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THE GARDEN OF EDEN AND ITS RESTORATION.*

By Sir WILLIAM WILLCOCKS, K.C.M.G.

LECTURING in November, 1909, in this hall, on "Mesopotamia, past, present and future," I placed the Garden of Eden of our Bible on the upper Euphrates between Anah and Hit. Here must have been the first civilized settlement of the Semites, the ancestors of the children of Israel, as they moved down from the north-west. And it may interest some to know that in the latitude of this region, not far from Damascus, wild wheat plants have within recent years been discovered. The wearing down of the cataracts deprived the settlers of the waters of the friendly river which had watered their garden, and they travelled eastwards and could see behind them nothing but the bitumen springs on the east of Eden, which seemed to them like flaming swords in the hands of the offended seraphim. Like all early peoples they called themselves the sons of God, and in their journey they soon encountered the sons of men who had already conquered the Tigris-Euphrates delta, and among whom had settled those of their sons whose hands were stained with blood and who could no longer be permitted to reside in the tents of their tribe. To-day I shall begin by describing the location of the Garden of Eden of these sons of men who had made their first settlement in the extreme south-east of the delta of the two rivers, and who had spread over the land, advancing westwards and north-westwards. Known as the people of Sumer and Akkad, or the Hollanders and Uplanders, they had made their earliest reclamation works in the marshes near the Persian gulf.

"When in the height heaven was not named,
And earth beneath had no signification,
Hurrying, confusing, the Floods were conceiving them,
Urged by their tides, the Seas were engendering them;

* Royal Geographical Society, June 10, 1912. Map, p. 240.
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The waters of Chaos were surging together ;
And no field was formed, no marsh was to be seen.

The holy house, the house of the gods, in the holy place had not been made ;
No reed had sprung up, no tree had been created."

As these people understood nature, the river by itself could not begin life until its waters had mingled with those of the sea, and from their union, under the action of the flux and reflux of the tides, sprung the marshes where life began on earth. As a matter of fact, salt water never reaches the marshes, owing to the delta of the Karun lying between them and the sea. The effect of the 10-foot tide in the gulf is communicated to the rivers, and travels up nearly 100 miles, but no salt water gets into the marshes. To the writers of these very early epics the Deep was a fresh-water deep.

"O thou river, who didst bring forth all things,
When the great gods dug thee out,
They set prosperity upon thy banks.
Within thee dwelleth Ea, wise god of the marsh.

Traversing wide marshes was the river,
When Eridu was made, when E-Sagil was built,
E-Sagil, the abode of the greatest of the great gods of heaven.
Marduk laid reeds in the face of the waters,
He piled up earthen banks and sheltered them behind the reeds,
That he might cause the gods to dwell in the habitation of their hearts' desire."

With translations of the Babylonian tablets of creation in my hand, and the plans and levels of the country before me, I have endeavoured, on the spot, to give local colour to the passages describing the Garden of Eden of Sumer and Akkad. After some thousands of years, the Euphrates in these reaches is again traversing wide marshes. For some 70 miles in length the river has left its old channel, and flowing over a flat plain some 12 miles wide, is covering it with 2 or 3 feet of water. I have seen Arabs taking reeds and earth and throwing up well-protected banks in the time of low supply, and so enclosing areas of land for cultivation and habitation, which will be safe from the attacks of the dragon of the Euphrates.

In my first lecture I had stated that the Garden of Eden of the Semites must have been near an outcrop of hard rock as we see it at Anah upstream of Hit, where water could be led off from above a rapid and utilized for irrigating, with free flow, gardens situated a little down-stream and above the reach of the highest floods. Below Hit, no place could be found for a garden without lifting apparatus or protecting dykes ; because, otherwise, any garden irrigated in the time of low supply would be inundated in flood, and if irrigated in flood would be left high and dry in the time of low supply. Since then I have studied on the spot the scriptures of Sumer and Akkad, and see that their earliest settlements were made inside the level plain perennially under water, where well-

protected dykes kept out the floods which are there never more than 3 feet above ground-level; and where, free from wild beasts and desert Arabs, they could build their cities and temples and cultivate their lands, which could be irrigated by free flow through openings in the dykes. It was in the marshes surrounding their settlements that they encountered the giant brood of Tiamat mentioned in the first tablet of creation. Sharks from the Persian gulf travel up the Tigris to Samarra, north of Baghdad, and must have been then, as now, a terror to bathers. The beasts described as raging hounds and rams in the translations may have been lions and wild boars, of which the former were common in Lower Babylonia before the Arabs possessed firearms, and the latter are still exceeding numerous. It is no unreasoning tradition which places the Garden of Eden of Sumer and Akkad, the city of Eridu and its temple E-Sagil, at Kurna, the late point of junction of the Tigris and Euphrates; though I cannot but think that it will eventually be found just north of Ur at the ancient junction of the two rivers. As the Persian gulf has a 10-foot tide, the flowing backwards and forwards of the waters of the rivers past Eridu may have given some over-enthusiastic Sumerian the idea that Sumer was above Akkad, and led to some confusing statements.

"In Eridu a dark vine grew, planted in a beautiful place,
To the glorious bower its shadow extends,
No man enters its midst.
Within are the sun god and the beautiful god of the east,
Embraced by the rivers where the two waters meet."

