

## VII.

## THE DECLINATION TOWARDS THE SOUTH SEA. CLIMATE.

In a former chapter I directed attention to the gigantic forms, and uninterrupted succession of the highlands of Mexico, South America also has plateaus, and those of Quito, Cusco, Cundinamarca are in part loftier than those of Mexico. But they are separated from each other by profound and extensive valleys, and bounded by those enormous chasms with a tropical climate, from which one ascends with incredible fatigue to the cold Paramos. Not so in Mexico, where from south to north, travellers and merchandise meet with uninterrupted vehicular transmission. Although there are three principal mountain ranges, at least from the 20th degree northwards, *viz.*, an eastern, a western, and a middle range, the last is so formed that the connection with the table-land is everywhere feasible by means of broad valleys. The declination towards the sea is less favourable for travellers. Notwithstanding, there are some roads on the east side; and the northern part, in particular, presents no impediment whatever to vehicular communication. In the south, indeed, the descent of the mountains from Chiapas to the Gulf is so steep, that it is impossible even to employ mules, and both goods and travellers must be conveyed on the backs of the Indians.

The western slope is not precisely the same as the eastern; taken altogether it is less abrupt, and yet in part more difficult for the construction of roads. If we regard the transverse section of the country by Humboldt, Burkhardt and others, we perceive three chief graduations from the plateaus to the South Sea; we descend from the higher to the lower, but must always cross another mountain-range, which conducts us from the region of palms to the oaks, and pine-forests. In some parts the mountain-ranges and deep valleys alternate so frequently, that on a single day's journey we pass repeatedly through the most opposite climates, sometimes resting beneath the shade of the bananas, sometimes of the oaks and strawberry-trees (*arbutus*). Here, too, on the borders of the plateaus, we have several snow-mountains, Popocatepetl, Toluca and Colima, which present us with every species of vegetation, at very short intervals. Volcanic mountains are most prevalent, extending almost as far as the sea, where the shores of the bays, the promontories and reefs consist of granite, which on the east side are unseen. On the west side, the volcanoes are in activity in Jorullo and Colima, and in the highest of the Mexican mountains, Popocatepetl.

The character of the landscape is very different from that of the eastern slope, although most of the plants are analogous. The effects produced by the trade-winds, which on the east coast give rise to clouds and moisture, are here

wanting; the country is drier and hotter, the dense luxuriant forests are rarer, whilst more grasses, and a slight growth of mimosas and terebinthias are met with. Of these resiniferous trees, the copal kinds are most frequent, of stunted growth and grey leaf, which with the mimosas almost every-where cover the heights. The sea-coast is rather rocky than sandy; safer bays than those in the Gulf are favourable to navigation. Dense palm-forests, of the thick-stemmed, fanleaved sabal palm, border the lagoons of the coast, which are rocky basins, closed towards the sea by a narrow bar of sand, which, however, is covered at high water. The valleys irrigated by the rivers are hot, but extremely fertile, and adorned with charming groups of palms (the oil-palm and a sort of cocoa), *cæsalpinix* and figs.

The oaks are met with at an elevation of 3000 feet above the sea, and are here represented by some peculiar species. The species we first come to has a large hard leaf shaped like a spoon; it is used by the natives for various domestic purposes, for instance, as a salt-cellar. Higher up we find the olive-leaved oak, which is wanting on the east coast. Here, on the contrary, neither liquid amber nor platanos are seen, at least not below the 19th to the 20th degree of north latitude, whilst, instead, the banks of the brooks and rivulets, at an elevation of 3000 to 5000 feet, are grown with *cupressus disticha*, with ash and willow. The large cactus (*cereea*) extends in all directions, besides the bignonix, bombax, arborescent convolvulus and crescentix; fewer myrtles and laurels are met with, and generally much fewer lianæ, tillandsix and bromeliæ. The pines and alders descend much lower than on the eastern slope, the juniper and cypress are more numerous represented; the arbutus and labiateæ, especially tree-sage are also very common.

