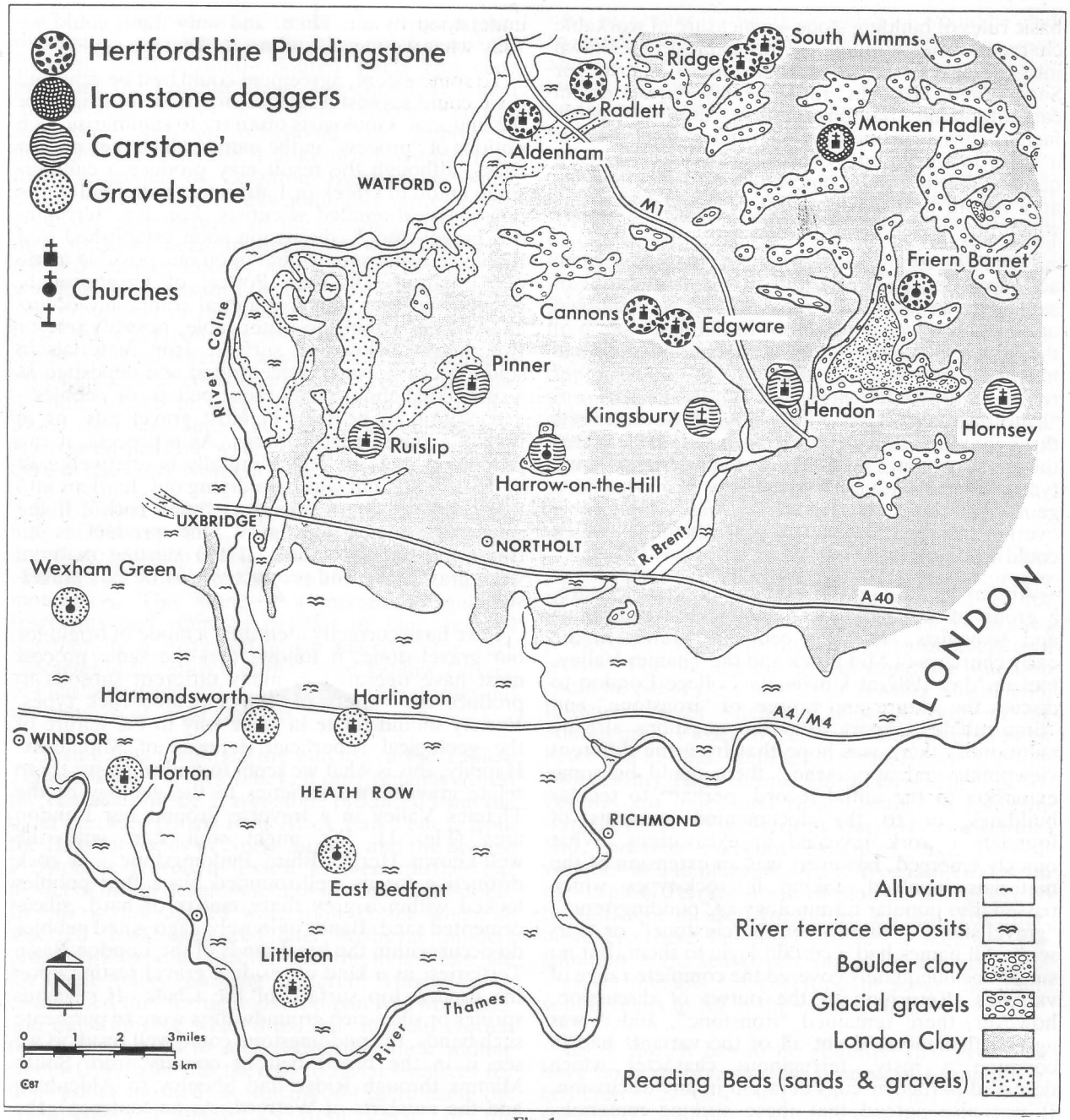

Fig. 1

Gravel-stone in Middlesex churches: what's in a name?

ERIC ROBINSON

THERE IS AN honesty about the fabric of older churches which reveals the opportunism of their builders. In the absence of recognised natural stone, any material locally available which would satisfy the

basic rules of building stone – a measure of workable character, and durability – was liable to be drawn into the structure. As much seems to be true for Saxon and Norman times. Only later, or in cathedral-scale buildings, were uniform ashlar facings considered necessary. If this is true, there is a sense in which early churches offer a geologist a quick synopsis of the outcrops and deposits of an area before he even looks for old quarries or pits which may have survived.

