particularly echinoids and belemnites. Geologically this stone is a form of the Newhaven Chalk Formation of the Upper Chalk (Bristow et al. 1997) and is an unusual variant of the chalk sequence in southern England. The stone weathers to a distinctive grey colour and surface texture which arise from the microscopic fossil content. Fragments of weathered stone from the quarry site have been collected and are identical to the building stone. It is important to note that no other sources of a similar phosphatic chalk have been recognized within the distribution area of the building stone.

Another distinguishing feature of the stone in medieval buildings is the concentration of grey-red lichen, which has been identified as *Diploicia canescans* (Dickson), syn. *Buellia canescans* (Dickson) (Morgan-Huws pers. comm.). This may be because the high phosphate content of this stone enhanced the growth of the lichen and is particularly useful in recognizing the stone when used above the level of close-up inspection.

This type of phosphatic chalk was deposited as current-sorted material filling depressions (‘cuvettes’).
on the floor of the chalk sea. Subsequent cementing of this relatively coarse-grained sediment produced a stone that is more resistant to weathering than the surrounding chalk. Such phosphatic chalk deposits are better known in northern France where they are generally about 20 m thick, no more than 1 km in length and 250 m wide (Jarvis 1992). Recent work has confirmed that a number of subtly different horizons within the Lavant stone were exploited at the same time (Partridge 2002). This may indicate that the quarry was being worked downwards through the geological sequence rather than, or as well as, laterally following a favoured bed.

It is possible that Lavant stone was a prominent feature in the topography of this area before it was quarried. Alternatively, as a harder material it may well have been found as fragments in the plough soil and so have suggested itself as a resource worthy of investigation. Unfortunately, the quarry is backfilled and no excavations or boreholes that could help to confirm its size or stratigraphy have been carried out.

HISTORY OF THE QUARRY SITE

ROMAN

The quarry site is relatively close to the Roman villa known as Chilgrove 1 in an area with extensive evidence of activity from the Iron Age to the present (Down 1979). Given the use of Lavant stone at Chilgrove 1 (see below) and its proximity to the villa, it is reasonable to suggest that the quarry could have been within the estate of the villa. The changing rural economy of the 4th century led to an increasing diversification of activity, including the development of quarrying to increase the marketable assets of a villa estate (Millett 1990, 205). Once the potential use of Lavant stone had been developed for its nearest villa, it is reasonable to expect that it would have been used elsewhere in the region, within the limits of transport costs. The quarry site would then have become the focus of occasional specialist exploitation of this resource.

MEDIEVAL

The quarry site lies within the early medieval manor of Mid Lavant which contained 10 hides, held in 1066 as 9 hides by Godwin and one hide by Alfward (Morris 1976, 11,5). At Domesday, the manor was part of the estates of Roger Montgomery within the honour of Petworth and was held by Ivo, apart from the one hide held elsewhere by Wido. Domesday makes no mention of a quarry, although elsewhere quarrying is recorded, e.g. millstones in an outlier of the manor of Bignor near Lodsworth (Morris 1976, 11,78). After the fall from royal favour of the Montgomery family, Henry I gave a number of their landholdings to more favoured courtiers. The unit of nine hides in Mid Lavant appears to have been one of these, given by Henry I to Savaric fitz Cana in the early 12th century (Thompson 2001). Henry had ruled the Cotentin before he succeeded to the throne of England and the fitz Cana were one of the many Norman families gaining land and influence from Henry in the late 11th/early 12th century.

The fitz Cana family (later known as de Bohun) is discussed in some detail by Thompson (2001). The key facts for the story of Lavant stone are their ownership of Mid Lavant, as part of not inconsiderable estates, and their subsequent fall from royal favour in the 1180s, when Henry II forced the de Bohuns to give lands including Mid Lavant to a more favoured courtier, Ralph of Arden. Ponsonby (1920, 27–9) considers Ralph of Arden to have been related to the de Bohuns, as he proposes that one of the daughters of Savaric fitz Cana was the mother of Ralph. The de Bohuns tried to reclaim these lands between 1199 and 1213, but matters were complicated by Ralph of Arden’s gift of Mid Lavant to the Augustinian priory that he had founded at Shulbrede (Calverley 1904).

In 1213, Engelgar de Bohun confirmed Mid Lavant as part of the Shulbrede estates but retained seven virgates of the manor for himself. The intriguing aspect of this is whether Engelgar de Bohun kept the quarry site. The site today occupies about 1/20th of an acre, whereas Engelgar kept between 168 and 210 acres (Brandon & Short 1990, 59). The land retained by Engelgar de Bohun has remained part of the estate that, since the Tudor period, has been known as the Cowdray Estate. These Cowdray lands in Mid Lavant, depicted on a series of Goodwood Estate plans and schedules compiled after 1778 (West Sussex Records Office, hereafter WSRO, Goodwood Estate Ms E88) probably preserve the seven virgates retained by Engelgar de Bohun (McCann pers. comm.). They include fields around the quarry, but not the site itself. This would suggest that the quarry was not amongst the lands retained by Engelgar de Bohun but was part of the Shulbrede Priory landholdings.