The variety of climate in New Spain naturally exercises great influence on the vegetable development. A short rainy season and a long drought only are known. For more than six months no verdure is seen in the whole of the extensive country, except where the roots of the plants are in immediate contact with water, consequently where natural or artificial irrigation is met with. There are districts towards the west, where the industry of man has made arrangements for artificial irrigation on a grand scale. In the fertile plains south of Mexico, lying to the west of the Popocatepetl, called the plains of Cuautla, Cuernavaca and Tetecala, watered by the rivulets that have their source in the snows of three lofty mountains, by means of expensive aqueducts, upwards of forty large sugar and coffee-plantations have been created, equal to the most considerable of the West Indies. In the plains of Mechoacan, too, extensive plantations are sometimes met with; though, strictly speaking they are but little oases in the uncultivated desert. Along the course of the rivers and larger brooks, in the vicinity of the mountains, Indian villages are met with, the inhabitants of which plant vegetables and fruits in artificially irrigated fields.

Wheels for drawing up water are often seen (their construction exhibiting a very slight acquaintance with mechanics), intended for the irrigation of melon-gardens during winter. Generally speaking, however, the seed is not sown till the commence-

ment of the rainy season, little being cultivated save maize, beans, and capsicum. Some districts of astonishing fertility are known, for example, the plain of Iguala, where the maize yields 600 fold.

The yield of cotton on the coast is plenteous, the quality good, but there is a want of hands in the plantations, and the dwellers on the plateaus shun the coast as carefully as they would the infernal regions. The country is very thinly peopled, and would have still fewer inhabitants, if the mountains towards the South Sea were not so rich in metals. Most of the towns and villages owe their origin to miners, and new colonies are founded by them alone. In these mountains mining is very ancient; before the Europeans discovered America, the Aztecs diligently worked the diggings of Tlascoko, where at the present day the mining-town of Tasco is built upon silver. From Tchuantepec to Arispe, and further to the north, the mountains between the sea and the table-land are metalliferous. In the north of Sonora are extensive gold-fields, richer perhaps than those of California. Silver, copper, lead, and iron have been found everywhere, but the rich veins can scarcely be said to have been opened, for want of hands to prosecute such undertakings with advantage.

These mountains have a remarkable number of salt-springs. At Istatlala, Istapan, and elsewhere hot salt-springs discharging much gas, issue from the soil. In the western district the salt-springs are so numerous, that the Indians merely pour the water on flat stones, round which they construct sides of resin, and leave the process of evaporation to the sun. So much salt is required for the amalgamation of the silver ore, that a hand-pump and a few copper pans would be a great source of profit; in these countries, however, labour has not made such striking progress.

As a supplement to our remarks on the surface of the country, a few observations on the climate and on the change of seasons which cause various meteorological phenomena will not be out of place. Throughout the year, day and night are nearly equal in the tropics, the difference, naturally, being greater or less, according to the distance from the equator. In Central Mexico the longest day has 13, the shortest 11 hours. Twice a year (in May and July) the sun is in the zenith, and in May the beautiful constellation of the crosier which adorns the southern hemisphere for six months, attains its meridian. There are two seasons only in the tropics: the rainy and the dry season. The rainy season is from June to November; this is the finest period of the year, the period when vegetation is most active, when all is verdure and blossom, the period for sowing and reaping. When in the month of May till the middle of June the intense heat has dried up everything, when the atmosphere is sultry and thick, but at the same time cloudless, the trees bare of foliage, peals of thunder in the mountains announce that Heaven's flood-gates are on the point of being opened. The rainy season commences with mighty electric discharges, flash succeeds flash, and the roar of the thunder, especially in the moun-

tains, is terrific. Heavy showers are discharged from the clouds; the drops cannot be distinguished, nothing but sheets of water; in half an hour, however, all is over. These storms occur usually towards evening, or according to the locality, before midnight, or towards daybreak. The clouds then gradually collect about the loftiest mountain-peaks, there become denser and denser, and descend to the valleys and plains. The figurative language of nations has connected these phenomena with mythology; the Greek beheld Jove gathering the clouds about Olympus; the Aztec awarded the same occupation to Atlanchana, the mother of the waters, on the Citlaltepētēl (Peak of Orizava). Other mountains about which the clouds gather, are distinguished by names indicating a net-work of water, *viz.* Matlacury, Matlacuiahuatl, etc.

The thirsty soil greedily imbibes the first showers, and awakens the slumbering germs of the plants. In a few days the earth is covered with a delicate coat of verdure, the trees shoot with incredible rapidity, the peasant can plough the moistened ground, and plant his summer crop. During the first fortnight of the rainy season, the showers are regularly accompanied by electric phenomena; afterwards it continues to rain at a fixed hour, but many days frequently elapse without thunder being heard. The air is now exceedingly pure and mild, the morning sky deep blue, the horizon remarkably distinct. The subterranean reservoirs are soon filled, and springs gush forth on all sides; the beds of rivers hitherto dry, now exhibit vast masses of water, lakes are given birth to in the plains, and the numerous artificial reservoirs also become filled. In many parts of the table-land, namely, where a scarcity of water prevails, moderately broad valleys, where the fall is not great, are inclosed with extensive dikes, and artificial lakes thus constructed, partly in order to irrigate large farms, partly to serve as watering-places for the cattle. Smaller tanks are met with everywhere in the highlands, which are also filled in the rainy season, to serve as watering-places during the ensuing drought.

