Fig. 1: machine-cut slot in trench 3.

Palaeoenvironmental investigations at Bryan Road, Rotherhithe

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Abstract

This article presents the results of analysis of biological remains collected from Bryan Road, Rotherhithe (Fig. 2), and briefly discusses them in the context of the archaeology of the middle Thames floodplain and the complexities of interpretation.

Introduction

The site (TQ 7994 3653) was the subject of an archaeological evaluation undertaken by the Museum of London Archaeology Service in the Spring of 1993[1]. Prior to development, three trenches were opened, each measuring 30 by 13m (100 by 40ft). The objectives were to determine the nature of the stratigraphic sequence, particularly with respect to any prehistoric peat horizons, and to investigate the

1. S Tucker *Salter Road and Rotherhithe Street London SE16. An Archaeological Evaluation.* Unpublished Museum of London Archaeology Service archive report (1993).

possibility of Roman activity in the immediate vicinity. Environmental sampling and analysis were considered necessary as part of the study of the stratigraphic sequence.

During the evaluation, trenches 1 and 2 proved to contain no archaeological deposits below the foundations of the 20th-century school which stood on this site. Trench 3 also had to break through the school foundations but the layer beneath this contained some post-medieval bricks. This layer in turn sealed a substantial waterlain clay-silt deposit, approximately 2m thick.

The site lies about 100m from the present course of the Thames. In antiquity, the Thames would have been shallower, but much wider and the likelihood of low-lying areas being occasionally/ seasonally flooded and covered with river silts would consequently have been much greater. Thus, waterlain deposits are common on sites close to the Thames and are generally regarded as the result of centuries of such flooding. The lower part of the waterlain clay-silt deposit at Bryan Road (Fig. 3) contained both Roman brick and tile, and a Saxon pottery sherd. The layer below (context 21) contained much Roman material, including pottery, more brick and tile and an assemblage of metal objects. Some burnt flint and a fragment of worked flint were also found; the collection has been dated to the mid-3rd century and the flint is assumed to be residual in this context. It was not possible to excavate by hand the deposits below this Roman layer, but a slot was opened by machine (Fig. 1), and the sequence was recorded and sampled in section. A peat/organic silt horizon was revealed directly underneath context 21, overlying another waterlain clay-silt deposit. It was not

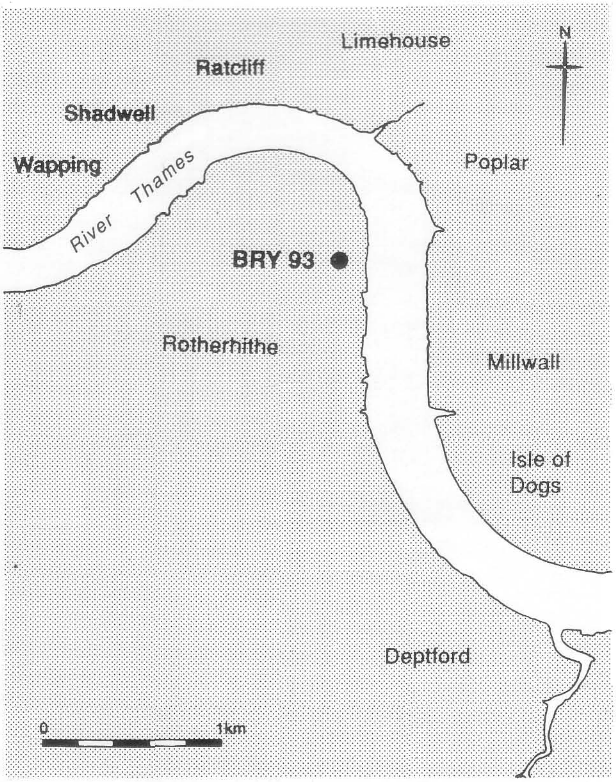


Fig. 2: map showing location of site.

possible to dig deeper as the water table had been reached and the trench required constant pumping.