Shulbrede Priory held its estate in Mid Lavant until the Dissolution, sometimes recording it by the alternative name of Rawmere (modern Raughmere), e.g. in the Lay Subsidy 1411–12 (Calverley 1904, 17). In 1534 the landholdings of Shulbrede were rented...
out to tenants rather than operated as a manorial unit and this is likely to have been of long-standing (Calverley 1904, 29). The properties of Shulbrede Priory are recorded in the Nonae Rolls of 1291, including a mill at Coultershaw, but the quarry is not listed (Calverley 1904, 8). Is this an indication that the quarry had been worked out by 1291? This is a possibility as phosphatic chalk deposits are limited in extent (see geology, above).

POST-MEDIEVAL
In the 16th century the quarry site was part of Langford Farm, in the manor of Mid Lavant. Following the dissolution of Shulbrede Priory, the manor of Mid Lavant was granted to Sir William Fitzwilliam, a senior courtier and occupant of the great Tudor house of nearby Cowdray. In 1557 Lavant was granted to John Wiseman of Essex and, through a variety of owners, in 1777 became part of the Goodwood Estate. The proximity to Goodwood led the area to be included in a number of the surveys commissioned by the Dukes of Richmond even before they owned it, but these show no topographical or place-name evidence indicative of quarrying. For instance, on the map of 1728 (WSRO Goodwood Estate Ms E4988) the area is marked as Sheep Down. After 1781, a Goodwood estate survey (WSRO Goodwood Estate Ms E88) names the field containing the quarry as Broadleys, again without any quarry feature. However, this survey does show the continuation of a track from opposite Great Gaston field (on the road from Lavant to Midhurst) slightly north of west to below Stoke Clump. Only the easternmost part of this track survives today, but an extension would have passed close to the quarry site and may well have been the original route for transporting the stone.

The Tithe Map of 1841 similarly shows no distinctive features on the quarry site and it continued to be known as Broadleys and used as grazing land. As the site was grazed and not ploughed, a shallow quarry might well have been forgotten as it became overgrown.

RECENT HISTORY
Aerial photographs of the quarry site taken in 1942, 1944 and 1946 (Fig. 2) show the abandoned workings and spoil tips obscured by mature vegetation and divided by a well-established hedge. Later aerial photographs show that the site was being cleared of vegetation, with the spoil tips being levelled and fresh white chalk from these being spread across the field (Fig. 3). It was at this time that geologists first recorded the occurrence of phosphatic chalk deposits.
with fossils and recognized that this was from ‘pit workings’ (Gaster 1944). Indeed the fossil-collecting potential led it to be included in a publication by the Palaeontographical Society (1954). Fossils collected at this time by Dixon Hewitt (and now in Chichester District Museum) were one of the starting points for this study.

By December 1957, the whole area was under arable crops. Subsequent aerial photographs through to 1971 suggest that occasional deep ploughing was exposing chalk rubble and levelling the original site topography. Today, there are only slight undulations in the field surface, whilst pieces of Lavant stone can be found after ploughing.

ROMAN USE OF LAVANT STONE

SITES STUDIED
Apart from the careful work at Fishbourne Roman Palace (Cunliffe 1971, vol. II, 1–42), few archaeological excavations in this area have paid attention to stonework or retained samples. This has limited the analysis of Roman building stones to sites where the authors have been requested to examine samples or where material retained in excavation archives have been examined.

In the Chichester area the villa system is best known in the Chilgrove valley. Extensive field systems and the minor road to Chichester indicate both Iron Age and Roman agricultural development and the three villas of Chilgrove I, Chilgrove II and Upmarden are well-known (Down 1979). More recently, a large villa complex at Battten Hanger has been studied (Magilton 1991; forthcoming). It was in the material from the Chilgrove villas that Lavant stone was first recognized in a Roman structure. A large column fragment (Down 1979, fig. 2 & p. 168) has now been identified as Lavant stone and is on display in Chichester District Museum. Even finer carved work was being produced and a decorated finial has been identified as Lavant stone, the published description of the stone type being incorrect (Down 1979, fig. 61 no. 8 & p. 168). Lavant stone may also have been used as general building material as it is less than two kilometres from the Chilgrove villas, but the building stones were not sampled before the sites were backfilled. Having recognized Lavant stone in use in the 3rd century, the authors carefully examined the surviving walls of Fishbourne Roman Palace, but no trace of Lavant stone was identified in this 1st-/2nd-century context.

At least three pieces of Lavant stone have been recognized by the authors at Bignor in the cover buildings of the villa, erected shortly after its discovery in 1811, although none was seen in the limited amount of visible Roman work. The cover buildings at Bignor may include stone found on site during excavations by Lysons and it is reasonable to suggest that the fragments were reused from the Roman 3rd-/4th-century villa. Recent excavations in the courtyard area at Bignor have also produced Lavant stone with Roman mortar (Barber pers. comm.) confirming Roman use some 18 kilometres from the quarry. The single piece of Lavant stone recognized in Barlavington church may well have been reused from Bignor, or from the bath-house and presumed villa at Duncton. This can be compared with examples of reuse identified by Allen and Fulford (1999), in which Roman building stones were traced in medieval churches near Saxon Shore forts. In Sussex the reuse of Roman brick and tile in medieval churches is well known at sites such as Westhampnett (Crook 1953b, 178) and Eastergate (Hudson 1997, 159).

