Reports from the Environmental Archaeology Unit, York **2001/43**, *6 pp.*

Micromorphology of soils/sediments from Adwick-le-Street, Roman Ridge, Doncaster, South Yorkshire

by

M. Raimonda Usai

Summary

Soils and sediments of materials sealed by a Roman road near Doncaster, South Yorkshire, were investigated with micromorphological analysis and compared to present-day local soil materials described in the literature.

The micromorphological investigation suggested that materials with traces of ploughing, buried under the road, were in situ *soils probably truncated or rearranged before burial. The analysis also showed that materials from a context at the roadside (Context 536) were not comparable to the buried soils sealed by the Roman road, and had probably been dumped or deposited by gravity at the road side. There was no evidence that the materials had been transported by water or wind.*

Keywords: MICROMORPHOLOGY, GEOARCHAEOLOGY, SOILS, ROMAN, DONCASTER, SOUTH YORKSHIRE, RIDGE

Author's address:
Environmental Archaeology Unit
Department of Biology
University of York
Heslington
York YO10 5YW
Telephone: 01904 433947

Prepared for:
Northamptonshire Archaeology
2 Bolton House
Wootton Hall Park
Northampton NN4 8BE
Northamptonshire
Fax: 01904 433850

Micromorphology of soils/sediments from Adwick-le-Street, Roman Ridge, Doncaster, South Yorkshire.

Introduction

An excavation was carried out near the A1-A638 road junction in the proximity of Adwick le-Street, Woodlands (SE5308) by Northamptonshire Archaeology, in advance of development works. The main excavation included Iron Age deposits, but a Roman Road was also found at the western side of the site.

Two trenches were excavated sub-perpendicularly to the Roman road. In the northernmost of the two trenches, the upper part of the sequence sealed by the road was characterized by plough marks, whilst no such features were found in the southern trench.

The site was visited by Dr Helen Keeley, who provided a description of the main local soils and geomorphology (Keeley 2000).

Two site visits and sample collection for micromorphological analysis were carried out by the present writer.

Aims

The geoarchaeological and micromorphological investigations were aimed at answering the following questions:

a) Did all the deposits sealed by the Roman road represent local *in situ* soils? Or did they include transported allochthonous materials?

b)What type of soils/sediments did these deposits consist of, and were they the same in the northern and southern trench?

c) Do geoarchaeological observations and/or micromorphological analysis confirm the archaeological evidence that one of the two buried soils was cultivated and the other was not?

d) Is there any environmental/site factors that could justify selective cultivation in only part of the area?

e) Was a large dark brown lens of material (Context 536), covered by a sand layer, washed from the road, or did it represent material deliberately dumped or redeposited along the edge of the Roman road? Were the constituents of Context 536 derived from the buried soils sealed by the Roman road or from other materials? If so, what type of materials?

Materials and methods

Modern local soils and topography were observed during the site visits, and observations were matched with the data of Jarvis *et al*. (1984) and Keeley (2000). Three undisturbed samples were collected for micromorphological analysis and replicated with loose samples. Micromorphological descriptions were carried out mainly following the methods of Bullock *et al.* (1985).

Samples collected and their location are described in Table 1.

Table 1. Samples collected and questions.

Context	Samples	Location	Notes/questions
536	ALS1 (undisturbed; thin section) ALS2 (loose replicate)	Southern trench, southern face	Possible marker bank deposit. Does this context represent materials deliberately dumped/redeposited along the edge of the Roman road? Is this context derived from the buried soils sealed by the Roman road or from other materials? What type of materials?
502	ALS3 (undisturbed; thin section) ALS4 (loose replicate)	Southern trench, northern face	Upper context sealed by Roman road. Is this the top-soil of an *in situ* buried soil? Was this truncated and thus has no traces of ploughing? Or does this context include transported allochthonous materials? Interpreted as possible pasture soil.
689	ALS3 (undisturbed; thin section) ALS5 (loose replicate)	Southern trench, northern face	Below Context 502. Is this the sub-soil of an *in situ* buried soil? Is this in continuity with Context 502?
601	ALS6 (undisturbed; thin section) ALS7 (loose replicate)	Northern trench, northern face	Context sealed by Roman road. Basal deposit. Upper boundary characterized by plough marks. Is this the top-soil of an *in situ* buried soil? Does it include allochthonous/exotic materials? Does it differ from Context 502?
580	ALS6 (undisturbed; thin section) ALD8 (loose replicate)	Northern trench, northern face	Below Context 601. Questions by the by the archaeological excavator: is this a natural subsoil below a possible plough soil, or is it a separate possible pasture soil below Context 601?