To-day, on the lower Euphrates, you see in the best reclaimed enclosures wide stretches of clover, out of which rise closely planted date-palms sheltering the ground from the excessive cold of winter and the parching heat of summer. From date palm to date palm are festooned luxuriant vines, from which hang rich clusters of purple grapes. Here we have the dark vine of Eridu planted in a delightful place, and the paradise of Sumer and Akkad. In this very region the Arab conquerors of the seventh century placed one of their four earthly paradises; Damascus, Shiraz, and Samarkhand being the other three. The trees of life were there sheltering the garden; and the forbidden fruit of the vine, the nectar of the gods, but indulged in by curious Eve to her undoing.

As years rolled on, the banks of the Kushite or old Kutha branch of the Euphrates, on which Eridu was situated, rose higher and higher owing to the silt-laden waters of the river; and eventually, on the occasion of some very high flood, the river left its channel in its upper reaches and flowed down one of the wide depressions of the delta. Kutha and the upper cities were left high and dry, and had to depend on silt-cleared canals for water, while Eridu and the lower cities were inundated. The Euphrates, however, was again traversing wide marshes, and the foundations of new cities and new temples were laid behind well-protected banks situated within the new flooded area. To the temple of Marduk or

Nimrod at Babylon was transferred the name of E-Sâgil, the venerated shrine of the cradle of the race of Sumer and Akkad.

"And Kush begat Nimrod, the beginning of whose kingdom was Babylon."

In like manner to-day, as one goes down the Hindie branch of the Euphrates or the Pallacopas, which has practically taken the place of the old Babylon branch, one sees the Arabs everywhere erecting cairns to commemorate the spots where Ali's camel stopped or Hussein dismounted. When the Babylon branch is completely dry, all the shrines which now stand on its banks will find themselves located on the Hindie branch, just as E-Sâgil moved from Eridu to Babylon. Eridu, in its evil day, had to content itself with the temple E-Apsu. Its doom was sealed.

When taking the names of the ancient gods and shrines of Babylonia, I have tried to pronounce the words as I think the marsh Arabs would pronounce them. The letter "E" which precedes the names of the shrines is undoubtedly the same as the "Yeh," which every Arab uses when he takes one of the ninety-nine names of the Almighty: "Yeh Sâtir," "Yeh Karim," etc. The god Ea becomes Yehya, an Arab name in use to-day. The word "Tiamat" becomes Têh-a mat, with the final "t" pronounced only on occasions. When a tribe of marsh Arabs is going to attack another tribe, the warriors form themselves into rings of from twenty-five to forty men, and run round and round, holding up their guns, stamping the ground, and shouting, as far as I could make, out "Têh-um," "Têh-um," with the first syllable hissed out very emphatically. On such occasions the warriors wear no clothing beyond a fold of cloth round the loins; and I once saw the wife of the principal sheikh, very lightly clad herself, run from group to group, pat the men on their backs, and urge them to the combat. She was so excited, she forgot that her husband's brother was a Turkish pasha. In Babylonia an expression like the Egyptian "Il kelb il kebir" becomes "Il cheleb il chebir," and Marduk would be pronounced Maruduch.

We are all agreed that the Semites moved down the Euphrates from the north-west, but the location of the original home of Sumer and Akkad is not so easy. Living in Baghdad and its surrounding deserts for three years, studying these questions and pondering over them, I have formed opinions on them, but my reading is not sufficiently deep to tell me whether I am not re-stating what others have stated before. When working at these problems, I tried to persuade the Rev. Prof. Sayce to come and study the question on the spot, but Karkemish on the upper Euphrates had superior attractions; while Miss Lowthian Bell could not be persuaded to abandon her researches into the comparative architectures of Akheider and Kasr Sherin.

When human beings first appeared on the earth, and for many a generation afterwards, men could only have just held their own against wild animals, and, while their dwelling-places were surrounded by forests and

jungles, the unending struggle must have left them but little time to make any real advance in civilization. It was far different in the oases of Arabia and practical oases like Anah and Hit on the upper Euphrates. Here it was possible for men to destroy the existing wild beasts, and as their numbers could not be recruited out of the deserts, they were exterminated ; and men had leisure to become gradually civilized. "Amalek was the first of the nations" was spoken, with knowledge, of the Arabs stretching from the delta of the Nile to the upper Euphrates. Living in tents and using gourds for vessels, they have left no traces such as we see in Egypt and Babylonia ; but Arabia has been able to pour forth from her parched loins her virile sons who began the subjugation of both the Nile valley and the valley of the Euphrates. Everything in Egypt was easy and to hand ; the Nile was and is the most stately and majestic of rivers, and, carrying a moderate amount of deposit, creates no serious difficulties for the dwellers on its banks ; the Garden of the Lord, the land of Egypt, is very fertile ; and the climate is mild in winter and never parches in summer. Egypt, therefore, produced no world ideas. None of her sons were possessed of a fine frenzy, with eyes glancing from heaven to earth and earth to heaven. It was far different with Babylonia. The Tigris and Euphrates in flood are raging torrents, and their ungoverned and turbid waters need curbing with no ordinary bridle. Babylonia's soil is very fertile, but the winters are severe indeed and the summers savage and prolonged. The range of temperature is between 20° and 120° in the shade. Brought up in a hard school they possessed virile intellects. Moses' first contact with Babylonian beliefs and creations, in the house of the priest of Midian on the slopes of Horeb, entranced him ; in the burning bush of the deserts he saw the footsteps of the Almighty, while heavenly voices spoke to him out of the storms raging on the summit of Sinai. In connection with this we must remember that Moses' wife is called, in one place, a daughter of the priest of Midian, and in another a Cushite or Babylonian woman. Her father was probably a learned Babylonian exercising priestly functions among the Arabs.