The sampling

Several types of environmental samples were taken from the section revealed in the slot at the bottom of trench 3. Three monolith tins (steel boxes 50 by 5 by 5cm; 20 by 2 by 2in) were used to collect material from the sequence itself (Fig. 4). These samples were described and sub-samples for pollen analysis

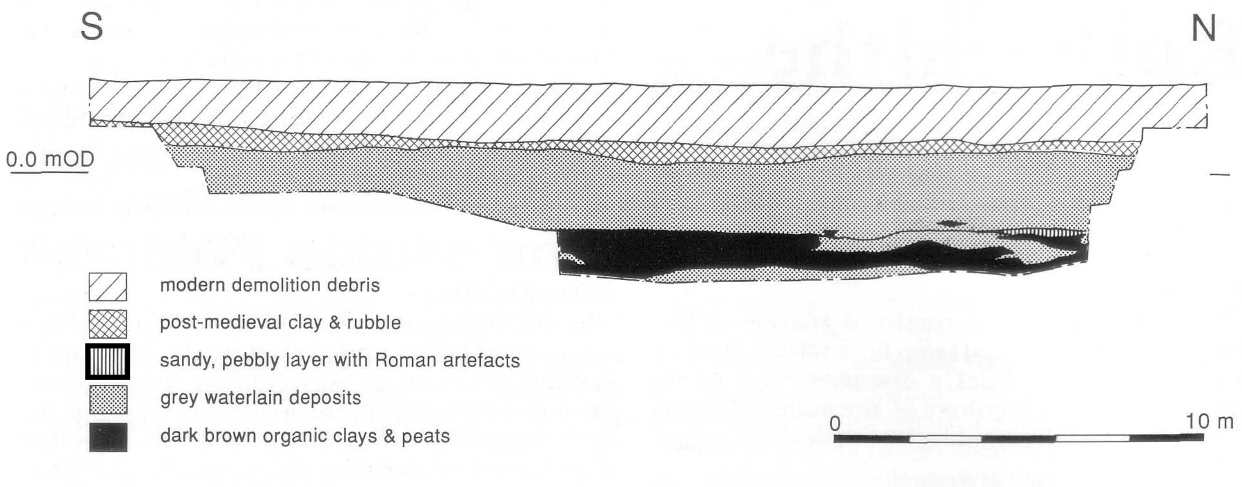
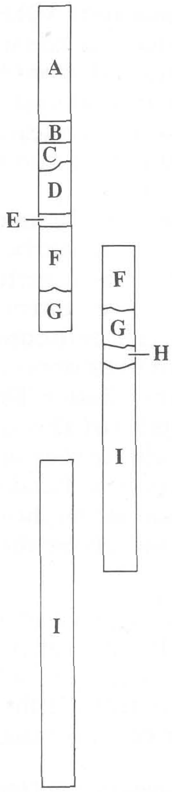


Fig. 3: section of trench 3.



A 10 YR 2/2 Very dark brown organic clay / silt. Many decayed and semi-decayed plant remains. Indistinct boundary to **B**.

B 10 YR 3/1 Very dark grey homogeneous silt / clay. Indistinct boundary to **C**.

C 10 YR 2/1 Black organic clay / silt. Sharp boundary to **D**.

D 10 YR 3.5/2 Very dark greyish brown clay / silt with occasional sand patches. Indistinct boundary to **E**.

E 10 YR 3/1 Very dark grey organic clay / silt. Indistinct boundary to **F**.

F 10 YR 4/2 Dark greyish brown homogeneous silty sand. Grades into **G**.

G 10 YR 3/1 Very dark grey mottled sandy silt. Sharp boundary to **H**.

H 10 YR 4/2 Dark greyish brown silt with occasional discrete organic patches. Sharp boundary to **I**.

I 10 YR 2/1 Black humic peat.

Fig. 4: three soil samples from the slot at the bottom of trench 3.

were taken. Bulk samples were taken in a column through a cut feature visible in the peat to one side of the monolith samples. Four samples of wood and peat were taken from the peat horizon for radiocarbon dating.

The samples were initially processed for very basic information; e.g. to see if biological material had preserved well and, if so, what could be learnt about the site. This preliminary study showed that preservation of several biological categories was good and would sustain further work. One peculiarity was that both pollen and molluscs had preserved well in certain locations. These categories of environmental remains are not generally found preserved together, since pollen is frequently not preserved in alkaline conditions. However, the molluscs had been recovered from the cut feature, which contained a higher proportion of minerogenic (inorganic) sediments than the peat, from which the pollen samples were taken. It was very difficult to identify either the character or purpose of, the feature. One possibility considered at the time of sampling was that it represented a hollow caused by a tree falling, which was then either filled with sediment including molluscs, or colonised by molluscs as a new micro-environment. This was one of several questions raised by the preliminary study. The principal objective was, however, to look at the character of the local vegetation and how this might have developed through time. A further point was whether any evidence for human activity could be isolated in the sequence.

