ANCIENT MONUMENTS LABORATORY

REPORT
3341

SERIES/No CONTRACTOR

AUTHOR M Bell and R I Macphail Mar1981

TITLE Environmental report on a 'dark earth' deposit at Tanners Hall, Gloucester

Environmental Report On A "DARK EARTH" DEPOSIT AT TANNERS HALL, GLOUCESTER

M. Bell and R. I. Macphail January 1981

During 1976 excavations were carried out on pre-Medieval and Medieval levels at Tanners Hall, Gloucester, by the City Excavation Unit, Gloucester (Director, Carolyn Heighway). The excavations revealed an enigmatic dark earth deposit some 90 cm. in thickness (layer 108), which overlay presumed fourth century Roman metalling and was cut into by a pit of fourteenth century date. It seemed to span a fairly long period from the fifth to eleventh centuries. The very dark grey colour (Munsell 10 YR3/1) of the deposit suggested it may be "dark earth", while the paucity of artifacts (only three Roman sherds, one twelfth century sherd and a few pieces of Roman Tile) and uniformity of the layer led the excavators to believe it to be the result of flooding from the nearby Twyer stream. Analytical work was carried out to test the latter theory, while at the same time biological and pedological analyses would complement previous studies of "dark earth" from other urban sites (Macphail, forthcoming). Particle size, coarse fraction and molluscan analyses were carried out by M. Bell, and soil chemistry and micromorphological investigations were undertaken by R. I. Macphail. Particle size analysis of the smaller than 2 mm. fraction shows that the deposit is a sandy silt loam with c. 40% fine sand. Even so the deposit is not particularly well sorted and its cumulative frequency graph on probability paper (Fig. 1) is a convex curve rather than somethin approximating to a straight line which would be expected from a well sorted alluvial deposit. The absence of sorting was confirmed by a sieve analysis of the coarse fractions in a 1 kg. sample. Some 7% of material was coarser than 2 mm. and these particles were examined under the binocular microscope in the hope that they would throw some light on the origin of the layer:-

Geoglogical material	248
Oyster	1
Land molluscs	3
Charcoal (frags.)	8
Carbonised cereal grain	1
Teeth and bone	49
Metallurgical slag	12
Hammerscale ?	2
Fired clay and pottery	33
Fragment of blue glass bead ?	1
Total particles	358

Thus although the layer appeared to be fairly sterile of artifacts in the field, the sieved fraction did contain a high proportion of material (c. 30%) of anthropogenic origin, which strengthens the case for a causal relationship between the deposition of this layer and human activity. The flot from the sample consisted largely of charcoal and this is presumed to account for its dark colour in common with the other urban dark earths (Macphail, forthcoming). A number of techniques have already been employed to try to establish under what conditions these deposits accumulated and it was considered that in this instance molluscan remains might help. Mollusca were present in the 1 Kg. sample (Limacidae-6; Cecilioides acicula-1; Cepaea-1; Trichia hispida-1; Helix aspersa-+) but in such small numbers as to be of no value, except in so far as the absence of freshwater species further militates against this being a stream deposit.

Chemical analysis of the "dark earth" deposit showed it to be neutral (pH 6.6) with 4.1% loss on ignition. Thin section description and point count analysis (Micromorphological description, and Table 1) clearly substantiates the earlier view that this material is not water lain. For example, it is poorly sorted, different soil elements are poorly mixed and has no evidence of layering. In fact, the deposit is strikingly heterogenous with two contrasting fabric types. One is dark grey and silty, while the other is dark grey but with almost no silt. The dark grey colour itself at x32 and x100 under plane polarised light relates to this deposit being gleyed. Further evidence is provided by nodules (glaebules) and neo-ferrans which relate to iron movement. "Un-gleyed" non-silty fabric is a yellow brown colour. These two distinctive fabric types thus show that this deposit clearly consists of two soil elements that were mixed "off-site" before being dumped at Tanners Hall, onto the Roman metalling. Interestingly, the unusual presence of amorphous organic matter set in the fabric is not pedological in origin and although charcoal and opaque plant fragments may easily have been just included in the dumped deposit, the presence of amorphous organic matter may suggest the purposeful addition of fresh organic matter, either before or after the soil was dumped. Normally, in a soil of this pH with an obvious organic content, earthworm activity would have certainly destroyed all trace of the amorphous organic matter, leaving only an intimate mixture of mineral soil and organic matter as described for "dark earh" elsewhere (R.I. Macphail, forthcoming). Here there is only the slightest trace of earthworm activity and thus

