POPULAR

GEOGRAPHY OF PLANTS;

OR,

A BOTANICAL EXCURSION ROUND THE WORLD.

By E. M. C.

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EDITOR'S PREFACE.

The subject to which this little volume relates is one of deeper and more general interest than would be likely to attach to a disquisition on any one branch of Natural History, considered irrespectively of its relations to others.

Whilst in an æsthetic point of view it recommends itself to the attention of every traveller in a foreign country, and indeed to all whose eyes are open to a perception of the features of external nature in their own, it connects itself, at the same time, with many intricate questions concerning the early history of our globe,—the origin of organic beings in general, the geological changes which our planet has from time to time undergone, and the dependence of vegetation upon climate, altitude, and other external conditions.

Although the interest it inspires will doubtless be enhanced in direct proportion to the knowledge we possess of individual plants, there is nevertheless a source of gratification derivable from the objects it brings before us altogether independent of what we should experience in them from being conversant with the details of Botany; for inasmuch as what may be termed the physiognomy of a region or country arises from the predominance in it of certain families or even of particular genera of plants, an intelligent observer, without any acquaintance with the characters which distinguish one species from another, is easily led to discriminate the general effect which the prevalence of each impresses upon the landscape; and will be affected with emotions of awe or admiration, of melancholy or gladness, according to the general tone of the picture presented to his imagination by the kind of vegetation which clothes the surface of the country. Just as in society we are impressed with the sprightliness of one individual, the sombre air of another, or the noble expression of a third, without waiting to analyse the several traits which contribute to impart their particular character to the countenance of each,—so our ignorance of the names and nature of the plants which grow in a given country by no means robs us of the grati-

fication which is derived from contemplating the features which they severally impart to the landscape.

But how is this gratification to be transferred to the reader, who seeks from books that which the traveller obtains from actual observation? In no other way, clearly, than by bringing before him in detail the distinct characters of these several regions, in such a way as to conjure up in his mind some kind of picture of the physiognomy of each.

It is by no means easy indeed to define in words the exact nature of the difference in this respect which exists even between those countries which are felt to be most contrasted in their general aspect; as, for instance, between the vegetation of the Tropics and of the Temperate Zone. It is true that to that of the former we are in the habit of applying the epithets of *rich* and *luxuriant*,—terms doubtless which cannot but be regarded otherwise than appropriate; and yet in the woodland scenery of colder climates, as, for instance, in the great forests of Norway and Lithuania, Nature often displays a vigour, as well as an exuberance, of creative power, which also in a certain sense stamp the vegetation as rich and luxuriant.

In the warmer regions of the globe doubtless she loves to exhibit herself in a greater variety of attire, and to dis-

port in forms more fantastic and extravagant; but in colder countries she compensates for the greater sameness of her gifts by the prodigality* with which she bestows them, and makes amends for the want of that gracefulness and delicacy of outline which mark the vegetation of sunnier climes, by the strength and loftiness of many of her productions, emblematic of the qualities of mind and body which belong to the human race in these situations, and distinguish them from the natives of the Tropics.

And yet, notwithstanding the embarrassment we should feel in finding appropriate terms to depict their distinctive physiognomy, how different is the impression produced upon the mind by a picture of the vegetation in each, such as may be conveyed through the medium of verbal description!

* The exuberance of Nature by no means seems to diminish in proportion as we approach the Polar Circle. On the contrary, as Professor Hausmann has remarked, ('Essay on the Physiognomy of Scandinavia,') in these northern regions the organic world is marked by even a greater multitude of individuals belonging to the animal, as well as to the vegetable creation. Legions of rats and mice people Norway and Sweden; in Lapland the swarms of gnats are so great, that he who travels in that country during summer must filter the air through a veil; thick Pine-forests cover the greater part of the habitable North; Reindeer-moss overspreads the largest flat districts of Lapland; and Lichens are in such abundance, that Norway and Sweden send whole shiploads of some of the species to England, where they are used in dyeing.

In the delineation of tropical scenery the plants would be represented ever struggling, as it were, for the mastery, and in a state of actual conflict for existence; the larger trees in danger of perishing within the grasp of snake-like lianas which entwine themselves around their branches, and seem about to throttle them in their embraces; the smaller and weaker plants only wanting room to develope their repressed energies, and greedily seizing upon whatever scanty vacancies the fall of any of these giants of the vegetable world may have left for them to occupy.

In the forests of Europe, on the contrary, all is peace and tranquillity,—a few species of timber-trees having established themselves in quiet possession of the soil, and allowing no interlopers to dispute their sovereignty, or to interfere with their domain. Thus in Scandinavia, Professor Hausmann says, two evergreen trees—the Scotch and the Spruce Fir —seem, as it were, to monopolize the soil; and whether it be owing to the care of the forests being in these regions committed wholly to Nature, their extent is in general far more remarkable than in countries where they are more watched over by man. The Scotch Fir in particular, which on the sandy plains of Northern Germany is found, for the most part, in a crooked form, here surpasses even the

To account, for instance, for the occurrence of arborescent Endogens in the Tropics, of herbaceous ones in the Temperate Zones of the earth; for the predominance of evergreen trees in the former, and of deciduous ones in the latter; for the greater profusion of annuals and perennials where the transition is great between the heat of summer and the cold of winter; for the prevalence of succulent plants in certain regions, as of the *Cacteæ* in Tropical America, or of certain *Euphorbiaceæ* in Africa,—are problems perhaps of not very difficult solution.

If we take the Palm tribe for example, we may appeal to the juicy and spongy character of the internal portions of their stem, and to the want of that protection against frost afforded in trees of exogenous growth by their numerous layers of bark, with intervening spaces occupied by air, which interpose a non-conducting substance between the external atmosphere and their sap, as accounting for the greater susceptibility of these plants to the influence of cold, and for the greater chance of damage being incurred by their delicate tissues, arising from the rending of their cells through the expansion caused by frost.

We can also understand why trees and shrubs which strike their roots deep into the ground should resist the

rigour of a northern winter, which destroys the life of herbaceous plants, either altogether, as is the case with annuals, or at least to the surface of the ground, as happens to our humble perennials.

It is obvious that the former will draw their juices from a zone which is quite inaccessible to the ordinary vicissitudes of climate; and when, in addition to this provision, we observe the trunk, as in the instance of the Birch, encircled with numerous layers of bark, or, as in the Pine tribe, replete with resinous juices, which are not liable to congeal, all the conditions favourable to the resistance of cold will be seen united in these inhabitants of the North.

Herbaceous plants, on the contrary, being sensible of every change of temperature, can exist only where neither the heat nor the cold is very excessive; and therefore abound most in the Temperate Zones, diminishing in number and variety both as we advance to the south or to the north of this middle region.

Nor would it appear surprising, if the stimulus of heat imparted to the productions of a tropical region that greater size and bulk, which distinguish them so frequently from plants of the same family met with in colder regions.

It would seem but natural that the Tree-ferns of the

former should belong to the same family as the herbaceous ones of our own woods and glades,—that the Lily of the Valley and other humble plants should be representatives here of a tribe which is illustrated in Africa by the *Dracænas,* some of the largest and oldest of tropical productions; and that the Mallows, which constitute trees of gigantic size near the Equator, should appear only in the form of herbaceous plants within the confines of Europe. Not however that we have any evidence of heat being capable of converting an herbaceous into an arborescent plant by any continuation of its action, for herbaceous species transported to the Tropics do not become arborescent, nor do arborescent ones dwindle into herbaceous ones in colder climes; but only that the stimulus of great heat was indispensable to the existence of those species whose habit it is to become *caulescent,* and unpropitious to that of others which continue *herbaceous* and therefore diminutive.

We may even go further, and assume, that, in temperate regions, the unequal length of the day at different periods of the year, as contrasted with the uniformity in that respect which prevails within the Tropics, would be likely to introduce corresponding deviations in the character of the vegetation in these two cases. A shorter duration of the sun's

influence may be supposed most suitable for plants which shed their leaves in winter, and which, like certain hybernating animals, fall into a kind of torpor during the colder months; whereas a more equal distribution of solar heat throughout the year would seem best adapted for evergreens, the progress of whose growth is never altogether arrested.

It has also been remarked, that plants whose leaves and flowers remain fixed in the same direction permanently, are calculated for climates where the light during summer is almost continuous; whereas in the Tropics species might be expected to occur, distinguished by that alternate opening and closing of these organs which characterizes what has been termed their waking and sleeping conditions, and harmonizes with the alternation of day and night in the climates of which they are natives.

Hence we need not be surprised to find that, in the countries with which we Europeans are most familiar, the vegetable productions that occur should be limited to such as are either able to sustain a considerable degree of cold, or to endure a long interruption of their vital functions. Nor is it difficult to explain, why succulent plants should prevail in countries visited with long periods of drought. They alone, either from the deficiency of stomata, or from

being encased in a sort of leathery membrane, preventive, to a considerable extent, of exhalation, retain for a long enough period within their pulpy and distorted stems the moisture which they had once imbibed, resembling certain tardigrade animals in the slowness with which they execute their vital functions, and like them exhibiting a tenacity of life as remarkable as is the languor of their circulation.

It would be an instructive, as well as an interesting occupation, to trace in detail the effect of this and other climatic conditions upon the several plants which occur in particular regions or countries; but after having exhausted all our ingenuity in referring their range and distribution to the influence of one or more of such causes, much, it may be apprehended, will remain unaccounted for, and an ample margin left for further speculation. It is difficult, for instance, by any such considerations to explain why all the Heaths, excepting five or six European species, come from the Cape; whilst the Epacrises, a nearly allied family, are confined to Australia; why the Orange tribe is derived exclusively* from China or India; the whole of one particular division of syngenesious plants—those which are called bi-

* Unless *Citrus spinosissima*, from Guiana, and *Limonia ambigua*, from Florida, be genuine species.

labiate—proceed from South America; why so large a proportion of the Passion-flowers are natives of the New World, and nearly all the Roses of the Old. The exceptions indeed which occur to the generality of these observations do but enhance our perplexity. Had the whole of one family been circumscribed within certain geographical limits, it might have been surmised that there was some yet undiscovered condition of climate, which had determined their distribution; but when we find plants of similar structure indigenous in continents so disconnected from the one which harbours the greater number of species, it becomes difficult to believe that climate can have anything to do with the matter.

The same inference seems to follow from the fact, that where a single species of a genus occurs on one continent, its representative, although not the same species, often exists in corresponding latitudes on the other. Thus two Plane-trees, the one from the eastern, the other from the western hemisphere, flourish side by side on the lawns and in the parks of Great Britain; and thus throughout the world we find only three herbaceous species of *Panax*, four or five of *Stillingia*, and three *Planeras*, in all which cases it is remarkable that one species inhabits the Eastern, the others the Western World, or *vice versâ*.

In like manner we know but of two *Mayanthemums,* five *Vallisnerias,* and three Chestnuts; and yet none of these genera are confined to a single continent, but each is represented in the New World as well as in the Old.

Indeed not only do the recognized effects of climate offer no explanation of such facts, but we are driven to discard all idea of accounting for them in this manner, when we find that many plants, when transferred to a foreign soil, vegetate even more luxuriantly than they do in their native country; thus proving the fallacy of any hypothesis which, assuming their universal distribution in the first instance, should attempt to ascribe their present limitation to the climate in other localities being unfavourable to them. When we observe the pampas of Buenos Ayres covered over with Thistles and Artichokes brought over by European settlers; when we see the *Anacharis Alsinastrum* invading the ditches and still rivers of Great Britain; when we find the Canadian *Erigeron,* which was conveyed to the Botanic Garden at Paris little more than a century ago, now distributed over the whole of Europe; and the *Plantain* occurring so commonly, it is said, in America, wherever an Englishman has trodden, as to have acquired amongst the Indians the name of the Englishman's Foot,—it is difficult to imagine that

such plants, had they been originally created in the countries in which, when imported, they thus prevail, could have been extirpated subsequently by the unfavourable influence of external conditions.

We are driven then, by a process of logical exhaustion, to conclude that each species was originally introduced into a particular locality, from whence it diffused itself over a greater or lesser area, according to the amount of obstacles which checked its propagation, and its own inherent power of surmounting them.

To this theory sufficient allusion has been made in the body of the Work, so that all I need do is to anticipate certain difficulties which may appear to stand in the way of its application to particular cases, and to point out the inferences with respect to the former condition of the globe which these facts serve to elicit.

In the first place then, I believe it must be admitted, that, after attaching all due importance to the curious contrivances so ably put before us by De Candolle,* through which Nature has in many instances provided for the dissemination of species, numerous cases will present themselves of a very embarrassing nature, both as regards the

* Essay on the Geography of Plants, Dict. d'Histoire Naturelle.

mode in which certain plants have spread over the globe, and as concerns the occurrence of others in detached islands, to which it is difficult to understand their transmission.

De Candolle indeed himself evinced his consciousness of these perplexing cases, in pointing out, as he has done, the existence of the same aquatic plants in two distinct basins destitute of all possible communication; as, for instance, that of the *Aldrovanda vesiculosa* in the valley both of the Po and of the Rhone, notwithstanding the intervening barrier which the Alps oppose.

These difficulties however have recently been more fully dwelt upon by Dr. Joseph Hooker, in the masterly essay he has appended to his Botany of New Zealand. Nor indeed can they be effectually grappled with, except by calling in, as he has done, the aid of two principles, each of which is suggestive of many important inferences, the one with reference to the former state of our globe, the other as relating to the influence of meteoric conditions, operating over vast periods of time, in modifying those characters which many botanists have relied upon for establishing distinctions in species.

The former of these speculations will be found alluded to in the body of this Work, where it is stated that the flora

even of our own island is made up of contributions from at least four different sources, namely, Scandinavia, Germany, France, and Spain; thus supplying Edward Forbes and other eminent geologists with an argument in favour of the former existence of a land communication between Great Britain and each of those countries.

A similar hypothesis is adopted by Dr. Joseph Hooker to explain the facts which he had ascertained, by personal observation, during his exploration of the regions of the South Pacific; such as the occurrence of the same plants in spots so detached one from the other as Fuegia and Kerguelen's Land,—that of the *Edwardsia grandiflora* inhabiting alike New Zealand and South America,—and of the *Oxalis Magellanica* being found in these same localities, as well as in Tasmania, although the seeds of neither plant are light enough to be wafted by the air, or so compact or oleaginous as to be transported uninjured by the waters.

But whilst he is thus led to speculate upon the possibility of the plants conterminous to the South Pacific being the remains of a flora that had once spread over a larger and more continuous tract of land than now exists within the confines of that Ocean, and to regard the Antarctic Islands as representing the remnants of a mountain-chain, of which

the lower portions have been submerged; he is at the same time compelled to give a greater latitude than is generally admitted to the variations produced by external conditions upon the structure of plants, in order to account for the distribution of allied, although not identical forms, over the different parts of this once continuous area.

The wider indeed the range may be over which a plant is disseminated, the greater will be the number and force of those external causes which tend to produce diversities of form; so that we have no right to argue, because within the narrow limits of these islands species usually present a near approach to uniformity, therefore that plants more widely differing one from the other than any of our recognized varieties, may not, if taken from the extreme limits of the area in question, belong to the same species. If we suppose a plant to have spread itself over a tract of land so extensive, that the several portions of it may possess widely different climates, it is quite possible to conceive such an alteration to have been brought about in its structure, that we might be disinclined to place together the extremes without having before us the intermediate gradations in form superinduced.

After the submergence however of a continent, many of

these connecting links may very possibly be destroyed, and hence the detached portions of the land, which still stand up above the level of the ocean, would present only those varieties which are too far removed one from the other to be recognized as belonging to the same type. Under these circumstances it is quite conceivable that the form most common at the present day might not be the typical one, but only one of many varieties which were superinduced by differences in external conditions.

Their prevalence at the present time may by no means imply that they were the predominant forms originally; since it is quite possible that subsequent geological catastrophes should have swept away those parts of the continent where the typical form had been developed.

Hence Dr. Hooker contends, there is no absurdity in supposing trees so different as the Deodar and the Cedar of Lebanon to be modifications of the same species. The great variations in form which occur in the latter tree when introduced into England, and the approach which some specimens of it make to the Cedars of the Atlas on the one hand and to the Deodar Cedars on the other, lead him to suspect that those which now grow on the Mountains of Lebanon belong only to an abnormal form of the species,

and that the Deodar, as it retains its characters with the least variation over the largest area, may be the original type of a species embracing in its varieties the Cedars of the Atlas and of Mount Lebanon, as well as those of the Himalayan Mountains. That this is not mere hypothesis may be shown, by an appeal to several New Zealand plants, as, for instance, to those belonging to the genera *Coprosma*,* *Celmisia*,† and *Epilobium*; whilst it is illustrated in a manner still more remarkable in the case of a Fern called *Lomaria procera*.‡ In short, differences in habit, colour, hairi-

* *Coprosma* is a genus of shrubs belonging to the *Rubiaceæ*, or Madder tribe, confined to New Zealand, Tasmania, and the South Sea Islands, emitting a very disagreeable smell when drying, and apt to vary very much in their characters. Drawings of several species are given in the 'Flora Antarctica.'

† *Celmisia* is a genus of syngenesious plants, often very handsome, but varying much in their size and appearance. See 'Flora Antarctica' and 'Flora Novæ-Zelandiæ.'

‡ *Lomaria procera* is a common Fern in the Auckland Islands, in Australia, and in Tasmania. Dr. Hooker distinguishes four principal varieties, but he states that specimens of this fern vary so much, that no one would have taken them all for the same species without examining the intermediate varieties. The Fielding Herbarium at Oxford possesses two specimens which differ so extremely in the shape of their pinnæ, that it requires all one's faith in the authority of the botanists who have investigated the subject to induce one to regard them as merely varieties of the same species. Some of our British Ferns indeed (*Polypodium vulgare*) vary very remarkably.

ness, the shape of leaves, or indeed anything short of a variation in the parts connected with the reproductive organs, may be regarded as falling within the limits of those changes which are induceable by climate.

It may be somewhat encouraging to the readers of this little Volume, when they are rising from its perusal bewildered by the contemplation of the vast fecundity of Nature, spread before them in the pictures of the vegetation of different climes therein given, to find that the efforts of many distinguished botanists in the present day are directed rather to the task of reducing the number of recognized species, than of increasing it.

But, it may be asked, if these principles be admitted, where are we to stop? and why may we not proceed, in the spirit of the author of a well-known Work, to deny the existence of species altogether, except perhaps as steps or halting places in that supposed march of progression, by which the most elaborately organized plant is gradually educed by a process of successive transmutations from the most simple one, just as in the animal kingdom the most perfect mammal is from the monad?

Without entering fully into this grave question, upon which much ink has lately been spilt,—sometimes mingled,

we may be in the dark as to the causes which produce them.

What indeed the exact limits may be, either in the animal or the vegetable kingdom, within which the power of producing prolific offspring may be circumscribed, our present knowledge is not sufficient to allow us to define; but this at least is certain, that both in the one and in the other the deviations from the typical forms produced by this cause are few and unimportant. On the hybridization of plants indeed, Gærtner is said to have instituted no less than ten thousand experiments, in the course of which he operated upon seven hundred distinct species; and yet he produced only two hundred and fifty true hybrids, most of which were feeble and barren; nor amongst the whole number were there any that exhibited characters foreign from those of their respective parents.

Whence this difficulty in the way of producing hybrids between allied forms should arise may perhaps ever continue a mystery; but the final cause of it seems obvious enough, as species could not have been maintained in their integrity, if intermediate forms were liable in this manner to spring up, and to continue permanent.

But, it may be asked, if the comparatively small variations

in external conditions which could have occurred within the areas over which plants of limited distribution have been disseminated, are capable of bringing about those diversities of form which we have here ventured to attribute to them, how is it that we find others spreading, as it would seem, over the entire globe, and yet presenting a remarkable uniformity of character? There are plants, for instance, like the *Sonchus oleraceus*, which, without the aid of man, have been dispersed through all latitudes from England to New Zealand; others, like the *Primula farinosa*, which, although everywhere rather rare, start up now and then in the most distant countries, without any apparent reason; and a still larger number, which seem to follow everywhere the migrations of man, such as the common Shepherd's Purse, the Clover, and the like. Now, in these instances, no change of importance has been induced by climate, but each plant continues to preserve the impress of its kind.

The answer to this perhaps may be, that the very reason why such plants have been able to diffuse themselves over such distant regions, is their comparative unsusceptibility of change,—their power of resistance, that is, to external agents,—in short, their relative hardihood of structure.

Other species, more flexible and more obedient to extraneous impulses, have, for this very reason, reached the utmost limits which Nature had assigned to their variation, under the operation of those circumstances to which they were subjected within the area of the same geographical region; and therefore, when submitted to climatic conditions still more different, necessarily became extinct.

Accordingly the humblest and simplest species of plants may be at once the most durable and the most widely diffused; just as in the animal kingdom certain shells, such as the *Lingula*, which existed during the earliest Silurian epoch are said by some geologists to be found in a living state at the present time, and thus to have survived all the catastrophes and changes of condition which the earth has undergone.

But as Bishop Berkeley, from expounding the virtues of tar-water, was led on to those high speculations respecting the *Anima Mundi* and the mysteries of the Trinity, with which his treatise concludes; so in this Preface I have gradually rambled from the subject of the Essay which it was my sole aim to introduce to the Public, until I came upon the discussion of questions of an intricate nature, concerning the origin of organic beings in general, and the

limits to the variation in species, which may perhaps be looked upon with dismay by the class of readers for whom this little Work is principally intended. I will therefore now take leave of these topics, and with them of the volume itself, respecting which I will merely remark in conclusion, that without meaning to make myself responsible for the accuracy of all the details introduced into its pages, I am ready to bear my humble testimony to the general truthfulness of the descriptions given; and may therefore venture to recommend the Book as one likely to supply a void in the popular scientific literature of the day; inasmuch as the subject is therein handled, on the one hand, in a less perfunctory manner than is commonly done in works embracing the entire extent of Physical Geography, and, on the other, on a less dry and technical plan than appears to have been hitherto the rule in the larger treatises on the Geography of Plants which have come before the public.

C. D.

Oxford, November 5, 1855.

AUTHOR'S PREFACE.

THE dimensions of this little book make it almost unnecessary to state, that the term "Geography of Plants" is not intended in that strict sense in which it is used in scientific books, which give the geographical distribution of individual plants in detail. All that has been attempted in compiling it, has been so to group together facts and arrange information derived from various authentic sources, as to convey some idea of the leading features of vegetation in different latitudes; and as even this is an undertaking of some difficulty and responsibility, an acknowledgment is the more gratefully made of Dr. Daubeny's kindness in consenting to become the Editor of the following pages, which have been largely indebted to his advice and supervision.

As references have been made, in the appropriate places, to most of the authorities which have been quoted, any mention of them here would be superfluous; except as regards Lindley's 'Vegetable Kingdom,' to which inexhaustible treasure recourse has been too often had for it to be possible to make a reference on every occasion.

The illustrations have been mostly taken from the following works:—'Winter Sketches in Lapland,' by Sir Arthur Brooke; Sir James Ross's 'Antarctic Voyages'; Dr. Hooker's 'Flora Antarctica;' Flinders' 'Voyage to Terra Australis;' Von Martius's 'Nova Genera;' Dr. Weddell's 'Histoire Naturelle des Quinquinas;' Bullock's 'Six Months in Mexico;' and Kittlitz's 'Vierundzwanzig Vegetations-Ansichten.' The diagram of the Distribution of British Flowering Plants is taken from the first volume of the 'Memoirs of the Geological Survey of Great Britain;' the other is an adaptation of Humboldt's diagram of the vertical regions of vegetation, to Meyen's view. The Maps have been constructed from different sources.

Descriptions of flowers have been frequently given from beautiful specimens in the Fielding Herbarium at the Botanic Gardens, Oxford, which contains a vast collection of dried plants from all parts of the globe. Lastly, to

Mr. Maxwell T. Masters, the Sub-Curator, and Lecturer on Botany to St. George's Hospital, London, my thanks are especially due, for the very valuable information and assistance he has kindly contributed throughout.

With regard to the plan on which these Chapters have been put together, Meyen's 'Botanical Geography' has supplied the framework of the greater part, the botanical details being generally derived from other sources.

E. M. C.

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POPULAR

GEOGRAPHY OF PLANTS.

INTRODUCTION.

Botany and Geography are mutual gainers by being studied in connection with each other. A new and living interest is given to a map of the world, when we glance over it with botanical eyes, and in fancy see each country clothed in its appropriate dress; and, on the other hand, wonderful life is infused into botanical studies when we look beyond the narrow limits of our own island, and make acquaintance with the native homes of rare exotics, and with the foreign relations of our British flowers. Our native Flora itself thus appears to us in a new light, and we pursue our study of it with far greater satisfaction when we look at it as forming a part of a great whole, and understand something of its relative position to the rest of the great vegetable kingdom.

Abstract knowledge, apart from human interests, or outlying interests of some kind, is to most a dull, dry thing; it will therefore be no departure from the plan of these sketches, but rather a part of it, to step aside occasionally, in our botanical ramble over the world, to subjects which, in themselves, are not strictly connected with either botany or geography, but to which the two together may sometimes lead us. The object is chiefly, so far as it can be done in such an outline as this, to bring together, within a small compass, facts which have been gathered from various and authentic sources, so as to convey some idea of the various aspects of Nature in those different and distant regions of the earth where dwell our unknown brothers and sisters in the great human family; and to help those who stay at home, to create for themselves a kind of mental picture of the sights which daily meet the eyes of those absent friends who have made a home for themselves in foreign lands.

The science of Botanical Geography, though it has made rapid strides of late, is yet in a very incomplete state. In the work which has chiefly been taken as a guide in arranging these pages,* the repeated and candid avowal of this fact is perhaps one of the first things that strikes the reader;

* Meyen's Botanical Geography (Miss Johnstone's Translation).

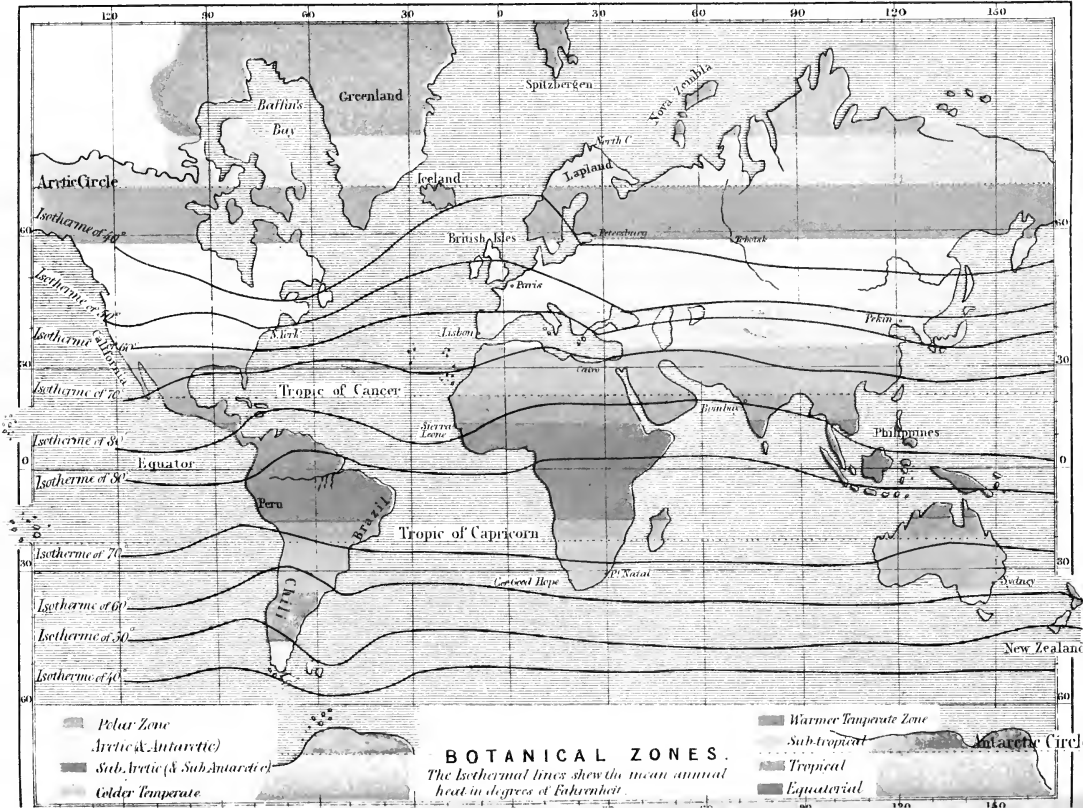
but the observations of botanical travellers are continually filling up the outline which was first sketched out some fifty years ago by Baron Alexander von Humboldt, who is considered as the founder of the science.

De Candolle and Schouw have mapped out the whole surface of the globe into botanical kingdoms; and Meyen has divided it into eight botanical zones. The boundaries of the different and ever-varying forms of vegetation may thus be marked out more definitely than could possibly be done in the wider divisions of the five astronomical zones; and a closer connection can thus be traced between the gradual changes in the appearance of vegetation, and the equally changeable varieties of temperature.

Still the character of vegetation is affected by so many, and often counteracting influences, besides that of the temperature, such as the absence or presence of moisture, prevailing winds, and a suitable or unsuitable soil, that, after all, *an approximation* to the truth is all that can be attained. Some kind of framework is necessary for methodizing knowledge, but Nature will not be tied down by too strict rules; so that the flowers which are named as chiefly characteristic of one zone, are often found wandering into the next, and it is as impossible to assign a definite limit to them, as to mark

where the hues of the rainbow melt into each other, or to fix the moment when day fades into twilight and twilight into night. One broad rule is nevertheless observed by vegetation—of a gradual development from the lowest state in which it exists near the Poles, to the glorious perfection and luxuriance of form, colour, and organization which it shows at the Equator; and to trace this will be an interesting task.

