

# THE DURHAM TL CERAMIC DATING SERVICE

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### Abstract

A TL dating service for archaeologists has been established at our laboratory and its viability is being investigated as part of a research project. The service has been structured to cater for the needs of British archaeologists, although we consider that the fundamental approach would be appropriate to most TL dating requirements. Two levels of accuracy are offered in *survey dating* and *dating programmes* as part of a two tiered system. In its first year of operation the laboratory has tested over 80 samples and in this paper we discuss the structure of the service and the dates produced.

### Introduction

The Durham TL Dating and Research Service was launched in 1983 as part of a research project to investigate the viability of a commercially-based service TL laboratory. The primary function of the project has been to test the feasibility of a routine TL dating facility and to establish a market for TL dating in the archaeological community. Presently we accept pottery, burnt clay, bricks and tiles, and may later extend this range to include burnt flint and unheated samples such as sediments. With the aim of retaining a degree of flexibility, and with the expectation that the archaeological market would take time to develop, the research service undertakes non-archaeological TL work for commercial bodies and University laboratories on a contract basis.

A major task during the first year of operation has been to circulate information about the Service. Publicity leaflets and booklets providing a basic explanation of TL dating and the structure of the Service have been produced and widely circulated within the UK and to major institutions abroad. Publications such as *Antiquity*, *Current Archaeology*, the *Council for British Archaeology Calendar* and *Ancient TL* have also carried details of the Service.

### Structure of the dating service

The service is structured to offer two levels of overall accuracy to archaeologists. The first level, *survey dating*, aims to provide low accuracy ( $\pm 20\%$  of the TL age) dates within one month of acceptance of the samples. Survey dating tests are intended to provide a means of assessing whether samples are suitable for high accuracy dating while also, in the majority of cases, permitting the production of a low accuracy TL survey date (see below). If the results of such tests are satisfactory the second level of the Service, a *dating programme*, may proceed, where an overall error of between  $\pm 5$

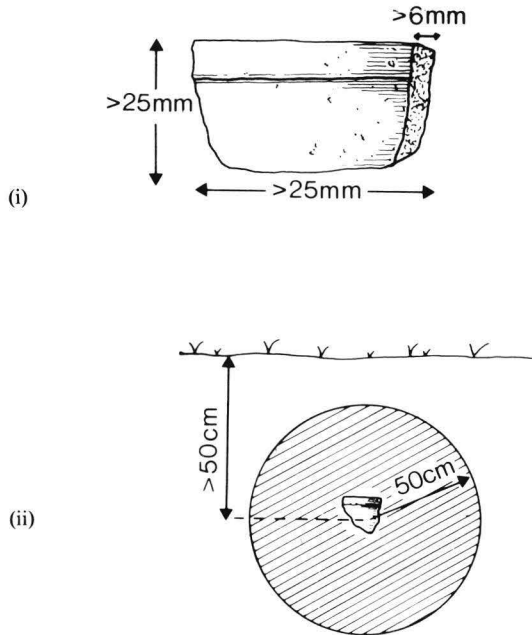


Fig. 1.(i) Minimum sherd size. (ii) the 'gamma' sphere, indicating the environment of interest.

and  $\pm 10\%$  of the TL age can be expected for single dates. A selection of representative fabrics will need to have been successfully survey dated and a minimum programme of ten sherds is recommended. We also consider high accuracy dating for a smaller group of sherds where there are difficulties in meeting this requirement.

### Sampling requirements for archaeologists

Our sampling requirements are based on those recommendations established by the Oxford laboratory (Aitken, 1977). They are described in the laboratory's TL Dating Service Booklet and concentrate on the two major aspects of requirements for samples (minimum 25 mm square and 10 mm thick) and burial environment (minimum depth 50 cm; avoidance of environments with large stone objects) as illustrated in figure 1. For Survey dating, archaeologists are required to submit the following:

1. A completed application form giving details of the site, of TL and soil samples, and of previously issued site reports.
2. A completed section form showing the position of TL and soil samples (figure 2).
3. TL and soil samples in sealed containers and bags. (The soil samples — 50 cc — are required to be representative of the burial environment, which we refer to in the booklet as the 'gamma sphere' of 50 cm radius centred about the TL sample).

