QUARTERNARY STRATIGRAPHIC SEQUENCE IN THE POTWAR BASIN AND ADJACENT NORTHWEST PAKISTAN

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Introduction: Prof. Ahmad Hassan Dani and Farzand Ali Durrani of the Department of Archaelogy, Univ. of Pesh., kindly permitted the writer to accompany them upon a number of their trips to the remarkable Archaelogy "digs" near Charsadda, Senghao and thana which were under investigation during 1963-64.

The problem faced by them in the dating of the formations within which artifacts occur at once aroused the writer's interest since they are in large parts geological problems in Quarternary stratigraphy. Nothing has been published on this aspect of the area, the nearest work has been in Kashmir(De Terra 1939) many miles to the north-west, and in Gujrat (Zeuner 1950-63) over farther to the south. Both are in different drainage systems, which might not correlate with Potwar System.

After a number of trips to various parts of the region, a pattern emerged in March of 1964, and tentative correlations appeared possible between similar sequences of unit found near the Swat River a mile south-east of Thana, along the Sher Garh nullah 17 miles north of Mardan and north of Katlang near Senghoa. Because of the absence of the previous publications, it seemed worthwhile to present the available data and some conclusioms reached as a guide to further investigation, inspite their highly tentative and incomplete nature.

Geographic Setting: The Potwar basin and vale of Peshawar lie between the Indus River on the east and the foot hills of the Hindukush on the west. They occupy a structural basin south of the Himalayan foothills which has been cut off from the southern part of the West Pakistan by the rise of Salt Range and the line of hills which extends from Attock to North of Kohat. As this folding(and faulting) progressed during upper Cenozoics time, the basin was filled with alluvial materials from the surrounding hills, brought down by the Kabul River, Swat and Indus riverrs and their many tributaries. Indeed, the evidence of high terraces around the periphery amply indicates the pre-Pliestocene topography was "drowned" during the lower Pliestocene by the accumulation of valley fill to an elevation several hundred feet above the present valley surface and that erosion during the Upper Pliestocene has removed much of this older fill and re-deposited a series of sediments which are the subject of this paper.

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The present valley floor is occupied by the braided
ses of the few parmanent(Kabul, Indus, Swat)and the
y intermittent streams and their interfluve areas.
arda the surrounding youthfully seulptured hills the
mont plains and fans rise gradually, with alluviated
ley straths extending in many cases for miles into the
ntains between enclosing spurs and ridges, Occasional
ensions of the spurs have been isolated far out in the
ins by the alluvial fill. Terrace level at many
vations have been cut in the fill during the period
erosion.

COMPOSITE SECTION:

The generalized section below represents a composite
a number of localities mentioned above,. All of the units
not present in all of the localities, and it is believed
t they do represent the same climatic spochs and therefor
correlative.

U N I T	CORRELATIVE	CLIMATES
Recent alluvium	Recent	Warm - Dry.
Shar Garh Lack Beds.	Late or post glacial.	Warm, moist
Younger loess in places red stained at base.	Last glaciation.	Cool Dry.
Cement, Gravel and Breccia.	Last intergla-cial.	Cool - Moist
Older loess, in places fine clay.	Penultimate glaciation.	Cool - Dry.
Laterite Zone.	Penultimate interglacial.	Warm - Moist.

The Archeological correlatives might be considered as

Neolithic	To 3000 B.C	Recent
Microlithic.	3000 to 15,000	Upper Wurm & Recent
Late Paleolithic.	15,000 to 50,000	Wurm or Wisconsin
Early Paleolithic.	50,000 to 250,000	Wisconsin and Last interglacial.
-do-	250,000 to 400,000	Mindel or Illinoian
-do-	400,000 to 550,000	Penultimate - Interglacial.

Description and interpretation of units:

1. Recent alluvium. occupies erosion channels in older

and bedrock, and consists of loose sand, gravel derived from the sediments and adjacent bedrocks and bed upper parts of the drainage channels. It represents the erosion which has formed the stream courses and nullahs.

2. Shergarh Lake beds are found beneath the present sur plains in the area between Dargai and Mardan, exposed in the Shorgarh nullah lying above the Younger Loess. Some up to 30 alternating coarse and fine beds which constit to 8 inches thick. The sediment is gray clay, silt, and The beds are cut by numerous clastic dikes of silt, a c commonly found in varved pro-glacial lake sediments. Th represent the accumulation in a lake of fine sediment d melting ice; in this case the ice of the Last Glaciatic post-glacial alpine glaciers. They may be from 3000 to old.

3. Younger loess-consisting of unbedded, fine-grained b silts are probably dominantly collian in origin. The ba sometimes red-stained. They underlie the lake beds in t but are found at higher elevations in the tributary val the basin and in the Swat Valley near Thana, where they sloping surfaces of terraces along the tributary stream overlain only along the margins by slope-wash from adja They may be correlative with the thick "badlands" loess east of Campbellpore. Artifacts near Thana lie in but intrusions within the Younger Loess, artifacts at Sangh in cave deposits which also may be correlative. The You represents the cool and relatively dry period of steppe the Last Glaciation. They are probably from 15,000 to 1 old.

4. Cement Gravel and Bricks- lie between the Younger ar Loess, their thickness ranging from a few feet in the v a few tens of feet near the hills. They are heterogenec -ion, completely unsorted as to size (up to boulders se diameter), and of angular shape. The valley sections ar cemented by calcium carbonate, the limestone conglomera cave is wholly cemented. These gravels represent a peri wet climate characterized by freezing and thawing and e solifluction, mud flows and flooding. Their wide distri that this was an important climatic change, the cementi gravels indicates excess flow from lime-bearing spring lack of sorting indicates freezing and thawing. It prol the Last Interglacial, dated at from 100,000 to 250,00(

5. Older Loess- is found beneath the Cement Gravel at r Its thickness is not known in the valley sections, it l: in the tributaries. At Sanghao it may be represented by -eath the Cement Gravel. In the field no differentiati -ics between it and the Younger Loess has been noted, bu work is being initiated to determine size range, degree kind of clay, minerals, etc. Like the Younger Loess, this a glacial period of cool dry steppe climate. If this is Glaciation the Loess would be from 250,000 to 400,000 :

6.-Laterite zone. In a few places the lower part of the Older Loess is reddened and in a few otherplaces it rests upon a more or less well-defined zone of lateritic soil, according to Dr.Dani. There is a red zone below the clay horizon at Sanghao Cave. If this laterite zone represents the Penultimate Interglacial it is from 400,000 to 600,000 years old.

Conclusions and suggestions for further work:The extremely tentative conclusions suggested in this paper need verification by further field work and detailed description and measurement of the mentioned sections and as many others as can be found over a still wider area. In addition laboratory work should be done on the various units to determine possible index heavy minerals, distinctive histograms,and other characteristics which would verify correlations made. Pollen for analysis should be searched for in the loess and lake beds; carbon for C^{14} analysis may be of value in the upper most units, lacustrine fossils or vertebrate remains may be found to add to the evidence.

To date we can only state that the "Power Loess" of wadia is no longer a single unit; a peri-or post-glacial lake once occupied a basin near Mardan; the loess is divided into two parts by a cemented gravel of widespread occurrence which represent a change in climatic conditions.