The dating

Apart from the fact that the peat horizon was sealed by a Roman deposit, no other dating information was available. As it would have been pointless to carry out a study of the vegetational succession in the absence of dating, two samples were submitted for radiocarbon dating: fragments of alder (*Alnus* sp.)[2] from just above the interface of the peat with the silt-clay beneath it. This location was selected as the most important part of the sequence to date. The purpose of the two samples from one location was to monitor the degree of internal consistency, and the validity of the results, which were as follows:

Lab. Ref.	calibrated date	uncalibrated date
Beta 68576	3940-3510 BC	4910+-80 BP
Beta 68577	3970-3700 BC	5040+-80 BP

These are given in radiocarbon years before present (i.e.1950) and calibrated years BC with a 95% probability that the actual date lies within the given

2. I Tyers, *pers comm.*

range. The dates show a high degree of consistency and may be quoted with a high level of confidence. To put the results in an archaeological context, the dates correspond to the Mesolithic/Neolithic transitional period. However, these are cultural periods and it is perhaps more meaningful to consider the dating in climatic terms. Broadly this would assign the dated phase to the middle Holocene Atlantic zone[3] that is, during the Climatic Optimum[4]; a period of warmer (some 1.5 degrees centigrade), wetter conditions. Unfortunately, it was not possible to submit any more samples for dating, so the framework as it exists is of peat formation beginning approximately 4000 years before the site was inundated with a deposit containing 3rd-century AD Roman artefacts.

The pollen

Pollen analysis has been carried out to reconstruct the past vegetation and general environment of the local area. Fig. 5 is a simplified pollen diagram constructed from data obtained from samples taken from the peat and sediment columns. The sequence can be divided into three pollen zones which illustrate the period of peat accumulation. The lowest zone (1) is attributed to the middle Holocene, Atlantic period (Godwin's pollen zone VIIa, Flandrian chronozone II). This period was the warmer (by some 1.5 degrees centigrade) and more humid period of the middle of this Interglacial which lasted from *c* 7000 to 5000 years ago. Typical pollen assemblages from this period show the dominance of woodland trees including, notably alder (*Alnus* sp.), oak (*Quercus* sp.), elm (*Ulmus* sp.) lime/lindens (*Tilia* sp.) and hazel (*Corylus* sp.). It should be noted that lime in this case is of the native lime/lindens species and not the Mediterranean citrus. This assemblage of trees reflects climax deciduous woodland which had developed with little or no impact of prehistoric (mesolithic) communities. The pollen percentages of lime are high for this usually poorly represented type and indicate that this tree was the dominant component of woodland on the better drained soils of the region. Alder, however, was dominant in carr woodland along the river floodplain.

The boundary between pollen zone 1 and zone 2 has been delimited at a point where pollen percentages of the elm decline to low values and which is also associated with a change in stratigraphy from sediment to peat. This is typical of pollen diagrams