It was in trying to apply these principles when accompanying Bridget Cherry on a reappraisal of stonework in Middlesex recently that we stumbled upon a geological conundrum. In the first edition of the Middlesex volume[1], Pevsner mentions from time to time "ironstone"[2], "flint rubble"[3], and "flint rubble with much ironstone"[4]. But what was "ironstone"? What was "flint rubble"? Several visits throughout the Middlesex ground made it clear that the Pevsner names covered a wide diversity of stone types, none of which were strictly ironstone in a geological sense. Clearly there was considerable overlap in usage between several disciplines which could lead only to confusion.

Aiming to clear up this problem of nomenclature, a group of archaeologists, architectural historians, and geologists, sharing a common interest in the early churches of Middlesex and the Thames Valley, met in May 1987 at University College London to discuss the nature and origins of "ironstone" and "flint rubble". Apart from the questions already mentioned, there was hope that from the different viewpoints and approaches, there could be some extension to the initial record, perhaps to secular buildings, or to the documented accounts of foundation work revealed in excavations. What quickly emerged, however, was an extension of the materials involved, taking in rock-types which passed into popular terminology as "puddingstone", "gravel-stone", "rubble-stone", "carstone", or "sarsen". All names had a certain logic to them, but no single one adequately covered the complete range of varieties. Returning to the outset of discussion, however, there remained "ironstone", and it was agreed that most, if not all of the variants had in common a rusty, ferruginous character which deserved particular consideration in any discussion. It was also agreed that these striking materials, which figure in the fabric of several medieval churches, apparently fell out of use in later times (roughly, post-16th century). Clearly, it was important to discover acceptable geological names for the material which could be objectively used and understood by all. Then, and only then, could we "Say what we mean, and mean what we say ..."

To some extent, agreement could best be achieved if we could suggest a satisfactory mode of origin for the material. Geologists often try to summarise such notions of "process" in the names which they give to rocks, although the result may produce a cumbersome union of Greek or Latin roots unhelpful to the non-Classical-minded scientists. For our "ferruginous gravel-stone", discussion soon established that there was some agreeement upon one possible mode of formation. Dr John Potter, of Farnborough, pointed out that similar material commonly occurs as iron-pan within the water-table, possibly one or two metres below soil surface. Iron materials in solution can become concentrated and deposited as a rusty crust about sand grains, pellets, or pebbles – a condition to be seen in most gravel pits, or in freshly exposed road cuttings. As a process, it can produce a material which initially is relatively soft and workable, but which on drying out, hardens into what anyone would regard as "solid rock". If the subsurface material is sand, the product is an iron-cemented sandstone. If the starting material were gravel, the end-product would be our gravel-stone.

If we have correctly identified a mode of origin for our gravel-stone, it follows that the same process must have operated in many different subsoils to produce the variety of iron-cemented rock types. Variety should relate in some way to the nature of the geological superficial deposits of Middlesex. Happily, this is what we seem to find when we try to relate gravel-stone varieties to the geology of the Thames Valley in a traverse around our London area (Fig. 1). We might well start with the well-known Hertfordshire Puddingstone – a rock distinctive for its well-rounded black flint pebbles locked within a grey flinty matrix of hard, silica-cemented sand. Bands of loosely-aggregated pebbles do occur within the basal sands of the London Basin Tertiaries, as a kind of residual gravel resting upon the eroded top surface of the Chalk. If siliceous springs or silica-rich groundwaters were to permeate such bands, the puddingstone could well result as we see it in the broad belt of country from South Mimms through Ridge and Shenley to Aldenham and the outskirts of Watford. As an 'outcrop', the best exposures are to be found in the towers of the village churches, on the assumption that the pebble-bed was known to occur just below surface, and building material was strictly local in origin before means of transport were much improved.

1. N. Pevsner (1951).
2. *Ibid.*, East Bedfont, p. 44; Pinner, p. 131.
3. *Ibid.*, Littleton, p. 123.
4. *Ibid.*, Harlington, p. 93.

Moving southwards and upwards in the geological succession, we come on to the outcrop of the Reading Beds – multi-coloured sands and clays predating the London Clays. The church at Pinner shows large blocks of a dark brown coloured sandstone, with an occasional flint pebble to distinguish it from the well-known Carstone from the Cretaceous of Leighton Buzzard or North Surrey. These same blocks admirably represent the grain-size and textures of the Reading Beds were they to have been impregnated with iron as a mineral cement. Locally, the actual outcrop of the Reading Beds runs into the centre of Pinner, up the valley bottoms of the small streams which join to form the Pinn running south to Ruislip. It only remains to find whether any of this local outcrop is iron-stained and consolidated, to have located the possible source of supply for a stone which also found its way into the fabric of St Mary's, Harrow-on-the-Hill, where large blocks occur at the base of the early Norman tower.

