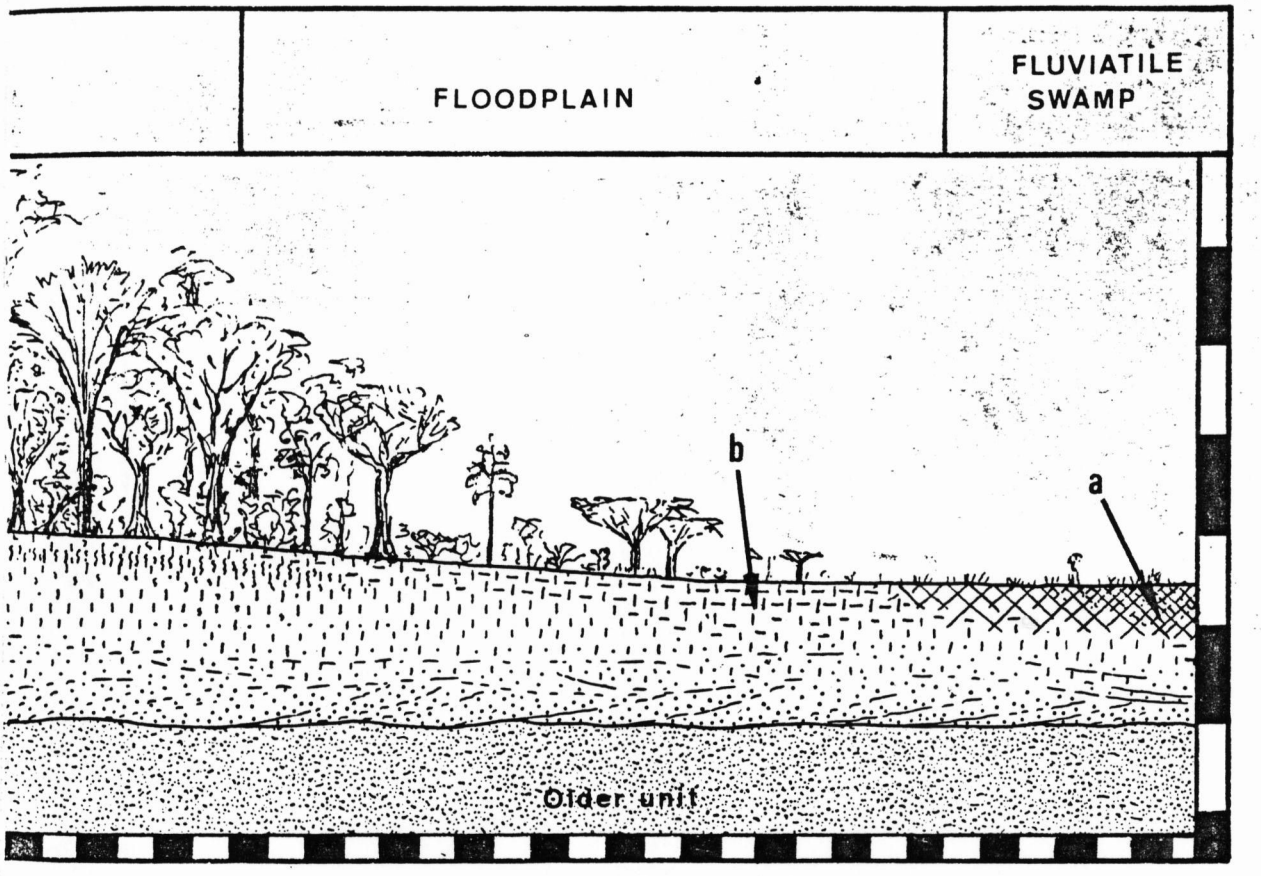
KONINKLIJK MUSEUM VOOR MIDDEN-AFRIKA – TERVUREN, BELGIË
ANNALEN – REEKS in-8° – GEOLOGISCHE WETENSCHAPPEN – nr. 85, 1983

THE OMO GROUP

CHRONOLOGY

VOLUME ONE – TEXT



ARCHIVES OF THE INTERNATIONAL OMO RESEARCH EXPEDITION

MUSÉE ROYAL DE L'AFRIQUE CENTRALE – TERVUREN, BELGIQUE
ANNALES – SÉRIE in-8° – SCIENCES GÉOLOGIQUES – n° 85, 1983

CHAPTER 6

CHRONOLOGY

by F.H. BROWN

Data relating to the chronology of the Plio-Pleistocene formations consists of potassium-argon dates on a number of horizons and magnetostratigraphic boundaries located within the stratigraphic section. As all data have been published elsewhere (Brown and Nash, 1976; Brown, Shuey and Croes, 1978) the relevant numbers are set out in summary form in table 5. Two of the horizons dated by potassium-argon appear to be discrepant and have been previously discussed (Brown and Nash, 1976); these are Tuff E and Tuff B. These data are not considered in the ensuing discussion. Here an attempt is made to reconcile all data presently available, and to give estimates of the ages of all members of the Shungura Formation (see also fig. 2).

The data of table 5 are plotted in figure 57 in which the limits on the age of various parts of the stratigraphic section are depicted. The figure was constructed assuming that the times assigned to the magnetostratigraphic boundaries have no associated error, and that the error estimates on the potassium-argon dates are realistic.

