Querns and quern stones.

Field walking produces finds of many different types and periods. Typically we find pottery from the Iron Age to the present day, bricks and tiles from the Roman period onwards, glass from windows and vessels of many sorts together with prehistoric struck and burnt flint. A lesser category would be worked stone (not including our flints) that are occasional finds. Figure 1 shows one such item, in this case a piece of a lava quern stone recovered from Honey Hill on the Childerley Estate. Quern stones are the most common type of worked stone find, although whet stones and, very occasionally, architectural stone are also found.

Figure 1. Examining a piece of a lava quern stone at Childerley. (Photo courtesy of Mike Coles)

What are quern stones and what were they used for

When hunter/gatherers first started growing wild wheats and barley cereals to supplement their subsistence diets some 10 thousand years ago, they found the need to de-husk the grains and reduce them to a powder. This aided the digestion and released the largest amount of nutrients. In the Neolithic period, and thereafter, this had typically been carried out by crushing the grain between two rough stones. The earliest form was known as a saddle quern, comprising a lower flat or concave stone, usually resting on the ground, on which an upper pebble was rubbed to and fro by hand. Grain was added at the nearest end to the operator and the ground material fell from the sides and furthest end on to a sheet where it was collected. Figure 2 shows a wooden model of a woman using a saddle quern and it came from an Egyptian tomb dating from 2134 – 1991BC (currently held in the William Randolph Hearst collection in Los Angeles Museum of Art).

The saddle quern reached Britain around 4000BC and examples have been recovered from hillforts like Danebury in Hampshire (Cunliffe, 1984), and causewayed enclosure sites like Windmill Hill in Wiltshire and Etton near Maxey in Cambridgeshire (Pryor, 1998). Saddle quern stones were usually prepared from local stone, although there is some evidence for them having been transported some distance where no suitable local material was available.

Figure 2. Wooden model of an Egyptian woman using a saddle quern to produce flour.

Saddle querns remained the main method of grinding food stuffs in Britain up until c.400BC when it was often superseded, but not entirely replaced, by the more efficient and easy to use rotary quern. However, saddle querns are still in use in some parts of the world today.

Rotary querns

This new form appeared in the Middle Iron Age and was probably introduced from Spain. Its earliest form is the so-called Beehive Quern, named as a result of the shape of its top stone and an example found locally is shown in Figure 3.

Figure 3. Top stone of a rotary quern stone, found at Eversden by Dominic Shelley. (Photo courtesy of Stephen Reed)

A beehive rotary quern consists of two thick circular stones of relatively small diameter placed one on top of the other – the lower one is stationary while the upper one is turned by a side handle (the hole for the latter seen clearly in Figure 3). The dimensions of this top stone are shown in Table 1. Material to be ground is fed into the quern via a central hole (or eye) drilled through the upper stone and ground

between the faces of the two stones. The advantage over the saddle quern is that the weight of the upper stone helps break up the grain rather than depending on the downward pressure generated by the operator.

Sub-circular top stone	Diameter 26 – 20cm	Height 12cm	Eye diameter top 6 – 5cm
Handle hole	Diameter 3cm	Deep 5cm	Eye diameter bottom 3cm
Lower surface slightly concave, centre 1cm higher than rim.			

Table 1. Dimensions of the top stone shown in Figure 3.

The stone used for a quern stone needs to be both resistant to wear and durable. Its surface must not wear and become smooth too quickly plus it needs to be capable of re-dressing when it does wear smooth. A variety of rock types have been used, such as the pudding stone shown in Figure 3 which is characteristic of many quern stones from the East Anglian region (Philips, 1950). Others include Greensand, Tertiary sandstones and Millstone grits and the type used depends largely on the availability of local supplies.

Regarding the shape of the quern itself, Curwen (1937 and 1941) produced a classification system that is still relevant today. Not only were there differences between adjoining areas but also a noticeable north-south variation.

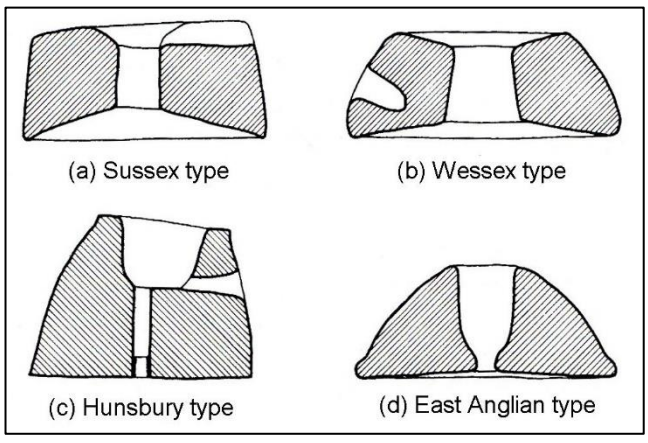


Figure 4. Regional variation in quern styles (based on Curwen)

