JOURNAL OF

THE TRANSACTIONS

OF

The Victoria Institute,

OR

Philosophical Society of Great Britain.

VOL. LXIX.

LONDON:

Published by the Institute, 1, Central Buildings, Westminster, S.W.1.

1937

809TH ORDINARY GENERAL MEETING.

HELD IN COMMITTEE ROOM B, THE CENTRAL HALL, WESTMINSTER, S.W.1, ON MONDAY, APRIL 5TH, 1937, AT 4.30 P.M.

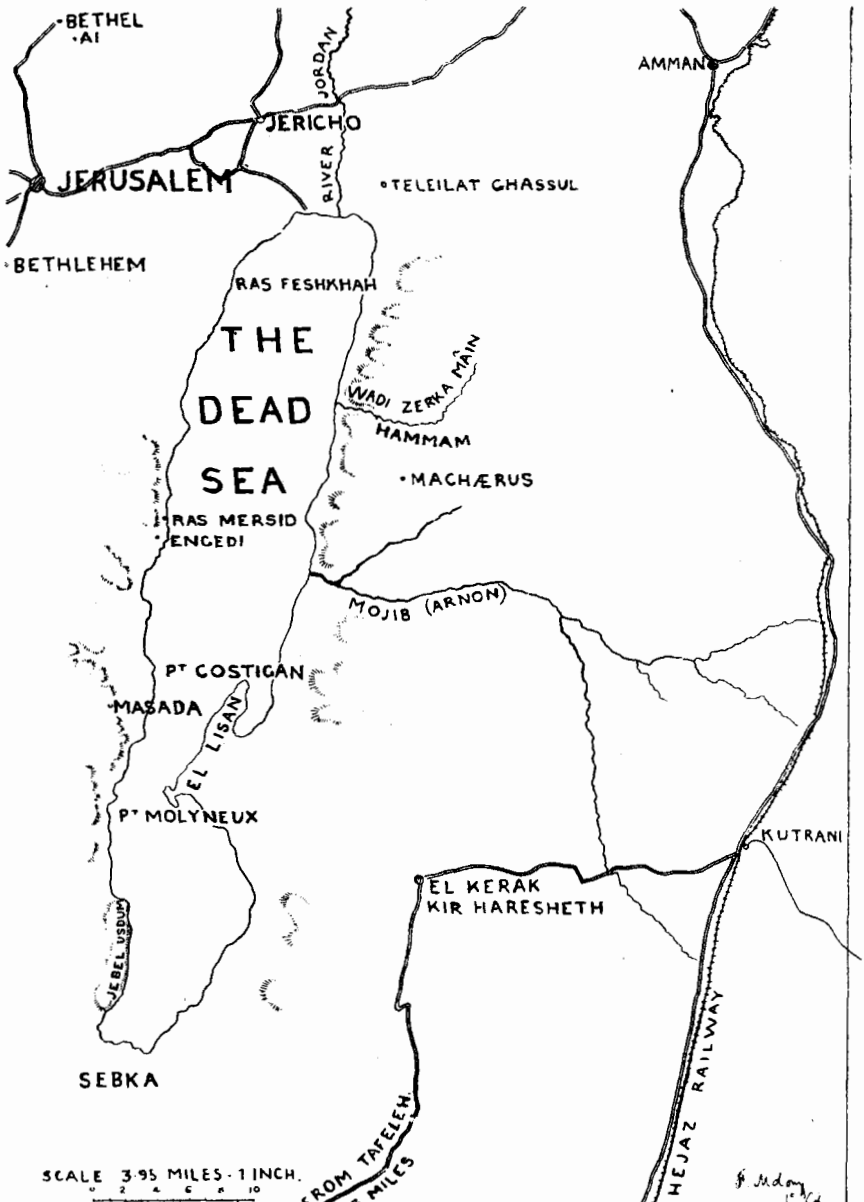
SIR RONALD STORRS, K.C.M.G., C.B.E., IN THE CHAIR.

The Minutes of the previous meeting were read, confirmed and signed. In the absence of the author, Col. S. F. NEWCOMBE, D.S.O., had kindly undertaken the reading of Dr. Masterman's paper entitled "The Dead Sea and the Lost Cities of the Plain," which was illustrated by lantern slides.

THE DEAD SEA AND THE LOST CITIES OF THE PLAIN.

By E. W. G. MASTERMAN, ESQ., M.D., F.R.C.S., F.R.G.S.