A similar figure could be drawn assuming a linear sedimentation rate between each fixed point in the section, but it is felt that the figure as drawn allows for broader interpretations should new data be obtained. The choice of a linear sedimentation rate is not necessarily the best, and a single example is given to demonstrate the sort of error which might be involved. The inset in figure 57 shows the part of the section between the top of the Kaena event and the top of the Gauss epoch. Hypothetical curves of the actual path of sediment accumulation with time are shown. The boundary between Members B and C is plotted as a dashed vertical line. The only constraint on the curves is that they must have a positive slope. Curve A assumes a linear relation between time and rate of accumulation of sediment. Using this model, the boundary between Member B and Member C would be placed at 2.64 m.y. Curve B assumes that sediments accumulation was slow at first and more rapid later - the B/C boundary in this case would be placed at 2.47 m.y. Curve C assumes a complex relationship between sediment accumulation and time, and with this model the B/C boundary would be placed at 2.77 m.y.

In fact none of the preceding hypothetical curves is probably correct because of the large number of diastems which allow the definition of Submembers within these Members. One way of trying to determine the length of time taken up by diastems is to consider the magnetostratigraphy in another way. Of 18 magnetozone boundaries, 8 fall on diastems, that is, there is no sedimentary record of actual reversal. From this we could conclude that 8/18 of geologic time or 44% is unrecorded in the Shungura Formation because of diastems. For the part of the section under consideration this amounts to about 190,000 years.

If it is assumed that all diastems are of about the same length, and that the sedimentation rate is constant during times of actual deposition, then we can count the

Table 5. - Chronological data on the Shungura, Usno and Mursi Formations.

Age (m.y.)	Feature	m	Stratigr. level Shungura Fm.	m	Stratigr. level Usno Fm.	Stratigr. level Mursi Fm.
around	Jaramillo or	749	L—6/L-7 boundary			
0.9 or 1.1	Mac Cobb Mountain Event	737	L-4/L-5 boundary			
1.27, 1.41						
1.41	K/Ar dates	717	Tuff L			
1.43, 1.51	K/Ar dates	692	Tuff K or K2			
1.71	Top of Olduvai Event	636	H-6/H-7 boundary			
1.75, 1.85	K/Ar dates	616	Tuff H-4			
1.81, 1.81,						
1.84, 1.87	K/Ar dates	602	Tuff H-2			
1.86	Bottom of Olduvai Event	558	Upper G-26			
1.93	K/Ar date	365	Tuff G			
2.00	Top of Reunion Event	362	F-4/F-5 boundary			
2.04	Bottom of Reunion Event	338	F-1/F-2 boundary			
1.99, 2.06	K/Ar dates	325	Tuff F			
2.37	K/Ar date	286	Tuff E			
2.12	K/Ar date	263	Tuff D-3-2			
2.16, 2.16						
2.31, 2.41						
2.51, 2.56						
2.60	K/Ar dates	245	Tuff D			
2.41	Top of Gauss Epoch	234	C-8/C-9 boundary			
2.93, 2.96	K/Ar dates	147	Tuff B-10-1			
2.84	Top of Kaena Event	105	B-2/B-3 boundary	135	U-16/U-17 boundary	
2.92	Bottom of Kaena Event	98	B-2	122	? U-15	
2.99	Top of Mammoth Event	95	B-2	112	Upper U-14	
3.09	Bottom of Mammoth Event	84	Upper B-1	88	U-11/U-12 boundary	
3.79, 4.99	K/Ar dates	77	Tuff B-δ			
2.64, 2.97	K/Ar dates	70	(= Tuff B-α)	70	Tuff U-10-1	
3.32	Top of Gilbert Epoch	33	Tuff A	45	Tuff H.C.N.	
3.11, 3.51	K/Ar dates			-4	U-1 (basalt)	
3.72	Top Cochiti Event	2	BAS-1	-18	14 m below U-1	
4.05, 4.1, 4.4	K/Ar dates					Basalt top Mursi Fm.

number of diastems in the section from B-3 to C-9 and assign time to the section in upper B and lower C by the following equation : $t = 2.84$ m.y. - $(sT + nl)$, where s is the sedimentation rate computed for the 56% of time during which sedimentation has been assumed to proceed, T is the stratigraphic thickness in any interval between diastems, n is the number of diastems, and l is the length of time on each diastem. The resulting curve does not deviate greatly from the assumption of a linear relation, but has taken account only of diastems, and that only in a rough way.

In table 6 the ages of member boundaries and midpoint ages assuming a linear relation between sediment accumulation rate and time are set out. These data should be used with the cautionary notes in the preceding paragraphs[1].

Table 6. - Best fit ages for members of the Shungura Formation.

Member	Boundary Ages	Midpoint Ages
L	0.96 or 0.84 - 1.25	1.05 or 1.10
K	1.25 - 1.50	1.38
J	1.50 - 1.64	1.57
H	1.64 - 1.85	1.75
G (upper)	1.85 - 1.89	1.87
G (lower)	1.89 - 1.93	1.91
F	1.93 - 2.06	2.00
E	2.06 - 2.23	2.15
D	2.23 - 2.39	2.31
C	2.39 - 2.62	2.51
B3-B12	2.62 - 2.80	2.71
B-B3	2.80 - 3.17	2.99
A	3.17 - 3.32	3.25
BAS	3.32 - 3.42	3.37

A number of other data may become applicable to the Shungura Formation because of recently established correlations between tuffs on the East Turkana sequence and tuffs of the Shungura Formation. The tuffs which appear to be correlable are the Chari Tuff and L, the KBS tuff, and H2, and the KBS tuff in area 105 E with Tuff H4 (Brown, Howell and Eck, 1978).

---

[1] Data on fig. 2 were computed independently by J. de H. This explains a few minor discrepancies.