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ARTICLE IV.

PALESTINE AND THE DESERT, PAST AND PRESENT.

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The leader of Israel was commissioned by the God of Abraham to lead his people out of Egypt into a land of the most exuberant fertility, "unto a good land and a large, a land flowing with milk and honey" — the familiar Hebrew expression to denote the exceeding fertility of the land of promise. The delegation whom Moses sent to spy out the land — "whether it be fat or lean, whether there be wood therein or not" — brought back a "cluster of grapes of Eshcol, with pomegranates and figs," in evidence that "it is a good land, and surely floweth with milk and honey." It is "a land of corn and wine, a land of bread and vineyards" — "of brooks of water, of fountains and depths that spring out of valleys and hills, a land of wheat and barley, and vines and fig trees and pomegranates, a land of oil-olives, and honey, a land wherein thou shalt eat bread without scarceness, thou shalt not lack any thing in it." It is "a pleasant land," "as the garden of Eden," "the glory of all lands," "a field which the Lord hath blessed." "God hath given it of the dew of heaven, and of the fatness of the earth, and plenty of corn and wine." It is "a land of hills and valleys, and drinketh water of the rain of heaven, a land which the Lord thy God careth for. The eyes of the Lord thy God are always upon it, from the beginning of the year unto the end of the year."

These representations of exuberant fertility require us to ascribe to ancient Palestine every element in soil and climate that can enrich the land, and evoke, sustain, and mature its rich and varied productions. It implies the existence of hills and mountains covered with woodland and forests, — vast primeval forests crowning the misty mountain-tops

with verdure, and scattering broadcast over the land their vegetable deposits, to feed the luxuriance of hill and plain and valley on every side. It implies a boundless evaporation not only from river, lake, and sea, but from the leaves of the forest, the grass of the field, and the teeming earth, — all giving off their vapors to be condensed in the clouds, and returned in showers that water the earth anew and drop down fatness on every field. It implies the benignant vicissitudes of sunshine and showers, as well as of the former and the latter rain in their season, with the genial influences of the heavens above and of the earth beneath combined to bless the labors of the husbandman.

All that is said by the sacred writers, of groves and thickets, forests and woods, of vapors and clouds and rain and showers that water the earth; of hail, hoarfrost, snow, and ice, — all that pertains to the meteorology of the land, its climate and changes of tempetature, seems to be descriptive of a country, climate, and seasons resembling those of our own land rather than anything now known in Syria.

The Hebrew language, again, has a wonderful copiousness of expression for rivers, brooks, and springs. For these three words of our own language it has, we are told, not less than eight or ten, each of which conveyed its proper distinctive sense to the Hebrew ear.[1] The English language, with eighty or a hundred thousand words, exhausts its vocabulary, "in this watery department," with fifty or sixty words; while the Hebrew, comprising only six or seven thousand words, has as many as *fifty* of this same class; nor is it to be doubted

[1] It is worthy of special notice that the New Testament is equally barren of the same class of words. Even the terms "river" and "fountain," whether singular or plural, occur but seldom; and these, we believe, exhaust its vocabulary on this subject. This singular fact, were other evidence wanting, would go far to prove that a great change had taken place in this respect between the periods when the Old Testament and the New were respectively composed. Both have the same air of country life. The writers of both are eminently in sympathy with the scenes of nature. The absence, therefore, or infrequent allusions to "woods," "forests," and "groves"; to "springs," "fountains," "brooks," "streams" and "rivers"; "clouds," "showers," "rain," "hail," etc. indicate conclusively a corresponding change in the country and the climate.

that the colloquial language of the common people had many more words of the same character.

All these peculiarities in the language of the Hebrews, all the imagery of their poets and their prophets, the whole tenor of the teachings of their historians, betoken a country, climate, and condition in striking contrast with the present aspect of this Land of Promise. The mountains in that land now rear aloft their summits, bald, barren, bleak, and desolate. Upon the plains below they send down nothing to fertilize the soil, but much to spread a wider desolation around their bases. The face of the country is a cheerless waste, where the flocks, instead of reposing on verdant pastures, roam in restless search of a scanty subsistence. The fountains, few and far between, sink at once into the dry and thirsty land, or sweep on in channels deeply worn, sustaining no verdure beyond the thick and thorny jungle which lines their rocky bed.

The springing of the year is cut short by the untimely drought of summer. Through all those dreary months of a Syrian summer no cloud intervenes to mitigate the burning heat. No rain descends, no dew distils; but every green thing withers and expires under the protracted, intolerable drought that fills up the gloomy interval between the former and the latter rain. The vine, the fig-tree, the olive, the apricot, and the citron linger still upon some of the hillsides; wheat, barley, and lentils still spring in some of the valleys and plains, sad memorials of the primitive luxuriance which has passed away, never to return. The Palestine of the present day is not the Palestine of the time of Moses, of Solomon, or even of our Lord. It has undergone a great change. Its forests have utterly disappeared, its fountains have dried up; climate, soil, and productions have changed; and the whole country appears desolate, withered, parched, — the very opposite of a land of invitation and of abundant blessings like the Promised Land.

"In Palestine the grass grows only so long as the ground that is adapted for it is moistened by the winter rains. The

traveller who passes through these tracts in the spring is ravished with the luxuriant vegetation and the multitude of flowers; but scarcely have the latter rains ceased, and the storms of the vernal equinox subsided, than an almost vertical sun withers up the grass and flowers, the scorching south winds come up from the wilderness; and the traveller who to-day has passed over a verdant and variegated carpet of herbage and flowers, will, three weeks after, at the same place, not meet with a blade of grass. All vegetation he will then find scorched to death; and if, during that interval, the sirocco has been more than usually powerful in its blast, then the grass, after being shrivelled into hay will have been swept off, and the surface of the ground will have assumed a dingy, yellowish, copper hue"[1]

"There is no doubt that the climate has, along with the entire physical condition of the country, undergone a very sensible change for the worse since the times when the judgments of desolation spoken of in scripture[2] reached their accomplishment. The destruction of trees in many places exposed the face of the land to the parching rays of the sun. Elsewhere fountains have been choked up; and the atmosphere, being thus deprived of its ordinary supply of moisture eminating from the soil, has, as the first natural consequence, not been able to return it in the shape of rain. The early and the latter rain have indeed not ceased to come down from heaven, but their amount is now comparatively small."[3]

The forests which crown the mountains and cover the hillsides and rocky districts of a country unsuited to tillage, are, in the economy of nature, at once the refrigerators of the climate and fertilizers of the soil. By their immense evaporation they supply the needful moisture to the atmosphere, the first requisite of vegetable life, and indispensable element of fertility. Year by year they overspread the earth with a vast amount of vegetable matter to enrich the

[1] Van de Velde, Vol. III. p. 81. [2] Matth. xxiv. 15.

[3] The greatest quantity of rain in one year, observed by Dr. McGowan at Jerusalem, is one hundred and eight inches. Van de Velde's Memoir, p. 29.

soil with another element of fertility equally essential to the support of vegetation. Their vast evaporation cools the atmosphere, disturbs its equilibrium, raising alternately the stormy wind and the whispering breeze, which sweep away the noxious exhalations from the earth, and circulate health and happiness through all the habitations of man. The vapor, received from the forests chiefly, is returned in fruitful showers to feed the luxuriance of every field. Thus God in his beneficent providence 'watereth the hills from his chambers, and sendeth the springs into the valleys which run among the hills. He causeth the grass to grow for the cattle, and herb for the service of man, that he may bring forth food out of the earth.'

But by the destruction of the forests, the mountains, denuded and barren, suspend their fertilizing influences on the valleys below; the showers of summer are reduced or suspended, the rains diminished, and the plains, deprived of their sources of fertility, are impoverished. The wash from the hills and mountains by winter rains and torrents, no longer a rich compound of vegetable matter, mixed with earth to fertilize the soil, becomes the waste of barren heights, overspreading with barrenness the fields which once it enriched with its alluvial deposits. The insects that prey upon the productions of the earth are multiplied, the temperature is increased, the labor of the husbandman fails, the earth refuses her increase, and whatever of fruit or grain or grass starts into life in the springing of the year, scorched by the summer's heat, brings forth little or no fruit in her season.