THE Dead Sea occupies the lowest part of that unique feature on the earth's surface, the Jordan Valley. This valley owes its existence to a great "fault" or rupture having occurred in the strata of rocks during their gradual elevation from under the sea to form the mountain ranges of western and eastern Palestine during the latter part of the Cretaceous or early part of the Tertiary period. This "fault" extends northwards through Syria and southwards to the Gulf of Akaba—a distance of 360 miles—not to mention its very probable further extension into the well-known rift valley of Central Africa. Along all this great crack the layers of rock to the east have risen hundreds of feet higher than on the west, and along this line a long slice, as it were, of the crust of the earth has dropped thousands of feet. It does not belong to this paper to discuss the fascinating subject of the Jordan Valley as a whole but only the lowest part where lies its famous lake, 47 miles long by an average of 9 miles wide. This lake, known in the Bible as the Salt Sea (Gen. xiv, 3, etc.), owes this name to the fact that its waters contain the concentrated mineral salts of a vast lake which once—in early glacial times—extended


BETHEL
AI
JERICHO
JERUSALEM
BETHLEHEM
JORDAN
RIVER
TELEILAT GHASSUL
AMMAN
RAS FESHKHAH
THE
DEAD
SEA
WADI ZERKA MÂIN
HAMMAM
MACHÆRUS
RAS MERSID
ENGEDI
MOJIB (ARNON)
Pt COSTIGAN
MASADA
EL LISAN
Pt MOLYNEUX
KUTRANI
EL KERAK
KIR HARESHETH
JEBEL USDUM
SEBKA
HEJAZ RAILWAY
FROM TAFFILEH
3 MILES
SCALE 3·95 MILES - 1 INCH.
0 2 4 6 8 10

190 miles in length, 30 miles in breadth, at a level of 108 feet above the level of the Mediterranean Sea. The volume of this prehistoric lake was four or five times that of the present lake. Diminished rainfall and the disappearance of the ice cap on the mountains around led to a gradual drying up of the vast inland sea, during the course of which desiccation many terraces or raised beaches were left which can be traced to-day at many varying levels.* The lake bottom, north of the present lake, consisting of hundreds of feet of stratified marl, became a long plain through which the Jordan has cut a very winding path, leaving grotesque hills and intricate valleys The outer edges of this great lake-bottom can be seen clinging to the sides of the cliffs in the neighbourhood of the Dead Sea at a height of about 250 feet above its level. From this the lake bottom slopes downwards towards the centre of the valley, where it is steeply cut by the Jordan and its tributaries into deep channels. At the mouths of each valley the streams have cut through the gravelly deltas formed by their many tributaries where in earlier ages they were mighty rivers. The Jordan Valley as a whole is known in Arabic as el Ghor, but the deeper inner valley—some half a mile across—is called el Zor. This latter, an area overgrown with tangled trees, bushes and reeds, is called in the Old Testament the swelling (R.V.) or pride (R.V.) of Jordan (Jer. xii, 5). In ancient times it was the haunt of wild beasts and still harbours a few wild boar. When the snows of Hermon melt, the Jordan overflows its banks (Jos. iii, 15) and floods much of this inner valley, through which the muddy, swift-flowing Jordan carries vast quantities of the old limestone deposits into the Dead Sea.

It is from the Jordan and its tributaries that the Dead Sea chiefly derives its waters, receiving, it is calculated, altogether 8,500,000 cubic metres of water daily. Besides the main supply, the Dead Sea receives in the rainy season much surface water, and there are contributions from hot springs in the course of the valley—notably at Tiberias, at el Hamma in the Yarmûk Valley and from the springs of Hammam ez Zerka in Wady Zerka Mâin (the ancient Callirrhoë). Though these last contributions are not great compared with the total, they are, as we shall see, of

* According to Prof. Huntingdon, raised beaches can be traced at 1,430, 630, 430, 300 and 250 feet above the present level, and there are several minor beaches lower down.