the organic matter has been preserved in much the original state as it was dumped. The effect of tanning locally may have been to inhibit earthworms and protect organic material. Interestingly, pollen preparation from this deposit by Dr. R. G. Scaife (Institute of Archaeology) revealed no pollen preserved indicating that oxidation of pollen had been very severe.

Scanning at the higher levels of magnification (x100 and x400) revealed large quantities of comminuted charcoal (not included in the point count analysis as this only recognised fragments >20 um), and so the dark colour of the deposit seems to relate to this charcoal as well as to its organic content and gleyed character.

Finally, the presence of neo-matrans, which are cutans developed from mobilised and redeposited matrix material and here include organic matter, suggest possible cultivation of the "dark earth" once it was deposited, as described from rural soils in the Ardennes (Kwaad and Mücher, 1979).

Conclusions The "dark earth" deposit at Tanners Hall, has been clearly shown to be a dumped deposit, rather than water lain. Coarse inclusion analysis and the presence of large quantities of charcoal here indicated an anthropogenic origin. Additionally, the deposit includes at least two soil types which were mixed prior to dumping. Obviously, organic matter had been added and so the deposit at Tanners Hall may justifiably be interpreted as a purposely dumped deposit for urban cultivation. The mixing of two different soil materials and the addition of organic matter had been suspected of "Dark Earth" previously studied from London, but later reworking by earthworms had always destroyed most of the evidence. It is unfortunate that Dr. R. G. Scaife found no pollen to compare with "Dark Earth" studies from London and York.

References

Kwaad, F. J. P. M. and Mücher, H. J. 1979 The formation and evolution of colluvium on arable land in Northern Luxembourg. Geoderma, 22, 173-192.

