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ORDINARY MEETING, MAY 6, 1878.

J. E. HOWARD, Esq., F.R.S., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following Elections were announced :—

MEMBERS :—The Right Rev. H. Cheetham, D.D., Bishop of Sierra Leone ; the Right Rev. J. R. Holly, D.D., Bishop of Haiti ; A. Duff Watson, Esq., Sidmouth.

ASSOCIATES :—The Right Rev. J. Mitchinson, D.D., Bishop of Barbados ; the Right Rev. C. T. Quintard, D.D., Bishop of Tennessee.

Also the presentation of the following Works for the Library :—

- “Proceedings of the Royal Society,” Part 186. *From the Society.*
 “Annual Address of the American Geographical Society” for 1878 *Ditto.*
 “The Philosophy of Man.” By J. Coutts, Esq. *From the Author.*
 “Some Sceptical Doubts.” By Rev. C. Bullock, B.D. *Ditto.*

The following paper was then read by the author :—

THE JORDAN VALLEY, IN THE LIGHT OF BIBLICAL HISTORY AND SCIENTIFIC RESEARCH.

By Professor J. L. PORTER, D.D., LL.D.

DOWN the centre of Syria, Palestine, and Arabia Petræa, runs a great valley from north to south, through six and a half degrees of latitude. At its northern end, on the shore of the Mediterranean, lie the ruins of Seleucia, where St. Paul embarked on his first missionary journey (Acts xiii. 4); and at its southern end, on the Gulf of Akabah, are the ruins of Ezion-geber, where Solomon built his fleet for Ophir (1 Kings ix. 26). The northern section of the valley forms the bed of the river Orontes, near whose banks once stood the great cities of Antioch, Apamea, Hamath, Emesa, Riblah, and Baalbek. The southern section is an arid desert, shut in on the east by the red cliffs of Edom, and on the west by the white calcareous ridges of the “Wilderness of Wandering.” Both these sections are of much interest to the classical and sacred geographer. East of the Orontes, between the parallels of Hamath and Aleppo, is a wide region of plain and mountain, studded with remarkable old towns and villages, to the existence of which I was among the first to call attention when

I visited Palmyra more than twenty years ago.* A portion of this interesting region was explored by the late Mr. Tyrwhitt Drake, and also by the Count de Vogué, who has given some beautiful drawings of its ruined churches and houses in his splendid work, *Syrie Centrale*.

2. At present, however, I wish to treat of the central section only of the great Syrian valley. It is more deeply interesting than either of the others, and it presents most important problems to the historian and the physical geographer, problems which have never yet been satisfactorily solved, and which, I believe, are not unworthy of notice in a meeting of the Victoria Institute. This section forms the bed of the river Jordan and the Dead Sea, and is in many respects unique. For a length of about 150 miles it is below the level of the ocean, and along the shores of the Dead Sea its surface has a depression of no less than 1,290 feet. It would seem that the name *Jordan* was intended to denote this remarkable physical characteristic. It signifies "the descender," and is most applicable, whether we consider the rapidity of the current, or the depth of the valley through which it runs. From whatever part of the country its banks are approached, the descent is long and steep. That this is the true etymology of the name appears highly probable from an incidental remark in Joshua iii. 16, where, in describing the effects of the opening of a passage for the Israelites, the word used for the "coming down" of the waters is radically the same as the name of the river. Such a play upon a name is common in Hebrew.

3. The snows that cover Hermon during the winter, and that still cap its glittering summit during the hottest days of summer, are the real sources of the Jordan. They feed its perennial fountains; and they supply, through a thousand channels, those superabundant waters which make the river "overflow all his banks all the time of harvest" (Josh. iii. 15). But it has two historical sources, one on a terrace of Hermon, at the foot of a cliff, beside the ruins of Cæsarea-Philippi, most probably the place where our Lord uttered those well-known words which have given rise to so much controversy—"Thou art Peter, and upon this rock I will build my Church, and the gates of hell shall not prevail against it" (Matt. xvi. 18). Perhaps, as Dean Stanley observes, the very rock impending over the fountain, and on which a temple of Pan stood, may have suggested the metaphor. The other fountain is four miles distant in the valley. There is here a cup-shaped mound,

* *Five Years in Damascus*, i. 197.

300 yards in diameter, now called *Tell el-Kady*, "The hill of the Judge." It is the site of the primeval Phœnician city *Iaish*, which the Danites captured and "called after the name of their father" (Judg. xviii. 27—29). It is interesting to note that *Dan* in Hebrew has the same meaning as *Kady* in Arabic,—“Judge”; so that *Tell el-Kady* might be rendered in Biblical phraseology “the mound of Dan.” The site is now desolate, and covered with a dense jungle of thorns and thistles, emblems of the curse pronounced upon all the high places of Palestine which the Jews had polluted by idol-worship (Ezek. vi. 3, 4; Isa. xxxiv. 13). There, at first, the Danites set up the graven image which they took from Micah, and there, nearly 500 years later, Jeroboam set up one of his golden calves (Judg. xviii. 30; 1 Kings xii. 29).

4. The streams from Dan and Cæsarea-Philippi unite about four miles south of the former, and flow through a marshy plain into a little triangular-shaped lake called *Hüleh* by the Arabs. The name is evidently a corruption of the *Oulatha* of Josephus (*Ant.*, xv. 10, 3). The lake is the Merom of the Bible, near which Joshua gained one of his greatest victories over the Canaanites (Josh. xi. 5); and somewhere close to its western shore we must look for the site of the long-lost Hazor, the capital and stronghold of the Canaanites in northern Palestine. When travelling through this district in 1874 I observed a large scarped mound, like a citadel, with traces of ancient ruins upon and around it, and the small village of Waggas near it. It lies on the lowlands, about four miles south-west of the lake, and it may probably be the site of Hazor. That city could scarcely have stood, as some suppose, on the top of the mountain-ridge to the west, for Jabin, king of Hazor in Joshua's time, and his successor Jabin in the days of Barak, had large forces of chariots, which could not have been used among the rugged mountains (Josh. xi. 6—10; Judges iv. 2, *seq.*).