Little stonework has been retained from excavations within the Roman town of Chichester, but one fragment of Lavant stone has been recognized from the site of the town baths (Down 1978, fig. 10.51 & p. 321 no. 18). Unfortunately, this piece is from an early medieval pit and so it may represent either Roman or medieval use. It has not been possible to examine in-situ remains at other Roman archaeological sites such as Batten Hanger, which were excavated before the recognition of Lavant stone.

DATING OF ROMAN USE
It appears that Lavant stone was not being used at Fishbourne Roman Palace, constructed in the 1st and 2nd centuries AD. Whilst much of the stone for Fishbourne (e.g. Caen stone and Purbeck marble: Cunliffe 1971, vol. II, 1–42) was being transported by water, the Lavant stone quarry is only about 7 km away and near enough to have made land transport economic. By the 3rd century there was use of Lavant stone for column and fine decorative work at Chilgrove and it was being transported a reasonable distance to Bignor, where the owner seems to have been able to spend more money on obtaining materials, such as oolitic limestone from the Bath area (Aldsworth, undated). The ways in which near-neighbouring villas such as Chilgrove and Bignor were linked by economy and social bonds...
is not known, but may have some significance here. As Lavant stone is not present at Fishbourne Roman Palace, in any of its phases, it appears that Lavant stone was used only in the 3rd and 4th centuries.

**MEDIEVAL USE OF LAVANT STONE**

**DISTRIBUTION PATTERN**

Churches dominate with regard to the survival of medieval stone structures, but Chichester city walls, Arundel Castle, hospitals and manor houses have also been examined. Several hundred sites have now been visited and recorded using data sheets and photographs, although rendering or plastering sometimes made stone identification impossible. The distribution of Lavant stone is mostly in West Sussex, with a few incursions into the nearest parts of Hampshire (Fig. 4). It is also noteworthy that the priory buildings at Shulbrede do not contain any evidence of the use of Lavant stone, where the only material not local to the priory is Caen stone.

**TRANSPORT**

The transport of medieval stone has been studied and it has been recognized that this could be over long distances, 100 km-plus in some instances (Jope 1964). This was generally for the ‘freestones’ that could be carved three-dimensionally (e.g. Caen stone) or those stones with particular decorative qualities such as Purbeck marble (Blair 1991). Long-distance transport was only affordable by water and for stone with particularly desirable qualities. For land journeys of over 19 km (12 miles) the cost of transport in the medieval period was greater than the cost of the stone (Salzman 1967, 119). For general-purpose medieval building stone, therefore, such a radius of distribution is to be expected. Land transport would have been by cart, pulled by draught animals such as oxen, with

![Distribution map showing the recorded use of Lavant stone (numbers refer to the sites listed in the table in the Appendix).](image-url)
preparation of the stone on the quarry site to reduce costs of transporting unwanted material. Fine carving would normally have been done on the building site (Coldstream 1991, 18).

It is therefore not surprising that the distribution of Lavant stone is mostly within a radius of 10 miles (Fig. 4). Even within this, boats may have been used, e.g. the two churches on Hayling Island (which could be reached through Chichester and Langstone Harbour), Ferring or sites in the Arun valley. It is noteworthy that the distribution seems to be centred upon Chichester rather than on the quarry site, but Chichester is the centre of the medieval road system (Munby 1984). Following the relocation of the cathedral from Selsey to Chichester in 1088, the building campaigns in the Cathedral and the City were long-drawn-out and the Cathedral mason’s yard must have been a likely source of expertise for commissioning other stone buildings. Such masons would have learnt the availability and qualities of the local stones and used this knowledge in procuring stone for other works.

**DATING OF MEDIEVAL USE**

As there are no surviving contemporary documents for the construction of Chichester Cathedral or the parish churches of the area, the dating of Lavant stone use (see Appendix) has to rely on other sources. A table can be produced showing the relative distribution over time of the use of Lavant stone (Fig. 5), provided a number of caveats are taken into account. Historical sources such as the Chartulary, wills of Bishops and accounts of the lives of Bishops allow the architectural historian to date phases of work in the cathedral (Tatton-Brown 1994). The surviving records of Boxgrove Priory also allow the accurate dating of phases of construction. Both Arundel Castle and Chichester City walls have contemporary records such as the licence from the King to repair the City walls (Page & Peckham 1935, 72). These can all be considered as providing ‘certain’ or relatively accurate absolute dates.