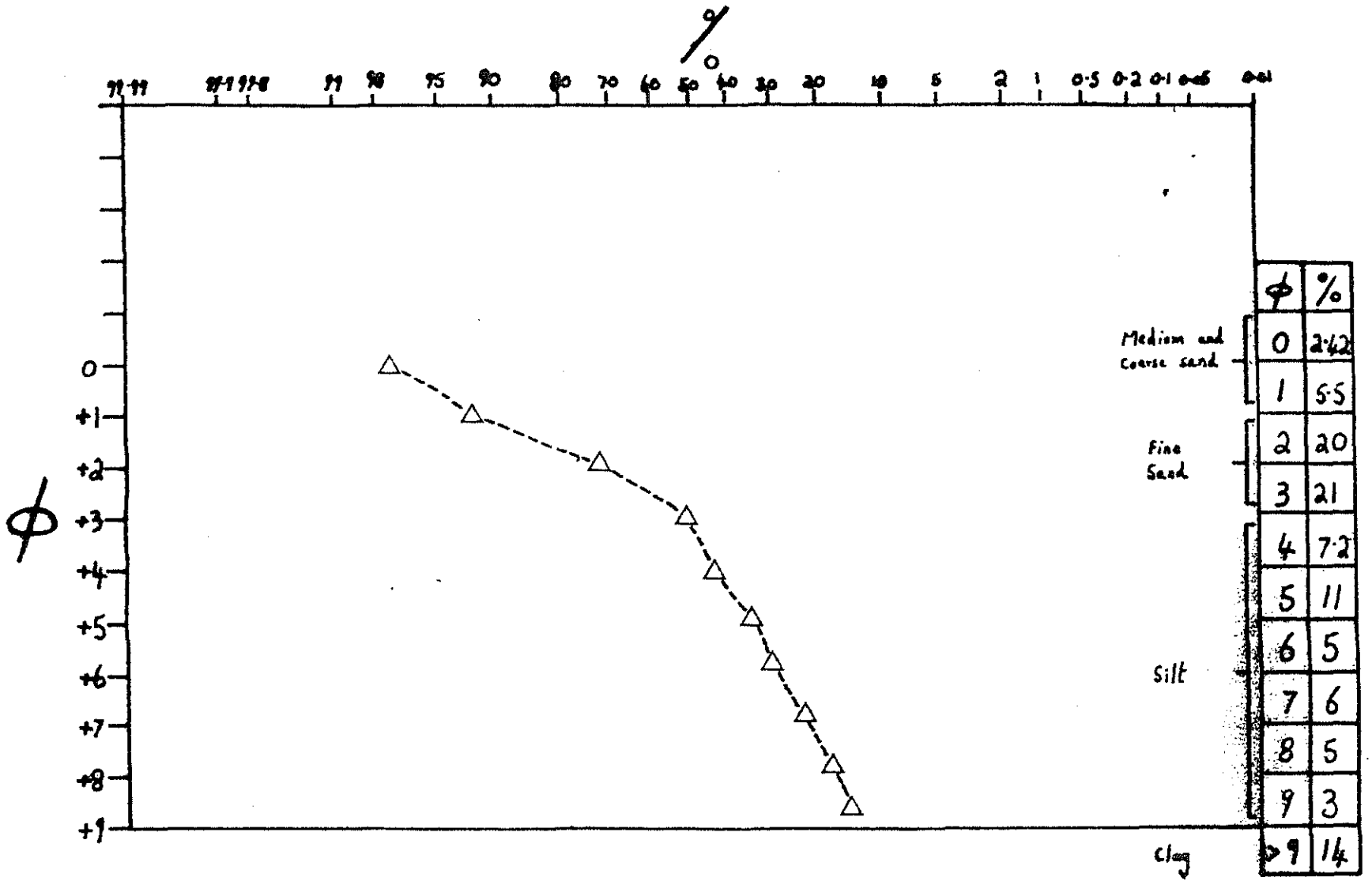
Macphail, R. I. Soil and botanical studies of the "Dark Earth" (B. A. R. forthcoming)

Micromorphological description of "dark earth" from Tanners Hall, Gloucester

Layer 108: 90 cm. Heterogenous with 20% (see Table 1) silasepic material interspersed with 35% finer argillasepic material; accomodated, subangular blocky; 22% Macrovoids (>20 um.), compound packing voids, metavughs, some arthovughs, many fine and medium, some coarse channels; 16% poorly sorted mineral material, mainly sub-angular to subrounded fine sand and coarse silt where silasepic fabric ; lithorelics of oolite and fine-grained sandstone, pot fragments; few coarse, common fine opaque plant fragments, common fine charcoal, few areas of amorphous organic matter; faint evidence of earthworm activity; few neo-matrans and neo-ferrans; few diffuse, few clear, and few sharp sesquioxidic nodules; few sharp ferrimanganiferous nodules; argillasepic and silasepic; porphyroshelic.

Table 1. 1000 (1065) point count analysis, percentages

Dark grey silasepic material	20
Dark grey argillasepic material	26
Yellow brown argillasepic material	9
Neo-matra n	1. 1
Voids	22
Mineral Grain	14
Lithorelic	2
Amorphous Organic Matter	1. 1
Plant Fragment	1. 7
Charcoal	0. 7
Nodule	0. 3



Tanners Hall, Gloucester, particle size analysis of'dark earth'sample plotted according to cumulative frequency on probability paper.