

## An experimental approach to study the effect of fire on flint tools

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### INTRODUCTION & AIM

On prehistoric sites, burnt lithic artefacts are generally numerous, in particular in association with domestic hearths. These artefacts are often discarded from use-wear analysis, which potentially causes a bias in the functional interpretation of prehistoric sites.

#### Aim:

Experimental and semi-quantitative approach to study the effect of fire on different flint types and on different use-wear traces.

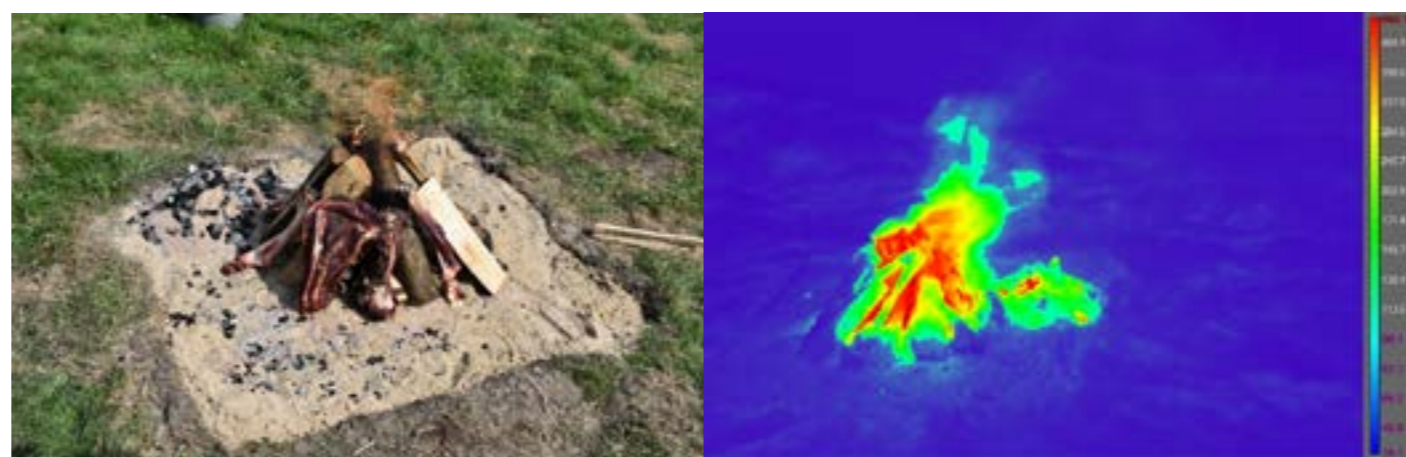
- How do physical and geochemical features of flint change during heating?
- How do these changes affect the preservation of use-wear traces?

### METHODOLOGY: TEST FIRES AND GEOLOGICAL SAMPLES

#### Evaluation of different fuels

Fuels known from archaeological sites in NW Belgium:

- Pine wood: used in the Early Mesolithic
- Oak wood: used in the Late Mesolithic
- Bone: commonly found in hearths throughout Prehistory



