

## DEAD SEA OBSERVATIONS.

(Continued.)

By Dr. E. W. GURNEY MASTERMAN.

## I.—NOTE ON THE NORTH SHORE OF THE DEAD SEA.

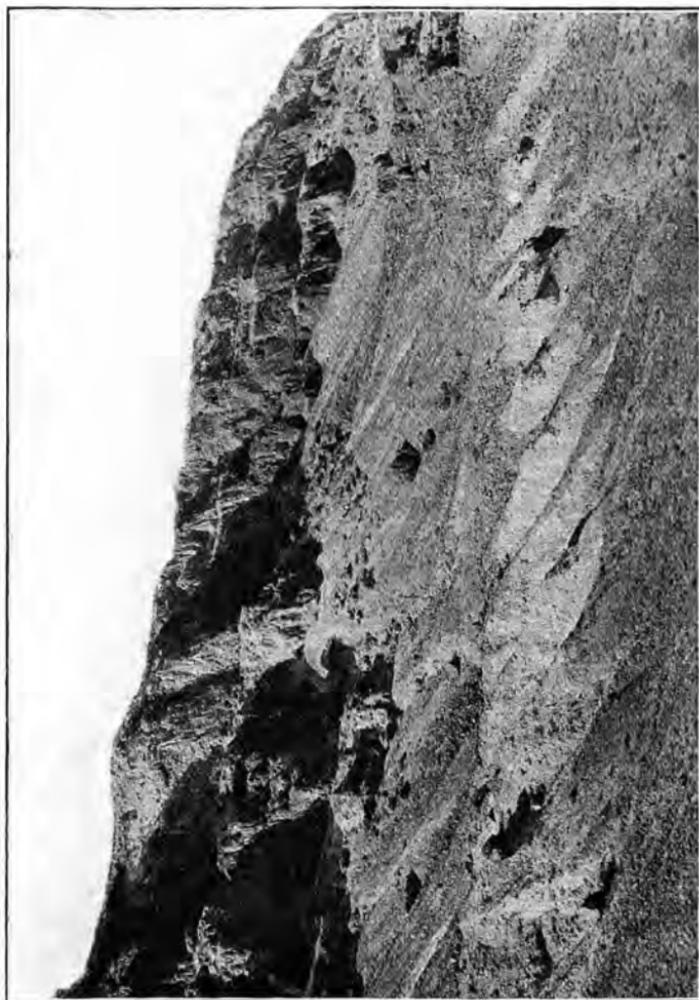
IN the January number of the *Quarterly Statement* I gave a summary of the observations made on the seasonal change of the levels of the Dead Sea as directly measured. The space at my disposal did not permit me to notice some physical phenomena at the north shore of the Dead Sea, which, while confirming a rise of level followed by a much more recent and smaller fall, also point to great changes of level at more ancient, though perhaps historical, times.

The first-mentioned *rise* of level is clearly marked at the north shore near *Ain Feshkhah* by the great quantities of trees and brushwood now standing gaunt and salt-encrusted out of several feet of water. It is true that some of these dry branches belong to dead trees, washed ashore and half-buried; but these are the exceptions, and in the neighbourhood of springs there are in many places large collections of dead trees and shrubs still rooted below the sea. Further, in such places the sea bottom near the shore is covered for many feet out with dead reed-roots.

The history of the *Rujm el-Bahr* gives us some dates by which we can mark the rise. In Lynch's time (1848) it was a well-marked peninsula. De Saulcy, in 1851, mentions it as a "small islet, divided from the mainland by not more than a hundred yards and by very shallow water, which our horses cross without difficulty." Tristram (*Land of Israel*, p. 250) tells us that in 1858 it was "a peninsula to be reached by stepping-stones almost dryshod," but in 1864 he found "an island, and we tried to ford across to it; but the water soon became too deep to allow of our reaching it without swimming our horses." We have various references to the island up to 1892, when it entirely disappeared, and has since shown no sign of its presence. When the rise of level which produced this disappearance reached its climax we cannot say, but we know for certain that during the last few years there has been a slight fall of level; to this the beach on the north shore bears witness.