Since, for survey dating, there is no requirement for the laboratory to visit the site it is particularly important to assess, as far as possible, any potentially perturbing effects in the burial environment and the excavator is encouraged to submit as much archaeological information as possible. Samples that do not meet our specified sampling requirements can also be submitted for Survey dating and in such cases we require full details of samples and burial environment before accepting material for dating.

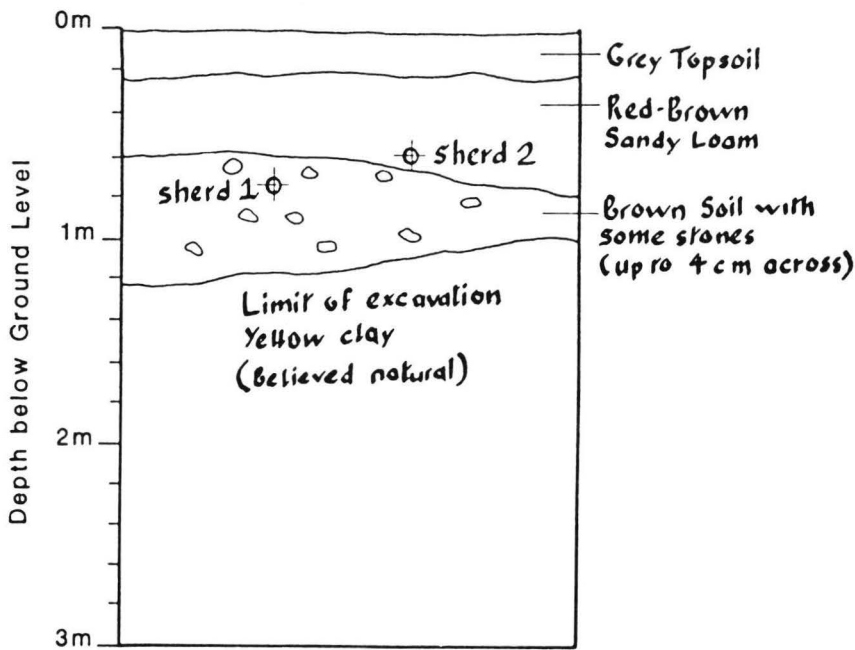


Fig. 2. Example of detail required showing the position of TL and soil samples.

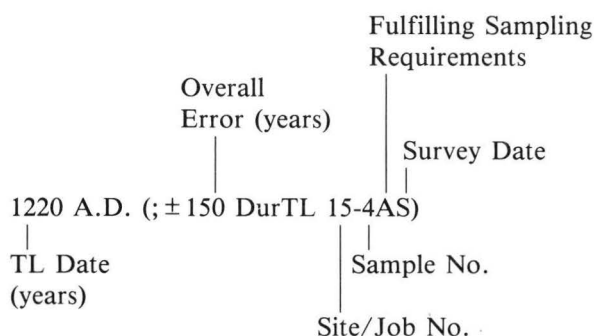
Where Survey dating work proceeds to a dating programme, the further essential requirements include on-site radioactivity measurements and more detailed discussion of a sampling strategy.

### Sampling strategy

For a dating programme, we would normally expect to have obtained satisfactory survey results from representative fabrics sampled from early, middle and late phases of the site. A minimum of five samples from each of these phases (one layer per phase if possible) enables us to obtain the basis of a *TL chronological framework* for the site which may be compared with other dating evidence. If diagnostic fabrics are available for testing, they usefully serve as chronological markers to complement this framework. Having considered the consistency of such a TL dating framework, further TL work may proceed to provide additional chronological detail. In view of the considerable laboratory time required for TL dating measurements (27 h operator time for 4 Survey tests) such a step-by-step approach is preferred and we also hope that it will lead to a more integrated use of TL dating on archaeological sites.