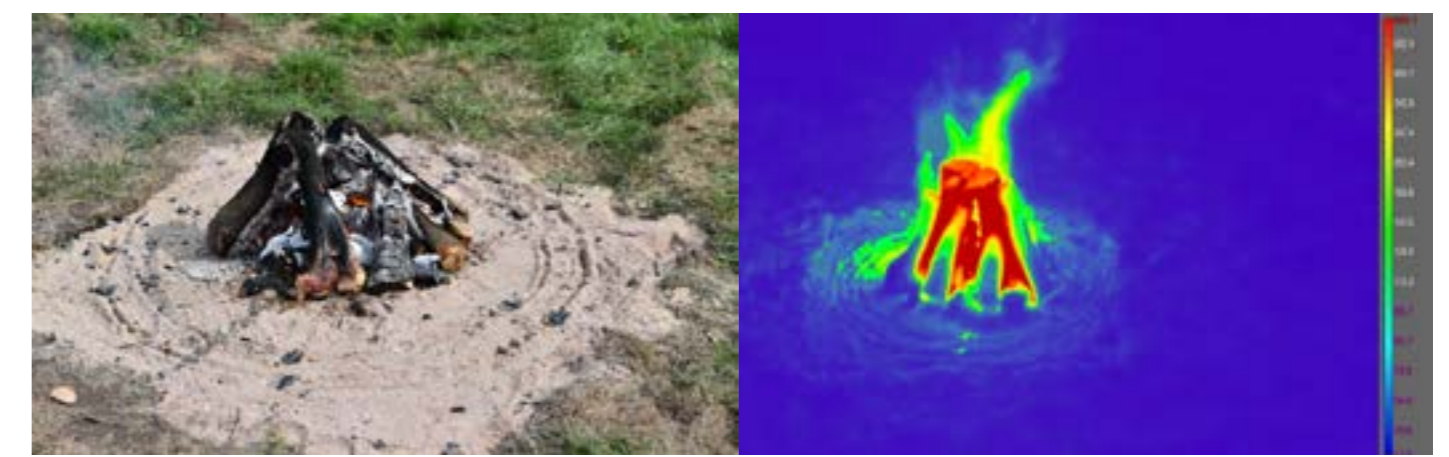
▲ Test fire with mixed wood and bone: Left: photograph; Right: thermal image



#### Reproduction of different degrees of thermal alteration on flints

Flakes from geological samples are positioned at different distances from the center of the fire.

Temperature was monitored using a heat camera and IR thermometer.



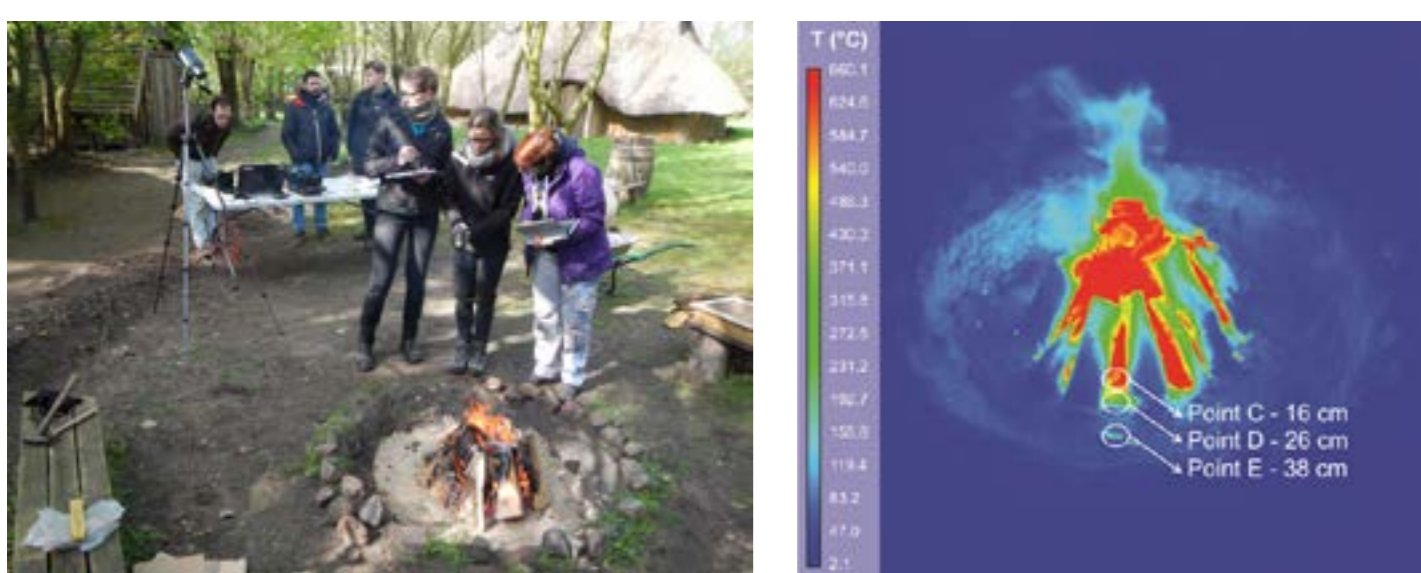
▲ Fire of oak and pine wood with bones and flint samples: Left: photograph; Right: thermal image