For the majority of the parish churches it is necessary to rely upon the dating of parts of the buildings from architectural styles. West Sussex was well-served by people such as Walter Divie Peckham in the 1930s and 1940s, and their studies form the basis of the work in the *Victoria County History* (hereafter *VCH*) volumes 3 and 4 (Salzman 1935; 1953). There has been little reassessment and so these dates should be used only as ways of grouping the sites rather than as absolute dates. The main sources of such dates are *VCH* and Nairn and Pevsner (1965). In some instances there are few features that are fashionable enough to be datable and then only fairly broad dates (perhaps by century only) can be suggested. Such dates are included under ‘general’ in Figure 5. Published sources cannot be relied upon totally. For instance, St Stephen at North Mundham is given in Nairn and Pevsner (1965) as Victorian, but is actually a rebuild of a 13th-century church and is a good example of reused Lavant stone. To avoid the dangers of incorrect interpretation such examples are marked as ‘uncertain’ in Figure 5.

The earliest medieval uses of Lavant stone are at Chichester Cathedral and Boxgrove Priory (see case studies below). Not surprisingly, East Lavant parish church, one of the closest to the quarry, has an early and particularly fine example of the use of Lavant stone in its Norman west doorway (see below). The considerable numbers of sites with 13th-century use of Lavant stone mirrors the great increase in parish church building in and after the 12th century (Parsons 1990). Lavant stone was not used in any quantity from the 14th century. Later dates can be explained as alterations and additions to existing fabric, it having been normal for masons to reuse as much stone as possible when making changes as this reduced material costs for new works — the contract for the repair of Bramber Bridge is an excellent example of this practice (Salzman 1967, 538–9).
The fabric of Chichester Cathedral was first analysed by Willis in the 1850s and, more recently, Tatton-Brown (1994; 1996) has considered the evidence as a geologist and archaeologist. The fabric of the cathedral is particularly interesting as it shows a clear link between stone types and phases of construction.

The earliest Norman work from the 1070s onwards was almost entirely in Quarr stone (a Tertiary limestone from the Isle of Wight). This was extensively worked in the late Saxon and early Norman periods but had been worked out by the end of the 13th century. Caen stone (Jurassic limestone from France) was first used in the repairs to the fabric after the death of Bishop Luffa in 1123 (Tatton-Brown 1994, 29). The work of repairing the cathedral after the disastrous fire of 1187 saw the first use of Purbeck marble (Jurassic limestone from Dorset) for column shafts and both Purbeck and Petworth marbles (Cretaceous limestone from West Sussex) for string courses, column bases and capitals. Later 13th-century works on the upper parts of buttresses and corbel tables and parapets used Binstead stone (a Tertiary limestone from the Isle of Wight) because the masons had recognized the importance of choosing a harder wearing stone for such exposed areas.

In the late 14th century repairs to the north transept, including buttress work, a new window and its gable in the north wall and the rebuilding of the upper clerestory wall were carried out in Upper Greensand, probably from the Ventnor area of the Isle of Wight. A lesser amount of Fittleworth stone (Lower Greensand from West Sussex) was also used. The later stone types used at the Cathedral are discussed in Tatton-Brown (1996, 49).

Lavant stone can be seen at a number of places in the cathedral fabric (Fig. 6) and has also been extensively recorded by Tatton-Brown (1994; 1996) and more recently by Atherton Bowen (Tyreman pers. comm.). The locations and dates are summarized in Table 1.

Lavant stone was therefore in use during one of the great periods in the history of the cathedral, a time when more exotic stones such as Purbeck marble were being imported. However, its use was as a humble ashlar rather than as a decorative stone. In areas not on public view, such as the stairs tower to access the 13th-century nave vaults, Lavant stone was used in great quantities. It is notable that it was apparently not used in courses in direct contact with

### Table 1. Use of Lavant stone in Chichester Cathedral.

<table>
<thead>
<tr>
<th>Location</th>
<th>Dating (after Tatton-Brown 1994; 1996)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two bays of Lady Chapel, immediately east of chancel</td>
<td>c. 1120–1187</td>
</tr>
<tr>
<td>Stair tower from near Lady Chapel to access areas above nave</td>
<td>c. 1280–1315</td>
</tr>
<tr>
<td>Parapet wall above south aisle</td>
<td>Re-roofing of 1220s–1230s</td>
</tr>
<tr>
<td>Base of south west tower</td>
<td>1215–1245</td>
</tr>
<tr>
<td>North walls of north aisle chapels of St Anne, St Theobald and St Edmund:</td>
<td></td>
</tr>
<tr>
<td>- St Edmund’s Chapel and walls up to string-course below window of other chapels</td>
<td>mid 13th century</td>
</tr>
<tr>
<td>- Upper parts of walls of St Theobald and St Anne’s Chapels</td>
<td>1288–1304</td>
</tr>
<tr>
<td>North nave – double corbel table</td>
<td>1280–1315</td>
</tr>
<tr>
<td>Chapel of the Four Virgins (north transept)</td>
<td>1188–1207</td>
</tr>
<tr>
<td>North-east corner of St John the Baptist Chapel</td>
<td>1188–1207</td>
</tr>
</tbody>
</table>

### CASE STUDIES

**Chichester Cathedral**

The fabric of Chichester Cathedral was first analysed by Willis in the 1850s and, more recently, Tatton-Brown (1994; 1996) has considered the evidence as a geologist and archaeologist. The fabric of the cathedral is particularly interesting as it shows a clear link between stone types and phases of construction.
the ground, where more durable Caen stone was used. Lavant stone was extensively used in the raising of the nave walls for the re-roofing carried out in the time of Bishop Gilbert of St Leofard (1288–1304), who also had the Lady Chapel rebuilt from its lowest levels (Tatton-Brown 1994, 41).