### Service dates 1983—1984

The 49 Survey TL dates issued by the laboratory are given in table 1: of 81 samples that were tested, 53 were from British sites and the remainder from the Americas, East Africa and Europe. These dates were obtained using either the quartz inclusion (Fleming, 1970) or pre-dose (Fleming, 1973 and Bailiff, 1983) techniques. Survey dates are issued using the following format:



In some cases further work was undertaken on the samples beyond survey requirements and the overall error is better than  $\pm 20\%$  (e.g. DurTL 1-1AS); in others it may be slightly worse because of poor TL characteristics (e.g. DurTL 33). The results in the date list show that, within the limitations of Survey accuracy, the TL results have confirmed the archaeological dating. They have, however, produced some rather more interesting results; for example, a Bronze Age date for a putatively medieval sherd from the Hirsle (DurTL 1-1AS) which the excavator later agreed was of a fabric type that did not fit into any of the medieval pottery groups (The site had already yielded late neolithic pottery which has also been TL dated in this laboratory to that period). Other important dates include confirmation of a Viking date (DurTL YK/1) for pottery from the Coppergate excavations (fabric suspected to be Roman) and the first TL dates for pottery from early raised field and canal systems in the Peruvian uplands (DurTL 26 and 35).

### Response from the UK archaeological community

There has been no routine TL facility available for archaeologists in the UK and cultivation of interest outside our established archaeological contacts, although time-consuming, has received a positive response. The availability of fast low-cost (£30 per sample) Survey dating has been welcomed since it can be accommodated within normal excavation budgets. On some sites Survey dating accuracy is considered sufficient to resolve a chronological problem where no other dating evidence is available (e.g. some kiln sites) or where archaeological dating is ambiguous and placement to a major period is required. In the UK the latter can arise on sites belonging to the pre- and sub-Roman Iron Age and the post-Roman Dark Ages, since some types of coarse pottery seem to have persisted in use for a period of over one millennium.

The costs of dating programmes (£100 per sample), on the other hand, are presently difficult to accommodate within normal excavation budgets and without the system of direct funding established for radiocarbon laboratories, a special application for funding by the archaeologist is required. Several archaeologists have now applied for financial aid for the coming year and we consider that such applications will be considerably helped when supported with the results of survey tests.

A large corpus of TL dates for British pottery does not exist, in contrast to that achieved for Scandinavian material over the last decade (substantially by the Riso Laboratory). However, the importance of TL as a technique for absolute dating is now recognised and in certain periods — notably the Iron Age and medieval periods — TL is considered to provide sufficient accuracy to resolve chronological problems. The major research programmes, such as Jarrow (Bailiff, 1982), which we discussed in the

Table 1. Survey date list September 1984.