Results

Soil distribution

Local soils in the area are represented by two main soil associations, the Brickfield 3 and the Aberford associations (Jarvis *et al.* 1984 and Keeley 2000). Soils of the Brickfield 3 association are often well drained and lay on drift material, whilst the Aberford soils are seasonally waterlogged and on calcareous parent material. Keeley (2000) suggested that perhaps the presence of poorly drained soils was one of the reasons why the Romans built the road so high above the surrounding land.

Soil/sediment micromorphology

Thin Section LS1 (Context 536)

Reddish brown silty clay (60% silt, 38% clay and 2% sand), with unsorted angular and rounded quartz silt grains and angular limestone gravels. Brown, opaque/masked, undifferentiated fine material, with porphyric related distribution, dominantly apedal (90%) but with some < 100 mm weekly developed granular peds; < 10% randomly oriented and distributed voids, including elongated and equant. cavities (500-2000 mm vughs and 2-5 mm chambers) and planes of 1-2 mm thickness. No lamination or layering observed. No charcoal observed within the section. All components are randomly arranged.

Thin section ALS3 (Context 502)

Dark brown silty clay (45% clay, 50 % silt and 5% sand), with poorly sorted coarse material including rounded and rarely subangular, often fragmented quartz grains, less abundant K-feldspars and strongly weathered plagioclase. No charcoal observed. Fe-Mn rich typic nodules. Dark brown, speckled, dotted, clouded or masked fine material. Dominantly porphyric (60%) and less abundant chitonic related distribution pattern. No peds observed. Packing voids and elongated cavities (vughs), some of which with random basic and related orientation patterns, and some with orientation pattern parallel to the ground surface. Clear sharp irregular lower boundary, with pockets. No lamination or layering. Rare/occasional thin orange brown typic dusty or impure silty clay coatings on vugh walls.

Thin Section ALS3 (Context 689)

Brown to orange-brown silty clay (45% clay, 50 % silt and 5% sand), with poorly sorted coarse material including rounded and rarely subangular, often fragmented quartz grains. Some silt fragments with referred distribution parallel to the ground surface. No charcoal observed. Up to 7 mm Fe-Mn typic nodules. Brown to orange-brown fine material, partly undifferentiated (50% of the area), partly speckled and partly granostriated (50 % of speckled+striated) fine material. 70% chitonic, and 30% porphyric related distribution pattern. No peds observed. Packing voids and elongated cavities (vughs), some of which with random basic and related orientation patterns, and some with orientation pattern parallel to the ground surface, as in Context 502. No lamination or layering. Abundant orange brown or masked typic limpid clay, or silty dusty and/or impure clay coatings, hypocoatings and quasi coatings on vughs wall and in the matrix.

Thin Section ALS6 (Context 601)

Brown silty clay loam (30% clay, 60 % silt and 10% sand) with poorly sorted coarse material including subangular to rounded, rarely fractured quartz grains, rare charcoal, charred wood, excrement pedofeatures. Brown dotted or masked fine material, undifferentiated b-fabric, porphyric and chitonic related distribution pattern. Moderately developed crumbs/subangular blocky peds over 50% of the area. Frequent (15%) > 300 m to 5 mm elongated voids (vughs) interconnected by fine channels, with parallel orientation pattern, inclined to ground surface. Rare typic dusty/opaque clay coatings, hypocoatings and quasicoatings in vughs or fabric.

Thin Section ALS6 (Context 580)

The area occupied by Context 580 in Thin Section ALS6 is too small to allow accurate measurements of voids, peds and coatings. Texture in the area sampled: silty clay. Coarse material, b-fabric, related distribution pattern, and nodules similar to those of Context 689 in Thin Section ALS3.

Discussion and conclusions

Context 536

Features of the sample seen in thin section do not suggest any sorting or transportation by wind or water. Thus, there is no evidence for the material having been washed down from the road side. The lack of sorting of any type, and the random arrangement of all components, do not suggest that the material was deposited by slow sliding down from the sides of the road with aid of water, but is rather in agreement with transportation by gravity, or with the hypothesis suggested by the excavators of deliberate dumping/redepositing at the edge of the road.

The material observed in thin section is not similar to any of the other samples observed, i.e. is not like the buried materials sealed by the road. The analysis suggested that the calcareous, mineral-rich materials of this context were compatible with the descriptions given for the local Aberford association rather than that given for till-derived soils of the Brickfield association (Jarvis *et al.*, 1985).

Contexts 502 and 689.

Though the materials of Context 502 are highly mineral-rich, the largely undifferentiated dark brown fine material possibly indicates a significant amount of humified organic material in the clay fraction. Though there is no micromorphological evidence for sorting or layering, some of the voids are arranged parallel to the ground surface. This could

have resulted from compression by the Roman road or, perhaps, from some deliberate arranging or compressing the material before road construction. Unfortunately there is no other supporting evidence for the two hypotheses.