5. Soon after emerging from the lake the Jordan is spanned by *Jisr Benât-Yakúb*, “the bridge of Jacob's daughters,” over which runs the ancient caravan road that once connected Egypt and Western Palestine with Damascus. Below the bridge the river enters a wild ravine, down which it rushes in a series of foaming rapids to the Sea of Galilee, falling about 700 feet in eight miles.

THE SEA OF GALILEE.

6. The Sea of Galilee is egg-shaped, about twelve miles long by eight wide. The great depression, and the general contour of the cavity in which it lies, give it the appearance of a

huge crater. The range of hills along its western shore, from the plain of Gennesaret southward, is basalt; and nearly the whole of the high table-land of Bashan, the side of which rises abruptly to a height of 2,600 feet above the eastern shore, is of the same geological formation. The basin of the lake has evidently been from a very remote period the centre of volcanic action, and perhaps owes its origin to some terrible eruption in prehistoric times. It is still frequently visited by earthquakes; and the shattered walls and houses of Tiberias bear witness to their desolating effects.

7. A mile south of Tiberias, close to the lake, are the warm springs and baths of Hammath, which gave a name to an ancient town of Naphtali (Josh. xix. 35). The name signifies "warm baths." They were well known in Roman times, being mentioned by both Josephus and Pliny. The water issues from the base of a cliff of *trap* rock, and has a temperature of 144° Fahr.; its taste is extremely salt and bitter, and it emits a strong odour of sulphur.

8. On the east side of the Jordan valley, three miles from the southern end of the lake, are the still more famous baths of *Amatha*, probably a corruption of the Hebrew word *hammath*. There are seven or eight springs, surrounded by Roman ruins, situated in the bottom of the deep wild ravine of the river Hieromax, one of the largest tributaries to the Jordan. The temperature of the water is 107° Fahr.; and in Roman times the baths were, in healing virtue, ranked next to those of *Baiæ*.

9. As the Sea of Galilee thus manifestly occupies a volcanic basin, and as its surface has a depression of 653 ft., it would be interesting to know, from thorough scientific research, whether the present formation of the basin, and the depression of the lake, are coeval with the general geological structure of the surrounding country, or whether there are any evidences that the basin was formed or deepened by more recent convulsions. The hills on the east have a uniform elevation above the lake of about 2,600 ft., and those on the west about 1,600; and behind each range is an expanse of table-land. A careful examination of the torrent-beds which fall into the lake would solve the problem. If the basin and the present level of the water be coeval with the table-land around, then the torrent-beds will have a gradual and regular descent to the lake; but, on the other hand, if the surface of the lake stood formerly at a higher level, and if it was depressed by a sudden convulsion, then an abrupt break will be found, as a rule, in the ravines, and a corresponding shore-line may be traced along the hill-sides. So far as I know, no minute

geological survey of the environs of the Sea of Galilee has yet been made.

THE VALLEY SOUTH OF THE SEA OF GALILEE.

10. The general geological structure of the Jordan valley, south of the Sea of Galilee, is evidently of the same age as the basin of the lake, or at least the upper part of the basin. The valley, however, presents some singular features. Its surface is mostly flat, varying from three to nine miles in breadth, and running along the steep mountain-ridges on each side, almost like a shore-line. Its bed is composed, so far as I could discover, of a thick alluvial deposit, covering for the most part very soft and recent horizontal calcareous strata. The present coating of the valley, therefore, is of a much more recent formation than its rocky sides and the mountain-chains adjoining; and it would seem to have been deposited, during a long succession of ages, at the bottom of a lake, in the same way that deposits are being at present formed at the bottom of the Dead Sea.

11. Another feature struck me as very remarkable. The river Jordan, as it is now, could have had nothing to do with the formation by erosion of the great valley through which it flows. It runs in a distinct ravine of its own, which it has worn in a tortuous course, through the bed of the valley, from end to end. As compared with the valley, this ravine is of recent origin; and it presents, along nearly its entire length, such an appearance as would lead to the conclusion that the river was at some former period much larger than it is now.

12. I have, during several visits, closely examined about three-fourths of the ravine of the Jordan; its features differ at different points, and probably the most characteristic are at the section near Bethshean, and from Damieh, southward, to Jericho. The bed of the valley is, as I have said, level, having no visible incline towards the river. On looking across it, from the foot of the mountain-range, on either side, the river is not seen at all, and the plain appears unbroken; but, on passing over it, one comes suddenly and unexpectedly to a ravine, varying from 50 to 150 feet in depth, and from 200 to 700 yards in width. Its sides are cut down sharply through the upper alluvial coating and the underlying calcareous strata; they are also deeply indented, and worn away by the action of winter rains and lateral streams, so that along each bank is a rim of white conical mounds; and in some places the mounds stand two or three deep, their tops mostly uniform in height with the adjoining plain.

13. It is evident that at one period the river covered the entire breadth of this ravine, for the sides bear everywhere traces of the action of water; and indeed, the ravine could only have been cut out by such action. Now, however, by far the largest portion of its bed is dry and coated with deep alluvial soil, here and there cultivated by the nomad Arabs, but generally covered with rank grass, or jungles of oleander, willow, and tamarisk; while the river has another channel, averaging about 30 yards wide, cut deeply into the alluvial bed of the ravine, and most tortuous in its course; now sweeping the western, now the eastern bank of the ravine, and occasionally doubling back, like the coils of a serpent. Through this channel the river rushes in a rapid current. During summer and autumn it is low, and the banks of its channel are from five to ten feet high; but in spring, when the fountains are copious, and the tributaries swollen with melting snow, the stream rises up to the level of its banks, and in places, especially in the lower part of the valley near the Dead Sea, it overflows the whole bottom of the ravine. When I was going from Jerusalem to Moab, in the spring of 1874, I found the entire bed of the ravine opposite Jericho covered with water. The fords were then impassable, and I was obliged to travel a day's journey northward, so as to cross by the ferry-boat on the caravan route from Nabulus to Es-Salt.