considerable commercial importance. The level of the surface of the Dead Sea is now about 1,300 feet below "sea level." It is probable that during some periods of human history the level may have varied, but such variations have certainly not been great. A state of equilibrium has long ago been reached. It was my privilege for thirteen years before the Great War to take regular measurements of the seasonal changes of level and since 1929 they have been resumed on more scientific lines. We know that during the rainy season and the river-floods of spring the level rises, reaching its highest about April and its lowest in November. But the difference is not great—a foot or foot and a half as a rule (my highest seasonal rise was 3 feet). The amount depends upon the total rainfall over the area draining into the Jordan Valley, affected somewhat by a prolonged rainy season, heavy snows, and by the height of the summer temperature. Besides this, annual change of level observations of various kinds made over the past eighty-seven years show that there has been another important change of level. Since the observations of Lieut. Lynch, of the U.S.A. Navy, in 1847, the level of the sea has certainly risen some twenty or more feet. This rise reached its highest in 1929 (which is believed to have been the highest since 1650) and since there has been a fall of about 9 feet. Such moderate variations of level may have occurred during the historic centuries. Some authorities think that the vast amount of debris carried down by the rivers and streams must have substantially affected the level by raising the lake bed and advancing its coast, particularly at the Jordan delta. During the last eighty years or so the rise of level has been marked by (1) the disappearance of the small island near the north shore known as the Rejm el Bahir, whose highest point reached by sounding is now $10\frac{1}{2}$ feet under the surface, (2) the very considerable advance southwards of the water over the Sebka—the mud flats to the south, and (3) the disappearance of the ford which once ran (2 miles) from the western shore and the most southerly point of el Lisan. The explorers Irby and Mangles* watched a caravan of animals and men crossing through the sea, and there were people living before the war who stated that their fathers had seen the ford in use. An airman has recently reported that when flying over the sea he could trace

* *See* their *Travels*, p. 454.

the course of this crossing as a white line under the water, but as a ford it has long ceased to be used.

The Dead Sea is about 47 miles in length and has an average breadth of 9 miles. Its area is calculated as about 300 square miles. It is divided into a northern, two-thirds, where the water is deep, especially on the east side, where a sounding of 1,300 feet has been made, and a southern bay of variable extent and depth, but nowhere over 30 or 35 feet, and much of it quite shallow. Possibly this portion is of less ancient date than the rest of the lake. The waters here are more saline and salt crystallises out at the bottom. Here, running parallel with the western shore, is the extraordinary ridge of rock salt known as Jebal Usdum. This hill, which runs along the shore for nearly 7 miles, rises to a height of 600 feet above the lake. The great mass of the hill is of the same marly substance as the rest of the sedimentary deposit, but under this, rising from the Dead Sea level to about 100 to 150 feet, it is a mass of crystallised rock salt. In many parts the rock is hidden by overlying marl, but in other parts furrows and caves have been made by water action, and the salt is exposed in beautiful and complicated forms. In the cave grottos there are stalactites and stalagmites of greenish translucent salt, and in the furrows the salt has been scored into intricate shapes of all kinds—pillars have at various times been pointed out as "Lot's wife." When I was there we lunched in one of these beautiful grottos, but the well-known large cave, which used to be approached by a road between the lake and the hill, can now only be reached by boat on account of the rise of the lake's level.

Roughly dividing the lake into its two parts is the curiously shaped peninsula known as el Lisan—the tongue. Its outline is like a boot with its toe pointing north. The seaward aspect of this peninsula consists of soft beds of marl with deposits of salt and gypsum rising to about 40 to 80 feet above the sea's level, and extends some seven miles from north and south, terminating in two points, not so marked now as formerly because of the rise of level; these are called respectively Point Costigan on the north and Point Molyneux on the south, after two explorers who lost their lives in consequence of the hardships they underwent in navigating these waters.

The scenery of the Dead Sea is attractive. There are frequent winds to ruffle its surface and produce sparkling waves. There

is commonly a slight haze. Storms arise at times perilous to boats because of the weight of the waves. There is, of course, no foundation whatever for the evil reputation once given to it nor for the mediæval tale of a poisonous miasma which, it was said, caused birds flying over its surface to perish. I have seen a beautiful flight of flamingos crossing its waters, and wherever the not infrequent springs along its shores produce little oases, there is abundant bird life. At such places small fish can be seen darting about close in shore, but none can live in the main mass of water. The attractiveness of the northern shores, now but an hour's motor drive from Jerusalem, is being increasingly modernised by immigrants to Palestine, and passing the Allenby bridge to Jericho one evening recently I noticed a long line of twinkling lights along the shore, reminding me of one of our sea-side resorts seen at night from the sea—on, of course, a small scale. Sea-bathing is becoming increasingly popular. Along the western border of the Dead Sea the mountains fall steeply to the water at several places, notably at Ras Feshkhah and Ras Mersid ; many valleys debouch into the lake and there are several springs, of which the copious warm springs of Ain Feshkah, near the N.W. corner, and Ain Jidy (Engedy)—300 feet above the sea—are the most famous. Some ten miles farther south of Ain Jidy is es Sebbeh, the site of the famous Masada where the last remnants of the Zealots, escaped from the siege and destruction of Jerusalem, for many months held out against the might of Rome and finally preferred self-destruction to falling into the enemies' pitiless hands. From the summit of this lofty and precipitous rock the remains of the wall of circumvallation, with its ruined Roman camps, are clearly traceable nearly 2,000 feet below.