The voids of the underlying Context 689 are similar to those of Context 502. The material of Context 689 in thin section ALS3 is rich in clay and silt coatings, but no path for their migration is visible, as interconnected voids are absent. Though this could be a feature of this thin section only (and thus not representative for the whole context) it is possible that clay/silt translocation occurred at a time when pathways were present, before they were obliterated by some agents such as for example compression by the road or some deliberate arranging or compressing of the material as suggested above. It is also more likely that silt was translocated when there was an unvegetated surface above Contexts 502 and 687, and thus after some disturbance/truncation of the soil cover, perhaps before road construction.

The lower Context 689 is rich in clay coatings, this matching the features of the local present-day Brickfield 3 soil association represented in small areas within the more abundant Abeford soil association (Jarvis *et al.* 1984). However, the modern local Brickfield soils are often characterized by profiles of the type:

Topsoil (Ap horizon): 0-20 cm,
Subsoil (Bt horizon): 20-50 cm,
Subsoil (BC horizon): 50-100 cm,

the Bt horizon being characterized by subangular blocky peds, absent in Contexts 502 or 689. Such peds, however, may have been obliterated and compressed, possibly as a result of the road weight or construction. The orientation and distribution pattern of voids and some silts also supports such hypothesis. Such evidence, as well as the similarity of voids and the coarse fraction of Contexts 502 and 689 suggests that the contexts are part of the same buried soil profile, though it is possible that the profile has been disturbed or truncated at some point. It is therefore unlikely that Context 688 was added on top of Context 502 at some later stage before road construction. The only strong difference between the two contexts is the fine fraction, darker and more organic-rich at the top, richer in clay and features typical of soil development at the bottom. This also supports the hypothesis of a top- and subsoil of the same material.

Contexts 601 and 580

The two contexts and their relationships are very similar to those of Contexts 502 and 689, likely to represent a continuum with two buried soil horizons: a topsoil (A horizon, Context 601) and a subsoil (B horizon, Context 580), as also shown by field evidence. As for Context 502 it is possible that the buried topsoil represented by Context 601 has been truncated.

The orientation pattern of the voids in this profile is inclined to the ground surface, differently from the void patters of the profile made of Contexts 502-689. The difference could be the result of a random variation, or of a difference in degree of compression by the road, as well as the result of different types of disturbance or truncation with rearrangement of materials, but there is not sufficient evidence to favour any of the above three interpretations. It seems possible, however, that the void orientation could be here the result of the presence of ploughing, witnessed by ard marks in the upper part of the horizon.

Summary

Aims a) and b)
The micromorphological evidence strongly supports the idea that the succession of contexts buried under the Roman road in both northern and southern trench do not represent discrete deposits deliberately deposited before road construction, but are rather buried soil profiles, possibly originally similar to modern soils of the local Brickfield association.

Aim c)
It could be possible that buried soils from both southern and northern trench have been ploughed, and plough marks have been preserved only in the profiles from the northern trench, whilst they would have been destroyed with truncation of the upper part of the buried profiles in the area of the southern trench.

In fact, evidence described in the previous sections seems to suggest possible truncation or disturbance of the upper part of the buried profiles, possibly before road construction. Differences in porosity between profiles of the two trenches, however, could also have resulted from differences in the two soils before burial, probably as a result of preferential ploughing in the area of the northern trench (Contexts 601-580).

Silty dusty clay coatings are present in the profile without plough marks, whilst only rare clay coatings are present in the horizon containing plough marks in the northern trench, also containing rare charcoal. Absence of exotic components in all profiles does provide any evidence for or against manuring.

Thus, the micromorphological evidence has helped to provide the above described hypotheses, but can not provide any additional help to prove conclusively whether both profiles were initially cultivated before truncation.

Aim d)
No evidence has been found to address this question.

Aim e)
Features of Context 536 do not suggest that the material had been transported by water or wind, or by slowly sliding down from the sides of the road with aid of water, but are in agreement with the hypothesis of transportation by gravity or deliberate dumping/redepositing at the edge of the road. The material of Context 536 is not similar to the buried soils sealed under the Roman road, but matches some of the descriptions given for modern local calcareous soils.

References

Bullock, P., Fedoroff, N., Jongerius, A., Stoops, G., Tursina, T. and Babel, U. (1985). *Handbook for soil thin section description.* Wolverampton: Waine Research Publications.

Jarvis, R.A., Bendelow, V.C., Bradley, R.I., Carroll, D.M., Furness, R.R., Kilgour, I.N.L. and King, S.J. (1984). *Soils and their use in Northern England. Soil Survey of England and Wales Bulletin No 10.* Harpenden: Lawes Agricultural Trust.

Keeley, H.C.M. (2000). *Report on a site visit to Doncaster (Wakefield Road), South Yorkshire, on 2 August 2000.* Unpublished report.