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The chronostratigraphy of the Haua Fteah cave (Cyrenaica, northeast Libya) — Optical dating of early human occupation during Marine Isotope Stages 4, 5 and 6

Zenobia Jacobs [a, *], Bo Li [a], Lucy Farr [b], Evan Hill [c], Chris Hunt [d], Sacha Jones [b], Ryan Rabett [c], Tim Reynolds [e], Richard G. Roberts [a], David Simpson [c], Graeme Barker [b]

[a] ARC Centre of Excellence for Australian Biodiversity and Heritage & Centre for Archaeological Science, School of Earth and Environmental Sciences, University of Wollongong, New South Wales 2522, Australia
[b] McDonald Institute for Archaeological Research, University of Cambridge, Cambridge CB2 3ER, UK
[c] School of Geography, Archaeology and Palaeoecology, Queens University Belfast, Belfast BT7 1NN, UK
[d] School of Natural Sciences and Psychology, Liverpool John Moores University, Liverpool L3 3LH, UK
[e] Department of History, Classics and Archaeology, Birkbeck College, University of London, London WC1B 5DQ, UK

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ABSTRACT

The paper presents the results of optical dating of potassium-rich feldspar grains obtained from the Haua Fteah cave in Cyrenaica, northeast Libya, focussing on the chronology of the Deep Sounding excavated by Charles McBurney in the 1950s and re-excavated recently. Samples were also collected from a 1.25 m-deep trench (Trench S) excavated during the present project below the basal level of the Deep Sounding. Optically stimulated luminescence (OSL) data sets for multi-grain, single aliquots of quartz for samples from the Middle Trench were previously published. Re-analyses of these OSL data confirm significant variation in the dose saturation levels of the quartz signal, but allow the most robust OSL ages to be determined for comparison with previous age estimates and with those obtained in this study for potassium-rich feldspars from the Deep Sounding. The latter indicate that humans may have started to visit the cave as early as ~150 ka ago, but that major use of the cave occurred during MIS 5, with the accumulation of the Deep Sounding sediments. Correlations between optical ages and episodes of "Pre-Aurignacian" artefact discard indicate that human use of the cave during MIS 5 was highly intermittent. The earliest phases of human activity appear to have occurred during interstadial conditions (5e and 5c), with a later phase of lithic discard associated with more stadial conditions, possibly MIS 5b. We argue that the "Pre-Aurignacian" assemblage can probably be linked with modern humans, like the succeeding "Levalloiso-Mousterian" assemblage; two modern human mandibles associated with the latter are associated with a modelled age of 73–65 ka. If this attribution is correct, then the new chronology implies that modern humans using "Pre-Aurignacian" technologies were in Cyrenaica as early as modern humans equipped with "Aterian" technologies were in the Maghreb, raising new questions about variability among lithic technologies during the initial phases of modern human dispersals into North Africa.

1. Introduction

The Haua Fteah, located at 22°3′5″E and 32°53′70″N, is a large limestone phreatic cave remnant at the foot of the northern escarpment of the Gebel Akhdar ('Green Mountain') massif, overlooking the present-day coast of Cyrenaica, northeast Libya (Fig. 1a). The north-facing entrance (Fig. 1b) is ~1 km from the coast and is ~50 m wide and ~20 m high; the interior roofed area measures ~80 m across. Excavations by Charles McBurney over three seasons (1951, 1952 and 1955: Fig. 1c) revealed a 14 m-deep sequence of cultural deposits, which has since been used as a key reference sequence for North Africa. At the completion of McBurney's excavations, the trench consisted of three stepped units (Fig. 1d): an Upper Trench (our terminology, not McBurney's) measuring approximately 10 × 11 m surface area x 2 m deep; a Middle Trench measuring about 7 × 6 × 5.5 m; and a Deep Sounding that was published by McBurney (1967) as being 2.5 × 1.5 × 6.5 m, although

* Corresponding author.
E-mail address: zenobia@uow.edu.au (Z. Jacobs).