The eastern shores of the Dead Sea are in great part precipitous, and for miles the rocks descend direct to great depths. There are two famous valleys, each with its delta and a very striking entrance into the Dead Sea between perpendicular cliffs of coloured sandstone. The northern one is the Wady Zerka Mâin. In its higher reaches rise the famous hot springs, known in Roman times as Callirrhoë, to which Herod the Great came when a dying man in hopes of relief. The southern valley is the Mojib, the biblical Arnon, which traverses a short but very deep course through the mountains. About half-way between these two valleys, some five miles east of the Dead Sea, is el Mukâwer,

the site of Herod's fortress palace Machærus, where probably St. John the Baptist was executed. Some thirty miles farther south lies the town of Kerak, which is connected now with the southern bay of the Dead Sea by a good motor road. During the Great War vast quantities of wheat from this region were brought by boat to the north end of the Dead Sea and thus into Palestine. The position of Kerak is one of extraordinary natural strength. It was Kir Haresheth of Moab in Old Testament times (2 Kings iii, 25; Isaiah xvi, 7–11). In the Middle Ages it was powerfully fortified by the Crusaders, and later after they left the walls and forts were added to and strengthened by the Arabs. It is to-day a picturesque survival, but within the ancient ruined walls the town is expanding. It is now an important centre, being connected by motor roads with the Hejaz railway at Kutrani, with Maan by way of Tafeleh and Shobek, and with the Dead Sea. There is a regular omnibus service between it and the capital, Ammān.

The chemical composition of the Dead Sea water is one not only of general interest but now one of considerable commercial importance. It is well known that the density is such that the human body cannot sink. Near the surface the specific gravity is subject to slight variations according to the locality, but at a depth of 250 feet it is constant at 1·235, because here the water has reached saturation point and at such a depth the temperature also is constant at 21° C. A litre of water contains about 316 grammes of salts, of which half is magnesium chloride and one-quarter sodium chloride or common salt.* The commercially valuable salts are the potassium chlorides, of which there are only 4·6 per cent. of the total salts, and the bromides, of which there are only 1·9 per cent.

The composition of the Jordan water alone adequately explains the presence and relative quantities of most of the salts with the exception of the bromide. It is thought that this last is supplied chiefly from the hot springs on the course of the Jordan

---

* The exact analysis is :—

Magnesium chloride	163·7	= 316 grammes.
Sodium chloride	84·2	
Calcium chloride	47·5	
Potassium chloride	14·7	
Magnesium bromide	5·9	
Calcium sulphate	0·6	

and its tributaries and also certain subterranean hot springs along the western shores. The Palestine Potash Co. commenced experiments in 1921 with a view to obtaining the best method of recovering the potash by fractional crystallisation under solar evaporation under the special climatic conditions of the Dead Sea. These were continued till 1925, when the company commenced experimental production. At the beginning of 1930 they began extracting and developing the salts of the Dead Sea on a commercial scale. Their main works are on the level ground at the north end of the sea where great evaporation pans have been constructed. Since 1932 the water has been pumped from the bottom of the sea through a 30-in. pipe, 2,500 feet long, into narrow shallow pans placed for two miles along the north shore on both sides of the Jordan. The output of the last years has been between 25,000 and 30,000 tons of potash and 1,000 to 1,200 tons of bromide annually. An extension of plant is now being made at the southern end of the Dead Sea, where 22 square miles of suitable land is available. It is hoped eventually to bring the total capacity of the plants to 100,000 tons of potassium chloride annually. Work was carried on under considerable difficulty during the recent strike because, this being a Jewish undertaking, the convoys to and from the Dead Sea were tempting objects for attack by the disgruntled " Arabs."