3. R L Jones and D H Keen *Pleistocene Environments in the British Isles* (1993).

4. J J Lowe and M J C Walker *Reconstructing Quaternary Environments* (1984).

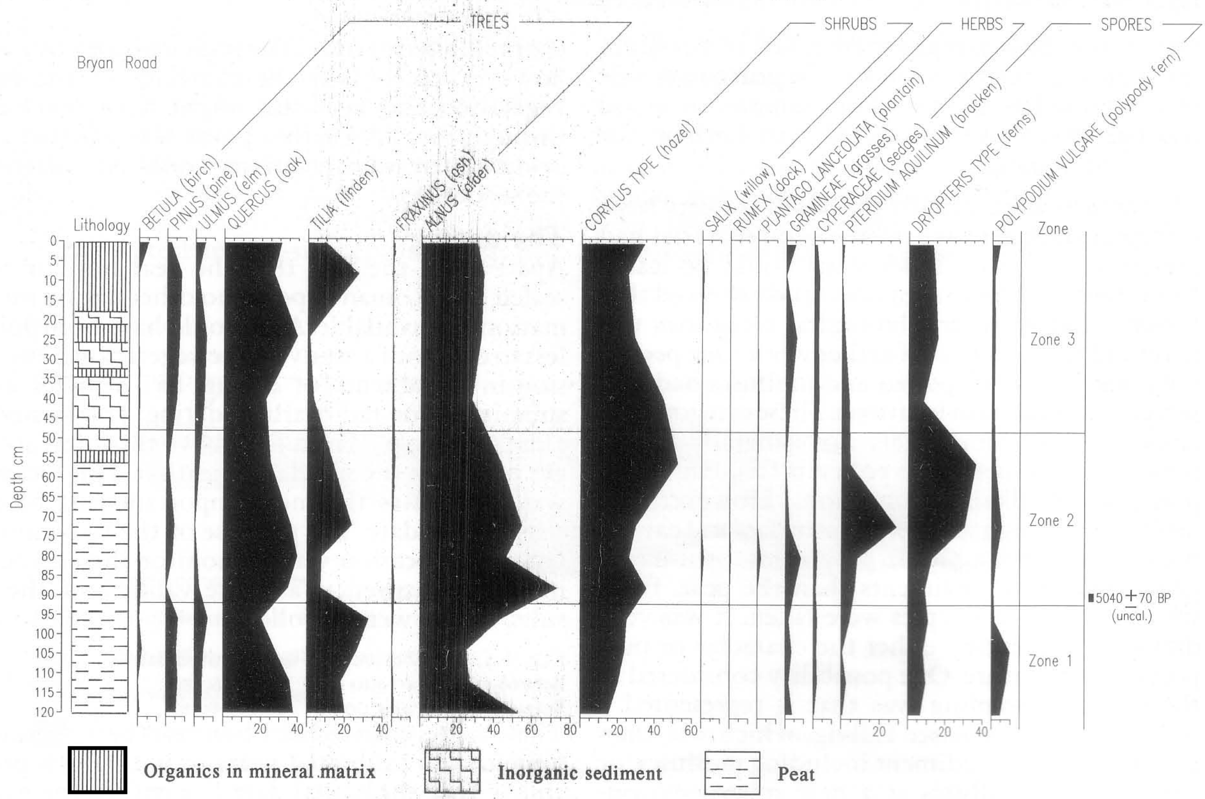


Fig. 5: simplified pollen diagram from peat and sediment columns.

spanning the period *c* 5000 radiocarbon years BP, being the often described 'Primary Elm Decline' which has been shown to be a broadly synchronous phenomenon across the country including southern England[5]. The radiocarbon measurement of 5040+70 BP (Beta 68577) at Bryan Road is thus typical. Many explanations for the cause of this event have been put forward, ranging from climatic change, Neolithic clearance of woodland for agriculture and the use of elm (and lime) leaves for fodder. The recent demise of elm trees during the 1970s has given weight to the Primary Elm Decline having been due to fungal disease carried by the elm bark beetle (*Scolytus scolytus*). The late Dr. Maureen Girling found evidence of such beetles on Hampstead Heath in peat horizons just prior to the elm decline identified by James Greig[6]. From this evidence, Girling suggested that although the elm bark beetle was present at an earlier date, it was the opening of woodland by Neolithic peoples which allowed the rapid spread of fungal disease carried by the beetle. Hence, the Primary Elm Decline is frequently associated with the first indication of cereal cultivation introduced at this time[7].