**Boxgrove Priory**

Boxgrove Priory was a daughter house of the Benedictine Abbey of Lessay, on the Cotentin peninsula of Normandy (Ratcliff 1976). Boxgrove Priory owes its origins to three Norman families originally from the Cotentin peninsula, the La Hayes of Halnaker (originally from La Haye du Puit, 8 km north of Lessay); the D’Aubigny family, Earls of Arundel (from St Martin d’Aubigny 15 km south-east of Lessay) and the St Johns (anglicizing their name from their home estates at St Jean le Thomas, 55 km south of Lessay). When Robert de la Haye married the sister of the Earl of Arundel (his Norman overlord), the two families gave land at Boxgrove to the Abbey of Lessay.

The earliest buildings remaining at Boxgrove are the Chapter House and the transept of the church, which date to about 1120 (Fig. 7). About 1170, the monastic cloisters (whose southern wall formed the north wall of the nave) were built, together with a reconstruction of the monastic choir. This choir was replaced in about 1220 in the Early English style and is the only part that survives intact today as the modern parish church (the medieval parish church was the nave of the monastic church). This article will use the medieval usages of the building in describing different parts of the structures.

There is very extensive use of Lavant stone in the construction of Boxgrove Priory. The fine Norman work of about 1120 in the doorway and adjacent windows of the Chapter House is almost entirely in Lavant stone, carved into columns and used for the blocks of the arches and door. In the north transept (and the bay west of this), Lavant stone was used as quoin stones and in the body of the wall. The blocked round-headed window in the west face of the north transept has Lavant stone in its sill and more rubble pieces (perhaps reused) are amongst the fill of the window.

The nave of the monastic church, which dates to the 1170s, has large amounts of Lavant stone in the surviving northern wall and it is especially common in the detail visible in the southern cloister/north wall of the nave. In some parts of this work there is also Caen stone, although there is no sign that the masons had any preference between Lavant stone or Caen stone and the mix seems to have been random. Variation in the lithology of the Lavant stone in this work, which is unusual compared to other sites, includes highly-phosphatic pieces and a wider range of fossils such as belemnites and echinoids. Recent work has confirmed that this is Lavant stone (Partridge 2002) and may indicate variation in the stone from the earliest phase of medieval quarry working.

The choir of the monastic church survives as the rebuild of 1220, which on architectural stylistic grounds seems to have been built from west to east. There are a number of pieces of Lavant stone visible in the external walls, but these are much less numerous and more scattered than in the earlier work of the nave. The columns of the choir are of Caen stone in the west. This was gradually replaced by Purbeck marble as the masons became more skilled and confident in using this material. The pieces of Lavant stone may have been reused from the earlier choir and there are certainly reused pieces in the 15th-century vestry (now used as the sacristy).
The guesthouse of the monastery survives to the north of the church. It was built in the 14th century and contains only one fragment of Lavant stone, blocking a putlog (and this piece may well have been reused). It would seem that either Lavant stone was no longer available at this period or was no longer the stone of choice of the masons.

**St Mary’s, East Lavant and St Nicholas’s, Mid-Lavant**

The parish church of St Mary, East Lavant, contains a considerable amount of Lavant stone in the west wall of 12th-century date. There is also Lavant stone in the south wall west of the porch, including pieces amongst pitched stonework which may be of earlier date and robbed from the Roman villa sites rather than quarried. The outstanding use of Lavant stone is in the Norman west door (Fig. 8). This early 12th-century doorway is almost entirely of Lavant stone and includes the soffit and two columns (0.14 m in diameter and 1.32 m in length), which are unlikely to be of reused material. More limited amounts of Lavant stone occur as reused pieces in the tower (which is mainly 17th-century brick) and in the east wall of the chancel, which was rebuilt before 1815 (Steer 1976).

The church of St Nicholas, Mid Lavant, is similarly of 12th- and 13th-century origin and was given by Savaric fitz Cana to the Priory of Lewes in the early 12th century. Only 11 pieces of Lavant stone have been located and these are all in the 13th-century church. However, the church was very considerably restored in the 19th century — to such an extent that the plan in VCH shows most of the nave as ‘modern’ work, i.e. Victorian (Crook 1953a, 106). Ponsonby (1920, 51) records that the north aisle was added in 1844 and the nave lengthened in 1872, considerably altering the north, west and south walls of the church. Most of the external walls are now of flint and there is no record of how much this replaced other medieval work. As the church is no earlier than Boxgrove Priory or the early uses of Lavant stone at Chichester Cathedral, it is possible that there was originally considerable use of Lavant stone (as the patron of the church owned the quarry), but that this was mostly too weathered to be reused in the 19th century.