| Lab. ref.     | Site                       | TL survey date               |        | Archaeological date |
|---------------|----------------------------|------------------------------|--------|---------------------|
| DURTL YK/1    | Coppergate, York           | 900 AD; ± 125                |        | Roman or Viking     |
| DURTL 1-1AS   | The Hirsels, Roxburghshire | 1500 BC                      | 700    | 800-1000 AD         |
| DURTL 1-2AS   |                            | 1180 AD                      | 120    | Medieval            |
| DURTL 1-3AS   |                            | 1175 AD                      | 120    | Medieval            |
| DURTL 1-4AS   |                            | 1065 AD                      | 140    | Medieval            |
| DURTL 1-5AS   |                            | 1110 AD                      | 130    | Medieval            |
| DURTL 1-6BS   |                            | 400 AD                       | 320    | Medieval            |
| DURTL 2-1AS   | Bearpark, Co. Durham       | 1400 AD                      | 120    | Med./Post-Med.      |
| DURTL 4-1AS*  | St. Helens, Hartlepool     | 980 AD                       | 200    | Early Med.          |
| DURTL 5-1AS   | Daws Castle, Devon         | 390 AD                       | 320    | Late Roman          |
| DURTL 7-1AS   | Esp Green, Co. Durham      | 230 AD                       | 350    | IA/Roman            |
| DURTL 7-2AS   |                            | 125 BC                       | 400    | IA/Roman            |
| DURTL 9-1AS   | Mucking, Essex             | 540 AD                       | 290    | Saxon               |
| DURTL 10-3AS  | Berwick                    | 520 BC                       | 500    | IA                  |
| DURTL 11-2AS  | Spalding Moor              | 110 AD                       | 375    | Roman               |
| DURTL 14-1AS* | Streethouses, Cleveland    | 3575 BC                      | 830    | Neolithic           |
| DURTL 15-1AS  | Eshott, Northumberland     | 1220 AD                      | 150    | Medieval            |
| DURTL 19-1AS  | Yarm, Cleveland            | 610 AD                       | 275    | Saxon               |
| DURTL 20-1AS  | Rousay, Orkney             | 10 BC                        | 400    | Prehistoric         |
| DURTL 21-1AS  | Jarrow, Tyne and Wear      | 1290 AD                      | 140    | 700-900 AD          |
| DURTL 21-2AS  |                            | 1030 AD                      | 150    | 800-1200 AD         |
| DURTL 21-3AS  |                            | 780 AD                       | 240    | 800-1200 AD         |
| DURTL 21-4AS  |                            | 1310 AD                      | 135    | 800-1400 AD         |
| DURTL 21-5AS  |                            | 1590 AD                      | 80     | 800-1400 AD         |
| DURTL 22-1AS  | The Hirsels, Roxburghshire | 825 AD                       | 230    | Medieval            |
| DURTL 22-3AS  |                            | 1480 AD                      | 95     | 1200-1400 AD        |
| DURTL 26-1AS  | Pancha, Peru               | 400 BC                       | 500    | 500 BC-0 AD         |
| DURTL 26-3AS  |                            | 1325 AD                      | 120    | 0-1500 AD           |
| DURTL 28-1BS  | Ontario, Canada            | 1350 AD                      | 130    | 1050-1150 AD        |
| DURTL 28-2BS  |                            | 1550 AD                      | 90     | 1300-1500 AD        |
| DURTL 28-3BS  |                            | 1400 AD                      | 120    | 1050-1150 AD        |
| DURTL 28-4AS  |                            | 830 AD                       | 230    | 200 BC-0 AD         |
| DURTL 29-1AS  | Freswick, Caithness        | 1088 AD                      | 180    | Early Med.          |
| -2AS          |                            | 1192 AD                      | 160    | Early Med.          |
| -3AS          |                            | 1177 AD                      | 160    | Early Med.          |
| -4AS          |                            | 1520 AD                      | 90     | Early Med.          |
| -5AS          |                            | 1130 AD                      | 170    | Early Med.          |
| DURTL 30-1AS  | Duncansby Head, Caithness  | 1355 AD                      | 125    | Early Med.          |
| -2AS          |                            | 1504 AD                      | 95     | Early Med.          |
| -3AS          |                            | 1419 AD                      | 115    | Early Med.          |
| DURTL 31-1AS  | Bucholly Castle, Caithness | 1676 AD                      | 60     | Early Med.          |
| DURTL 33-1AS  | Runhams Farm, Kent         | 1620 AD                      | 90     | RB or modern        |
| -2AS          |                            | 1390 AD                      | 150    | RB or C12 AD        |
| DURTL 35-1AS  | Juchata, Peru              | 380 AD                       | 30     | post 1000 AD        |
| 35-5AS        | Huatta, Peru               | 1310 BC                      | 660    | 1000 BC-0 AD        |
| 35-6AS        |                            | 80 AD                        | 380    | 1000 BC-0 AD        |
| 35-7AS        |                            | 1540 AD                      | 90     | 1200-1400 AD        |
| 35-8AS        |                            | 440 AD                       | 310    | 1000 BC-0 AD        |
| DURTL 38-1AS* |                            | Maddison Street, Southampton | 160 AD | 360                 |

\* Burnt clay sample

last proceedings, and a recently completed Iron Age/early medieval project are now playing an important role in supporting the Service by demonstrating the value of TL dating.

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