

Himalaya was hitherto based mainly on the existence of a continuous and normal superposition of the different rock formations and the grade of metamorphism. The presence of overturned succession recorded here on the evidence of lower Permian fossils in the Lower Bijni Unit would contradict the earlier theory of 'Four Tier' structure offered by Ravi Shanker and Ganessan⁶. A simplified and more rationale interpretation of the structure of Garhwal Himalaya is possible with the evidence of overturned succession.

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DISCOVERY OF STONE AGE SITES IN THE PALERU VALLEY—COASTAL ANDHRA PRADESH

THE Paleru river Valley in Prakasam District lies between 15° 15' and 15° 30' N latitude and 79° 15' and 80° 5' E. longitude. The Paleru river originates in the Velikonda hills and drains through Kanigiri and Kandukur taluks into the Bay of Bengal. The Paleru Valley has yielded 18 Stone Age sites. The sites discovered are : Gannavaram, Veligandla, Jillallapadu, Ballavaram, Perugupalle, Tammanenipalle, Chiná Alavalapadu, Katretipuram, Yeruvaripalle, Peddā Alavalapadu, Agraharam, Muppalla, Oguru, Singarayakonda, Nandanamarella, Tsallagirigala, Kanigiri and Tsakirala.

In the simple stratigraphic sections studied, the Acheulian tools are located in the Conglomerate bed overlain by a thin deposit of fine sand, which in turn is topped by light reddish clay. In fine gravel, Middle Palaeolithic tools are found in a few places overlying the conglomerate. On the eroded surface of fine gravel are located the Upper Paleolithic sites. Most of the sites are situated on the gravel fans emanating from the Velikonda hills or on the colluvial gravel in the source region.

At Peddā Alavalapadu, Agraharam and Muppalla, the Paleru river cliff-sections showed an implementiferous conglomerate gravel bed resting on the rock, clearly indicate the sinking gradient of the river bed. The geomorphological features in this valley show that the gradient of the river had undergone changes during the Stone Age. An interesting evidence of ancient sea-level is available near the village Vaviletipadu situated at an altitude of about 8 m above the present sea-level. Here the coastal sand dunes are seen around the village. These fluctuations seem to be related to changes in land and sea relationship in this part of the coast during Quaternary. For the first time we have been able to find evidence of some kind of sea-level changes during the Late Acheulian (the later pleistocene) times in coastal Andhra Pradesh. The significance of this discovery is apparent as a similar evidence of sea-level changes and the occurrence of Acheulian industries has been established in Saurashtra on the West Coast of India (Marathe¹).

The sites are generally located close to water sources. However, a few of them are situated at the feet of the hills. Many of these are open-air camp sites as well as factory sites. The material utilized in the manufacture of tools is predominantly quartzite and quartz which are locally available in the old gravel bed. Quartz is also available as veins in the proximity of the sites. The tools are mainly made out of waterworn pebbles and from the flakes detached from them.

The tools discovered from this valley belong to Lower, Middle and Upper Palaeolithic Cultures. The Lower Palaeolithic tools include handaxes, cleavers, choppers, discoids, scrapers, knives, etc. (Fig. 1).



FIG. 1. Lower palaeolithic tool types.

Handaxe is the predominant tool type, and cleavers and choppers are less. Handaxes show careful and extensive flaking with small, and shallow flake-scrafs and are refined. On technotypological considerations the Lower Palaeolithic tools belong to a late phase of

Acheulian Culture. This has been further established by statistical studies on handaxes by measuring the parameters like weight (W), length (L), breadth (B), thickness (T) and their comparison with the Early Acheulian site of Chirki-on-Pravara in Maharashtra. The statistical deductions were made by computer studies and the estimates of the mean (M), standard deviation (s.d) and coefficient of variation (c.v.) are as follows :—

Parameters	M		S.d.		C.V.	
	Chirki-Paleru		Chirki-Paleru		Chirki-Paleru	
W (in grams)	539.23	216.84	171.43	105.19	31.77	48.51
L (cm)	13.79	9.80	3.77	1.74	26.98	17.78
B (cm)	7.63	6.89	0.30	1.06	3.97	15.37
T (cm)	4.81	3.06	1.26	0.66	25.13	21.42



FIG. 2. Middle palaeolithic tool types.