"My view of the case," says Captain Allen, with reference to the present condition of Palestine, "may be thus summed up: The destruction of the primeval forests, for the wants of an improvident population, created an element of sterility, which by reaction caused depopulation."[1]

"So it has been in Palestine," says Isaac Taylor. "Once it was a land of dense timber growths, and of frequent

[1] Dead Sea Expedition, Vol. II. p. 296.

graceful clusters of small trees, and of orchards, and of vineyards, which retains now only here and there a remnant of those adornments."

With this disappearance of her forests, many ages since, the climate has changed, the rain has abated, the fountains and streams have dried up, or failed, in a great measure, to yield their wonted supply;[1] the soil has become impoverished and many portions of the country hopelessly desolate and irreclaimable. The fixed, industrious, and populous residences of other days have given place to the wretched, restless, roving Arabs who pine in want, consumed by drought, on the fields which God had blessed, and selected as the abode of his chosen, where they should neither fail to eat bread without scarceness, nor lack any thing in it. Over all this land, where "the pastures were clothed with flocks, the valleys covered over with corn, and the little hills rejoiced on every side," now roams the gaunt and hungry Arab, tending his famished flocks amid the ruins of forgotten cities.

> Bare of herbage is the country round,
> Nor springs nor streams refresh the ground.

Not only upon Palestine proper, but upon the Desert of Sinai also, a similar blight has fallen. The population of this desert must anciently have been numerous and powerful; compared with which the present inhabitants are but the gleanings of the summer's vintage. In the Exodus a single tribe for some time resisted the advance of two millions or more of the Israelites. In a pitched battle, with a chosen army under Joshua, the fortune of the day remained a long time doubtful. Israel and Amelek both by turns prevailed. But at present, the entire population of the pen-

[1] The brook Kidron must in the time of the kings of Israel have been a running stream, where now not a particle of water is found, except for a time in the season of the winter rains, 1 Kings xv. 13; 2 Kings xxiii. 6; Neh. ii. 15, etc. Dr. Barclay, in his City of the Great King, has noticed other striking failures about Jerusalem in the supply of water to that ancient city. The same is doubtless true of several other fountains and streams, now lost, of which mention is made in Jewish history.

insula is variously estimated by Burckhardt, Rüppell, and Robinson from four to seven thousand.

It may therefore be assumed as a fact that, since the period of recorded history, the population of the desert has been reduced from numerous and formidable hordes to a few petty tribes, weak and small, who have declined, age after age, with the increasing sterility of this "great and terrible wilderness."

The vast ruins scattered over this wilderness tell of its former resources and population. Dr. Robinson discovered the ruins of a single city, before unknown, which must have contained a population of more than double that of all the tribes of the desert at the present time. These ruins occupy a "level tract, of ten or twelve acres in extent, entirely and thickly covered over with confused heaps of stones, with just enough of their former order remaining to show the foundations and form of the houses and the course of some of the streets. Once, as we judged upon the spot, this must have been a city of not less than twelve or fifteen thousand inhabitants. Now it is a perfect field of ruins — a scene of unutterable desolation — across which the passing stranger can with difficulty find his way." [1]

In this connection the ruined cities of Elusa and Eboda claim each a distinct consideration as indicative of the ancient population of the desert. The former of these, Dr. Robinson supposes, may have contained a population of fifteen or twenty thousand souls, and the latter "must have been a place of importance. But the desert has reassumed its rights; the intrusive hand of cultivation has been driven back, the races that dwelt there have perished, and their works now look abroad, in loneliness and silence, over the mighty waste."

In the desert of Sinai, again, the old city of Pharan, probably the Rephidim of the Exodus, where the Israelites encountered the Amelekites, attests the existence formerly of a numerous population. In the early centuries of the church

[1] Biblical Researches, Vol. I. p. [illegible]

it was the seat of an Episcopal see. The large church, crowning the summit of the hill in the valley, where Moses by his earnestness in prayer may have turned the battle against the foe, the chapel surmounting the neighboring height, and innumerable cells, caves, and hermitages on all the surrounding mountain-tops and declivities, evince the abodes of thousands of anchorets, who must have found subsistence there where now a few Bedouins of the desert scarcely obtain a precarious sustenance. In many other places, scattered over the desert, are found ruined cloisters, hermitages, gardens, and fields, — lone monuments of the people who once inhabited these parched places in the wilderness, now a salt land and not inhabited.

The mysterious Egyptian monuments of Surâbet el-Khâdim, again, evince the existence once in this "waste, howling wilderness" of an ingenious and powerful people. Here are found catacombs and hieroglyphics, and other memorials of the dead, near vast copper mines and enormous mounds of clay. These copper mines, Lepsius learns from the monuments still remaining, were worked here more than three thousand years before the Christian era.[1] They lead us back into the gray mists of antiquity, and constrain us to contemplate with wonder and awe the stupendous remains of men who labored and died here ages before Abraham lived.

In one tract now utterly desolate, "of tolerably fertile soil, capable of tillage," were found by Dr. Robinson the remains of long ranges of low stone walls, which probably once served as the divisions of cultivated fields. Afterwards many such walls were observed which obviously were not constructed by the present race of Arab inhabitants, but must be referred back to an early period.[2]

All these monumental remains point unmistakably to a more numerous and cultivated race, who, in a happier age, under a more propitious climate, cultivated a soil upon which the blight of the desert had not yet fallen.

[1] Lepsius's Letters, Egypt, Ethiopia, and the Peninsula of Sinai, p. 300.

[2] Biblical Researches, Vol. I. p. 281.

Isaac once sowed on this land in the margin of the desert, "now barren and desolate in the extreme," and received "in the same year an hundred fold" (Gen. xxvi. 12). No husbandman could now recover from the same soil the seed sown.

Moses took his wife and his sons, and set them upon an ass, and he returned to the land of Egypt (Ex. iv. 20). No Arab of the desert would attempt the same journey by similar means. It is an utter impossibility except perhaps in the midst of the rainy season.

The brethren of Joseph, once and again went down from the land of Canaan into Egypt, in time of extreme drought and famine, with asses (Gen. xlii. 26; xliv. 13). Jacob with all his sons and their families went down into Egypt by the same means of conveyance, taking with them their cattle (Gen. xlv. 23; xlvi. 6). This route has in a few instances been traversed by modern tourists with horses, though not without subjecting the horse to extreme suffering for lack of water; but neither the ass nor the ox could by any possibility make the journey, which was oftentime accomplished under the pressure of a fearful famine and drought.

The flocks and the herds of the Israelites, "even very much cattle," subsisted for forty years on the desert where at the present time they could only be sustained by a continued and stupendous miracle. The children of Israel repeatedly complained for lack of water for themselves and their flocks, but only in specific localities, at different intervals; nor is there an intimation that their continuous supply was miraculous. In this connection the reflections of Dr. Robinson on this subject are peculiarly pertinent and suggestive: "How they could have obtained a *sufficiency* of water during their whole stay in the peninsula and their subsequent wanderings in the desert, even when want of water is mentioned, is a mystery which I am unable to solve; unless we admit the supposition that water was anciently far more abundant in those regions than at present. As we saw the peninsula, a body of two millions of men

could not subsist there a week without drawing their supplies of water, as well as of provisions, from a great distance."[1] What possible solution of this mystery can be offered other than that of this learned traveller, that the supply of water and of provisions for man and beast was then vastly more abundant than at present over all the desert?

The existence of the *petrified forest* which overspreads the desert between Cairo and the Red Sea, is a significant fact, worthy of particular attention in this connection. This region is a part of the great desert, of which that of the peninsula of Sinai is only a larger section. "If the tree fall toward the south, or toward the north, in the place where the tree falleth there it shall lie." There the trees of this petrified forest are still lying in vast numbers in the place where first they fell, — a perpetual memorial of the primeval forest which originally overspread the desert. But no portion of the wilderness is now more hopelessly barren, more utterly void of vegetation, than that of the petrified forest, which once spread a verdant landscape out over these regions of drought and desolation.