The shingle on the shore near *Ain Feshkhah* is in many places thrown into very definite sizes of ridges. As a rule each ridge has a distinct furrow behind it, and in places there are on the ridges or in the furrows fragments of driftwood. At one point where a photograph was taken as many as seven such lines of raised shingle could be traced, and the more prominent of these could, with some interruptions, be followed all along the north shore. After traversing this district several times I have come to the conclusion that most, if not all, of these lines represent the maximum height attained during previous seasons. Thus the lowest

line, now some 2 feet above the present level (November, 1903), represents the highest that the sea reached in 1903, and so on with the higher levels. We cannot, of course, be sure that every year since the fall of level is represented, as we do not know whether the fall has been continuous, nor for how many seasons it has occurred.



[by Mr. Ilonstein.]

FIG. 1.—VIEW OF CLIFFS TO N.W. OF 'AIN FESHKHAH OASIS.

From a photograph.

At a higher level than the shingly beach is a ridge of sandy material crowned with great quantities of salt-saturated brushwood, palm trunks, &c. This level has not been reached by the sea for several seasons, but it marks the highest level attained a few seasons back, for indeed, I think I may say, many years.

Further inland than this, however, there is evidence that previously the Dead Sea has occupied a considerably higher level. Behind the ridge just mentioned, with its crown of driftwood, there lies a depressed area over a great part of the north shore, this is occupied by lagoons of water, some intensely salt (the salt pans from which the salt is crystallised out for commercial purposes), and others brackish and covered with reeds. At other parts the ground is dry and covered with soft finely-powdered sandy soil with scattered brushes, but *always at a lower level* than the driftwood-covered ridges.

To the north of this lower ground at a distance ranging from a few to over a hundred yards is a consolidated raised ridge of gravel. This ridge, or as I would venture to call it "raised beach," runs like a firm road about 40 feet wide all the way through the 'Ain Feshkhal district to the landward of the springs and reeds and along the north shore for at any rate some miles. It is only interrupted by being washed away where torrent-beds find their way through it; it is thus markedly broken up at the wide *Wady Kumran*.

I send a photograph of the appearance of this "raised beach" with figures stationed at its sides to mark its boundaries. The ground to the north is again at a lower level, until it rises again into another even wider and more massive ridge. This second "raised beach" does not appear at the 'Ain Feshkhal' district because, apparently, at the level at which it lies, the sea must have washed the foot of the cliffs. There is evidence that at one period this was the case in the carrying away of the great terrace of marly deposit (see *Quarterly Statement*, 1902, p. 162), which now clings as a comparatively thin layer to the face of the cliffs (see Fig. 1).<sup>1</sup>

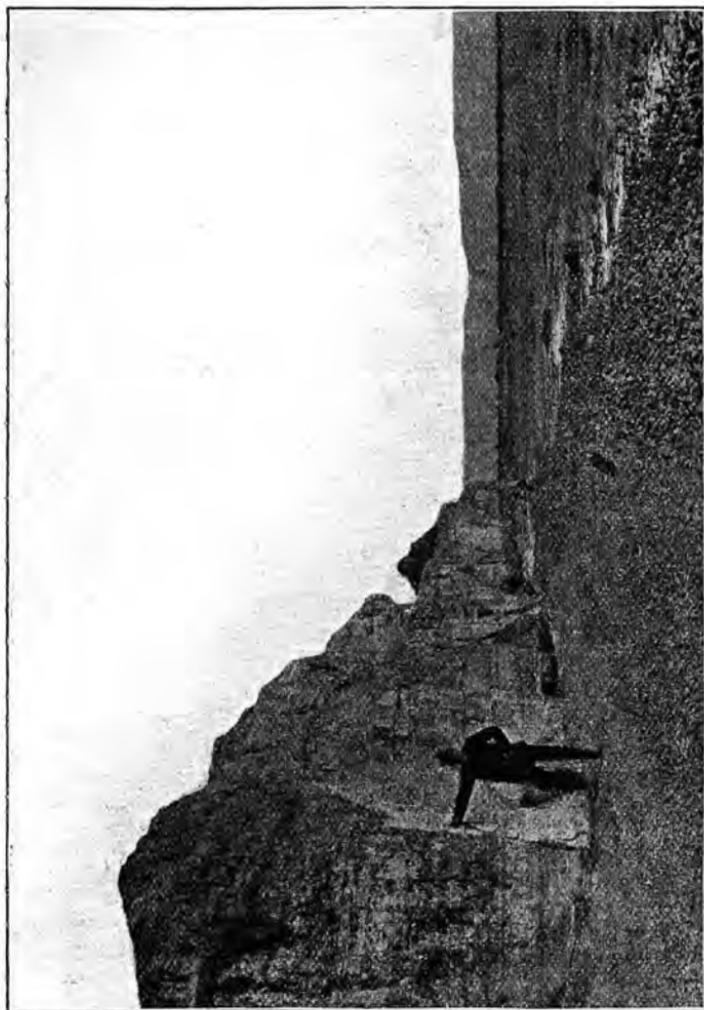
To the north of the second "raised beach," and at a higher level, there is another similar ridge, and I believe others, much more broken up, could convincingly be made out by an experienced geologist.