As will be seen, the main products sought are the potassium chloride and the magnesium bromide. Notwithstanding the low content of the former in the water, ranging from 1·1 per cent. to 1·4 per cent., it is possible by the process of fractional distillation to eventually recover 80 per cent. The various salts crystallise out during evaporation in a certain order. During the first stage—the first pans—90 to 95 per cent. of the sodium chloride (common salt) crystallises out;* the next two series of pans are concerned with the concentration and crystallisation of the potash salts; in the third stage magnesium chloride crystals are obtained, and the final " concentrated brine " is pumped into the bromide factory where the bromide is extracted by treatment with chloride and steam. " In the production of potash, the Palestine Potash, Ltd., does not import any raw

* Before the War Arab smugglers used to obtain a considerable quantity of common salt in primitive pans at the same spot. As, however, salt was a government monopoly, if they were caught bringing it into the towns they were liable to lose both their salt and their baggage animals.

materials apart from the fuel oil for drying the wet potash, which contains about 12 per cent. moisture, and Diesel oil for generating electric power. All the main 'raw materials' used in the production of potash, the waters of the Dead Sea, the sun, and the fresh water of the Jordan, are available on the spot."*

There is another product of the Dead Sea which was considered of great importance at the beginning of the Christian era, namely, asphalt or bitumen. In Josephus, Pliny, and other classical writers, the name Lake Asphaltitis was given to the Dead Sea, and undoubtedly some asphalt was exported to Egypt. Though small quantities of bitumen are found among the pebbles along the shores and large masses have occasionally—particularly after earthquakes—floated to the surface, no deposits of commercial importance have been exploited. There must be considerable deposits somewhere on the sea bottom.

It is a far cry from a discussion of the commercial possibilities of the Dead Sea to the topography of the Bible story of the destruction of the "cities of the plain" and the escape of the righteous Lot. To-day the Arabs—who are familiar with the story through the Koran—call this lake the Bahr Lût or the Sea of Lot. Biblical students have been speculating for many decades as to where stood the fair plain and its cities—of which Sodom and Gomorrah remain for all times as the types of special wickedness. In considering such a question it must be always remembered that there have been very considerable changes in the configuration of the sea, especially on the north. Here year after year the Jordan has been building up a delta of deposits. It has been calculated† that since the time of Abraham it is a conservative estimate that the Jordan and its tributaries between the Lake of Galilee and the Dead Sea have brought down sediment enough to have encroached upon the sea to the extent of 15 or 20 square miles. Similar encroachment must have occurred on a smaller scale from all sides, causing a tendency to the raising of the level of the water. But it would be dangerous to argue, as has been done, that the "cities of the plain" lie below the waters of the southern bay of the Dead Sea. There is

---

* Quoted from "The Dead Sea, a Storehouse of Chemicals," by M. A. Novomeysky, a paper read at the Institute of Chemical Engineers, 1936. Those wishing for full particulars are referred to this paper.

† Prof. G. F. Wright.

nothing to make this probable, and competent modern geologists* who have studied the question on the spot all argue that the southern basin dates back to prehistoric times. That Jebal Usdum contains an echo of Sodom is sure, and the pillars of salt which have formed there from weathering of the rock salt have frequently been associated in men's minds with the story of Lot's wife. But neither the southern bay nor the adjoining mountain of salt has any other connection with the destroyed cities. It was supposed by many that a Zughor or Sugos mentioned by Arabian geographers at the base of the mountain. of Moab—where there is an oasis—might be the site of Zoar Archæologically there is nothing to support this view. The remains here have been explored and are not pre-Roman. Dr. Albright, searching the whole region S.E. and S. of the Dead Sea, did not find any remains which go back to the time of Abraham.

At the N.W. corner of the sea we have a Wady Kumran which may have an echo of Gomorrah, but this was, I can state positively from personal knowledge, never the site of any large city. Gen. xiii, 10ff., certainly seems to indicate that the "cities of the plain" were to the north in the well-watered "plain of Jordan." The south of the sea would have been quite invisible from Bethel or Hai.

Recently Père Mallon, of the Biblical Pontifical Institute of Jerusalem, has put forward the most hopeful suggestion considered archæologically which has appeared. Near the N.E. corner of the Dead Sea there is a large relatively level area which can be described as the "Plains of Moab" (Numbers xxxiii, 48). In the centre of this area some $3\frac{1}{2}$ miles north of the Dead Sea, 3 miles east of the Jordan, and $2\frac{1}{2}$ miles west of the mountains, there is a double Tell known as Teleilat Ghassul. This site was excavated in 1929–30 by Père Mallon with interesting results. He found that this mound—and there are other mounds of a similar kind in the vicinity—covers archæological remains belonging to an age which corresponds with the traditional date of the catastrophy which overthrew the "cities of the plain," viz., the Early Bronze Age. Further, there is evidence that the town which stood here underwent destruction by fire at four periods with no great interval between; on each occasion the town was rebuilt on the ashes of its predecessor. "There can

* Koeppel, Picard, Blanckenhorn.

be no doubt that the fourth town sank in a vast conflagration," " heaps of ashes, with broken and calcined stones, fill the ruins and at points appear on the surface." The site was never re-occupied.