Seetzen, in what is perhaps as arid and desolate a region as any in the whole desert, asked his guide to mention all the neighboring places whose names he knew. He received a list of sixty-three places in the neighborhood of Madŭrah, Petra, and 'Akabah, and of twelve more in the Ghôr es-Sephia, of which total of seventy-five all save twelve are now abandoned to the desert, and have retained nothing but their names, — "proof," he remarks, "that in very early ages this country was extremely populous, and that the furious rage with which the Arabs, both before and after the age of Mahomet, assailed the Greek emperors, was able to convert into a waste this blooming region, extending from the limit of the Hedjaz to the neighborhood of Damascus."[2]

Joshua enumerates "six cities with their villages" (xv. 61, 62) in the wilderness of En-gedi, west of the Dead Sea,

[1] Biblical Researches, Vol. I. p. 106.

[2] Seetzen, Reisen, Vol. III. pp. 17, 18. Cited in Smith's Biblical Dic.

where David lived "among the rocks of the wild goats," and where no human habitation is found but the tents of the wild Arab of the desert.

In view, therefore, of all the foregoing considerations, the conclusion is irresistible that the resources of the desert were aforetime much greater than at present. There the ox and the ass of the patriarch traversed, in safety, the wilderness, and the flocks and the herds of the Israelites found pasturage — there where now only the stricken, starving camel drags on a miserable existence. And primeval forests drank of the dew of heaven and the fatness of the earth, from out of those dreary wastes where now all verdure sickens and dies.

Tantum aevi longinqua valet mutare vetustas.

This devastating change is, in a measure, still in progress in some parts of the desert. Burckhardt, in 1813, near the Aelanitic gulf, passed many ruins of walls, where, half a century before, was a fruitful valley abounding in date-palm, and other fruit trees. These were swept away by a flood, and the whole valley had become utterly waste.[1]

Wellsted records a similar catastrophe in the same region. Rüppell, again, in his route from 'Akabah to Sinai, passed through the Valley of the Fountain, which appeared evidently to have been covered with forest trees.[2] Ritter, in addition to other authorities, cites that of Ewald, the learned historian of the Jews, and concurs himself in the same opinion, that the desert of Sinai anciently sustained a population vastly more numerous than its present inhabitants.[3] Even as late as the seventeenth century, if we may trust the expression of Monconys, the Wady en-Rahâv, north of Horeb, and near the convent of Saint Catharine, now entirely bare, was a vast *green* plain, — "une grande cham-

[1] Travels in Syria, p. 538. Cited by Ritter, Erdkunde, Vol. XIV. p. 219.

[2] Geschichte des Volkes Israel, Bd. II. 1843, § 201, u. s. Compare Ritter, Erdkunde, Theile XIV. pp. 926–928.

[3] Cited by Ritter, Erdkunde, Theile XIV. p. 274.

pagne *verte*."[1] The soil, originally lean and meagre, having no recuperative power in itself, once wasted, changes into an arid desert.

But this change, which in the lapse of ages has passed upon Palestine and the desert, is only such as is incident, more or less, to other lands under the influence of similar causes. Denuded of their native forests, which reduced the temperature of the climate and supplied the sources of fruitful showers, the result is a heated atmosphere and an arid soil. Bad husbandry and improvident tillage lend their influence to augment the increasing sterility. Vast tracts of country, inadequately supplied with the essential elements of a permanent self-sustaining fertility, change thus, in process of time, into desert wastes. As the desert has become utterly desolate, Palestine wasted and worn out, so in other lands the same results are observable, under the operation of similar causes, around the whole circuit of the Mediterranean.

Let us begin our survey on the desert waste of the African shore, of which the desert of Sinai and of the petrified forest is only an integral part. The result is given in the language of an accomplished English scholar: "Within the lapse of what is called historic time, the Lybian wastes have become far more arid than once they were; and in consequence they have acquired a higher mean temperature. North Africa is much less abundant in corn, and is much less graced with tropical vegetation, than in ancient times. In the course of two or three thousand years, the sand hurricanes of Lybia and of the Sahara, in sweeping over the valley of the Nile, have not only sepulchred its sepulchres and entombed its temples and palaces in a covering of ten, or twenty, or thirty feet in depth, narrowing continually the Nile, but they had given dryness for moisture to the neighboring countries. Dense forests once shed coolness and humidity over large tracts of northern Arabia."[2] In this

[1] Cited by Stanley, Sinai and Palestine, p. 26.

[2] Isaac Taylor, Hebrew Poetry, p. 116

connection it is pertinent to refer to ancient authors on the condition of the coast of the Lybian desert, once regarded by the Greeks as a kind of terrestrial paradise, where they located the Gardens of the Hesperides, where flourished the powerful and populous cities of Cyrene and Ptolemais, now given over to irremediable ruin by the encroachments of the desert and the lack of water.[1]

Even the isles of the sea, by the destruction of their forests, are subject to the same deterioration of soil and rise of temperature, notwithstanding all the counteracting influences of the ocean. We shall recur again to the condition of the Grecian Isles, but subjoin in this place a brief remark of Malte Brun, the great geographer: "In the Cape de Verd Islands it is the clearing of the forests which has dried up the springs and rendered the atmosphere sultry. Persia, Italy, Greece, and many other countries have thus been deprived of their delightful temperature."[2]

Barrenness has, in like manner, fallen upon a large part of both Spain and France. The benign influence of forest land upon the soil and climate of a country, and the disastrous influence of the axe in felling the forests of Spain, have been forcibly illustrated in a recent number of Chambers' Journal.

The writer states from personal observation that the great central plateau of Spain is "almost denuded of its primeval forests, leaving it in summer dry, barren of grass, and dreary. The springs and rivers, in summer, are nearly dried up. We inquired the reason: The inhabitants cut down

[1] In Palestine and many other parts of Asia and northern Africa, which in ancient times were the granaries of Europe, fertile and populous, similar consequences have been experienced. These lands are now deserts, and it is the destruction of the forests alone which has produced this desolation. — Asbjörnsen, cited in Man and Nature, p. 189, by G. P. Marsh, a work of vast research and profound erudition, in which the desolation which succeeds the destruction of forests is largely discussed.

[2] Geography, Vol. II. chap. xvii. p. 404. "The terrible droughts which desolate the Cape de Verd Islands must be attributed to the destruction of the forests." — Man and Nature, p. 184.

the trees many years ago, because, they said, the woods harbored birds which destroyed the grain!"[1]

The change of climate in Spain is forcibly manifested by contrasting the statements of Strabo with the present temperature of that country. This geographer, who wrote near the beginning of the Christian era, states that "the part of Spain next to the north, which borders on the ocean, is extremely cold; and besides its rugged character, has no communication or intercourse with other countries, and thus to dwell there is a peculiar hardship."[2]

It agrees with this that the olive, the vine, and the fig, the productions of a warm climate, were not found in the north of Spain. "In olives, vines, figs, and every kind of similar fruit trees, the Iberian coast next the Mediterranean abounds; they are likewise plentiful beyond. Of the coasts next to the ocean, that towards the north is destitute of them on account of the cold."[3]

As in Spain, so also in France, Strabo informs us that on the coast bordering on the Atlantic ocean "the vine either does not grow at all, or attains no maturity."[4] "As we advance towards the north, and the mountains of the Cevennes, the plantations of the olive and fig disappear, but the other fruits remain. Likewise the vine, as you proceed northward, does not easily mature its fruit."[5] This is said of the interior of France, proceeding northward from the coast of the Mediterranean.