But a horizontal division of the surface of the globe is not all that has been attempted. It is well known that in ascending high mountains, the temperature becomes gradually colder towards the snow-line. Meyen has deeply considered this subject, and gives it as the result of his own personal observations, that a vertical division of mountains may be made with respect to climate and vegetation, corresponding exactly with the horizontal one of the surface of the globe into zones. For example:—a mountain at or near the equator, which rises to the limit of perpetual snow, would exhibit every variety of climate, and consequently of vegetation, which is found from the equator to the poles, and might be divided into eight vertical regions, corresponding with the eight horizontal zones. In the same way, in whatever zone a mountain stands, the number of regions from the plain to the snow-line (supposing it to reach so


120
90
60
30
0
30
60
90
120
150
Greenland
Baffin's Bay
Spitzbergen
Nova Zembla
North C.
Arctic Circle
Iceland
Lapland
Isotherme of 40°
British Isles
Petersburg
Tobolsk
Paris
Isotherme of 30°
Isotherme of 20°
California
Madrid
Lisbon
Pekin
Cairo
Isotherme of 70°
Tropic of Cancer
Bombay
Sierra Leone
Philippines
Isotherme of 80°
Equator
Peru
Brazil
Isotherme of 70°
Tropic of Capricorn
Cape of Good Hope
N. Natal
Sydney
Isotherme of 60°
Chili
Isotherme of 50°
New Zealand
Isotherme of 40°
Antarctic Circle
Polar Zone
Arctic (& Antarctic)
Sub Arctic (& Sub Antarctic)
Colder Temperate
Warmer Temperate Zone
Sub Tropical
Tropical
Equatorial
BOTANICAL ZONES.
The Isothermal lines shew the mean annual heat in degrees of Fahrenheit

high) would be the same as the number of zones from that in which it stands, to the pole.

The eight zones (Plate I.) are as follows :—

1. The Equatorial Zone, including 15° of latitude on each side of the Equator.

2. The Tropical Zone, from 15° of latitude to the Tropics.

3. The Sub-Tropical zone, from the Tropics to 34° of latitude.

4. The Warmer Temperate Zone, from 34° to 45° of latitude.

5. The Colder Temperate Zone, from 45° to 58° of latitude.

6. The Sub-Arctic (and Sub-Antarctic) Zone, from 58° of latitude to the Arctic (and Antarctic) Circle.

7. The Arctic (and Antarctic) Zone, from the Arctic (and Antarctic) Circle to 72° of latitude.

8. The Polar Zone, including all the land above 72° of latitude.

The corresponding Vertical Regions (Plate II.) into which, according to Meyen, mountains may be divided, are the following :*—

* It will be remembered that, as a general rule, the mountains of the Equatorial Zone alone can exhibit all the eight regions.

1. The Region of Palms and Bananas, extending from the level of the sea to an altitude of 1900 feet; with a mean annual temperature of 81° Fahr.

2. The Region of the Tree-Ferns and Figs, from 1900 feet to 3600 and 3800 feet; mean temperature 74°.

3. The Region of Myrtles and Laurels, 3800 or 3900 feet to 5700 feet; mean temperature 68°.

4. The Region of Evergreen Trees, from about 5700 feet to above 7600 feet; mean temperature 63°.

5. The Region of Deciduous Trees, from 7600 feet to 9500 feet; mean temperature 58°.

6. The Region of *Abietinæ* (Firs), from 9500 feet to 11,500 feet; mean temperature 52°.

7. The Region of Rhododendrons extends (and that of the plants which represent them in the New World—*Bejariæ*—ought to extend) from 11,400 feet to 13,300 feet; mean temperature 45°.

8. The Region of Alpine Plants, from the upper limit of bushes to the line of perpetual snow; mean temperature 38°.

These divisions appear however (as Meyen himself allows) to be sometimes a little at variance with facts; but he thinks that more extensive observations will establish his theory.

And now—to begin with the lowest forms of vegetation—let us investigate the Flora of the Polar Zone. We shall only have to attend to the northern one, as all the land which lies within this limit in the southern polar regions is entirely devoid of vegetation. Victoria Land, stretching from 70° to 79° south latitude, was discovered and explored by Sir James Ross, in 1841, and is the nearest point to the South Pole which has been reached.

CHAPTER I.

THE POLAR ZONE.

INCLUDING ALL TRACTS OF LAND ABOVE LAT. 72°.

THAT we may prize at its full value the scanty vegetation of the Polar Zone, let us try to forget that such a thing as a tree, or even a shrub, exists; for nothing of the kind is to be seen beyond 72° of latitude. Let us place ourselves there in fancy, and look round; and, that we may properly enjoy the six weeks' summer, let us first imagine the state of things through the long night of winter. All the great white bears tucked up to sleep out the cold in their hollowed beds of snow;—the 'cold round moon' looking steadily down on all that white, frozen world, never setting for fourteen days and nights together, and only hiding her face from her third to her first quarter, as if for sorrow that she could then be of so little use;—but even then

there is still the glorious aurora lighting up the heavens and darting bright rays through the air, to make some amends for the loss of sun and moon.

Let us watch by this light that ambiguous-looking animal, with his canine head and his fox-like tail, and listen to his ambiguous voice too, between a dog-like bark and a fox-like yelp,—the Arctic Dog as he is called;* even in the severity of winter he prowls for his prey. The Reindeer too braves the polar winter; and even in Spitzbergen we may see him hard at work, with his monstrous branching horns reaching backwards as far as his tail and forwards beyond his nose, digging through the deep, hardened snow, and turning it aside with his great, broad feet, in search of the *Cenomyce rangiferina*,—a Lichen which forms his winter fare, and which, in honour of him, is called Reindeer Moss.

But the long twilight steals on and on till towards the end of March, when the sun's face appears once more above the horizon; his slanting rays have yet however so little power to warm, that till the middle of May the whole country is still locked up in ice. But now the ice begins to break up, and white bears and arctic dogs find themselves

* Identical, as some suppose, with the silver-grey fox of North America.

starting on involuntary voyages upon floating islands of ice. The sun's rays call a world of beauty forth: they strike the icebergs, and every varied colour of the prism breaks forth—bright glowing crimson and sapphire blue—they all unite in silent praise of God. The air is filled with myriads of shining icicles, sparkling like diamonds; the very depths of the water glow with the tints of the beautiful mackerel of those northern seas, green and azure and polished silver.

The thermometer has risen in three weeks' time from 56° below zero to 40° above it. But the melting snow does not discover, as it does in our happier land, a green grass carpet beneath:—"whole countries within this zone are, on account of the barren soil, perfectly destitute of vegetation; and in others, the little, and, for the most part, exceedingly pretty plants, grow in turf-like patches, or at least socially."

Short are the lives of the flowers: about the beginning of July they are in blossom, but not a human eye or heart is there to greet them; and by the end of this month, or the beginning of August, the seed is ripe. We shall find a great many old friends amongst them: in the first place, there are plenty of Crowfoots (*Ranunculaceæ*): numbers

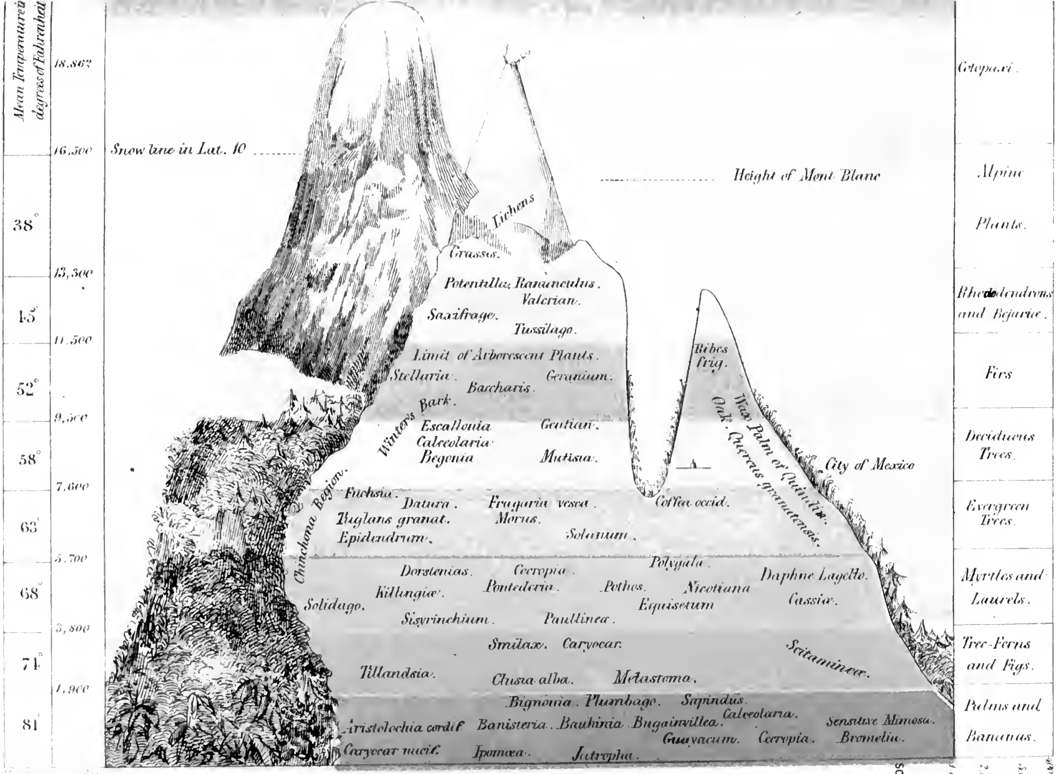


DIAGRAM OF VERTICAL REGIONS OF VEGETATION ON THE ANDES.

of them grow in Melville Island.* Captain Parry's officers likewise found there a variety of Saxifrages, all of which may be met with on our own higher mountains, chiefly in Wales and Scotland. For instance, Purple Saxifrage (*Saxifraga oppositifolia*), with its egg-shaped leaves and prostrate stem, and its purplish-red blossoms; the white-blossomed Drooping Bulbous Saxifrage (*S. cernua*); the Clustered Alpine Saxifrage (*S. nivalis*), distinguished by the two pale green spots on its white petals; Alpine Brook Saxifrage (*S. rivularis*), with a stem no more than two inches high, and a few small, white flowers; and the Tufted Alpine Saxifrage (*S. cæspitosa*), with its white petals streaked with three green nerves. In Melville's Island too there are a considerable number of flowers belonging to the Composite Family.

Some very pretty kinds of *Eriophorum* are found in these regions (Cotton Grass as it is called, though it is, strictly speaking, a Sedge): some species of it grow in damp situations in England. Thread, spun from some of our English Cotton Grass, was to be seen in the Great Exhibition of

* The above list of plants, which Meyen has taken from Phipps and Scoresby, is here borrowed from him again, with the addition of the English names.

1851: there is something very elegant in the appearance of its shining, almost silk-like, white seed-down. Then there are numbers of true Grasses to be met with, though not, of course, clothing the country as ours do; and to judge of the rest by one specimen (*Phippsia algida*), they have a very starved look. Alpine Fox-tail Grass (*Alopecurus alpinus*) is another; it also grows on some of the highest mountains in Scotland.

The Field Rush (*Luzula campestris*) is one of the plants which are met with in the Polar regions. There is also a very pretty plant in which a strong family likeness may be traced to our common Heaths, and which is a species of that family, called *Andromeda tetragona*, with imbricated leaves, and blossoms like little white cups, growing on rather long, hair-like stalks. The same resemblance may be seen too in another heath, called *Pyrola*, which is a somewhat larger plant than most that grow in that part of the world: it is a beautiful flower; the little white blossoms look like a fairy peal of bells, with the clappers (the black tips of the pistil) just hanging out: we have species of both. Then there is a small marsh-growing plant, called *Tillæa aquatica;* and the little Mouse-ear Chickweed (*Cerastium alpinum*) of course will be there: it belongs to a hardy family; some

of its nearest relations have been found in blossom on the Austrian Alps, at the height of 9500 feet, no more than an inch high.

Potentillas too are amongst the characteristic flowers of this zone; and the Mountain Avens (*Dryas octopetala*), with its large white flowers and feathery styles. There are the flowers too which some people call Bachelor's Button (*Lychnis dioica*), and Ragged Robin (*L. Flos-cuculi*), belonging to the tribe of *Sileneæ*. The order of plants called Figworts (*Scrophulariaceæ*) is represented in the Polar zone by a flower (some pretty species of which we have) called Lousewort (*Pedicularis*). There are species of the wholesome Cruciferous family too, such as Danish Scurvy-grass (*Cochlearia Danica*), not unlike Shepherd's Purse (*Capsella Bursa-pastoris*) in its general character; a plant, too, related to our Ladies' Smock (*Cardamine pratensis*) called *Cardamine bellidifolia;* and Alpine Whitlow-Grass (*Draba aizoides*), of the same tribe. Those who have seen the flowers of this region with their own eyes seem to consider the Poppy (*Papaver nudicaule*) as the queen of them all.

But the prettiest things of all—to judge by very perfect dried specimens—are the little Willows (*Salix polaris* and *S. herbacea*); they are exactly like Willow trees in minia-

ture, some of them six or seven inches high, others much shorter, and covered with little catkins.* The plants which have hitherto been named are such as we have examples of at home in some species or another; there are a few others peculiar to the Polar zone, almost all of them Grasses. There is a proportionate number of Cryptogamic plants; of Lichens there are nineteen species; one of these, called Tripe de Roche, was for a long time the only food which could be procured by Franklin, Richardson, and Back, during their daring scientific researches. Such is the vegetation of the Polar zone. Amongst the obstacles which prevent a richer development, we must remember, in addition to the temperature being through the greater part of

* The *Salix herbacea* is also found on the sharp declivities of the Alps, under circumstances which exert a peculiar influence on the manner of its growth. It not unfrequently happens, that the soil on the steep mountain-sides, when moistened with rain, gives way, and covers up both the woody, creeping stems, and the leaves which grow in pairs at their extremities. From the axils of each separate pair of leaves, thus suddenly buried alive, two more diverging branches, each terminating in another pair of leaves, are then developed, which force their way upwards to the air, through the earth which has been heaped upon the plant. As this process is repeated every time a fresh deposit of the soil is washed down by the rain, one plant, by thus multiplying itself in a geometrical ratio, soon covers a wide surface; the woody underground branches in this manner attaining an extraordinary length.

the year below the freezing-point, the rocky, barren soil, and a want of water during the short summer.

And now we may form some faint idea of what this Polar summer is like, if we imagine the sun shining on this scanty vegetation, almost as bright at midnight as at midday (so as to give the air no time to lose any of the heat it has received), till it sometimes even melts the tar in the seams of the ships which make their way there. When the sun shines from the north, it may be looked at as we look at the moon, with an undazzled eye; and sometimes its rays are obscured for a time by thick and sudden fogs. Clouds of wild-fowl fill up the picture, darkening the air as a whole flock of them rises at once; and not only wild-fowl, but a variety of other birds congregate in these regions in summer, to lay their eggs.

Though there is neither tree nor shrub growing in this zone, the frequent appearance of Pine-trees, drifting about in the Arctic Ocean, used to be considered by sailors as a kind of mystery; but it is supposed that these trees have at some time been torn up by land-floods, and driven into the sea by the many great rivers which flow through the northern parts of Russia into this ocean. From the decayed state in which they are always found, there is reason to

think that, owing to the opposition of tides and winds, many years elapse before they arrive there. Something far more inexplicable was observed by Captain M'Clure in his late successful attempt to discover the North-west Passage, which shall be given in his own words; it is impossible to read them without a feeling of surprise, when we remember the "total absence of trees and shrubs above 72° of latitude," which, in the present state of our globe, is laid down as a rule. "An exceedingly old Esquimaux encampment was met with in making some inland excursions (apparently in Baring's Island), and a most interesting discovery of a range of hills, composed of one entire mass of wood in every stage, from a petrifaction to a log fit for firewood; *many large trees were amongst it*, but, in endeavouring to exhume them, they were found too much decayed to stand removal; the largest piece that we have been able to bring away being three feet ten inches in girth and seven feet in length. These were found at an elevation of three hundred feet above the beach, in latitude 74° 27′ north: the beach is strewed with chips and small bits of wood, as are the water-courses and ravines as far as any person has walked inland, evidently washed down by the thaw from these ligneous hills." This is one proof amongst others which exist, that

the climate of the Polar regions must at some time have been warmer than it is at present. The beds of coal, for instance, which were discovered during Captain Parry's researches, both in Melville Island and in Jameson's Land, in Old Greenland, bear silent witness to the previous existence of forests there; coal-beds being now pronounced by geologists to be the remains of ancient forest timber in a mineralized state.

CHAPTER II.

THE ARCTIC (AND ANTARCTIC) ZONE.

FROM LAT. 72° TO THE ARCTIC (AND ANTARCTIC) CIRCLE.

A MOST unpromising field for a botanical excursion the countries in this zone may seem, at first sight, to present; our notions of them are perhaps, in most respects, rather indefinite,—about the extreme north of Siberia for instance. As regards Lapland indeed we know at least so much more, that its name cannot be mentioned without raising images in our minds of reindeer and reindeer-sledges, and diminutive people living almost in the dark for weeks together. In like manner, Greenland is associated in our thoughts with whale-fishing and bears, and we have a general idea of some tribes of Esquimaux that inhabit the northern coast of North America.

We are therefore the more indebted to the patient labours

of those who have endeavoured to throw any kind of light upon these remote and unattractive regions. Sir William Hooker has acquainted botanists with the character of vegetation in the American portion of the Arctic Zone; but the 'Flora of Lapland,' by Wahlenberg, was the first work "in which the botanical geography of a particular country has been worked out with extraordinary success." Much attention seems to have been given to the flora of Lapland by northern botanists. We read of a tour being made for the express purpose of examining it as long ago as 1695, by a botanist named Rudbeck, at the command of Charles XI.; unhappily all the copies of the first volume of his 'Campi Elysii,' except two, were destroyed in the terrible fire at Upsal in 1702. One of these has been lost; the other, the sole remaining copy, is in the Sherardian Library at the Botanic Gardens, Oxford. In 1732, Linnæus, then a young man of about five-and-twenty, was appointed by the Royal Academy of Sciences at Upsal to make the tour of Lapland; and it is remarkable that he also lost many of the natural productions he had collected, by the upsetting of a boat.

"The most eastern countries of the old continent which project into the Arctic Zone are unfortunately quite unknown;" and it is expected that the character of their ve-

getation, whenever it is investigated, will be very different from those parts which have already been explored; because the wind, which in the higher latitudes generally blows from the west, grows colder by travelling over great tracts of land; so that the temperature of the more eastern countries must be considerably lower than that of the western, which the wind reaches after passing over the warmer sea.

One great feature which distinguishes this zone from the last, is the first appearance of trees;—some almost reach North Cape, at the very extreme of the Scandinavian peninsula. If we had to guess what these hardiest of all trees are, we should probably fix on Firs (*Abies*); and we should have made a very intelligent guess, but a wrong one after all. The elegant, delicate-looking Birch (*Betula*) it is, with its light waving foliage and silvery bark, that stands foremost to face the cold; it is said moreover to be the most predominant of all the plants of this zone. It is the nature of its thick bark which enables the Birch thus to encounter the cold; for being a non-conductor of heat, none of the vital warmth of the tree is able to escape. It was not at all a bad guess about the Firs; for, next to the Birch, some species of the Fir appear in the greatest numbers. (Plate III.) There are even extensive forests of the

Scotch Fir (*Pinus sylvestris*), and the stiff-looking Spruce Fir (*Abies excelsa*). The Spruce Fir extends as far as Alten, —to from 69° to 70° of latitude; and on the eastern side of Norway and Sweden the beautiful Pine reaches as far as 69°, and even above 70°. The only other plants of tree-like growth which venture beyond the Arctic Circle are the Aspen (*Populus tremula*) and the Mountain Ash (*Sorbus Aucuparia*).

As it is always interesting to trace the correspondence which exists between the particular food of all kinds of different wild animals, and the facilities for obtaining it which Providence has placed within the reach of the most helpless, it will be worth while just to observe here, that the appearance of trees is coincident with that of an animal (found in all the countries bordering on the Northern Ocean) which is indebted for his subsistence to the curious and crafty use he makes of them in securing his prey. This animal is called by the very disagreeable but well-deserved name of the Glutton. In figure he is very much like a badger, but he is about twice the size; his legs were never made for running, and he is but an indifferent walker. It is clear then, when we learn that he preys on such animals as the reindeer, elk, hare, etc.,—all so fleet of foot,—that

he must supply the defect of his feet by the cunning of his head. He accordingly climbs into the trees, and having hidden himself, he watches his opportunity, till some unfortunate victim passes below; he then darts down like an arrow upon it, and fixes so firmly on its body with his teeth and claws, that the animal tries in vain to get rid of him by rubbing against the trees; and he continues to gnaw the flesh and suck the blood till his wretched prey falls down and at last expires, after which he devours it at his ease.

Having told over the short catalogue of trees, let us next see of what the brushwood consists; and it must be remembered, that in acquainting ourselves with the plants of this zone in the Old World, we learn at the same time what they are in America; for there is, we are told, "an extraordinary accordance" between them. The brushwood is chiefly composed of that particularly handsome spreading shrub, the Juniper (*Juniperus*); of the Mountain Bramble (*Rubus Chamæmorus*); Dwarf Cornel (*Cornus Suecica*), which has very small dark-purple flowers, growing in an umbel; of a plant called *Diapensia Lapponica*, the stamens of which look like petals with the anthers fixed on the top; and of *Azalea procumbens*. They are all very short, as might be expected, and may all be found on heathy pas-

tures or in mountainous situations in England, Wales, and Scotland. As for the little Azalea, it gives one a slight sensation of surprise on first seeing it, to discover how unlike it is to its highly-cultivated drawing-room relations; but indeed these last must own the connection,—for the structure is the same,—though it is a very humble little thing, growing close to the ground, with hard little dark green leaves, and small crimson blossoms: as however it grows in masses, it must have a considerable influence on the appearance of vegetation.

The summers in this zone are no warmer than they are in the Polar Zone; so that we shall meet again with many of the alpine plants, as they are called, which we found there, growing here at the level of the sea. For instance, near Kunnen, on the west coast of Norway, we find in the meadows (for the verdure of some of our own grasses is not quite wanting in the Arctic Zone) a species of *Lychnis;* the Purple Saxifrage (*Saxifraga oppositifolia*); a kind of Potentilla (*Potentilla alpestris*), which must surely be the same as the rare orange-yellow Potentilla sometimes found on our own mountains: and besides these, Alpine Meadow Rue (*Thalictrum alpinum*); a shrubby, heath-like plant (but a Monochlamyd), called Crowberry (*Empetrum*

nigrum), which is not uncommon in shrubberies; another small shrub, which does truly belong to the Heath tribe, called the Black Bearberry (*Arbutus alpina*), with white flowers and a black berry;—the following plants too, with the familiar names of Alpine Ladies' Mantle (*Alchemilla alpina*); Alpine Fleabane (*Erigeron alpinus*); Alpine Milk-vetch (*Astragalus alpinus*), a thorny plant of the Leguminous tribe, not unlike Gorse in its general character; and the small Alpine Gentian (*Gentiana nivalis*), a pretty little flower which also grows in Scotland, and is not unlike *Gentiana amarella* in appearance. We also find a kind of Buckwheat (*Polygonum viviparum*); a very handsome flower of the Composite family, something like a Marigold, called *Arnica montana;* a species of Mountain Avens (*Dryas integrifolia*); a grass called Alpine Soft Grass (*Holcus alpinus*); two or three kinds of Lousewort (*Pedicularis*); and besides these, our common Ribwort Plantain (*Plantago lanceolata*); a species of Mouse-ear Chickweed (*Cerastium viscosum*); Mountain Sorrel (*Oxyria reniformis*); and Sea Arrow-grass (*Triglochin maritimum*). We next find a plant of the Colchicum family (*Tofieldia borealis*); the flowers are greenish-white, but very small, growing in a cluster at the end of the long flower-stalk, which springs out of a bunch

of grass-like leaves. There are likewise two or three species of the beautiful Willow-herb tribe (*Epilobium*).

Near the sea-coast grow Sea Sandwort (*Arenaria peploides*); another plant something like our Bird's-foot Trefoil (*Lotus siliquosus*); and one of Ragged Robin's relations, called Sea Campion (*Silene maritima*), with "white petals and a purple calyx, beautifully reticulated;" and here too grows Danish Scurvy-grass (*Cochlearia Danica*).

In the open plains grows a small kind of *Rhododendron* (*R. Lapponicum*); its structure shows it to be of the same family with the beautiful American shrub of that name, but there is about as much resemblance to it in its general appearance as there is between the little Azalea before mentioned and the Azaleas of the greenhouse: both are here associated together. In such situations too grow the Red Whortleberry or Cowberry (*Vaccinium Vitis-idæa*); the Cranberry or Marsh Whortleberry (*Vaccinium Oxycoccus*); and three species of the heath-like *Andromeda*, one species of which (*A. tetragona*) we met with in the Polar Zone, with little white cup-like flowers on long hair-like stalks.

The manner in which this flower was first discovered by Linnæus himself in his Lapland tour, is too interesting to be omitted. "Equally a stranger to the language and to

the manners of the Laplanders, he even traversed what is called the Lapland Desert,—a tract of territory destitute of villages, cultivation, or any conveniences, and inhabited only by a few straggling people. In this district he ascended a mountain called Wallevary, in speaking of which he has given us a pleasant relation of his finding a singular and beautiful new plant, *Andromeda tetragona*, when travelling within the Arctic Circle, with the sun in his view at midnight, in search of a Lapland hut."* He travelled on foot, we are told, the whole way, from near the northern extremity of the Gulf of Bothnia to the shore of the Arctic Ocean, attended by two Laplanders, one his interpreter and the other his guide.

That name of the "Lapland Desert" helps out wonderfully the picture of these regions. The names of a few heaths, and the plants which commonly grow intermixed with them, are soon read over; but when the idea of these few species of plants has been taken in, it must be expanded till we see in imagination vast tracts of woodless heathland, forming a large proportion of all those countries which border on the Frozen Sea.

It is doubtless under the covert of these heaths that our

* From the Life of Linnæus, by Dr. Pulteney.

old acquaintance, the Silver-grey Fox, or Arctic Dog (which also inhabits this zone), finds his favourite food,—a species of mouse called the Lemming. "He loves open countries, and never frequents the woods;" and here, at certain times of the year, these foxes in vast troops together pursue their helpless prey,—a kind of hunt conducted on entirely different principles to those received in England, particularly where a fox is concerned.

An extensive surface of dry and barren country, covered with an incredible number of lichens, forms another and very distinguishing feature of the Arctic Zone. In North America there are numbers of *Gyrophoræ;* and in the Old World large tracts of land are clothed with the Reindeer Lichen, or Moss, as it is commonly called (*Cenomyce rangiferina*); it forms "a matting over which it is very fatiguing to travel in summer, when the plants are dried up by the perpetual sunshine."

It is however chiefly in winter that the Reindeer Lichen forms the food of the reindeer. In appearance it is very much like the Iceland Moss we see in the chemists' shops; it must likewise possess the same nutritive qualities, for it is a remarkable fact that "though the reindeer eats nothing during the winter but great quantities of this moss, he always

fattens better, his skin is cleaner, and his hair finer than when he feeds upon the best herbage, at which time he makes a hideous appearance."

In the extreme north of Norway and Sweden, a clothing of a kind of moss (*Polytrichum*) prevails, of the most luxuriant beauty; and we find Captain M'Clure giving a corresponding description of an island lying in the same latitude on the north coast of America,—Baring's Island, discovered and taken possession of by him for Her Majesty. He says, "From an elevation obtained of about five hundred feet, we had a fine view towards the interior, which was well clothed with moss, giving a verdant appearance to the ranges of hills that rose gradually to between 2000 and 3000 feet."

The natives on the coasts of those seas which Captain M'Clure explored, must be very different from those of the Arctic Region in the Old World, of whom we have been accustomed to hear dismal descriptions. He speaks of them as "a kind and merry race;" "a fine, intelligent race, cleanly, handsome, and well-grown;" and deeply regrets that hitherto so little has been done towards their conversion and civilization.

CHAPTER III.

THE SUB-ARCTIC (AND SUB-ANTARCTIC) ZONE.

FROM THE ARCTIC (AND ANTARCTIC) CIRCLE TO LAT. 58°.

A PECULIAR interest must be felt by all botanists in making acquaintance with the flora of this zone, from the circumstance of its including Sweden, the native country of Linnæus. Many of the plants we shall meet with, were those which first occupied his thoughts; for, beginning as he did in the surest way to become great, by industriously using the opportunities which lay within his reach, the young Linnæus first carefully studied the wild flowers of his own neighbourhood and those which grew in his father's garden. At no part of his life did his observations extend far beyond Northern Europe, being chiefly limited to his own country and Lapland, Denmark, and Holland: Germany appears to have been the most southern country he visited.

As no researches seem to have been made, as yet, in the North American portion of this zone, we will start from the most westerly land in the old continent—Iceland: the Faroe Islands may be spoken of at the same time, as their vegetation is much the same as that of Iceland; and it may be further remarked, that it "agrees very closely" with the coast flora of Norway. The absence of trees is a characteristic of all; for though the Birch and the Alder (*Alnus*) grow in Iceland, they only attain the height of shrubs, and these are the nearest approach to trees to be seen in the island, together with the Juniper, which is the only coniferous plant found there: Firs however grow in the Faroe Islands, and Willows are not wanting. The mountains in these islands are often covered with long mosses; and both here and in Iceland corn is cultivated, though it does not always ripen.

But Iceland was not always the treeless island it is now, nor, as there is reason to suppose, was the temperature always so low as at the present day; for there are facts which prove that there were once high Birch forests standing where now the ground is changed into moors and bogs; and not Birch-trees only, but Oaks probably as well; for Mackenzie, in his Travels in Iceland, speaks of seeing fossil

wood there, found in the north-western part of the island, which he says "seemed to be oak." The specimen which he mentions was of considerable size, being made use of as a table in a farm-house. When submitted to fire, "it burns with flame;" but its nature is only incompletely understood at present, and "this substance is one of the interesting objects that remain to be investigated in this remarkable country."

There are also masses of mineralized wood of a very different kind met with on the mountain of Drapuhlid, which is now almost entirely destitute of vegetation; it has the appearance of charcoal, but is heavy when lifted, and, unlike that before mentioned, it burns without flame when exposed to heat, and afterwards takes the appearance of fresh wood, though the resemblance is in appearance only, its other properties being very different. These are riddles for philosophers to read, and facts to be wondered at by those who are uninitiated in geological mysteries.

But although the ground which was once covered with forests is now changed to moors and bogs, we must not imagine that there are no sights more cheering than these to be met with in Iceland. There are meadows there as green as ours; and several kinds of Clover (*Trifolium*) grow

and blossom there as gaily. There are tracts of land covered with the common Heath (*Erica*), the common Juniper growing interspersed. The same plants grow in the stagnant pools that grow in ours, and the same on their margins as those we see in England; such as Mare's-tail (*Hippuris vulgaris*), and the blue-flowered, long-leaved Water Speedwell (*Veronica Anagallis*); Marsh Cinquefoil (*Comarum palustre*), and the little Mudwort (*Limosella*), with its oar-shaped leaves.