Still further south, away from the London Clay hills of Harrow and Wembley, we come to the gravel-stone which first drew attention in the walls of churches of the area between the A4 and M4 motorways. This stone is a mixture of angular fragments and rounded pebbles of flint, bonded together by a rusty red-brown matrix – the very character of the gravels of the broad Taplow Terrace of Pleistocene age, extending beneath Heathrow and the suburbs of West London.

Having thus identified the outcrop of the Taplow Terace of the Thames valley, it only remains to test the character of the gravel-stone produced from the older terraces (Boyn Hill, Black Park, etc.), from the Bagshot Sands of North Surrey, and the diverse Pleistocene gravels of Essex, to check further our model of *in situ* development of the cemented stone. In this we all agreed with John Potter when he asserted that Saxon and later medieval builders probably looked no further than the immediate site for their bulky building material. Having once established that ferruginous iron-pan was workable, and quite durable when dried out, it could be that they felt no need to seek further for their walling stone. Only later did they go to distant sources for finer ashlar finished, at which point there came the cream-coloured limestones from Caen, or the green-speckled Greensands, popularly known as Reigate Stone, from the quarries of the North Downs in Surrey. This pattern may have continued up to the 14th century for modest parish churches, after which time the better quality building stones from Oxfordshire and Lincolnshire were being frequently transported by ox-cart or river barge into the Thames Valley. Whether our gravel-stone was used thereafter is something which we would be glad to hear about from any site archaeologists now alerted to the interest in this distinctive suite of stones. Re-use there certainly was at earlier times, and it may have continued to be re-used in the core of later walls.

It still remains to clear up the name which we might give to this whole category of rocks. If ironstone, gravel-stone, and carstone, are all inappropriate for one reason or another (and ferruginous-cemented-gravel-stone too cumbersome though accurate), there remains the descriptive term *Ferricrete*, introduced by Lamplugh in 1902. At that time, he introduced two other terms which have been widely accepted, namely *Calcrete* (for lime-cemented sands or gravels), and *Silcrete* (for silica-cemented sands or gravels). Ferri- in our term stresses the iron cementation which we have already agreed is shared by all the varieties of our range of textures. It may not be euphonious at first, but it could solve our problem and allow us to "Say what we mean ..."

Because Geology is at best practical if not pragmatic, we need to cite type localities for our rock types so that the reader can go and see for themselves the colours and textures. They can then proceed to identify further examples on their own ground. For the original 'gravel-stone' the standard could be either the churches of St Mary Magdalene, Littleton, or St Michael's, Horton, both in the Staines area. Closer to Central London would be St Peter and St Paul, Harlington (Figs. 2 and 3), or the 14th century Tithe Barn at Harmondsworth (Fig. 4). For the 'carstone' sand variety, either St John the Baptist, Pinner (Fig. 5), or St Mary, Harrow-on-the-Hill, provide excellent examples. To find all varieties in one place, St Mary, Wexham Green, on the Taplow Terrace north of Slough, may prove to be sufficient in itself for future studies. Together, however, these buildings provide a skeleton distribution map, tentatively linked to regional geology. It remains for everyone to scour the intervening areas to fill in the missing links.

In all this, it has to be admitted that geologists have no certainty over the process of formation of ferricretes as described above. What has been suggested is but one possibility which we shall have to continue to examine and test by expanding the record of the material in buildings, and by critically examining iron-pan whenever it is exposed. Already, it has been found that familiar ferricretes of our Middlesex experience are also to be found in the very similar geological setting of the Hampshire Basin. Dressed blocks of sand facies and rarer sands with flints pebbles are to be seen in the walls and