Such is Strabo's account of the temperature of France, now proverbially mild and genial. This account of Strabo is fully sustained by Diodorus Siculus, though he seems to

[1] "I do not know at what period the two Castiles were bared of their wood, but the Spaniard's proverbial 'hatred of a tree' is of long standing. Horace vigorously combats this foolish prejudice; and Ponz, in his prologue to the ninth volume of his journey, says that many carried it so far as wantonly to destroy the shade and ornamental trees planted by the municipal authorities. 'Trees,' they contended, and still believe, 'breed birds, and birds eat up the grain.'" — Man and Nature, p. 279.

[2] Book III. chap. II. § 2.

[3] Book III. chap. IV. § 16

[4] Book II. chap. I. § 16.

[5] Book IV. chap. I. § 3.

refer particularly to the north of France, as far as the parallel of the Rhine. Possibly his representations may be qualified by his notions of it as a northern country. "Lying near the north, it [Gaul] is exceedingly wintry and cold. For in the wintry season, in cloudy days, instead of rain abundance of snow falls; and in clear days it abounds in ice and extraordinary frosts, by which the rivers when frozen are by their own nature bridged over; for not only ordinary travellers in small numbers pass over the ice, but immense armies cross over with their baggage and loaded wagons." After naming the Rhone, the Rhine, and the Danube as the principal rivers, and giving some account of them, he adds that there are many other navigable rivers in Gaul. "But almost all of them, hardened by the frost, bridge their currents; and because the ice by its physical properties causes those who are passing over to slip, the crossing is made safe by laying down chaff.[1]

The facts already noted, on the authority of Strabo, of the failure of the olive and the fig at a short distance from the Mediterranean coast, and of the vine also in the interior of France, by reason of the cold, stands in confirmation of these representations by Diodorus of the severity of the climate, and indicate conclusively a great rise of temperature since these authors wrote near the beginning of the Christian era. France is now the vineyard of the world, and the vine grows in the greatest luxuriance several degrees north of France, on the Rhine, the Elbe, and the Danube.

These changes of temperature and climate are justly

[1] Κειμένη δὲ κατὰ τὸ πλεῖστον ὑπὸ τὰς ἄρκτους, χειμεριός ἐστι καὶ ψυχρὰ διαφερόντως. Κατὰ γὰρ τὴν χειμερινὴν ὥραν ἐν ταῖς συννεφέσιν ἡμέραις, ἀντὶ μὲν τῶν ὄμβρων χιόνι πολλῇ νίφεται, κατὰ δὲ τὰς αἰθρίας κρυστάλλῳ καὶ πάγαις ἐξαισίοις πληθύει· δι' ὧν οἱ ποταμοὶ πηγνύμενοι, διὰ τῆς ἰδίας φύσεως γεφυροῦνται. Οὐ μόνον γὰρ οἱ τύχοντες ὀδῖται κατ' ὀλίγους κατὰ τοῦ κρυστάλλου πορευόμενοι διαβαίνουσιν, ἀλλὰ καὶ στρατοπέδων μυριάδες μετὰ σκευοφόρων καὶ ἁμαξῶν γεμουσῶν ἀσφαλῶς περαιοῦνται ..... Πάντες δὲ σχεδὸν ὑπὸ τοῦ πάγου πηγνύμενοι, γεφυροῦσι τὰ ῥεῖθρα, καὶ τοῦ κρυστάλλου διὰ τὴν φυσικὴν ἰδιότητα ποιοῦντος τοὺς διαβαίνοντας ὀλισθαίνειν, ἀχύρων ἐπιβαλλομένων ἐπ' αὐτούς, ἀσφαλῆ τὴν διάβασιν ἔχουσι. — Biblioth. Hist., Lib. V. c. 25.

ascribable to the various agencies of man in opening a country and reducing it to a condition adapted to the diversified wants of civilized life. For this end all the resources both of nature and of art are made subservient to man. "Now, fire, water, steam, gravitation, his own muscular strength, and that of animals rendered obedient to his will, are the instruments by which he has converted the desert into garden, drained marshes, cut canals, made roads, turned the course of rivers, cleared away forests in one country and planted them in another. By these operations he has altered the climate, changed the course of local winds, increased or diminished the quantity of rain, and softened the rigor of the seasons. In the time of Strabo, the cold in France was so intense that it was thought impossible to ripen grapes north of the Cevennes.[1]

In this connection let us particularly notice the effect of these influences, not only upon the climate and seasons, but upon the sources of supply, from above and from beneath, of water upon the earth. A late French writer has shown "that within two centuries the extent of forest in France has been reduced *by two thirds;* and that according to the calculations of the illustrious Laplace, if this extent of forest be not restored fuel will entirely fail." He adds that by this destruction of the woods the supply of water has been reduced, and in many places its sources have entirely failed.[2]

Several of the Alpine provinces of the south of France, comprising a territory of fourteen or fifteen thousand square miles, have, within the last generation, been reduced to the most appalling desolation by the clearing of their forests. "Signs of unparalled destitution are visible in all the mountain zone, and the solitudes of these districts are assuming an indescribable character of sterility and desolation. The gradual destruction of the woods has, in a thousand localities, annihilated at once the springs and the fuel." The

[1] Miss Somerville's Physical Geography, chap. XXXIII. p. 451.

[2] De l'Influence des Déboisments, etc., par M. Paul Laurent, Prof., etc., a Nancy.

population has decreased or entirely withdrawn from these fearful wastes of the woodman's axe. "I have, the present season," says Blanqui, in 1843, "found not a living soul in districts where I remember to have enjoyed hospitality thirty years ago." Authorities to the same effect, and terrible statistics, in extended detail, are given in the work from which these citations are taken.[1] The following statement indicates the efforts of the tree to recover itself and repair the desolations made by man on the earth. The governments of Europe have of late sought by legislation to aid this restorative process of nature. Many thousands of dollars are annually expended in France to restore by culture the woods in her southern provinces. "The law of July 28, 1860, appropriated ten million francs, to be expended, at the rate of one million of francs per year, in executing or aiding the replanting of woods. It is computed that this appropriation will secure the creation of new forest to the extent of about two hundred and fifty thousand acres."[2]

Humboldt found that in consequence of the clearing of forests in the valley of Aragua, in the province of Venezuela, during a century, the waters of Lake Tacarigua had been much diminished. This cause having ceased, M. Boussingault, twenty years afterwards, found that, with the growth of the forests, the surface of the lake had regained more than half its ancient bed.[3]

The classic authors of Rome abundantly attest the severity of an Italian winter in their day, even in this bland and sunny land, where now ice and snow are seldom seen, and frost but slightly felt, except upon the mountains. The change of climate in this country, and the causes thereof, have been distinctly noted by the learned Dr. Arnold.

"On the Apennines, and in Etruria, and in Latium the forests occupied a far greater space than in modern times. This would increase the quantity of rain, and consequently

[1] Man and Nature, pp. 237 – 252. [2] Man and Nature, p. 396.

[3] Cited by Capt. William Allen, Dead Sea, Vol. II. pp. 279 – 281. Compare Man and Nature, p. 242.

the volume of water in the rivers; the floods would be greater and more numerous; and before man's dominion had completely subdued the whole country there would be larger accumulations in the low grounds, which would still further increase the coldness of the atmosphere. The language of most writers on the whole favors the same conclusion, that the Roman winter in their day was more severe than it is at present. It agrees with this that the olive, which cannot bear a continuance of severe cold, was not introduced into Italy until long after the vine. Fenestena asserted that it was unknown as late as the reign of Tarquinius Priscus, and such was the notion entertained of all inland countries, even in the latitude of Greece, that Theophrastus held it to be impossible to cultivate the olive at the distance of more than forty Roman miles from the sea."[1] But at the present time Italy is not only the natural habitat of the olive and the fig, but even the tropical spices, the clove and the pepper tree, flourish in the gardens of Rome as in their native climate. These facts stand as decisive proof of a great change of climate in Italy.

