

Chasing spectral shadows into the dark proteome. How cultural heritage is making us question our assumptions about the analysis of old proteins

S-02.3-1

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In the realm of cultural heritage - parchments, glues, and binders - spectral shadows haunt the dark proteome. A profound challenge exists: a significant portion of fragment ion spectra—up to 94%—fail to be matched through conventional database searches. Identification is impeded by the databases selected, the modifications considered, missed cleavages, inconsistent digestion, and almost certainly many other factors.

The complexities encountered in palaeoproteomics are not isolated to this field. They must also be relevant in areas such as metaproteomics, studies involving non-model organisms, low-abundance and/or highly priced proteins. The complex composition of historical materials, from the types of animal skins used in parchments to the diverse range of natural adhesives and binders, adds layers of complexity to the identification process, mirroring the challenges faced in these other proteomic disciplines.

Such advances are pivotal not only for uncovering the untold stories hidden within the "dark matter" of ancient proteomic datasets but also for enriching our understanding of historical and cultural heritage. Improvements in data sharing and search methodologies will help the study of ancient manuscripts and artefacts, offering new insights into the materials and techniques employed by past civilizations. This collaborative endeavor has the potential to shed light on the legacy of human creativity and ingenuity, revealing connections across time.