A proper survey of these "beaches" and other altitudes requires technical skill, but the summit of the first one (that photographed) is but 20 feet above the present sea-level. This can be directly measured, because at one part of the north shore the ridge is actually cut into by the sea, forming a perpendicular cliff of that height above the sea (see Fig. 2, p. 166).<sup>2</sup> This naturally-made section shows the ridge to consist of very finely striated layers of brownish marl and sand, alternating with whitish layers of what appears to be almost pure salt. The summit

<sup>1</sup> The long ridge of marly deposit appears a little below the centre of the photograph. It marks a definite line some 70 feet above the level of the oasis. Here much of it has been washed away, and it is scored all over by small runnels.

<sup>2</sup> The line of cliffs runs for about a quarter of a mile on the north shore of the Dead Sea, not far to the extreme eastern limit of the 'Ain Feshkhal' oasis. Where I am standing the cliff is almost perpendicular for 18 feet. The view is looking towards the east, and the mountains of Moab are in the background.

of the "second beach" cannot be many feet higher than the first, but the third is at a considerably higher level. These raised beaches, produced not by land rising but by the sea-level falling, are worthy of attention, and are, I think, clear evidence of changes of level in the Dead Sea within



[by Mr. Horvathia.]

FIG. 2.—VIEW OF LINE OF CLIFFS ON N.W. SHORE OF THE DEAD SEA.

From a photograph.]

no very distant period. During the last 50 years the level must have been raised a good deal over 20 feet, and it is highly probable that if such a change can occur during so short a time, these beaches may mark old sea-levels within historic times. M. Clermont-Ganneau (*Recueil d'Archéologie Orientale*, vol. v, parts 12-17) argues for a change of level

of over 300 feet since the time of Joshua, and though Sir Charles Wilson considers this highly improbable, yet changes of a few score of feet in the course of centuries are most likely to have occurred (*Quarterly Statement*, 1903, p. 94).

When the sea was up to the first beach almost the whole of the present oasis of 'Ain Feshkhah must have been below the sea, but in the lower ground between the beach and the cliffs there may have been a smaller oasis. At the level of the second beach there could have been no oasis at all at the present situation of 'Ain Feshkhah.

## II.—REPORT OF THE SEVENTH VISIT TO 'AIN FESHKHAH IN 1903.

Visit paid November 21st, 1903. Mr. Hornstein, who accompanied me, most kindly brought his camera and took a number of views to illustrate my "Second Report on the Dead Sea Levels."<sup>1</sup>

We left Jerusalem 1.30 p.m. November 20th, and reached Jericho after dark. We went to 'Ain es-Sultân, and found that some workmen engaged in building had unearthed two pedestals for columns among the mud-brick débris of the *tell*. These remains, fine worked pedestals in very fair preservation, were lying in the open. The cut surface of the *tell* showed very distinctly the markings of mud bricks exactly similar to those with which the men were then building a house for the miller on the other side of the road.

November 21st.—Started at 5.30 for 'Ain Feshkhah. After the usual route we turned aside to examine parts of the north shore of the Dead Sea, and reached our destination at 9.45.