Versions (a) and (b) are illustrated in the Danebury Report (Cunliffe, 1984) while (c) and (d) are described by Philips in the Breedon Hill excavation report (Philips, 1950). The local example shown in Figure 3 is very similar to the East Anglian variant shown in Figure 4d. The East Anglian variant is characterised by the use of Hertfordshire pudding stone as its raw material.

Hertfordshire pudding stone is a conglomerate which consists of well-rounded flint pebbles in a pale coloured sand matrix bound together with a hard silica cement. It is typically found as boulders and is very hard to shape, hence the quern stones required some skill to make.

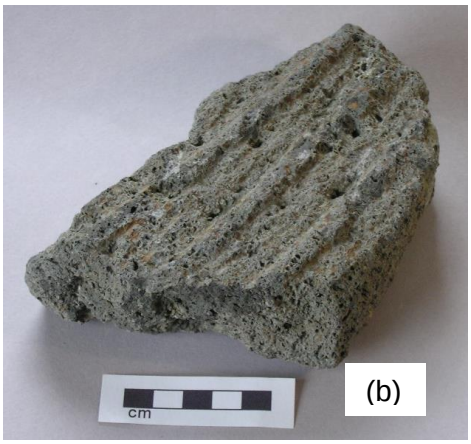
The Roman influence

With the Roman invasion of Britain, they brought with them many innovations and these included changes in how food was prepared. Mills powered by men, animals and water were introduced which used much larger stones and were mostly to satisfy urban needs. Rural and military sites still used small rotary querns. There was also a change in materials, with quern stones manufactured from lava being imported from Germany in large numbers via the Rhine and the North Sea.

The quarries near Mayen in the Eifel region (shown in Figure 5) had been used since Neolithic times and continued to supply material well into medieval times. The advantage of its basalt lava is its lightness so that the Roman army carried them as part of their campaign equipment. It was a reasonably durable material and its open vesicular surface gave a good grinding surface that was effectively self-regenerating. It gave rise to flat disk-shaped stones that were larger in diameter than beehive stones, typically 38 – 43cm, and they were thinner. The grinding faces were often dressed, i.e. cut with furrows in various patterns, to improve grinding efficiency. However, a disadvantage is the material's brittle nature which made it liable to breakage. To minimise losses, it appears the lava was imported as unfinished blocks which were finished off nearer their market. During the Roman period, lava quern stones were used extensively until the end of the 3rd C AD when other, more local, materials

Figure 5. Quarried working surface of the Mayen volcanic lava outcrop.

became popular. Stones made from Millstone Grit and Greensands were also common. Our field walking studies have recovered many small fragments of lava, especially from suspected Roman sites on the Childerley Estate, as shown in Figure 6. These are broken pieces and this makes it hard to accurately size the original complete stone.



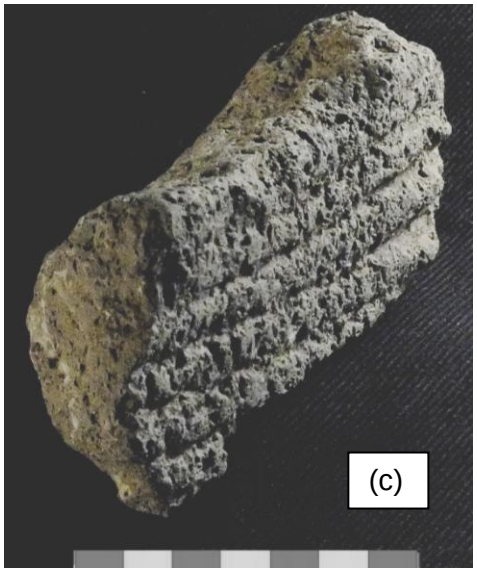
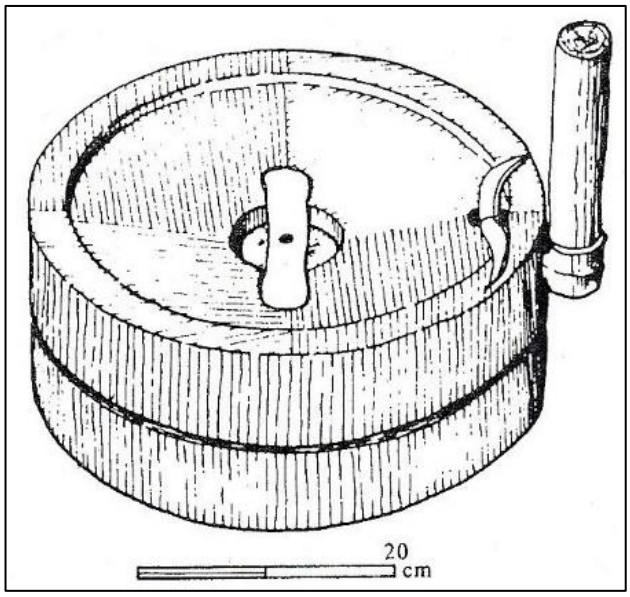