Here we have, perhaps, the best suggestion *if* the site of these cities in the " plain of Jordan " are to be found anywhere. There is nothing positive to identify the site, and the civilisation indicated by the remains found is primitive. Certain inscribed pebbles found here are no exception. They are of interest archæologically but are of no assistance in identifying the site or explaining its history.

We must therefore leave this question of the site of these cities as one not yet solved, realising at the same time that the surface changes on the Jordan plain to the north of the Dead Sea have been so considerable over the last four thousand years as to make it quite probable that the traces of such a complete destruction as that recorded in Genesis might be hidden under deposits made during these many centuries and be lost to us for ever.*

Supplementary Note.

A visit I recently paid to these elaborate potash works was a wonderful experience, when I recall the utter solitude of the same shore before the war. The area now occupied extends for some miles along the north shore. To the west lie four-storeyed flats and many houses belonging to the workers, a large restaurant and bathing-beaches. Several motor boats were anchored near the beach and at one point a motor launch was being built. A quick motor run eastwards brought us to the entrance, where a permit to see the works must be shown. My conductor, the engineering director, Major Campbell, led me in the car for nearly five kilometres past huts and offices and series of evaporating pans. Then, standing on the summit of a lofty building, he courteously demonstrated the great and intricate arrangement of the pans. These extend along both sides of the Jordan, along the north shore and for two miles inland. The pans have a surface area of from $7\frac{1}{2}$ to 30 acres.

* A brief account of Père Mallon's excavations is given by the Rev. J. Garrow Duncan in the *Quarterly Statement* of the Palestine Exploration Fund, April, 1932.

The Dead Sea water is pumped up inland into the highest pans and thence runs downwards through sluices from pan to pan. In the higher pans the water is a peacock green ; here the sodium chloride crystallises out. As it passes on, the carnellite pans (where crystals of chlorides of potassium, magnesium and some sodium crystallise out), the water assumes a dull, muddy colour. From here, this water is pumped through flexible pipes floating in the pans to special " separators," where the solid salts are left and the brine returned. The complicated processes whereby the salts are first treated in vacuum filters and then flushed with fresh water for the removal of the remaining sodium chloride, was fully described. The high-grade potash product is dried in vast flat tanks and is then mechanically conveyed to another building, where it is pressed into sacks ready for transport. Largely in consequence of last year's disturbances, there is an enormous quantity awaiting export. At the time of my visit the active manufacture was temporarily suspended though the evaporating pans continued to be utilised. It was also stated that at the south end of the sea the construction of the evaporating pans was very much simpler, since there is abundance of flat ground available for the purpose. The finished product from the south will, for the present, be conveyed the length of the sea by motor boats and barges. Bromine is obtained in a separate building by treating the remaining liquid with chlorine. At present, the bromine obtained amounts to from 1,000 to 1,200 tons a year, but this could be vastly increased.

Discussion.

The Chairman (Sir Ronald Storrs) drew the attention of members to the gradual formation of the " fault " which formed the Dead Sea depression ; a geological fact which is contrary to the general belief that it was due to a sudden convulsion of nature. He added that the " grotesque hills and intricate valleys " had always reminded him, seen either from the heights of Zion or the road down to Jericho, of the hideous dead scarrings on a contour projection of the Mountains of the Moon. He reminded members of the notice that had been put up in Sir Herbert Samuel's time informing motorists at what point on the Dead Sea road they were passing below sea level ; many airmen in the Allenby campaign

were able to boast with justice that they had flown their machines below the level of the sea.

Sir Ronald Storrs said: Of the wild boars mentioned very few were left; most having been hunted down by our gallant allies, the Australians. Sir Ronald had only seen two during his nine years.

He hoped someone present might inform them how many times salter the Dead Sea was than the English Channel. The only test he had unintentionally applied was of getting a few drops into his eye while bathing, an experience no more to be forgotten than the filthy bitterness of its taste. Its buoyancy was sometimes a source of embarrassment to bathers.

A notable experience had been the ascent of Masada with Bishop Charles Gore, who although over seventy had easily outstripped the rest of the party, not one of whom was yet forty.

Asphaltitis: the classical name was reproduced by Milton in "Paradise Regained" as the "asphaltic pool."

Concluding, Sir Ronald observed that there were few more splendidly romantic views in the world than the glimpse from the Russian Tower of the Ascension, of the Dead Sea, set like a deep glowing turquoise against the amethystine scarf of the Mountains of Moab and of Edom.