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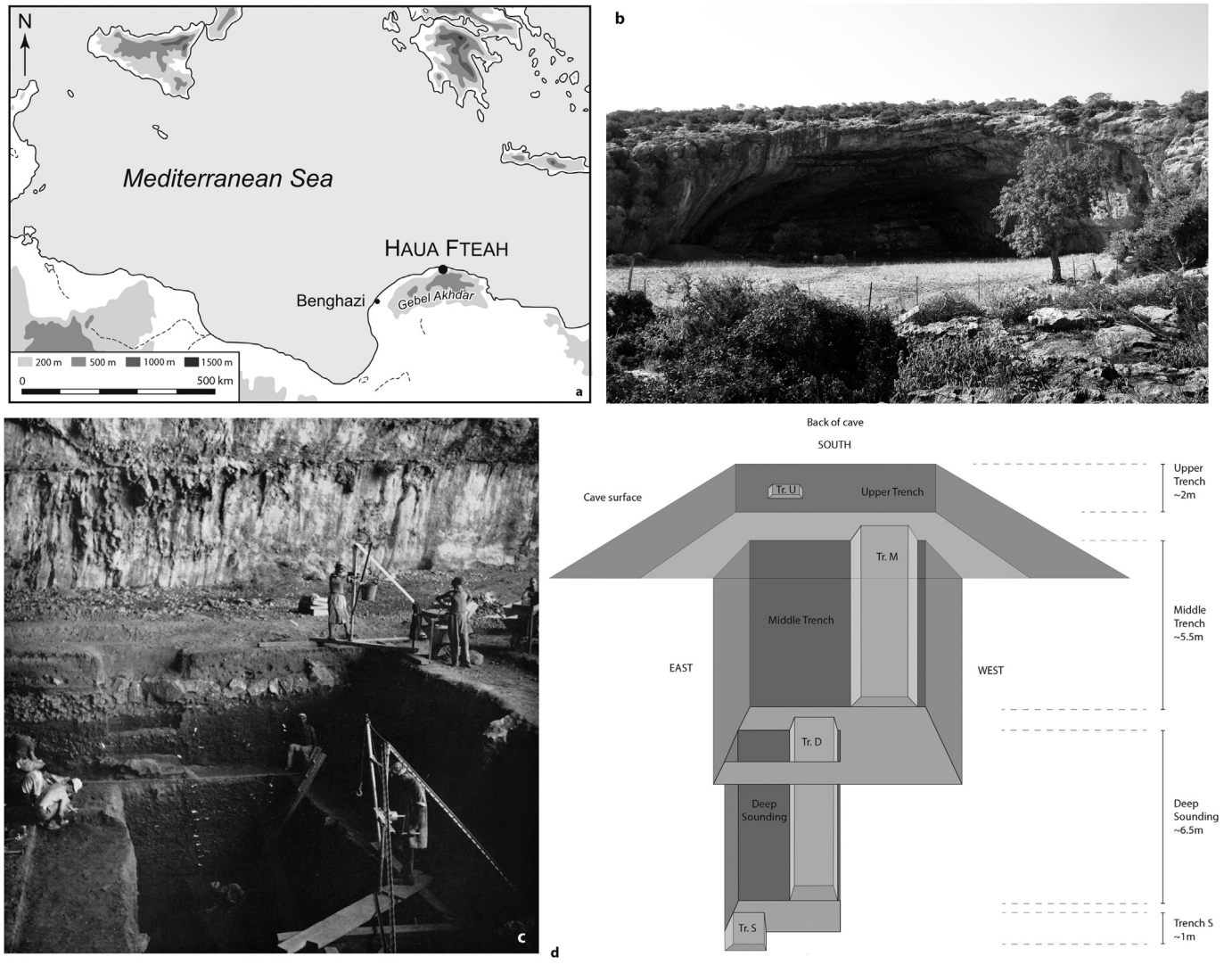

Figure 1. The Haua Fteah cave (Cyrenaica, northeast Libya), showing (a) its location in northeast Libya, (b) the entrance to the cave, (c) the 1950s McBurney excavations, and (d) schematic diagram of the stepped McBurney trench and the TRANS-NAP trenches down its sides (U, M, D and S). (b: photograph by Graeme Barker; c: reproduced with the permission of the Museum of Archeology and Anthropology, University of Cambridge; a, d: illustrations by Lucy Farr.)

we measured it in 2012 as 3.8 × 1.6 × 6.5 m. It is known that the Deep Sounding was expanded rapidly at the end of the 1955 season and was not fully recorded by McBurney. Most of his excavation, the deeper layers especially, was undertaken using horizontal spits, so his samples of lithics and fauna can cross-cut different sedimentary units. He used the (then recent) technique of radiocarbon (^{14}C) dating to establish a numerical chronology for the uppermost 7 m of the sequence and, from these ages, estimated the sedimentation rate to infer an age of ~80 ka for the base of the deposit, marked by rockfall at the base of the Deep Sounding.

McBurney (1967) defined seven cultural phases of occupation, based on the typology and technology of the lithic material recovered. The earliest phase (A), from spit 176 (at the bottom of the Deep Sounding) to spit 50 (underlying Layer XXXV at the base of the Middle Trench), was a Middle Stone Age (MSA) industry based on flakes and blades which he termed the "Pre-Aurignacian" because it was taken to resemble the Pre-Aurignacian and Amudian assemblages in Southwest Asia. This was overlain (Phase B: Layers XXXV–XXV) by "Levalloiso-Mousterian" industries, so called from their broad comparability with these industries in the Levant and Europe. Two human mandibles in Layer XXXIII were originally regarded as 'Neanderthaloid', but have since been confirmed as an early form of modern human (Hublin, 2000). Phase C (upper part of Layer XXV to Layer XVI) was an industry characterized by blade technology and an Upper Palaeolithic tool inventory. McBurney termed this the "Dabban" after the Cyrenaican cave of Hagfet ed-Dabba where he had found similar material (McBurney, 1960). The Dabban was succeeded by a microlithic late or final Upper Palaeolithic industry (Phase D, Layers XV–XI) and termed the "Eastern Oranian" or "Iberomaurusian" from its similarities with assemblages in the Maghreb (northwest Africa). At the junction of the Middle and Upper Trenches (Phase E, Layers X and IX) was a microlithic Mesolithic-type industry with parallels to Capsian assemblages in the Maghreb and, hence, classified as the "Libyco-Capsian". Above this was the final prehistoric occupation (Phase F, Layers VIII–IV), with Neolithic pottery and domestic sheep and goats, which was termed "Neolithic of Libyco-Capsian tradition" because of similarities in stone tools (the frequency of backed pieces, for example) with the preceding Libyco-Capsian. The prehistoric sequence was capped (Phase G) by a substantial boulder-supported structure dating to the Graeco-Roman period (Layers III and II), covered by burnt animal dung and other evidence of