In pollen zone 2, a few centimetres above the elm decline, weeds of cultivation are found. These include Gramineae (grasses), ribwort plantain (*Plantago lanceolata*), docks (*Rumex* sp.) and bracken (*Pteridium aquilinum*) which are a clear indication that localised short-lived clearances were being made for cultivation in the Neolithic. This may be an example of landnam clearance[8]. Cereal pollen was not recovered, but the early types had poor dispersal characteristics and are not found unless cultivation was close to the sampling site. Whether the preceding Mesolithic cultures had any impact on the environment through their hunting and foraging subsistence is much debated. However, the events discussed here mark the first significant effects of prehistoric people on the woodland and landscape of this region. Subsequently, in the upper part of pollen zone 2 and in zone 3 which are thought to be late Neolithic and perhaps early Bronze Age, there is some regeneration of forest. This secondary forest comprises the re-establishment of elm and lime (although the latter fluctuates). In pollen zone 3, expansion of herbs marks later prehistoric activities which led to further opening of the woodland. Radiocarbon dating of the upper peat boundary has not yet been undertaken but it appears likely that there was a hiatus between these peats/sediments and the overlying Romano-British context 21. This apparent stratigraphical anomaly is likely to be tied in with fluctuating sea-level and ground water-level changes in the period under study (see below).

The molluscs

The samples on which the mollusc analysis is based come from the feature in the peat. It was sampled in order to reconstruct the environment at the period when the feature formed by examining the type of mollusc community living there, and the range of environmental conditions indicated. These are reconstructed by a study of habitat preference of the modern representatives of the species.

Four samples were examined, but the majority of shell fragments were concentrated in the bottom sample. It is possible that the shells accumulated as a result of a single depositional event, rather than representing a community living on a stable surface, particularly as the assemblage is composed of both terrestrial and freshwater snails in approximately equal proportions (Fig. 6). Some of the freshwater species, for instance *Lymnaea truncatula*, indicate low energy aquatic conditions, such as pools, whilst others such as *Valvata piscinalis* prefer channels or rivers. It would also appear that there was some input from a larger body of water, for instance the putative channel seen in the section recorded in the slot. Alternatively, the molluscs could have been deposited during a storm or flood, which may also have transported the terrestrial species. The large quantities of freshwater shells indicating slum-type environments (i.e. marshes, ditch bottoms) perhaps represent an established community as many individuals of marsh-dwelling species were identified in the terrestrial assemblage. The species in question, including such comparative rarities as *Segmentina nitida*, indicate that local conditions were damp and muddy, with plenty of aquatic vegetation and perhaps shallow pools of water, indicated by species such as *Bathyomphalus contortus* and *Planorbis planorbis*. The land snails were dominated by shade-dwellers and marsh species, the latter including *Vertigo antivertigo*, suggesting the same slum environment as indicated by part of the freshwater assemblage.

5. R G Scaife 'The '*Ulmus* decline' in the pollen record of South-East England and its relationship to early agriculture' in M Jones (ed.) *Archaeology and the flora of the British Isles* (1988) 21-33.

6. I G Simmons and M J Tooley *The environment of early man in Britain* (1981; M A Girling and J R A Greig 'A first fossil record for *Scolytus scolytus* (Fabricius) (Elm Bark Beetle): its occurence in elm decline deposits from London and the implications for Neolithic elm disease' *Journ Arch Sci* 12 (1985) 347-52.

7. *Op cit* fn 5.

8. M A Girling 'The bark beetle *Scolytus scolytus* (Fabricius) and the possible role of elm disease in the early Neolithic' in M Jones (ed.) *Archaeology and the flora of the British Isles* (1988) 34-8.

but not yet from carr environments.

