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ARCHAEOMAGNETIC DATING: NORTH CAVE, HUMBERSIDE.

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Summary

A clay feature, thought to be perhaps a hearth or furnace, from a Roman site at North Cave, Humberside, was sampled for archaeomagnatic dating Howver, owing to its poor preservation, no date could be obtained.

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Archaeomagnetic Dating: North Cave, Humberside.

Introduction

A fragmentary burnt clay feature thought to have been perhaps a hearth or furnace, discovered during excavations near North Cave in Humberside, was sampled for archaeomagnetic dating. This feature was in a Roman context and possibly dated from the first or second century AD. It was in a poor state of preservation, having been cut by a field drain. Also the floor was missing and the surviving semicircular wall was fractured in many places.

The sampling was carried out on the 22nd of August 1986 by A. David of the Ancient Monuments Laboratory. Laboratory tests, measurements and evaluation were undertaken by the author.

Method

Sampling and dating followed the standard procedures outlined in the Appendix. The samples were collected using the disc method and orientated using a compass. Measured declinations were subsequently corrected to take account of the variation between the direction of the magnetic pole and true north. Nine samples were taken and their compositions are described below:

Samples 1, 4, 5 and 6; predominantly red clay with earthy inclusions.

Samples 2, 3, 8 and 9; predominantly a brown earthy material with some small black inclusions.

Sample 7; A black material, probably a mixture of fired earth and clay.

The brown earthy material mentioned above did not appear to be a clay and thus would not be capable of supporting significant thermoremanent magnetism. In addition it was noted that samples 4, 5 and 6 came from the outer edge of the feature and had possibly been part of a collapsed superstructure.

Results

The NRM field measurements for these samples are tabulated in table 1; owing to the anomalous nature of these results, expanded on below, they have neither been corrected for magnetic refraction nor to Meriden (see Appendix, 3b and 3c).

The samples exhibit high remanent intensities, even those consisting mainly of brown earthy material having magnetisations around 10mA/m. This suggests that the material contains a high proportion of Iron minerals and has been fired well above its blocking temperature. Nevertheless, the apparently random scatter of remanent field directions, most of which deviate significantly from any direction attained by the earth's magnetic field in the last three thousand years, indicates that the

feature has been severely disturbed since its last firing. It thus proved impossible to date by archaeomagnetic means.

Samples 4, 5 and 6 do have similar, highly anomalous, field directions, suggesting that they did, indeed, derive from a single fragment of a collapsed superstructure.

Conclusion

It is clear from the above discussion that no archaeomagnetic date can be obtained for this feature. The only evidence suggested by these results was that the material was fired to a high temperature and that some sort of superstructure probably existed originally. This may help to give some indication of the function of the feature.

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Table 1; NRM measurements for all samples (uncorrected).

Sample	Declination (deg)	Inclination (deg)	Intensity (mA/m)
NCV01	49.049	44.766	11156.93
NCV02	32.384	77.760	108.78
NCV03	39.612	64.409	94.93
NCV04	282.767	8.956	314.18
NCV05	292.339	1.437	2276.43
NCV06	278.466	-0.858	2578.90
NCV07	326.717	62.264	3347.04
NCV08	202.962	50.018	242.27
NCV09	217.236	48.627	107.72

Appendix: Standard Procedures for Sampling and Measurement

1) Sampling

One of three sampling techniques is employed depending on the consistency of the material (Clark, Tarling and Noel 1988):

a) Consolidated materials: Rock and fired clay samples are collected by the disc method. Several small levelled plastic discs are glued to the feature, marked with an orientation line related to true north, then removed with a small piece of the material attached.

b) Unconsolidated materials: Sediments are collected by the tube method. Small pillars of the material are carved out from a prepared platform, then encapsulated in levelled plastic tubes using plaster of Paris. The orientation line is then marked on top of the plaster.

c) Plastic materials: Waterlogged clays and muds are sampled in a similar manner to method 1b) above; however, the levelled plastic tubes are pressed directly into the material to be sampled.

2) Physical Analysis

a) Magnetic remanences are measured using a slow speed spinner fluxgate magnetometer (Molyneux *et al.* 1972; see also Tarling 1983, p84; Thompson and Oldfield 1986, p52).

b) Partial demagnetisation is achieved using the alternating magnetic field method (As 1967; Creer 1959; see also Tarling 1983, p91; Thompson and Oldfield 1986, p59), to remove viscous magnetic components if necessary. Demagnetising fields are measured in milli-Tesla (mT), figures quoted being for the peak value of the field.

3) Remanent Field Direction

a) The remanent field direction of a sample is expressed as two angles, declination (Dec) and inclination (Inc), both quoted in degrees. Declination represents the bearing of the field relative to true north, angles to the east being positive; inclination represents the angle of dip of this field.

b) Aitken and Hawley (1971) have shown that the angle of inclination in measured samples is likely to be distorted owing to magnetic refraction. The phenomenon is not well understood but is known to depend on the position the samples occupied within the structure. The corrections recommended by Aitken and Hawley are routinely applied to measured inclinations, in keeping with the practise of Clark, Tarling and Noel (1988).

c) Remanent field directions are adjusted to the values they would have had if the feature been located at Meriden, a standard reference point. The adjustment is done using the method suggested by Noel (Tarling 1983, p116), and allows the remanent directions to be compared with standardised calibration data.

d) Individual remanent field directions are combined to produce the mean remanent field direction using the statistical method developed by R. A. Fisher (1953). The quantity "alpha-95" is quoted with mean field directions and is a measure of the precision of the determination; the smaller its value, the better the precision.

4) Calibration

a) Material less than 3000 years old is dated using the archaeomagnetic calibration curve compiled by Clark, Tarling and Noel (1988).

b) Older material is dated using the lake varve data compiled by Turner and Thompson (1982).

c) Dates are normally given at the 68% confidence level. However, both the quality of the measurement and the estimated reliability of the calibration curve for the period in question are taken into account, so this figure is only approximate. Owing to crossovers and contiguities in the curve, alternative dates are sometimes given. It may be possible to select the correct alternative using independent dating evidence.

d) As the thermoremanent effect is reset at each heating, all dates for fired material refer to the final heating.

e) Dates are prefixed by "cal", for consistency with the new convention for calibrated radiocarbon dates (Mook 1986).

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