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SOME CLIMATOLOGICAL FACTORS AND THEIR RELATION TO THE BIBLE

I

THE stimulus for a good deal of the special study involved herewith was provided by a famous Biblical scholar discussing the route and nature of the invasion of Canaan. The professor, while being cognisant of the different geographical regions of Palestine, was entirely unaware of the evidence for the change in climate throughout the centuries and also for important annual differences which are peculiar to sub-desert regions. In fact the learned doctor openly admitted that he knew nothing of these questions and it offered a field for fresh study. Hence the author's interest at odd times for the past thirteen years.

The writers of the O.T. were accurate observers of climatic features, even showing a remarkable knowledge of what is now called the planetary systems of winds, and other constituents of climate. N.B. Eccles. i. 5, 6, 7. Job xxxviii. 25, 26. "*God makes a weight for the wind; Yea, he meteth out the waters (rains) by measure. When he made a decree (seasons) for the rain, And a way for the lightning of thunder.*"

The basic components of Climate are location, temperature and barometric pressure. Under the term location we must include Latitude which determines sunlight, its strength and seasonal distribution. Height above sea level and position in relation to land and ocean also are under this head. Under Temperature we not only consider heat and cold but the times of their incidence, whether they are diurnal or annual extremes. Under Pressure we consider the humidity of the atmosphere as well as high and low pressure, for it is actually upon humidity that rainfall depends.

These and associated phenomena often appear in the Bible under picturesque titles. Thunder, lightning, hail, drought, wind, rain, all play their part in Scripture. The weather becomes of paramount importance in the defeat of some foe, in the prosecution of a campaign, in harvesting and many other connections.

Joshua's victory over the five kings is expedited by hailstones, Job's servants are slain by lightning, his sons by a whirlwind and the coming of rain is vividly portrayed in 1 Kings xviii. 45. For beauty and grace what can compare with Hosea's expression, "*I will be as the dew unto Israel*"? (xiv. 5).

Occidentals sometimes fail to realise the fundamental differences of their own climate from that of Palestine, resulting in a less accurate understanding of the Bible where such knowledge is involved. "*A land flowing with milk and honey, full of vineyards, olives, pomegranates*" suggests to the Western mind dense foliage and luxuriant pastures. If he arrived in September the traveller would be surprised to find the grass almost completely absent, and the land bare and crying out for rain. The climate of Palestine is epitomised in the words—warm wet winters, hot dry summers. Our own is radically different—cool wet winters, warm moist summers. Observe the following rainfall figures—

	June	July	August	September	Total
Jerusalem	0"	0"	0"	0"	0"
Aberdeen	1.7"	2.8"	2.7"	2.2"	9.4"

Jerusalem: Observations over 20 years. Aberdeen: 45 years.
Average monthly rainfall in inches.

Aberdeen has a total annual rainfall of twenty-nine inches. Jerusalem with no rain for four months of the year receives twenty-five inches for the year. These are remarkable figures and explain a great deal. Further, it may be observed at this point that, in general, less than ten inches of rainfall a year, unless there is some other extraordinary factor such as the Nile of Egypt, results in desert conditions. Under twenty inches represents sub-desert unless there are favourable factors, such as appertain in parts of Canada.

Thus in the Holy Land we find products peculiar to summer drought conditions, such as olives and citrus fruit. The grain harvest is in early summer, growing during winter. In midsummer animals are in distress for water, the ground is iron hard and most of the water courses are reduced to a trickle or to a series of stagnant pools. The skies are cloudless except for the darkening power of sand and dust storms. This accounts for a number of beautiful expressions concerning shade, such

as "*The shadow of a great rock in a weary land*". The sun's rays strike the ground almost vertically so that only a large rock is able to cast an adequate shadow. After months of drought and heat, with a cloudless sky and strong sunlight, one is able to appreciate drink and shade to the full. Hence the Bible emphasis on brooks and springs which do NOT FAIL, and trees which do NOT CAST their leaves—able at all seasons to give drink or shade to the traveller.

II

The summer of Palestine is hotter than ours and the winter is warmer but the extraordinary changes in altitude which characterise the country cause much modification in climate, enabling Jericho to be termed the "*City of Palms*", yet it is practically impossible to grow decent specimens at Jerusalem which is less than twenty miles away as the crow flies. The account of the Triumphal Entry of the Lord indicates that branches of trees were broken down to honour Him. But it simply states that "*they took branches of the palm trees*". Doubtless palm leaves were used for domestic purposes, being imported into the city from Jericho and other adjacent places. Climatic differences due to the remarkable topography of the land account for the feat of Benaiah who "*went down and slew a lion in the midst of a cistern in the day of snow*" (2 Sam. xxiii. 20). The lion prowling up from the tropical "Ghor" into the Judean highlands where snow occasionally falls in winter, had fallen through the light covering of snow into the domestic reservoir. The uplands are over two thousand feet above sea level and the Jordan valley in the vicinity of Judea is thirteen hundred feet below the surface of the sea, making over three thousand feet difference in all, resulting in one of the most sudden changes in climate to be found in the world, i.e., between Jerusalem and Jericho.