14. This fact illustrates that statement in the book of Joshua, where, in describing the passage of the river by the Israelites, the writer says: "The Jordan is full up to all his banks all the time of harvest" (Josh. iii. 15). In the low plain harvest begins early in April, which is the time of highest flood; and then the swollen river not only rises over its immediate banks, but covers the ground up to the outer banks of the ravine. I noticed at several places south of the ford of Damieh two distinct lines of terraces along the Jordan, below the general level of the plain, showing that at some remote period the river ran upon a higher level; and that, from some cause, it sunk forty or fifty feet to its present channel. All this process of subsidence, however, must have been prehistoric, and could have had no connection with that catastrophe which led to the destruction of Sodom. It would be interesting to make a complete survey of the banks of the Jordan, so minute and systematic as to show whether the gradual sinking of the bed of the river has been connected with any corresponding depression of the Dead Sea.

15. Another feature of the Jordan valley deserves the attention of the geologist, and perhaps, also, to some extent,

of the antiquarian. It contains a large number of remarkable mounds, generally of the form of a truncated cone; their sides steep and regular, as if scarped, and occasionally strewn with ruins of a primeval type. The cup-shaped mound of Tell el-Kady I have already mentioned; I observed several very large ones not far from Bethshean, and there are others dotting the plain of Jericho. It is worthy of note that mounds of a similar shape occur at intervals along the great Syrian valley up to Antioch, and there are several on the plain of Damascus. Some of them are unquestionably artificial—that, for example, at Emesa, on which the famous temple of the Sun stood, and that on the site of Loadicea ad Libanum, a few miles farther south. What are these mounds? By whom were they constructed? Do they point back to a primeval people, whose name and history have alike been lost? Excavation might reveal the secret, and bring to light some strange relics of a prehistoric age. On one of the mounds near Damascus I discovered a slab of limestone containing the figure of an Assyrian priest in relief, now, I believe, in the British Museum.

FORDS OF THE JORDAN.

16. The fords of the Jordan have always been important in connection with the history of the country. A ford, called *Vadum Jacob* by William of Tyre, was an important pass in the time of the Crusades, and was probably at the place where the "Bridge of Jacob's Daughters" now spans the stream. The origin of the name is unknown; but, perhaps, the ford was confounded with the Succoth, where Jacob crossed the Jordan. Near the place where the upper Jordan falls into the Sea of Galilee, the stream can be crossed almost anywhere; and here the multitudes that followed our Lord from Capernaum were able to pass over to where He fed the five thousand, on the side of the plateau of Bashan (Mark vi. 32, *seq.*).

17. The first ford on the southern division of the Jordan is about half a mile below the lake, where the ruins of a Roman bridge lie. It is on the road leading from Tiberias to Gadara, and it was probably here our Lord crossed, when He went from Galilee to Judæa "by the farther side of Jordan" (Mark x. 1). About five miles below it, is *Jisr-el-Mejâmia*, "the bridge of the meetings," now the only passable bridge on the river. Over it runs the old caravan route from Damascus to Egypt, by Gadara. Probably a Roman bridge existed here, but the present structure is Saracenic. At Succoth, where

Jacob crossed when on his way from Padanaram, there is a good ford. It may be the *Bethbarah*, "house of passage," where the Israelites intercepted the routed Midianites (Judges vii. 24). It is still the ford by which the Eastern nomads cross on their periodical invasions of the plain of Esdraelon. The next ford of historic importance is that near the confluence of the Jabbok, on the ancient road from Samaria to Ramoth-gilead. Its modern name is Damieh, which is probably derived from the "city Adam," mentioned by Joshua in connection with the passage of the Israelites (iii. 16):— "The waters which came down from above stood and rose up upon an heap very far off, by the city Adam." This was the scene of that tragic event, when the Gileadites under Jephthah "took the passages of the Jordan towards Ephraim," and distinguished friends from foes by the word *Shibboleth*. It is a remarkable fact that at the present time there is a palpable distinction between those residing on the east and those on the west of the Jordan, in the pronunciation of certain words. It would be as easy to find a *Shibboleth* now as it was in the days of Jephthah (Judges xii. 5 and 6).

18. There are several fords in the plain of Jericho, but none of them are passable during harvest, that is, from March till June. This is the "holy ground" of the Jordan, the scene of those stupendous miracles of power and mercy when a way was opened through the swollen river to let Israel pass over; and when, again, the waters were divided for Elijah and Elisha. Here occurred a still greater miracle when our Lord was baptized: "And, lo, the heavens were opened unto Him, and He saw the Spirit of God descending like a dove, and lighting upon Him: and, lo, a voice from heaven, saying, This is my beloved Son, in whom I am well pleased" (Matt. iii. 16, 17).

19. The passage of the Jordan by the Israelites is described with great minuteness; and a knowledge of the topography and physical features of the district throws much light on the Biblical narrative. The people had been encamped for some time "in the *Arabah* of Moab." The word *Arabah*, translated "plain" in our version, is the proper name of the southern section of the Jordan valley, and hence the Dead Sea is called "the Sea of the *Arabah*" (Josh. iii. 16). The word is from a root which signifies to be white or sterile, and is very appropriate. The *Arabah* is here perfectly flat, and about seven miles wide from the Jordan to the foot of the mountain-chain of Moab. The camp was placed close to the mountains, under the projecting peak of Nebo. When I stood upon Nebo in the spring of 1874, I was greatly impressed with

the commanding view it affords, not merely of the whole plain of the Jordan, four thousand feet below it, but of the whole of Palestine, from the heights of Naphtali, on the north, to the Negeb, beyond Hebron, on the south.