### METHODOLOGY: EXPERIMENTAL ARTEFACTS

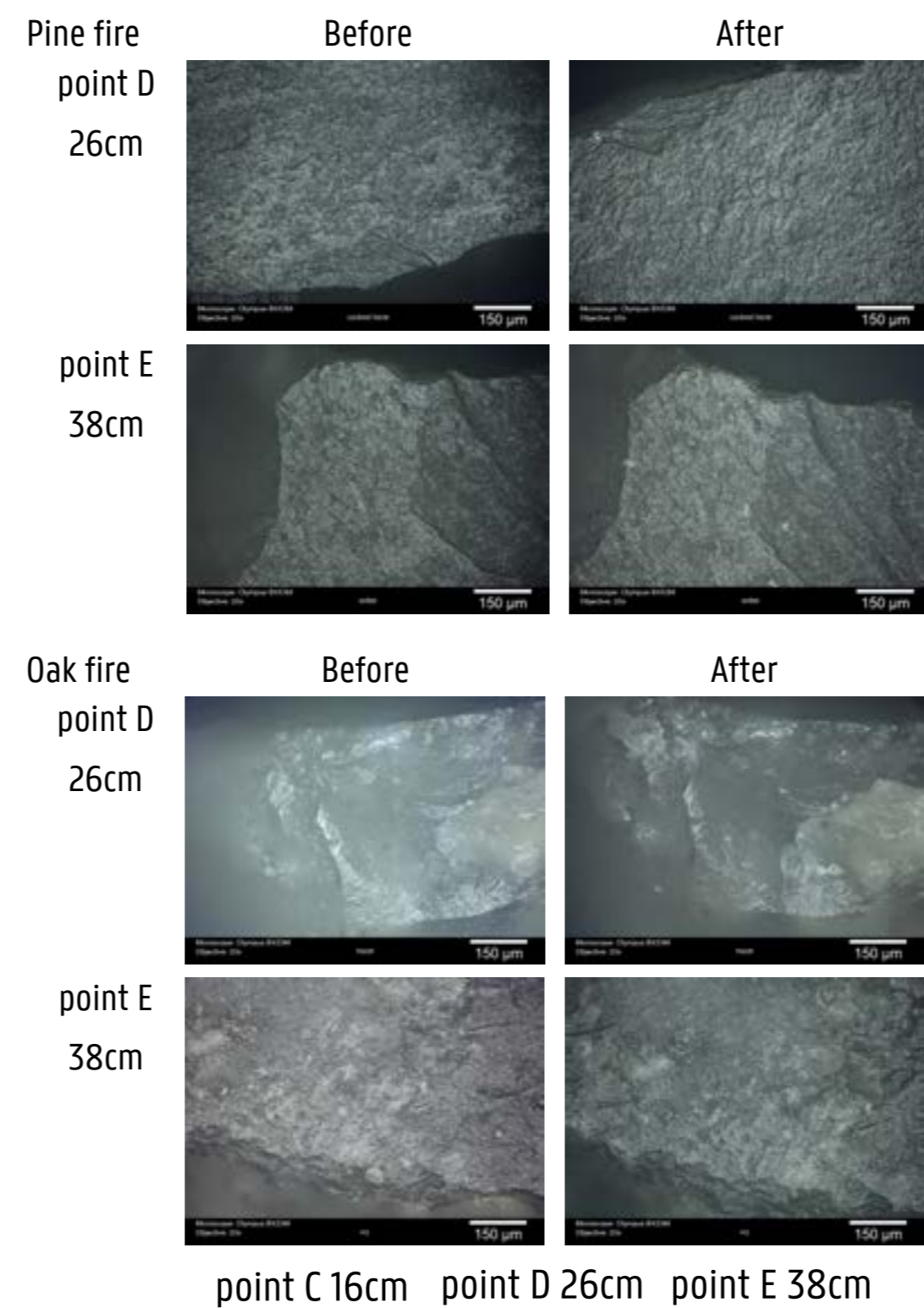


▲ Flowchart of protocol for burning experiments of used tool replicas



▲ Fire with experimentally used artefacts; Left: documentation during experiment (heat camera and IR thermometer); Right: thermal image with indication of locations of visible artefacts

