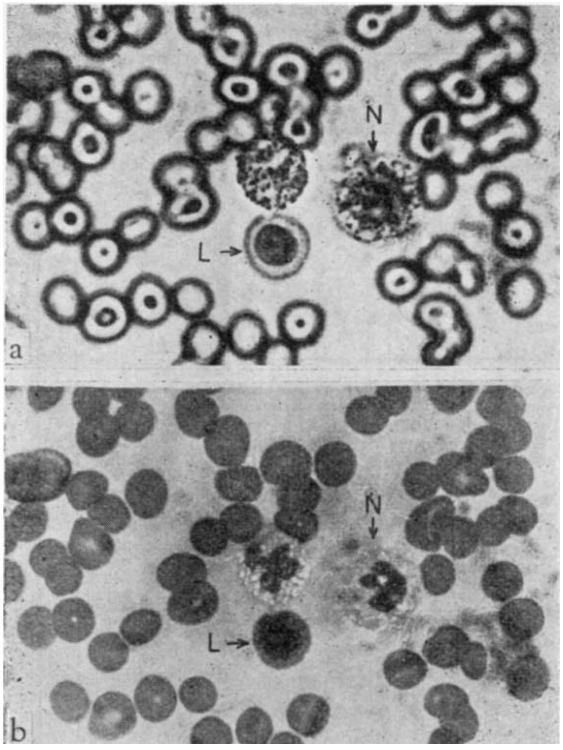

Fig. 1. *a*, Blood smear showing two neutrophils with 'surface granulation' (*N*) and one lymphocyte with clear cytoplasm (*L*). Counterstained with Leishman. Phase contrast × 450. *b*, Same field as in *a* but under oil immersion (× 450). Disappearance of 'surface granulation'

containing acetic acid often produce considerable distortion of the cell[3].

Sodium thiosulphate in the presence of acetone, water and acetic acid is effective in producing neutrophilic 'surface granulation', but the change is dependent on *p*H and is best developed at a *p*H near 5·5. This was determined by testing freshly prepared air-dried blood smears against the various components of McNary's stain. Neither dithizone, sodium potassium tartrate nor potassium cyanide was necessary for the production of 'surface granulation'. Absolute acetone, or acetone plus water, alone does not produce 'surface granulation' although it adequately fixes blood smears.

If blood smears are fixed first in methanol, formalin vapour, or osmium tetroxide vapour, neutrophils no longer show 'surface granulation'. Neutrophils from the dog do not show 'surface granulation' under conditions which produce it in human neutrophils.

The differences described here between human neutrophils and lymphocytes must reflect biochemical differences in cell proteins. These differences are being investigated in lymphocytic and granulocytic cells at various stages of maturation.

This work was supported by a grant from the Anti-Cancer Council of Victoria. I am grateful to Dr. T. E. Lowe for his help.

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ARCHÆOLOGY

Absolute Age of Pleistocene and Holocene Deposits in the Haua Fteah

The general characteristics of the large coastal cave site known as the Haua Fteah, in north-eastern Libya, have already been described, together with a brief résumé of the most important results obtained up to 1952[1,2]. A further season's work in 1955 provided additional fossil human remains associated with Middle Palæolithic occupation débris[3a,b], enabled a much closer analysis of the stratigraphy, and, by opening up a wider area, made possible the excavation of a deep sounding into earlier cultural horizons than any hitherto examined, down to a total depth of 42·5 ft. In the past six years a detailed programme of study of the cultural, palæontological and other collections has been carried out in this Department, and further samples for carbon-14 analysis have been processed.

From an archæological point of view the site is now seen to offer a nearly continuous cultural succession from a pre-Mousterian stage (provisionally labelled Libyan Pre-Aurignacian by analogy with the "Praeaurignacien" identified by Rust[4] in Syria) up to the present. The stratigraphy containing this succession consists for the most part of remarkably regular horizontal layers, distinguished from one another by minor differences in colour and lithology, and ranging in thickness from about 6 to 18 in. (ref. 2). Mammal bones form a considerable proportion of the occupation debris and are the subject of a separate communication elsewhere[5]. The object of the present note is to make available, in advance, the principal data on which the absolute age of the cultural and biological succession is based, since these would appear to be relevant to other investigations being carried out elsewhere in the Mediterranean and adjacent areas.

Carbon-14 age estimates were obtained by H. E. Suess, at the Washington Laboratory, from samples collected in 1952 (ref. 6), and by the late Hl. de Vries, from samples collected in 1955 (personal communication). In the accompanying diagram (Fig. 1) these ages have been plotted against the cumulative depth obtained by adding together the maximum observed depth of each layer. This device has been adopted in order to minimize the effects of localized denudation, and hence approximate as nearly as possible to the relative time-interval represented by each layer.

It will be noted that as far back as 28,500 before the present the points appear to approximate to a logarithmic curve representing a gradually decreasing ratio of thickness to time unit. This is not unexpected since the effects of compression by increasing overburden, plus possible weathering *in situ* by percolating water, should in general lead towards progressive reduction in thickness.

