ABSTRACT: A technical model is presented of lead bole smelting as it is known to have been practised in late medieval and early post-medieval Derbyshire and elsewhere. It uses known parameters of fuel characteristics and reaction temperatures, together with contemporary descriptions of the technology. These are applied to the Linch Clough bole (SK165943) excavated in 1997. A hypothesis is offered for its operation, differing from the interpretation presented by its excavators.

Introduction

Our knowledge of bole (ie wind-blown hearth) lead smelting is still rudimentary, and it is not possible to provide an adequate evaluation of all types of bole smelting technology. The model developed below, described by Bevan, Doonan and Gale in their report on Linch Clough (Bevan et al 2004) as traditional, is limited to the large bonfire (over two metres in diameter). It would not necessarily apply to smaller-diameter bole hearths, especially those below one metre in diameter, in which there was a smaller thermal mass, limited chimney effect due to lack of height, less exclusion of excess air by an ash mantle and little opportunity to add fuel and ore during the process. It does not apply to hearths, whatever their location, in which bellows were used. Whether all types of smelter were known as boles by contemporaries is not known, although all may appear in places where the term 'bole' survives as a place-name.

Kiernan (1989) has provided the most data, based on historical sources; this is supplemented by papers and discussion from an HMS conference (Willies and Cranstone 1992). The most significant subsequent publication on technical aspects of bole smelting, apart from the report on Linch Clough, has been by Smith and Murphy (2003), a study of bales (boles) in the Yorkshire Dales. There is also relevant information in late-19th and early-20th century metallurgical texts (eg Collins 1910).

The Linch Clough bole, in the uplands near the headwaters of the Derbyshire river Derwent in the northern part of central England (Fig 1), was excavated in 1997 (Bevan et al 2004). This excavation was the first comprehensive investigation of a large bole, whose late-medieval technology is only partially understood. The present paper began as a review of the original article, for this journal, but it became clear that the excavation results could be interpreted in different ways. The paper questions the interpretation of this bole site; to do so it is necessary to understand details of the process. This background forms the first part of the paper, which is followed by the re-interpretation. The writer is grateful to Bill Bevan (the excavator) and to Roger Doonan (post-excavation) for the opportunity to visit and discuss the excavation: his own views are limited to the technological aspects of the bole, leaving the detail of the site and its metallurgy, and the wider picture painted by Bevan et al, to be read in the original article.