In the fields the flowers are identical with many of ours: for instance, Shepherd's Purse (*Thlaspi* (or *Capsella*) *Bursa-pastoris*); the pretty little Whitlow-grass (*Draba verna*); Self-heal (*Prunella vulgaris*); Wild Thyme (*Thymus Serpyllum*); Ragged Robin (*Lychnis Flos-cuculi*); Corn Spurrey (*Spergula arvensis*), etc.; two or three kinds of Whortleberry (*Vaccinium*), and the red Bearberry (*Arbutus Uva-ursi*). The wild Pea (*Pisum maritimum*) grows on the seashore too, and is used in Iceland as an article of food.

We must not forget one plant which is of great importance in Iceland, not only as an article of food, but as an article of commerce,—the Lichen called Iceland Moss (*Cetraria Islandica*); so great is the value of it to the Icelanders, that the season of gathering it is like a merry harvest-time.

It has to go through a long process before it can be rendered sufficiently palatable to be used as food; it is first soaked in water till the bitterness is extracted, and then boiled with milk; a kind of bread is also said to be prepared from it.

We shall find, as we proceed to Norway, that there is a great dissimilarity in the climate of different parts of this zone. We are especially surprised, on reaching Christiania, to find Ash-trees (*Fraxinus excelsior*), Limes (*Tilia Europæa*), and Elm-trees (*Ulmus campestris*). And although the average temperature is between four and five degrees lower than that of London, there are "apples and cherries, pears and apricots, growing in the gardens, and even grapes have been known to ripen in the open air." This however is mentioned by Meyen as a most striking exception to the usual vegetation of these latitudes; further east there is nothing to be found like it; and it must be owned, that if the old rule, that "The proof of the pudding is in the eating," is here applied, the fruits above named will scarcely stand the test, as they are of a very inferior nature.

The Pine (*Pinus sylvestris*) appears to be confined to the western coast of Norway; in the interior of the country it is replaced by the lofty and dark green Firs, which, with

the Aspen-tree (*Populus tremula*), the Service-tree (*Pyrus torminalis*), and the Juniper, there compose the forests. Oaks (*Quercus*) and Beeches (*Fagus*) indeed begin to appear towards the southern limit of this zone, but scarcely ever above 60° latitude, and "they show little of the grandeur and luxuriance they display in the thick forests of Germany and England."

The plants which grow in the Pine-forests on the west of Norway will be very interesting, from their names and forms being familiar to us at home. Let us only hope that whilst we are engrossed with them, we shall not fall in with any of the fierce brown bears, which no doubt consider themselves lords of the manor there; they possibly might not approve of people poking about and botanizing, and might hug the breath out of us before we had time to beg pardon. A *black* bear, if we should chance to meet, we need not run away from; he will most likely save us the trouble, by running away from us instead; for these black bears have a great dislike to society, and have no interested motives, like the brown bears, for wishing to cultivate the acquaintance, being for the most part strict *vegetarians*, living on roots and fruits,—acorns, for instance, when they can get them; the only exception being an occasional feast of ants.

But let us take courage and plunge into the gloomy Pine-forest; we shall meet a friend to cheer us before we have taken many steps,—the beautiful wild Foxglove (*Digitalis purpurea*). Venturing a little further on, we find the white English Stonecrop (*Sedum Anglicum*), with red spots on its pretty white blossoms; small upright St. John's-wort (*Hypericum pulchrum*), and the Earth Nut, or Pig Nut (*Bunium Bulbocastanum*), which the black bears, no doubt, have an eye to. There is a flower here, too, which is sometimes found in the woods in England, but is not indigenous there, called Orange Hawkweed (*Hieracium aurantiacum*); there are little bushy Burnet Roses too (*Rosa spinosissima*); the common Heath (*Erica cinerea*), etc.

Having now become accustomed to the solemnity of a forest, we shall feel no hesitation about making an excursion by-and-by in the forests of Siberia; we will therefore bend our course eastward. Those who please may perform a part of the journey in a sledge, over one or two of the great frozen Swedish lakes; but we would rather decline that method of travelling, as travellers are often put in considerable danger on these occasions by the attendance of hungry wolves in their rear following their track across the ice.

It will be worth while to pause a little on the shores of

the Baltic, for the sake of making acquaintance with a plant which is often found here under very curious circumstances; this is *Ledum palustre*, one of the Heath family, but not in appearance at all like what we generally understand by a Heath. This plant is frequently found entirely encased in amber, which, as it oozes from the Pine-trees, is supposed gradually to encrust these plants when growing near them, and in this state they are found,—leaves, flowers, and all in a state of perfect preservation. The leaves are peculiar from the manner in which they are uniformly rolled under at the edges; at the back they look like soft leather, of an orange-red colour.

For want of materials we must pass over the intervening space, and begin our promised excursion in the forests of Siberia, in that portion of them at least which has been explored,* where we shall find footsteps ready marked out for us.

The trees which compose these forests are different kinds of Pines; namely, the Cembran Pine (*Pinus Cembra*); the Larch (*P. Larix*); and the Spruce Fir (*Abies excelsa*). Plane-trees (*Platanus orientalis*); the White Poplar (*Populus alba*); another variety of Poplar, called *Populus balsamica*,

* By Langsdorf, from whom Meyen takes his list of plants.

and three different species of Birch (*Betula Alnus*, *B. nana*, and *B. fruticosa*). There are so many pretty little creatures leaping about the boughs, it is impossible not to stop and watch them for a little while; the white squirrel of Siberia darting up the trees to its nest on the top, and the Siberian grey squirrel, with its beautiful long hair, quite silvery at the ends;—that curious animal too, the flying squirrel, dozing away the whole day on a bed of leaves; he grows more brisk when twilight comes, though he is but a lazy fellow at best; but an empty larder acts as a stimulant, and so with one spring, his skin expanded like wings between his fore and hind legs, and his bushy tail serving for a rudder, he sails a distance of twenty-five or thirty feet from one tree to another, making a dainty supper on the buds and young shoots of the Pines and Birch-trees. At the foot of the trees gleams the delicate little white ermine, darting after mice like a cat.

But there is yet another beautiful animal, the sable; hiding away from the rays of the sun where the trees are thickest, as if he knew it would fade the beauty of his fur, he leaps perpetually with such agility from tree to tree, that he seems to be only doing it for amusement. But he has probably more utilitarian ends in view; for some say, that

though he is partial to dining on hare, and such dainty dishes, in their season, in summer he prefers a light diet of the fruit of the Service-tree. He is making the most of his merry time; for in winter, when the skin of the sable is handsomest, there is regular war declared against them by Russia.*

It was indeed to be feared, if we once began to watch the ways of these little animals, that we should spend too much time upon them; but we must remember the object for which we came into the forest, and attend to business. We no sooner cast our eyes on the ground than we find one or two kinds of little Rhododendrons; and next come two familiar friends, Marsh Woundwort (*Stachys palustris*), and Hedge Woundwort (*Stachys sylvatica*); we shall certainly think sometimes of the forests of Siberia when we meet them in our country walks, and that, we all know, will be often enough. Here too are the blue flowers of the com-

* The business of hunting and shooting sables used to be carried on by the unhappy exiles of Siberia; and when Russia has had no nobler prey in view, detachments of soldiers have been sometimes *quartered in Siberia* for the same purpose for several years together. "A colonel from *seven years' service in hunting sables* may draw of clear profit four thousand crowns; the subalterns in proportion, and each soldier six or seven hundred."—*Relations de la Muscovie, etc., quoted by Buffon.*

mon Skull-cap (*Scutellaria galericulata*), growing side by side with the Woundworts, just as they do with us.

The next flower, though not familiar to English eyes, we find to be a kind of Gentian, called *Swertia perennis*, with little blue blossoms. Then there are Great Burnet (*Sanguisorba officinalis*), with purple spikes; and common Tansy (*Tanacetum vulgare*): such a merry-looking flower it is, with its bunches of blossoms like yellow buttons, and its leaves so beautifully cut. Next we find a flower which grows in England and Scotland, Chickweed Wintergreen (*Trientalis Europæa*); it is a rare and beautiful flower of the Primrose family; the flowers are yellowish-white, and the stamens of course opposite the lobes of the corolla.

We cannot get away from our English friends; and who would wish it? That handsome flower, the Great Wild Valerian (*Valeriana officinalis*), greets us next; here too are two of the Whortleberries again (*Vaccinium Vitis-idæa* and *V. uliginosum*). And now we find two most elegant and distinguished-looking flowers, which no one ever saw in England, though by the family likeness we can tell they are relations of the Wood Anemone; these are *Anemone narcissiflora* and *A. sylvestris;* but though some of the characters are the same as in our own species, the flowers

in both are much larger, as large as those of the Evening Primrose, but white. A Siberian species of Clematis (*Atragene alpina*) grows also in these forests; the flowers are generally blue, though occasionally white;—a white *Fritillaria*, if the petals were all extended, would give some idea of the size and appearance of the latter. The seed-down is extremely elegant, from the perfect regularity of its long white feathers. One or two kinds of Heath too grow here (*Andromeda polifolia*), and the Red Bearberry (*Arbutus Uva-ursi*). And here is that flower that *will* be seen (and one cannot help being glad to see it),—Toad-flax (*Linaria*), almost like a yellow Snapdragon; everybody must know it, it is so determined to poke its head out at the very top of every hedge it grows in. Its near but humble little relation, the modest Eye-bright (*Euphrasia*), grows close by.

Here is also our wayside Silver-weed or Goose-grass (*Potentilla anserina*), and one of the Bedstraws (*Galium boreale*). Another of the Primrose tribe comes next, Tufted Loose-strife (*Lysimachia thyrsiflora*), not growing like a Primrose, on the ground, but tall and erect, with clusters of little yellow flowers growing upon the sides of the stalk. The beautiful heath-like *Pyrolæ* grow here too, some of which we met with in the Polar regions.

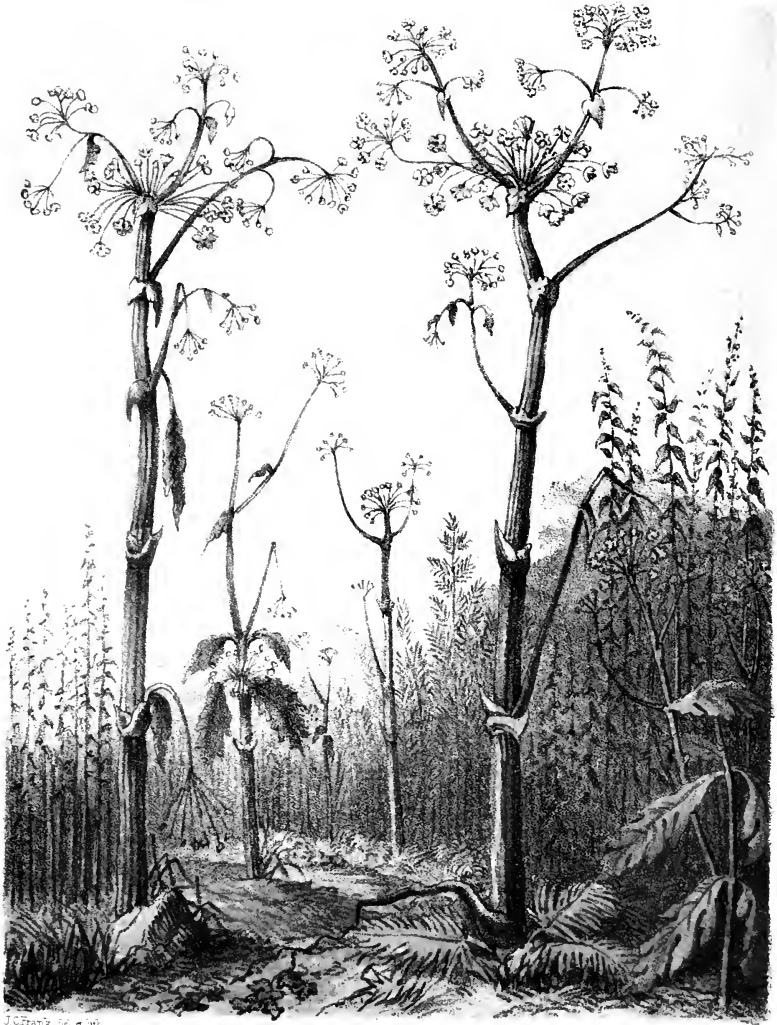
Glancing at the map, we find we have reached the eastern limit of this zone, and conclude there is nothing more to be done,—at least in this hemisphere. But our labours are not yet at an end. It is true that scarcely any of Kamtschatka lies in this zone, but its cold climate produces a flora of such a sub-arctic character, that, with the exception of the southern part, Meyen includes it in this region. The trees are nearly the same as those in the Siberian forests:—two or three different kinds of Birch; the Larch, and other Pines; the White Poplar, the Plane, a Willow (*Salix pentandra*), a smaller shrubby Willow (*S. arenaria*), and the common Juniper. There is also the Mountain Bramble (*Rubus Chamæmorus*); and another called *Rubus Arcticus;* the Red Whortleberry (*Vaccinium Vitis-idæa*), and the Bog Whortleberry (*V. uliginosum*); the common Barberry (*Berberis vulgaris*), the Red Currant (*Ribes rubrum*), the common Crowberry (*Empetrum nigrum*), the Wild Cherry (*Prunus Padus*), the Mountain Ash (*Sorbus Aucuparia*), and the Red Bearberry (*Arbutus Uva-ursi*).

It is an agreeable surprise, in this distant land, to meet with Wild Roses and Honeysuckles, and with another old favourite, the White Thorn,—(*Rosa spinosissima* and *Rosa canina, Lonicera cærulea* and *Cratægus Oxyacantha*). To

judge by dried specimens, the Honeysuckles are very much like ours, except that the flowers are considerably smaller. —Tall *Umbelliferæ* of some thirteen feet high have a remarkable influence on the character of the landscape in some of the level valleys on the western side of the peninsula, particularly in autumn, from the dark red colour of the hollow stalks, and the very bright whitish-yellow of the root-leaves. Gigantic nettles too, nearly ten feet in height, grow together in great numbers in the western region, in many respects resembling our *Urtica urens*, though without its stinging properties. (Plate IV.)

The flora of the corresponding zone in the Southern Hemisphere will detain us but a short time (if flora that may be called, whose only claim to the title depends on one solitary Grass and a few Mosses and Lichens). This one Grass, which grows in the South Shetland Islands, seems to be the nearest approach to anything like a flower in the Sub-Antarctic Zone. When we remember that these islands lie between 61° and 64° south latitude, and compare the low state of vegetation which they show, with all the pretty little flowers we met with even in the Polar regions, the difference appears very unaccountable.

Yet lower down in the scale of vegetation is Cockburn



Umbelliferæ, p 42

Island, about 64° 12′ south latitude,—due south of Cape Horn. Vegetation does in truth reach its last limit here, as nothing but Mosses and Lichens are to be seen. Cockburn Island is a barren rock:* "on approaching it, the cliffs above are seen to be belted with yellow, which, as it were, streams down to the ocean, among the rocky *débris*. This appearance was found to be entirely owing to the abundance of a species of Lichen (*Lecanora miniata*). Mosses grow in the soil which is harboured in the fissures of the rocks; they are excessively minute, the closest scrutiny being requisite to detect them; and so hard frozen into the ground, that they could not be removed without a hammer. Three of the Mosses are likewise European, *Tortula gracilis*, *T. lævipila*, and *Bryum argenteum*, which is also Arctic. The flora of Cockburn Island contains nineteen species, all belonging to the Orders Mosses, Algæ, and Lichens." Over the solitude of this island reign unmolested, penguins and cormorants, and the beautiful white petrel, whose nest, consisting only of a few feathers, is built on the bare and precipitous cliffs.

* From Sir James Ross's Antarctic Voyages.

CHAPTER IV.

THE COLDER TEMPERATE ZONE.

FROM 58° TO 45° LATITUDE.

THE face of most of the countries of the Old World lying in this zone is so greatly altered by long cultivation, that to get any idea of what they originally were, we must recollect what the state now is of that part of North America called the British Territories, which is included in this belt of land. Our best plan will be, first, to find our way, as well as we can, through the North American forests, and then, crossing the Atlantic, we shall be able to compare the natural state of vegetation, as it still exists in the New World, with its altered and cultivated appearance in the older countries of this hemisphere,—England, France, Germany, etc. The desolate steppes of the Don and the Volga also lie in this zone; Caucasus, the Ural and Altai moun-

tains, and part of Chinese Tartary. It is an historical fact, that vast tracts of European countries which are now cultivated and well populated were many thousand years ago covered with forests. Where the husbandman now drives his plough, the reindeer once ranged at will; an animal which from the description can be no other, is mentioned by Julius Cæsar as existing in the forests of Germany; and fifteen hundred years after, a similar animal is spoken of by Gaston de Foix as being found, in his day, in the French forests, even as far south as the Pyrenees. If there were reindeer, there were no doubt bears and wolves in numbers, for they are all found in the forests of Canada at the present time; and when we remember how far northward these wild animals have all retired, it conveys some idea of the gradual but complete alteration which human intellect and industry have effected.

In consequence of the clearing of the forests, the climate, as well as the face of many parts of Europe, is greatly altered. The climate of France was once exactly what that of Canada is now; the descriptions of the ice on the Seine some fifteen hundred years ago are precisely the same as those we hear in these days of the river of Quebec.

As our object in North America will be to see nature in

its uncultivated state, we will not spend our time in that part of Canada which within the last fifty years has been thickly settled and cultivated; it is as yet a mere border of the great primeval forests; for, though seven hundred and fifty miles in length, the average depth of the tract of land hitherto redeemed is no more than forty miles. It will be better to begin our explorations on the western coast, where, as usual, we find a much warmer climate than on the eastern side of the continent.

With a large proportion of the genera we meet with we are familiar in some of their species, and many are even identical with our own. As we travel inland, we find the bright yellow Meadow Crowfoot (*Ranunculus acris*), and two different kinds of Veronica (*V. serpyllifolia* and *V. Anagallis*); a little white-flowered Bedstraw too (*Galium boreale*); and a species of Plantain (*Plantago*); Lousewort (*Pedicularis*); *Bartsia, Fritillaria, Potentilla,* etc.; and amongst these we are struck with some beautiful strangers. One, a kind of Iris, called *Sisyrinchium;* and another belonging to the Primrose tribe, not unlike a Cyclamen, called *Dodecatheon.*

The forests are composed of colossal Fir-trees, amongst which are to be seen species of Alder, the Mountain Ash,

and the White Thorn; a white-flowered Bramble (*Rubus odoratus*) forms the underwood. The plants which are mentioned in company with the forest-trees, are,—first, that elegant little plant which was discovered by the daughter of Linnæus, and is named after her, *Linnæa borealis*, with pinkish-white blossoms; it grows also in the Fir-woods of Scotland. There is Chickweed Wintergreen too (*Trientalis*), a kind of Currant, and a tall *Azalea*.

In these forests we find, growing wild, a kind of Arum (*Calla*), and a *Lathræa*, which belongs to the Orobanche family; with dingy-looking blossoms growing all the way up the stalk. It is a parasitical plant; one species of it, *L. squamaria*, is often found in England growing upon the roots of trees: there is likewise a kind of Willow. But the most characteristic plant seems to be a very remarkable climber called *Panax horrida;* the epithet is well deserved, from the spiteful-looking prickles scattered over the surface of the very large leaves: "it renders the forest so dense that it is difficult to penetrate it." This plant belongs to the Ivy tribe (*Araliaceæ*); and the clusters of blossoms are very similar in appearance to those of the Ivy. There is also a species of an Orchidaceous plant called *Cymbidium*, a yellow flower with dark brown spots.

The vegetation of the Rocky Mountains, some portion of which lies in this zone, is too vast and too difficult a subject for these narrow limits.* The one prevailing feature of that part of those grotesque mountains is a "comparative barrenness and desert-like appearance, some small parts of river-valleys only excepted. The most prevalent colours amongst the flowers are white and yellow; the white colouring is occasioned by *Achillea Millefolium;* the yellow by *Calliopsis bicolor,* with *Helianthus tubæformis, Stanleya,* divers *Solidagines,* and *Ranunculi.*" A plant, called *Shepherdia,* resembling our Sea Buckthorn (*Hippophae*), is very abundant in those districts; and a striking feature is formed by the Yucca, "with its rich symmetrical, silvery foliage, and floribund scapes. The colour of the foliage passes through every shade, from deep dull green to silvery-white, the trees being chiefly *Cupuliferæ* and *Coniferæ,* besides groves and thickets of *Salicineæ.*"

Passing on to the forests of Canada, we find they are of two distinct kinds; namely, boundless Fir-forests, and forests of deciduous trees. Amongst the latter, the Maple appears to predominate: they are composed, besides, of Beeches,

* A detailed and interesting account of Geyer's Journey across the Rocky Mountains, etc., is given in the 'London Journal of Botany,' vols. iv. and v.

Elms, different species of Oak, and the White Birch, the Black and the White Ash, and other trees with less familiar names, such as Basswood, and the Butterwood tree, or Grey-branched Walnut (*Juglans cinerea*). Some of the latter grow to an enormous size; they bear a great resemblance to the Sycamore, both in the wood and the manner of growth.

Hickory-trees abound in the Canadian forests, which are also akin to the Walnut. The Black Cherry also grows wild there, and to a large size; the trunk is sometimes more than ten feet in circumference, and measures fifty feet up to the first branch; it is used extensively for furniture, and is little inferior to mahogany either in appearance or durability.

As the danger of losing our way in these mighty forests is very great, it will be as well to mention a method of steering through them which has been found of great use. "If the forest consists of deciduous trees, the best way to find the points of the compass is to observe the moss on the trees, which grows more luxuriantly and in greater quantities on the north side. In Pine woods there is another guide, namely, the general inclination of the trees from the north-west.* The trees of these forests are described as

* From 'Twenty-seven Years in Canada West,' by Major Strickland; from which also the above particulars of the Canadian forests have been gleaned.

being generally large, massy, and vigorous; the time when they appear in their greatest glory is the month of September. The splendour of their autumn colours is something wonderful to an English eye. The leaves of the Sycamore and Maple show every hue from richest crimson and orange to deep warm shades of brown, mingled and beautifully contrasted with the palest shade of buff-colour and light green. The Sumach-tree too grows near, with its uniformly arranged leaves, dyed bright vermilion.

The inhabitants of these forests are chiefly bears, wolves, foxes, tiger-cats, martens, hares, and squirrels, of which there are four different kinds; these industrious creatures hoard up large stores of provisions for winter in the holes of trees; the business of "putting up their preserves" is most diligently performed by these good little housekeepers, as they carefully skin every beech-nut before they stow it away. The bears seem to be some of our old vegetarian friends, as they too feed on the beech-nuts, hickory and butter-nuts. The most formidable animals to encounter are the wolves, particularly when they are in a pack together. "There is something very appalling in the wild unearthly din of a pack of Canadian wolves in full cry in the woods at night, hunting deer."

The indigenous fruits of Canada are the Plum and the Grape; but the Grapes are crude and sour in their present uncultivated state. "Raspberries, good enough for dessert, grow more plentifully than blackberries do in England, about the snake-fences, and are delicious fruit." In the Huron Tract we hear of meadows producing enormous quantities of hay and pasture, and of fine fields of rice on some of the lake islands; "but the so-called wild rice of Canada is a totally different plant, namely, *Zizania aquatica*."

There are openings in the forests sometimes of several acres in extent, dotted with clumps of Oak and Pine, which in spring are gay with wild flowers. Amongst the first to appear are the red, white, and blue Hepaticas, and white and yellow Violets; and later in the season are seen Lobelias, Lupines, and Tiger Lilies; the beautiful climbing plant called *Maurandia* grows wild here too, which is now well known in English gardens. It is well perhaps that we have no longer list of flowers to detail, though the few which have been mentioned can convey but a faint idea of the truth; but we have already spent too much time in North America, so that we cannot now visit Labrador; it may just be stated however, that the vegetation there is far behind

that of the western coast, just as Kamtschatka, on the eastern coast of the Old Continent, shows an inferior vegetation to that of the western coasts in the very same latitude.

We must now sail on to more familiar scenes. We will not land in England; for every Englishman knows what the broad but varied features of vegetation are, which chiefly characterize the face of his own country:—the undulating hills, some richly wooded with Beeches and Oaks, and others clothed with Heath and Gorse; the bare but beautiful sea-side downs too, covered, and but just covered, with short grass, with no other feature to distract the eye as it watches the shadows of the passing clouds gliding over their quiet faces;—the bleak, level heaths of some parts, contrast with the broad rich pastures of others, which are often relieved by clumps of the Elm-tree—that most perfectly pleasing of all forms—and girdled round by Whitethorn hedges. The large proportion of cornfields, and the large tracts of exceedingly useful, but exceedingly ugly, flat turnip-fields; the Fir plantations, and the last remains of the old forests, to be found still in some parts;—these sights are too well known to every one for it to be necessary to spend the time in England; we will therefore "sail by the white cliffs of Britain" and land in Germany, taking

what we see there as a fair average specimen of the vegetation of this zone in the Old World.

Here also, as almost everywhere in this part of Europe, we find noble meadows and wide heaths, extensive pastures and cornfields, forming chief features of the vegetation. Another characteristic is the prevalence of shrubs, most of them with large and beautiful flowers; such as the numerous Roses and different species of Bramble, and the Snowball Tree, or Guelder Rose (*Viburnum Opulus*). The forests form a very important feature of the German landscape,—both Pine-forests and forests of deciduous trees. The mountain forests are composed of Firs and Beeches intermixed, more particularly of the Beech (*Fagus sylvatica*); together with the Hornbeam (*Carpinus Betulus*), which, next to the Beech, is the most prevalent tree. The Firs are chiefly *Abies excelsa*, *Pinus picea*, and *P. Pumilio*, growing on the Alps at a height of more than 3000 feet; and higher still grows the Stone Pine (*Pinus Cembra*), even as high as 5000 feet and upwards.

Woods of the Scotch Fir (*Pinus sylvestris*) characterize the whole of Northern Germany; the plains and sand-flats are almost everywhere enriched with it. The brushwood in these Fir-woods is composed of the common Heath (*Erica*

vulgaris), and in boggy places of the Cross-leaved Heath (*Erica Tetralix*). On the north-west only of Germany extensive woods of the Oak are met with, composed both of *Quercus Robur* and *Q. pedunculata*.

In Northern Germany, particularly in Schleswig-Holstein, the fields are everywhere enclosed by hedges; the White-thorn (*Cratægus Oxyacantha*) and Privet (*Ligustrum vulgare*) here scent the air, mingled with Blackthorn (*Prunus spinosa*) and the common Hazel-nut (*Corylus Avellana*). In Prussia, a very peculiar character is given to the great lakes by the thick forests of the reed called *Arundo Phragmites*, which grow round their margins; it is the same reed the straw of which is often used in England for thatching.

In the southern part of Germany the noble Spanish Chestnut (*Castanea vesca*) is one of the most striking features. In this part of Germany alone, woods of the Chestnut tree are to be met with; which elsewhere is only to be seen in gardens and vineyards. The Walnut-tree is beginning to be very much cultivated in Bohemia, where the fields may be often seen planted with fruit-trees. In most parts of Germany the fields are unenclosed; it is only in mountainous districts that we usually find them surrounded with a stone fence.

The banks of rivers and brooks are adorned with different kinds of Willow, and the common Alder; the skirts of the woods are generally bordered by a line of White Birch.

It would be impossible here to give more than an outline of the varied forms of vegetation which the mountain flora shows through all the different regions, from the meadows at the foot (made verdant often by the streams which wander through them) to the last traces of vegetation just below the snow-line. From the meadows we wander up through the thickets of Willow and Alder which cover the rising ground; with Meadow-sweet (*Spiræa Ulmaria*), and the Great Yellow Loosestrife (*Lysimachia vulgaris*), and the handsome Purple Loosestrife (*Lythrum Salicaria*), and the great wild Valerian (*Valeriana officinalis*) growing intermixed. We have no time to pluck the wild Sage (*Salvia verticillata*) and Geraniums growing by the pathway which leads up through the sweet-scented, thick-growing Privet (*Ligustrum vulgare*) to the woody heights covered with Pines (*Pinus picea*) and Beech-trees (*Fagus sylvatica*), and bordered by thick bushes of the White Rose.

But, whether we have time or not, we cannot but stop to wonder a little at the groups we meet with hereabouts of colossal Sycamores (*Acer Pseudo-platanus*), from whose gi-

gantic branches hang enormous beards of green and dark grey Lichens,—types, we may call them, of the giant trees in the primeval forests of the tropics, oppressed by the weight of their intertwining parasites. Long might we loiter on these woody heights; for here, in open spots, and in the mountain meadows too, the ground is covered with flowers, and beautiful parasitical plants attract us: of the *Orobanche* family we see whole tribes within the limit of a few steps.

As we mount higher and higher, and reach the dark covert of the lofty Pines and Firs and Beech-trees, we see fewer and fewer of the sunshine-loving flowers, and walk upon a thick layer of twigs and fallen beech-leaves, sinking in at each step as if we were treading on moss. In damp places and by the side of brooks which wander through the forest we find a few flowers again:—Saxifrages (*Saxifraga rotundifolia*), *Pyrola uniflora*, Gentians (*Gentiana asclepiadea*), a Cardamine we do not remember to have seen in England (*Cardamine trifolia*), and one of the Forget-me-not's relations, Rock Scorpion-grass (*Myosotis alpestris*).

The trees as we get higher up grow further apart, and become dwarfish and more like shrubs; our prospect widens, and as the wood grows lighter and lighter, the ground is again covered with flowers of various kinds, with large

blossoms and of dazzling colours, growing together in turf-like patches. The flowers which grow in the greatest numbers are the bright yellow Mountain Globe-flower (*Trollius Europæus*), the dark purple Monk's-hood (*Aconitum Napellus*), a kind of Spurge (*Euphorbia pilosa*), Coralwort (*Dentaria enneaphyllos*), a Valerian (*Valeriana tripteris*), a Violet (*Viola biflora*), one or two kinds of Gentians (*Gentiana Germanica* and *G. obtusifolia*), Hawkweed (*Hieracium villosum*), and a kind of Groundsel (*Senecio alpinus*).

But we must mount to a higher region still before we reach the crowning beauty of the mountain flora,—the mingled garland of Rhododendrons, or Alpine Roses, as they are called—and shrubby, dark green Firs,* encircling the alpine meadows at the height of some six thousand feet. These two characteristic kinds of shrub—*Rhododendron hirsutum* and *Pinus Pumilio*—which grow here to the size of bushes, are almost impenetrable in some places; so that, between them, they choke all other vegetation. Masses of the large blue Gentian (*Gentiana acaulis*) are another characteristic of the "Alpine region," with from thirty to fifty blossoms in a cluster, set so close together that the finest blade of grass could scarcely make its way between.

* Called in Germany "Knieholz."

