Quick assessment of Collagen preservation in fossil bones using Hyperspectral Imaging

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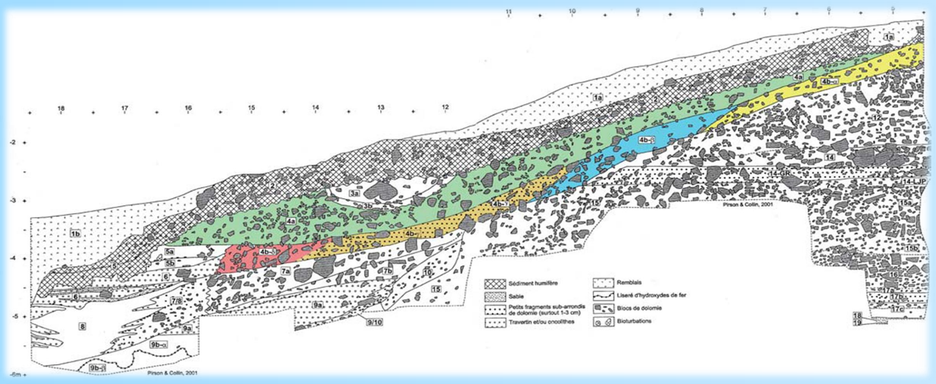
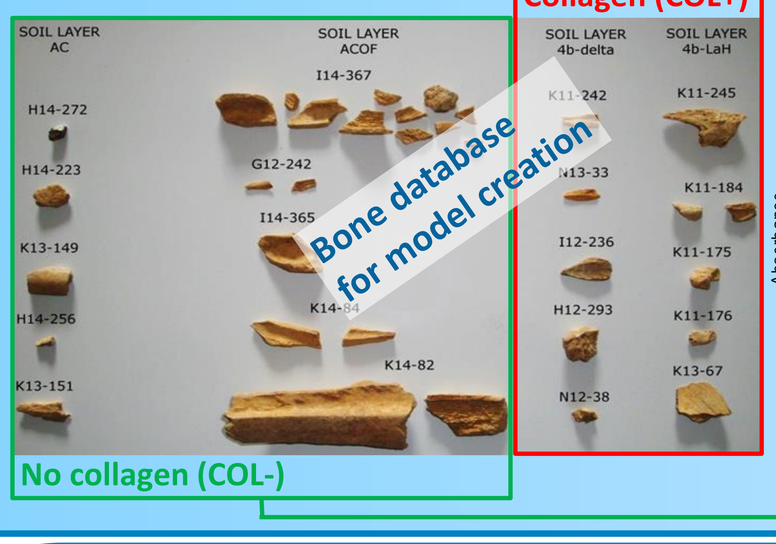
Collagen is a critical material in archaeology required for different analyses (radio carbon dating, ancient DNA, etc.). For such analyses at present, archaeologists are faced with the issues of cost and time, and the risk of failure if collagen preservation is insufficient.

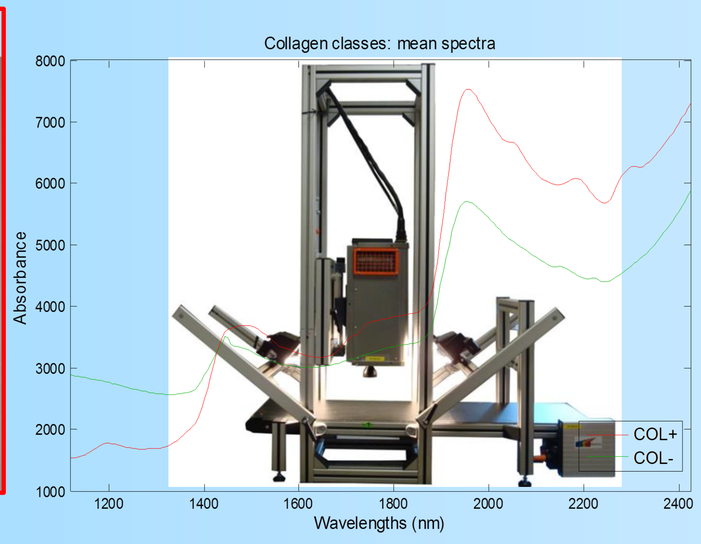
Rapid and non-destructive techniques are needed to screen, at laboratory and on-site, a large number of bones to detect and quantify the amount of collagen preserved. Spectroscopy techniques such as Near Infrared (NIR) and NIR hyperspectral imaging fulfill all these conditions.

