Collagen preservation in archaeological bones

Fast & non-destructive detection

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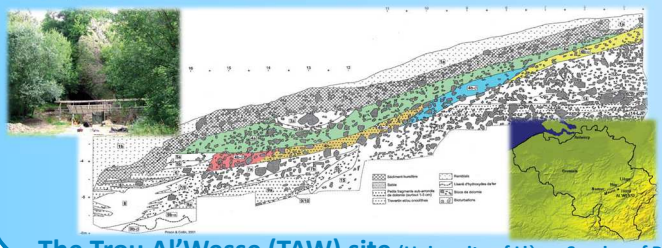
Collagen is a critical material in archaeology required for different analyses (radio carbon dating, ancient DNA, etc.). For such analyses at present, archaeologists are faced with the issues of cost and time, and the risk of failure if collagen preservation is insufficient. The cost of these techniques requires a careful and time consuming screening of the samples.

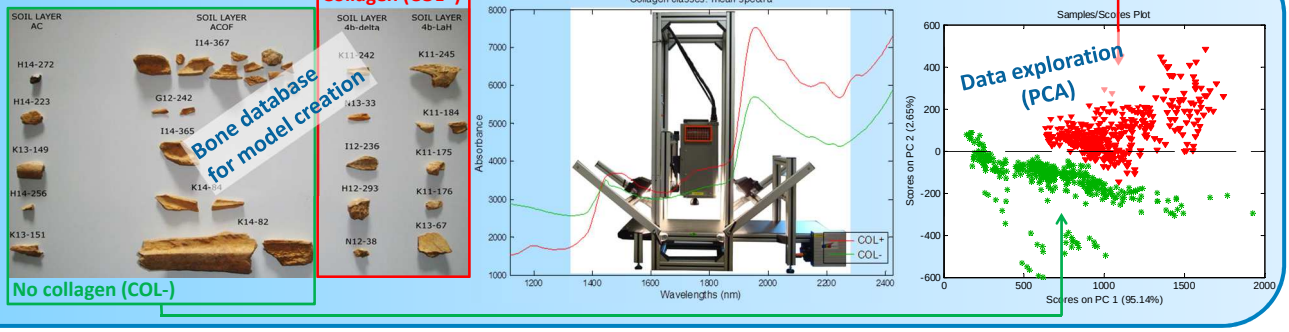
Rapid and non-destructive techniques are needed to screen bones to detect and quantify the amount of collagen preserved, capable of processing large numbers of samples and potentially to directly measure them on-site. Spectroscopy techniques such as Near Infrared (NIR) and **NIR hyperspectral imaging** fulfill all these conditions.

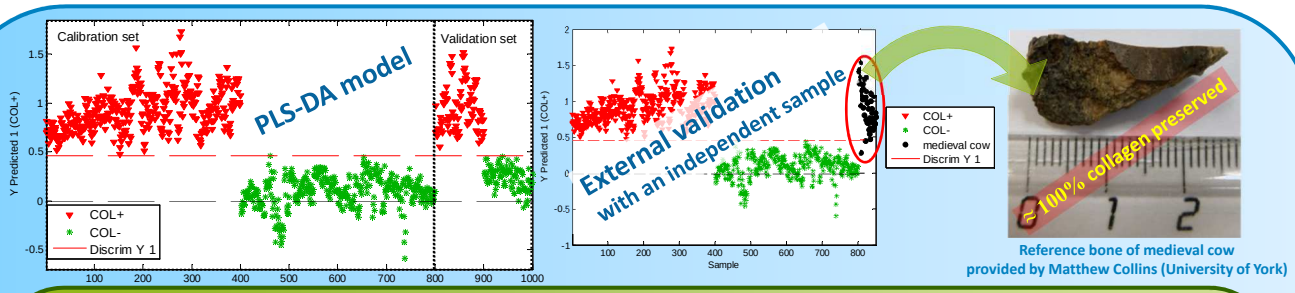


Climate and environment play a key role in explanations of human adaptation, survival and extinction when hominids are confronted with changing climate, particularly rapid oscillations. NIR and NIR Imaging analyses of the fauna will contribute to these questions by clarifying differences in faunal taphonomy (study of the weathering of archaeological remains) within and between strata, leading to further analyses that will refine the palaeoenvironmental and climatic sequence observed in the TAW sequence.

The Trou Al'Wesse (TAW) site (University of Liège, Service of Prehistory, Belgium)

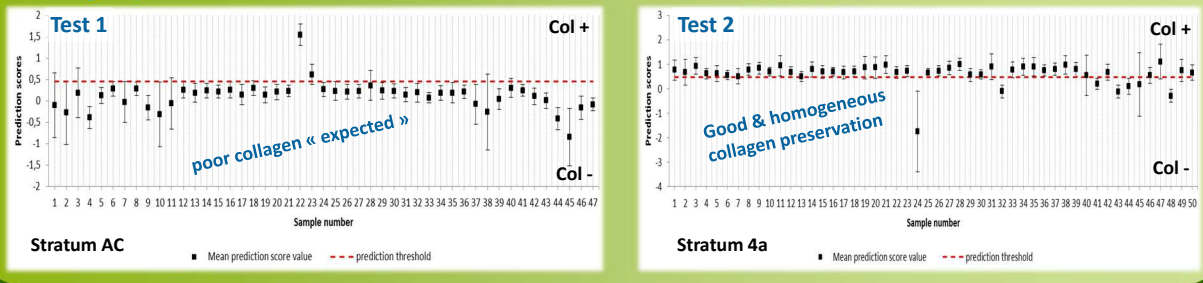
Database & Model design





Reference bone of medieval cow provided by Matthew Collins (University of York)

Comparing bones from a single stratum provides information on the homogeneity in collagen preservation, which could be linked to the environmental conditions that occurred in the past and the post-depositional processes that affected the stratum. Comparison of sample sets from two different strata can evaluate the degree of similarity/difference between them and provide further support when distinction between geological strata is unclear.



The results shown here indicate that NIR hyperspectral imaging combined with chemometric tools has enabled the detection of specific spectral bands characteristic of collagen (not shown here) and the analysis of the degree of collagen homogeneity within and between different strata. These results have direct implications for archaeological applications (e.g. sample selection for subsequent analyses requiring collagen preservation and taphonomic analyses).

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