EXPERIMENT IN THE HEAT-TREATMENT OF FLINT, A RE-ENACTMENT EVENT AT BOSTON SPA, JULY 2006.

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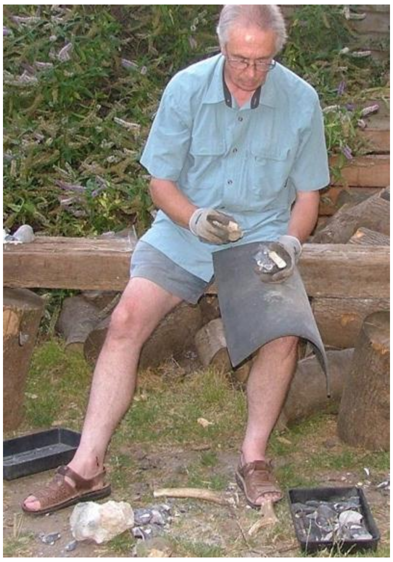
Re-enactment events

Each summer one of our monthly meetings becomes a re-enactment event linked with some aspect of the fieldwork we have been doing. There are two aims – having fun and finding out how things work archaeologically. So they have both a social and a serious side. We've tried flint knapping, prehistoric and Roman cooking, 'saddle-querning', rock carving…All except the flint knapping proved surprisingly easy to do. There have been pleasing spin-offs too, like observing the effects of heat and rapid quenching on sandstone river cobbles, which we found worked well as pot-boilers. This enabled us to recognise them more confidently in excavations. But it was the flint-knapping that proved the biggest challenge and was most closely linked to our archaeological fieldwork.

We had investigated the distribution of burnt flint across the site at Leys Lane, Boston Spa and luminescence-dated some examples, including two nodules of raw material and a neolithic scraper which appeared 'overheated' (beyond the temperature useful for assisting the knapping process, that is). The inclusion of medieval as well as prehistoric dates in the testing results, suggesting later land clearance burning, explained the overheated appearance of some of the material on site. We decided to conduct a re-enactment experiment to see if we could reproduce the conditions which might have allowed flint to be heat-treated in prehistoric times to improve its knapping qualities. Our prehistoric cooking re-enactments in previous years had demonstrated that leaving flint 'pot-boilers' in the fire for too long reduced them to small calcined pieces useful only for crushing and using, say, as burnt flint temper in pottery. As well as this latter function, we were interested therefore in discovering the conditions that might allow flint to be heated just sufficiently to assist knapping. We did not have the use of a pyrometer, so could not record the temperature of the fire. Indeed, we felt that our methods should be more realistic, yet repeatable, while being recorded reasonably accurately.

Method

It is known that prehistoric flint knapping was sometimes facilitated by pre-heating the flints beneath a fire to make them smoother, less brittle and easier to flake. But was it a process of trial and error? Was it easily repeatable? John Whittaker (*Flintknapping*,1994) recommends pre-treating flakes or tool blanks, rather than larger nodules of raw material, slowly heating them to 450-500 degrees Fahrenheit and then slowly cooling them.



Knapping the blank flakes to be heat treated

Arranging them at different depths in a bed of sand

The flint nodules arranged in the centre of the fire

For our experiment we used good quality blacky-brown till flint outcropping on the east coast, similar to the material encountered on the prehistoric flint site we have been investigating at Boston Spa. We decided to knap the blanks and heat them the night before the BBQ re-enactment event, so that the temperature of the fire could be built up slowly. It then burned for two hours and cooled slowly overnight. In that way we might avoid the problem of cracks and potlid fractures from rapid changes of temperature. In reality that would mean the flint knapper could heat his flint at the same time as his evening meal and begin work the next morning in daylight.
We laid the knapped flakes and blanks on a bed of yellow building sand in a flat-bottomed 40cm square pit, divided into four quadrants with depths of 2.5, 5, 7.5 and 10cm respectively. An iron stake was driven in to mark the centre so we could find the quadrants later. The flints were covered with sand up to ground level. Flint nodules were arranged around the central stake above ground so that these, unlike the flakes to be knapped, would be in direct contact with the fire. We intended the nodules to be broken down by overheating so that we could crush them for use as temper. The fire, which extended beyond the edges of the pit, was built up gradually to a good hot campfire size.