**Quantity of stone and quarry size**

The only known source of Lavant stone is the one quarry site, but this has apparently provided stone for at least 66 buildings in West Sussex, and it could be questioned whether the quarry was of sufficient size. Medieval quarries often appear to have been small in size. Knoop and Jones (1938) quote areas from 1230 m² to as small as 150 m², with some examples of less than 100 m². The aerial photographs of the Lavant quarry suggest a working area of about 30 m diameter (707 m²), which is therefore quite comparable to that of other medieval quarries. To answer the question whether the quarry supplied sufficient stone, it is necessary to make some assumptions.

Problems with identifying Lavant stone in buildings, particularly on interior walls, have already been noted. Stone counts range from single blocks in some buildings to many hundreds in Chichester Cathedral and Boxgrove Priory (and many more uncounted in these large structures). Weathering and decay must have reduced these numbers over the centuries, especially with replacement of original materials during refurbishment (e.g. recent work at Chichester Cathedral). Several churches in the area have also been ‘restored’, particularly by the Victorians, and it is probable that significant quantities of less durable Lavant stone were discarded. Many older structures and abandoned churches have difficulties in identifying the stone, but some are still thought to contain significant quantities of Lavant stone.
also been demolished and the use of Lavant stone can only be identified from the occasional pieces in surviving structures (e.g. St Martin’s, Chichester).

It is still possible to estimate the volume of Lavant stone used and confirm that this could have been produced from the quarry. A total of 4522 stone blocks have been counted at 66 medieval sites where positive identification of Lavant stone has been made. An additional estimate of 3000 blocks has been made for Chichester Cathedral and its precinct where only a proportion of the buildings has been surveyed. This gives a starting estimate of 7522 blocks (assume 7500 for the calculations below). Most Lavant stone is built into walls, but it has been possible to measure 246 blocks from 30 different buildings (usually quoin stones) in three dimensions so that an average volume can be calculated:

- **Average size of single block:** 296 × 208 × 159 mm (approx. 12 × 8 × 6 inches);
- **Average volume of single block:** 0.0106 m³ (approx. 0.35 ft³).

The largest stone block (a slab 1.9 m long, 180 mm thick, unknown width) is in the footings of the south wall of the Lady Chapel, Chichester Cathedral, but this is exceptional. Kenny (pers. comm.) has suggested that this piece is so large that it may well be a reused grave slab. The average block size is fairly small. There are larger carved mouldings and ashlar that could not be measured in three dimensions, but this does not significantly affect the following calculations that deliberately overestimate potential quantities.

- **Assume** that only the lower half of buildings have been surveyed and therefore double the total estimate. This is not strictly true as Lavant stone has been recognized high in walls, but it does make an allowance for large buildings such as Chichester Cathedral and Boxgrove Priory, and goes some way towards making an allowance for buildings that have been demolished or reconstructed in other stone. Therefore, 7500 × 2 = 15,000 blocks.

- Only the outsides of buildings have been surveyed, as interiors are usually rendered, lime-washed or painted. Therefore double the estimate to allow for interior use, i.e. 15,000 × 2 = 30,000 blocks.

- **Calculate** the total volume of worked stone: 0.0106 m³ × 30,000 = 318 m³.

- **Assume** an equivalent volume of quarry waste. This is an arbitrary but not unreasonable assumption. Therefore the total worked volume is 636 m³.

- From aerial photographs, a depression of about 30 m diameter defines the quarry area (i.e. 707 m²). A simple calculation gives a working depth of only 0.9 m. This also assumes that the original outcrop of Lavant stone was not above the surrounding ground level.

It can therefore be seen that the quarry had adequate potential to provide stone for the many buildings and structures in which Lavant stone has been identified, as well as stone for Roman and medieval buildings now demolished.

**DISCUSSION**

It may be that the Roman and medieval Lavant stone was being worked from different pits, but without detailed fieldwork (and excavation) it is difficult to resolve this. However, the lithology of the material appears to be identical and whilst other phosphatic chalks are known in the region, they are not of the same lithology or within close proximity to either Chilgrove or Bignor. It is possible that the hard phosphatic chalk was a topographic feature in the local landscape and Roman farming activity would have led to its discovery. Even excavation may never provide an answer to this question, as medieval activity may have destroyed the evidence for Roman quarrying and mining.

Stone types have sometimes been studied in medieval buildings, but the study of the distribution pattern of a particular stone is much less common. Also, although quarrying as a medieval industry has been studied, the economic and social context is much less well known. However, as this study is within a limited geographical area where a range of historical studies have already been carried out, such a socio-economic analysis has been attempted for Lavant stone.

To attempt to understand the ways in which Lavant stone was traded, the social and economic context of England after the Norman Conquest must be understood (especially given the lack of documentary evidence). The recent account by Dyer (2001) examines the ways in which the system of land-holdings was linked to duties to the lord of the manor and to the sub-lord, the complicated family relationships resulting from intermarriage between Norman families and the relationships between Norman families and the Church.
Using *VCH* volumes, each of the sites where Lavant stone has been identified was researched to establish the ownership of the manor and the patronage of the building. In most cases there is no documentary evidence about the construction of these buildings. Whilst many authors argue that the manor equals the parish, the patronage of the parish church does not always remain with the lordship of the manor. As the lords and patrons were the main source of wealth in the area, it is very likely that they were influential in commissioning or directly arranging the construction of these buildings. This information is summarized in Table 2.