The curious may scramble higher if they will after the plants which, even in the "snow and glacier region" of some mountains, are scattered here and there, springing out of the clefts of the rock like starved and pitiful-looking plants, but nevertheless producing luxuriant blossoms; such, for instance, as the two kinds of Gentian (*Gentiana Bavarica* and *G. nivalis*), *Valeriana Celtica*, *Juniperus nana*, etc.

Those who will may mount still higher, and bring down as a trophy some little Arctic plant,—some isolated, inch-high Mouse-ear (*Cerastium latifolium*), or Saxifrage (*Saxifraga muscoides*), growing in solitude at some nine thousand five hundred feet above the world where mortals dwell. But the beauty of the Alpine region has satisfied us; and not till we have filled our hands with Orchises and Anemones, and other flowers which grow in numbers on the Alpine meadows, can we consent to retrace our steps down the mountain.*

The multitude of little herbaceous plants of Germany must be sought in botanical works; here it is only possible to mention the two most predominant families, the *Umbelliferæ* and *Cruciferæ*. We know too in this part of the

* The above particulars of German vegetation have been gathered from the writings of Herr Carl Sachse, of Dresden.

Colder Temperate Zone how common different kinds of the Mint tribe are (*Labiatæ*), of the Crowfoots (*Ranunculaceæ*), and the *Compositæ*. A German flora is altogether filled with names of flowers familiar to our eyes, and vegetation shows the same character unchanged as far as the Volga.

Beyond this river we come to a totally different and less pleasing scene. The steppes of the Don Cossack country are "local phenomena, and exhibit a vegetation quite peculiar to themselves."—"The undulating prairie, covered with a short dry grass, interspersed with quantities of wild Thyme and lilac Crocuses, stretches away illimitably, and looks like an ocean regaining its tranquillity after a three days' storm; for miles we do not meet a soul." Such is the impression on the unbotanical traveller. The "lilac Crocuses" were most likely the Meadow Saffron (*Colchicum*), as the time when they were seen was in the autumn: the black Henbane (*Hyoscyamus niger*) is said to luxuriate along the banks of the Don. The vegetation on the sandy steppes is composed of grasses with rigid, rolled-up leaves, and of different kinds of Goosefoot (*Chenopodium*); which, though they may want the attraction of showy flowers, have at least the merit of being always "content to live, upon the least that Heaven can give."

The strange salt steppes, which in summer often glitter as if covered with new-fallen snow, from the salt which lies on their surface, possess three plants which are considered peculiar to them,—*Anabasis, Halocnemon,* and *Brachylepis,* —all of them elegantly-shaped little plants, with clusters of very small blossoms, but with a look of poverty about them which plainly speaks of the soil on which they grow. The plants which prefer this kind of soil, and which we may therefore expect to find in company with those last mentioned, are common Wormwood (*Artemisia Absinthium*), Fleabane (*Inula Britannica*), Bird's-foot Trefoil (*Lotus corniculatus*), Thrift (*Statice Tatarica*), a kind of Saltwort (*Salsola prostrata*), some species of the Liquorice plant (*Glycirrhiza*), and, besides many other little plants, that elegant shrub the Tamarisk (*Tamarix Gallica*).

Further on and on we might still wander, if we had courage, over the Tartarian steppes; but that word "desolation" is so connected with them in our thoughts, that our hearts are chilled when we think of encountering them; and we shrink from an undertaking which might expose us, houseless and defenceless (if by chance the winter overtook us there), to the terrors of a steppe storm; during which "the clouds hang dense and gloomy over the barren waste,

and the cutting north wind drives over the surface, and the snow falls thick, till silvery streaks begin to rise continually from the plain, and the wind howls and blusters, and the air glistens with crystals of snow, and all is one dense, dim mass; till at last, caught by a whirlwind, it rushes round in a circle, or rebounds from the elevated parts of the steppes, and the snow-wreaths succeed one another, circling violently and rapidly round, and confounding everything in painful dizziness."

But we feel conscious that we are only inventing excuses to avoid doing what we dislike; it will be wiser to conquer our prejudices, and see whether ignorance has not exaggerated our notion of the desolation of the steppes of Tartary.

We find them, after all, not quite so desolate as we had anticipated; poor hovels here and there offer a prospect of shelter; for though these steppes are sparingly populated, they are not altogether without inhabitants; and vegetation here has an interest of a peculiar kind. The eye is relieved sometimes, when weary of wandering over a level surface, by tracts of land covered with groups of low-growing Blackthorns and Hawthorns, Brambles, and wild Roses too. There are also Grasses, which supply pasture to the herds of cattle; one very curious kind, called the Feather Grass

(*Stipa pennata*), is the most important amongst them, and very beautiful to look at. "Directly after flowering it expands its long, delicately-feathered awns (not unlike the tail of a bird of paradise) from the spike which rises high above the tuft of narrow, dry leaves." The woody root-stem too is a peculiar feature in this grass, which, from the height to which it stands out of the ground, is a serious annoyance to the labourer in mowing.

The awn, in the *Stipa*, is provided with a curious apparatus, not found in any other grass but the Oat: the part nearest the seed is twisted like a corkscrew, and looks and feels as hard as a delicately twined wire; when the seed falls, this screw in all probability first worms its way into the ground, thus boring a hole for the entrance of the seed to which it is attached.

The *Stipa pennata* was formerly said to grow in England, on the Westmoreland mountains, near Kendal; but as it cannot now be found, there is reason to fear that this was a mistake, or else that it has become extinct.

Other tracts of land on these steppes possess a different character, being overgrown by rough, branching plants, with woody stems, which go by the general name of *Burian* amongst the Tartars. Being quite unfit for pasture, they

are still eminently useful in their way, as they are the only source from which fuel is supplied in these regions; and the husbandman who lamented in summer over the unproductive land covered with these weeds, finds good reason in winter to retract his opinion, whilst he listens to them as they crackle under the boiling pot, and watches the cheerful flickering firelight on the walls of his cabin, which, but for them, had been cold and comfortless.

As it not unfrequently happens in our domestic circles that in the absence of the elder brothers and sisters the useful qualities of the younger branches are called forth, which till then had passed unnoticed,—just so on the Tartarian steppes, such plants even as the little unnoticed Milfoil (*Achillea*) do their best to supply the place of their vegetable brethren of a larger growth. It here attains several feet in height, and is not a little prized by the inhabitants, who value it as the best of all fuel. Wormwood too (*Artemisia*) is here found side by side with a gigantic Mullein (*Verbascum*), the "Steppe-light," as it is sometimes called.

But the Thistles are one of the most distinguished families in these situations, where "they acquire a size, a development, and ramification which is really marvellous. Often

do they stand like little trees around the humble earth-hovels of the country-people; on favourable soil they often form extensive bush, even overtopping the horseman, who is as helpless in it as in a wood, since they intercept the sight and yet afford no trunk which might be climbed." One of them, which the Russians call the "Leap in the Field," and to which Germans have given the more poetical name of the "Wind Witch," possesses characters of a most remarkable kind, which cannot be better described than in the words of Professor Schleiden, from whom many of the foregoing facts have also been collected.

"A poor Thistle-plant, it divides its strength in the formation of numerous dry, slender shoots, which spread out on all sides and are entangled with one another. More bitter than Wormwood, the cattle will not touch it, even in times of the most severe famine. The domes which it forms upon the turf are often three feet high and sometimes from ten to fifteen in circumference, arched over with naked, delicate, thin branches. In the autumn, the stem of the plant rots off, and the globe of branches dries up into a ball, light as a feather, which is then driven through the air, by the autumnal winds, over the steppe.

"Numbers of such balls often fly at once over the plain,

with such rapidity that no horseman could overtake them; now hopping with short, quick springs along the ground; now whirling in great circles round each other, rolling onward in a spirit-like dance over the turf; now, caught by an eddy, rising suddenly a hundred feet into the air. Often one Wind Witch hooks on to another, twenty more join company, and the whole gigantic yet airy mass rolls away before the piping east wind. Surely man does not need a rocky abyss, a mine, or howling sea-storms to give him food for superstition."

A more terrible life is imparted to the steppe when a countryman "cleans his farm," that is, when he has set on fire the "Burian" upon it, with the remains of old straw and hay, now useless, on account of the new harvest, and full of mice and other vermin. When the dry grass of the steppe has caught, the fire creeps amongst it, like a serpent, with measured swiftness; here it seizes a Burian-bush, and with a tremendous noise the blaze soars high toward heaven, crackling and hissing; there, reaching a tract of flourishing Feather-grass, it rises in a light white flame, and darts with terrible activity over the waving field, devouring millions of delicate feathers in a few moments. Sometimes hemmed in between two roads, bare of vegetation, or between streams

of water, the flame draws itself together and almost disappears, then suddenly reaching a new dry surface of grass, gains new and fearful power, and spreads into a wide sea of smoke and fire, in which the columns of flame, whirling up higher and brighter than the rest, mark the unlucky situations of human dwellings.

Steppe fires of this kind often move about over a region for eight or ten days, "crossing and diverging in directions which cannot be calculated on, following every direction of the breeze, and bidding defiance to the best-considered attempts at escape." Such an aspect of nature is a thing we had not dreamt of; and we are rewarded for the resolution with which we conquered our disinclination to explore these regions, by the images of wildness and grandeur which we have added to our store.

For want of a guide we cannot now travel further in this hemisphere; we have moreover something to employ us in the corresponding zone on the opposite side of the world. We have only one little memorandum to make about the Oak before we leave this part of the world, which in this zone finds its eastern limit at about 75° east longitude, in latitude 55°, though in gardens it may be met with in company with the Hazel-nut (*Corylus Avellana*), as far to the

east as 80°, and in the 59th degree of latitude. We will take this memorandum with us, and all the rest we have been making in the Northern Hemisphere, that we may the better compare what we have seen, with the character of vegetation in the southern extremity of South America, in Tierra del Fuego, Staten Land, the Falkland Islands and others, which were visited and explored by Dr. Hooker some twelve years since, when he accompanied Sir James Ross on his Antarctic expedition, and of which he has published a most interesting and beautifully illustrated Flora.

Only a few portions of the extremity of South America are known. The woods in some parts are described as "so thick that the sun's rays cannot penetrate them; but the trees which compose them never grow very high, though their trunks are of a considerable thickness at the base;" they are chiefly two kinds of Beech, and an evergreen tree called *Drimys Winteri*, or Winter's-bark. On the western coast, the ground in these forests is covered with moss.

It is only in the middle part of the Straits of Magellan that vegetation appears to be luxuriant; there also the principal trees are the Beech (of which one species, *Fagus betuloides*, is an evergreen) and the Winter's-bark. Some of the Beeches grow to a great thickness. The evergreen trees

cover the land, and the mountains to the height of two thousand feet, with perpetual verdure, "which presents an extremely remarkable spectacle, particularly where the glaciers descend to the sea." The bright flowers of the scarlet *Fuchsia*, which is a native here, adorn the gloomy Beech-forests; and both the *Fuchsia* and *Veronica* grow to such a size, that the stems are sometimes six or seven inches in diameter. On the western side of the Straits, "vegetation is very stunted," and on the eastern side there is a total absence of trees; these differences are in some measure accounted for by a great variety in the soil. Those who have visited this coast in summer, describe the craggy hills, which are of an amazing height, as completely covered with snow; whilst the plains were adorned at the same time with flowers equal in fragrance and beauty to those we see in the gardens of England. The woods are full of parrots and other beautiful birds; and in other seasons and other localities there seems to be an equal abundance of less beautiful, but far more useful, ducks and geese.

It is interesting to compare the different accounts which have been given of that much-decried land, Tierra del Fuego, which lies, it will be remembered, in the corresponding latitude with that of the southern part of England. This

island, and the adjacent one of Staten Land, seem hardly so bad as Lord Anson described them; or rather, the appearance of the country was no doubt very different as he saw it, in autumn, to that which it showed in the middle of summer, when the two naturalists, Sir Joseph Banks and Dr. Solander, visited it (in the year 1769), in company with Captain Cook. Lord Anson speaks of "high craggy hills towering above each other, mostly covered with snow;" of "deep horrid valleys; some few scattered trees; no plains; nor one cheerful green through all the dismal prospect;" and he considered the inhabitants of that "land of desolation" to be "the most miserable of human beings."

In Staten Land, the "horror and wildness" with which Lord Anson depicted it "were not discernible by Banks;" on the contrary, the land was neither destitute of wood or verdure, nor covered with snow. Tierra del Fuego also is described by Captain Cook as having "the sea-coast and the sides of the hills clothed with an agreeable verdure, with a brook at the foot of almost every hill." This account is confirmed by Dr. Hooker, who speaks of the "wild woodland scenery, secluded bays, precipitous mountains, and interesting vegetation of Tierra del Fuego;" though something of the "horror and wildness" is implied in the words which

follow, when he says that "terrible as the war of the elements there is, they (himself and his fellow-passengers) were in some measure sheltered from its fury."

Banks and Solander had nevertheless sad experience of the severity of the climate, even in summer. Having one day spent some hours on shore, and collected more than a hundred unknown plants, Sir Joseph Banks next formed a party for the purpose of making an excursion further into the country; upon which occasion he seems to have done things which no one but a botanist would have dreamt of undertaking. The least extraordinary performance was to walk across a bog thickly covered with closely interwoven bushes of Birch; "however, as they were not above three feet high, they *stepped* over them," between each of these *steps* going into the bog up to their ankles; "but they found a great variety of plants that gratified their curiosity and repaid their toil." Snow however came on, and benumbing cold and stupor, and the night was passed in an unfrequented wood. Surely this was the saddest botanical excursion that ever was made; for alas, when morning dawned, it found two poor Negroes who had been of the party, dead on the ground, in spite of every effort which had been made to save them.

Besides the bogs or wet moors covered with low Birch-trees, like that mentioned above, another feature of the country is formed by fertile plains, adorned with beautiful turf, the base of the mountains being clothed with wood. The two Beech-trees and the Winter's-bark "occupy exactly the same positions which the Birch, Oak, and Mountain Ash do in Scotland."

One very interesting and remarkable feature of the vegetation in Tierra del Fuego, as well as in South Chili, is formed by a parasitical plant, called the *Myzodendron*, of the same family as our Misletoe (*Loranthaceæ*), which is very abundant on various species of Beech. One species, *M. punctulatum*, is spoken of by Dr. Hooker as a conspicuous object, even from a considerable distance, from its yellow hue, which "may be recognized when coasting along the shores of Fuegia, from its contrasting so strongly with the otherwise lurid colour of the dusky forests. It grows indifferently upon the evergreen, or deciduous-leaved, Beech."

One chief peculiarity of this plant consists in the feathery appendage attached to the seed, which performs a similar function to the gluten with which the seed of the Misletoe is provided, though in a different way; that, namely, of attaching the seed to the tree on which it is to grow.

"Several of the ripened seeds, still enclosed in their pericarps,* are generally detached together from the parent plant; they adhere by their viscid filaments, and are carried by the birds, winds, or other natural causes, from one tree to another, where they may often be seen hanging entangled amongst the leaves and twigs. The grain is placed almost in contact with the stem; it is immaterial to which surface." As described from one species in which Dr. Hooker closely watched the process, that part of the seed from which the future stem of the plant is to be developed becomes elongated when the seed springs, and pushes away, by this process, the old disc and style, which fall away; "the radicle always escapes at this point and protrudes beyond the pericarp, to which the embryo remains attached until the parasite has gained a firm lodgment on the tree.

This union however is anything but a happy one in its results to either party; for though "a branch attacked by the *Myzodendron* suffers no apparent change below their point of union, all beyond it, being insufficiently nourished, does not increase in proportion, and after a time dies from atrophy;" and the parasite, having thus injured the supporting branch on which it grew, itself dies away, after

* Seed-vessels.

"having finally arrived at its full growth; a time probably coincident with, if not dependent upon, the period when the Beech cannot supply it with sufficient nutriment."

The list of flowers is composed of such familiar names as Crowfoot (*Ranunculus*), Marsh Marigold (*Caltha*), Barberry (*Berberis*), Ladies'-smock (*Cardamine*), Whitlow-grass (*Draba*), Shepherd's-purse (*Thlaspi*), Lychnis (*Silene*), Stitchwort (*Stellaria*), Mouse-ear (*Cerastium*), Wood-sorrel (*Oxalis*), Violet (*Viola*), *Geranium*, *Potentilla*, Bramble (*Rubus*), Gentian (*Gentiana*), Skull-cap (*Scutellaria*), Butterwort (*Pinguicula*), Groundsel (*Senecio*), Hawkweed (*Hieracium*), Dandelion (*Taraxacum*), Pimpernel (*Anagallis*), etc.

On reading such a list of thoroughly English species, the conclusion seems forced on us that similar latitudes produce a similar vegetation in the opposite hemispheres; but we are told by Dr. Hooker, that "experience has proved the fallacy of such a conclusion," and that, on the contrary, "the flora of Tierra del Fuego possesses an additional and peculiar charm in its being the only region south of the tropics where the botany of our temperate zone is, as it were, repeated to a very considerable extent."

There is an island called Hermite Island, situated close to Cape Horn, to which a particular interest belongs, as

being the highest southern latitude in which any flowers are to be met with, with the exception of the single Grass before mentioned in the south Shetland Islands. These flowers belong chiefly to the families of *Umbelliferæ* and *Compositæ*, Heaths (*Ericeæ*), and Crowberries (*Empetreæ*). The deciduous Beech (*Fagus Antarctica*) grows here too; but these Beeches, like their prototypes the little Willows in the Polar regions, are only trees in miniature, about three inches in length, and growing in a prostrate posture, as if they were crouching on the ground to shelter themselves from the rough gales and snow-storms.

We must however take our leave of these wild regions, and our last look at the little people on the shore,—none of them much above five feet, with flat faces, and low foreheads smeared over with red paint; with black hair hanging straight down, and little black eyes peering out from under it,—we must leave them in this bitter climate to wander in the woods, almost without clothing, and build their miserable hovels; and little as they, as yet, are indebted to us, we Christians may carry away a lesson of content from them, who, though they are called "the outcasts of human nature," are nevertheless described as being "cheerful and good-tempered."

Having had time to finish these reflections on our voyage to the Falkland Islands, we look out as we near them to see of what the general features of the landscape consist. Look where we may, we can see no trees; not a single tree is to be seen in these islands; the nearest approach to them are thickets of bushes from four to five feet high, which consist of Brambles (*Rubus*), Heaths (*Arbutus* and *Andromeda*), and the Crowberry (*Empetrum*). If there were but trees, the country would not be unlike some parts of England, from the extensive meadows and moors which characterize it; the grasses which cover the meadows are the same as ours, such as different kinds of *Agrostis*, *Aira*, and *Festuca;* and growing with them are Rushes, Reeds, and Sedges, amongst which is the Club-rush (*Scirpus*).

Though there are many South American plants to be met with, we also recognize many familiar species. In damp and moory places we meet with a plant very like our pretty Moneywort, but with smaller blossoms,—*Lysimachia repens*, and two kinds of Marsh Marigold (*Caltha*), though these are also smaller than ours; there is the common little Chickweed too (*Sagina procumbens*), and a variety of Composite flowers. A most singular plant, called Balsam-bog (*Bolax glebaria*), here attracts our particular attention; it would convey no

idea of it to say simply that it belongs to the Umbelliferous family, as (to an unobservant eye) it has not the slightest resemblance to any of that family with which we are acquainted. This, and a kind of grass called Tussock-grass, seem to be the chief objects of interest in the vegetation of the Falkland Islands. The following description of these plants is borrowed from Dr. Hooker.

"Grasses and the Balsam-bog (*Bolax glebaria*) form the chief and indeed the only conspicuous botanical feature in the landscape, covering the hills, plains, peat-bogs, and coasts through the whole year. The Tussock-grass grows in a very peculiar manner: the roots of these plants project above ground; the roots of each plant forming a hillock of some six feet high and four or five in diameter. From the top of this hillock springs the copious grassy foliage, with blades full six feet in length, drooping on all sides; and as there is a space of some few feet between each plant, the tips of these Grasses meet each other so as to overarch the space between." A Tussock-bog, as it is called, is "like a forest of miniature Palms, and forms a complete labyrinth; leaves and sky are all that can be seen overhead, and these curious roots and decayed vegetable matter on both sides, before and behind; except now and then when a penguin

peeps forth from its hole, or the traveller stumbles over a huge sea-lion stretched along the ground, blocking up his path." There is perhaps "no Grass likely to yield nearly so great an amount of nourishment as the Tussock, and cattle are excessively fond of it." There are specimens of it in the Royal Gardens of Kew, but it grows so slowly that it will be long (if ever we do) before we see fields of Tussock-grass in England. In the Shetland and Orkney Islands however, where it has been introduced, it thrives well, and seems to have found a congenial home.

"Bogs and damp woods in Britain very frequently produce a Sedge (*Carex paniculata*), whose mode of growth is, on a small scale, identical with that of the Tussock-grass, and to which the name of Tussock is applied. In South Wales they may be met with two or three feet above the ground; and if they were higher, larger, and placed close together, the general resemblance would be complete."

The Balsam-bog (the other characteristic plant) is thus described: (Plate V.)—"At first its appearance is that of a little herb, densely tufted, its stems radiating on every side, all of the same length, and covered with leaves, so that it takes the shape of a ball; when still larger, it assumes the shape of a hemispherical cushion rising out of the

ground, of a pale yellow-green colour and very firm substance; the little branches being so densely and firmly packed together, that they present an even surface of such hardness and compactness that the knuckles may be broken against the mass. These hummocks of living vegetable matter often attain a height of four feet, and an equal or much greater diameter. They are called Balsam-bogs or Misery-balls, because they generally indicate a barren soil."

In the same situations where the Balsam-bog grows (on the sides of damp mountains) there is also found in the greatest profusion a very curious Fern, *Lomaria Magellanica;* it might well be called the Proteus of Ferns; for though the fructification has the same character in all the varieties, their appearance differs so greatly that scarcely any general likeness can be traced; sometimes the fronds are arranged in as orderly a manner as they are in our common Brake, whilst at others they assume some grotesque form; the fertile frond occasionally growing in the shape of long brown tails.

There is still much that is very interesting in this zone, which must be crowded into a short space, namely, the character of vegetation in the Auckland Isles and Campbell Island. In the Auckland Isles there are no mountains so

high as to reach the limit of perpetual snow, and but few rocks or precipices. "The whole land seems covered with vegetation. A low forest skirts all the shores, succeeded by a broad belt of brushwood, above which, to the summit of the hills, extend grassy slopes." The trees of the forest are "stag-headed, gnarled, and stunted by the violence of the gales;" beneath their shelter there is an undergrowth of bright green feathery Ferns and several gay-flowered herbs. Even if there were space, it would be useless to repeat the names of trees whose forms are unknown to us, and of which description could give but a faint idea; one however may be singled out as a specimen, which, to judge by the figure of it in the 'Antarctic Flora,' is no less elegant than singular; this is *Dracophyllum longifolium;* it has black bark, and slender, upright branches. The long and very pale green leaves look like bundles of blades of grass springing out of the very tips of the twigs, which gives the tree a very uncommon appearance; it belongs to the *Epacris* tribe, and has little white blossoms with five divisions, which, contrasted with the green- and red-tinted calyx, have a very beautiful effect.

Only two or three of the handsome plants which are found on the hills can be mentioned. Perhaps the most

striking is *Chrysobactron Rossii:* to say that it is one of the *Asphodel* tribe would convey no idea of its appearance to those who only know the English branches of the family: it has tall stiff spikes of deepest orange, set thick with beautiful little blossoms. The spikes are often a span long, and about two inches across. There is another showy plant of the *Compositæ* family—*Pleurophyllum speciosum,* like a large Ox-eye Daisy, only purple; and a very elegant flower of the same family, called *Celmisia vernicosa;* the linear glossy leaves are "spread out on the ground like the spokes of a wheel; the flowers are pure white with a purple eye," and as large as those of the plant last named. "There is a remarkable predominance of such handsome species over such weeds as Grasses and Sedges."

In Campbell Island, which lies a hundred and twenty miles south of the Auckland Isles, most of the same beautiful species occur again; amongst which the splendid *Chrysobactron* is conspicuous, studding "the bright green slopes, so as to give them a yellow tinge, visible a full mile from the shore. There is a belt of brushwood forming a verdant line close to the beach, composed of some of the same trees as those in the Auckland Isles, but in a very stunted state. This is only seen on entering the quiet har-

bours; at a distance the rocky mountains appear bare of vegetation."

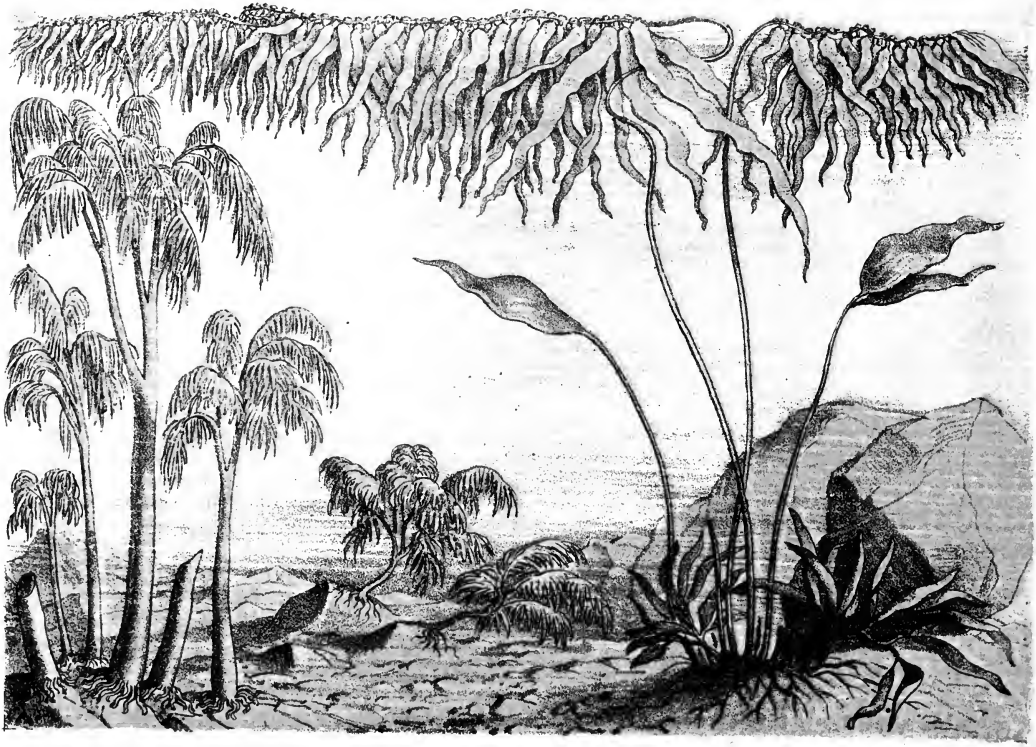
These islands are an instance of the dissimilarity of vegetation in the corresponding latitudes of the two hemispheres: though they lie in the same latitude as England does on the other side of the globe, there are "only three plants found there which are indigenous in our own island." When compared with other countries in the Southern Hemisphere, Dr. Hooker finds a greater resemblance to the flora of New Zealand than to any other. The vegetation shows nevertheless an incipient leaning to an Antarctic character in some respects, whilst on the other hand there is a kind of anticipation of sights with which we shall become more familiar under a warmer sky, in the tree-like form which the Ferns begin to assume in Campbell Island, which is the nearest latitude to the pole in which this tendency has yet been observed.

It is very remarkable that Kerguelen's Land, though it lies rather nearer the equator than the last-named islands (in about 50° south latitude, and 70° east longitude), has a much more Antarctic character. "Even in Spitzbergen there are nearly three times as many flowering plants as there." The same curious fact occurs in this island too, which we met

with in the Polar regions, that in the total absence of trees and even shrubs, at the present day, there are fossil remains of trees and numerous beds of coal there, which afford abundant proof that at one period this land was clothed with forests, which have been destroyed by "the successive overflowings of volcanic matter," till the country was reduced to the "state of almost vegetable desolation" in which it now exists.

But why spend our time and thought on such a poor and starved set of plants as we should meet with here, when a world of wonders and an inexhaustible source of interest exists in the submarine vegetable kingdom?—the seaweeds being, in this part of the globe, amongst the most important features of vegetation. (Plate VI.) It has not indeed been attempted or intended to include the geographical distribution of seaweeds in these chapters; but where they play so conspicuous a part as they do in these regions, it would be a manifest error to omit all mention of them.

From so rich a store as Dr. Hooker's 'Flora Antarctica' we are sure we may borrow some account of those "wonders of the deep," which those only who "go down to the sea in ships" are privileged to see. Three seaweeds are particularly mentioned as the most remarkable in the Antarctic regions,



especially on account of their size, namely, *D' Urvillæa utilis*, the *Lessonia*, and the *Macrocystis*.

With two exceptions, the *D' Urvillæa utilis* exceeds all other seaweeds in bulk. In Kerguelen's Land "its enormous and weighty fronds, sometimes ten feet long, and almost too heavy for a man to lift, form the only shelter for the shells and soft animals which there find a refuge from the flocks of aquatic birds that cover the shores, and follow the receding tide."

The habitat of this seaweed is Tierra del Fuego, the Falkland Islands, and Kerguelen's Land; it is very abundant at half-tide mark and below it; but it is also found in the open ocean, ranging as far to the north as "the latitude of Valparaiso, or 33° south, on the west coast of South America, and 50° south on the opposite shores of the same continent," which "will probably be its northern limit." It was observed floating in the open ocean in the meridian of the Cape of Good Hope in the 51st degree, but "does not appear to inhabit or be cast upon the southern extremity of Africa." In the Indian Ocean its range is not thought likely to extend further to the north than Prince Edward's Islands, the Crozet group, and Kerguelen's Land.

"On the other hand, the south latitude it attains is pro-

bably regulated by the position of the pack ice, to within a few miles of which it was traced by the Antarctic Expedition, on one occasion, south of New Zealand, to the 65th degree, which is probably its "ultima Thule" in any longitude, for it was there the last trace of vegetation; it grows invariably accompanied by the *Macrocystis pyrifera*."

The poorer classes of West Chili are stated on good authority to use this plant for food, which, when made into soup, is very palatable, being sweet and mucilaginous.

Two species of *Lessonia* are particularly described by Dr. Hooker; the first of these, *Lessonia fuscescens*, is on many accounts a most curious and interesting plant, whose well developed form and large dimensions give it a good claim to be called a submarine tree, or at least an arborescent seaweed. Its habitat is "Hermite Island, Cape Horn, and the Falkland Islands; most abundant always far beyond low-water mark. Christmas Harbour, Kerguelen's Land, rare." Its range extends from Cape Horn along the coasts of South America, probably to Valparaiso.

