

On the basis of the above-given reasoning we have the following proximate dates:

Anau founded . . . . .	Middle of 4th century A. D.
Iron culture on South Kurgan . . . . .	Middle of 5th century B. C.
Copper culture ended on South Kurgan . . . . .	About 22d century B. C.
Copper culture began on South Kurgan . . . . .	About 52d century B. C.
Upper (copper) culture began on North Kurgan . . . . .	About 6000 B. C.
Beginning of domestication of animals . . . . .	About 8000 B. C.
North Kurgan founded in . . . . .	IX millennium B. C.

### CYCLES.

The platting of the aggradings and cuttings-down of the delta-channel makes very clear an apparently cyclical character in these processes, and emphasizes their relation to the sequence of the civilizations of the region. How are these cycles to be interpreted? Are they due solely to movements of the crust in which the cutting-down may have been caused by change of base-level through a relatively sudden relief of strain after long accumulation of load? Or are the cuttings-down the result of recurring climatic change, and if so, whether of change to increased or diminished precipitation in the mountains? We have in chapter II connected the deepening of the valley with periods of diminished water-supply; let us now see whether the historical portion of our series of cycles offers any means of testing the correctness of that hypothesis.

The evidence obtained from the observations in our shafts at Merv as given by R. W. Pumpelly in his report may be summed up as follows:

The ancient city of Ghiaur Kala, which is now surrounded by the present delta, was founded on a rolling loess-steppe with a relief of at least 25 feet, on which flying sands, after beginning to accumulate, were being buried by alluvial silts when the city was founded. The interpretation of these conditions is that the invasion of the sands indicates a climatic change to dryness sufficient to destroy the vegetation which, during the previous less arid period, had arrested the movement of the surrounding dunes, while the burying of the sands by alluviation points to a retreat of the delta, due to a diminished volume of water corresponding to the climatic change to dryness. Now we can determine the time proximately in which the founding of Ghiaur Kala falls. There are in the city 30 to 35 feet of culture-strata below the level at which glazed pottery begins to appear. I have given above reasons for placing the introduction of this ware in the sixth century A. D. As the city was abandoned in the twelfth century, the rate of growth of the strata would be about 3 feet per century. Applying this rate to the 30 to 35 feet below the glazed ware would date the founding of the city at least about the middle of the first millennium B. C.,\* that is, at about the same time as the founding of the iron-culture settlement on the top of the South Kurgan at Anau. We have thus

\*The medieval Arab and Persian historians all agree that the citadel of Ghiaur Kala was founded by Tachmurez, a legendary ruler, and that later Alexander the Great founded the city itself; which probably means that he surrounded with walls the settlement that already existed adjoining the citadel.