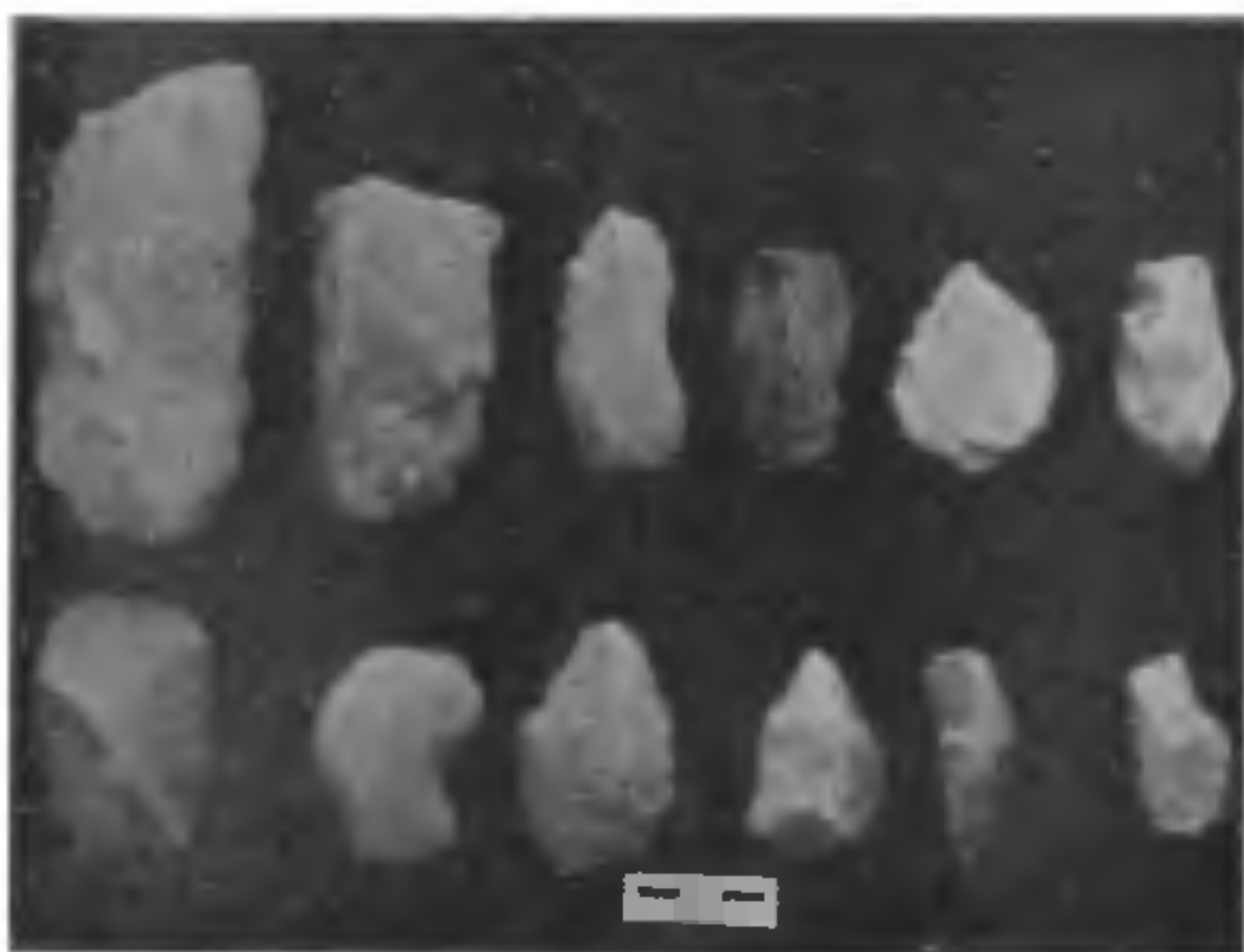


FIG. 3. Upper palaeolithic tool types.

The low mean values for all the parameters for Paleru clearly suggests the Late Acheulian trend of the Paleru industry.

The Middle Palaeolithic tool-kit comprises scrapers, points, borers, and miniature handaxes, discs and choppers (Fig. 2). The Upper Palaeolithic collection includes typical blades, blade-flakes, burins, scrapers, points, borers, knives, etc. (Fig. 3). Backed pieces are rare in the collection. Burins are mainly on fluted cores.

The Paleru river Valley, therefore, provides a rich potential area for detailed investigations.

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RAPID MULTIPLICATION OF *EUCALYPTUS* BY MULTIPLE SHOOT PRODUCTION

VEGETATIVE propagation of forest trees is mainly through rooted cuttings. However, cuttings do not easily root due to inhibitory substances present¹. An alternative method is to attempt to regenerate plantlets via the tissue culture technique. The more recent application of tissue culture to propagation has enormously increased the scope and potential². Tissue culture not only provides increased rates of propagation but also can facilitate their asexual multiplication. In *Eucalyptus*, plantlets have been obtained from callus of lignotubers³, cotyledonary⁴ and hypocotyledonary⁵ segments. Plantlets obtained from embryos or seedlings (cotyledons and hypocotyledons) have the disadvantage of the genotype being different from that of the parent plant. Hence attempts are made to stimulate the axillary shoots normally inhibited by the main shoot by using tissue culture methods.

Eucalyptus citriodora seeds were germinated in petridishes at 37° C. Seeds germinated on the 3rd day. Five day old seedlings were used with or without cotyledons as inoculum. In all the cultures only the apical portion, measuring about 5 mm was left, trimming the root portion and hypocotyl region before