Dr. Arnold adds in a note that "the *freezing of the rivers*, as spoken of by Virgil and Horace, is an image of winter that would not, at the present day, suggest itself to Italian poets at any point to the south of the Apennines." He cites also the authority of Chevalier Bunsen, who, after a residence of seven years at Rome, affirms that "ice in the Tiber is now as unknown as it would be between the tropics." But Horace, after all due allowance for poetic licence, leaves us the image of a stern winter's day, even for our own latitude: Soracte in the distance covered with snow and ice — the woods bending under the weight of the snow, and the rivers congealed in their course by the cold.[2]

[1] Pliny, Nat. Hist., Lib. XV. I. Arnold's Hist. of Rome, chap. XXIII.

[2] Vides ut alta stet nive candidum
Soracte; nec jam sustineant onus
Sylvae laborantes; geluque
Flumina constiterunt acuto. — Od. I. 9.

We subjoin a few familiar passages from the same author which indicate the prevalence of snow and ice as a common phenomenon of an Italian winter.[1]

Juvenal, in his terrible satire on Roman women gives an account of a superstitious woman *breaking the ice* of the Tiber to bathe in its wintry stream.[2]

To the same effect are also Virgil's representations of the severity of an Italian winter — the earth congealed, and the fields covered with hoarfrost.[3] As a prudent and careful shepherd he commands an ample supply of straw and fern for a litter to protect the tender flock of sheep from the cold.[4] Even the hardy goat requires the same attention to protect him against the rigors of an Italian winter[5] in the south of Italy, where the rivers are frozen and the rocks rent by the frost.[6] From these representations make the most liberal abatements for poetic exaggeration, and you must leave a cold reality, quite unlike all that is now known of the frosts and rigors of winter in the south of Italy.

But perhaps the strongest proof that the rivers of Italy were usually frozen over in winter, is derived from Aelian, who devotes an entire chapter to a description of the mode

[1] Positas ut glaciet nives
Puro numine Jupiter. — Od. III. 10. 7.
Diffugere nives. — Od. IV. 7. 1.
Bruma nives Albanis illinet agris. — Epist. Lib. I. 7. 10.
Cum tonantis annus hibernus Jovis
Imbres nivesque comparat. — Epod. 2. 29.

[2] Hibernum *fracta glacie* descendet in amnem;
Ter matutino mergetur. — Sat. VI. 522–523.

[3] Rura gelu tunc claudit hyems, nec semine jacto
Concretam patitur radicem affigere terrae. — Geor. II. 317.
Horrida cano bruma gelu. — Geor. III. 443.

[4] Et multa duram stipula filicumque maniplis
Sternere subter humum glacies ne frigida laedat
Molle pecus. — Geor. III. 297.

[5] Ergo omni studio glaciem, ventosque nivales
Avertes. — Geor. III. 317.

[6] Et cum tristis hyems etiamnum frigore saxa
Solveret, et glacie cursus fraenaret aquarum. — Geor. IV. 136.

of catching eels in the river Po, when it is frozen over with ice. This scrap of history is at once so curious and so conclusive that we insert the description, giving the original in the note.[1] The scene of this fishery is on the river Po, at the junction of the Tanarus with it, near the city of Turin. In a cove or small bay in the river's bank, where the eels are accustomed to lie collected in a tangled mass, the fishermen, "in the early spring, while the river is still bound fast with the ice, cut away a circular trench, and let down a wide net, made fast to the margin of the ice by strong ropes, to cut off from the eels all chance of escape. Then the men on the bank, in large numbers, detaching the ice from the land, drag the net ashore, filled with fish, with the ice, and the fishermen upon it, as if borne along on a floating island." But we are informed by a gentleman who has resided several years in the north of Italy that "he has crossed the Po, and some other rivers of northern Italy, at all seasons of the year, and never knew nor heard of their being frozen over." From the foregoing authorities it must be accepted as an undeniable conclusion that in all Italy a great change of climate and temperature has ensued since Virgil and Horace, Juvenal and Aelian lived.

[1] Εἶτα ὑπαρχομένου τοῦ ἦρος, τῶν ῥευμάτων τῶν προειρημένων δι' ἣν αἰτίαν εἶπον ἔτι ἑστώτων, κολπώδη τινὰ τόπον προαιροῦνται οἱ γεωργοὶ τέως, νῦν δὲ ἁλιεῖς, καὶ περιτέμνουσι τοῦτον εὖ μάλα πεδηγμένοις πελέκεσι, καὶ τὸ ὕδωρ ἀναφαίνεται περιφερὲς κατὰ τέλμα· οὐ μὴν πλησίον ἔτι τῆς ὄχθης κόπτουσιν, ἀλλὰ ἐῶσι τὸν κρύσταλλον ὡς ἐξ ἀρχῆς ἐνεπράφη· περιβάλλουσιν οὖν τῷ χώρῳ τῷ γεγυμνωμένῳ πλατὺ δίκτυόν, καὶ μέντοι περιβάλλουσιν [lege αὐτῷ] αὐτὸ κάλων ἀδρότερον. Καὶ τοῦτό γε τὸ δίκτυον ἐπισπῶσιν ἄνδρες ἐπὶ τῆς ὄχθης ἑστῶτες, καὶ ἁλιεῖς καὶ ἄλλοι· καὶ μέντοι τὴν τῶν ἰχθύων ἅλωσιν θεῶνται πολλοί, τῆς τέχνης οὐκ ἐπαΐοντες, ψυχαγωγία δέ τις ὑπεισιν αὐτούς. Ὅταν γε μὴν ἀγόμενοι τῆς ὄχθης πλησίον ἀφίκωνται, τηνικαῦτα καὶ τὸν ἐντεῦθεν τέμνουσι κρύσταλλον [lege οἱ ἔξωθεν· οἱ ὑδροθῆραι γὰρ αὐτοὶ τῇ θήρᾳ.] οἱ ἔξωθεν ὑδροθῆραι· τῇ γάρ τοι θήρᾳ ἐνέχονται, καὶ ἀναστέλλονται τοῖς ἰχθύσι τὸν ἔξω πόρον. Τούτου δὲ οὕτω γενομένου, πλῆρες ἰχθύων τὸ δίκτυον ἐκεῖνο τὴν περιτμηθεῖσαν ἐκωθεῖ τοῦ κρυστάλλου πέτραν, καὶ [lege συνεπάγει.] συνεπάγη, καὶ οἵ γε ἐφεστῶτες ἁλιεῖς αὐτῇ ἐοίκασιν ἐπὶ νήσου φέρεσθαι πλωτῆς.— Aelian, de Nat. Anim. (ed. F. Jacobs). Jena, 1832. XIV. 29.

For this passage from Aelian we are indebted to an able Article on The Change of Climate in Italy and some other Countries, by the Hon. Daines Barrington, in the Philosophical Transactions of the Royal Society of London, Vol. LVIII.

The following paragraph from Gibbon's Decline and Fall of the Roman Empire indicates a similar change of temperature in Germany: "Some ingenious writers have suspected that Europe was much colder formerly than it is at present; and the most ancient descriptions of the climate of Germany tend exceedingly to confirm their theory;" in proof of which the author specifies two remarkable circumstances:

"1. The great rivers which covered the Roman provinces, the Rhine and the Danube, were frequently frozen over, and capable of supporting the most enormous weights. The barbarians, who often choose that severe season for their inroads, transported, without apprehension of danger, their numerous armies, their cavalry, and their heavy wagons over a vast and solid bridge of ice. Modern ages have not presented an instance of a like phenomenon. 2. The reindeer, that useful animal, from whom the savage of the north derives the best comforts of his dreary life, is of a constitution that supports, and even requires, the most intense cold. He is found on the rock of Spitzberg, within ten degrees of the Pole; he seems to delight in the snows of Lapland and Siberia, but at present he cannot subsist, much less multiply, in any country to the south of the Baltic. In the time of Caesar the reindeer, as well as the elk and the wild bull, was a native of the Hercynian forest, which then overshadowed a great part of Germany and Poland. The modern improvements sufficiently explain the causes of the diminution of the cold. These immense woods have been gradually cleared, which intercepted from the earth the rays of the sun. The morasses have been drained; and, in proportion as the soil has been cultivated, the air has become more temperate. Canada, at this day, is an exact picture of ancient Germany. Although situated in the same parallel with the finest provinces of France and England, that country experiences the most rigorous cold. The reindeer are very numerous, the ground is covered with deep and lasting snow, and the great river of St. Lawrence is regu-

larly frozen, in a season when the waters of the Thames and the Seine are usually free from ice."[1]

Ovid earnestly represents, in many passages, that the region of Bulgaria west of the Black Sea and south of the Danube, to which he was banished, had all the rigor of a Siberian climate. He appeals to the personal experience of the Roman governors, whom he names, for the truth of his assertion, that not only the Danube, but the sea itself to a great extent, was frozen in winter; that his wine was served on the table in broken fragments, and that the snows of winter often remained through the whole summer. Modern travellers describe this inhospitable climate as now temperate and genial; and the soil as yielding in abundance the fruits and crops of the season. After making large allowance for the exaggerations of the impatient, exiled poet, the passages cited in the margin constrain us to recognize a great change of climate since the days of Ovid, in the region of the Danube and the Black Sea.[2]

Hungary, on the same parallel as this inhospitable country,

[1] Gibbon, Decline and Fall of the Roman Empire, Vol. I. chap. IX.