20. Before the passage, the Israelites removed to the bank of the Jordan, opposite Jericho. Then we read:—"And as the bearers of the ark came to the Jordan, and the feet of the priests, the bearers of the ark, were dipped in the margin of the waters (for the Jordan is full up to all its banks all the days of harvest)." The explanatory clause here is very important. Had the Jordan not been in flood, the waters would have been confined within their own proper banks, which are perpendicular, so that the feet of the priests could not have been dipped in the water without their plunging overhead into the rapid current. The sacred writer consequently explains how the feet of the priests came to be dipped in the waters; it was because the river had risen over its proper banks and covered the flat bed of the ravine with a shallow flood.

21. Then the miracle took place. The waters that came down from above, that is from the upper part of the river, "stood—rose up one heap, a very great distance off, at Adam, a city which is beside Zaretan, and those which flowed down to the Sea of the Arabah, the sea of salt, were exhausted, were completely removed; and the people passed over opposite Jericho." I translate from the Hebrew, endeavouring to give as fully as possible the exact meaning of the passage. The name *Adam* is still retained, as I stated already, in the ford *Damieh*, seventeen miles north of Jericho; and the name *Zaretan* is also retained in the modern *Surtabeh*, a ruin on the top of a very conspicuous hill just over the ford. The great valley is at this point narrower than elsewhere, so that here, as in many other cases, the natural and the supernatural were combined in working out the will of God in reference to His Church.

22. The exact scene of our Lord's baptism is not known; but there is reason to believe that it was at least not far distant from the place where the Israelites crossed.

THE DEAD SEA.

23. Not the least interesting part of the great valley is the section which constitutes the basin of the Dead Sea. The scenery is widely different from that farther north, though there is no break or interruption in the mountain-chains. Trees entirely disappear, the cliffs that hem in the valley are white limestone, naked and rugged, in some places

rising sheer out of the water; the surface of the plain along the shores is a desert—an *Arabah*, covered with a white nitrous crust, like hoar-frost; vegetation only exists where a little fountain bursts from the ground, or a streamlet murmurs down to the lake. In fact, for stern grandeur, and silent, lonely desolation, the shores of the Dead Sea are almost unparalleled.

24. As in the environs of the Sea of Galilee, we find here also many traces of volcanic action, both recent and remote.* The warm spring of Callirrhoe on the eastern side has been long celebrated; and there are two others, though less copious, on the western side. Most of the fountains around the lake are brackish; and at the south-western extremity is a range of hills, about seven miles long and some 300 feet high, composed almost entirely of rock-salt, and bearing an old and well-known name,—“the hills of *Sodom*.” These facts, together with the great and incessant evaporation, account for the intense saltness of the sea. Canon Tristram describes a valley at the northern end of the hills of Sodom, of which the sides are cliffs of old limestone, showing here and there on their surface traces of post-tertiary marl; but he says, “since the marl has been washed out, there has been a second filling-in of an extraordinary character, which is only now in course of denudation. There are exposed on the sides of the Wady, and chiefly on the south, large masses of bitumen mingled with gravel. These overlie a thin stratum of sulphur, which again overlies a thicker stratum of sand, so strongly impregnated with sulphur that it yields powerful fumes on being sprinkled over a hot coal. Many great blocks of bitumen have been washed down the gorge, and lie scattered over the plain below, along with huge boulders, and other traces of tremendous floods. The phenomenon commences about half a mile from where the Wady opens on the plain, and may be traced at irregular intervals for nearly a mile farther up. The bitumen has many small water-worn pebbles embedded in it. We are at once led to inquire what has been the probable origin of this singular deposit. The first solution that suggests itself is that the bitumen and sulphur have been washed up when the sea was at this level; the next, that it may have been deposited by a spring on the spot. Of the latter we could find no traces, and all appearances are against it. Against the former supposition are

* These I purpose to examine with some care, as I believe they serve to explain, if not the actual destruction of Sodom and Gomorrah, at least the mode in which they probably were destroyed by the employment of natural agencies under supernatural guidance.

the objections—first, that the formation is evidently subsequent to the scooping-out of the marl, and therefore to the subsidence of the lake; secondly, that the bitumen and sulphur are not deposited as they would have been by a tide or stream, but at most irregular heights, sometimes detached, sometimes in masses slightly and irregularly connected with the next fragment by a thinner stratum. The layer of sulphurous sand is generally evenly distributed on the old limestone base, the sulphur evenly above it, and the bitumen in variable masses. In every way it differs from the ordinary mode of deposit of these substances as we have seen them elsewhere. Again, the bitumen, unlike that which we pick up on the shore, is strongly impregnated with sulphur, and yields an overpowering sulphurous odour; above all, it is calcined, and bears the marks of having been subjected to extreme heat. In weight and appearance it differs from the bitumen of the shore as coke does from ordinary coal.”

25. This discovery seems to me very important, and Canon Tristram's remarks upon it are interesting to the Biblical student; they are as follows: “Here, so far as I can judge, we have the only trace of anything approaching to volcanic action which we have met with in our careful examination of the northern, western, and southern shores. The only other solution of the problem, the existence of a bituminous spring when the supply of water was more abundant, would scarcely account for the regular deposition of the sulphurous sand, and then of the sand with the bitumen superimposed. I have a great dread of seeking forced corroborations of Scriptural statements from questionable physical evidence, for the sceptic is apt to imagine that when he has refuted the wrong argument adduced in support of a Scriptural statement, he has refuted the Scriptural statement itself; but, so far as I can understand the deposit, if there be any physical evidence left of the catastrophe which destroyed Sodom and Gomorrah, or of similar occurrences, we have it here. The whole appearance points to a shower of hot sulphur and an irruption of bitumen upon it, which would naturally be calcined and impregnated by its fumes; and this at a geological period quite subsequent to all the diluvial and alluvial action of which we have such abundant evidence. The vestiges remain exactly as the last relics of a snow-drift remain in spring—an atmospheric deposit. The catastrophe must have been since the formation of the Wady, since the deposition of the marl, and while the water was at its present level; therefore, probably, during the historic period.” (*Land of Israel*, pp. 355, *seq.*)