### RESULTS: ARCHAEOLOGY



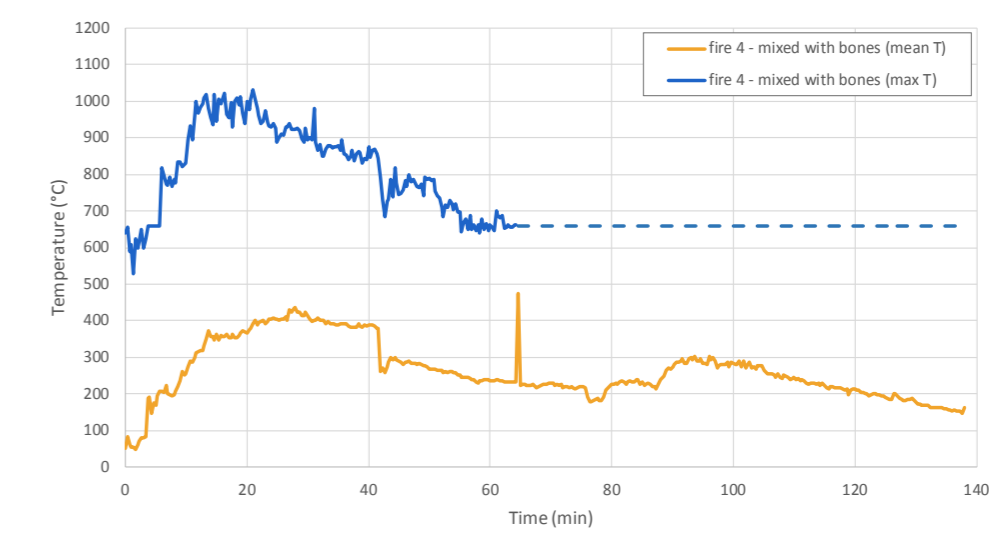
Microscopic photos of use-wear before and after burning



Visual alteration on flint when placed at different locations in the fire. Heavily (1), medium (2) and slightly (3) burnt samples are replicated.

