International Workshop
The Emergence of the Acheulean in East Africa
Rome September 12-13, 2013

Chrono-stratigraphy of the Acheulean sequence of Melka Kunture

Raynal J.P.[a, b], Bonnefille R.[c], M. Mussi [d, e]
[a] CNRS, UMR 5199 PACEA-PPP, Université Bordeaux 1, F-33400 Talence, France
[b] Dept. of Human Evolution, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany
[c] Cerege, CNRS, Université Aix-Marseille, 13545 Aix-en-Provence cedex 08
[d] Italian Archaeological Mission at Melka Kunture and Balchit
[e] Dipartimento di Scienze dell'Antichità, Sapienza Università di Roma, Rome, Italy

At Melka Kunture, about 50 km South-West of Addis-Ababa on the northern Ethiopian plateau and 2000-2200 metres asl, the present course of the upper Awash River cuts through formations consisting of its own Plio-Pleistocene fluvial or sub-lacustrine deposits interbedded with tephra falls that were laid down in an earlier expression of the river's evolution. Some of these formations have been re-deposited and are now preserved in a tectonic basin that is distinct from the more familiar rift zone. This area has been studied since 1963 and is remarkable for the abundance of archaeological stone tools, their persistent successive assemblages and associated mammal remains that include several human fossils. Assemblages of the Oldowan, Acheulean, Middle Stone Age and Late Stone Age are all well documented. Consequently, Melka Kunture is one of Africa's most important places in which to study the timing and modes of cultural change that lead from the end of what was previously defined as the Oldowan to the emergence of the Acheulean and its subsequent development.

The Melka Kunture outcrops are not as extensive as are those in the Rift Valley sites and are sometimes thickly covered with vegetation making correlations between the different sub-areas difficult to establish. Comparisons based upon archaeological correlation with similar East African assemblages as well as chronological information and palaeomagnetic studies provided the first clues to the placement of the succession in the broader regional sequences until recent litho-stratigraphical revisions defined the *Melka Kunture Formation* following which geo-chronological Ar/Ar dates were obtained for several volcanic ash horizons. These provided precise chronological boundaries for the different parts of the sequences and allowed the re-examination of the pollen results obtained some decades ago from several distinct sub-units, some of these samples coming from localities where archaeological excavations were later carried out (Garba I, Garba IV, Gombore II).

Litho-stratigraphic analyses of sedimentary sections at Kella, Gombore, Garba and Simbiro have clarified the dynamics of the depositional processes which contributed to the lower part of the *Melka Kunture Formation* (i.e. Lower Pleistocene). Downstream transport and accumulation dominated the sedimentation processes. Channel-lag petrographic suites reflect the basin's structural geology and indicate that as well as a period of global dismantling of ancient volcanic relief there were important lateral contributions to the alluvial accumulations by tributaries emerging from both banks. Volcanic activity has been the main source of the fine grained sediments; pumice derived from pyroclastites of pene-contemporaneous plinian eruptions have made the principal contribution to channel lags and to major accretion events (Sl, Sp, St facies). Reworked coarse tuffs have formed massive beds (Sm facies), while cinereous tephras have been mainly responsible for deposition of the silts (Fsm, Fm facies). Resistant and opaque minerals make up the matrix of bed lags and

are the principal components of the sandy bases of current structures. Grain-size distribution also reflects the evolution of channels.

Six superposed and partly embedded channels can be identified at Gombore. Each of them exhibits a logical facies succession that ultimately lead to complete infilling and abandonment while the main stream migrated towards the south-east. Archaeological layers are systematically associated with each of the bedforms. It was the input of volcanic products that was responsible for overloading the streambeds and forcing the changes that occurred in channel placement. Facies that were previously considered as lacustrine can now be shown to be mostly fluvial. The “major cut-and-fill” once considered as major erosional phases are probably only simple channel development processes and accumulation within an active semi-graben.

At Garba IV, three channels are superimposed and partly embedded one within the other. Each of them exhibits a logical succession of facies leading to complete infilling and eventual abandonment. Archaeological layers are associated with the bedforms, local erosional surfaces or temporarily abandoned channels. At this location volcanic input was systematically responsible for over-loading the current bed and for forcing new channel routes. As for Gombore, facies previously considered as lacustrine have been identified as being fluvial and the “major cut-and-fill” events previously considered as important erosional phases are now known to be simple evolutionary channel developments.

Considering the palaeomagnetic data, the absolute dates and the revised tuff correlations, it can now be concluded that both series were deposited between 1.7 Ma (end of Olduvai Polarity Subzone) and around 0.7 Ma (Brunhes Chron). Within these limits, the Acheulean appears and evolves. Oldowan/First Acheulean falls between 1.7 and 1.4 Ma (Gombore I, Gombore I gamma, Garba IV E and D) and classical Acheulean appears between at least 0.9 and 0.7 Ma (Gombore II *loci* 1 and 2, Garba XIII and probably Garba XII), following on after a major regional ignimbrite event known as the *Kella Formation* which is dated between 1.3 and 1.2 Ma. Occurrences in other localities are not yet accurately dated.