26. On the peninsula of Lisân, a low bank which projects upwards from the south-eastern angle of the lake a distance of nine miles, pieces of sulphur and bitumen, rock-salt and pumice-stone, are found in great profusion. Probably, if examined with care, geological phenomena similar to those in Wady Mohawât, might be found on this peninsula, and some additional light might thus be thrown upon the mode in which the cities of the plain were destroyed. Poole says, "the soil appeared sulphurous" (*Journal of Royal Geographical Society*, xxvi. 62). It is well known that during and after shocks of earthquake, to which this region is subject, large masses of bitumen rise to the surface of the lake between the promontory of Lisân and the western shore. North of the Lisân, the mountains of Moab rise from the water's edge in sublime cliffs of red sandstone or white limestone. Basalt also appears in places, sometimes overlying the limestone, as on the plain of Bashan, and occasionally bursting through the sandstone strata in dykes and veins. The ravines of Mojob, the Arnon of Scripture, and Zerka Maîn, are like huge rents in the mountain-chain. Among other smaller basaltic streams, three were found by M. Lartet, bordering on the eastern edge of the sea, to the south of the little plain of Zarah. The plain between the mountains of Moab and the mouth of the Jordan, under the heights of Nebo and Pisgah, is generally well watered and covered with luxuriant vegetation. Along the shore pieces of pumice-stone, lava, and bitumen are found embedded in the sand and mud, as if washed up by the waves.

27. The dimensions of the Dead Sea have never been accurately determined. Its length is about forty-five miles, but this varies considerably at different seasons of the year, and in different years. When the sea is filled up by winter rains, the flat plain on the south is submerged for several miles. The annual rainfall, too, is not uniform in Palestine. Some years it is more than double what it is in others; and this produces a corresponding effect upon the volume of water in the sea, and consequently on its area. The sea attains its greatest breadth opposite Engedi, where it measures nine and a half miles. The peninsula of Lisân divides the sea into two unequal parts—the northern, an elongated oval; the southern, nearly circular. The narrowest part of the channel between the peninsula and the mainland is about a mile and three-quarters wide, and is sometimes fordable.

28. The physical conformation of the bed of the lake is worthy of special notice. The section north of Lisân is a deep, uniform basin, like a huge crater, its greatest depth being 1,308 feet (Lynch, *Official Report*, p. 43); the southern section

is very shallow, a few feet, and sometimes only a few inches, of water covering a bed of soft, slimy mud. Of this latter section Tristram says, "Sulphur-springs stud the shores, sulphur is strewn, whether in layers or in fragments, over the desolate plains; and bitumen is ejected in great floating masses from the bottom of the sea, oozes through the fissures of the rocks, is deposited with gravel on the beach, or, as in Wady Mohawât, appears with sulphur to have been precipitated during some convulsion. . . . Everything leads to the conclusion that the agency of fire was at work, though not the overflowing of an ordinary volcano."

29. I now turn for a moment to the Scripture narrative. The references to the Dead Sea in the Bible are few, and mostly incidental. Three of them call for special attention here. In Gen. xiii. 10, where the sacred writer relates the story of the separation of Abraham and Lot, he represents the two as standing on the mountain-top east of Bethel:—"Lot lifted up his eyes, and beheld all the circuit of the Jordan, that it was well watered, before the Lord destroyed Sodom and Gomorrah." It has been inferred from this that the cities of Sodom and Gomorrah were in sight from where Lot stood, and must, therefore, have been situated at the northern end of the lake. But this does not follow. Lot "beheld the circuit of the Jordan"; it is not said, or implied, that the cities were in sight. One thing is evident from the passage—that the valley of the Jordan was very fertile before the destruction of the cities, but not so afterwards; and this is corroborated by the narrative in Gen. xix. 24, 25. I have stood upon the same spot, and the view over the Jordan valley is now as dreary and desolate as could be well imagined.

30. The second passage is Gen. xiv. 2-10, containing the story of Lot's capture by the Eastern kings. At ver. 3 we read—"All these were joined together in the vale of Siddim, *which is*" (or, it is) "*the salt sea.*" There cannot be a doubt as to the meaning of the Hebrew; the region called the "vale of Siddim" in the time of Lot, had become, in the time of the writer, "the Salt Sea."* Some, however, attempt to get over the plain signification by saying that the clause, "which is the Salt Sea," is an explanatory note interpolated by some subsequent reviser; but this is untenable, for the clause is found in all the ancient MSS. and versions, and in the Targum of Onkelos. Its genuineness rests on the same basis as the

* The same Hebrew phrase is used in the preceding verse:—"Bela *which is Zoar.*" No one will venture to question what the writer here meant to affirm—that Bela and Zoar were the same.

other portions of the narrative. We have still another incidental remark, which helps us to identify the site of the cities: "The vale of Siddim was full of pits of asphalt." Now, there is no part of the valley north of the lake to which this would apply; nor, indeed, is there any part of the plain adjoining the lake, north or south, now full of bitumen-pits.

31. The third passage is Gen. xix. 24, 25: "Then the Lord rained upon Sodom and upon Gomorrah brimstone and fire from the Lord from the skies. And He overthrew those cities, and all the plain, and all the inhabitants of the cities, and that which grew upon the soil." We are afterwards informed that Abraham on the following morning went from his camp at Hebron to a neighbouring mountain-peak, and "looked out upon Sodom and Gomorrah, and upon all the land of the plain, and behold, and lo, the smoke of the land went up as the smoke of a furnace."

32. There can be no doubt from these statements that the destruction of the cities was miraculous. A shower of ignited sulphur was rained upon them. But may we not connect this fact of Biblical history with the facts stated above as observed by Canon Tristram and others? May we not admit that while the ultimate cause was miraculous, natural agencies were employed? We might suppose a mass of burning sulphurous matter to have been ejected from some open crater, as is often the case with Vesuvius; and this falling in showers upon the cities, and the bituminous plain around them would have produced just such form of conflagration as Abraham saw from the heights of Hebron. Bitumen is very inflammable, and the plain of Siddim was filled with bitumen-pits. Canon Tristram says of Wady Mahawât, at the side of the plain, that "the whole appearance points to a shower of hot sulphur, and an irruption of bitumen upon it." The smoke from such a conflagration would be like the smoke of a furnace, and would cover the whole plain. Then the sacred writer says that the vale of Siddim became the Salt Sea, or was submerged. The southern part of the lake is, as I have shown, an expanse of slimy mud, covered with only a few feet of water. Suppose the vale to have sunk a few feet, or the water to have risen a few feet, after the conflagration; either supposition would accord with the Biblical narrative, would not be without a parallel in the history of countries exposed to volcanic eruptions, and would not be opposed to the results of modern investigations.