During the dog-days the rain is less regular, little showers fall suddenly, and at all hours of the day, or several days pass without a drop falling. The countryman dreads this season; he says, it easily rains worms on the maize, or mildew on the beans; sudden changes of temperature naturally affect the health both of vegetables and animals. When the dog-days are over, violent storms recommence, succeeding each other regularly, and attaining their highest pitch towards the middle of September, or the autumnal equinox. Then gradually decreasing, pauses intervene, and about the end of October they disappear wholly. This is the finest season of the year: the air is fresh and clear, day and night are perfectly cloudless, vegetation is in full vigour, the pastures are green, the herds in prime condition, and water is still universally plentiful.

The close of the rainy season is ordinarily announced by the birds of passage arriving from the north. When a species of plover (grey and white with black about the neck) is heard at night, and sandpipers appear on the banks of the ponds and lakes, then the rain is over. Large flocks of water-fowl now arrive on the

lakes of the table-land, ducks of all kinds, the same as are met with in North America, water-hens, herons, tantalus etc. Geese and cranes keep further to the north, but enter the tropics, nevertheless. The migratory falcons arrive at the end of September, the swallows, however, leave in October, though there is no want of food.

November is distinguished for its fresh pure air; the heat is bearable, even in the coast-districts; the noxious fevers of the lowlands disappear, and the traffic of the country is renewed. During the rainy season, the communication with various districts is completely interrupted, partly because the swollen rivers, unprovided with bridges or fords, are impassable, partly because the narrow mountain and forest-paths are obliterated. On the plateaus, and on the whole of the west-coast, the rain has now ceased, but on the east side the *nortes* (northerly storms) begin. At longer or shorter intervals (8, 14 or 20 days) violent storms come suddenly across the sea from the north, agitating the gulf in its profoundest depths, often for 24 hours only, often for eight or ten successive days. The experienced countryman or shepherd can mostly foresee the coming of a "norte". The spiders render their nets firmer, the little red ants convey their larvæ to a dry spot, the migratory ants remove from the valley to the hills, the *vaquero* (a reddish-brown kite) screams, and at night the oxen crowd together in their pasture ground, with anxious bellowings. A sure indication is, when after great heat, a sudden calm prevails, succeeded immediately by a south wind; for then the north wind will be at hand in a few hours. A white-blossomed, sweet-smelling *comelina*, which sometimes remains for weeks without unfolding its buds, does so on the approach of the north wind. It is not the wind, but the moisture that exercises its influence on the plant. The wind raging across the sea, drives vast clouds towards the mountains, where they are condensed, and cover the heights with fog and fine rain, from 2500 feet to the ridge. The change of temperature within a few hours is remarkable, the thermometer in Vera Cruz often falling from 24 to 12 degrees; whoever has business in the open air, wraps himself in his cloak, and can scarcely make head against the wind. Nothing is felt of the storm in the interior, but the coolness of the atmosphere is very perceptible, and at an elevation of 2500 feet, the clouds repose on the ground. From here to the summit of the mountains, the soil is moistened with fine rain, as long as the storm rages at sea; and precisely this circumstance renders the middling heights of the east coast so fertile, and well-adapted for cultivation, since here nature provides a sufficiency of moisture, which in other parts of the country must be procured by art.

The influence of the *nortes* does not extend so far as the plateaus; the clouds are limited to a certain height, and the traveller emerges from the clear sunlit landscape into the thick grey fog. When the storm has ceased, the clouds often remain some days on the mountain, usually disappearing at night; a remarkable purity and freshness of the atmosphere is the consequence, and the whole mountain, as low as 8000 feet, is invariably beheld covered with snow.

Towards the vernal equinox the north winds cease, and some heavy thunderstorms usually succeed, which last till the middle of April, and are not unfrequently accompanied by hail. These highly fertilizing phenomena are met with only in the mountains, and never descend lower than 2000 feet.