Mr. R. DUNCAN said the paper was a mine of very interesting information regarding the Dead Sea to-day, for which we were greatly indebted to the learned author. Towards its close the paper was more conjectural in character, and necessarily invited debate. Views differed, and would still differ, as to the actual site of the Cities of the Plain. One clue to a true solution of the problem may lie in trying to determine where Abraham and Lot were when they separated. From this point, wherever it was, the narrative tells us that Lot journeyed east.

It is probable that ready access to water for the animals was what their respective herdsmen were quarrelling about, as we find that assurance of a good water supply was the magnet drawing Lot and his company in their eastward trek. Strong probability exists, then, that it was in the Beersheba neighbourhood that the dispute between the herdsmen had come to a head. In later periods Abraham him-

self, and subsequently Isaac, were involved in conflicts with the Philistines concerning wells in this locality. Apparently it was quite a good grazing district, but not too plentiful in water. A nomadic community with great flocks and herds, coming out of Egypt to Palestine, would almost certainly make a long sojourn here; and here, as afterwards, contention about the water was only too likely to develop. It is suggested, then, that this was the region where Abraham and Lot found it desirable for peace' sake to part company. Moving eastwards from here would bring Lot towards the southern end of the Dead Sea.

At the same time it is recognised that a superficial reading of the narrative might indicate that Abraham and Lot were together much farther north, viz., in the Bethel neighbourhood, at the time of their separation. It was, however, as a pentitent seeking re-communion with God after backsliding in Egypt that Abraham went to Bethel, and there is no mention of Lot's having accompanied him. Nor would there be much point in imposing so long and toil-some a journey on their concourse generally, especially if there were no intention of remaining at Bethel. The next time we hear of Abraham he is, in fact, back south again, near Hebron.

It is recognised also that Lot's choosing of " the plain of Jordan " seems to point to a conclusion that this decision was come to in the Bethel neighbourhood, where there would be opportunity of looking down over the Jordan valley. Let us remember, however, that river names are apt to be repeated. In England there are three Ouses and four Stours. Why, then, should there not be more than one Jordan in Palestine ? Other instances of duplication of names in that country can be adduced. There were two Carmels, for example. It is accordingly suggested that there was a second river or stream called Jordan which watered the plain towards the southern end of the Dead Sea.

Jebel Usdum, which we may translate as the mountain of Sodom, stood up from this plain. Its base is rock salt and the marl overhead is largely impregnated with sulphur. Asphalt was characteristic also of the neighbourhood. It was what would now be known as a region rich in oil-bearing strata. Some ten years ago the American archæologist, Professor Kyle, after a study of the locality, reached the conclusion that the Cities had been destroyed through the medium

of a subterranean explosion rupturing the strata, and carrying skywards vast quantities of burning sulphur, salt and asphalt, which descended again as a fiery rain, blasting the neighbourhood for thousands of years afterwards. Modern illustrations of the terrifically destructive effects of any sudden release of forces pent up beneath the earth's crust are afforded by what happened at Krakatoa in the Java Sea some fifty years ago, and, in lesser degree, by the recent explosion of natural gas at Houston, Texas, bringing death to hundreds of children through the shattering to pieces in a few minutes of the large building in which they were at school.

It was Professor Kyle's opinion that the Cities of the Plain lay in front of Jebel Usdum, their site being now covered by a southward extension of the Dead Sea owing to its waters having risen. In ancient times before the extension had taken place, the ruins of the Cities were well known, and mention is made of them by Strabo, Tacitus and Josephus.

Professor A. SAARISALO said: I am pleased to see here a notable person, whom I often saw in Jerusalem at the meetings of the Palestine Oriental Society, namely, the Chairman.

In trying to locate the lost Cities of the Plain Dr. Masterman gives preference to the theories of the Jesuit, Father Mallon. The latter has put forward the suggestion that the lost Cities ought to be identified with the mounds of Teleilat Ghassal, situated north of the Dead Sea. In this he has not the support of modern authorities on Palestinian Archæology (Vincent, Albright, Fisher, Garstang).