"The trunks usually are about from five to ten feet long, as thick as the human thigh, rather contracted at the very base, and again diminishing upwards." The trunk in all the *Lessonias* divides into two branches; the branches being

pendulous and again divided into sprays, from which hang linear leaves, from one to three feet long.

The individual plants are described as growing "attached in groups, or solitary, but gregarious, like the Pine or Oak, extending over a considerable surface, so as to form a miniature forest, which is entirely submerged during high water, or even half tide, but whose topmost branches project above the surface at the ebb." A beautiful and living picture is drawn of this submarine vegetable world and its inhabitants, which is so full of interest of various kinds, that "to sail in a boat over these groves on a calm day affords the naturalist a delightful recreation; for he may there witness, in the Antarctic regions, and below the surface of the ocean, as busy a scene as is presented by the coral reefs of the tropics."

The leaves of the *Lessonia* are crowded with different kinds of zoophytes and mollusca; other seaweeds grow parasitically upon the trunk, with which are intermingled *Chitons*, *Patellæ*, and other shells: "at the bases and amongst the tangled roots swarm thousands of *Crustacea* and *Radiata*, whilst fish of several species dart amongst the leaves and branches."

Some idea may be formed of the immense masses in which this seaweed grows, when we are told that from the sunken

rocks of the outer coasts (where this genus chiefly prevails) "thousands of these trees are flung ashore by the waves, and with the *Macrocystis* and *D'Urvillæa* form along the beach continued masses of vegetable rejectamenta, miles in extent, some yards broad and three feet in depth; the upper edge of this belt of putrefying matter is well in shore, whilst the outer or seaward edge dips into the water, and receives the accumulating wreck from the submarine forests throughout its whole length."

The resemblance of this *Lessonia* to a tree is not confined to its outward form, but the internal arrangement of the trunk, when cut across, presents "the curious appearance of concentric elliptical rings, in many respects similar to, though very different from, those of an exogenous trunk, surrounding a lance-shaped pale line, which occupies the broad axis of the compressed stem, without reaching across it." The trunks of the *Lessonia* which are washed up on shore are not unfrequently mistaken by the ignorant observer for pieces of drift-wood, "and on one occasion no persuasion could prevent the captain of a brig from employing his boat and boat's crew, during two bitterly cold days, in collecting this incombustible weed for fuel!" But however useless as fuel, the trunk "is very usefully employed by the Ganchoes,

for knife-handles; the haft of the instrument is plunged into a rudely-shaped piece of this weed, which contracts into a substance harder than horn."

The other species of *Lessonia* (*L. ovata*) of which a description is given, grows very abundantly near Hermite Island, Cape Horn, and the Falkland Islands:—"It has good claims to be considered a distinct species; but is so like the last, that it is thought not impossible that it may be *L. fuscescens* in an immature state."

As regards the last of the three Algæ which are the wonder of these regions,—the *Macrocystis pyrifera*,—Dr. Hooker took advantage of opportunities which a long sojourn in the Southern Hemisphere afforded of studying it under the variety of appearances it assumes; and the result is, that he brings together under one, ten species which have been described by five different authors, and thinks they may be all safely referred to *Macrocystis pyrifera*. "Nor can these variations excite surprise, when it is considered that this gigantic weed is subject to every vicissitude of climate, of temperature, and exposure: that it literally ranges from the Antarctic to the Arctic Circle, through 120 degrees of latitude; that it lives and flourishes, whether floating or attached, growing in bays, harbours, or

the open sea when most distant from land; and lastly, that it equally adapts itself to the calmest or most tempestuous situations, to waters of uniform depths or those which rise or sink with the tide, to dead water or to strong currents. One thing alone it requires, and that is, a mean depth of six or more fathoms; for, like the *Laminariæ* of our own shores, it and others of the same tribe in the South invariably form the outer belt of marine vegetation."

The first account of the gigantic dimensions of the *Macrocystis* was given by Sir Joseph Banks; on his authority, and that of Solander, who called it *Fucus giganteus*, the stems attain a length of a hundred and twenty feet. "That these dimensions are considerably under the mark there is little doubt, though the report that specimens have been measured upwards of a thousand feet is perhaps as much of an exaggeration." From the nature of the plant however, and the manner of its growth, there are no impediments to its almost indefinite elongation, "provided the water be smooth and of sufficient extent." "Specimens measuring between one and two hundred feet are common;" but as they are always found broken off at the lower end, they afford but little help in ascertaining to what length the plant is naturally capable of extending itself. The longest speci-

mens which Dr. Hooker mentions were encountered in a strait between two of the Crozet Islands, the stems of which, from careful calculations, were believed to be about seven hundred feet long.

In the Falkland Islands, Cape Horn, and Kerguelen's Land all the harbours are so belted with its masses, that a boat can hardly be forced through; it generally grows in water from eight to twelve fathoms deep, the fronds extending "upwards of one hundred feet upon the surface."

On the outer coast of the Falkland Islands, where the beach is lined for miles with cables of entangled *Macrocystis* much thicker than the human body, we might have supposed that it would have been easy to make exact measurements of this wonderful plant by separating single specimens from the mass; but nothing could be further from the truth than such a supposition; for these entangled monstrous cables are "twined of innumerable strands of stems, coiled together by the rolling action of the surf" in such a manner, that "no one succeeded in unravelling from the mass any one piece upwards of seventy or eighty feet long; as well (we are told) might we attempt to ascertain the length of hemp fibre by unlaying a cable."

The *Macrocystis* is no less remarkable for its eminent

usefulness than for its gigantic size. Like many other sea-weeds, it has always been regarded amongst seamen as a kind of natural buoy, which "often proves his unerring guide towards land," and shows him the direction of the currents with equal certainty. The *Macrocystis* performs a still more important service even than this, "for it is, where growing," (as distinguished, that is, from floating pieces,) "not only the infallible sign of sunken rocks, but every rock that can prove dangerous to a ship is conspicuously buoyed by its slender stem and green fronds;" and it may be safely affirmed, "that without its presence many channels would be impracticable, and numerous harbours in the South closed to our adventurous mariners."

But we shall have formed a very inadequate idea of the usefulness of the *Macrocystis* if we regard it only so far as it is serviceable to man; for "myriads of living creatures depend on it for food, attachment, shelter, and means of transport;" they themselves constituting "so extensive a field of research, that the mind of the philosopher might shrink from the task of describing them."

As regards the distribution of the *Macrocystis*, it has already been mentioned that its range extends from the Antarctic to the Arctic Circle; but it is remarkable, that

though in the Southern Temperate Zone "it girds the globe," this is not the case either in the Tropics or in the Northern Hemisphere. The southern limits of the belt which it forms were often observed as "between the Southern Sea and the Southern Ice, within which there is no vegetation."

On the southern border the boundary of the "Macrocystis sea" is regulated by the position of the ice: where open sea extends, as it does in the longitude of New Zealand, to the 65th degree, this plant is found as far as 64°: its northern limit depends "on the currents and temperature of the water." As regards the temperature of the ocean, "it neither enters the Tropics of the Atlantic, nor passes up the shores of Africa, or into the Indian Ocean; whilst it does inhabit the whole surface of the Pacific Ocean and the west coast of both Americas."

It is interesting to trace the influence of the other agent, namely the currents, by whose action the *Macrocystis* is carried far and wide. "The South Polar current divides at Cape Horn, one portion following the west coast of South America to Cape Blanco and the Galapagos Islands under the Equator, carrying the *Macrocystis* with it, which then enters the cold waters which flow from the Arctic islands

of the Pacific, and over whose entire surface it is spread, reaching Kamtschatka, New California, and the Aleutian Islands; so that in the longitude of Western America, the *Macrocystis* ranges from the Arctic to the Antarctic Circle. The eastern branch of the Cape Horn current passes between the Falkland Islands and Fuegia, conveying vast masses of this seaweed two hundred miles north of the Falklands, as low as the 44th degree, and some even reaching the Plate River in 35°, its northern limit in the Western Atlantic."

Many speculations are entered into in the 'Flora Antarctica' as to the probable northern limits of the *Macrocystis* in other seas; but it is time to remember that we too, in following its course, have been carried by the current very far from the Colder Temperate Zone, where we first made acquaintance with it: we must therefore leave those who wish to pursue the subject further, to study the details of it in the above-named work.

CHAPTER V.

THE WARMER TEMPERATE ZONE.

FROM LAT. 45° TO 34°.

In this zone vegetation is in a transition state. In travelling through Europe, no sooner do we find ourselves on the southern side of the Pyrenees or the Alps, than we are conscious of a change. The eye is not so often refreshed by the sight of green meadows, but numerous evergreen trees and shrubs bear witness to the increased warmth of the temperature; and even in winter give a beauty to the landscape unknown to us in our colder zone. Perhaps the new aspect which nature wears in Southern Europe is occasioned, more than by anything else, by the Chestnut-forests and groves of Olive-trees and Laurels. Beautiful evergreen Oaks too are now a frequent sight, such as the Bitter Oak, or Mossy-cupped Oak (*Quercus Cerris*), the Cork Oak

(*Q. Suber*); and the Ilex (called in England the "Evergreen Oak" *par excellence*); the Chestnut (*Castanea*), the Cherry Laurel (*Prunus Laurocerasus*), and the Laurustinus (*Viburnum Tinus*) fill in the picture with their glossy, dark green leaves.

Amongst the evergreen shrubs may be named the kind of Bearberry called the Strawberry-tree (*Arbutus Unedo*), which some may remember as growing about the Lake of Killarney; also Butcher's-broom (*Ruscus aculeatus*), with its scarlet berries; different kinds of Rosemary (*Rosmarinus*) and *Phillyrea*, and the beautiful Cistuses, or Rock-roses, with one species of which, the Gum Cistus (*Cistus ladaniferus*), we are familiar in English gardens. Whilst "the trees, as with us, have small, insignificant flowers, those of the shrubs are large and handsome;" but amongst them all, the Cistus tribe seems unrivalled in beauty:—"In their native countries, particularly in the South of France, Spain, and the Islands of the Mediterranean, the Cistuses are by far the most lovely objects that nature has planted in the woods, rocks, and other stations they inhabit." The blossoms are remarkable for their beautiful regularity, in every part of which the number five may be unfailingly traced. Here too, in all the luxuriance they

show in their native home, we see the true Laurel, which we call the Bay-tree (*Laurus nobilis*), the Myrtle (*Myrtus communis*), and a tree-like Heath (*Erica arborea*).

But old sights still often meet our eyes, particularly amongst the little herbaceous plants. Flowers of the Mint family (*Labiatæ*), and the order of Cloveworts (*Caryophylleæ*) (that is to say, species of Lychnis (*Silene*), Stitchwort and Chickweed (*Stellaria*), and Pink (*Dianthus*), many of which have *cloven* petals) so abound here, that Schouw "formed the kingdom" of *Labiatæ* and *Caryophylleæ* in southern Europe and northern Africa. The Pinks reach such perfection in some of the countries bordering on the Mediterranean, that one species, which is a native of Greece (*Dianthus fruticosus*), "grows to the size of a shrub, three feet and more in height, bearing the flowers of the common Pink." Plants of the Composite Order are common too, and all that family of plants with blossoms like the Pea (*Papilionaceæ*), as well as the Umbelliferous and Cruciferous Orders. Amongst the latter, wild Stocks must be named as growing so abundantly on some of the rocks of the Mediterranean, as to impart quite a grey tint to them by the colour of their leaves. Sometimes these rocks are clothed with wild Olives, and a kind of Pine called the Aleppo

Pine (*Pinus Halepensis*), intermixed with Oaks, Myrtles, etc.

We find an everyday friend and favourite, which is so familiar in our gardens that we almost forget it is a foreigner, namely, the garden Mignonette (*Reseda odorata*), growing wild in that northern portion of Africa which lies within this zone, as a half-shrubby plant, like the Wallflower. It is said to be a native of Barbary, "but its only certain station is in the sandy country about a fortified town of Algiers called Mascara." The temperature of many of the southern parts of this zone is considerably above its average heat, particularly on the sea-coast, or in sheltered situations. As an example of this, Meyen contrasts the vegetation of Majorca with that of Minorca. In Majorca, which is sheltered in the north by a chain of mountains, the Olive-tree grows with the greatest luxuriance in the plains, together with a tree of the Leguminous family, called the Carob; the Olive even grows on the mountains at the height of fifteen hundred feet; "but in Minorca, where the shelter from the north is wanting, the Carob-tree and Olive almost entirely disappear. The sketch given of the vegetation of Majorca generally is too interesting to be omitted. While the mountains are covered (where the Olive ceases) with forests

of the Aleppo Pine (*Pinus Halepensis*) and Oak, extending upwards to the height of 2400 feet, and above this, as far as to 3000, with brushwood composed of Clematis (*C. cirrhosa*) and St. John's-wort (*Hypericum Balearicum*); the Dwarf Palm (*Chamærops humilis*) covers the coasts and the lower hills, "sheltering under its broad leaves" different kinds of *Cyclamen*, of Milkwort (*Polygala*), Rest-harrow (*Ononis*), and the Kidney-vetch (*Anthyllis*), commonly called Ladies'-fingers; "in the rich plains of Palma and Manacor the Almond and the Fig are cultivated, as well as grain and pulse; whilst the Date-tree (*Phœnix dactylifera*) shades the dwellings, and *Cactus Opuntia* fences the gardens." The Vine too is mentioned as covering the sides of the mountains, and the Cotton-plant and even the Orange may be cultivated there.

The Cotton-plant (*Gossypium*), of the Natural Order of *Malvaceæ*, is to be met with in all the countries round the Mediterranean (the species cultivated in Europe is *Gossypium herbaceum*); it is also grown on the northern boundary of this zone, in the Crimea, and even beyond it, in Astracan; those countries where it is principally cultivated are Asia Minor, Egypt, and the adjacent parts of Asia; but as we travel eastward through this zone, we shall still meet

with the Cotton-plant amongst the most important objects of cultivation.

We are not furnished with many details of the vegetation of Italy. The luxuriant manner in which the Vine grows there is a fact well known to all. In one of the hottest places in that sunny land, Catania, at the foot of Mount Etna, it even produces both fruit and flowers at the same time. The Olive too is native in this country;—it may just be mentioned, in passing, that though the Olive itself does not grow in England, we are not without some branches of the family, as, for instance, the common Privet, and the fragrant Lilac, which, though a native of Persia, is now completely naturalized here. In both, the distinguishing mark of the Olive tribe is to be traced, namely, the very unusual combination of a *regular* monopetalous corolla and two stamens; indeed the blossoms of the Olive and the Privet are not at all unlike in appearance.

In the same way Mignonette has a connection living on the chalk and volcanic rocks of the south of Italy and Sicily; namely, the tribe of Capers, the seeds of which are arranged exactly in the same way in the seed-pods as they are in the Mignonette, and there is a great similarity in their structure.

We cannot omit to mention a species of the Cactus tribe, called (somewhat inappropriately) the Indian Fig (*Opuntia Ficus-Indica*), which lives where few other plants could exist,—on Mount Etna, that is to say, and its volcanic fields,—but it is the nature of this tribe to be fond of hot, dry, rocky places. This kind of Cactus is employed by the Sicilians, as we learn from Professor Lindley, to render such desolate regions susceptible of cultivation. "It readily strikes into the fissures of the lava, and soon, by extending the ramifications of its roots into every crevice of the stone, and bursting the largest blocks asunder by their gradual increase, makes it capable of being worked."

These are foreign sights to English eyes; but far more foreign-looking is the vegetation in some parts of Spain. In that land of stagnation, where the pristine beauty of nature is still undisturbed and uninjured by railways and other modern improvements, we may not only feast our eyes on the golden glory of the Orange-groves—for the Oranges are naturalized there—but we may wander in splendid groves of Gum Cistus (said to be almost peculiar to the South of Spain and Portugal), in which are intermingled tree-like Heaths, adorned with a profusion of gay flowers; and more than this, we here for the first time make acquaintance with "several

beautiful tropical plants which grow in the South of Spain with the greatest luxuriance. Even the *Banana* (with which we shall be more familiar by-and-by) is frequent on the banks of the Guadalquivir" (though not truly wild there), as well as a plant of the Leguminous family with a very showy flower, called *Erythrina corallodendron.*

On the southern coast of Spain too we meet with the Dwarf Palm, as also in Naples, but it does not extend further to the north than Nice, where we must take leave of it, and bend our steps towards the East.—The southern part of the Crimea lies in this zone, and seems to partake of its general character. On our way thither we will steam down the Danube from Orsova, and admire the Poplars and Cypresses which in this picturesque part of the river embower a mosque on a river-island there, on which the lofty cliffs frown down on either side. We will lament as we go over the once fertile provinces on the northern bank: provinces fertile enough, and with a corn-trade prosperous enough to excite the jealousy of Russia; but now the cornfields are changed into battlefields, and we hasten on past the low swampy banks at the mouth of the river, that we may see the Crimea before that too is trodden under the soldier's foot.

If this is the fate in store for the beautiful Crimea, the blow will not fall unfelt; for not only has the Empress of Russia a delightful residence there on the shores of the Black Sea, but it has of late become a favourite resort of the Russian nobility.*—"Wildness" is said to be the word most purely characteristic of the Crimea; "changeableness" would be almost equally so. Towards the western part the aspect of vegetation is described as not unlike many glens in the Highlands; "it is a rocky country, covered with *scrub*" (?). At some distance from the coast lies the fertile valley of Baidar, which stands so thick with corn that it seems to laugh and sing. In the centre of the southern part of the Crimea (just on the northern limit of this zone) is the ancient capital of Crim Tartary, Baktché Serai (the Seraglio of Gardens), which is a sequestered dell embowered amidst the most luxuriant vegetation, overtopped by a forest of mingled minarets and Poplars. Proceeding thence in a south-easterly direction towards the sea-coast, the traveller goes through a pass in which he is surrounded by magnificent peaks and crags, below which, dark Pine-woods thickly clothe the mountain-side. On the south side of these mountains

* It is needless to say that this passage and the preceding one were written before the Crimea became the seat of war.

the Vine is cultivated, having been only recently introduced there. On the shores of the Black Sea, under the shelter of rocks, which enhance its beauty by contrast, the Empress's residence is situated; the roads in its neighbourhood are bordered by hedges of Cypress and Olive, Pomegranate and Laurel, and sparkling fountains are overshadowed by the spreading arms of patriarchal Walnuts.*

In the Crimea we find the Vine growing in a cultivated state as an introduced plant; but to see it in its native beauty, we must cross the Caucasus chain of mountains with its steep walls of rock, and frightful abysses, and look down on the gently sloping green hills of the blooming land of Georgia, where it grows to a great thickness and height. In all the countries between the Black Sea and the Caspian it is not only cultivated, but is considered as native; it is however on the Asiatic side of the Black Sea that it grows in the greatest perfection. "In the forests of Mingrelia and Imereti the Vine is the queen of the trees. The stem is sometimes six inches in diameter, and mounts to the tops of the highest trees, festooning and binding them together;" and though it is not regularly cultivated in those countries, it yet produces "such an abundance of excellent grapes,

* Gleaned from Oliphant's 'Russian Shores of the Black Sea.'

that even the poor peasant does not gather all that grow in his little patch of land, but leaves them over the winter, and often a short time before Easter the grapes of the previous year are beaten off the trees."

Had we chosen a different route from the Mediterranean, across the plains of Troy from Smyrna, our road would have led us sometimes through park-like scenery; smooth turf slopes watered by rivulets; or amongst picturesque rocks of red and yellow ochre, contrasting with the dark green foliage of the Pine; and at others through Olive plantations or magnificent forests of Oak. But we must now travel still further to the east,—to the northern part of China and through Japan. In both these countries we find the Cotton-plant extensively cultivated; but perhaps the plants most distinctly connected in our minds with these two countries, the flora of which is as yet so little known to us, are the Tea-plant and the Camellia, which are nearly allied, and are both genera of the family of *Ternstrœmiaceæ*. The family connection may be traced in the flower; the blossom of the Tea-plant being very much like a single white Camellia in miniature. In the north of China, near Pekin (as we learn from Schouw), the Tea-shrub will live in the open air, but the tea is not good, so that it does not

pay to cultivate it on a large scale;" it appears to be also as intolerant of too warm a climate as of too cold a one; for though "tea-growing is met with in Tonquin and Cochin China, it is not very extensive, and the product is not good. It is grown indeed over a wide zone, from 15° to 40° north latitude;" but the profitable cultivation is restricted between 23° and 31° in China, and between 30° and 35° in Japan.

The Tea-shrub is however not indigenous in Japan; for, as we also learn from Schouw, Japanese history mentions its introduction there by Chinese bonzes, apparently as long ago as the ninth century A.D.; its only native home is in China, "and, according to recent discoveries, in Assam, on the borders of China."

In spite of Japanese exclusiveness, and at all risk of the cruelties they sometimes condescend to practise upon ordinary mortals who find their way there, we mean to see what we can of the general character of vegetation in this wonderful country, which seems by nature calculated to live apart from, and independent of, other nations;—with its dangerous seas, which make its shores so difficult of access, and its ample internal resources; its varied climate, yielding, from the northern to the southern limit of the empire, both

the most useful products of our temperate zone and some of the most remarkable tropical plants. We have not travelled far before we arrive at the conclusion that the dense and self-supporting population of Japan know how to make the most of every inch of ground. As we raise our eyes to the tops of the mountains and the heights of the hills, which in other countries would lie wholly neglected, we see that even in situations like these the land is all brought into cultivation; and as it is impossible to plough with oxen (which are employed on the flat, low ground), the ploughing on the hills and mountain-sides is done by men.

The crops which cover this steep and high ground consist of Corn, Rice, Peas, and other kinds of pulse, and numberless other eatable plants; on the level ground we see scarcely any meadows and pasture-ground, but crops of the same kind as those on the hills. As rice is the main food of the natives, rice-fields everywhere meet our eyes, particularly in low, flat situations, the land being cut through by canals, to supply the wants of this water-loving plant: the best rice grows in the northern provinces, and is said to be superior to any in Asia. Everywhere—round the edges of the rice- and cornfields, and in places where nothing else would grow—we see the Tea-shrub. It is however only in the southern parts of the Japanese empire that the growing

of tea is important, though everywhere the common drink of the people is supplied by it, which is brewed from the larger leaves; it is only in the houses of people of quality that the young tender leaves are used; they are powdered and mixed with hot water into a kind of soup, which makes its appearance before and after meals, and is always handed to guests both on their arrival and when they take leave.

Schouw relates an amusing Japanese myth concerning the origin of the Tea-plant, which, as he remarks, contains a symbolical indication of its effects on the nerves. "A Buddhist saint, Darma, an historical personage who lived in the sixth century, came from India to China, with the intention of spreading his doctrines in that country; to strengthen himself in his mission, and to give distinction to his religion, he made a vow to pass night and day in uninterrupted religious exercises; but sleep at length overtook him. When he awoke, in anger at his fault, and in atonement of his broken vow, he cut off his eyelids, and threw them on the ground; but these grew up into a plant wholly unknown before, the leaves of which he tasted; after which he felt strengthened, and in a condition to withstand sleep better. He recommended this valuable plant to his disciples, chiefly with a view to the same ascetic purposes."

Amongst the list of eatable plants in Japan which is

given in Thunberg's 'Flora Japonica,' the principal appear to be two kinds of Wheat (*Triticum sativum* and *T. hybernum*), Oats (*Avena sativa*), *Eleusine coracana*, the plant we call Rough Panick Grass (*Panicum verticillatum*), a kind of Soft Grass (*Holcus Sorghum*), the Water Chestnut (*Trapa natans*), common Beet (*Beta vulgaris*), the wild Carrot (*Daucus Carota*), Rice (*Oryza sativa*), some species of *Convolvulus* and *Dioscorea*, Buckwheat (*Polygonum Fagopyrum*), the eatable Chestnut (*Castanea vesca*), the Pomegranate (*Punica Granatum*), Sesame (*Sesame orientale*), *Arum esculentum*, *Cycas revoluta*, and *Nelumbium speciosum*. Some of our European fruit-trees, Walnuts for instance, and one species of Pear, are native here also, as well as Figs, and Oranges and Lemons of different sorts, which are exceedingly productive.

The large proportion of tilled land to pasture land, before mentioned, is accounted for when we remember that animal food is a thing forbidden by the Japanese religion, as well as unnecessary in that climate; the law which makes it illegal to taste animal food one would suppose to be the natural result of a belief in the transmigration of souls, which forms an important article in the creed of every devout Japanese.

But to pass on: we find, as we wander through the woods and forests, several kinds of Firs and Cypresses, which are commoner here than any other trees; and the sight of the Fir-trees, and the merry song of a lark overhead, raise visions of English scenes in our minds; though, to be honest, we must allow that, whilst for some reason we cannot help liking the English larks best, these foreign brothers of theirs are certainly more finished performers. We meet with two species of Oak too (neither of them the same as our own), and with two different varieties of Maple, both possessing the same peculiarity of the leaves changing to a purple tint; with this difference only, that the leaves of one turn purple in the spring, and of the other in the autumn.

Several kinds of the true Laurel, or Bay-tree, are natives of Japan, and the Camphor-tree, which is one of the same family. But one of the most important amongst the trees is the Mulberry (both black and white), which is to be met with in most parts of Japan, but particularly in the northern provinces. Its value arises, not from the fruit, which is insipid and unfit to eat, but from its leaves, on which the silkworms feed which supply the extensive silk manufactures,—a trade by which not only many villages but many

cities in that part of Japan subsist. There is a noble tree, said to be peculiar to Japan (*Stagmaria verniciflua*, Nat. Ord. *Anacardiaceæ*), which the Japanese call the Varnish-tree (*Urusi*); it is the juice obtained from this tree which is employed to varnish, or, as we call it, to japan, articles of domestic use. These japanned articles are held in such estimation by the Japanese, that, from the Emperor downwards, they are universally used; and though this kind of ware is nothing but wood lacquered over with varnish, services of this material are preferred, even at court, to those of gold and silver.

Here, as in the East Indies, we everywhere meet with the elegant Bamboo, which, in common with the Firs, is held in high esteem amongst the Japanese for its constant verdure: this plant is used for decorating the temple-walks and sacred places, chiefly on festivals and other solemn days. —The names of three more of our European fruit-trees occur in the Japanese flora; the Cherry, which deserves to be mentioned for its flowers rather than for its fruit, as it is only for its blossoms that it is prized in Japan, which are so improved by culture that they become as large as roses; Apricots and Plums also, which are very plentiful, are often cultivated for the same reason. With regard to most of

the fruits, it may be said that they are far from equalling in their flavour the pleasant aromatic taste of those which grow in China and other Eastern countries; a circumstance for which it is difficult to account in a country lying in the Warmer Temperate Zone. The Vine, for instance, is seldom grown, because it has been found that the grapes do not ripen well; "Raspberries are not very agreeable to the taste, and Strawberries are entirely insipid, and not fit to eat."

There is the same unaccountable deficiency of scent in the flowers; which, though of the same kind as those growing in other countries, fall as far short of them in this respect, as they exceed them in the exquisite beauty of their colours. Some of the most remarkable of Japanese plants are *Nandina domestica* (Nat. Ord. *Berberidaceæ*), made use of like the Bamboo for decorating the temples; the curious *Aralia Japonica* (*Araliaceæ*), *Daphne odora* (*Thymelaceæ*), *Bignonia grandiflora* (*Bignoniaceæ*), *Magnolia obovata* (*Magnoliaceæ*), *Lilium Japonicum* (*Liliaceæ*), the well-known *Pyrus Japonica* (*Rosaceæ*), and *Corchorus Japonicus* (*Tiliaceæ*).

The climate of the countries on the eastern limit of this zone becomes so much colder, that Pekin has an average temperature no warmer than our own, though it lies in the same latitude as Naples. The same diminution of heat is

observed on the eastern coast of North America; New York also lies in the same latitude as Naples, "and yet the trees there flower at the same time as they do at Upsal." But when once the summer sets in, the heat is so great, that it would ripen even tropical fruits, the thermometer, even in the shade, being often up to 95°. An English eye is painfully struck by the total absence of our beautiful green turf, which no money can procure, even in the gardens of the wealthiest; for the sun of the hot summer months burns it up. In vain too we look round for the evergreen trees and shrubs, and wonder why they are not there; but we must spend a winter in New York before we know what varieties the climate shows, at which time the thermometer sometimes falls to zero, which is quite sufficient to explain the absence of the evergreens.

The trees which are chiefly characteristic of this zone in North America are numerous Oaks and Pines. Further inland, "in the forests of Missouri above St. Louis, appear thorny roses, which ascend to the top of the highest trees, and adorn them with countless rose-red flowers." The bare relation of this raises an image of beauty in our minds, and makes us look forward with longing to the sights in store for us in warmer lands.

On the banks of the Ohio grow evergreen forests like those of Southern Europe. There are also Chestnuts, and vast woods of Oak, Hazel, Beech, and Ash; and Plane-trees (*Platanus occidentalis*) of immense size, "whose pale green foliage contrasts beautifully with the other dark green trees." Trees called *Gleditschiæ* grow also on the banks of this river, which are quite overgrown with climbing Bignonias; both the trees and the climbers bearing showy red blossoms. There is a correspondence with the Old World portion of this zone in the plentiful appearance of thorny shrubs; there are, for instance, several different kinds of a plant called *Smilax*, the root of one of which supplies the medicine called Sarsaparilla.

As we travel further south we first begin to observe gigantic reeds—something of the nature of Bamboo, which, even here, reach the height of small trees. Now too we meet with some very grand relations of our Crowfoot family. Who would think, when looking at an English meadow covered with Buttercups, that these humble, every-day flowers have the honour of reckoning the superb Magnolias as being near akin? And yet the structure is very much the same, the chief difference being that the leaves of the Magnolia are provided with a spur-like appendage called a

stipule, and that the fruit is dissimilar in some respects, particularly in its becoming a large cone. These trees must be seen in America before we can form any conception of their splendour. A petted Magnolia nailed up against a south wall in an English garden, gives a very poor idea of the magnificent trees to be seen there, sometimes ninety feet in height—which is higher than the highest trees we see in England; whilst the profusion of their large white blossoms, just delicately tinted, is beautifully contrasted by the background of shining dark green leaves.

Of the herbaceous plants, more seems to be known of what do not grow there, than of those that do. Different kinds of Golden Rod (*Solidago*) and of Asters appear to prevail; so that the kingdoms of these two genera are fixed here by Schouw. There is also an abundance of different kinds of Whortleberry (*Vaccinium*); but though in Europe they generally grow in the same situation as the Heath, no Heaths are met with in this part of the world. There are also very few of the Cruciferous and Umbelliferous tribes, and a deficiency of those branches of the Composite family which, like the Dandelion (*Taraxacum*) and Chicory (*Cichorium*), have all the florets strap-shaped, as well as of that other division of the same Order, in which most of the

florets are tubular, and the involucre hard and almost thorny, like the blue Corn-flower (*Centaurea Cyanus*).