33. This was the view taken by the late Dr. Robinson, of New York, and sanctioned by Leopold von Buch. Robinson says: "It seems to be a necessary conclusion that the Dead

Sea extended no farther south than the peninsula, and that the cities destroyed lay on the south of the lake as it then existed. Lot fled from Sodom to Zoar, which was *near*; and Zoar, as we know, was in the mouth of Wady Kerak, as it opens upon the neck of the peninsula. The fertile plain, therefore, which Lot chose for himself, where Sodom was situated, which was well watered, like the land of Egypt, lay also south of the lake 'as thou comest to Zoar.' Even to the present day more living streams flow into the Ghor at the south end of the sea than are found so near together in all Palestine besides." (*Physical Geography of the Holy Land*, p. 21.)

34. All this, I admit, is theory; but then it is theory suggested by the physical aspect of the country, and by scientific observation—theory, too, which accords with and explains the Biblical narrative. The subject is not one for vague speculation, much less for dogmatic assertion. The problems which the Dead Sea presents must be solved, if solved at all, by careful scientific research.

35. One other point I wish to note ere I close. The hillsides and narrow strips of plain, on both the eastern and western shores of the Dead Sea, appear to be marked by a series of terraces, in all probability the shore-lines of former ages. The highest of these I noticed when examining the ranges of Moab under Nebo. Its elevation corresponds pretty nearly with the level of the Mediterranean, being about 1,300 feet above the surface of the lake. There is a corresponding terrace on the western side, of which Canon Tristram says:—"These terraces in the old secondary limestone must be about the present level of the Mediterranean, and they seem to tell of a period long antecedent to the tertiary terraces and deposits below." (*Land of Israel*, p. 247.)

36. About 230 feet above the level of the lake are traces of another ancient shore-line, marked by a strip of alluvial marl adhering to the rocks and cliffs, particularly at the north-west angle. The deposit is mixed with shells of existing species, layers of gypsum and gravel. This terrace, or shore-line, might correspond with the general level of the lower section of the great valley, through which, as I have shown, the Jordan has cut for itself, at a more recent date, a deep channel. It has also been observed that where there are ravines running down to the lake between high cliffs, the deposit reaches up their sides in places to a height of 400 feet, and then slopes away in a series of terraces to the level of the lake, indicating, just as is indicated at various places along the banks of the Jordan, a series of stages in the

depression of the water, each stage apparently caused by some great convulsion.

37. A similar phenomenon was observed by Canon Tristram along the western shore, where he counted "no less than eight low gravel terraces, the ledges of comparatively recent beaches, distinctly marked. The highest of these was 44 feet above the present sea-level." It would seem, in fact, that at some very remote period the whole valley, from the base of Hermon to the water-shed near Kadesh, on the borders of Edom, was the bed of a lake. While it remained in that state, those deposits were formed which now constitute the plain through which the Jordan flows. From some cause now unknown, the waters gradually decreased until they were reduced to their present level; leaving along the mountain ramparts that hemmed them in on each side distinct traces of the several stages in their subsidence.

38. The water of the Dead Sea is intensely salt and bitter, and its specific gravity is consequently very great. It contains about 26 per cent. of pure salt, yet it is transparent, and of a delicate green hue. It is fatal to animal life; and this fact, according to Jerome, was the origin of the name Dead Sea. Lying in a deep basin, encompassed by bare white cliffs and white plains, exposed during a great part of the year to the burning rays of a Syrian sun, without a cloud to dim their fiery heat, it is not strange that the shores of the Dead Sea should exhibit an almost unexampled sterility and death-like solitude; nor is it strange that in a rude and unscientific age the sea should have become the subject of wild and wondrous superstitions. The sky over it is brilliant; the colouring of the cliffs and glens along its eastern shore, when the last rays of the sun fall on them, is exquisitely beautiful; but, as Mr. Grove well says, "There is something in the prevalent sterility and the dry, burnt look of the shores, the overpowering heat, the occasional smell of sulphur, the dreary salt marsh at the southern end, and the fringe of dead drift-wood round the margin, which must go far to excuse the title which so many ages have attached to the lake, and which we may be sure it will never lose."

The CHAIRMAN (J. E. Howard, Esq., F.R.S.).—I am sure you will all unite with me in presenting the cordial thanks of the Institute to the learned traveller who has given us so interesting a description of the regions with which this paper deals. (Hear, hear.) We are under special obligations to those who recall to us facts connected with those varied scenes and countries which the sacred Scriptures take us over in their course. (Hear.) As we study these scenes, we gradually learn many facts which corroborate the exceeding

literality of the Scriptures, a circumstance which is not only important as regards the view we take of the Scriptures themselves as inspired works, but, in my opinion, it has a very strong bearing against those who would make out that the book of Genesis and the earlier books of the Old Testament are forgeries of a date as late as the Babylonian Captivity. (Hear, hear.) If this really were the case, I do not think we should find the extremely literal and remarkably graphic touches which have been noticed by Dr. Porter, and of which, indeed, I may say, the book of Genesis is full. I shall now be glad to hear any remarks from any present.