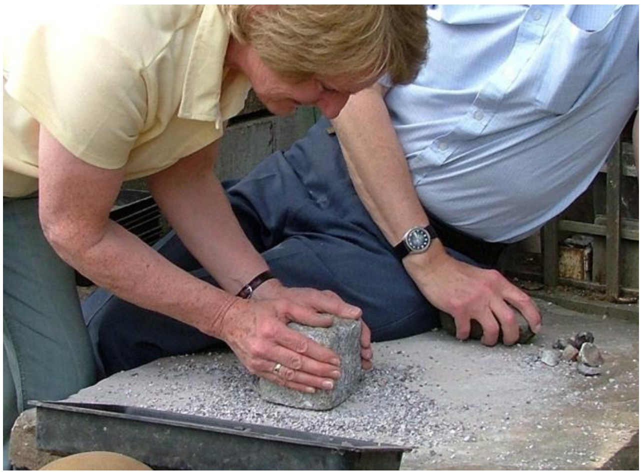
Sorting the calcined flint from the ashes of the fire to process it as temper for the pottery

Removing the lowest layer while testing the heat effects on the shallower flints by pressure flaking

Results

<u>Flint nodules placed directly in the fire</u>:

The next evening the calcined nodules of flint were sorted from the ashes by eye and by sieving. The reduced pieces were easily crushed with stones and further sieved to produce grains suitable for blending with clay to temper our imitation prehistoric pots.

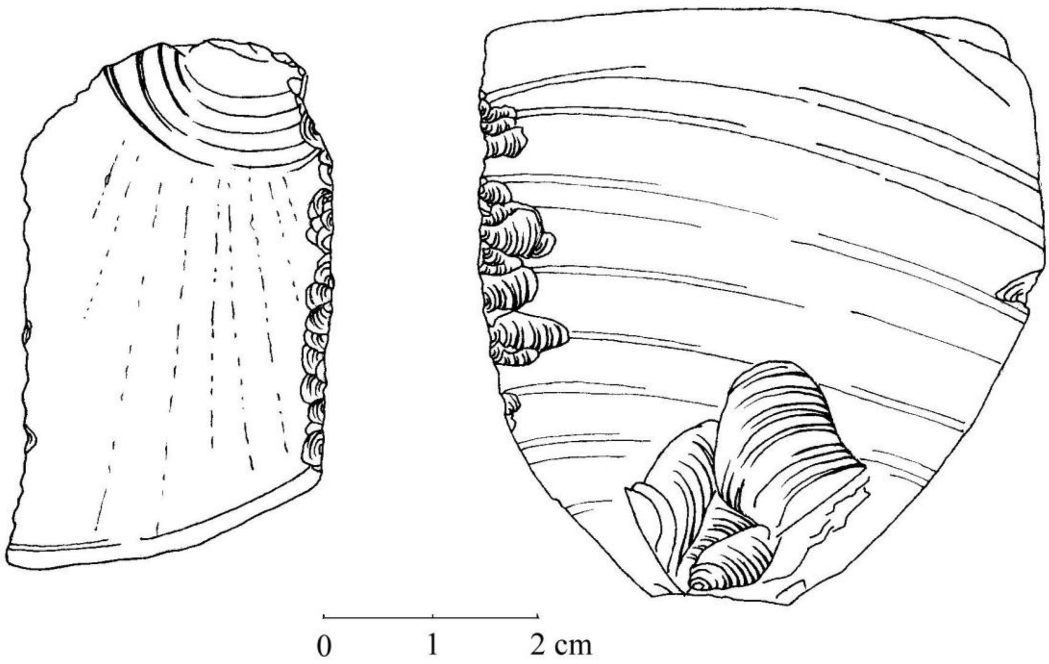


Crushing the burnt flint

Making coil pots with clay grogged with burnt flint

Flint at 2.5cm deep:
The sand had turned red. Pressure-flaking these flints produced longer flake scars than untreated flint and a glossy, silky surface was evident on the flake scars. This effect had not been present on the unscarred surface. The treatment proved useful, but at this shallow depth the heat had caused many potlid fractures.

Flint at 5cm deep:
The sand above the flints in this section had turned red, but remained yellow below, providing a useful guide to heat penetration. The effect on the flint was excellent, with all the above benefits, but none of the problems of crazing or potlid fractures. It was possible to lengthen pressure-flaked scars considerably, from a maximum of 4mm on an untreated flake (below left) to 8mm on one heated at this depth (right). This would be particularly useful when working on fine implements with thin sections, such as knives or arrowheads.



Flint at 7.5 cms. deep:
The sand remained yellow. The effects on the flint were limited and of little benefit.

Flint at 10 cms. deep: there were no observable heat effects.

Conclusions
The optimum depth for burying the flint beneath the fire was 5cm. At that depth heat treatment was particularly beneficial in improving pressure flaking. Admittedly, the experiment was observed empirically, rather than by using more scientific measures, such as a pyrometer or a temperature-controlled oven, and its repeatability would depend on an element of trial and error. However, as the aim was to find a way of reproducing a realistic method, which could work 'in the field' rather than in the laboratory, we were very pleased with the results. It makes a practical re-enactment activity, at once both entertaining and educational, which any group might try.

Acknowledgements
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