

## U-Th burial dating of ostrich eggshell beyond the $^{14}\text{C}$ limit

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Current dating techniques do not fully meet the needs of archaeologists investigating human evolution during the Middle Stone Age in Africa and Middle Paleolithic in the Near East (>300-30 ka). Such sequences commonly contain ostrich eggshell fragments (OES), made of ~2-mm thick, low-Mg calcite that are geochemically suitable for U-Th dating. Unlike previous attempts at U-Th dating of OES, recent work<sup>1</sup> explicitly recognizes that U in OES is taken up from soil pore water on burial and has produced concordant U-Th and  $^{14}\text{C}$  ages on OES. LA-ICP-MS profiling and mapping of OES from 10 archaeological sites reveal profiles of [ $^{238}\text{U}$ ] and [ $^{232}\text{Th}$ ] across eggshells that guide selection of optimal OES and sub-sample positions. We prepare two or more surface-parallel tablets from each OES, determine  $^{230}\text{Th}/\text{U}$  ages via solution ICP-MS, and apply a diffusive uptake model to estimate U-Th burial ages; i.e., when the OES was first exposed to U in soil pore water. OES tablets have [U] ~ 5 - 2000 ppb and ( $^{230}\text{Th}/^{232}\text{Th}$ ) ~ 7 - 3300. Using OES from deeply stratified sites, we assess reproducibility of U-Th ages within single layers, preservation of stratigraphic order, and agreement with independent dates ( $^{14}\text{C}$ , OSL, U-Th on conventional materials) for OES ranging ~20-150 ka.

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<sup>1</sup> Sharp et al., *U-Th dating of ostrich eggshell*: American Geophysical Union Fall Meeting 2015; in prep