Mr. D. HOWARD.—I think the paper we have just heard one of the very highest value, not merely from the extreme interest it awakens on important matters of Biblical criticism, but also when regarded from a geological point of view. Here we have disproofs of the most absolute character of a mere uniformitarianism and proofs of convulsions of the vastest kind. Surely some stupendous convulsion has depressed the Valley of the Jordan, which begins at the level of the sea, and sinks to the profound depths of the Dead Sea, which in itself is one of the most remarkable of the phenomena of the globe. Indeed, at each step of the Valley we have the most striking proofs of uniformitarianism, but not uniformitarianism in the sense in which it is often understood. We have the water-worn terraces which form the level of the Valley and the deep bed, dug out apparently after the alteration of the level, causing the increased rapidity of the river. A more remarkable study of the mode of the formation of valleys could not, I believe, be found; but still more remarkable is the formation of the Dead Sea. There are few more interesting geological formations than the salt-beds, of which that at Stanfurth is perhaps the most perfect example. In the Dead Sea we have before our eyes the conditions under which such a salt-bed may form. A diminution in the supply of water from the Jordan would cause the almost saturated brine of the Dead Sea to deposit its salt in the same state as in the beds mentioned, but with this difference, that here, in the Jordan Valley, you have the extraordinary evidence of volcanic action which has been described in Dr. Porter's paper. You do not usually find beds of salt associated with sulphur and bitumen, pointing as the latter do to the marvellous convulsion which destroyed the Cities of the Plain. The problem is one which would take a great deal of time to work out, and more minute study than it has yet been feasible to give to it on the spot; but there are few phenomena more interesting, from a geological point of view, than those presented by the Valley of the Jordan. It is extraordinary to find the notices of this Valley, as given in the Old Testament, so scientifically accurate. Undoubtedly the Old Testament was not intended to teach science; and it is a remarkable proof of the truthfulness of the eye-witnesses, that these little points of detail which are so compatible with scientific truth, are those which it is absolutely impossible that a forger should have put in. It is inconceivable that a forger,—I do not mean in the worst sense of the word, but some old scribe improving ancient documents, could

have put in these minute touches of geological accuracy of which we have heard, and which are of the highest value in demonstrating the verba accuracy which prevails in the Old Testament. (Hear, hear.)

A MEMBER.—There is one question that I should like to ask Dr. Porter I have been much interested in what has been said about the southern end of the Dead Sea. Dr. Porter is here ranged against several learned authorities as to the theory of the site of Sodom and Gomorrah. I venture to think that Dr. Porter's view is exceedingly likely; and yet there is this difficulty: where is there a volcano sufficient to account for the eruptions to which reference is made? Is it likely that the northern end of the lake, which Dr. Porter says, in paragraph 28, is "like a huge crater," formed part of a lake which must have existed in pre-historic times, or is it possible that the great depression it exhibits was of a volcanic character? Had volcanic agency been at work, would there not have been a gradual raising of the surface, rather than a depression? In the southern end of the lake, Dr. Porter says the depth varies from "a few feet" to "a few inches," but the depth is not very great in any case. How is volcanic agency discoverable in such a shallow slip of sea? We hear of the discoveries in the Zuider Zee and of the lake-dwellings found in Switzerland; is it not probable that in this case persistent research might make some further discoveries?

Dr. PORTER.—I have no idea whatever whether there was in historic times a volcano in connection with the northern section of the lake; but I think it is by no means improbable that in the southern section of the lake there may have been a small volcanic opening, and I will give you my reason for saying this. I have travelled in the northern section of Palestine, near the present town of Safed, which is a centre of volcanic action in that country, and I saw there, about two or three miles north-west of Safed, a little opening in the plain on the summit of the mountains—an opening that had manifestly been a crater, and which cannot be of a very ancient date. It is not more than eight or ten times the size of this room. I think it not unlikely—of course, this is merely a theory of my own—that there may have been some little opening such as this, in the centre, or near the centre, of the southern section of the lake. We know that at the present day, when earthquakes occur, large masses of bitumen are thrown up from the bottom of that southern section of the lake, and are found, by the Arabs, floating on the surface. When on these occasions masses of bitumen are found thrown up from the bottom of the lake, they must come from some opening, and I think it most likely that some such opening may exist in the southern section of the lake. With regard to the dwellings, I have looked at the ruins north, east, and west of Galilee, and have found that they were built of the materials there at hand, and never, like portions of the Temples of Baalbeck, of materials brought from a great distance. My opinion is that the houses in the plain of Sodom were built in part of bricks formed of bituminous clay, and also partly of bituminous limestone, which is found there to a considerable extent, and that bituminous limestone would burn like coal, when once set on

fire, while bituminous clay, when acted upon by a strong heat, would melt away. Consequently, if the houses of Sodom and Gomorrah were built of such materials, the action of fire would completely destroy them. (Hear, hear.)

Rev. C. LLOYD ENGSTRÖM.—As chaplain of one of the largest children's asylums in England, I wish to say that I find my satisfaction in hearing this paper infinitely increased by the knowledge, derived from my use of previous papers read at the Victoria Institute this session, that it will not only help me better to understand that blessed Book, of the truth of which I find daily confirmations in nature and science, but enable me to explain the sacred narrative with more life and reality to the lambs of Christ's flock.

Rev. ALFRED KENNION.—Having had the privilege of travelling in Palestine, I can entirely corroborate all I have heard in the very interesting paper that has been read by Dr. Porter this evening. Perhaps I may be permitted to ask one question. Having said, in the first place, that my view as to the site of the cities of Sodom and Gomorrah has been for many years precisely that which has been put forward in this paper, I would add that one difficulty has nevertheless occurred to me, and I shall be glad if Dr. Porter will solve it. The attack by Chedorlaomer and his allies was made from the south. Is there a roadway by which his invading army could have swept up along the other side of the Dead Sea, so as to reach, as he afterwards did, up the Jordan valley to Damascus and the neighbourhood? I do not know the eastern shore of the Lake, and it has always been a difficulty to me, if the site of the town was on the southern shore of the sea, how his army was afterwards found up in the region in which we know Abraham subsequently attacked it. Passing from this to another subject, the site of Damieh, I should be glad to know whether that translation, which I have never paid any attention to, as to the water rising up in a "heap," is exact and accurate? It seems to me (although I am a full and implicit believer in miracles), that we ought not to foist in as a miracle, that which may be accounted for on natural grounds, unless there is strong reason for doing so. It has frequently occurred to me that an earthquake, or something of the kind, may have raised the level of the ground at that particular point—Damieh,—that this might have made a lake at that place, and the lower part of the waters would be drained off into the Dead Sea; that just at that particular juncture at Damieh the ground would rise, so as to form a lake in the northern part and drain off the water towards the south. I should like to hear whether this can be confirmed. The description given by Dr. Porter of the general character is, as all of us know, strikingly accurate and correct. I may add that I have had great pleasure in listening to this paper. (Hear, hear.)

