

natural sediments are nowhere over 10 or 15 feet thick. Their delicate laminations and extreme fineness of material differentially colored in thin bands of clay, for the most part buff and brown, are evidence of slow accumulation over a surface exposed to the oxidation of desert conditions. Although in a general way the growth of natural sediments came to an end with the beginning of irrigation and was superseded by that new kind of growth, we should expect to find layers similar to the natural at any horizon and interstratified with both culture and irrigation beds. From the time when one of the Murg-ab's distributaries which fed Ghiaur Kala came under the control of man for irrigation, it ceased to be natural, *i. e.*, became an artificial canal, and thenceforth any sediments deposited by its waters were other than natural. We have called those accumulating under the stratigraphically disturbing influences of cultivation irrigation sediments. Sediments formed in choked-up canals, reservoirs, and abandoned fields may be termed *canal sediments*. The irregularities produced by occupation and irrigation of a plain, with such a gentle slope as the one with which we are dealing, inevitably result in the formation of extensive shallow depressions where, sooner or later, canal sediments accumulate. It is, then, canal sediments that have risen by the west wall and that form a 2-foot capping to the irrigation stratum cut by brick-yards southeast of the walls of Bairam Ali.

Shafts I, II, and IV penetrated characteristic dune-sand, so loose that shafts I and IV had to be abandoned before the underlying loess was reached. But in shaft II we had just enough to give a key to the section and yet not enough to interfere with sinking, though the same mass attains a thickness of over 15 feet in the wall of the main excavation (lower digging), just to one side and a few feet above. Sand-dunes were evidently characteristic of the region before it was occupied and much of the city appears to overlie them. It is a significant fact that flying sands are found beneath both culture-strata and water-laid deposits, natural and artificial, and beneath it all is the loess. Every shaft that went deep enough found the great underlying mass of loess. Shaft II found it under dune-sand at -27 feet and sank 36 feet down into it, pure fine loess with vertical cleavage and calcareous concretions all the way down to where we stopped at water-level, 63 feet below the surface. How much deeper it goes may be guessed, but there is no reason to doubt that it might be many hundred feet.

THE STRATIGRAPHIC ORDER: (1) LOESS, (2) DUNE-SAND, (3) ALLUVIUM, EXPLAINED BY CLIMATIC CHANGE TO DRY, AND RECESSION OF THE DELTA.

Now we are in position to correlate. The direct neighborhood of Ghiaur Kala had long been a loess steppe with topographical relief amounting to at least 25 feet elevation between its summits and depressions. As a result of some change in conditions it was invaded by flying sands, after which began the alluvial flooding and depositions over its lower portions; and it was during this stage that the builders of Ghiaur Kala arrived to look upon a land of desert dunes and playas, with here and there a remnant of the old half-drowned loess topography. Upon one of these remnant loess masses rising about 16 feet above the flood-plain of a dis-