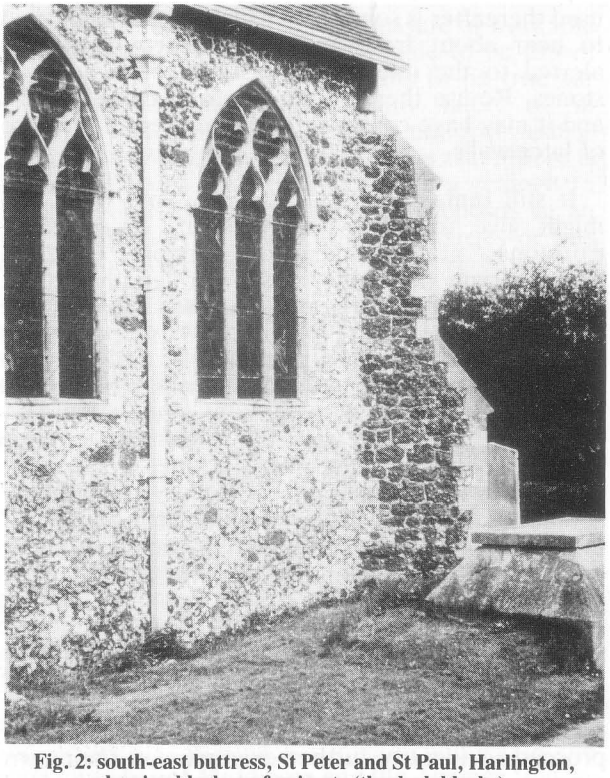

Fig. 2: south-east buttress, St Peter and St Paul, Harlington, showing blocks or ferricrete (the dark blocks).

simple tower base of the 12th century church of St Mary, Swaythling, in the northern outskirts of Southampton. There must be others if we have the time to look. This alone, however, suggests that the material most likely is formed by a process as universal as ground-water circulation through sands or gravels of appropriate openness of texture. If this is correct, then we should expect our ferricretes in the heathlands of East Anglia, or the moors of the Cheshire Plain amongst other areas of sandy soil.

Apart from this prospect of geological questing, there remain some essentially archaeological questions which I simply pose without trying to answer. Why for example are there no records of ferricrete from the frequently explored foundations within the City of London or Westminster? The sands and gravels of the Thames terraces are and were there *in situ*, including iron-pan levels. Was it a material unrecognised as a potential walling stone until late Saxon-early Norman times? Then, why, once it had been used, did it so abruptly fall out of favour in or around the 14th century? It was one of the express purposes of this short article to put just these questions to a readership who might possess the answers which elude a geologist.

It is difficult to understand why there has been no mention of ferricrete blocks in the accounts of London excavations. "Once seen, never forgotten!" must be an old adage which we could apply to this strongly coloured and strangely textured rock type, yet up to now I can find no clear reference to anything which could be examples in many published accounts of excavations. As much is true in the experience of my colleague in this study, Colin Bowlt, who originally came upon the puzzling rock-type in excavations of a medieval manor house in Isleworth. If we are not correct in this, it is a point on which we would dearly like to be corrected, so do prove us wrong!

Post-scriptum, October 1987

In a collaborative exercise such as this, new facts are appearing all the time. For example, my colleague Robin Sanderson of the Geological Museum, South Kensington, has discovered that what must be ferricrete was referred to in the Geological Survey Memoir for Basingstoke[5] under

Fig. 3: close-up of ferricrete blocks in St Peter and St Paul, Harlington. Angular flints, gravel-stone blocks of subangular flint pebbles bonded in a rusty-red matrix. Gravel-stone variety of ferricrete. (Lens cap is 50mm in diameter).

what he regards as the nicer-sounding term "ferrells", possibly straight from Hampshire vernacular. Satisfyingly, ferrells relate to the High Level gravels of the area, and were used for rough walling.

In September, an article was published on this subject[6].

Finally, to resolve all possible uncertainties, it would be sensible to deposit typical specimens of ferricrete varieties in both the Geological Museum (now part of the British Museum (Natural History)), and the Museum of London, if they would accept them. There is, however, one problem unusual for a geologist, the ethics of sampling the known outcrops; the risk of prosecution for deliberate vandalism. It may take a little time to acquire specimens.

5. Osborne White, , 1909.
6. J. Potter 'Geological traces of Saxon churches in the London Basin' *Geology Today* **3** no. 5 (1987) 164-8.

