

in the Kara-kum, and upon reaching the shore of the Caspian they coalesce with the high coast-dunes which already exist there. Walther offers a remarkable proof of how these æolian transgressive masses of sand are giving rise under our very eyes to a new sandstone formation, which is spreading out over the bottom of the former Aralo-Caspian Sea and the Sarmatic sea of the Miocene era; the sandy desert growing in area in proportion as that sea continues to shrink.

Walther maintains therefore, that the Kisil-kum and the Kara-kum have been formed by the sand brought down by the rivers. But is it indeed possible that any rivers could give rise to sandy deserts of such immense extent as these? For my own part I cannot believe it. The two rivers in question are not sufficient to explain the origin of this desert zone; that would on the contrary exist even though there were no rivers. I do not of course mean to assert that the areniferous muds of the rivers do not make any contribution to the sandy desert; yet they do it to what is relatively so insignificant a degree, that in all probability the character of the sandy desert would be but very slightly altered even if this fluvial supply were to be entirely cut off. The belts of sand which are formed by the side of the great rivers of Russia are infinitesimally small as compared with the Kisil-kum and the Kara-kum. Possibly this difference is to be attributed to the fact that they bring down smaller quantities of sediment and sand, and come from low-lying mountainous regions. Nevertheless I believe that the key to the puzzle is to be found in the fact, that no river, however big and powerful, can under any circumstances give rise to a great sandy desert. Consequently wherever we find a desert of this character beside a river, as, for instance, the Amu-darja, other and more powerful agencies are there operative, and it is purely an accident that the river makes its way through the desert, the dunes of which it certainly does help to augment, though it does so entirely in a secondary way. In this case, owing to the local conditions, the direction of the wind, and the shifting of its bed by the river, the river offers no insuperable impediment to the progress of the dunes. The sand cannot be destroyed, it is only disturbed for a certain time. But in the case of the lower Tarim, between Arghan and Tschigelik-uj, the circumstances are quite different; for there the river has been for several years stationary, so that the west bank has been swept clean of sand; hence the river there *is* an obstacle to the farther advance of the dunes.

Yes, even though the Amu-darja and the Sir-darja did not exist, there would nevertheless be a sandy desert there, because the climatic and other conditions are favourable to the origination of a desert. These conditions, the presence of sand on the surface of the ground coincidently with a very dry climate, are absent in the basins of the rivers of South Russia, and consequently the formation of dunes is dependent solely upon these rivers' power to form them; as a result of this the dunes there occupy but narrow strips. When the two principal conditions are present, the absence of the third, namely the river, is of less consequence. For example, in several places beside the Caspian Sea and the Sea of Aral there are extensive patches of sandy desert where rivers are entirely wanting. Walther says: »Eine weitere Quelle des Wüstensandes sind der Boden und die Küsten von Seen mit wechselndem Wasserstand und der Boden von Trockenseen. Sanddünen werden von den Ufern