Figure 6. Various pieces of lava quern stones from the Childerley Estate (a and b) and Comberton (c)

(Photos by Stephen Reed and the author).



The top stone shown as Figure 6a with its raised outer lip is very similar to the reconstruction of a Roman quern from Newstead Roman fort, Melrose, Scotland shown in Figure 7

Figure 7. Reconstruction of a Roman hand quern showing the raised lip, or kerb, around the outer edge. (Taken from Watts, 2002, p34).

Dressing of stones

The surfaces of stones like pudding stone eventually become worn flat and have to be regenerated, usually by pecking the surface with a stone or metal tool. Another reason for modifying the surface of a quern stone is to improve the grinding efficiency and to move the ground flour out of the quern more quickly. There are a number of ways this is carried out and Figure 8 shows some of the simple alternatives.

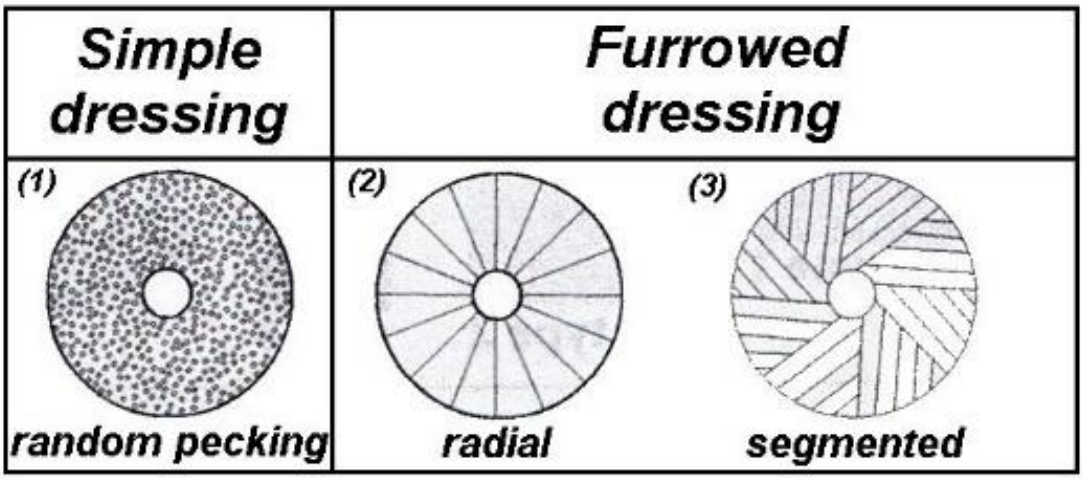


Figure 8. Examples of dressing patterns on hand querns, (1) random pecking over the surface, (2) radial lines drawn from the centre and (3) segments laid out at different angles.(Adapted from Lepareux-Couturier, 2014, p153).

Lava quern stones are often not dressed, especially during the Anglo-Saxon period, however the two medieval millstones shown below illustrate the effect (stones above 50 – 55cm diameter are considered to be classed as millstones)

Figure 9 shows the grinding surface of a small (estimated to be 60cm diameter) lava millstone with a random pecked surface.

Figure 9. Part of a medieval upper millstone with random pecked dressing. (Courtesy of Oxford Archaeology East and photograph by Stephen Reed).

The fragment of a lava quern stone recovered from an area of Roman finds shown in Figure 6b illustrates a widely separated furrow design, which may be segmented.

The photograph shown as Figure 10 illustrates the grinding surface of a medieval medium (estimated 72cm diameter) lava millstone with a surface clearly showing the segmented design.

Figure 10. Part of a medieval upper millstone with a segmented dressing. (Courtesy of Oxford Archaeology East and photograph by Stephen Reed).

