

Without reliable measurements such as those that have been taken in connection with the Trans-Caspian Railway, and in several similar places where cultivation and road-making are threatened by the invasion of the drift-sand, it is impossible to arrive at sure results.* I made indeed an attempt of this character in 1896, after the discovery of the ruins of the ancient town between Tavek-kel and the Kerija-darja, in that I made the following calculation: »In the region of the buried city the prevailing winds come from the north-east and east, and are particularly violent in April and May. It is in these months that the greater number of the *kara-burans* or »black sandstorms» occur, which carry on their wings such vast quantities of sand and dust as to make day as black as night. In March and June come the *sarik-burans* or »yellow sandstorms», which, although less violent, nevertheless possess an enormous carrying capacity. — During the other months of the year the wind blows less frequently and with greater variableness. — On January 25th, with a tolerably strong south-west wind, I found that the crest of a sand-dune travelled 11.9 cm. to the north-east in the space of forty-five minutes. — The wind changed in the night, and the top of the dune then returned to the south-west, travelling 91 cm in 9 hours. Assuming that in every year there are on an average twenty-four days in which the wind blows with hurricane violence towards the south-west, and that on each such day it blows almost uninterruptedly, so that a sand-dune will travel six to seven feet (2 meters), it would travel altogether about 50 m. in the course of the year, and would therefore require a thousand years to reach the point at which the desert sand has now arrived in its journey towards the south. At the same time, it must be borne in mind, that I have assumed the greatest possible number of burans in the year, and hence have obtained a minimum estimate for the age of the city. — Then again the sand-dunes do not move directly south, but to the south-west, a circumstance which increases the probable age to some 1500 years. — Finally we have to take into account the less violent wind which blows in the opposite direction; which probably adds yet another five

* Whilst travelling through Transcaspia by rail in 1890 I made certain hurried observations upon the methods adopted by the Russian railway engineers to protect their lines against the sand. These observations I recorded in my book (issued in Swedish) *Genom Khorasan och Turkestan* (vol. I, p. 239), where I wrote as follows: »Unless special precautions were taken to arrest the sand, the dunes would soon climb upon the railway-line and bury the metals. Along the top of the dune-crest a thick hedge has been made of bundles of faggots placed upright in the sand, and by this means it is prevented from plunging down the steep slope, while the onward movement of the dune itself is also arrested, and it is compelled to halt where it is. Similar bundles of faggots and dry scrub are inserted along the outer edges of the railway line itself. Saksaul also has been planted for considerable distances alongside the line. The deep spreading roots of these plants hold the sand together in an effective way. The outer sides of the raised roadway along which the metals are placed are protected partly with a backing of clay, which prevents the underlying sand from being blown away by the wind, and partly with a network of plaited withes. In yet other places the roadway is protected by a hedge of dry faggots which overlap one another in the same way as slates do on the roof of a house. In this manner the engineers of the line have cleverly protected their work by means of such scanty materials as the locality itself affords.»

Just as Marco Polo speaks of the great desert of Lop and its terrors, so also does Clavijo, the ambassador of Henry III of Castile to the court of Timur, in his journey across the Kara-kum (see the English translation in the Hakluyt Society's publications) in 1403 tell us, that his route lay across sandy deserts, where the wind whirled up the sand in clouds and hid the road, so that he frequently lost sight of it. These and similar notices are of course much too brief, to allow us to infer anything beyond this, that the Desert of Lop and the Desert of Kara-kum existed six hundred and thirty and five hundred years ago exactly as they exist to-day.