The extraordinary dry heat of the summer, by day and by night, gives a lustre to the stars, a distinctness to the constellations, and a glow to the fields of powdered stars (called here the milky way) which cannot be conceived by one who has not spent the whole summer in the plains of Shinar. The sons of Sumer and Akkad were the first astronomers and thinkers of the world. They divided the year into months, the months into weeks, and the weeks into days, on a system which lasted to the days of Julius Cæsar. They created the sabbath day, peopled heaven with Cherubim and Seraphim, and they first saw Orion leading out the starry hosts of heaven. Perennial irrigation was their creation, and that in the face of floods such as the Tigris and Euphrates bring down. By their skill they introduced wheat on the Earth, but in the domain of abstract thought they were especially predominant. In evolution they out-Darwined Darwin.

Seeing the delta of the rivers which had been at the mercy of the high floods, gradually reclaimed, and steady progress on every side of them, they cast their thoughts back and saw as the beginning and origin of everything, infinite chaos represented by the devastating spirit of the floods of the river mingling with the wasteful spirit of the sea, and producing monstrous births; but less monstrous than themselves. Tiamat, through her union with Apsu, gave birth to Lakhmu and Lakhamu, and ages increased, and Ansar and Kisar were born, and long were the days, and the indifferent gods came into existence, and long intervals of time elapsed, and the good gods were evolved, each better than those who gave them birth, until finally Marduk appeared, the greatest and most beneficent of all.

Darwin has stated that man bore about his body the indelible traces of his lowly origin; but these people had been very bold—they had said that everything in heaven and earth and under the earth bore witness to its lowly origin.

Apsu, the flowing and ebbing but limitable sea, appeals to Tiamat, the illimitable and ever-moving flood, to help him to overthrow the beneficent works of Marduk, who was so ordering the worlds that such rest as even he, Chaos, took, was banished from him. So opens the Epic of Creation which describes how Ea and the older gods mastered Apsu and the marshes, but it was Marduk, the last born of the gods, who entrapped Tiamat or Rahab with a network of canals and dykes, and clove her into two pieces; and the rains from heaven above and the floods on earth below were both controlled by her split body stretched from pole to pole. Marduk, known as Nimrod by the Arabs, was the typical sportsman of the Arab world. To the Sumerians he was the arch engineer. So completely had the poetic ideas of Babylonia taken possession of the world, that one of the Psalms represents Rahab as being cut into pieces and given as meat to the people in the wilderness. Day was more glorious than night, and consequently evolved out of it, and therefore the evening and the morning were the first day. They found reasons why man, who was created after the good gods were developed, was yet inferior to them. In their poems they give living pictures of the floods which overwhelmed the generation of the man of Surippak on the Euphrates, the prototype of Noah. With the same courage that they faced the floods of their two torrential rivers, they faced every problem of life which presented itself to them.

Now, where was the original home of these interesting people, to whom we all owe so much? For reasons already given, it must have been in some country of oases surrounded by deserts, and Arabia is such a country, and at their very doors. The oases of Arabia are close at hand to both the Nile and the Euphrates, and the natural overflow of the surplus population would be Egypt and Babylonia. According to Dr. Pinches, in the written language of Sumer and Akkad there is only one sign for "mountain" and "country." So in Arabia to-day there is but one word for "mountain" and "irrigated plain," the word "jebel," which is

always applied to the desert. The Arabs have special words like "barga" and "sahara" for the desert, but they always use "jebel." The oldest town in Babylonia after Eridu was Niffur, whose temple was named "E. Kura," or "Yeh jebel," or the desert. The Sumerians had no sign for "river" and there are no rivers in Arabia. It is curious that, although the children of Sumer always represented themselves as clean shaven, they represented their gods and deified heroes as full bearded, like the desert Arabs. Their ancestors doubtless entered the valley as a bearded race, and in their new damp homes shaved themselves clean for hygienic reasons. Again, according to Dr. Pinches, the Sumerians represented themselves as a tall and slight race, as would become the early generations of those descended from the Bedawin.

The Arabs of to-day are descendants of the Semites who overflowed into the desert oases from the north, and overcame the ancestors of Sumer and Akkad. Still they mingled their blood, drank in the spirit of the deserts, and became the children of the soil. In the delta of the Tigris and Euphrates to-day, with the uncontrolled floods of the rivers and irrigation without any system, the present inhabitants must have many characteristics of the first people who strayed into the plain of Shinar, and who were probably forced to take to agriculture by stress of numbers. The Emir Khazzal of Mohammera stated the simple truth when he told me that the Arabs were pleased to see irrigation engineers, not because they looked forward to agricultural pursuits, but because the land could no longer support them as shepherds. As of old, these people are genuinely fond of all religious questions and discussions. In the time of the Klalifs the population of the delta was Sunni; to-day it is almost entirely Shia. Travelling among the Arabs who live on the borderland of the two faiths, I soon learnt why it was very difficult for part of a tribe to be Sunni and part Shia. The Arabs spent the whole of their time arguing with each other in the most violent and wearying manner. Sitting among them once for some three hours, I was wearied to death with their unending war of words, when suddenly the sheikh turned to me and said, "Here is a stranger who understands us, let him decide which side is right." Out of temper with them, I said, "You are both wrong." Immediately a dozen young men jumped up, and, gesticulating in the Arab manner, insisted on my explaining my religion. I at once said, "Allah abûna, Sayedna Îsa akhûna." The sheikh, in his own high-bred manner, walked across the tent, laid his hands on my shoulders, and rewarded my rudeness by saying, "Sir, you have a very beautiful religion." The party then broke up, and the sheikh said to me, "We have hitherto professed that man's religion, Sunnism, but we shall soon all profess that woman's religion, Shiaism. All day long my tribe argue with me and worry me, and when I retire to rest my wife begins." I used once to wonder why every single Arab became a Moslem; the majority worried the minority into believing.