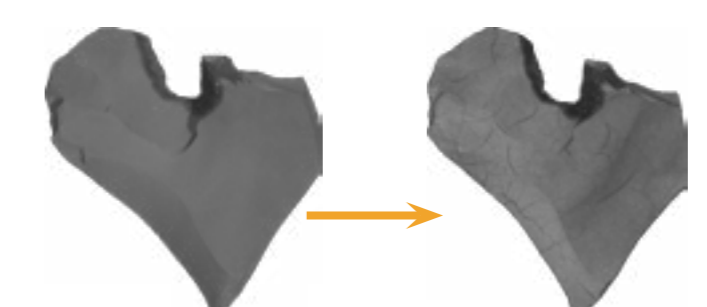
### RESULTS: BURNING CHARACTERISTICS

#### Fire characteristics

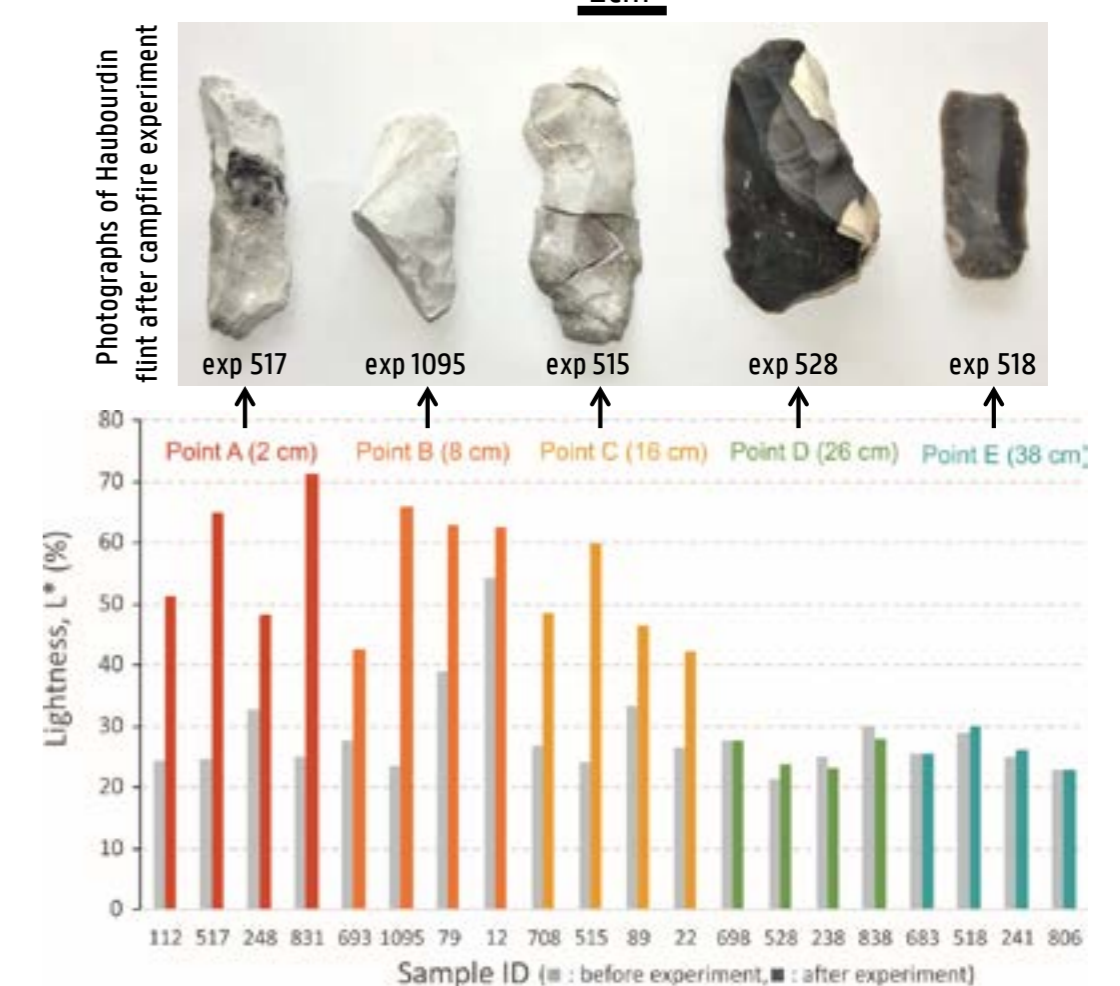


◀ Temporal plot of temperature during the fire with mixed wood and bones. At dashed line the max temperature was below 660°C (calibration setting of heat camera).

#### Flint alteration features



◀ Haubourdin flint before and after burning in the middle of the fire (microCT 3D rendering)



▲ Colour measurements before (grey) and after (coloured) heating in campfire. Note larger L\* difference in samples closer to the centre of the fire

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### CONCLUSION

The developed methodology allows to study

- the different changes in flint during heating;
- the preservation of use-wear traces in different stages.

Thermal damage in campfire can be linked to maximum heating temperature by continuously monitoring the temperature.

The use-wear traces are still clearly recognisable on medium burnt pieces, these should be included in the functional analysis of archaeological assemblages.