The "early and latter rains" are well-known Bible terms. The former commence at the end of October and continue into November. The latter rains occur in March and April. Actually there are not two rainy seasons, for rains continue throughout December, January and February. But the rains coming in October are termed early because the onset of the rains following six months drought is very important. Those which immediately precede the drought, the March-April rains, are even

more important, because if these fail the grain and other crops will be withered before they are full and ripe. Hence the Bible terms emphasising these vital early and latter rains. Of recent years there has been a welcome increase of the April rains, of which more later.

But there is a variation in rainfall due to *locality* as well as season. Owing to the proximity of desert on the south and east, the rains are heavier on the high ground to the north and on the west of Jordan. Southwards and eastwards the rainfall diminishes and in consequence the land is not so suitable for agriculture. Fortunately, in the more arid east the soil is of a different nature, retaining the moisture more effectively so that herbage for roving herds is possible. One calls to mind "bulls of Bashan", which suggests that these animals were a major product of that district. Much of the land east of Jordan is termed wilderness, but this term does not connote desert, rather land unfenced and unused for agriculture. The wilderness provides scrubby herbage for cattle and sheep, and a few showers of rain will make it "*blossom as the rose*". Such land, however, passes imperceptibly into true desert except where springs turn a locality into a luxuriant oasis. These oases are called the "eyes", the most precious parts of the country. They are the objects of jealousy and strife between the people who itinerate in the scattered pasture lands. The Israelites came from this wilderness to enter Canaan. The crossing of Jordan indicated a change from an itinerating pastoral life to a settled agricultural life—from roving to resting. The two and a half tribes preferred to rove and maintain their cattle wealth. The others were prepared to leave the old life and advance to the new and ultimately to more settled conditions. Rivers frequently form political boundaries but seldom do they form a boundary between differing natural occupations, but in Jordan we have one of the few examples where this is actually the case. Of course, hard and fast lines cannot be drawn between the agriculturalist and the pastoralist. The farmer in Canaan would most certainly possess flocks, but sufficient of his wealth would be in grain and fruit raising to prevent his moving far from his established home. The symbol of dwelling in Canaan west of Jordan is a house, to the east and south it is a tent. Possibly herein lies the explanation of the explicit commands to Abram *to journey through* the land, as in many of the central parts the tendency would

be to get "*a house*" and settle down, as Lot actually did. There is much spiritual truth behind these simple geographical facts.

In the border lands of the Negeb and east of Jordan where the true desert is not far distant there is an eccentricity of rainfall from year to year. This has a significance which has not been given due weight. The land already experiences drought for six months of the year so it does not require a large decrease of rainfall to make it impossible to grow grain at all. In some seasons in these southern lands the rainfall is of sufficient quantity to allow the raising of fine crops. Isaac reaps one hundred-fold at Gerar (Gen. xxvi. 12), yet a year or so previously he experienced famine at the same spot (xxvi. 1) and a little later in the same region he is searching for water. To harvest one hundred fold was exceptional, but in Isaac's time the precipitation was greater than in post-N.T. days. Actually Gerar and Beersheba depend on wells, permanent watercourses being completely absent. In this same dry southern border Abram experienced the famine which enticed him to go into Egypt (Gen. xii. 10). The famine was probably due to a slight diminution in annual rainfall over one or two seasons which would cause severe hardship in any land bordering on the semi-desert. The borderlands always feel drought most keenly. If instead of "going on still toward the south", towards the Egyptian boundary, the patriarch had remained in the centre of the land, he would not have felt the pressure of the drought so severely, possibly not at all.

To the south of Beersheba are the ruins of a number of villages, each based on wells which indicate that the Negeb in distant times has supported a larger population. One or two seasons of prolonged drought, not involving a great decrease in rainfall, would quickly depopulate it. To-day there is practically no settlement here at all. The reason for this ancient peopling of the Negeb is that, like the rest of Palestine, it has experienced greater rainfall in the past. Prior to the Mandate, Palestine was full of evidence indicating that the vegetation was far more luxuriant centuries ago. This would be due to the larger rainfall, not necessarily a very great increase from the present, but sufficiently large to make all the difference between settled agriculture involving towns and villages, and scrubby pasture involving a scattered and roving minority. The compression of the total precipitation into the winter six months results in