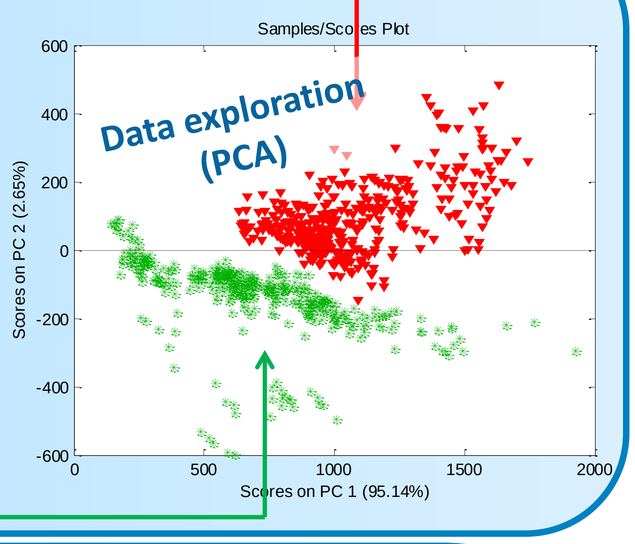


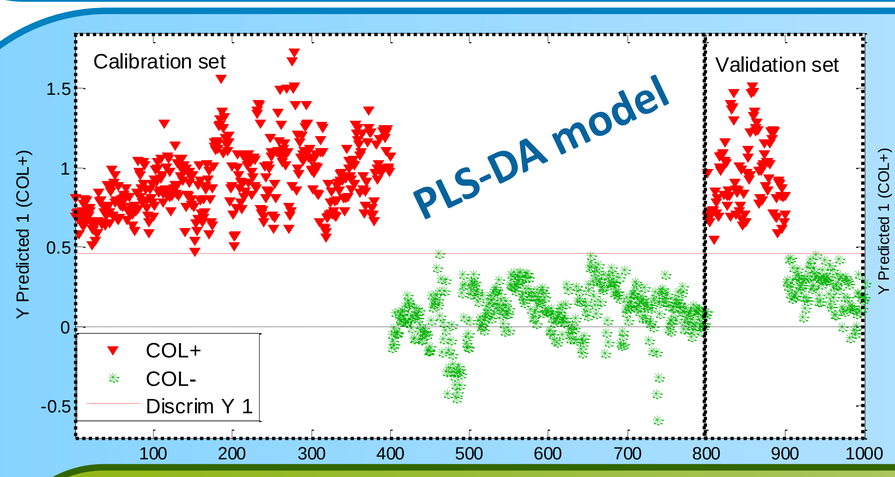
The Trou Al'Wesse (TAW) site (University of Liège, Service of Prehistory, Belgium)