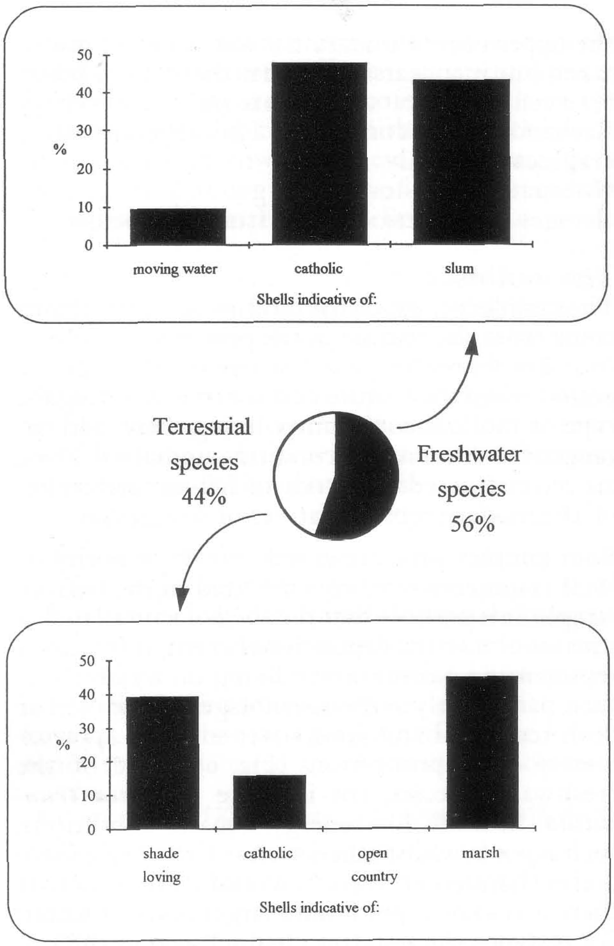


Fig. 6: breakdown of molluscs recovered into ecological groups.

The shade-dwelling part of the terrestrial assemblage contains no species which actually live on trees, but some of the species recovered, notably *Discus rotundatus* and *Aegopinella nitidula*, may indicate woodland or scrub as opposed to long grassland, and suggest that trees were present. One species is particularly interesting in this context. *Trichia striolata* is a species thought to have lived in early and middle Flandrian (mesolithic) forests, and then became locally extinct in the British Isles following habitat destruction as a result of neolithic deforestation[9]. The level of the main mollusc horizon is approximately contemporaneous with the regenerated woodland suggested by the pollen evidence, and so could be an indication that the species survived through a brief phase of woodland clearance. One species, *Pupilla muscorum*, was found whose modern environmental preference is for open-country habitats. However, it is thought to have lived in marsh environments in the Late Glacial (Devensian) and early Flandrian periods[10]. This would compare well with the damp, marsh-like environment suggested by the other molluscan species.

The process by which this mollusc assemblage accumulated in one location is problematical, but it is possible that a carr-type environment was inundated on a seasonal basis by flood water. It is also possible that the assemblage did accumulate in a tree-throw hollow in the marsh. Such occurrences are known on chalk downland[11], but not yet from carr environments.

The Southwark peats and the 'Tilbury' model

Similar studies have previously been undertaken on a number of sites in Southwark which have peat horizons[12], for example Willsons Wharf and the Southwark Leisure Centre. Radiocarbon dating of the peat horizons has placed these sites within the same broad time span, roughly equivalent to the Bronze Age, *c* 1500-850 BC. It is tempting to consider all new data in relation to the existing corpus of information from Southwark.

A model for the formation of the peats in the Lower Thames Estuary was put forward by Devoy in 1979[13], who suggested that a number of factors and events had led to the deposition and accumulation of alternating marine clay-silts and peat bands in since the end of the last Glacial. Since then, it has been widely accepted and applied (in a rather cavalier fashion) to sites in London which frequently lie outside the original study area. This presents a number of problems, as touched on by Rackham[14], namely that the sites are generally much further upstream than Devoy's sample locations and could, therefore, have been subject to different influences at different periods. This is particularly the case in locations not directly associated with the Thames itself, for instance in the Thames tributaries and courses of palaeochannels. In such instances, sediments and peats could accumulate in the manner described by Devoy, but as a result of processes and/or events different from

9. J G Evans *Land snails in archaeology* (1972).

10. M P Kerney, R C Preece, and C Turner 'Molluscan and plant biostratigraphy of some Late Devensian and Flandrian deposits in Kent' *Phil Trans Royal Soc London* **B291** (1980) 1-43; *op cit* fn 9.

11. M G Bell 'Valley sediments as evidence of prehistoric land-use in the South Downs' *Proc Prehist Soc* **49** (1983).

12. I G Tyers 'The prehistoric peat layers (Tilbury IV)' *in* Excavations in Southwark 1973-76 and Lambeth 1973-79 London Middlesex Archaeol Soc and Surrey Archaeol Soc joint pub 3 (1988) 5-12.

13. R J Devoy 'Flandrian sea-level changes and vegetational history of the lower Thames estuary' *Phil Trans Royal Soc London* **B285** (1979).

14. D J Rackham 'Prehistory 'in' the Lower Thames Floodplain' *London Archaeol* 7, no. 7 (1994) 191-6.

those prevailing further downstream in the estuary. Also, and more crucially, such deposition or formation could take place at different periods from those outlined in Devoy's model.