We must by no means leave this northern Warmer Temperate Zone without paying a visit to those wonders of the Vegetable Kingdom which are to be seen in California: a journey of some three thousand miles across North America will be easily performed in fancy, and we shall be amply repaid. If, as was just now said, ninety feet is higher than the highest trees we see in England, how great is our astonishment as we reach the west of California, and mount the lofty slopes of the Sierra Nevada, to find Fir-trees at an elevation of 5000 feet, of the gigantic height of 250 and even 320 feet! Within the circuit of a mile eighty or ninety of these giants were not long since discovered, some ten and some even twenty feet in diameter. The diameter of one which was felled was more than twenty-nine feet; and as the rings of the wood in firs afford great facility in reckoning the age of a tree, and the rate at which they grow is believed to be two inches in twenty years, there is reason to suppose that this tree must be above three thousand years old: "that is to say, it must have been a little plant when Sampson was slaying the Philistines, and Paris was running away with Helen, and Æneas was carrying off good

Pater Anchises upon his filial shoulders."—"The cones are about two and a half inches long;" the leaves are "of a pale grass-green, and the branchlets somewhat pendent and resembling a Cypress or Juniper." The learned however are of opinion that these trees are an entirely distinct Coniferous form,—a genus in themselves, to which the name of *Wellingtonia* has been given. The general shape and character is unlike that of a Pine; the foliage is much more light and elegant, and in the arrangement of the branches it more resembles an Elm. "The bark has been removed from the lower part of the tree which was felled, to the height of twenty-one feet, and taken to San Francisco, where it has been put together again in its natural shape; it is carpeted within, and contains a piano and seats for forty people."* Seeds have been sent to England, and, from the valuable nature of the wood, the introduction of these trees is considered a great acquisition; the benefit of which however can be felt only by remote posterity.

A gigantic species of Coniferous tree had before been described as growing in California, but it is thought not of the same species as the monsters mentioned above. It is a kind of deciduous Cypress (*Taxodium*), and is said to

* The above particulars are taken from 'The Gardeners' Chronicle.'

invest the mountains it grows upon with "a peculiar and almost awful appearance; something which plainly tells us that we are not in Europe." Some of these also are as much as three hundred feet high and thirty-two feet in circumference.

But as we have as yet much to see of the character of this zone in the other hemisphere, we too must betake ourselves to San Francisco, and from thence set sail for the southern part of Chili, as that portion of it which lies in this zone must be visited before we proceed to other countries more interesting, for many reasons, to us English people. It will not take long to tell all we know of the broader features of vegetation in this part of South America. Thick forests of tall timber-trees cover a great portion of the country, composed chiefly of different kinds of Beech and Laurel, a tree of the Laurel family called *Persea*, and others.

In one district called Talcahuano "evergreen woods prevail just as in the corresponding zone in the South of Europe, only two or three trees losing their foliage in the winter." Amongst the climbing plants, one must be particularly mentioned, with "large, evergreen, and glossy dark-green leaves, and bright red liliaceous flowers," called

Lapageria. It strikes us as a little strange to find the brushwood here composed of Fuchsias and Myrtles, together with Arbutus, etc. etc.; and great masses of giant, tree-like Grasses begin to remind us that every step we now take towards the tropics, the character of vegetation is becoming more and more unlike the familiar forms at home; whilst, on the other hand, our thoughts are sent back occasionally to the cold regions whence we started, by the sight of the Mosses "which, even in the latitude of Conception, still often cover the stems of the trees," and remind us over how large a portion of the globe we have already travelled.

On the western side of the Andes, in the south of Chili, there are forests of trees which particularly attract our attention, and perplex us a little as to their exact nature. They look more like Pines than anything else; and yet the fruit, "which grows just at the extremity of the twigs," instead of being a cone, is globular, and as large as a man's head. These are the Chili Pines (*Araucariæ*), which in this part of the world 'represent,' as it is called, the Coniferous trees of the Northern Hemisphere. The Chili Pine is *Araucaria imbricata*. The trunks of these trees are seventy or a hundred feet high; "the crown, which includes about a fourth part of the whole height, is a perfect quadrangular

pyramid," supported on the tall bare trunk. The branches which compose the crown spread horizontally, and are arranged in whorls at regular intervals; "they are quite covered with leaves, which are three inches long and one inch broad, heart-shaped, and as hard as wood." When the fruit is ripe it cracks open, and the seeds fall out. "Each fruit contains from two to three hundred seeds, which are twice the size of almonds, and are a pleasant and favourite food of the inhabitants of this country."

If, in the course of our travels, we should happen to land in Norfolk Island, we should there see some magnificent specimens of another species of *Araucaria*, called the Norfolk Island Pine (*Araucaria excelsa*), which was first discovered in this island, but also grows in Tasmania, below 40° south latitude, and in the eastern districts of Australia. It is one of the loftiest trees known to exist, apparently only rivalled or surpassed in height by the Californian Pines, and is an instance of the wonderful vegetation of that proverbially fair land and happy climate to which it owes its name.—Those who are acquainted with the beautiful specimens of this tree in Kew Gardens, may form some notion of the imposing effect which its massive, dark green foliage imparts to the landscape.

But now we must again spread our sails, and visit those lands to which so many English hearts now turn with interest,—the Colonies, namely, of New Zealand, South Australia, and Tasmania. Gladly shall we gain some idea of sights, unknown to us, which daily meet the eyes of absent friends; and for their sakes too we shall rejoice to find that amidst the very foreign-looking vegetation of these lands, some forms are still met with which raise a thought of the old country. All thanks are due to Dr. Hooker for the result of his botanical researches in those countries, both from us at home and from the colonists themselves; for whom, in great measure, he has published the beautifully illustrated 'Flora of New Zealand,' with a view to enable the colonists to identify plants, and call them by their right names; so that now they need never raise strange and false notions in our minds at home, as uninformed settlers in Australia have formerly done, with marvellous accounts of "wooden pears," and "cherries with the stones outside;" of "grapes growing on bindweed;" "prickly currant-bushes," and "gooseberry-bushes without thorns;" "honeysuckles without odour," and "oaks with no foliage." "These," says Professor Lindley, "are mere idle tales, arising from the names of European plants being misapplied to New Holland species of a totally different nature."

That part of Australia in which the English colonies lie is mostly low and even ground, compared with the northern part, which is hilly but not mountainous; and in the southern part the grass is richer and the trees higher than in the north. Considering the object of our visit to Australia, we could not begin our observations in a more appropriate part than Botany Bay (alas, for the unhappy associations!), which, except in the broad outline, probably wears a very different face now, to that which it did when Captain Cook described it. "On the north side of the Bay the country resembles the moory grounds of England, the land being covered with plants (?) about sixteen inches high. The hills rise gradually behind each other to a great distance, with marshy ground between." On the muddy shores grow numbers of the singular Mangrove-trees, both in the water and out of the water; they are very large trees, but usually not more than forty or fifty feet high, and bare of branches to a great height, the great trunks standing together like a range of columns. But the great peculiarity of these Mangrove or Mangle-trees (*Rhizophoreæ*) is, that the seeds begin to grow before they fall from the scarlet berry which protects them; from which the root, which looks very much like a strong coral-coloured fibre, hangs suspended in a curious manner, till at last it drops into the mud below.

There are, besides the Mangroves, a few different kinds of Palms, Gum-trees (*Eucalyptus*), and a few shrubs; the Palms contrast oddly with the thoroughly English-looking crows we find there; but the swans, as black as the crows themselves, remind us where we are. The flocks of beautiful cockatoos and paroquets seem more in harmony with the gaunt, straggling, unfamiliar shapes of the Gum-trees, which, where the wood has not been cleared, stand thickly together, destitute of leaf or branch to a height of fifty or seventy feet; but where they have room to branch they make a great display of their twisted elbows and bare arms, which have tufts of leaves only at the very extremity. These trees, whose structure places them in the Myrtle family, seem generally to have little brush-like blossoms of a deep orange-colour; which sometimes grow thickly together like a little wreath all along the stem, filling the air with their fragrance, and attracting the bees to their rich stores of honey.

The Gum-trees (*Eucalyptus*) and the extraordinary *Protea* tribe are the two trees most characteristic of Australia. The truest description which can be given of the Proteas is, that, like Proteus himself after whom they are so aptly named, they wear such various forms, that whatever we

might say of one species would be belied by the next we met with. They are truly astonishing sights to English eyes: many of them have huge red blossoms, something in shape like the head of an artichoke, but they are almost all of different shapes and sizes. The foliage too is still more variable; in some, the leaves are broad and handsome, whilst in others they are as narrow as those of the Yew, or long and not more than three-quarters of an inch wide, and deeply toothed on both sides. In some respects the Proteas rather resemble the Daphnes, but differ greatly from them in others, particularly in the stamens being situated *on the points* of the calyx, instead of *between* the divisions, and in the uniformly harsh and rigid character of the leaves.

But as we have other sights to see, we must now sail up the magnificent harbour to Sydney,—that harbour "so beautiful to the eye of the painter, so perfect to that of a sailor,"—and from thence go further up the country, in a hope of finding some of those remarkable Cherries and Currants. Truly enough we find occasionally something as to which we are puzzled at first whether to call it a grape or a currant: "The fruit is of the deepest lapis-lazuli blue, very much like the colour of the Sèvres porcelain," and, as we find to our disappointment, "almost as hard to the touch;"

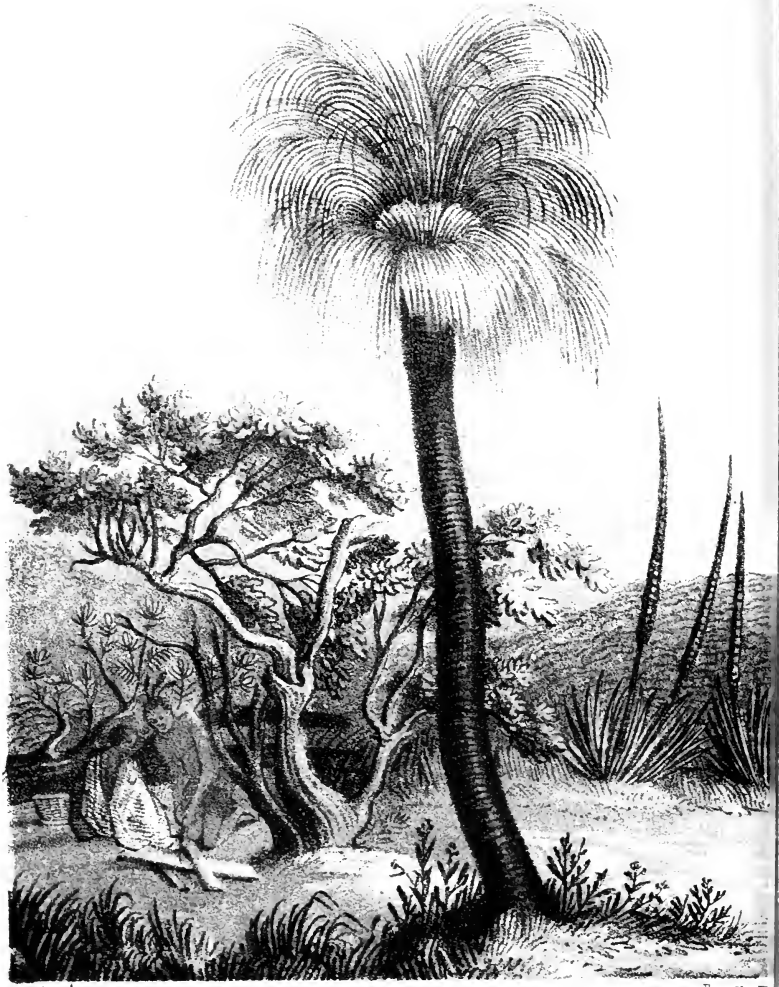
but having at last succeeded in crushing the hard outside, it is impossible to help making a wry face, for the inside, which is nothing but "cottony or spungy pulp, would taste of nothing if it were not for a dash of turpentine." This plant, which is called the *Billardiera,* is a beautiful twining evergreen, with small dark green leaves and clusters of small greenish-yellow bell-shaped flowers, of a regular shape, and the stamens alternate with the petals: it belongs to a tribe called the *Pittosporum* tribe, and though not a Vine, it is really near akin to it. So much for the nauseous "grapes growing on bindweed."

We next look out very carefully for something like a Honeysuckle, but in vain; till at last the so-called Honeysuckle-tree is pointed out to us, which proves after all to be one of a genus of the *Protea* tribe, called *Banksia.* The blossoms of the Banksias are not at all like Honeysuckles (except perhaps a very little in one species); but in this species (*Banksia latifolia*) the tubular blossoms form a kind of cone, "much the size and shape of a large English teazel," and are of a greenish-yellow; the general form of the tree, which grows to the height of about thirty feet, "may be pretty well represented by a grenadier's cap set on a stick. The foliage is thick and solid-looking, the trees often forming fine

groups in the open landscape; as, when several grow together, their formal outline is not preserved." When growing in groups they are valuable from the dense shade they afford; the leaves however are rather small, and are generally of a dull rusty olive-green. Shade from the trees is not always to be found in Australia, as the leaves, instead of growing horizontally as on our English trees, often hang perpendicularly like bundles of rags—going by the rule of contrary, as most things there are said to do.* These "honeysuckles without odour" are destitute of scent, except at the time when they shed their pollen, when a very faint one may be perceived.

But the trees we feel most curious to see are the "cherries with the stones outside;" there is something so very odd in the idea! That they ever came to be called so is more odd still, for they really do not look much like cherries, nor have they the slightest connection with them. The fruit, both in size and appearance, is very much like the pulpy

* The right explanation of this is, that by one of those metamorphoses which sometimes occur in the parts of plants, the true leaves remain undeveloped, whilst the leafstalks expand and assume a leaf-like appearance; with this difference, that they hang perpendicularly instead of growing horizontally as true leaves do.—It is not uncommon to see leaves without leafstalks, but in this instance we have leafstalks without leaves.



red berries of the Yew-tree; only instead of the black seed lying nearly concealed within the berry, it projects "out of the fruit," to which it fits in closely, like a stopper in the mouth of a bottle. This funereal-looking tree, the proper name of which is *Exocarpus*, is in fact nearly allied to the Yew, and the character of the foliage is extremely similar.

Amongst the most remarkable trees of Australia are the *Kingia*, one of the Rush family (*Juncaceæ*), and the *Xanthorrhœa*, which belongs to the family of Lilies, both of which go commonly by the name of "Grass-trees." (Plate VII.) There are points of similarity between the two trees, only to be appreciated by scientific botanists, which are said to form a connecting link between Rushes and Lilies. The *Xanthorrhœa* has been poetically called "the sceptre of Flora" (rather an uncouth-looking one, it must be owned), from the manner in which the long cylindrical spikes of densely compacted flowers, resembling Bullrushes, rise out of the tufts of long wiry foliage which surmount the clumsy stem,—the stem and the foliage together looking something like a caricature of a Palm-tree.

Most of the Australian trees are evergreen.—Amongst the few deciduous ones, the White Cedar (*Melia Azedarach*) may be mentioned as an exception; the very rarity of the

fall of the leaf imparts an interest to the tree. But it is the shrubs, rather than the trees, which are the chief beauty of Australian vegetation, so that, whilst "a perpetual flower-garden is formed by these, there is not a single scene of which a painter could make a landscape, without greatly disguising the true character of the trees."

Though Australia is almost without any kind of native fruit, the soil and climate are so congenial to European fruit-trees, that those which have been introduced seem to thrive as well or better there than in their native land, and the Vine is said to have there found a second home.

It would be perfectly useless, as well as impossible in so small a space, to enumerate a long list of Australian plants; but it is interesting to know that amongst numerous unknown ones, it also contains the names of several of which we have species at home, though they form but a very small proportion of the whole. For instance, there are two different kinds of Beech (*Fagus*), a Dock-sorrel (*Rumex*), a Plantain (*Plantago*), a Skull-cap (*Scutellaria*), and an Eye-bright (*Euphrasia*). In addition to these, we find the familiar names of Speedwell (*Veronica*), Nightshade (*Solanum*), Scorpion-grass (*Myosotis*), Gentian (*Gentiana*), Avens (*Geum*), Flax (*Linum*), Sundew (*Drosera*), Crowfoot (*Ra-*

nunculus), and a flower which, in appearance, is almost the same as a Daisy (but belonging to a different branch of the Composite family), called *Vittadinia*. The species of the flowers indeed may not be the same as ours, but there would be sufficient resemblance to raise a thought of home when met with in that distant land.

The character of vegetation in the neighbouring island of Tasmania corresponds in great measure with that of Australia. It is a beautiful country; its features varied by valleys and mountains, by forests and heath-land. Here again we find the Gum-tree (*Eucalyptus*): one species which grows here is the most elegant of the family, called the Weeping Gum-tree; it is "large and lofty, with dense glossy foliage, and finely grown, having something the character of a Portugal Laurel grown into a forest-tree." The Proteas abound here also, the so-called Honeysuckle-trees forming a marked feature in the landscape.

There is a very beautiful and very common tree too, which goes by the name of the Wattle-tree, the wood being very much used in wattling cattle; it is an *Acacia*, one of the *Mimosa* tribe, and has therefore the peculiar character which distinguishes all that tribe, of a Leguminous seed-vessel, without having papilionaceous blossoms. These

Acacias are tall, elegant trees from twenty to forty feet high, clothed with "delicate Sensitive-plant foliage," feathery and pendulous, but thick; and they are covered from the very summit to the bending branches that sweep the ground, with bright canary-coloured blossoms. When standing underneath, the appearance of the tree overhead is "like a canopy of gold," and the rich and almost overpowering scent is "like the hawthorn or meadow-sweet." These are the *true* Acacias; the trees which go by that name in England, with pinkish-white papilionaceous blossoms, which were originally introduced from North America more than two hundred years ago, are called by botanists *false* Acacias, because they want the distinctive mark above named; they are, properly speaking, Robinias. The character of many of the true Acacia blossoms may be seen in the little greenhouse *Mimosa*, in which a number of separate flowers are set close together, the long projecting stamens forming a globular head; in others they grow in a number of little separate tufts.

Amongst the un-English forms which we meet with in Tasmania (and also in Australia) are the tree-like Nettles, "armed with a fierce array of poisoned spears, and towering above the human race in height." So sharp is the

sting of these nettles, that it is related of a horse which happened to be stung by one of them, that he became infuriated by the pain, and in a short time died in convulsions.

But one of the most beautiful and striking features of the Tasmanian forest are the Tree-Ferns. They are often of a gigantic size, and quite Palm-like in their appearance: —"Some tall and erect as the columns of a temple; others bending into an arch; their wide-spreading, feathery crowns forming half-transparent green canopies, so close together that only a span of blue sky can peep down between." The stems vary in height from six to twenty or thirty feet, and in diameter from eight inches to two or three feet. "So luxuriant is the vegetation, that the stems of these ferns are often overgrown with other little ferns, growing on them parasitically: one particular kind wreaths itself round and round their mossy columns, like living garlands; and the wondrously elegant, stately crown-canopy of feathers (from twelve to eighteen feet long), springing from the summit, bends over in a graceful curve all around, as evenly and regularly as the ribs of a parasol. Far above the Fern-trees and their beautiful parasites huge forest-trees soar up aloft, throwing their giant arms about in a gale that is blowing above, whilst scarcely a breath lifts the lightest

feather of the ferns below."* To this beautiful picture must be added the tree-like Grasses, which choke up the spaces between the trees, and we may form some notion of a Tasmanian forest. An additional beauty is given to them in spring-time by the many kinds of Orchis with which the ground is carpeted.

The tracts of heath-land in this country (if we may so call them) must be a very beautiful sight,—gay with the *Epacris*, both crimson and white; which so very much resembles the Heath both in appearance and structure, that Professor Lindley thinks "it really is of no practical importance whether the *Epacris* tribe is considered a distinct assemblage, or a mere section of the Heath tribe;" some kinds even agree with the Heath in the stamens being situated below the ovary, while in others they arise from the corolla; but there is some difference in the formation of the anthers. It is remarkable that only one or two of the Heath tribe are found in the countries occupied by the *Epacris*, which is indigenous in Tasmania and Australia, in the Polynesian Islands and the Indian Archipelago; in all of which it grows in profusion.

The scenery on the river Huron is very rich: its banks

* From 'My Home in Tasmania,' by Mrs. Meredith.

are clothed with lofty timber; some of the trees are a hundred and eighty feet high and twenty-eight feet in circumference, covering the ground with a dense forest.* Much more might be told of the beauties of this favoured land, with so fertile a soil and so delicious a climate. An English eye, however, is sensible of one drawback; and "thoroughly to enjoy the luxuriant vegetation, it is necessary to forget the rich and varied verdure of our own forests; for, luxuriant though it be, its prevailing tint is a dingy green."

There is one little flower which must be particularly named, because it seems to be to the Tasmanian settlers what the Daisy is to us;—a kind of universal guest, though "more especially growing on rocky, gravelly banks." It is an elegant white flower called *Diplarrhena Moræa*, which blooms through all the spring and summer. Its three large petals are snowy-white, the smaller inner ones delicately tinted with yellow and lilac, and its great tussocks of long reedy leaves flourish all the year round; it belongs to the *Iris* tribe, and is very much like that flower in appearance.

One other English colony, New Zealand, still remains to

* In Sir James Ross's Antarctic Voyages there is a very interesting account given of some wonderful fossil trees in the Derwent valley, which are said to be some of the most perfect that have ever been found.

be visited; and to many perhaps the most interesting. Since Captain Cook was there in 1770 the natural features can have undergone but little change as yet, altered as it is for the better in its moral aspect. For now, instead of being greeted as we land, by the sight of tatooed natives painted with red ochre and their hair tied up in a bunch on the top of their heads, baling water out of their canoes with a human skull; instead of being invited on shore with the anything but inviting salutation, "Come to us, come on shore, and we will kill you all with our *patoo-patoos*," we now find Englishmen regarded, for the most part, as friends; and though tatooed faces are still to be seen (contrasting a little oddly sometimes with an English cravat), tatooing is going out of fashion. Now, instead of no better religious worship than an offering of a basket of fern-roots, many a good Maori may be seen going to church service with a Maori prayer-book in his hand; and "since the Gospel of peace has been preached, and war has ceased to be their occupation," we find them described by Sir James Ross as "dispersing in small groups over the more fertile parts of the land, building detached cottages and small villages, and living in a degree of comfort and security to which they were formerly strangers."

The feature which may be said to be the predominant one in the vegetation of New Zealand is that of *sameness*, produced by the one green mass of forest. Nor is any one family of plants so prevalent over the rest (except perhaps the Pines) as to impart a particular character to any one part of the island more than to another. "The vast number of trees, the paucity of herbaceous plants, and the almost total absence of annuals, are," as we learn from Dr. Hooker, "the most remarkable features of the flora." It is alarming to New Zealand settlers desiring to study botany, to hear that "he thinks it may safely be said that the flora of this country is, for its extent, much the most difficult on the globe to a beginner."

There are few botanists, either there or elsewhere, who after reading Dr. Hooker's Introductory Essay to the 'Flora of New Zealand,' will not think twice before they run the risk of being classed amongst the "thoughtless aspirants to the questionable honour of being the first to name a species," warned, as they there plainly are, that to add "an uncalled-for synonym" to the list of species, which is already too large perhaps by half, is "an exposure of their own ignorance and deserving of censure;" whilst on the other hand it is shown how much more really great a thing

it is to prove seemingly different plants to be identical, by detecting in each the one link which connects them.

An instance is given of the manner in which species have been erroneously multiplied, in the case of two different kinds of *Oxalis;* of the varieties of one of them, *Oxalis corniculata,* "no less than seven or eight species have been made, most of them supposed to be peculiar to New Zealand," whilst to the name of this plant no allusion whatever is made. As similar instances appear to be of common occurrence, and as the so-called species have been catalogued as such in ordinary works of reference, the result has been that the number of species of known plants compiled from these sources has been commonly estimated at about 100,000; whilst in the essay here quoted it is concluded, "from a multiplicity of data," that half that number is much nearer the truth.

Such distinctions as depend on "differences of habit, colour, hairiness, and outline of leaves, and minute characters drawn from other organs than those of reproduction," are pronounced to be generally untrustworthy guides in deciding upon the species of a plant, as they are the result of external causes, "such as difference of climate, soil, etc., and easily obliterated under cultivation." Botanists are further re-

minded that, "without full series of specimens from many localities," differing varieties of a plant cannot be recognized as members of one species; and as an example of the wide sense in which these words are to be taken, the instance of one particular Fern may be named, *Lomaria procera*, the different appearances of which Dr. Hooker tells us he could not understand by studying them in New Zealand alone, nor until he had examined those of Australia, South Africa, and South America as well. The inspection of a large and correctly named herbarium, is also mentioned as a mode in which the dispersion of species may be profitably studied. This is a long digression, but an excusable one, both on account of the importance of the subject, and from the circumstance of its first having been put forward in connection with the flora of New Zealand.

The proportion of different kinds of trees in that country to other plants is immensely greater than in England. The vegetation is further described as of so peculiar a nature, that more than two-thirds of the whole flora are unknown in any other country. To form any idea of its character therefore, with no English types to point to, would be simply impossible by means of mere description.

Of the two-thirds above mentioned as peculiar to New

Zealand, the greater proportion are exogens. Of the remaining third, not quite one-twelfth of the species contained in it are European; but a much larger proportion, namely, nearly one-fourth, is found in Australia, to the vegetation of which country that of New Zealand bears a closer resemblance than to any other. "The decided preponderance of Australian forms is not confined to this large number of absolutely identical species; it prevails also in the genera containing peculiar species; and with regard to the Natural Orders in New Zealand, with the exception only of four, there are none which are not also found in Australia and Tasmania." A much smaller proportion of species is common to South America, namely, nearly one-eighth; and a smaller still—nearly one-sixteenth—to the Antarctic and Fuegian Islands, etc.

The few genera which were before mentioned when speaking of Australia, as including species with which we are familiar in England, are likewise to be met with in New Zealand. Amidst all the foreign forms which meet the eye, an English Silverweed (*Potentilla anserina*) must be a refreshing sight; or a Wood Sorrel (*Oxalis*), or a Sundew (*Drosera*), or any of the Crowfoot tribe (*Ranunculaceæ*). There is one most splendid species of this tribe called *Ranunculus insignis*,

with heads of about fifteen large Buttercup-like flowers; the splendid yellow flowers each an inch and a half broad, and with large handsome leaves. But such sights must be comparatively rare; for "the traveller from whatever country, on arriving in New Zealand, finds himself surrounded by a vegetation that is almost wholly new to him; with little that is at first sight striking, except the Tree-fern and an herbaceous little shrub, called the *Cordyline*, in the northern parts, and nothing familiar, except possibly the Mangrove; and as he extends his investigations into the flora, with two exceptions (*Pomaderris* and *Leptospermum*), he finds few forms that remind him of other countries. Of the numerous Pines, very few recall by habit and appearance the idea attached either to trees of this family in the Northern Hemisphere, or to those which represent them in the Southern. The only plants which, when examined, are found to be closely allied with plants of other countries, are those of the *Myrtle*, *Epacris*, and *Protea* tribes, though this resemblance would scarcely be guessed by the general appearance. There are no Leguminous plants; an abundance of bushes and Ferns, and very few Grasses;" nevertheless some of the arborescent Grasses, which "properly belong only to the tropics," are said by Meyen to be found in New Zealand, even below

36° of latitude," and the Palm called the Cabbage-palm (*Areca oleracea*) is said to extend even beyond 41° of latitude. The now well-known name of New Zealand Flax (*Phormium tenax*) must not be omitted, which grows nowhere else, except in Norfolk Island; it belongs to the Lily tribe, and grows in great tufts of long, tough, grass-like leaves.

Some of the flowers which are figured in the 'New Zealand Flora' are very beautiful; the most striking perhaps amongst the herbaceous plants is one of the Composite order, called *Celmisia*, which belongs to New Zealand in common with Australia and Tasmania. The conspicuous-looking blossoms are like gigantic Daisies, about four inches wide; the disc is yellow, with a broad, white, pink, or purplish ray; the lower leaves are spreading, straight, and grass-like, and generally covered with thick white wool underneath. This plant grows often in immense patches on the boggy mountain-tops in the southern part of the island.

Peculiar as the vegetation of New Zealand is, Dr. Hooker still finds sufficient resemblance between the flora of this country, those of Australia and Tasmania, and the southern part of South America,—"the three great areas of land in the Southern Hemisphere,"—to found a very interesting

speculation upon it, as to the probability of a much larger and more continuous tract of land having once existed in that hemisphere, large portions of which may at some time have become submerged, but by which the different floras were originally connected.

Of the general aspect of the country near the north-western extremity, not far from Waimaté, as seen from the sea, we are told that nothing could be more uninviting; the gently undulating surface, covered almost entirely with Fern, gives it a uniformity of aspect, which the few clumps of trees with which it is varied, serve only to render the more remarkable; whilst in those parts where high Fern-groves prevail, travelling is rendered extremely tedious and laborious by the thickly interwoven underwood. There is a total absence of roads through the country, and the native paths through the woods are very impracticable; but we may divest ourselves of all fear of wild beasts as we wander through these woods, as it is a remarkable fact in the natural history of New Zealand that rats are the largest animals found there; and it is doubtful whether even these were not introduced in ships from other countries.

CHAPTER VI.

THE SUB-TROPICAL ZONE.

FROM LAT. 34° TO THE TROPICS.

THE perpetual verdure of vegetation throughout the year gives an aspect to the countries in this zone which is entirely new to us travellers from the North; and in some parts it possesses the peculiarity of what may be called a *double* character:—plants which are natives of the warmer zones, and even some tropical fruits, luxuriating in the summer heat; whilst in winter are found many old European acquaintances—our summer flowers, that is—blooming there in winter. The inhabitants of this zone "rejoice in the happiest climate," which even in winter is "so mild, that man scarcely needs a substantial dwelling to shelter him."