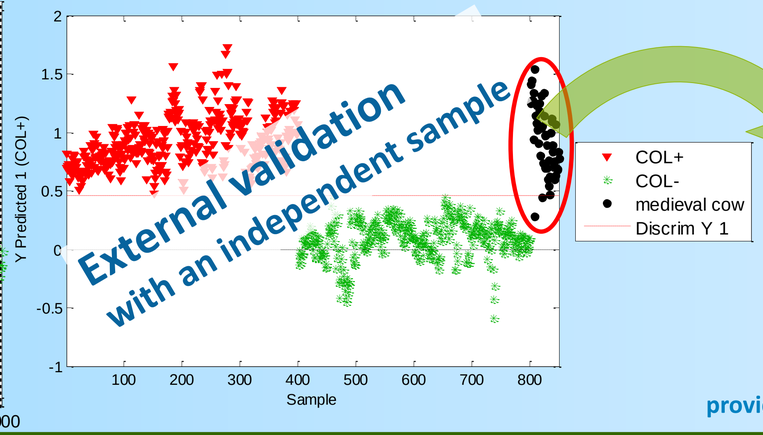
Database & Model design





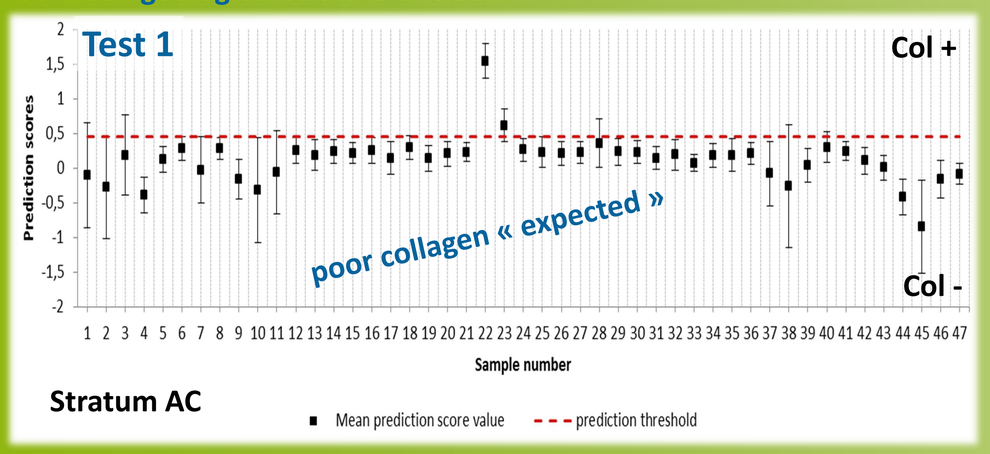


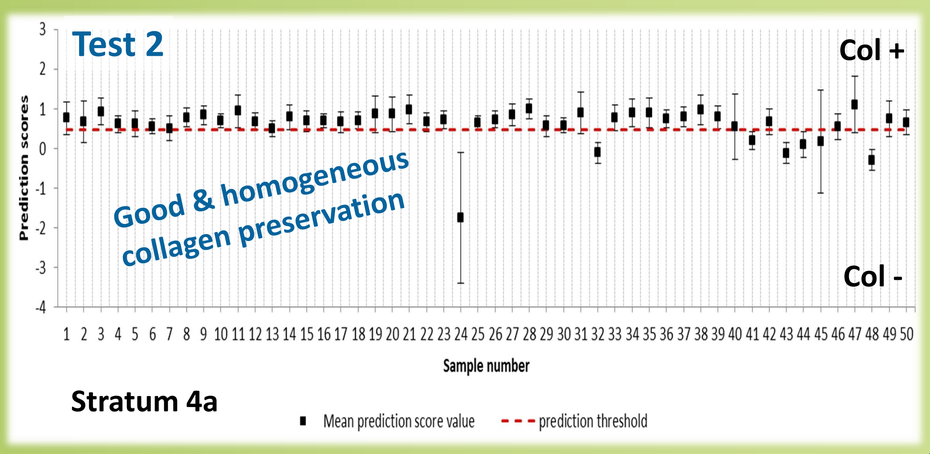




Reference bone of medieval cow provided by Matthew Collins (University of York)

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 obtained in this work indicate that NIR hyperspectral imaging combined with classic chemometric tools enables the detection of specific spectral bands characteristic of collagen as well as 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).

The ArcheoNIR project is funded by the Fonds de la Recherche Scientifique (FNRS), Fonds de la recherche Fondamentale Collective (FRFC), project number F.FRFC 2.4621.12. The Trou Al'Wesse project is supported by annual subsidies from the Service public de Wallonie (SPW). We are also grateful to Ouissam Abbas (CRA-W) and the technical staff of all of the teams.

"Analysis of collagen preservation in bones recovered in archaeological contexts using NIR hyperspectral Imaging." 2014, Vincke D., Miller R., Stassart E., Otte M., Dardenne P., Collins M., Wilkinson K., Stewart J., Baeten V., Fernández Pierna J. A., Talanta 125, 181-188.

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