maximum advantage for plant growth from a minimum fall. It all comes at the growing season. The melting winter snows on the Canadian prairies effect the same for grain in that region. Thus it can be readily understood that where all the rainfall comes in winter (when loss by evaporation is smallest) an increase of four or five inches in rainfall would be sufficient to make the land fertile for six months of the year, which is actually what obtains in the rest of Palestine. There is varied and widespread evidence that this increase of rainfall from the present amount of precipitation was experienced by these areas in south Palestine and Sinai years ago. It is suggested that the original statement about the abundance of fruit, foliage and pasture in the Holy Land is not mere poetic licence. All over the country prior to 1918 were the remains of terraces which once had been vineyards, the soil now entirely denuded, mere stone and rock remaining. In times gone by, embankments were erected in order to support terraces of deep earth upon which vines and other characteristic fruits were produced. The slopes now bare used to produce luxuriantly. Trees, too, were far more widespread in Palestine, although modern reforestation has made great progress. The Turk *taxed* trees, whether fruitbearing or no, so that in a land where fuel is not plentiful there was added a far more serious reason for peasants removing trees—inability to pay the tax. The wars which have swept across this international cockpit have aided in the deforestation and ruination of orchards and vineyards; thus the soil, becoming bare of vegetation, has been easily disintegrated by weathering and swept away by storms until vast tracks of rock have been uncovered. There are passages (Deut. xx. 19, 20) which indicate a partial respect for trees in O.T. times, but not sufficiently adequate to prevent deforestation when war and poverty became frequent.

One important reason for the more favourable rainfall in the past was the presence of greater vegetation and in particular trees. Desolation due to war, and the systematic destruction of trees and the breaking down of terraces upon which were many orchards, have most certainly reduced the rainfall of Palestine. This is seen particularly in the border areas where a slight diminution makes all the difference between the close vegetation of agriculture and horticulture, and the sparse growth of the sub-desert.

III

Possibly some may question the possibility of a change in climate. But this can be paralleled by a more modern example. Parts of Spain are situated in a climatic zone where rainfall is slight. So many oaks and other great trees were cut down in the days of the Armada without replacement, that the rainfall of that country has been definitely reduced, so that in large areas it is *impossible to grow trees* which were grown there in times past and used to build the Armada. Rainfall and soil depth are now too small. Throughout N. Africa, Libya and Tunis there are ruins of towns and villages—in fact ruins of Christian churches. To-day their sites are occupied by desert and merely nomadic dwellings. These ancient stone buildings indicate permanent dwelling, and this points to permanent water supply—something which does not exist to-day. Quite possibly this supply was by *rainfall*, stored in tanks during the dry season. Springs and streams would exist only in winter—to-day they do not exist at all. Each house had its cistern to store the rain, but the *rain does not fall* to-day in any quantity. As I have suggested, towns and villages do not point to grass, they indicate grain growing. There must have been considerably more than ten inches annual rainfall when these places were flourishing.

Beersheba is the nearest town to the desert in southern Palestine to-day, but further south there are ruins of many villages. This is also true to the east and south of the Dead Sea. In the Sinai peninsula there are the ruins of the temple of Serabit and the dwellings of metal miners. The disappearance of trees has assuredly malaffected the climate, making it now impossible to grow them owing to the reduction in rainfall consequent upon the removal of vegetation. Thus a far greater agricultural and pastoral population could be supported in Canaan and its borders centuries ago than was possible, say, in 1910. The same reasoning applies to the Sinai peninsula—increased rainfall accounts for archaeological remains of populous places which to-day are practically barren. Criticism of the numbers of the Israelites during the Exodus, the supply and size of acacia trees used in the Tabernacle, food supplies for herds and people recorded in the Pentateuch must not be based on present climatic conditions. The geographer classifies different areas according to cost of supporting life therein. Some are termed

Lands of Plenty, like some of the South Sea Islands. Some are termed Lands of Ease, the fertile Vale of Jezreel might be included here. Others are Lands of Effort like the Negeb and parts of our own land. Finally, some areas are called Lands of Hardship—where life can only be maintained precariously and at great cost. Greenland and the Sahara desert come under this nomenclature. Thus, in the case of southern Palestine and the eastern borders, war or some other interruption of "effort" quickly brings the land back into the "hardship" category where life can be maintained precariously and but for the few. This change has taken place in some of the lands bordering Canaan, and the Promised Land itself has not been clear of these bad effects. Present climatic conditions form an unreliable basis for assessing the productivity of the past. Similarly the present climatic conditions, which already show some amelioration, will not provide accurate criteria for the future if the great schemes of rehabilitation, reforestation and irrigation are fully implemented. Hence we might go on to suggest that the prophetic foreviews of a golden period for the Holy Land and its People may be reasonably probable. The vision of Isaiah concerns a land where drought and dust are very common at the present time. But he says: "*He shall give the early rain, that thou shalt sow the ground withal; and bread of the increase of the ground, and it shall be fat and plenteous; in that day shall the cattle feed in large pastures. The oxen likewise and young asses that till the ground shall eat savoury provender which hath been winnowed with the shovel and with the fan*" (xxx. 23, 24).

"*And the glowing sand* (the illusion which mocks the traveler) will become a reality *and the thirsty ground springs of water. In the habitations of jackals, where they lay, shall be grass with reeds and rushes* (xxxv. 7). Looking at these words from the standpoint of likely climatological variation, there is a probability of the fulfilment of the prophetic word. In fact, already there is an indication of greater fertility and a consequent improvement of general conditions.

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