[2] Ipse vides certe glacie concrescere Pontum:
Ipse vides rigido stantia vina gelu.
Ipse vides, onerata ferox ut ducat Jazyx
Per medias Istri plaustra bubulcus aquas.—
Ovid, Epist. ex Pont., Lib. IV. 7.

Mentiar, an coeat duratus frigore Pontus;
Et teneat glacies jugera multa freti. — Lib. IV. 9.

Hic agri infrondes, hic spicula tincta venenis:
Hic freta vel pediti pervia reddit hyems.
Ut qua remus iter pulsis modo fuerat undis,
Siccus contemta nave, viator eat. — Lib. IV. 10.

Nix jacet: et jactam nec sol pluviaeque resolvunt:
Indurat boreas, perpetuamque facit
Ergo, ubi delicuit nondum prior, altera venit;
Et solet in multis manere locis.
. . . . . .
Quaque rates ierant, pedibus nunc itur: et undas
Frigore concretas ungula pulsat equi.
Perque novos pontes, subter labentibus undis
Ducunt Sarmatici barbara plaustra boves.—
Tristium, Lib. III. 10

next to France, is now the greatest wine-producing country of Europe. Wine is the universal beverage among the rich and the poor.

But Strabo fully sustains the representations of Ovid: "Near the mouth of the Palus Meotis, [the Sea of Azof] the frost is so strong that a general of Mithridates defeated the barbarians here, in a cavalry engagement during the winter, and on the very same spot in a naval fight in summer, when the ice was thawed.[1]

Indeed, the parallel of the mouth of the Don and of the Dnieper is, according to this author, the limit of the habitable parts of the world: "The countries beyond this, which border upon the regions uninhabitable on account of their cold, have no interest to the geographer."[2] "We are acquainted with the mouths of the Don; but a small part only of the tract above these is explored, on account of the severity of the cold and the destitute state of the country."[3] The passage across the Cimmerian Bosphorus, he informs us, "is at times performed in wagons, thus being both a sea passage and an overland route,"[4] as the season may determine.

The limits of the habitable parts of the earth on the north might be indicated, according to our author, by a line running from the mouth of the Sea of Azof to the north of Ireland: "The geographer should attend to none but our own habitable earth, which is defined by certain boundaries,—on the south by the parallel which passes over the Cinnamon country; on the north, by that which pass over Ierna"[5] [Ireland]. "Modern writers tell us of nothing beyond Ierna, which lies just north of Britain, where the people live miserably and like savages, on account of the severity of cold."[6] The farthest voyages northward were to Ireland, "which, on account of its extreme cold, barely sustains life."[7] But the climate of Ireland is now mild and temperate, like that of the middle latitudes of our own states.

[1] Book II. chap. I. § 16.
[2] Book II. chap. V. § 43.
[3] Book XI. chap. II. § 2.
[4] Book VII. chap. III. § 18.
[5] Book II. chap. V. § 34.
[6] Book II. chap. V. § 8.
[7] Book II. chap. I. § 13.

Polybius, B.C. 146, describes the climate, even of Arcadia, as "very cold and severe," in strong contrast with the present climate of Greece. On account of this rigor of their climate[1] he supposes it was that the Arcadians themselves were strong and rough in character, except as qualified and refined by their culture of music.

Fraas has endeavored to show, by the history of vegetation in Greece, not merely that clearing and cultivation have affected climate, but that change of climate has essentially modified the character of vegetable life.[2]

In view of all these data, the conclusion is irresistable that in the south of Europe, along the whole line of the Mediterranean, the climate and seasons have greatly changed, and the temperature increased as the forests have been cleared away for the service of man, and the soil subjected to tillage in the progress of civilization.

Can this coldness in the classic ages of Greece and Rome have been the lingering chill of that unknown, mysterious glacial period in which a great part of Europe lay incrusted under boundless fields of ice? Once, we know not when; for ages, we know not how long; and for causes alike mysterious, inscrutable, this quarter of the world must have been overspread with stupendous fields of glaciers, and buried deep beneath their ample folds of thick-ribbed ice. Can, then, the cold of the early historic ages of Europe be the lingering influence of that long, dark, and dreadful winter which, in ages yet more distant, wrapped her in those fearful folds of more than polar ice and snow? In answer to this inquiry, science the most profound sits in dumb amazement, musing silently over this unsearchable mystery.

Let us turn to topics more obvious to our comprehension. In Syria the change of *temperature* may perhaps have been less marked than in Europe. There, so far as is known, the fig and the olive have ever grown together, as at present.

[1] Διὰ τὴν τοῦ περιέχοντος ψυχρότητα καὶ στυγνότητα. — Lib. IV. c. 21.

[2] Man and Nature, p. 9.

But a variation of a few degrees of temperature would break up the companionship of these two indigenous fruits of Palestine. With the exception of temperature, however, the change of climate and seasons in this country appears to have been greater than in those on the coast of the Mediterranean, which have passed in review before us.

"Most travellers have noticed the almost *treeless* condition of eastern countries. On the shores of the Euxine Sea, and especially on the *northern* slopes of the mountains of Asia Minor; having perhaps never been very thickly peopled, the primeval forests have never been subdued. This primeval belt stretches almost from the Archipelago to the Caspian Sea. But of this mountain range, the back-bone of Asia Minor, all travellers describe the southern slopes as a perfect contrast to the well-wooded northern side. 'The huge forms of these hills are all bare,'[1] except in some few localities difficult to be reached."

"In the central basin of Asia Minor, containing the great salt lake of Tuzzoli, the country is remarkable for its wild and stony districts, which are all wanting in wood, though it has fertile plains.

"All the hills and mountains in the neighborhood of Smyrna are extraordinary in their nakedness, as well as those of the south coast of the Bosphorus; and these countries are comparatively deserted.

"The mountains of the Peloponnesus, as well as nearly all the islands of Greece, are bare, and the population is so scanty as to form the mockery of a kingdom."[2] Long ages since have passed away the forests, woodlands, and groves of classic Greece; the haunts of her wood-nymphs, poets, and philosophers. Now their fair land, with her thousand isles, and the whole coast of Asia Minor, and Palestine herself, — treeless, bald, and barren, arid and desolate, — all wear the common aspect of neglect, decay, and destitution.

[1] See Hamilton, Ainsworth, Walpole, War. Smyth, and others.

[2] The Dead Sea, a new Route to India. By Capt. William Allen. Vol. II. pp. 277–279.

In all the East, indeed, this process of deterioration is still in progress. Far away in the east the process itself is forcibly sketched by one of the missionaries of the Presbyterian Board of Missions in India, as having passed under his own observation. The valley to which his remarks have reference is near the river Indus and the boundaries of Hindostan and Afghanistan.

