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tion of the water-rights in the Kushk, and so we must leave him. Should the subsequent proceedings appear to me to interest the Society, I shall make a point of sending a note on them.

THE DIVARICATIONS OF THE LOWER OXUS.

By GENERAL J. T. WALKER, C.B., F.R.S., LL.D., ROYAL ENGINEERS.

IN a bulletin of the French Geographical Society for 1892, M. Edouard Blanc gives an interesting paper on the hydrography of the basin of the Ancient Oxus, in which the question of the probable divarications of the Lower Oxus in ancient times is discussed. At the present time the river is known to discharge itself wholly into the Aral Sea; there is, however, indisputable evidence to show that it once flowed, partially if not wholly, into the Caspian Sea. M. Blanc holds the opinion that, from the earliest Christian times up to the fourteenth century, it flowed into the Aral; that during the fourteenth century it became diverted into the Caspian, and flowed wholly into that sea through the whole of the following century; that in the sixteenth century it began throwing out branches to the north, which disembogued into the bogs and marshes of a region which is now covered by the Sea of Aral; and that in the seventeenth century the south-west branch from Urghenj—the dry bed of which debouches on the south-east coast of the Caspian, and is known as the Uzboi—became completely obstructed, and then the Sea of Aral became the sole recipient of the waters of the Oxus.¹

For a long period there seems to have been much ignorance regarding the geography of these regions, more particularly on the part of all the Greek geographers whose writings are still extant. The very existence of the Aral Sea appears to have been unknown to them. The sea is not indicated on any map now forthcoming which was published before the commencement of the eighteenth century; whence it would appear that it was only then that the fact of there being an Aral Sea began to become generally known to western geographers.

The existence of the Caspian Sea was, however, long known, and singularly enough its position and shape and surroundings are more accurately described by Herodotus than by any of the Greek geographers of the six centuries following him. Writing about 450 B.C. he describes it as a sea by itself, having no connection with any other sea; as being about fifteen days' voyage in a row-boat in length, and eight days in breadth, and as bounded on the west by the hills of the Caucasus, and on the east by a vast plain stretching out interminably, which was inhabited by the Massagetæ. He describes a river flowing through this plain which he calls the Araxes, but has evidently confused with some other river, as

¹ *The Road to Merv.* By Major-General Sir H. C. Rawlinson, K.C.B. *Proc. of the R.G.S.*, 1879.

Notes on the Lower Amû-darya, Syr-darya, and Lake Aral, in 1874. By Major Herbert Wood, R.E. *Journal of the R.G.S.*, 1875.

he says that it rises in the Matienian mountains, and Professor Rawlinson has shown that if so, it could only be the modern Aras, which disembogues on the west coast of the Caspian. But Herodotus says of his Araxes that it flows through the country of the Massagetæ who occupy the greater portion of the vast plain stretching to the east of the Caspian; that it is about the same size as the Danube, and has large islands; and also that it has forty mouths, of which thirty-nine flow into bogs and swamps, while one flows with a clear course into the Caspian Sea. Professor Rawlinson suggests the identity of this river with the Jaxartes which flows into the northern basin of the Aral Sea; but if so, any branch it might have thrown into the Caspian must have first passed through the Oxus, a river larger than itself, and lying between it and the Caspian. It is surely more legitimate to infer that the Araxes was identical with the Oxus, and even to allow that Herodotus may have had some knowledge of the region of bogs and swamps into which he makes it partially disembogue, and to which he gives no name, though it is obviously identical with the bed of what is now known as the Sea of Aral.

Eratosthenes, two centuries after Herodotus, describes the Caspian as a bay of the North Sea, with which it was connected by a long narrow gulf. He makes both the Jaxartes and the Oxus flow into the Caspian.

Strabo, four centuries after Herodotus, falls into the same mistake as Eratosthenes regarding the connection of the Caspian with the North Sea. He says that the Caspian or Hyrcanian Sea is a bay extending from the ocean to the south; that it is very narrow at its commencement, but widens as it advances further inwards, attaining a width of about 500 stadia (furlongs) at its southern end; he gives the lengths of portions of the coast-line which appertained to different nations dwelling on the banks; he makes both the Jaxartes and the Oxus flow into this sea, and places their mouths at a distance of 2400 stadia apart. And he says that the wares of India are brought down the Oxus to the Caspian, whence they are conveyed by the Cyrus and other rivers to the districts bordering the Euxine Sea.

Pliny, writing about 50 A.D., follows Strabo and Eratosthenes, and it was not until about six centuries after Herodotus that Ptolemy restored the Caspian to its true position as a sea by itself; he makes both the Oxus and the Jaxartes flow into it; but he appears to have distorted the sea by making it about twice as broad from east to west as from north to south.