In view of the complexity of studying the river regime along even a limited stretch, and the 'keyhole' nature of excavation in London, it can be extremely difficult in the majority of cases to establish with certainty whether the archaeological sites we are excavating in the floodplain were directly and exclusively influenced by the Thames or should more properly be considered as part of a wider river network. The results from Bryan Road have emphasized these problems outlined above. It was initially considered (before any form of analysis) that the peat horizon could be ascribed to the Tilbury IV stage (a period of peat formation defined by Devoy, falling within the Bronze Age, based on the type site at Tilbury, Essex). The date of approximately 3800 BC for the beginning of peat formation at Bryan Road demonstrated that this was a false assumption. This is further emphasized by the absence of silt and clays within the peat horizon, which is characteristic of Devoy's model. Subsequent analysis of the pollen and molluscs also indicates pre-Tilbury IV peat formation.

Information from Bryan Road has shown how complex the interpretation of archaeological material is from river floodplain locations. In addition to dating and archaeological interpretation, it is necessary to carry out detailed studies of the associated peats and sediments to attempt to provide a clearer understanding of mans context within the landscape.

Acknowledgements
The Museum of London Archaeology Service would like to thank; Geoff Chapman and Peter Murphy of Davis Langdon Management, Hexagon Housing Association Limited and Wandle Housing Association Limited for assistance and funding, Gareth Blacker of the London Borough of Southwark Property Division, while John Dillon, Borough Archaeology Officer at Southwark kindly provided archaeological guidance on site.

The authors would like to acknowledge the assistance from the Project Manager, Robin Densem; Tony Dyson for commenting on the text, and Hester White and Lesley Dunwoodie for preparing the graphics.

Letters

Brockley Hill

IT IS NINETEEN years ago (to this very month of November) that I last excavated at Brockley Hill, so the excellent paper *Back to Brockley Hill* was not only thought-provoking, but brought back many happy memories of this rural north Middlesex site. It may interest readers to know that the photograph on the front cover portrays the late Philip Suggett, left, with two of his children and the late Gilbert F. Cole inspecting a flagon. These were the excavations carried out in 1952, adjacent to the former Hilltop Cafe, on the east side of Watling Street.

The period 1968-75 witnessed a campaign of intensive excavations, very largely rescue work – hampered by the limitations of amateur weekend activity and, in 1968, an acute shortage of labour! The wholesale destruction of, and extensive tipping on, archaeological features in Field 157 (Fig. 4, Area 3) pointed to the need for adequate full-time professional commitment.

Whilst it is gratifying to report that much of the Roman site has now been scheduled by English Heritage and the former Department of the Environment, a vast tract of land from Area 2, south-eastwards to Area 4, has been damaged by ploughing. Ironically land owned by that learned institution, All Souls' College, Oxford, since the reign of Henry VI. Yes, post-excavation research is to be welcomed, but please remember the inadequate nature of the various excavations from which the material was recovered and do not rule out the possibility of future large-scale work.

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Reigate stone

IN HER interesting article in *LA* 7, no. 9 (Autumn 1994), Ms de Domingo states that Domesday Book records two *Reigate* stone quarries near Limpsfield and that 'transport to London was easy with the River Mole about a mile away from the Upper Greensand quarries ...' I would like to comment on both these points.

Firstly, although DB does record two *fossae lapidu* under Limpsfield vill, it is not certain that these were Upper Greensand quarries. This rock does not outcrop noticeably at Limpsfield but a subordinate manor of Limpsfield is to be found at Willey in Chaldon, currently being studied by Mr Peter Gray. The medieval parish of Chaldon extended across the scarp of the Downs to reach the Upper Greensand beds at a place where they do outcrop notably and have been greatly exploited.

My second point is that the River Mole at Wonham and Flanchford is about two miles from the closest possible medieval quarry sites – those at Colley in Reigate parish. It was much further from others in Reigate and from those in Merstham, Chaldon and Godstone. Limpsfield itself is closer to the Darent.

The Mole is an erratic stream at the best of times and supported many mills and fish weirs, but its usefulness for transporting stone downstream is worth considering. The logistics of transporting stone in medieval times seems to have received all too little study, but the task is not likely to have been easy.

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