"Forty years ago Lord Elphinstone was charmed with the aspect of this valley, when on his way to the ill-fated Shah Shujah. He entered it in March, and that certainly is the finest month in this region. He would then see the plain clothed with richest verdure; the gardens and trees just covered with fresh foliage; the river banks fringed with willows and tamarisks; the orchards, rich with their immense variety of blossoms; while a few groups of date-trees, and the never-failing peeput tree, hiding some Hindu tank or temple, would remind the traveller of the heat that must reign here during the summer months.

"But the thirty years of strife succeeding have crushed out the beauty and opulence of this unhappy valley. One victorious army took possession of it only to yield in turn to another more powerful, until at length it fell under the comparatively peaceful but hated rule of the British; and though the land is very slowly and slightly improving, the poverty of resources makes rapid advances in improvement impossible. A few orchards have again sprung up here and there, and kind nature does much to beautify the most desolate scene. But the remains of alleys of trees, ruined fountains, dilapidated tanks, ornamental groves, neglected bridges over now dry water-courses, are the sad reminders of past times. Much of the valley lies uncultivated; and it is a curious observation one is often forced to make in many portions of India, the Punjab, and Afghanistan, that nature resents fiercely the neglect of man: regions left uncultivated for many years, through wars and misrule, change evidently their character; where there are abundant indications of past fertility and richness, the land now seems often abso-

lutely irreclaimable. I apprehend much of the same nature has taken place in the land that once flowed with milk and honey — Palestine. It is certain that Persia has gone through that process; and no Cyrus, even, *could* ever make Persia a prosperous empire again."

It appears, then, that in all of northern Africa and southern Europe, in Greece, Asia Minor, Syria and the desert of Arabia, the destructive agency of man has changed climate and soil alike, exhausted the fertility even of those countries which were distinguished by the most happy combination of physical advantages, and reduced many of them to frightful, remediless desolation. A large part of the Roman Empire, once fertile and populous, has, by the improvidence of man, been withdrawn from human uses, and abandoned to hopeless sterility; and the destruction of the forests has caused this desolation.

On the other hand, the influence of forests in collecting moisture and diffusing it through the soil is subjected to the test of actual observation by the Rev. Mr. Van Lennep, of the American Board of Missions in the eastern part of Asia Minor, in Asiatic Turkey. The following extract is from a late number of the Missionary Herald. It should be noted as another illustration of the important service which our foreign missionaries render to the public by their contributions to our current literature and science.

"In this region, some three thousand feet above the sea, the trees are mostly oak, and attain a large size. I noticed an illustration of the influence of trees in general in collecting moisture. Despite the fog, of a week's duration, the ground was everywhere perfectly dry. The dry oak leaves, however, had gathered the water, and the branches and trunks of the trees were more or less wet. In many cases the water had run down the trunk and moistened the soil around the roots of the tree. In two places, several trees had each furnished a small stream of water, and these uniting had run upon the road, so that travellers had to pass through the mud, although, as I said, everywhere else the ground was

perfectly dry. Moreover, the collected moisture was not sufficient to drop directly from the leaves, but in every case it ran down the branches and trunk to the ground. Further on we found a grove, and at the foot of each tree, on the north side, was a lump of ice, the water having frozen as it reached the ground. This is a most striking illustration of the acknowledged influence of trees in collecting moisture; and one cannot for a moment doubt that the parched regions which commence at Sivas, and extend in one direction to the Persian Gulf and in another to the Red Sea, were once a fertile garden, teeming with a prosperous population, before the forests which covered the hill-sides were cut down, — before the cedar and the fir-tree were rooted up from the sides of Lebanon."

It follows that a wooded soil is favorable to the production of springs; even the half civilized Turks are well aware of this influence of woodlands on the ground which they occupy. There is at this day, in the neighborhood of Constantinople, a splendid wood of the finest beech and oak which is protected by law because it feeds a spring which supplies the city with water, conducted there by an aqueduct.[1]

The moisture, the shade, and the evaporation of the woods produce also a cooler atmosphere and a lower temperature.[2] Humboldt includes among the causes which tend to lower the mean annual temperature, the existence of extensive woods, "acting in a threefold manner, by shade, evaporation, and radiation."[2]

The woodlands of a country perform an important office, not only in collecting and retaining the moisture of the soil by overshadowing the land and staying the exhausting process of evaporation, but they at the same time spread out from their leaves a boundless evaporating surface to supply the atmosphere with requisite moisture, drawn by the roots

[1] Many similar examples of the influence of the forest on springs are recorded in the Hon. G. P. Marsh's learned work, Man and Nature, pp. 197 – 209.

[2] Cosmos, Vol. II. pp. 319 – 320.

from hidden springs within the earth, without exhausting the surface of the soil. The *extent of surface* which is opened out by the leaves of a forest for evaporation outruns all calculation; and the aggregate amount of water that, by this process, is drawn off into the skies is equally vast, immeasurable, inconceivable.[1] Various attempts have been made to estimate the amount of evaporation from the trees of a forest. These experiments, though but approximations to the truth, have brought out the most surprising, startling results. By an experiment conducted some years since with great care in Vermont, an acre of forest trees was found to throw off, on the 12th of June, eight hundred and seventy-five gallons in twelve hours.[2] By another independent process, an acre of wheat, in luxuriant growth, has been estimated to give off two thousand five hundred gallons of water in twenty-four hours. A distinguished naturalist, who has bestowed much attention on this subject, has expressed the opinion that the amount of evaporation from a given surface of woodland is as great or greater than that from lake or sea of the same extent. But the evaporation in twenty-four hours from a tropical sea is, according to Maury, equivalent to a sheet of water half an inch in thickness over the evaporating surface. In our latitude the average evaporation in the summer months, by the most careful observation, is found to equal two hundred and twenty-one one thousandths of an inch in the same time. According to these estimates, the evaporation from an acre of water in the tropics equals eleven thousand one hundred and twenty-two gallons, and in our latitude it equals four thousand eight hundred and eighteen gallons, in a day. These several estimates, though but approximations to the truth, sufficiently show how vast is the amount of water that is drained off from sea and land by evaporation.

[1] The Washington elm at Cambridge, a tree of no extraordinary size, was some years ago estimated to produce a crop of seven millions of leaves, exposing a surface of two hundred thousand square feet, or about five acres of foliage. Man and Nature, p. 146.

[2] See Williams's History of Vermont, pp. 89–91.

"All the rivers run into the sea, yet the sea is not full," because all their waters are taken up by evaporation. "Unto the place whence the rivers come, thence they return again." The sea is but a vast evaporating basin, a part of a stupendous system of hydraulics, by means of which all the rivers of the earth are made to discharge their contents, through the seas, into the skies.

How beneficent the providence of God in establishing this stupendous laboratory of nature for the health and happiness of all the living. The rivers drain from the land, in decaying animal and vegetable matter and noxious miasmata, many ingredients of disease, and flow on to the ocean, turbid, foul, and feculent, charged with pestilence and death. But by this wondrous process of distillation, they return, through the skies, pure, fresh, and sweet, shedding down, anew, streams of life and health and joy over all the earth.

But be it remembered the while, that we are not indebted to the ocean alone for these streams of life and health. This vast laboratory is in like ceaseless action over all the wide world, on the dry land as well as upon the sea. The distillations from the forests especially, in proportion to their extent, send up a freer, fuller flow of waters into the heavens to refresh and water the earth.