Below a depth of about 25 ft., however, this tendency seems to be reversed by dates *W*85, *GRO* 2022, 2023, and a preliminary reading for layer XXIX, *GRO* 2050 (de Vries, personal communication). Both Suess and de Vries, however, considered that these dates were best regarded as minimum rather than absolute, owing to the well-known greatly increased disturbance of small contaminations, etc., on readings of this great age. On the whole, therefore, the projection of a line drawn from *GRO* 2586 through the mid-point between the readings for layers XX and XXI would seem to provide as reasonable a first approxi-

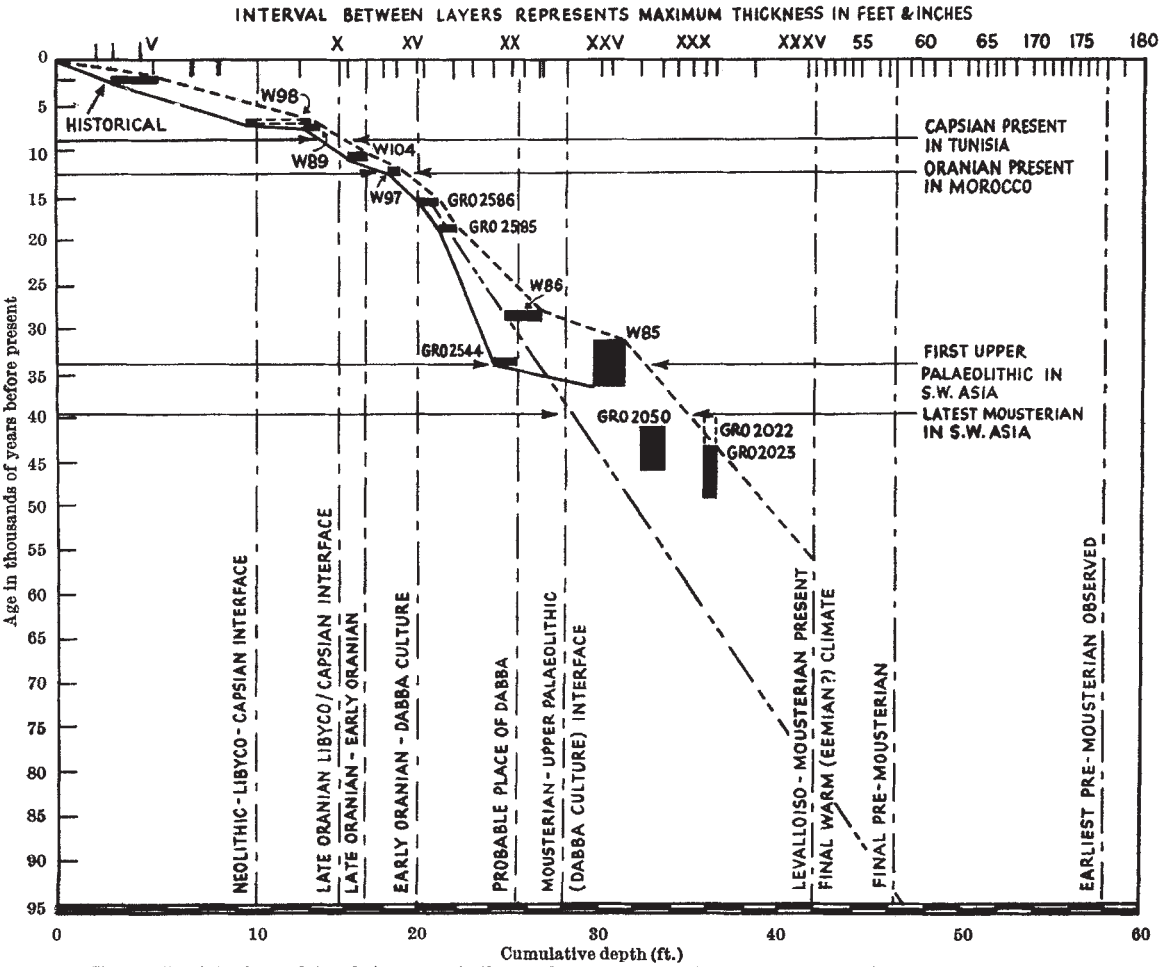

Fig. 1. Graph to show relation between age in thousands of years before the present and cumulative depth (ft.), of carbon samples from the Haua Fteah, Cyrenaica, Libya. The rectangles represent the depth through which the sample was taken and the standard error of the carbon-14 reading expressed in years. The central broken line represents the hypothetical trend beyond the range of the readings regarded as most reliable. The numbers at the top of the diagram are the reference numbers assigned to each layer

mation to the possible ages of the earlier interfaces as the present data allow. Although a wide margin must naturally be left to alternative estimates, an age for the earliest occupation horizon within the limits 100,000–150,000 seems probable.

It is interesting to set this against the geological evidence for an Eemian date recently established for the closest typological homologue, the Pre-Aurignacian of the Levant[7], since the end of the Eemian according to most carbon-14-based estimates would have occurred between 55,000 and 75,000 (refs. 8*a*, *b*, 13).

Using the same gradient, an age of 38,000 would be indicated for the Mousterian–Upper Palæolithic interface at the Haua, which would compare with previous estimates for the corresponding horizon at Shanidar (Kurdistan) of 35,000–40,000 (refs. 9, 10) $\geqslant$ 32,000 at Kara Kamar (Afghanistan) (ref. 10), and $>$ 32,000 (ref. 12) (estimated 36,000, ref. 13) at Istallöskö (Hungary). On the other hand, a date $<$ 39,500 (ref. 14) is indicated by the presence of a Mousterian horizon of this age at Tabun (Palestine).

Again, the age of 14,000 indicated for the earliest Oranian at the Haua may be compared to 12,000 recently established for the middle Oranian horizon at Taforalt (Morocco)[15], whence the earliest Oranian at this site can be estimated as between 11,000 and 15,000 on the stratigraphical context.

On the basis of these figures it may be said that the chronology suggested by the combined carbon-14 readings and stratigraphy at the Haua Fteah is in general agreement with available carbon-14 dates for the corresponding cultural events in not too distant areas.

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