One day I was riding with a young Englishman, who, in Oriental language, was a goodly man and well favoured, and we had as our companion the sheikh of a powerful tribe. Suddenly the sheikh turned to my companion and said, "Sir, are you married?" He said, "No." The sheikh continued, "Will you marry my daughter? She is young and handsome, and will make you a good and faithful wife." Her father was certainly a fine-looking Arab. My friend being utterly taken aback, I said, "Sheikh, how can he marry your daughter? She is a Moslem, and he is a Christian." He promptly replied, "A woman has no religion beyond what her husband has. You are people of the book, we are people of the book—nothing hinders." I have often thought he would have acted wisely in marrying the girl, for Arab women make good wives.

Late one night I arrived at a Bedawin camp, and went straight to the sheikh's tent. On my telling him I was an Englishman, he said he was pleased, as he loved their ways. I asked him which were the ways he liked. He put his hand on a big pile of Arabic newspapers by his side, and asked me if I could read the name. I told him that it was the *Mowayad* newspaper of Cairo. He said, "Yes; I can't read, but a man in the tribe can, and he explains them to us. Here is a newspaper published in Cairo occupied by English troops; the paper fills its pages with abuse of the English, and they allow it to be printed and circulated. If a Mesopotamian editor treated the Turks in this way, he would spend the rest of his life in prison. Why do not you English come over and teach us freedom?" "No use, sheikh," I said. "Why, we have been in Egypt under thirty years, and from one end of the country to the other they all wish us out. In twenty years you would be tired of us, and try to get rid of us." The old man stroked his beard, and said, "Yes; are we not all sons of Adam? He thought he could improve on paradise." Mind, the man could neither read nor write. I found him much more original in every way than any of his countrymen who could read. It is certainly a fact that in ninety-nine cases out of a hundred book-learning deprives people of originality.

While travelling among these people, I take a mule or camel laden with oranges, boxes of dates, Turkish delight, and sweets for the families of the Arabs who show me hospitality. I tell the sheikh that the rules of his country insist on his giving me shelter, and the rules of my country insist on my sending something to his children and family. Some of the children of the family are called up, and, with their laps full of fruit and sweets, they run round to their side of the tent. Between the men's and women's sides of the tent there is nothing but a suspended reed mat, and it is easy to see why the Arabs lead such healthy and sane lives. Deception is out of the question. Leaning against the mat and retailing information to the men, of the great world outside Arabistan, I can every now and then hear the women's expressions of surprise and pleasure. Long may the Arabs keep to their simple and natural life in their native deserts and conserve a type of manhood and womanhood which does credit to the

world. Few people could say as I have heard these people say, that they knew of no illness except the illness of death.

Every part of the Euphrates delta, from Hit to the Persian gulf, has at some time or another been called "Eden," the irrigated and cultivated plain, as distinct from "Kura," the unirrigable hill or plain. So in Egypt to-day the "reef" is the irrigated plain, and everything else is the "jebel," the desert where there is no rain and hill or mountain where there is rain. Soil and climate are eminently suited to fruit gardening. From date palms and oranges to peaches and plums every fruit tree is at home. The date palm is really the indigenous tree of the country. "Put its feet in water and its head in hell and it will do all the rest" is the saying of the people.

Every engineer beginning work in the delta for a canal or railway must always keep before him the memory of Noah's flood.

"The appointed time came near,
In the evening the gods sent heavy rain.
The dawning of that day I feared,
I feared to behold that day,
I entered the ark and closed the door.
The storm raged high,
Over the deserts the water prevailed,
No man beheld his fellow.
Istar cried like a woman in travail,
Cried with loud wail the queen of the gods :
'The former race is turned to clay.'
Six days raged the storm, on the seventh it ceased ;
Like palings before me the marsh reeds appeared ;
I noted the region, the shore of the sea ;
Twelve measures of water covered the land.
To the desert of Nisir the ark made its way ;
The desert of Nisir would not let it pass."