Of the southern part of the United States, of the Texas,

and that part of Mexico belonging to this zone, only a few of the broader features can be given. The evergreen character between 30° and 36° of latitude is chiefly produced by the Laurels and splendid Magnolia-trees, by *Ilex vomitoria,* Pines, etc.; the green leaves of the Oak too are seen interspersed; Kalmias, the American Olive, etc., are likewise amongst the list of evergreen trees and shrubs with "large, shining, deep green leaves, which have sometimes astonishingly large and fragrant flowers," and are a distinguishing mark of this part of North America. The North American portion of this zone differs in many respects from the Old World countries contained in it. For instance, there are vast forests of Cypress on the lower part of the Mississippi and in Mexico, the trees of which are covered with a tropical parasite, called *Tillandsia usneoides,* a well-grown plant with perfect leaves and handsome red flowers, which, contrasted with the splendid background formed by the dark Cypresses, must be not only a peculiar but a most beautiful sight. Dicotyledonous trees are less frequent in these regions, and the little Fan-palms, called *Chamærops Palmetto,* begin to "appear in greater or smaller numbers, often in extensive social masses, where a marshy soil favours their propagation," and excite a desire in our minds to see

their tropical kindred of a larger growth. In the swamps on the borders of the Mississippi there grows a kind of Vine (*Vitis riparia*), which on account of the disagreeable flavour of its fruit has been named the Fox-grape; and different species of Bramble are found there in numbers. At the junction of the Ohio and the Mississippi the banks are covered with magnificent pyramidal Poplars (*Populus deltoides*) and Willows (*Salix nigra*). If we bend our steps southwards, we meet, as we approach New Orleans, with "impenetrable forests" of those Grasses allied to Bamboo, growing on the banks of the river, which here well deserve their title of "arborescent," reaching, as they do, from thirty-six to forty-two feet in height.

This is but a few out of a long list of plants which might be named; but as there is much to be seen in the other hemisphere, we must now steer straight from New Orleans for the Canary Islands. Both here, as throughout the western Old World portion of this zone, we find the Date Palm. It seems indeed to be almost limited to the Subtropical Zone, "being equally intolerant of the heavy rains of the tropics as of the rigour of more northern regions," and in many parts the inhabitants of this zone depend on it for a large proportion of their daily food. But one of the

chief features in the vegetation is formed by the number of succulent plants, of the same nature, and some of them of the same family, as our Houseleek (*Sempervivum*).

As rain seldom falls in these regions, these succulent plants, which may be called "vegetable camels," are provided with an apparatus of little cavities in their fleshy stems, in which, when the rainy season comes, they lay in a supply of moisture, by which the life of the plant is supported through the long drought; the outer skin being so thick as to prevent the absorption of this moisture by the hot sun to which they are exposed.

In Teneriffe the Sempervivums are very common, and often become "shrubs of some size; growing on steep cliffs and rocks in the neighbourhood of the sea, and on old mansions; making them glow with the most brilliant golden tints."

With our limited English ideas of the Spurge tribe (*Euphorbiaceæ*), ranging from the little weed we are for ever pulling up in our gardens, to the Box-tree (*Buxus*), which grows in such a decorous, English sort of way—we can scarcely believe, at first sight, in the identity of the Euphorbias we meet with in the Canary Islands. Till we have seen the blossom we should unhesitatingly say they were

Cactuses, for they have the same angular fleshy stems, containing the same sort of apparatus for laying in water; but Cactuses we remember are almost entirely confined to the New World. These Euphorbias, some of them, grow to the size of trees, with crooked, dropsical-looking trunks, and no leaves, except a bunch at the very end of the branches. The milky-looking juice, which is a peculiarity of all the tribe, and generally acrid, is however in one species (*Euphorbia balsamifera*) "so innocuous and sweet that it is thickened to jelly and eaten by the inhabitants." There is another species (*Euphorbia Canariensis*) in which "there is nothing which can recall to us the ordinary form of a bush or tree;" it looks more like an enormous lustre than anything else; its branches "bend in a semicircle down to the ground, and then rise again perpendicularly at various distances;" scarlet flowers break forth at the ends of the thick fleshy branches, "which at a distance are like burning coals."

Though very few tropical plants are found in the Canary Islands, we again meet with the broad-leaved Bananas there, and make acquaintance with the graceful-looking Sugar-cane (*Saccharum*), with its drooping grass-like leaves. There are a few other tropical plants besides, amongst

which are the gigantic Liliaceous plants called Dragon-trees (*Dracæna*), which when young have branchless stems, with an elegant canopy of broad leaves at the top. There is a celebrated gigantic Dragon-tree at the little town of Oratava in Teneriffe, supposed to be older than the Pyramids; to speak sober truth, it is known to have been held in veneration by the natives when the island was first visited by Europeans in the year 1400; it is seventy feet high, and rather more than forty-two feet in circumference; "the trunk is hollow,and may be ascended in the interior by a staircase."

In Madeira we find an unusual mixture of English fruits and tropical ones, all growing so luxuriantly that it is difficult now to ascertain what plants are native and what have been introduced; we are in a perfect *embarras de richesses*, so varied is the choice, from Pine-apples and Mangoes, Guavas and Bananas, to Chestnuts, Apples, and Walnuts, all of which grow almost without cultivation in the rich soil of this island, each different fruit finding its appropriate climate on hill or plain. Even the Chinese Tea-plant is cultivated there, as we learn from Sir James Ross, in a plantation belonging to a private individual; and the flavour is so excellent, that it has been thought it might become an article of commerce, if it were not for the cost

of labour necessary in its preparation. Coffee also, of a good quality, is raised in the island, sufficient to supply the wants of the whole population.

Some of the hills are very high (Pico Ruivo is nearly 5100 feet), and are covered round with Vines to a certain height, above which there are great numbers of Chestnut- and Pine-trees; and, higher still, various sorts of timber-trees, so thick as to form forests. There is a kind of wood used in England called Madeira Mahogany; but as no mahogany is really brought from thence, it was supposed by Sir Joseph Banks, who visited Madeira with Captain Cook, to be the wood of a Laurel-tree (*Laurus Indica*), which is so like mahogany that it can hardly be distinguished from it.

In the African portion of this zone, as might be expected, we again meet with some of the succulent plants before named, which find a congenial home in that hot climate and dry soil. There is one kind with which we are familiar in English gardens, called the Ice-plant (*Mesembryanthemum crystallinum*), with the whole surface of its leaves and stems raised into minute, transparent blisters. We are not furnished with many particulars about this part of Africa; and where so little can be told, it might seem wiser perhaps to say nothing.

One tree must nevertheless be particularly mentioned, both on account of its useful properties and the peculiar manner in which it grows; this is the Argan-tree of Morocco (*Argania Sideroxylon*), "very little known in Europe, even to botanists," of which a very interesting account is given in the 'Journal of Botany' for April, 1854. This tree grows more or less throughout the States of Western Barbary, forming woods in the southern and western regions of the kingdom of Morocco, principally in the province of Haka, and south of Mogador. The tree has a very uncommon appearance, from the disproportion which exists between its low stature and its circumference; the individual whose dimensions are given is only sixteen or eighten feet in height, whilst the circumference is two hundred and twenty. One of the chief peculiarities is that the trunk, which measures twenty-six feet round, branches off at the height of three feet, so that the branches actually rest upon the ground, till at the length of fifteen feet from the trunk hey begin to ascend. The roots extend to a great distance underground, sending up shoots at intervals; by which means, it appears, the tree is propagated, as well as by seed.

From the appearance of some of the trees, they are supposed to be from one to two hundred years old; the one

whose measurement is given above, is probably three hundred. They are usually seen on the hills, in a light, dry, sandy soil, where nothing else will grow. The Argan (which is said to be a low-spreading *tree* or *shrub*, varying in size according to locality) belongs to the Natural Order *Sapotaceæ:* its chief value arises from the oil which is expressed from its kernels.

But the most important feature of vegetation in North Sub-tropical Africa is doubtless the Date Palm (*Phœnix dactylifera*) (Plate XX.), constituting, as it does, the sole means of support to nineteen-twentieths of the population of Fezzan during nine months of the year; forming the food of beasts as well as of human beings, "the oases being bare of herbage." Though it is cultivated as far to the north as 41° in Spain, as well as in the south of France and in Italy, at Athens and at Smyrna, the fruit does not ripen there. Its true native home is the North of Africa, Egypt, Nubia, Syria, Arabia Felix, and Persia. The range of the Date Palm is limited towards the south by the region of equinoctial rains. A sandy and well-watered soil is that which best suits this tree, for which reason it is always found in the great African deserts in the neighbourhood of springs.

With regret we leave a large portion of this part of Africa unexplored, and turn our thoughts and our steps in an easterly direction, towards Egypt and the Holy Land.

When we reach the busy town of Alexandria—which, from its sandy soil, and its situation without the Delta, seems scarcely to belong to Egypt—we are struck by the picturesque contrast of the spreading Palms and the low-roofed houses, and are amused for a little while with all the stir and bustle that is going on; but we feel no great inducement to spend our time in the new town, with its narrow ill-paved streets, crowded with awkward-looking camels, laden with leathern sacks of water; we get tired of meeting bearded, swarthy-faced men, with turbans and long robes (though indeed such picturesque costumes are going out of fashion), and of wondering at the phantom-like women we occasionally meet, of whom we can see nothing but two eyes looking through a long piece of drapery; and we wander on to the ruins of the ancient town, to linger for a little by the Pillar of Pompey, or by Cleopatra's Baths, where, amidst all the ruined grandeur, the Palm-tree is still found growing, and owls may sit and hoot there, and bats may flit, and jackals wander unmolested. Around is nothing to be seen but a sandy, flat, and barren soil; the only plants which

strike the eye as growing in any numbers are the spiky Glasswort (*Salicornia*),* and a row of Palm-trees following the course of the canal as far as the eye can reach.

But instead of following the canal like the Palm-trees (for nothing could be so dull as the country we should pass through before we reached the Nile at Atfé), we will leave the beaten track, and proceed by a different route, to Rosetta. Here the African sand ends, and we first observe the black rich loam which is the characteristic soil of Egypt, and, from the contrast which it presents to the adjacent part of Africa, is supposed to be a deposit which has been brought down by the Nile from the heart of Abyssinia. The effects of the fertilizing Nile are here everywhere to be seen; in the forests of Palm-trees on each bank of the river, and in the orchards watered by its streams; in the Lemon-trees and Orange-groves; the Bananas, Peach-trees, and others; all bestowing a peculiar charm on Rosetta by their perpetual verdure: within the Delta too we recognize the Sugar-cane.

As we sail up the river to Cairo, the shores on either side are low and marshy, stretching out into a boundless flat,

* This plant, which the Arabs call El-Kali, is an important article of commerce, and produces the salt called alkali, so extensively used in the manufacture of soap and glass.

varied here and there by Palm-trees, single or in clumps. "Uninteresting" is the word which best characterizes the greater part of this river voyage. We are disappointed too that we can see nothing exactly answering to the tall, reed-like stems of the Papyrus, such as those we have seen in hothouses at home, with bunches of light thread-like leaves growing at the top; and we give up the thought at last, on making the discovery that now it only grows above the cataracts, nearly five hundred miles up the river. Now and then indeed our hearts leap up at the sight of the beautiful white blossoms of the Arum (*Calla Æthiopica*) growing wild on the islands of the Nile, the very same as those we prized in our drawing-room window at home; and here and there, as we pass these islands, we see that elegant shrub the Tamarisk, which we remember in English gardens as an interesting exotic; but here, in its native land, it has a beauty we never saw in it before, and in its "long, brown, slender stems, and graceful plumes of faintly blushing blossoms," we recognize the truth of Lindley's description.

The eye however is refreshed for a mile or two before reaching Cairo, by a shady avenue of Sycamores on one side of the river; but as we approach the town, the banks are so covered with counting-houses and custom-houses, gardens

and summer-palaces, iron-foundries and cotton-mills, calico printing establishments and arsenals, that we might as well think of botanizing on the Thames near London.

Perhaps it requires a great deal of learning as to the construction of the Pyramids to wonder at them as we ought, but we cannot help thinking that in any other landscape their hard outline would be unendurable; and, as far as usefulness is concerned, that triumph of modern engineering called the "barrage," is far more to be admired, by which the Nile is dammed up near the head of the Delta, and carried three canals in three different directions, so as to render a larger proportion of land capable of cultivation.

We are doing very little all this time in the botanical department, and are likely to do still less on our journey across the desert to Suez; for not only is the method of travelling —either swinging along on a camel, or being shaken to pieces on a dromedary—highly unfavourable to such pursuits, but the almost entire absence of vegetation makes our idleness a necessity. The only plant we see is now and then a graceful Tamarisk, which we look at with additional interest when we remember that it was "a familiar object to the children of Israel" in their journeyings, growing as it also does on "the desolate coast of the Red Sea, and in the wilderness of Sinai."

On reaching Suez, no prospect we think could be more dreary; not a single tree, nor a shrub, nor a vestige of a green herb to relieve the eye from the glare of the yellow sand; so, as we have no inducement to stay here, and are bent on visiting Palestine, we again resign ourselves to a long desert journey to Gaza, learning patience as we go from the patience of our camel.

After so many miles of sandy desert, the sight of fertile black soil as we reach the neighbourhood of Gaza is really a cheering sight; here, as everywhere else on these shores of the Mediterranean, we are refreshed by the sight of numbers of Date-palms; and in the gardens, which are watered by limpid streams, Pomegranates and Oranges grow spontaneously. As we proceed on our journey towards the ancient Hebron, our road lies through a long hollow, interspersed with rocky elevations, with groves of Pines and stunted Oaks, and a few plantations of Vines and Olives. And now we take every step with reverence as we enter the Holy Land. Some ten miles further on stands the village of Bethlehem, on an eminence surrounded by hills and valleys, whose fertile soil produces Vines and Olives and other fruits. A few miles more, and we pass on through the valley of Hinnom towards Jerusalem; not at this time how-

ever will we enter the Holy City, but we will bend our steps towards the Mount of Olives. The only Olive-trees now standing there, grow near the foot of the mountain, and, from their enormous thickness, it is thought probable that they are the same which stood there when our Lord was upon earth. "They are eight in number, at least eighteen feet nine inches in circumference, and from twenty-eight to thirty-one feet in height."

There is a thorny shrub growing in the Holy Land, from which the Crown of Thorns is said to have been made, called *Paliurus aculeatus;* it is "a light, elegant-looking shrub when it puts forth its new leaves in the spring, but of a savage appearance in the autumn, when its leaves are dried and discoloured, and its branches covered with a profusion of little round orange-coloured, flat seed-vessels, like little bucklers. It has small pale greenish-yellow flowers, growing in little stalked clusters. The leaves are furnished at the base with a pair of sharp, slender thorns, which, upon the old branches are curved outwards, and become so strong as to render hedges made from the plant impenetrable."*

Reeds grow in profusion on the Jordan, and no doubt also near the brook Cedron; reeds like those we remember in that

* From Lindley's 'Ladies' Botany.'

part of the other hemisphere which lies in this Sub-Tropical Zone, of a size and strength they attain only in these hot countries. Reeds such as these they probably were which the rude Roman soldiers placed as a mock sceptre in the hand of our blessed Lord; with which they smote His sacred head, and on which they extended the sponge filled with vinegar, to His lips.

The tree called Palma Christi, which we may infer from the name is the one supposed to have supplied the branches with which the multitude went forth to meet our Lord on His entry into Jerusalem, is, in truth, not a Palm-tree, but has perhaps been called so from the shape of its palmate leaves; it is a tree belonging to the Spurge tribe (*Euphorbiaceæ*), and its right name is *Ricinus communis*, or the Castor-oil-nut tree; it is however extremely doubtful whether the plants mentioned above by the names they bear at the present day, are identical with those intended in the Holy Scriptures.*

* The "Mustard-tree" of the Scriptures, after much diversity of opinion on the subject, is now supposed (in consequence of the learned researches of Dr. Royle) to be the *Salvadora Persica*, of the natural order *Salvadoraceæ*; —a tree common in the neighbourhood of Jerusalem, there known by the name of *Khardal*, "an Arabic word signifying Mustard throughout the East;" the seeds are employed in Syria as a substitute for mustard.

We cannot pass by the neighbourhood of Jericho without mentioning a curious plant which takes its name from thence, and is found growing in dry sandy parts of Palestine, namely, the Rose of Jericho. It is a singularly inappropriate name, as it has nothing at all to do with Roses, and belongs to the Cruciferous family; its proper name is *Anastatica hierochuntica*. Professor Lindley speaks of it as "an Eastern herb, which grows in the most arid deserts. At the end of its life, and in consequence of drought, its texture becomes almost woody, its branches curve up into a sort of ball, the valves of its pods are closed, and the plant holds to the soil by nothing but a root without fibres. In this state, the wind, always so powerful on plains of sand, tears up the dry ball, and rolls it upon the desert. If in the course of its violent transmission the ball is thrown upon a pool of water, the humidity is promptly absorbed by the woody tissue, the branches unfold, and the seed-vessels open; the seeds, which if they had been dropped upon the dry sand would never have germinated, sow themselves naturally in the moist soil, where they are sure to be developed, and the young plants will be certain of nourishment. Specimens of this curious production are sometimes brought from Palestine (where it is called *Kaf Maryam*), and although

they may be many years old, will, if placed in water, start, as it were, from their slumbers, stretch out their arms, straighten their leaves, and assume all the appearance of plants suddenly raised from the dead."

And now (to continue our journey) we still find, as we follow the course of the Jordan, that the banks "are mantled with a thick forest of reeds, willows, and various shrubs;" and growing wild there, we meet with a little herbaceous plant with a papilionaceous flower, called *Indigofera*, one species of which produces the Indigo dye. It is as well to be wary how we approach this kind of jungle, for ounces and wild boars often lurk amongst the reeds and willows, which are also a favourite hiding-place for jackals and hares. In the plains we may catch a sight sometimes of the elegant gazelle, with its twisted spiral horns and large eyes; and in the green pastures which clothe the valley through which the river runs, there are buffaloes grazing, and camels too sometimes, when they do not prefer browsing on the Thistles and Nettles which grow on the more rocky parts around.

In the autumn these pastures are arrayed in a golden dress, being covered with flowers which are supposed, with reason, to be "the Lilies of the field" from which our Lord taught us a lesson of trust in God's providence. These are

the *Amaryllis lutea;* they are of the brightest yellow, and very much like a Crocus in general appearance, only much larger and taller; but as they differ in the number of stamens, in the character of the anthers, and in some other particulars, they do not exactly belong to the same family.

The hilly but fruitful country of Samaria (now Nablous) produces quantities of corn, as well as Olives, and the Cotton-plant (*Gossypium*). We shall so soon meet with the Cotton-plant in countries where it is a chief article of commerce, that we will not stop to examine it here. As we approach towards Mount Carmel, we arrive at a chain of hills, on the summit of which we again recognize Oaks and Pines, from which we will keep at a respectful distance, having no wish to encounter the wild boars and lynxes which lurk there. On the flattened cone of Carmel, interspersed among Brambles, grow wild Vines and Olive-trees, —wild now, though it is thought by some only degenerated from trees which in former times were cultivated there. When we reach the neighbourhood of Bairout, we are struck with the numbers of white Mulberry-trees with which the plains around are so thickly planted, that as we look down into the valley from the mountain heights, the foliage of these useful trees clothes them with a beautiful verdure:

the silk produced by the silkworms which feed on these trees is said to be "of the very finest quality." All around Tripoli too we find orchards of white Mulberry-trees, Pomegranates, Orange- and Lemon-trees, "which bear fruit of the greatest beauty." Here even in the middle of winter the Orange-trees are covered with fruit and flower at the same time, and the Banana is flourishing in the plain, whilst the distant summits of Lebanon are covered with snow.

In the account which travellers give of the trees on the mountains of Syria, we may trace almost all the different regions marked out by Meyen, which we may conclude, are found at different elevations: we hear, for instance, of Figs, Myrtles, Laurels, Box and Yew trees, of Oaks and Pines.—But where are the Cedars of Lebanon? Alas! for the glory of Lebanon is departed; and now amongst the crags of the rocks four or five Cedars only remain, of sufficient importance to attract our notice.

In this favoured land the fruits of the most distant climes might be produced under proper cultivation. It is rich in corn of various kinds, including Maize and Rice; the Sugar-cane too is found to flourish there; and besides the fruits already often mentioned, Citrons and Water-melons may be added to the list. The Cactus on which the

cochineal insect feeds (*Opuntia cochinillifera*) also grows throughout the coast in as high perfection as in Mexico and St. Domingo, having been long since introduced here.*

After the experience we have had of desert travelling, we are not at all inclined to repeat the experiment, though for curiosity's sake we should have liked to see some of those "many little plants of the Mint tribe (*Labiatæ*)" which, Professor Lindley tells us, we should find "even enduring the scorching sun of the Syrian desert;" so as the next portion of this zone about which we have much information is the Himalaya Mountains, we will begin our journey afresh, on the western part of those mountains, in the country round Delhi.

Here the double character which was before mentioned as characteristic of some portions of this zone, is most clearly developed. The heat of the summer is sufficient to ripen even almost any of the tropical fruits; these however are not common there, owing most probably to the cold of the winter, when the temperature is so low that often old trees of those tropical plants which do grow there are killed. There is a summer harvest of Rice and Maize, during which

* Most of the facts relating to Syria and Egypt are given on the authority of Volney.

season also the cultivation of those two important plants goes on—the Cotton-plant (*Gossypium*) and the Indigo (*Indigofera*).

There is a plant which we often pass unheeded by the roadsides in England, out of which, if we knew or remembered its extensive and useful connections, we might spin a long thread,—namely the Mallow (*Malva*); and by no means least in importance amongst the branches of the family is the Cotton-plant, the flowers of which show the very same construction,—the same valvate calyx, and the stamens united in a column;—the colour of the blossom is yellow, and occasionally red.

Where the Cotton-plant is cultivated for the purposes of commerce, its height is kept down to about five or six feet by breaking off the upright branches; this is perhaps that the pods may not grow out of reach: these burst open as they hang, and the white cotton, which encases the seed, forces its way out. "Gathering the cotton-pods in large plantations is a severe labour, and a great number of Negroes are required for it; but the labour of separating the Cotton from the seeds is still worse; at the present day this, as well as the packing of the great sacks of cotton, is done by machinery."—England alone consumes three

hundred million pounds' weight of cotton every year, one-twentieth only of which is brought from India.

The Indigo-plant, which is to provide the dye for the Cotton, grows in the same neighbourhood, and has been before described as a little herbaceous plant with a papilionaceous flower. The species chiefly cultivated is *Indigofera tinctoria*. The whole of the plant is pervaded with the colouring matter, so that, in preparing the dye, the entire plants—which are mowed down when in flower—are plunged into vessels of water; when the water has extracted the dye, it is poured into other vessels, in which the dye soon separates from it, and is precipitated to the bottom. When first extracted it is yellow, but it becomes blue by exposure to the air. The water is got rid of by boiling the whole together till the water all evaporates in steam; when the dye is put into wooden moulds, from which it takes the shape in which it appears as an article of commerce. The number of pounds brought to England from her different colonies yearly is six millions and a half; of which two millions are used in England, and the rest exported to the Continent.—It was impossible to pass by two such important plants as Cotton and Indigo without giving the above interesting details, from Meyen.

Amongst others of the summer flowers with whose names we are familiar, are Ginger and Turmeric, which both belong to a family called *Scitamineæ;* they are herbaceous plants about a foot in height. The flowers of the Ginger grow out of a spathe; the corolla is tubular and irregular, with six segments, in two whorls; a very peculiar character is given to the plant by the warm orange tint of the bracts. —The Turmeric too has very much the same general character.

The names of the winter plants, both in the cultivated and uncultivated parts of these mountains, have perhaps more of interest for us when English eyes are refreshed by the sight of crops of Wheat, Barley, and Oats, Beans, Vetches, Mustard, Carrots, etc. etc.; then old English scenes are recalled by the sight of Potentillas and blue-belled Campanulas, Mallows (*Malva rotundifolia*), Veronicas (*V. hederæfolia*), the blue Pimpernel (*Anagallis cærulea*), the common Sow-thistle (*Sonchus oleraceus*), and the small Snapdragon (*Antirrhinum Orontium*), wild Oats (*Avena fatua*), and wild Verbena (*V. officinalis*),—the very same species that grow in England; indeed there is reason to think that some of them have been introduced with English grain.

"In the autumn season some of the cultivated valleys in

the Himalayas have a gay appearance, occasioned by crops of a species of the plant commonly called the Prince's Feather (*Amaranthus frumentaceus*), which clothes them with waving plumes of yellow and vivid crimson. It is extensively grown as a staple grain, and the bread made from its seed is the common food of the people." Travellers tell us also of "Red Currants high up the mountains, and of abundance of Raspberries, Strawberries, and Black Currants in the forests." Amongst the water-plants there are likewise many of our common species, such as Arrow-head (*Sagittaria*), the Flowering Rush (*Butomus*), White Water-lilies (*Nymphæa*), Water Crowfoot (*Ranunculus aquatilis*), and others; and even among the tropical water-plants there is one very much like our Arrow-head, called *Pontederia*. But amongst them all none perhaps is so beautiful as the Lotus (*Nelumbium speciosum*), with large rose-tinted blossoms, shaded into white towards the centre, about half a foot in diameter, and shaped very much like a Pæony; they stand out of the water on long stalks, sometimes as much as five feet in height, and contrast well with the large cool green leaves, which are almost circular (with the stalk in the centre), and sometimes measure more than a foot in diameter,—some floating, some on long stalks like the flowers.

This plant, which is very nearly allied to the *Nymphæaceæ*, is also called the Water Bean. The so-called Beans (which do not resemble Beans in any way) are partially buried in the cushion-like top of the elongated flower-stalk, called the *torus*, which forms the centre of the flower; they are, properly speaking, fruits in which the seed is contained, the upper end of which projects a little out of the *torus;* they are often eight in number, sometimes many more; one, in the centre of the flat, yellowish-green, round *torus* (which is sometimes three times the size of a five-shilling piece at the time the fruit is ripe), the rest being placed round in circles. The *Nelumbium speciosum* is said to have been formerly common in Egypt, but to be extinct there now; at the present day it is chiefly found in the East Indies. Some think it was this species of Lotus which was called by the Egyptians "the Sacred Bean," and the flower of it is supposed to be that mythic Lotus which so often occurs on the monuments of Egypt and India; but there appears to exist a diversity of opinion as to the species.

In the accounts which travellers give of the wild parts of the Himalaya Mountains, we can again trace out many of the different regions in the list of forest-trees, such as Box and Yew, Chestnuts and Oaks, and immense Pines; we

also read of Cedar-trees, which are perhaps what we call the Himalaya Fir, or Deodar Pine, which is a species of Cedar. But the Rhododendrons seem to be the crowning beauty. Where the mountain path leads through the midst of these plants "no garden can surpass the loveliness of the scene;" and in some parts the Gentians "enamel the sward with blossoms of such intense brilliancy, that the eye can scarcely rest upon them." In Dr. Hooker's account of his researches in the Himalayas there is one passage which beautifully illustrates the theory of the different vertical regions of vegetation, in which he describes one wonderful scene which exhibits several of these regions at a glance, one above the other:—"From the deep valleys choked with tropical luxuriance, to the scanty *yak* pasturage on the heights above, seems but a step at the first *coup d'œil*, but resolves itself on a closer inspection into five belts. 1. Palm and Plantain. 2. Oak and Laurel. 3. Pine. 4. Rhododendron and Grass. 5. Rock and Snow. From the bed of the Ratang, in which grow Palms with Screw-pine and Plantain, it is only seven miles in a direct line to the perpetual ice. From the plains of India, or outer Himalaya, one may behold snowy peaks rise in the distance, behind a foreground of tropical forest; here, on the contrary,

all the intermediate phases of vegetation are seen at a glance. Except in the Himalaya this is no common phenomenon, and is owing to the very remarkable depth of the river-beds."

Descending from the mountains and passing over some of the hills which gradually lead us down to the plain, we traverse beautiful forests of Chestnut, Walnut, and Filbert-trees; or our road takes us perhaps for miles through a magnificent forest of Cedars; and in the neighbourhood of some village we meet with "groves of Apricot-trees," for which fruit the bears, of which there are numbers in the Himalayas, have a great *penchant*, as the villagers often find to their cost.

The district round Delhi is adorned in summer with Acacias of different kinds, Figs, Mulberries, etc. etc.; and the Palms called *Phœnix humilis* and *Phœnix sylvestris* appear in place of the Date-palms we left near the Mediterranean. The uninteresting country we meet with when we reach the level plains is a great contrast to the sights we leave behind; we soon grow weary of a thick jungle of tall grass and reeds, all matted together with shrubs and creepers; and we are afraid to go near the thorny masses of tangled Rose-bushes, as this is a favourite *lay* of tigers.

To the east of the Himalayas we meet with "some important forms of plants, through which vegetation assumes another character." We find not only Plantains and Bananas, but arborescent Grasses rivalling these in height. As we shall now so often meet with Bananas and Plantains, it may be as well to mention that both belong to a tribe called *Musaceæ;* in appearance there is very little difference between them, both having similar very large, oblong, flapping leaves. "A spike of flowers springs up from the centre of these leaves; the flowers are arranged round the spike in whorls, each whorl being protected by a coloured *bract,* which afterwards drops off and allows the fruit to expand and ripen." The fruit of the Plantain is used only as a vegetable, whilst that of the Banana is fit for dessert; in shape it is not unlike that of the Vegetable Marrow, but smaller, and grows seven or eight together in a cluster. Some practice is generally necessary in acquiring a liking for the flavour, which is something like a Pear in a state of decay.

Many also of a tribe called the *Cycas* tribe grow in this part of the Sub-Tropical Zone, to which the peculiarity belongs (in common with a few other plants, such as the Fir and the Yew) of forming a connecting link between the

Brooks Imp

Cycas revoluta, p.16?

two great classes of Exogens and Endogens. These plants, which are small trees or shrubs (Plate VIII.), agree with the Exogens in the concentric rings of the wood, and with the Endogens in the straight veins of the leaves, which resemble those of the Palm. In the manner in which the fruit grows they agree with neither, the seeds being arranged in cones like those of the Fir, without any covering, and only protected by a kind of scales called *bracts*. The pith of these plants supplies a kind of sago; most of that which is imported is however the product of a true Palm (*Sagus lævis*).

As we have spent so much time in the Northern Sub-Tropical Zone, and have nothing in addition to say of China and Japan, we must now see whether this zone has at all the same character in the Southern Hemisphere.—The first glance around however, when we land in that part of Chili which lies in this zone, tells us that vegetation here wears a totally different aspect; its character too on the western side of the Andes differs from the eastern; the eastern side, where the country is low, having a more tropical appearance than the western, where the land lies at a greater variety of elevations.

The plants most characteristic of this part of Chili are

the Myrtles; even above the height of 2000 feet the Myrtles seem to be a principal feature in the noble evergreen forests, growing as large trees, "thirty and forty feet high, and with trunks three and four feet thick." Here too majestic Laurels are to be seen, "sending up ten, twelve, and thirteen stems, each a foot in thickness, from a single root."