Quern and mill stones from the Anglo-Saxon period onwards

The Anglo-Saxon period saw a resurgence in the use of lava stones. These were imported from the Rhineland as unfinished blanks via a number of major Saxon trading centres and ports like *Gippeswic* (Ipswich), *Hamwic* (Southampton), *Eoforwic* (York) and *Lundenwic* (London). Examples have been recovered from the Graveney shipwreck (Fenwick, 1978) near Whitstable, Kent (where they could have been cargo or used as ballast). Also from the Thames Exchange excavation (Freshwater, 1996) in London (where they were broken fragments used to reinforce a riverside structure but which could represent a manufacturing site). Stones from lava and local materials all had a similar size, 400 – 530mm diameter and 40 – 65mm thick. Anglo-Saxon stones did not generally have dressed surfaces.

In the medieval period, the situation changed as milling became controlled by the manors through their ownership of the water mills. This was a significant source of revenue and the mills of Meldreth, for example, had an annual render value of nearly £3 in 1086. Peasants were obliged to use the manor mill and were fined for failure to do so. Only freemen could use hand mills at home and it is estimated that only 20% of grain was milled by hand at this time. Windmills were introduced and became increasingly used from the late 12th C. As they did not need a source of water, like a stream or river, they could be placed in many more locations. Lava stones were still imported via Kings

Lynn in the 17th C but were used more for malt grinding as there was a trend to a demand for white flour to make bread. Both lava and millstone grit gave a grey flour due to the worn particles present in the milled product. This led to the import of French stones from Northern France from the mid-13th C which did give a white product. In the 17th C these were called French burrstones and they cost nearly twice the price of German lava and even more than that of local stones. Dressed stones also became more common again in the 14th C.

French burrstones were built up from a number of small pieces of stone cemented together and the whole bound together by an iron band, as shown in the example from Lode Mill in Figure 11.

Figure 11. Used French burrstone from Lode Mill on the left and a new one on the right. (Author's photograph)

Figure 12. A mushroom shaped millstone from the production site on Curbar Edge, Derbyshire. It is 1.2m in diameter. (Author's photograph).

Due to the cost of French stones, millstone grit stones were still used in the Midlands, Eastern and Northern England for the majority of non-bread milling. Early millstone grit stones were often mushroom-shaped, like the one in Figure 12, but gradually became smaller and more cylindrical, like the blank shown in Figure 13.

Figure 13 A shaped cylindrical stone before its central hole had been cut. Padley Gorge. (Author's photograph)

In the last quarter of the 19th C flour milling started to use porcelain and steel rollers so that traditional mills and millstones gradually disappeared. Artificial cement and grinding medium stones were employed in grinding animal feed.

In the 21st C there has been a resurgence in traditional milling and craft flours and bread have been a recent success story. The traditional water mills at Lode and Houghton, for example, continue to produce small quantities of craft flours using old-fashioned French burrstone millstones. Numerous old windmills have been restored and numbers of them continue to produce baking flours.

Conclusions

Although roving hunter/gatherers undoubtedly used stones to pound roots, nuts and seeds for food, it was the change to a sedentary occupation and cultivating of wild wheats and barleys that saw the development of specialised tools to process grains. The early saddle querns using natural stones gave way to rotary querns in a variety of materials and specially shaped in the search for more efficiency. It is fragments of these robust artifacts that we find today on archaeological sites and while field walking.

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Traces of quern and mill stone production are still visible in the Peak District

The Peak District was the common source of millstone grit querns and millstones in East Anglia. Traces of this industry are still evident in the Peak District today.

Figure 11. Part of an abandoned millstone grit quarry in Padley Gorge, near Hathersage. (Author's photograph)

Figure 12. A line of small pecked holes on Curbar Edge marking out an intended block of millstone grit to be quarried. (downloaded from www.peakscan.freeuk.com/millstone_quarry_features.htm).

Figure 13. Part of a large block of millstone grit in Padley Gorge waiting to be split into smaller blocks.

The small pits shown in Figure 12 would have been joined up using a pick axe to create the groove shown here. Iron wedges are then driven into the groove to split the rock into smaller pieces which are then shaped. (Author's photograph)

Figure 14. A smaller block of millstone grit in Padley Gorge together with individual pieces waiting to be shaped in a working area. (Author's photograph)

Figure 15. Completed and part completed millstones in the Padley Gorge working area together with individual pieces waiting to be shaped. (Author's photograph)

Figure 16. Completed millstones in Padley Gorge. There are believed to be over 150 completed millstones that were never shipped lying in this area. (Author's photograph)

Figure 17. More completed millstones left awaiting collection by the main trackway in Padley Gorge, but never used. (Author's photograph)

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