In addition to these lords and patrons, there are 14 other sites where the lord/patron occurs only once. These range from great monastic estates such as Jumièges (Hayling), Battle Abbey (Appledram) or the king (Bosham) to minor local families holding only one manor (such as the de Erneleys at Earnley).

This shows that use of Lavant stone was not exclusive to any one lord or patron. Neither does the use of Lavant stone seem to reflect proximity to the quarry site. The Archbishops of Canterbury had quite scattered lands and, although East Lavant is close to the quarry site, localities such as Slindon and Pagham are more remote. Similarly, buildings of the Earl of Arundel using Lavant stone are widely distributed. The distribution map shows that Lavant stone was reaching a wide range of building projects (Fig. 4).

It is clear that Lavant stone was used with a range of other building stones and without any specialist function in most cases. Tyreman (pers. comm.) suggests a scenario wherein considerable quantities of stone had been brought to the masons' lodge on a building project and rapidly became muddled. This is quite different from the situations proposed at Sompting (Aldsworth & Harris 1988) where there seemed to have been consistent stone types in each delivery, perhaps because it was brought by boat. In most of the sites identified with Lavant stone, transport would have been by cart (probably drawn by oxen) as there was no navigable water within easy reach. When the geographical distribution of Lavant stone is examined, it is clear that this distribution is not centred upon the quarry site, but upon the medieval town of Chichester. The many campaigns of building work upon Chichester Cathedral, the city walls and the other religious and private houses of the city may have led to the establishment of a stone yard in the city. Within Chichester there was also, at first, a large resource of stone available for reuse from the Roman buildings, most of which have been robbed out to foundation level and below. There were certainly yards in medieval towns where building materials were stored, including material from earlier phases of the town, the most famous example being St Alban's Abbey where 11th-century builders used material stockpiled in the 10th century (Parsons 1990, 2). Sadly, there is no documentary proof of such activity in Chichester. At present the reuse of Lavant stone from Roman contexts has not been recorded and so the types of analysis proposed (Eaton 2000, 11) are not yet possible, but should be considered in future work.

Are there perhaps reasons for the use of Lavant stone that are more to do with the links between families than with the stone available by trade? The earliest medieval uses of Lavant stone at Boxgrove Priory occurred when the quarry was owned by the fitz Cana family. Muriel, the wife of Savaric fitz

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### Table 2. Patrons of buildings constructed with Lavant stone.

<table>
<thead>
<tr>
<th>Lord of Manor/Patron</th>
<th>Locations with Lavant stone</th>
</tr>
</thead>
<tbody>
<tr>
<td>De Bohun family</td>
<td>Earhtam, Mid Lavant, Racton, Stoughton, Upmarden</td>
</tr>
<tr>
<td>Boxgrove Priory</td>
<td>Barnham, Boxgrove, Birdham, Hunston, Stoughton, Walberton, Westhampnett</td>
</tr>
<tr>
<td>Bishop of Chichester</td>
<td>Aldingbourne, East Wittering, Selsey, Sidlesham, West Wittering, Cakeham Manor House</td>
</tr>
<tr>
<td>Prebends of Chichester Cathedral</td>
<td>Aldingbourne, East Marden, East Wittering, Oving</td>
</tr>
<tr>
<td>Dean and Chapter of Chichester Cathedral</td>
<td>Chichester Cathedral, Cathedral precincts, Chichester St Mary’s Hospital</td>
</tr>
<tr>
<td>Archbishop of Canterbury</td>
<td>Chichester All Saints, East Lavant, Pagham, Slindon, South Bersted</td>
</tr>
<tr>
<td>Bishop of Exeter</td>
<td>West Stoke, West Thorney</td>
</tr>
<tr>
<td>College of Bosham</td>
<td>Appledram, Bosham, Chidham</td>
</tr>
<tr>
<td>Earl of Arundel</td>
<td>Bilsham, Arundel Castle, East Dean, Singleton, West Dean, Westbourne</td>
</tr>
</tbody>
</table>
Cana, was a member of the de Bohun family whose estates centred upon St George de Bohun in the Cotentin (Thompson 2001, 21–2). As the estates of Savaric’s father were at Beaumont sur Sarthe, it may well have been through his wife (or her family) that Savaric had the opportunity to come into contact with Henry I (who had controlled the Cotentin) and families such as the La Hayes and the other founders of Boxgrove Priory. In our 21st-century lives it is easy to forget the ties of a shared location of family origin and distant kinships that were important to these Norman families.

It is also important to remember that the donation of funds or of materials for church building and repairs carried a spiritual benefit in the granting of indulgences. An indulgence gives its recipient the benefit of a reduced period in Purgatory (the waiting-room of the medieval heaven) and so had real value to the medieval soul. Indulgences were given, for instance to those contributing to the repairs and the carting of timber (given by Henry III to his Chancellor, Bishop Ralph Neville) for Chichester Cathedral in the 1230s (Tatton-Brown 1994, 31).