Dr. Masterman, speaking of the southern part of the Dead Sea, states: "The remains here have been explored and are not pre-Roman. Dr. Albright, searching the whole region south-east and south of the Dead Sea, did not find any remains which go back to the time of Abraham." The last sentence is correct if we substitute "cities" for "remains." In fact, some ten years ago, Dr. Albright found a Canaanite high place on a mound called Bab ed-Dra, situated in the south-east corner of the Dead Sea. This site has never been a city because it contains no layers of debris, as is invariably the case where there has been regular occupation. It is a natural mound, the surface of which is strewn with potsherds dating back to the Early Bronze Age, *i.e.*, until and in the time of Abraham,

but not later. When we remember that the religious festivals lasted frequently a whole week, we can easily understand how the surface of the high place, used as a camping ground, became strewn with potsherds and other household implements. Dr. Albright found, too, many tombs of the Early Bronze Age. We can also appreciate the fact that since, according to ancient custom, the people who used the mound as their high place must have dwelt at a lower altitude (the Moabite cities were situated far away, as well as much higher up on the plateau, and also came into existence later), we must accordingly look for the lost Cities, whose inhabitants used this high place, at a point below the present surface of the Dead Sea, for the waters of the Dead Sea have now almost reached the mound. In view of the well-known fact that the surface of the Dead Sea has been rising during the historic periods, and that the southern basin is rather shallow, we can infer that this basin was dry in the time of Abraham. The ancient tradition of the "Mountain of Sodom," Gebel Usdum, points to this basin. The lost Cities are four in number, so that they each could have had a separate stream. In fact, there are still at the present day four perennial streams leading down to this southern basin from the south.

May I still add another fact? The expedition of Chedorlaomer (Gen. xiv) against Sodom and Gomorrah followed a commercial route east of Jordan in the direction of the south. On his way he conquered three places which have been identified (Asteroth, Ham, and Kirjathaim). Kirjathaim, the most southern of the three, is situated south of the northern end of the Dead Sea.

When working with Dr. Albright on his excavations at Tell Beit Mirsim, the speaker had the opportunity of comparing the Bab ed-Dra pottery with the clear Abrahamic strata of Tell Beit Mirsim.

Rev. H. T. WILLS, M.A., B.Sc., said: In his very scanty remarks on the site of the Cities of the Plain, Dr. Masterman says, "At the north-west corner of the sea we have a Wady Kunoran, which may have been an echo of Gomorrah, but this was, I can state positively from personal knowledge, never the site of any large city." I wish to call attention to a lengthy quotation in Urquahart's *New Biblical*

Guide, Vol. II (pp. 229–234). There a quotation appears from a book, entitled *Journey Round the Dead Sea, &c.* (Vol. II, pp. 42–46), where an account of a ride up the west coast is given by a M. de Saulcy. In this account Saulcy says he was riding for miles through ground strewn with ruins. To give his words, " From the head of the Ouad Goumran the extensive ruins which we have found bear the name of Kharbet Goumran . . . My own conviction is, without the slightest hesitation, that the ruins called by the Arabs Kharbet-il-Yahoud, Kharbet Fechkhah, and Kharbet Goumran, which form a continuous mass, extending without interruption, over a space of more than 6,000 yards, are, in reality, the ruins of the Scriptural Gomorrah."

These findings were later confirmed by " a veteran traveller in Palestine, Fr. Lieven," and others. M. de Saulcy visited the sites on a later occasion and then said " North of the Lake there is a mount, called by the Arabs, ' Gebal Sedoum,' (Mount of Sodom) and below the mount, ruins called ' Kharbet Sedoum ' (Ruins of Sodom), the Arabic exactly repeating the Hebrew name. These ruins do not lie in the route by which travellers in the Holy Land are generally conducted, but they are conspicuous enough not to be overlooked by those who pass near them, and, to the eye of an archæologist, they are of sufficient age and proper Biblical character. They consist of blocks of hewn stone . . . ," etc.

Author's Reply.

To me it is a misfortune that I was unable to answer at the time, on the spot, some of the comments on my paper. I cannot now do more than refer to one or two points. Mr. Duncan's suggestion that there may have been two Jordans seems to me an extraordinarily hazardous theory. Professor Saarisalo's theory that the " Cities of the Plain " are buried beneath the Dead Sea Southern Bay seems to be chiefly founded upon his view that it is a " well-known fact that the surface of the Dead Sea has been gradually rising age after age." I do not know when the Professor has heard such a " fact, " but this view is entirely contrary to all the geological evidence, which shows that age after age the level of the Dead Sea has gradually fallen, though during the historic periods there has been no

great change, but periodical rises and falls of level of a few feet. With regard to Mr. Wills' reference to de Saulcy's claims as given in his book, I thought that these were entirely discredited half a century ago. Many years ago Professor R. A. S. Macalister and I rode over this region with these remarks in mind and were quite satisfied that de Saulcy was entirely mistaken. I have been over the ground repeatedly and am satisfied that none of the scanty Arab remains could possibly belong to any ancient city. Nor has anyone but de Saulcy ever found a Kharbet Sedoum at the north end of the Dead Sea.