*Weather*.—Slight south-west breeze before dawn, but soon after sunrise a north-east breeze, but very slight and intermittent. On the whole, the air was still and close. Atmosphere clear. Slight mist over sea in early morning, but later all the hills to east very clear and distinct.

Surface of sea, small waves in early morning, but smoother in latter part of afternoon.

Irregular lines of foam, but *no definite white line* in the morning. In the afternoon a somewhat irregular and ill-defined white line down the lake.

*State of Level*.—A fall of 5 inches at both the Observation Rock and the Pool. The Pool is now very shallow and the water lower than ever before. Measurement now 3 feet 6 inches.

*Barometric Observations*.—November 20th, 1.30 p.m., Jerusalem, 27.93; 6 p.m., Jericho, 31.3; 9.30 p.m., Jericho, 31.34. November 21st, 9.45 a.m., 'Ain Feshkhah, 31.77; 10.15 p.m., Jerusalem, 27.95.

*Thermometer*.—Temperature at Jericho, November 20th, at 9.30 p.m., 62°. November 23rd, temperature of air at 'Ain Feshkhah, 11.30 p.m., 72°; water of 'Ain, 75°.

*State of Oasis*.—Reeds in flower except over recently burnt areas, where the young reeds, which have grown with extraordinary rapidity, are a rich green.

<sup>1</sup> [Mr. Hornstein's photographs are now to be seen at the office of the Fund; a few are reproduced in Dr. Masterman's first note (*see above*).—ED.]

The once-cleared area round what I first<sup>1</sup> called '*Ain el-Mabneyeh* is now fast being encroached upon by reeds, the fountain itself being so surrounded as to be almost unapproachable. Very soon, unless the reeds are destroyed again, a stranger could not possibly find it. No cattle nor inhabitants at oasis.

The usual bird life. Sand and rock partridges, pigeons, &c. Of small birds I collected the following:—Chipchaff (very plentiful), blackstart (ditto), whinchat, and the red chat. I also saw the hopping thrush, Tristram's grakles, coot, &c.

Near the most eastern part of the oasis, where the ground is unusually soft, we saw the footprints of wild boar, ibex, gazelle, jackal, and many partridges.

On the road, near *Wady Dabr*, saw three gazelles.

## THE EARLY NOTICES OF PALESTINE.

By Colonel C. R. CONDER, R.E., D.C.L., LL.D.

THE oldest known Egyptian notice of countries north of Sinai is found in the Story of Saneha, who lived at the beginning of the twelfth dynasty—perhaps about 2300 B.C. The region to which he refers, after his flight beyond the "wall" defending Egypt on the north-east, lay between *Edima* and *Tonu*, which were lands in the "north," and countries—or *Tonu* at least and *Aia* a district therein—which were *Fenekh* or Phœnician lands according to one translation. There is nothing very definite told us about their position, but they were in Western Asia, and *Tonu* could be reached in "ships" from Egypt, probably being near the shore. *Edima* has been supposed to be Edom, but as *d* and *t* are not clearly distinguished in Egyptian it might be Etham (Exodus xiii, 20) nearer to Egypt: it was the first place reached in the lands of the *Sati* or Asiatics. *Aia* may mean "shore," and could not be in Edom, for it was a land full of "figs, grapes, wine, milk, olives, corn, and cattle." The chief of *Edima* was named *Maki*, and in *Tonu* we hear of archer troops who repelled foreign invaders. This region was beyond the possessions of the Pharaoh, and under chiefs called *Moni's* or *Menu's*, which recalls the Akkadian words *Mar* and *Uman* for "Lord." One of these chiefs was *Ammiansi*, a name recalling those of Cassite kings. Another was *Khundi-aus*, which recalls the word *Khundi*, supposed to be the name of a God, found in Elamite (e.g., *Kudur-na-Khundi*): so that it is probably to a region with a non-Semitic population that we must look, and to one not far from the seashore.

In later Assyrian texts of Tiglath Pileser III (eighth century B.C.) we read of a country called *Tuna* in Asia Minor. It is mentioned with

<sup>1</sup> At a later visit I had reason to doubt the correctness of the name (see *Quarterly Statement*, 1902, p. 298).