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(Article begins on next page)

Through the Looking-Glass, and What Amino Acids Found There

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Timing is everything: accurate dating of the archaeological record is essential to an understanding of the history of the human species. Chronology underpins our understanding of the past, but beyond the limit of radiocarbon dating (~60 ka), sites become more difficult to date. Amino acid geochronology uses the time-dependent breakdown of proteins in biominerals, with the racemisation reactions (conversion between mirror-images) of amino acids having the potential to date the whole of the Quaternary. Recent studies have shown that a very small fraction of 'intra-crystalline' protein within mollusc shells, opercula and eggshell forms a closed system, and if this is targeted, the difficulties due to leaching, contamination and environmental factors are removed. The analysis of a coherent calcite intra-crystalline system has enabled the development of a chronology for Britain back to at least 2.8 Ma.

Our research is now focusing on building chronological frameworks on a wide spatial and temporal scale. Beginning from the Lower Palaeolithic in Northern Europe, we are making our way back into Africa: from Gibraltar, home of the last Neanderthals, we crossed the Strait to Morocco, and are venturing into the Arabian Peninsula and South Africa. Ever expanding the range of materials we are testing, we also present here some preliminary work on enamel, along with the potential and the limitations of the technique.