M. Blanc says that though sufficient light on the course of the Oxus in ancient times is not to be obtained from the Greek geographers, it is to be found in the works of Arabian and Turkish writers. He quotes the great Arabian geographer, Abu-Abdullah Mahomed el-Edrisi, who lived in 1099 to 1164 A.D., as stating that in his time both the Jaxartes and the Oxus disembogued into the Aral Sea, which he calls the Blue Sea; and he declares that other Mohammedan writers say the same thing up to the fourteenth century, when that sea ceases to be spoken of, and is not even mentioned by travellers, as Ibn-Batutah, proceeding from the Caspian over the very region now covered by the Aral Sea. He

points out that the Emperor Baber—who was ruler of Ferghana at the end of the fifteenth and commencement of the sixteenth century, and who had a very intelligent knowledge of his kingdom—says of the river Jaxartes (which he calls the Sihun or Sir-daria) that its lower extremity was lost in a region of sands, but makes no mention whatever of the Aral Sea. M. Blanc infers that that this can only be explained on the hypothesis that during the time of Baber the Oxus was wholly diverted into the Caspian, and consequently that the Aral received such a small supply of water that it became reduced to a simple marsh of little or no importance. But two centuries afterwards Abul-Ghazi Bayadur Khan, who was ruler of Urghej in the seventeenth century, distinctly says that the branch of the Oxus, which flowed into the ancient Uzboi, became obliterated in his time, and that this caused great disturbance in the system of irrigation in his country, which was all conducted from the Caspian through the Oxus.

A French writer, M. Moser, has suggested the possibility of the waters of the Jaxartes having once upon a time flowed into the Oxus, and influenced the direction of its lower course. He has discussed the system of rivers in the vast plain to the north of the Jaxartes—the Chu from the east, the Talar from the south-east, and the Sari-su from the north, all of which now disembody into separate lakes, which are at no great distance apart from each other nor from the Jaxartes. He conceives that these rivers were united in ancient times, and formed a considerable volume of water which flowed to the south, and joined the Jaxartes some little distance below the present town of Perovsk, and that the united rivers then flowed in a south-west direction through what is now known as the bed of the Yani River, which lies nearly parallel to the south-east coast of the Sea of Aral; local traditions assert this river to have been the ancient bed of the Jaxartes, and to have become dried up in the eighteenth century.

M. Blanc has paid a great deal of attention to this suggestion. In 1890-91 he travelled up the course of the Chu River, to the celebrated lake Issik-kul, which was once its source; he found that, though the lake is now too low to discharge into the river, there is geological evidence to show that it was once much higher, and considerably larger than it is at present, and may have contributed a considerable volume of water to the Chu; but this must have happened at too distant an epoch to have affected the course of the river during historic times. The whole region has been subjected to a gradual climatic desiccation, which has greatly diminished the rainfall and reduced the volume of the rivers, as is attested by extensive ruins of towns and villages, which have become abandoned because of the failure of the water supply.

Examinations of the surface of the ground, which have been made of late years by Russian topographical surveyors, have sufficiently demonstrated that the Oxus might naturally tend to flow indifferently either into the Caspian or into the Aral Sea; the ground is generally flat, with a slight slope downwards which is uniform towards both seas. The Aral Sea is 158 feet above, and the Caspian Sea 85 feet below, the mean sea-level; the Aral is 59 feet below Khojeili, a point on the Oxus 110 miles from

the Aral; thus the slope in this direction is about 6 inches per mile; the Caspian is 300 feet below a point near Khojeili, on the Urghenj branch of the Oxus, which disembogues into the Caspian at a distance of 600 miles; thus, here also, the fall is about 6 inches to the mile. Thus, so far as the configuration of the ground is concerned, there appears to be little reason why the river should flow into one sea more than the other.

It has been suggested that a change of direction may have been caused by geological disturbances to which the region is said to be liable. But the natural action of accumulations of silt in some channels during floods, tending to cause overflow elsewhere, and thus produce new channels, as is shown by the formation of deltas at the mouths of all great rivers which debouch into the sea through extensive plains, may well have sufficed to divert the Oxus from the Caspian, and throw it wholly into the Aral. Numerous great canals are carried from the river to irrigate the adjoining country, and dams are believed to have been constructed, and afterwards abandoned, and all this might, in course of time, have influenced the course of the waters. But it does not appear that sufficient information will ever be forthcoming to furnish a true history of the various transitions of the great river.

THE WILDS OF ICELAND.¹

THE geography of the greater part of the interior of Iceland is very imperfectly known; and this is not to be wondered at, seeing that the country lies high and consists principally of deserts of sand and lava, often quite bare of grass, where the traveller must take with him enough fodder for his horses to last several days. Even of the inhabited parts the geology and geography have not been thoroughly investigated, for travelling is difficult, and the scientific explorers who have visited the island have not gone beyond the more populous parts. Moreover, the summer is short, the distances are long, and travelling on horseback is slow, so that the valuable observations made by several noted explorers are not linked together into a connected whole.

Herr Thoroddsen has spent ten summers in Iceland, visiting its unknown districts and gathering materials for a general purview of the physical geography and geology of the country. His researches are not yet quite complete, but there are few tracts he has not traversed. In some summers he made only short excursions, but as a rule he travelled long distances into the most remote localities. He has spent altogether 500 days in the saddle, and ridden about 5900 miles. In his lecture to the Geographical Society of Berlin he described the nature of his journeys, and gave some account of the physical geography of Iceland.

There are no roads in the island. In the inhabited parts the

¹ Herr Th. Thoroddsen: *Reisen in Island und einige Ergebnisse seiner Forschungen. Verhandlungen der Gesell. für Erdkunde*, Bd. xx. No. 4.