One has only to see the old Babylonian banks, never less than 100 feet wide, to understand that the gods of the earth were helpless against the dragon of the Euphrates. The gods of the highest heaven had to be invoked. If Babylonia is to be thoroughly reclaimed without the aid of tens of thousands of hard-worked captives, weeping by its waters, the Euphrates certainly, and, if possible, the Tigris, must be provided with escapes into the deserts in a more effective manner than the ancients could accomplish. Heavy rain in April with a warm south wind melting the snows on the Persian and Armenian hills, brings down such extraordinarily heavy floods that the channels cannot possibly contain them. The ancients controlled the Euphrates by an escape into a wide depression in the deserts north-west of Kerbela. This depression is 500 square miles in extent and 20 feet deep, and capable of holding half the dangerously high flood of the Euphrates and so mastering it. While studying the question of the Wadi Rayan escape for the Nile and the location of the ancient Lake Moeris, I was surprised to find the day on the slopes of the desert a thick belt of Nile shells. I had the level taken and found it to be $22\frac{1}{2}$ metres above

sea-level. Engineers were sent east and west and north and south to find these shells and their level. They were met everywhere at $22\frac{1}{2}$ metres above sea-level. These were the limits of the ancient Lake Moeris. In despair for the proper irrigation of the Euphrates delta, unless we could find an escape for this torrential river, I searched for a depression and was rewarded one day by finding a thick belt of Euphrates shells away in the deserts. Parties of engineers began levelling in every direction and the shells were found everywhere at a level of 25 metres above sea. Here was the escape, and maybe the reservoir of the Babylonians, mentioned by many writers. The Habbania escape, under construction by Sir John Jackson & Co., has been designed to carry the excess waters of the Euphrates into this depression. The hills are formed principally of salted marl overlaid by gypsum, and as the fall from the Euphrates into the depression is 90 feet, there should be, in the future, complete control of the floods of the river. The Euphrates can be mastered; there remains the Tigris.

The ancients never completely mastered the Tigris, and there were occasional inundations, when, according to Arab historians, hundreds of engineers and subordinates were sacrificed. In the project submitted to the Turkish Government I have proposed a very massive canal and dyke along the right bank of the Tigris in imitation of the Babylonian works, and the sacrificing of the left bank of the river to the floods. But this is not final, as I have said in my report. We have found that that strange river, the Tarthar, which comes down from the Sinjar hills and runs between the Tigris and the Euphrates, terminates in a salt pan in the deserts south-west of Samarra. The bottom of the pan is 4 metres below sea-level, and as the Tigris in flood near the site of Nimrod's ruined dam is 56 metres above the sea, the total fall from the river is 200 feet. My engineers would have sacrificed much to level up the Tarthar and fix the contents of the reservoir, but unfortunately the salt pan is debatable ground between the Shammar and Dillem Arabs, and they could not fall into accord to let us complete our work. The Shammar were the only Arabs in the country who prevented us from working. As a rule the Arabs helped us and some were even anxious to have copies of our plans. One of them had the temerity to say that he had the same tastes as the great Arabian prophet, and being consequently fond of women, scents, and geography, he would help us to complete our work. The Shammar, unfortunately had different tastes. The construction of an escape into the depression would mean much to Babylonia, and I have therefore devoted much time to thinking out the kind of work needed to raise the level of the Tigris in flood by 8 metres and lead off the excess waters into the Tarthar depression. Two barrages on the Tigris would cost £2,000,000, and a canal capable of carrying 2500 cubic metres per second would cost some £4,000,000. These two works would cost between them £6,000,000; and, with the Euphrates escape, would by themselves double

RAHALIA OASIS. FRESH-WATER SPRING.

SNOW IN BAGHDAD.

BREACH IN THE OLD HINDIE BARRAGE ON THE EUPHRATES.

OLD HINDIE BARRAGE. FALLING TOWERS FOR CLOSING BREACH.

the value of every acre of land in the delta ; be a godsend to Baghdad and every other town and village ; and allow the Baghdad railway to traverse the cultivated land, and not, as at present proposed, cling to the deserts as Noah did to his ark. The engineers who aligned the railway have shown a timidity which would have cost them their lives in the times of that arch-engineer Marduk or Nimrod. They have fled from Tiamat.

Once the Euphrates and Tigris floods are controlled, the irrigation works will present no great difficulties, and the delta of the two rivers will be richer than the delta of the Nile, and a safer place to invest capital in. The great Mehemet Ali proposed to the Sultan of his day to exchange Egypt for Babylonia ; and, as the Egyptians are so eager to return to the protection of Turkey, England would make no bad financial bargain if she were to exchange Egypt for Babylonia.

The chemical constituents of the soil are all that an agriculturist could desire. The Sudan Government has been recently analyzing the soils of the Sudan Gezireh, and I am enabled to give in a comparative table the relative values of the soils of the Sudan, Egypt, and Babylonia.

Locality.	Per 10,000 parts.			
	Nitrogen.	Phosphates.	Potash.	Lime.
Sudan	3	12	60	400
Egypt	10	20	60	300
Babylonia	12	24	60	1500

Looking at these figures we see that Maimûn, the son of Harûn-el-Rashid, had some slight justification for the words he uttered on the summit of the Mokattam hill as he overlooked the delta of the Nile, "Cursed be Pharaoh, who said in his pride, 'Am I not Pharaoh, King of Egypt?' Had he seen Babylonia he would have said it in humility."

The dawn of the day which sees the floods of the two rivers controlled will be comparable to the day on which Noah beheld the rainbow after the flood and saw in it a sign of divine repentance ; or when Istar, after the Deluge, suspends in her hands the jewels from about her neck, and, as they hang in crescent form, swears to protect the race of men :—

"These days, by the jewels about my neck, I shall not forget.
Upon these days shall I think, I shall never forget
That my people were given to destruction."