Dr. PORTER.—In reference to the first question just asked me, as to whether there is a road running along the banks of the Dead Sea, I may state that if there be a difficulty arising on this point it is not applicable to my theory any more than to the other; because we well know that the forces which came from the east, swept down in the first place through Bashan, and along the heights of Moab, then past Kadesh, some forty or fifty miles

south of the Dead Sea; and then they came up and smote the Amalekites, in a position to the south-west of the Dead Sea, after which they went and attacked Engedi; so that if the cities stood here (pointing to the map at the north end of the sea), they must have come from Engedi in this direction. Supposing the cities stood here (pointing to the south end), then they turned back from Engedi, having come, as I believe, from the land of the Amalekites across the high land called the Negeb, over which there is a road descending on Engedi, and then they turned southward to this spot (pointing to the south-western shore of the Dead Sea). But in going northward from Sodom after its capture, they may either have marched along the eastern side of the Dead Sea, ascending the heights of Moab, traversing Gilead in the route of the Israelites under Moses when invading Bashan, and then descending again to the upper valley of the Jordan, where Abraham attacked them; or they may have followed the western shore of the Dead Sea as far as Engedi, and then, there being no path along the shore farther north, ascended the mountains and crossed over by very difficult, but still practicable roads for horsemen and camel-men, into the valley of the Jordan at Jericho. While making this march Abraham would naturally have heard of them. Therefore, whatever be the difficulty, it is equally applicable to either theory, but it is greater when applied to the theory which places the cities in the north.

Rev. C. LLOYD ENGSTRÖM.—During a lecture at a meeting recently held under the auspices of a leading London society a suggestion was made by a well-known lecturer, which I think was quite insufficient to account for the miracle of the “heaping” up of the water. It was, that a large piece of rock might have fallen and blocked the river at, I think, the Damieh ford.

Dr. PORTER.—I am particularly well acquainted with that section of the river. All I can say in reference to the theory just alluded to is, that we have heard of the Irish legend, which tells how the giant Finn M’Coul moved large rocks into the sea and made a roadway from Ireland to Scotland, and it would require some such rocks as he must have employed, to do what has been suggested in the case of the Jordan. There are in reality three valleys or ravines: there is the great valley, measuring at the place indicated at least six miles in width; that would require a tolerably large rock. Then there is the lower ravine through which the Jordan itself runs, and it is about three-quarters of a mile in width at the place pointed out; that also would take a pretty large piece of rock to block up the passage. Upon every ground I believe that the miracle was an absolute miracle; the Hebrew words can only mean, “the waters stood and rose up one heap,” just as the waters must have risen up on each side of the Israelites, when they passed through the Red Sea. (Hear, hear.) This I believe to be the true meaning of the Hebrew words, and it is utterly impossible for any one visiting the ford of Damieh, to imagine that the river could have been stopped at that point by any naturally-placed or falling rock.

Mr. R. W. DIBDIN.—With regard to the word “Shibboleth,” mentioned in the seventeenth paragraph, I wish to know whether the same difficulty is found

in regard to pronunciation now, as was formerly associated with that particular word. I should also like to ask whether Dr. Porter thinks there is any trace of the old inhabitants on the other side of the Dead Sea. We can hardly suppose that the difference of pronunciation arises from mere geographical causes; can Dr. Porter say whether there is any trace of the two tribes formerly existing on the two banks of the Jordan?

Dr. PORTER.—That is a most interesting problem, and by no means the least interesting of those which presented themselves when I was travelling, as I have done repeatedly through that country. It is a fact which I have followed through past history down to the present time, that there has been and is a marked distinction between the people who inhabit the eastern bank of the Jordan, and those who reside on the western—a distinction that is seen in their habits—those on the eastern side generally living in tents, and following the pursuit of shepherds; while there is also, and has been from the earliest times, a marked distinction in their dress. Those on the east of the Jordan wear the *agyl*, a fillet of camel's hair bound round the handkerchief which covers the head, and this is not found in the west. From the earliest period down to the present day, as is noticed in the case of the word "Shibboleth," there has been a marked difference in pronunciation. I could mention familiar Arabic words which resemble "Sibboleth" and "Shibboleth." There is the word *kalb*, which signifies "heart," which they pronounce differently on the eastern and western sides of the Jordan. There are a number of other words, especially sibilant words, in which there is a similar difference of pronunciation. I can only account for this by saying that there has been a regular succession of people inhabiting the eastern and western sections of the country, and that these have in each case transmitted their peculiarities of dress, habits, modes of life, and accent, from ancient down to modern times. Of course, in the earliest historic period there was the Phœnician language, which was closely allied with the Hebrew, and that was followed by the Hebrew under the Jews. The Hebrew was in turn followed by the Arabic, which is a cognate language, and almost identical in its roots with the Hebrew.

Mr. ENGSTRÖM.—Do I understand that the northern part of the Dead Sea is supposed to have come to be a sea at the time of the destruction of Sodom and Gomorrah, or is it supposed that it was there anterior to the time of Abraham and Lot?

Dr. PORTER.—I am not aware that any one supposes that the northern section of the Dead Sea was ever anything else than a sea.

Mr. ENGSTRÖM.—It could not conceivably have been the crater of a volcano?

Dr. PORTER.—Not in historic times.

The CHAIRMAN.—In closing this meeting I have to thank Dr. Porter for a most interesting evening.

The meeting was then adjourned.