But when the forest has been removed, the "great reservoir of moisture stored up in its vegetable mould is evaporated, and returns only in deluges of rain to wash away the parched dust into which that mould has been converted. The well-wooded and humid hills are turned to ridges of dry rock, which encumbers the low grounds and chokes the water-courses with its *debris*, and — except in countries favored with an equable distribution of rain through the seasons, and a moderated and regular inclination of surface, the whole earth, unless rescued by human art from the physical degradation to which it tends, becomes an assemblage of bald mountains, of barren, turfless hills, and of swampy and malarious plains. There are parts of Asia Minor, of Northern Africa, of Greece, and even of Alpine Europe,

where the operation of causes set in action by man has brought the face of the earth to a desolation almost as complete as that of the moon; and though, within that brief space of time which we call 'the historical period,' they are known to have been covered with luxuriant woods, verdant pastures, and fertile meadows, they are now too far deteriorated to be reclaimable by man; nor can they become again fitted for human use, except through great geological changes, or other mysterious influences or agencies of which we have no present knowledge, and over which we have no prospective control."[1]

These considerations illustrate the part which the forests of a country are designed to play in the economy of Providence. Where the supply of atmospheric water is deficient and the distribution unequal, as in Palestine, and the temperature high, there the presence of extensive forests is indispensable to qualify excessive heat, and by their various fertilizing influences, to sustain the productions of the earth. Remove these forests, and the country changes to a dry and thirsty land; the labor of the husbandman fails; "the heaven overhead becomes brass, and the rain of the land powder and dust."

On the contrary, where the waters of the earth are in excess, as in the valley of the Mississippi for example, there the clearing away of the forests promotes, by evaporation from the surface, the drainage of the waste waters, and redeems the soil from the floods for the service of man. The rivers, the natural channels for draining the land, do in reality carry off but a small part of its superfluous waters. Far the larger portion is taken up by evaporation.

The Commissioner of Patents at Washington, in his Report on Agriculture for the year 1859, has an instructive paragraph on the effect of cutting away the forests on the shores of the Mississippi in diminishing the waters of this river.

"In a report made by Andrew Brown and Hon. M. W.

[1] Man and Nature, p. 43.

Dickeson to the American Association in 1849, these gentlemen remark that the annual quantity of rain that falls in the valley of the Mississippi may be estimated at 169,128,960,000,000 cubic feet, which is about 11⅜ or 11.3636 times the quantity which is discharged by the river; or, in other terms, $\frac{3}{11}$ pass off by evaporation and $\frac{8}{11}$ are discharged by the river. There can be but two ways by which this immense quantity of water can make its escape from the valley; one is by the course of the river, the other, by evaporation. Thus we arrive at a fact of the most momentous importance to the planting interests of Louisiana and Mississippi; for it will be at once perceived that the more exhalations are promoted, the less liable will the low or bottom lands of these two states be to the periodical inundations by the river.

"If it is asked by what process it is expected that evaporation can be promoted over such an extensive area as the Mississippi valley, so as visibly and permanently to affect the planting interests of the above-named states; the answer will be found in the fact that the process has been, and is now, in the most rapid and successful progress, and of that kind which is the best calculated to produce so desirable a result, viz. the clearing of such large portions of the valley of its forest for the promotion of agriculture, and the consequent exposure of the lands to the action of the sun and winds, the very best promoters of the evaporating process, particularly on a large scale.

"So rapid is the progress of this increased exposure, and its consequent evaporating tendency, that one may hazzard the assertion with safety, *that there is not now, by twenty-five per cent, as much water passing down the Mississippi as there was twenty-five years ago.*"[1]

Our author proceeds to show that vast tracts which were then annually overflowed and valueless are now in a "high

[1] The river Volga, the life artery of Russian internal commerce, is drying up from this cause, and the great Muscovite plains are fast advancing to a desolation like that of Persia. — Man and Nature, p. 299.

state of cultivation," and adds: "Such changes are progressing, generally unsuspected and overlooked, but not the less sure."[1]

In the Professional Papers of the United States Topographical Engineer Corps, whose observations and operations were in progress during ten years ending with 1860, it is stated that only about a quarter of the water that falls in the valley of the Mississippi runs off by the river, the other three quarters passing off by evaporation, or by striking into the ground.[2]

The humidity of the atmosphere depends pre-eminently on the forests of a country. The prevalence of fogs, vapor, clouds, streams, rain, and snow is determined in a great measure by the same source of supply. These all modify or determine the temperature of the climate in a given latitude as relatively cold or hot, humid or dry. The mountains and highlands both of the Levant and of Palestine, beyond a doubt originally covered with forests, were at once the original refrigerators of the climate and fertilizers of the soil. They sustained a vast evaporation which mitigated the intolerable heat of the climate. They cast over the land their cooling shade, and spread out the clouds as a covering from the scorching heat of a cloudless sky. They caused the timely vicissitudes of sunshine and rain. They brought on both the small and the great rain in their season, causing the grass to grow for the cattle, and herb for the service of man. They fed a thousand hidden springs with fountains, rills, and streams which ran among the hills, giving drink to every beast of the field. But these same mountains and hills, now treeless, bald, and barren, only give off in the rainy season, desolating winter torrents, mixed with the waste of barren heights to spread barrenness over the fields which once they enriched with their deposits. Thus, by the operation of fixed laws of nature, Palestine, once flowing with milk and honey, has become a parched land; much of it

[1] Patent Office Report, 1859, pp. 144–145.

[2] See No. 4 of the Series, by Lippincott and Co. 1861.

hopelessly desolate. The rivers are turned into a wilderness, the water springs into dry ground, a fruitful land into barrenness. The land still retains lingering traces of great fertility: portions of it continue to yield an abundant increase, particularly in wheat. Doubtless much more might, by skilful husbandry, be restored; but it is mainly a waste land, bare of verdure, barren, and unproductive.

Manifold and powerful are the causes which, for thousands of years, have been in operation upon Palestine and the Desert, in common with the other countries which have passed in review before us, to work out this strange contrast of the past with the present.

In this connection the changes in the productions of Palestine are worthy of notice, as indicative of a change of soil and climate. Several of the distinguishing products of the country have entirely disappeared; others linger in decayed and stinted growth, as if struggling for subsistence on the unfriendly soil which once generously yielded them a boundless luxuriance. The balsam, for example, or the balm of Gilead, once included in the costly merchandise of the country, of which Theophrastus, Dioscorides, Pliny, and Justin, Strabo and Josephus, make mention, in common with the scriptures — this has entirely disappeared. Not a vestige of the palm remains on all the plains of the city of Palm Trees, and but a few solitary remnants linger in all the land. The vine, which once sent out her boughs unto the sea, and her branches to the river, has withered away. It still flourishes in the valley of Eschcol, but is rarely seen on the hills which once were covered with the shadow of it. "The spoiler has fallen upon her summer fruits and her vintage, and joy and gladness is taken from the plentiful field." The labor of the olive has failed in a great measure. Near Bethlehem an extensive olive-yard is cultivated; a few olive-trees still linger in Gethsemane, at the base of the Mount of Olives; elsewhere, at distant intervals, a few may be seen, lone remnants and representatives of former luxuriance. Even the fig languishes, as if hastening on to its

final extinction. At Jerusalem, in answer to the inquiry: How can the city obtain a supply of fuel; there is no forest timber in all the land, no coal or peat? the missionaries resident there replied: "There is no lack of fuel. The city is abundantly supplied from the roots of olive-trees, which are grubbed up and brought to market, as from an exhaustless storehouse; the supply always equaling the demand." This single fact presents the past productiveness of the land in striking contrast with its present destitution.

But desolate though this good land may be, even in her desolation she remains an undeniable witness still of the truthfulness of all that the sacred historians, prophets, and poets have said and sung of her goodly mountains, her charming landscapes, her exuberant soil, and matchless productions.

The glory has indeed departed from this holy land, but it is holy still, hallowed by the presence of godly men, — patriarchs prophets, apostles, martyrs enshrined in her tombs; thrice hallowed by the foot-prints of the Son of Man; thrice hallowed by his heavenly words and works, by the tears, the blood he shed for our redemption. Palestina, Judea, that holy land! her tragic history, the sorrowful catastrophes of her wondrous story, the holy memories and sacred associations that throng around her still, in the sear and yellow leaf of age, — these all lend a strange charm to her faded features, which smile in desolate beauty on her rugged hills, and sink in sad repose on her silent, deserted plains.

> Blest land of Judea — thrice hallowed of song,
> Where the holiest of memories, pilgrim-like, throng
> In the shade of thy palms, on the shores of thy sea,
> On the hills of thy beauty, — my heart is with thee.