The first direct irrigation works to be carried out will be the Feluja and Hindie barrages on the Euphrates, and the canals and drains dependent on them. The first work will be at the site of the battle of Cunaxa, and, if I had thought of it sooner, I should have called it the Cunaxa barrage, as the ruins of Cunaxa are up against the work. The other barrage will be built on a far more interesting site. The first public work Alexander the

Great undertook in Babylonia was the construction of a new head through solid ground for the Hindie branch or the Pallacopas. Its head had hitherto been in sandy soil, and as the branch had to be opened annually in flood to escape the excess waters of the Euphrates, and then closed after the flood to keep the Babylon channel full of water, the annual closure had been a work of extraordinary difficulty, entailing the presence of 10,000 men. Next to building a masonry barrage it was the wisest thing he could have done. And till to-day, the Hindie branch at its head traverses some of the hardest soil of the delta, and it is possibly owing to the wisdom of Alexander's choice that the barrage holds its own in the way it does. No sooner had Alexander fixed the site of the head of the Pallacopas than he turned to the drainage of the country. Here was the true irrigation engineer.

On the Tigris, the canals to irrigate the country north-west of Baghdad will be taken off above the proposed barrages near Nimrod's dam. Once these barrages are finished, the canals and drains will be very easy and the works remunerative. This spot on the Tigris is full of interest.

The Tigris enters its delta at Beled, south of Samarra, where were situated the famous weirs of antiquity, which, judging from the bed-level of the El-Gaim head of the Nahrwân, must have held up the water of the Tigris to a height of 10 metres. In this reach of the Tigris, under the surface alluvium, lies a 10-metre belt of very compact conglomerate which again overlies a stratum of clay. This bed of conglomerate dips to the south-east and disappears under the bed of the river east of Beled. Formerly the Tigris rolled its waters above this hard conglomerate and entered the delta at a high level. The undermining of the conglomerate began in historic times, and the serious consequences to the country moved some giant of antiquity to construct an earthen dam across the channel and turn the waters over the hard conglomerate on the right bank of the river. In this new channel the river flowed for many years and, indeed, through historic times. The site is known locally as Nimrod's dam to-day. From upstream of the work were taken the two lower heads of the great Nahrwân canal. In the troublous days which followed the devastations of Halaku, everything in the country went to ruin, and either the earthen dam was swept away by the floods of the Tigris, or the undermining of the rock on the Tigris diversion reached the dam and annihilated it.

The terminal line of the conglomerate, as it was gradually undermined, must have been a cataract 10 metres high, and it was this which Tavernier saw in his travels. He has often been accused of gross exaggeration, as there is no sign of a cataract to-day, but he simply stated what he saw. Similarly, in antiquity, the Assuan cataract may have been a real cataract with a thundering roar of water.

Commander Felix Jones, of the Indian navy, who was in command of the gunboat which lies before the British Residency at Baghdad, and who was the first to describe these works, well observes—

"The summit of Opis, as we gaze around, affords a picture of wreck which could scarcely be conceived, if it were not spread at the feet of the beholder. Close to us are the dismembered walls of the great city, and many other mounds of adjacent edifices, spread like islands over the vast plain, which is as bare of vegetation as a snow tract, and smooth and glass-like as a calm sea. This appearance of the country denotes that some sudden and overwhelming mass of water must have prostrated everything in its way; while the Tigris, as it anciently flowed, is seen to have left its channel, and to have taken its present course through the most flourishing portion of the district, severing in its mad career the neck of the great Nahrwân artery, and spreading devastation over the whole district around. Towns, villages, and canals; men, animals, and cultivation must thus have been engulfed in a moment; but the immediate loss was doubtless small, compared with the misery and gloom which followed. The whole region, for a space of 250 miles averaging about 20 in breadth, was dependent on the conduit for water, and contained a population so dense, if we may judge from the ruins and great works traversing it in its whole extent, that no spot in the globe, perhaps, could excel it. Of those who were spared to witness the sad effects of the disaster, thousands, perhaps millions, had to fly to the banks of the Tigris for immediate preservation of life, as the region at once became a desert, where before were animation and prosperity. The ruin of the Nahrwân is the great blow the country has received. Its severity must have created universal stupor, and was doubtless followed by pestilence and famine of unmitigated rigour."

Before any work is undertaken for the regulation of the Tigris or raising its flood surface, borings should be taken from upstream of the site of Nimrod's dam in a southerly direction, to see if it may not be possible to imitate the action of the old Babylonian engineers and turn the Tigris again over the conglomerate. If such action could be taken there would be an economy of over £1,000,000; but the new channel of the Tigris would flow through Lake Akkar-Kuf and join the existing channel of the river near the iron bridge on the Kerbela road south of Baghdad. This is noted on drawing No. 80 of my book, 'The Irrigation of Mesopotamia,' published by Messrs. E. & F. N. Spon, of 57, Haymarket. I have also noted on drawing No. 2, that when the delta is developed, the Tigris escape should be carried out, even if it entails sending the Tigris water through the salt pan and across the Euphrates, on the level, down the Habbania escape. This extreme measure will not, however, I think, be necessary.

The second barrage on the Tigris will be made at Kut, so as to enable the Hai branch of the Tigris to be converted into a perennial canal. The Hai branch is the Tigris of Babylonian, Persian, and Arab times, and traverses very rich lands. On its banks are the ruins of Wasit, one of the three early capitals of the Klalifs; and a little lower downstream, Tel Lo, the Lagash of the Sumerians, a very ancient town of the delta.