The side of the country towards the Atlantic, has alone the privilege of winter-rains; all the other districts have then the dry season, as already shewn. The winter-months, from December to March, are very cool on the table-land, and cold towards the north. Rime, and night-frosts are not uncommon, the trees shed their leaves, grass and shrubs dry up. The morning air at this season is very keen and penetrating; the traveller should not neglect warm clothing, and should protect his mouth, partly that his lips may not crack, which is anything but pleasant, partly that he may not inhale the cold air. As soon as the sun rises higher, the lower stratum of air becomes warm, so that towards noon, an oppressive heat may perhaps be felt, especially there where dusty roads, and white rocks, destitute of all vegetation, increase the reflection of the sun's rays.

On the western slope of the mountains, the heat is much greater during the whole of the dry season; the soil dries up and exhibits deep fissures, the trees lose their foliage, the savannahs become grey, and the course of the streams through the valleys, is only now and then indicated by stripes of green. In the last three months the drought and heat increase daily: in the coast-regions of the South Sea, and in the more distant plains and valleys the noonday heat is almost insupportable, the nights sultry and oppressive. On the loftier mountain-ranges and on the plateaus the nights at least are fresh, whilst during the day the heat is scarcely equal to that of the summer in Central Europe. Man and beast wait anxiously for the approaching rainy season, and the first peal of thunder is greeted as though it were delightful music. The instinct of the cattle is very singular at this season. If the cows for example, are removed to other pastures, a sort of home-sickness would seem to be felt by them at this period, and frequently, after a long round-about journey of several days, they succeed in arriving at the meadows where they were born.

Let us now consider the climate of the country in general, and we shall find that according to its geographical position, it must necessarily be hot, its whole extent being within the tropical and sub-tropical zone; but the formation of the surface, the elevation above the sea, brings us into colder regions of air, and we find therefore under one and the same degree of latitude a regular gradation of temperature. It is usually thus described by the natives. "On the plateaus and loftier mountains the climate is cold, both the coasts are hot, and between it is temperate". Unsatisfactory as this account is, we find it in every description of Mexico. It would be more correct to say that, from the seashore to the height of 2500 feet, the climate is tropical; all the tropical vegetation is found within these limits, the average temperature being 24° Reaumur. This tract has all the advantages and all the annoyances of hot regions: quick and luxurious vegetation,

great fertility, but also mosquitoes, sand-flies, and sand-fleas, besides the danger of climatic fevers, intermittent fevers, bilious fevers, and putrid fevers; on the east coast the yellow fever appears, which is only met with on the shores of the Atlantic.

From 2500 to 4500 feet above the sea a sub-tropical climate is found, with an average temperature of 18° Reaumur. Many tropical plants flourish here even; but the air is fresher, the disposition to fever is not met with unless local causes are at hand, for example, marshes; the troublesome insects occur only in the dense forests, and near the streams, as during the summer in Europe.

On the mountains, up to 6000 feet, the average temperature is from 15 to 16° Reaumur, the climate of a European spring; it is perfectly healthy, and fit for the cultivation of the cerealia, and all the fruits of Southern Europe. All the plains and hills, situated from 6000 to 8000 feet above the sea, have a temperature, on the average not exceeding 14°. They exhibit the products of Central Europe, have a pure wholesome air, and so equal a climate, that the natives of every zone can settle here without anxiety.

It will hardly be necessary to observe, that this is only a medium estimation. From the 16th to the 34th degree of north latitude, the isothermal lines cannot be the same; they decline towards the north, and ascend towards the south; thus, in order to be precise, one would be compelled to possess the meteorological observations of a long series of years, of different transverse sections from one sea to the other. These, however, do not exist. The result, however, is certain, that we find in Mexico every climate, the proper elevation for every branch of agriculture; and that this country can grow all the vegetable products of the earth, and thus be independent of every other country.

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### VIII.

### VOLCANOES.

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The workings of Nature in her profoundest laboratories are concealed from us; we see merely the results of mighty forces, sometimes heaving up mountains from the abyss, sometimes crumbling them to atoms, and often changing the appearance of whole districts within a few hours. In Mexico vast revolutions have been effected by volcanic agency; the cyclopean forges, indeed, are for the most part cold, but the subterranean fires are not everywhere extinct, and occasionally burst forth here or there, committing the most extensive ravages, or convulsing the earth with terrific spasms.

In the south a succession of volcanoes passing from Oajaca through Chiapas are connected with the burning mountains of Guatemala. Cempoaltepec, one of



VOLCAN JORULLO