The wide range of sites where Lavant stone was used indicates the potential income of a quarry site to an estate, whether held by a lord or by a priory. This income might be obtained by directly working the quarry as part of the manor or by letting the rights to the quarry to a specialist tenant. Such a tenant might be part of the supply chain for great building projects, such as Chichester Cathedral. Shulbrede Priory farmed out the rest of the operation on the manor of Mid Lavant, so it is very probable that the quarry was also tenanted.

One of the few accounts to consider the organisation of the medieval stone quarry and masons is that of Knoop and Jones (1938). The early uses of Lavant stone may fit their model of a quarry opened for particular building projects with the stone being used by fitz Cana and his Cotentin associates. Later it seems that the quarry was worked to produce stone for sale on the open market. The purchasers then mixed it with a wide range of other stones, a subtlety not reflected otherwise in Knoop and Jones (1938, 6).

**OPPORTUNITIES FOR FURTHER RESEARCH**

The study of Lavant stone has highlighted the historical and archaeological information that is already available but, all too often, the work of both archaeologists and architectural historians pays little regard to the stones used in the past. There is a real need to improve both the sampling and the recording of stone types on archaeological sites and in historic buildings. This requires an interdisciplinary approach that can result in an improved understanding of the site or monument being studied as well as adding to the understanding of the production and distribution of stones in Sussex and beyond. Prehistoric stone tools are already studied in this way and the increasing study of building stone will prove to be equally worthwhile. Such improvements are beginning, but there is great scope for widening this approach to other stones quarried or used in Sussex. Work on archaeological sites needs to be extended to the careful choice of stone samples for preservation in excavation archives. In site archives the absence of Lavant stone may indicate a flaw in stone recognition and sampling strategies rather than an actual absence from the site.

Those repairing historic structures need to commission stone-by-stone drawings to record and understand the evidence. Frequently historic stonework is cut out for refacing and samples of the material are not kept in an accessible collection. One of the authors (David Bone) is now working with the Weald and Downland Open Air Museum, Singleton, to establish a regional collection of building stones that will be able to house such samples and will become a reference collection for stone identification studies.

There are a great many unanswered questions about building in stone in the 12th to 14th centuries. For many buildings there are no surviving records of construction contracts, of the people involved and their respective roles or the precise dates and costs involved. This was indeed a great period of building in stone, with the master mason acting as architect in the sense of both designer and project manager. Few building contracts survive; there are only four from Sussex published in Salzman (1967, appendix B). It is not known whether or not there was one group of masons who moved from job to job, perhaps taking with them their experience and preferences, or if the pattern was one of more itinerant individual masons. There is the potential to study more of the masons’ marks (e.g. recent work in Chichester Cathedral, Tyreman pers. comm.) in the hope of establishing groups of marks that might be traced from one site to another. Given the recognition of individual
stone types within such structures, it might also be possible to determine if particular masons favoured one stone type or whether stone selection (within a range of what is strong enough for the task) was purely arbitrary.

CONCLUSIONS

Lavant stone was important in its local area as a Roman and medieval building stone. Its use appears to have ceased by the 14th century (apart from reuse when it was incorporated into rebuilding works), perhaps because the stone source had been worked out. It offers opportunities for further studies of the quarry site because there was no later use, unlike such great building stones as Bath or Beer stone. This would be an almost unique opportunity to study a medieval quarry and the working areas surrounding it, providing that plough damage is not too extensive. If there were Roman working areas surviving this would be of additional interest as the survival of Roman quarries is extremely rare (Stanier 2000, 13).

The medieval distribution of Lavant stone has a number of possible explanations that may include the social networks of the Norman lords as much as economic factors. The focus of the geographical distribution of the stone is Chichester, which may indicate the predominance of the city in medieval trade patterns or may indicate the role of a stone yard in the city as the distribution focus of Lavant stone.

This study has also, hopefully, highlighted the opportunities for local people with a variety of skills and experience to undertake original research at very little expense and without any intervention in the archaeological record. There is also a growing role for professional archaeologists, architectural historians, church architects and geologists in recording and conserving the county’s heritage of building stones.

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REFERENCES


Aldsworth, F. G. & Harris, R. 1988. The tower and ‘Rhenish Helm’ spire of St Mary’s Church, Sompting. Sussex Archaeological Collections (hereafter SAC) 126, 105–44.


West Sussex Record Office (hereafter WSRO), Goodwood Estate Ms E88, plans and schedules of landholdings, after 1778, no named cartographer.

WSRO, Goodwood Estate Ms E4988, *Survey and Mapp of a Farm called Langford lying in the parish of Middle Lavant belonging to Thomas May Esqr now in ye occupation of Rebekah Caplin Widow* … by Samuel Jenner of Burwash 1728.
Appendix. Dating of the medieval use of Lavant stone by site. ‘Count’ is the actual number of individual blocks of Lavant stone seen by the authors. These are usually ashlar, but also include some rubble. Blocks are generally on exterior faces and recognizable from ground level.