Further down the delta and at the junction of the two rivers, regulating works, dykes, and canals are proposed to reclaim the rich delta of the ancient Karun river, from Busra to the Khor Abdalla. In ancient days, when the joint waters of the Euphrates and Tigris entered the Persian gulf by the western head of the Khor Abdalla and the Karun by the eastern head, the muddy waters of the Karun swept over these lands and laid down this deposit. The Karun, unlike the Tigris and Euphrates, traverses no swamps, but comes straight down from the Persian hills at a high velocity and carries its muddy water into the sea, and is capable to-day, as it was in the past, of forming such a delta. It is owing to the high land formed by this delta that the swamps of the Tigris, Euphrates, and Kerkha rivers are all fresh-water swamps and totally unlike the salt-water lakes of Egypt. These fresh-water lakes are potent with future wealth. To-day great herds of buffaloes are fed in them, and they are moreover full of wild boar. The Kerkha river which flows into the Tigris downstream of Gurna is the ancient Choaspes, on whose banks are the ruins of Susa or Shushan, the residence of the kings of Persia, and the prison of all the kings conquered by the Persians. It was on this account probably that it was known in ancient times as "the stream out of which none but kings do drink." It was here that M. de Morgan found the tablets containing the laws of Khummurabi, the best known king of early Babylonian days. The tablets were doubtless taken there from Babylon by Cyrus or one of his successors.

Both the Kerkha and the Karun have ruins of ancient dams built across them for purposes of irrigation. It is extraordinary how capable an Arab is of turning a country into a desert. Outside of his own desert home he begins by being little else than a human locust. As the Euphrates, Tigris, and Kerkha bring practically no deposit into the Shatt el Arab, this latter river carries only Karun mud, and it is in consequence of this that the bar at the mouth of the river is not nearly so serious as it would otherwise be. To deepen the channel across the bar and to keep it clear would be a work of no great difficulty.

The Adhaim river, which flows into the Tigris at the site of the ruins of Opis north of Baghdad, is fed by considerable swamps and marshes north of the Hamrin hills. At the point where it emerges from the hills are the ruins of a massive dam, from upstream of which were led off two canals to irrigate the level plains on both sides of the river. These works could be easily reconstructed when the more important works in the delta were undertaken.

Downstream of Baghdad the Tigris is joined by the Diala river, the ancient Gyndes. Of this river, Herodotus records that the favourite horse of Cyrus was drowned in its waters, and that, in consequence, he employed his army in digging thirty canals, among which the waters of the river were divided and made incapable of ever drowning a horse again. Xerxes might have so employed his army, but Cyrus was cast in a different mould.

One of the canals to-day bears the name of Khorassan canal, and was probably dug by the Khorassan contingent of troops. In examining the project for the reconstruction of the Nahrwân canal which was led into and out of the Dyala, it was evident that whatever motive Cyrus may have professed for the action he took, the mastering of the waters of the Dyala was the only solution of the problem. Every other solution seemed to me so difficult that I asked the opinion of Sir John Benton, the able head of the Irrigation Department in India at the time, and he wrote back that he considered that Cyrus' engineers had solved the problem in the best way in which it could be solved.

The Beled Ruz, Khalis, Khorassan, and Mahrût canals utilize all the perennial waters of the Diala to-day, and irrigate a very large area of country and many beautiful gardens. The flood waters of the river are, however, quite ungovernable. I have proposed the construction of an earthen dam across the Diala, a little downstream of the point where it issues from the Hamrin hills, and the diversion of the river down the El Mardj depression, after the example of Cyrus. With the Diala thus controlled, it will be possible to feed the existing canals, and to carry down the Diala itself, only as large a supply as the lower Nahrwân can take. A second earthen dam across the Diala downstream of the Nahrwân head, similar to the one constructed by Cyrus' engineers, will suffice to turn this restricted supply down the canal. When this proposed diversion is carried out, not only will the delta of the Tigris from Baghdad southwards be greatly relieved in flood, but the waters of the Diala, spreading over the gently sloping and wide Khôr Merj and Khôr Sevekî, will create a new delta of great value.

After the question of flood protection, the most important matter in the delta is that of silt prevention. The two rivers in flood carry five times as much deposit as the Nile. It was an old saying in India that when an irrigation engineer died, the letters "SILT" were found engraven on his heart. In late years the Punjab engineers have lifted the question on to a much higher plane, and with their aid and my own observations, I have been enabled to design works which will, I trust, even master the Euphrates in its muddiest moods. The ancient Babylonians, not having barrages, had to locate their canal-heads in the deep cutting reaches of the river, and turn them into veritable silt traps. With barrages we shall be able to take the main canals out of trained reaches of slack water, free of the coarse silt which is incorrigible. By imitating nature and aligning the canals just like all natural branches of the rivers which do not silt; by closing the main canals when very muddy freshets come down; by taking those of them which have little slope through wide depressions; and by freely using escapes, we shall lay our hand on even the silt of the Euphrates. And in order that the fields may not lose the rich muddy waters of the floods, the minor canals will have flood heads on the rivers, traverse the main canals by syphons, and course down the steep transverse

slopes of the country, carrying the deposit with them. In low supply the minor canals will be fed by subsidiary heads on the main canals. Perennial irrigation will thus be secured. It is interesting to note that the steep transverse slopes of the Mesopotamian rivers impressed the prophet Ezekiel, who was long a captive in Babylonia. His slope of one in a thousand has been found accurate by my engineers again and again. "And when the man measured a thousand cubits the waters were to the ankles. Again he measured a thousand, and the waters were to the knees. Again he measured a thousand, the waters were to the loins. Afterwards he measured a thousand, and the waters were waters to swim in, that could not be passed over."