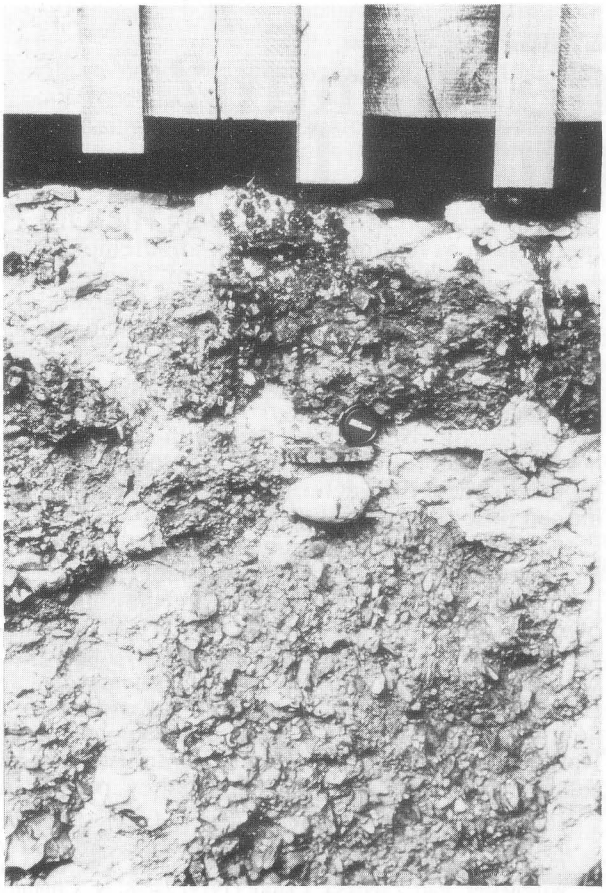

Fig. 4: close-up of ferricrete blocks in the base of The Tithe Barn, Harmondsworth. Lens cap is 50mm in diameter, making these the largest blocks of gravel-stone variety of ferricrete discovered in this survey.

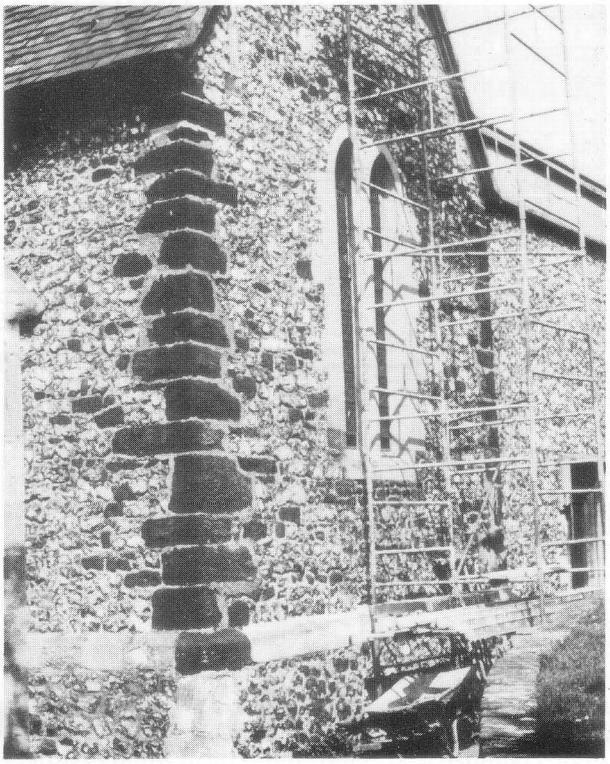

Fig. 5: dark red-brown carstone facies of ferricrete, south face quoins, St John the Baptist, Pinner.

A short inventory of Churches containing ferricrete varieties

Hertfordshire Puddingstone

St John the Baptist, Aldenham (140950), the tower and buttresses.
St Margaret's, Ridge (213005), large blocks in the tower.
St Margaret's, Edgware (192918), blocks in the tower.
St Lawrence's, Stanmore (185913), many blocks in the tower.

London Clay septarian nodules

St Mary the Virgin, Monken Hadley (251975), mainly in the tower.

Ferricrete of carstone variety

St Mary's, Hendon (229896), infill to S.W. arched doorway, buttresses to the tower.
St John the Baptist, Pinner (124896), blocks in the tower; long-short quoins to N. and S. chapels.
St Mary's, Harrow-on-the-Hill (153875), blocks in courses in the west tower; internal wall facings to the south aisles beneath windows.
St Martin's, Ruislip (091878), five or six blocks in E. and N.E. walls.
St Mary's, Hornsey (308892), many blocks in base to the tower.

Ferricrete of pebble-gravel variety

St James', Friern Barnet (271979), blocks in tower and S. wall.
St Peter & Paul, Harlington (089782), E. end wall and buttresses.
The Tithe Barn, Harmondsworth (052779), enormous blocks in walls.
St Mary's, East Bedfont (085736), E. end walling and buttresses.
St Mary Magdalene, Littleton (070688), E. end wall and S. wall.
St Michael's, Horton (013759), blocks in the tower.
St Mary's, Wexham, Slough (991814), blocks in the W. end and S. wall (together with carstone variety).