On the subject of navigation I hold the views of nearly every engineer in Upper India. In the arid regions of the Earth water should be monopolized for irrigation, and railways for transport. You cannot leave the waters of the rivers in their channels and irrigate the country with them. For navigation you may substitute railway transport; for purposes of irrigation nothing can take the place of water. When Alexander decided to send his fleet up the Tigris, he had to cut the earthen dams thrown across the river. Just as the river was then dammed, so it will be when the delta is developed. A discharge of 10,000 cubic feet a second are needed in the Tigris to allow of navigation between Busra and Baghdad. This quantity of water could irrigate 750,000 acres of cotton worth £7,500,000.

Where the alluvium of the rivers overlies the pebbly deposits of the deserts at a convenient depth, there are strong currents of fresh water which may be in places artesian. An extended series of bores might disclose sources of supply of great value for perennial irrigation, especially for the irrigation of palm groves and fruit gardens. This study seems to me worth pursuing. I learnt the fact too late to make any use of it in my projects.

I bring this lecture to a close by expressing my genuine pleasure at being privileged to address a meeting of the Royal Geographical Society on so interesting a subject as the restoration of the Garden of Eden. By the side of Marduk, the Pontifex Maximus of the gods of Babylonia, I am but a Pontifex Minimus, still a Pontifex. And it is my firm trust that works carried out on the broad lines of the project submitted by me to the Turkish Government, provided the works themselves are executed with the expedition and liberal supervision which are their life, will secure a firm foundation for the resuscitation and future prosperity of this once famous land. Perennial irrigation with regulating works on the two rivers will be widely different from the irrigation of the ancients in the upper parts of the delta, where tens of thousands of captives laboured at the unending task of clearing silt from the waters of Babylon, by which they sat down and wept. Irrigation such as we propose, will bring us back to the happier days of the early settlements in the marshes where the waters were comparatively free from silt and where they created for

themselves gardens of Eden, whose memory has lasted so long. We shall once again realize on the banks of the Euphrates, the meaning of the affectionate address of some ancient Sumerian seer :—

“ O thou river who didst bring forth all things,
When the great gods dug thee out,
They set prosperity on thy banks.”

The PRESIDENT (before the paper): We are about to hear a paper from the gentleman on my left—not the first time that he has honoured us in a similar fashion in this hall. Many of you will remember (I did not have the good fortune to hear it myself) the very interesting paper he read to us eighteen months ago. Since then Sir William Willcocks has been working at various problems connected with Mesopotamia, geographical, irrigational, historical, and biblical, and the results of these studies he proposes to give us to-night. I need hardly remind you, because you know already, of the extensive experience and the great reputation of Sir William Willcocks in irrigation works in India, South Africa, and Egypt, as well as in Mesopotamia. He is no doubt a great hydrographical engineer, but the paper to which we are about to listen will show that he is a good deal more.

The PRESIDENT (after the paper): We have with us to-night that great authority, Prof. Sayce, who, if I may say so, lives equally in the past and the present, and is better able than any man living to read to us the riddles of time. I hope he will consent to do so to-night.

Prof. SAYCE: It has been a great privilege to-night to listen to a masterly paper by one of the most eminent of engineers and the most experienced of irrigators. It has been an especial privilege for myself, who have been occupied most of my life in trying to solve questions connected with the earlier history of Babylonia. All history is largely dependent upon geography, but in no part of the world is that more true than in the case of Babylonia. Babylonia was the gift of the rivers, and it was made inhabitable by the irrigation works carried on in times which we now call prehistoric by the earliest engineers of the country. The Babylonian plain was called the Land of Eden by its inhabitants—Eden signifying a plain in the primitive language of Babylonia. It was in this plain that the garden was situated. It was not a garden in our sense of the term. The word signified what we should now call a plantation mainly of fruit trees. In the Old Testament it is stated that the Garden of Eden was watered, not by rain, as would have been the case in a country like Palestine, but, as it is translated in our Authorized Version, by a mist which rose from the ground. The word in the Hebrew, which is translated mist, is a word which occurs nowhere else in the Old Testament. It was borrowed from Babylonia, where it signifies first of all the inundation of the sea, and secondly, the annual inundation of the rivers. It was thus the annual flood of the Babylonian rivers which irrigated Paradise. There is one point in the paper I am inclined to criticize. We have learnt from Sir William that at present the delta of the Karun prevents the salt water of the Persian gulf from making its way into the marshes in what was originally the southern part of the Babylonian plain, not very far from the sites of the ancient Eridu and Ur. Now, I gather he would imply it was also the case in the early days of Babylonia that the marshes in the extreme south of Babylonia were protected similarly by the silt of the Karun from being contaminated by the salt water of the Persian gulf. Eridu, however, was the primitive seaport of Babylonia. It was built upon a horn of the sea, and in an early Babylonian map a horn is represented running up from the Persian gulf. It was in Eridu that the first man lived and fished in the sea, and every day presented a dish of food to his

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