Cactuses are extremely prevalent here also, ascending from the coasts up to the second region on the mountains; one of the most beautiful sights in nature, for contrast of colour, must be the kind of Cactus called *Cereus*, when its large white blossoms are mingled with the scarlet ones of a parasitical climber which often covers it, called *Loranthus;* —a plant with thick, leathery leaves like the Misseltoe, to which it is allied. Dodder (*Cuscuta*) is also amongst the parasitical plants here; not like a little twisted wire, as with us, but of a large size.

There is a plant, now often seen in English gardens, called *Eccremocarpus scaber*, one of the Trumpet-flower or *Bignonia* tribe, with orange-red blossoms like polished wax; at Valparaiso this plant grows wild over the hedges and thickets, and seems to take peculiar delight in decking the withered-looking *Acacia Caven* with its gold-red blossoms. Most of the trees and shrubs have strong, thick, leathery,

and shining leaves, and are overgrown by climbing plants with brilliant flowers. The "Myrtles and Fuchsias are covered with lovely blossoms throughout the year," and *Calceolarias* too are native here. On the level plain both to the east and west of the Andes there are numbers of bushes with woody stems and Composite flowers, and others with blossoms like the Mint tribe (*Labiatæ*). During the rainy season these wide plains are adorned "with thousands of gay liliaceous plants. But when the moisture has disappeared, when the sun has beat for months during summer on the plain, all its splendour is gone, not a trace of these beautiful Lilies is to be seen, and the bushes even seem dead; their leaves lie in heaps round the stem, and in the leaf-buds only we perceive the dormant life of these plants." One feature which the northern and southern portions of this zone possess in common, is formed by the majestic tree-like Grasses; but with the exception of these, we have seen few sights to remind us of the Old World, and we again set forward for the southernmost part of Africa, wondering whether we shall see a more familiar kind of vegetation there.

But in Southern Africa we are surrounded with fresh, and still more foreign sights; for with the exception of the

Oak, which to our surprise we find growing luxuriantly, the character of vegetation there reminds us in but few respects of what we saw in the Northern Sub-Tropical Zone, or of what we have just left in Chili; so perfectly unlike anything else it is, for the most part, that it would be worse than useless to enumerate the names of a dozen unknown trees which compose the forests there; their names and natures must be sought in botanical works. The almost entire absence of Palms in the extreme South of Africa is worth remarking; one species only is mentioned by Schouw, as growing in Cape Colony, namely *Phœnix reclinata*. There are in their stead some peculiar-looking trees, which, though not very much like them, are considered as their representatives, called Zamias, or *Encephalarti*. They have thick, unshapely, pithy trunks, of a very singular appearance; and "as they grow in the desert and barren table-lands, where the ostrich and gazelle take up their abode, they exercise the greatest influence over the character of the vegetation in those places." There is something very un-Palm-like in the stiff, fleshy, bluish-green, antler-like leaflets, bristling up like *chevaux-de-frise* along each side of the long stems which diverge from the top of the clumsy-looking trunk.

A very interesting circumstance connected with these Zamias must just be mentioned, which, like the fossil-trees at the North Pole, proves that our globe at some previous time had a very different constitution from its present one. Though Zamias are only found at the present day in the warm climate of South Africa, of tropical South America, and the north of New Holland, there are nevertheless numbers of fossils found imbedded in the building-stone of the Isle of Portland, which Dr. Buckland identified with the underground part of the stem of these trees, and which, even to the eye of a common observer, bear a striking resemblance to the stem of the species called *Encephalartos horridus*. These fossils commonly go by the name of petrified birds'-nests.

A striking character is given to vegetation at the Cape of Good Hope by the great prevalence of the Heath tribe (*Ericæ*), which here reaches its greatest development. We have indeed in the Northern Hemisphere single representatives of the family, which have a very wide range, extending northwards as far as Kamtschatka, and even into the Arctic Zone, to Lapland and Greenland; and in a southerly direction we find them assuming even an arborescent appearance, in the extreme South of Europe, that is to say, and in the

Island of Teneriffe, on the declivities of the Peak of Teyde, where they grow luxuriantly, and look like little Fir-trees covered with masses of pretty flowers, of the most brilliant colours. Still, the species which appear in the Northern Hemisphere are considered as representatives only of the Heath tribe, which has its true home at the Cape of Good Hope, and it is a singular fact that in the New World only one out of the three hundred species of Heaths is to be met with; the limits of this plant in the Southern Hemisphere are very definitely marked; but within these limits the different species grow in such rich profusion, that at the Cape whole tracts of land are so thickly covered with little tree-like Heaths, that they are spoken of as forests.

Another peculiar feature of vegetation there is formed by the "countless species of flowers belonging to the Corn-flag or *Iris* tribe." During the dry season those tracts of land called *Karroos* are parched and half naked; but on the commencement of the rains, they are soon "covered with a robe of the deepest green, adorned with all manner of gay and sparkling colours." Here too we meet again with numbers of those succulent plants we remember in the Northern Sub-Tropical Zone, particularly in the Canary Islands. There is one most interesting tribe of these, called

the Fig Marigold tribe (*Mesembryanthemum*), which inhabits rocks and dry plains in the most arid parts of the southern extremity of Africa. They are shrubs, with "fleshy leaves, often of most singular forms;" the flowers are of various colours, and in shape have a slight resemblance to the Marigold.—Like Wordsworth's "Little Celandine," these are "flowers of wiser wits" than to open in the shade, or in dull weather, but only expand under bright sunshine. "I scarcely know," says Professor Lindley, "a more interesting sight than on a summer's day after a storm to watch a bush of this genus, which has thrown its weak, trailing arms over a piece of rock, and which leans forward to the south, as if to catch the earliest influence of the beams it loves so well. While the sun is darkened by clouds, all its blossoms are shut up so closely that one would hardly suspect the bush of being more than a tuft of leafy branches, with some withered or unexpanded blossoms scattered over them. But the moment that the bright rays of the sun begin to play upon the flowers, the scene changes visibly beneath the eye; the petals slowly part, and unfold their shining surfaces of almost metallic brilliancy to the sunbeams, and in a few minutes become so many living stars of the most gorgeous tints, and so entirely hide the leaves that scarcely a

trace of them is visible, while the whole bush has burst into a blaze of glittering splendour."

There are some very attractive-looking plants, natives of Southern Africa, to be sometimes met with in hothouses, which would deceive us at first sight into thinking that the flowers have a brilliant scarlet corolla; but on looking closer we find that what we took for a corolla is composed of coloured bracts, assuming the appearance of petals, encircling the stamens and pistils, which plainly bespeak these plants to be of the Spurge tribe (*Euphorbiaceæ*). The beauty and excellence of the Constantia Grapes at the Cape of Good Hope is a fact well known to all. Most of the cultivated greenhouse Geraniums, as they are called, are also amongst the beauties of vegetation there: botanists call them *Pelargoniums;* the chief points which distinguish them from Geraniums being that they have seven stamens instead of ten, the flowers very irregular in form, and one of the divisions of the calyx extended into a nectariferous tube; the creeping ivy-leaved Geranium is perhaps one of the commonest. "The golden-flowered *Mimosa* too, and the deliciously-scented Cape Jessamine, combine with the Geraniums in imparting a peculiarly distinctive character to the woods; while the long ringlets of grey moss or lichen

(*Usnea florida*) that droop in profusion from the boughs, bestow on the trees a venerable appearance, which in some degree compensates for their small size." Near Graham's Town "the bristling Aloe" gives a character of its own to the landscape, and "the tall chandelier *Euphorbia* (*Euphorbia grandidens*) often grows to a height of thirty or forty feet;" here too grows that curious plant "the Spek-boom (*Portulacaria Afra*), with its fleshy nutritious leaves, spongy stems, and pink blossoms,—the favourite food of the elephant."*

The difference in the general character of African vegetation from that which we saw in South America has already been mentioned; the very same thing strikes us again when we reach Australia. The Australian, the South African, and the South American parts of this zone all differ from each other; and the character of the Southern Sub-tropical Zone shows little similarity to the Northern; but in South America there is a degree of resemblance to the southern part of Europe, which lies, it will be remembered, in the Warmer Temperate Zone. Such, at least, is the view given in Meyen's 'Botanical Geography.'

In that part of Australia included in this zone the prevailing trees are still the curious *Proteas*,—the Gum-tree

* From 'Life in the Wilderness,' by the Rev. H. Methuen.

(*Eucalyptus*), which has been before described, and others of the Myrtle family; the *Exocarpus* too, leafless Mimosas,* and some few others with names which are strange to English ears, compose the forests, amongst which is a tree called the *Casuarina*, which is like an *Equisetum* (Horse-tail) grown into a tree, with weeping branches. The trees above named strike us as being larger in the interior than those we first saw in the more southern parts, and they are all "of such various forms, and of such remarkable beauty, that the landscape there is certainly very different from ours." We find the handsome parasite before named (*Loranthus*), as well as Misseltoe (*Viscum*), growing on the trees; and, climbing over their stems, we again see the *Billardiera*, with its berries of lapis-lazuli blue.

"In the interior of Australia there is a kind of Buck-wheat (*Polygonum junceum*), which spreads over wide tracts of country; the Kangaroo-grass too (*Anthistiria Australis*) is said to appear in great masses;" this, and a kind of Fig-Marigold (*Mesembryanthemum æquilaterale*), are supposed

* As the word "leafless" may convey the idea of a tree with bare branches, it may be as well to explain that these Mimosas are an example of that metamorphose before spoken of, by which the leafstalk assumes a leaf-like appearance, whilst the true leaf is undeveloped. The same thing may be observed in the little greenhouse *Mimosa*.

to be the most widely diffused plants in Australia. One cannot look at a specimen of the Kangaroo-grass without being struck with a kind of correspondence between the great length of this elegant-looking grass and the leaping powers of the kangaroo.

There is a very pretty sight to be sometimes met with in Australia (either on the plains, studded with Acacias (*A. pendula*) and other small trees, or on the bushy slopes of the lower hills), "namely, some very ornamental-looking bowers, which, unless we had been told so, we should never guess to have been built by birds. Their architects are nevertheless some shy little birds (*Chlamydera maculata*) called Spotted Bower-birds, not much larger than our common thrush; their brown feathers tipped with buff on the back, and an elegant fan-like rose-pink crest of long hanging feathers set at the back of the head. The bowers are formed of twigs outside, and lined within with tall, smooth grass (sometimes they are made of grass only), which, by means of a stone very cleverly placed upon the lower end, is made to stand upright; the bending heads of the tall grass nearly or quite meet overhead, so as to form an avenue, which is ornamented with bones, shells, etc."

We love to linger by the margins of rivers and sheets

of water; for there we meet with scarcely any but familiar flowers, such as the Water-Plantain (*Alisma*), Sedges (*Carex*), Mint (*Mentha*), Arrow-grass (*Triglochin*), Club-rush (*Scirpus*), etc.; and in the wide plains of Bathurst and Macquarrie the number of European plants gives the country the aspect of our Colder Temperate Zone.

The general appearance of the country is hilly, but not mountainous, to the north of 33° latitude, and to the south of this latitude it is low and even. The hills are varied with woods and lawns; the trees nowhere seem to grow very close together, the largest trees standing at a distance of not less than thirteen yards asunder. In the bays the shores are covered with Mangroves, which reach about a mile inland, on soil which is constantly overflowed by the spring-tides. In some parts there are bogs covered with thick grass, and there is plenty of underwood in the valleys.

The interior of Australia is sometimes spoken of as almost devoid of water, yet Captain Cook (from whom the above outline of the landscape is taken) spoke of the country generally as abounding in springs and brooks of fresh water, though not possessing any rivers of considerable size. He also speaks of finding three different kinds of Palms in Australia, and the Fig-tree.

It is as well, before plucking a leaf from a tree, to make sure that it is not covered with green ants, which live on the trees and form their nests of the leaves; for troublesome intruders generally pay for their curiosity by getting severely stung. Amongst other kinds of ants, there is one like the white ants of the East Indies, which, not content with one house to live in, has one on the trees as big as a half-peck loaf, containing several apartments opening into each other, and another on the ground, six feet in height and almost as much in breadth, which is supposed to be the wet-weather house, as they are built in such a manner as to be proof against rain: the huts of the poor chocolate-coloured natives are far less commodious and artistic.

CHAPTER VII.

THE TROPICAL ZONE.

FROM THE TROPICS TO LAT. 15°.

Of the botany of some large portions of this zone little or nothing is known as yet; still, in the same way as an unfinished drawing, if faithful as far as it goes, is thought better than none at all when it represents some scene of which we desire to learn all we can, so perhaps it will be better to use those materials which are available, in giving an outline of this zone, than to lay the pen down in despair, because, after all, it can be only an imperfect one.

But defective though our information be as to many countries in the Tropical Zone, its broader features, as a whole, have been sufficiently well defined to enable us still to trace the gradual development of perfection in vegetation, to which the luxuriance which characterizes it so largely

contributes; melting as it does into the next—the Equatorial—and possessing many characters in common with it, it nevertheless has its own peculiarities. Those maps on which the "lines of equal heat" are marked, show at a glance that in some parts of this belt of land the heat is even equal to that of the Equatorial Zone; but, in spite of this heat, the vegetation in some of those parts is extremely meagre, on account of the counteracting influence of drought or barren soil; and in certain localities which are more particularly exposed to the blighting effects of the monsoons, vegetation during the summer is perfectly dried up.

The points of resemblance between this zone and the Equatorial are many more than the points of difference, so that a description of one will be in great measure a description of both. The most distinctive marks of the Tropical Zone are the prevalence of the Tree-ferns and the dense underwood which chokes the forests; whilst in common with the Equatorial Zone (as we shall see when we reach it), they are entangled with a variety of climbing plants, called by the general name of Lianas, amongst which are different genera of the beautiful *Convolvulus* tribe: the blossoms of some of these, called *Ipomœæ*, are almost the same in general appearance and tints of colour as the *Convolvulus major* of

our gardens, though some of them are rather larger. A family of plants, called *Melastomaceæ*, may be mentioned with them, which show a pretty contrast of colour between the clusters of little purple corollas and the yellow anthers, which in this flower are very large and protrude beyond the petals. Climbing over the Tree-ferns grow the twining Pepper-plants (*Piperaceæ*), and in most parts of this zone the *Orchis* tribe is to be met with in all its variety.

Perhaps an introduction to some of the many distinguished foreigners whom we shall now so often meet may be as well, before we attempt to take a step in the strange lands we are about to explore. The Palms are first in dignity, which we shall now find everywhere, increasing in beauty the nearer we approach the Equator. Their prevailing form is a straight and unbranched stem, with an immense tuft of gigantic leaves at the top, in some spreading horizontally, in others shooting up perpendicularly, or in others again drooping. "Some of them attain the most extraordinary height, and shoot up far above the loftiest tropical forests: Palms seventy, eighty, and a hundred feet high are not unfrequent." The species called the Wax-palm, which grows on the Andes of Quindiu, "reaches the height of a hundred and sixty and a hundred and eighty feet." But, as we

shall find before we reach our journey's end, they sometimes grow in a very different manner, one kind even twining round the stems of other trees; and if we had visited the neighbourhood of Egyptian Thebes when we travelled through the last zone, we might have seen the very uncommon sight of a Palm with a branched trunk, called the Doum-palm (*Cucifera Thebaica*). The leaves of the Palms are very varied in shape, sometimes "long and simple, sometimes feathery or fan-shaped;" in colour they are of a shining dark green. As for the flowers, they are small, and often of a greenish-white colour; though in some Palms the stameniferous blossoms are of a dazzling whiteness, and may then be seen shining from a great distance; but in most species they are yellow, closely compressed, and of an almost faded appearance, even when they first burst from the spathe. In all species of Palms the flower-buds break forth from the stem, immediately beneath the crown of leaves; on the manner in which they are developed, the peculiar character of the different Palms in great measure depends. In some the sheath is perfectly erect, and the fruit is arranged round and round the spike; but in the greater number the sheaths (which in some species are smooth, and in others very prickly and rough) incline downwards.

The fruit, as we know from the two specimens with which we are all familiar, the Date and the Cocoa-nut, is very varied in size and appearance. "But of all the fruits of the Palm, none can be compared for beauty (as we are told by Humboldt) with those of the Pirijao Palm of San Fernando de Atabapo and of San Balthasar. They are oval, and partly of a golden colour, partly of a purplish-red; they are mealy, without seed, two or three inches in thickness, and hang in clusters like grapes from the summit of their majestic Palm trunks, seventy or eighty in one bunch."

Since the time of the death of Linnæus, when fifteen species of Palms were all that had been described, the list has increased, till it now contains no less than four hundred and forty-four; as many as twenty out of which number were first examined by Humboldt and Bonpland. This achievement can only be duly appreciated when we know the almost insurmountable difficulties which must be encountered before a Palm blossom can be examined, which are feelingly spoken of by Humboldt in his 'Aspects of Nature.' The difficulties of reaching and procuring the blossoms of Palms (he tells us) are, in fact, "greater than can well be conceived. Most of the Palms flower only once a year (this period near the Equator is generally about the months of January and

February). The period of blossoming of particular trees is often limited to a few days, so that the traveller is not unfrequently doomed to disappointment by finding on his arrival in the region of Palms that the blossoms have passed away." Besides which, perhaps only three or four different species are to be met with in an area of 32,000 square miles, so that it is impossible for the same individual, unless he were ubiquitous, to make acquaintance with them all in one season, during the brief period of blossoming.

But even supposing the botanist to arrive just in time for the flowering season, he has often the mortification of seeing the much-desired blossoms suspended at a height of sixty or seventy feet above his head, from stems formidably armed with huge thorns, with no available means of reaching them at hand. "They who contemplate distant travels from Europe for the purpose of investigating subjects of natural history, picture to themselves (says Humboldt) visions of efficient shears and curved knives attached to poles, ready for securing anything that comes in their way; and of boys who, obedient to their mandates, are prepared with a cord attached to their feet to climb the loftiest trees! Unfortunately scarcely any of these visions are ever realized." It is also an additional mortification that the natives, who for

their own amusement will climb trees of any height in pursuit of a parrot or a monkey, cannot be induced either by money or presents to deviate three steps from the regular path, supposing one to exist, being rendered "rich and independent by their apathy, their poverty, and their barbarism."

Humboldt relates how that once in the month of January, when the stems of the Palma Real were covered with snow-white blossoms in all the most frequented thoroughfares of the Havannah and in the immediate vicinity of the city, though he and his fellow-traveller offered, for several days running, a couple of piastres to every Negro-boy they met in the streets of Regla and Guanavacoa, for a single spike of the blossoms containing both stamens and pistil,—it was in vain; "for, in the tropics, no free man will ever undertake any labour attended by fatigue, unless he is compelled to do so by imperative necessity!" and even the botanists of the Royal Spanish Commission of Natural History "confessed to him that for several years they had been unable to examine these blossoms, owing to the absolute impossibility of procuring them."

Though the region of Palms extends no further, as a general rule, than from the plain to an elevation of 1900

feet, the mean temperature of which is from 81·5° to 86° Fahr., there are nevertheless some hardier species which grow on the Andes "at a height varying from 6400 to 9600 feet, where the thermometer frequently sinks in the night to 42·8° and 45·5° Fahr., and the mean temperature is scarcely 57°. They grow interspersed with Oaks (*Quercus Granatensis*), Nut-trees, and species of *Podocarpus*, trees somewhat resembling the Yew. One of these is the beautiful Wax-palm (*Ceroxylon Andicola*) before mentioned. From these "kings among Grasses, whose physiognomy is expressive of a grandeur of character which it is difficult to describe in words," we must pass on to other natives of the same warm regions.

There are two plants, which may be named together here, whose cultivation is extensively carried on within the tropics, —the Sugar-cane, namely, and the Cotton-plant, which will now be still more familiar objects to us than heretofore, though not altogether new acquaintances, both having been recently met with in extratropical countries.

Amongst the trees (or bushes, for their size varies) the Mimosas must not be forgotten, which reach their greatest perfection in tropical countries. Hot, damp tracts of land are sometimes quite covered with them; their spreading

branches, clothed with feathery foliage, which is sometimes as finely cut as some of the Ferns, have a light and beautiful effect. There is also a tribe of trees called *Meliaceæ* to be often met with, one of which is the Mahogany-tree (*Swietenia*), which form a great contrast to the Palms by their European, Beech-like style of growth. There is too a tribe called *Anonas*, which are nearly allied to the *Magnolia*; and the great flapping leaves of the Bananas and Plantains we shall see everywhere, as well as another family amongst the lower growing plants, something like Bananas on a small scale, called *Scitamineæ*, which, as was mentioned before, includes Ginger and Turmeric.

There is a very beautiful tribe, common in the Tropical Zone like those above named, though more properly belonging to the very hottest regions, which has precisely the same character (only on an immensely larger scale) as our Wild Arum, or "Lords and Ladies," as it is called; this is the *Pothos* tribe. In the *Pothos* the spathe is composed of a large green leaf, rolled together like a horn, inclosing a spadix covered with large, shining, whitish flowers. These plants are sometimes parasitical, but not always; at one time growing in great masses together on the earth, so as to influence the character of vegetation; and at others fixing

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themselves upon trees, to which they impart a luxuriant appearance, as the leaves of some of the *Pothos* plants are of an enormous size.

An introduction to one or two more families is indispensable; there is a very important one called the *Pandanus* tribe (known also by the name of Screw-pines) which whenever the soil or the atmosphere possesses a sufficient quantity of moisture, has a decided influence on the appearance of the landscape. (Plate IX.) They have, in general, long, linear-lanceolate leaves of a shining green, which are placed in regular spiral lines on the tall, straight, or sometimes winding stems, and cover them to the top. They sometimes grow in dense jungles, and frequently in loose sandy soil, when they are provided with a curious and wonderful apparatus for keeping them steady in this otherwise insecure foundation; they are supported by the aid of roots, which are put out from various parts of the trunk at some height from the ground, and from thence descend into the earth in a slanting direction; acting, in short, as so many buttresses. The *Pandani* have rather a different character in the New World, where they have no stems, and feathery foliage.

The *Ananas* family too,—of which the Pine-apple (*Bro-*

melia Ananas) will assist us in forming some idea,—especially aids in producing the rank luxuriance which we see within the tropics. The whole of this family have long, narrow leaves, of a mealy, bluish-green; and in the splendour of their flowers they surpass most of the tropical plants. Large ears or spikes of flowers of the most varied colours rise from the centre of the mass of leaves. A great number of them are stemless; but the Pine-apple in its native countries grows to the height of four or five feet.

It must particularly be remembered too, what a very marked character is given to these regions by the forests of Tree Grasses. We have only to look at a field of grass to see how entirely it is the nature of grasses to grow thickly together in great masses, and then to reflect that the same social disposition distinguishes the whole family; we have only to substitute a Bamboo of some thirty or forty feet high for the little Grasses which compose our hay-meadows, and in the place of a meadow to imagine a vast tract of land covered with these Bamboos growing so closely together as to be impenetrable, and we know what a Bamboo-forest is like,—the long narrow leaves all hanging from the pendent branches, which spring from the straight green stem, in tangled untidy-looking confusion.

But however carefully we may be introduced to the plants which compose the tropical vegetation, we must still feel, in starting on our tour through this zone, that we are in a strange land; so strange, that we can now seldom point to anything we see, as we have heretofore done, and say this is like such or such a plant we have in England.

Let us now pass hastily through the Sandwich Islands, and take our first look at a tropical forest; it will be necessary to go hatchet in hand, for besides the larger forest-trees, amongst which we see some immense Acacias (*Acacia heterophylla*), there is an endless mass of Tree-ferns, *Pandani*, and *Scitamineæ*, all closely interwoven with different kinds of *Ipomœæ*. But cutting our way through this becomes a hopeless case, where, in the thickest part of the forest, the *Pandani* and *Ananas* grow in such numbers, that they choke up all the intervening space between the trees with their large leaves, and surround them with hundreds of branches: the whole mass forming a tangled underwood some eight or ten feet high. No hatchet will open a passage through this; the only alternative is to mount on the top of this dense matting, which is sufficiently firm to walk on, whilst we take a satisfied look at the beautiful hangings with which the parasitical ferns adorn the trees. Amongst these are

some immense Spleenworts, the very largest variety of *Asplenium Nidus,* with leaves two or three feet long, and broad in proportion.*

Besides these (all growing together on the same tree) are little species of Brake (*Pteris*), exquisite *Jungermanniæ,* and Mosses with well developed leaves; whilst numbers of little Pepper-plants are climbing about the branches. On all sides we see large plants of the Nettle tribe (*Urticaceæ*), whose great leaves covered with white hairs make a beautiful contrast with the masses of scarlet flowers on some of the surrounding trees: such, for instance, as *Metrosideros polymorpha,* one of the Myrtle family, with flowers not unlike a

* The tropical Ferns and Orchises, and many other plants which fix themselves, like them, on the surface of other bodies, though commonly spoken of as parasites, are not really so; but are distinguished from them by a very important difference. The true parasite, such for instance as our Misseltoe, sends its roots into the substance of the bark, and that so deeply, that it is closely connected with the woody substance of the supporting plant, and sucks its food from it. The so-called parasites, on the contrary, do not send their roots into the substance of the supporting plant, and therefore can draw no nourishment from it; plants which grow in this manner are called Epiphytes, in contradistinction to parasites. The so-called parasitical Orchises, and the *Pothos* plants (a genus of a family called *Aroideæ*, Arum-like plants with immense leaves), are the most common instances of this kind of growth, and are provided with peculiar organs to enable them to imbibe the moisture of the atmosphere, which is, in fact, the food on which they live.

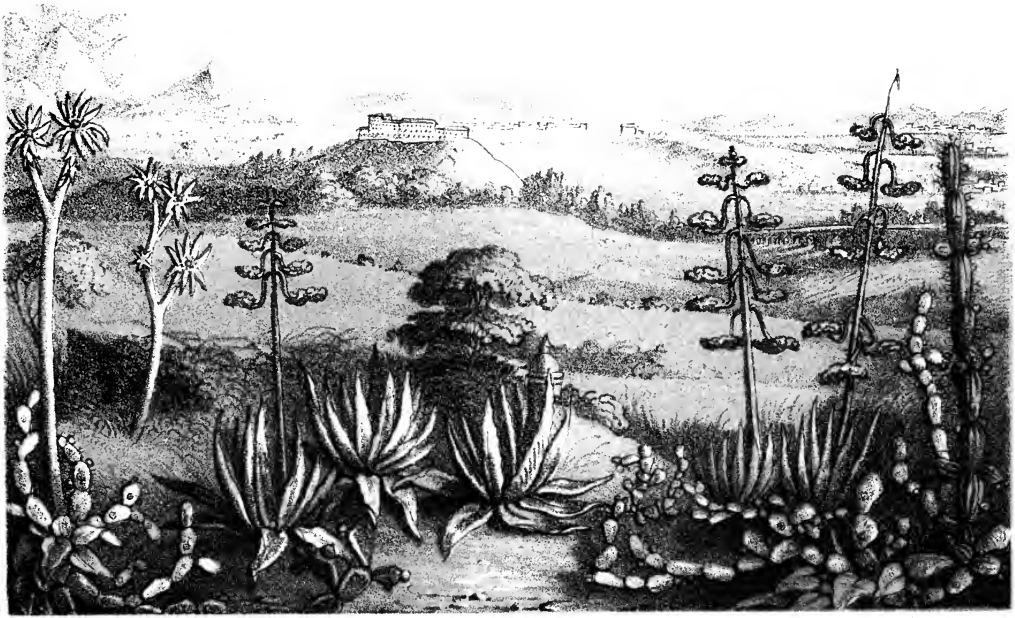
number of Myrtle blossoms clustered together in a head (except that they are red, instead of white): whilst the tall Plantains shooting up between the other trees, add another feature to this wild scene. But for Orchises we look in vain, for in the Sandwich Islands they are never to be met with.

When we escape from the forest, we find wide tracts of land in these islands quite covered with those plants before described as being something like Bananas on a smaller scale, the *Scitamineæ;* and planted round the huts of the natives we see an extremely ornamental fence made of a species of the Dragon-tree (*Dracæna terminalis*), the foliage being sometimes green, and sometimes red: these Dragon-trees are not allowed to reach more than five feet in height; for the tuberous roots abound in starch and sugar, and a spirituous liquor is likewise obtained from them, for the sake of which they are occasionally cut from the stalks, and these being stuck in the ground again, soon send out new roots.

But the Sandwich Islanders depend chiefly for their subsistence upon the roots of one or two species of Aroideous plants, which are cultivated extensively within the tropics as a general article of food, scarcely less necessary than bread is to us. In these islands, whole fields are as carefully

planted out with these plants (*Colocasia macrorhiza*, etc., or Tara, as the natives call them), as potato-fields are in England. (Plate X.) The plants are placed in deep trenches, at equal distances from each other, the trenches being so deep that the leaves of the plant only just project over the edge. A large field of these leaves, surrounded by the Plantain and Sugar-cane, whose various shades of green contrast so pleasantly with each other, is said to give "a very agreeable tone to the landscape." The quantity of water which these plants require is the reason for planting them in trenches, into which water can be turned at will. The tuber is about the size of a child's head, and is cooked by being boiled, or baked in hot earth. Sometimes the Sandwich cooks show their skill by cutting it in slices, and frying it with lard; but the most common process is to boil it, and then mash it into frumenty, which is allowed to ferment before it is considered fit to be "served up." When a baked pig is in the question, the leaves are also put in requisition, for "stuffing," and these two dishes, baked pig and frumenty, form a chief feature in the Sandwich dinners and *déjeúners*, which, be it observed, according to the laws of etiquette in that part of the world, are never *à la fourchette*.

When we again set forward from the Sandwich Islands,



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and pass on to the narrow belt of North America which lies in this zone, which is a part of Mexico, we cannot help pausing to gaze at a sight quite unlike anything we ever saw before, which forms a very remarkable feature in the landscape. We see large tracts of land bristled all over with plantations of broad, stiff-leaved plants, which look, we think, exceedingly like the Aloes we have seen in ornamental gardens at home; but in this we are not quite right, for these plants (though something like them in general character) do not, like the Aloes, belong to the Lily tribe, but to the kindred order of Amaryllids. In Mexico these plants, which are a kind of *Agave*, go by the name of the Maguey plant (Plate XI.); "unlike, indeed, to our fields of waving corn are these straight-rowed, stiff-looking plantations;" they grow on elevated table-lands at the height of some 7000 feet, on the very driest ground, which is scarcely covered with mould, and in a climate very nearly approaching to that of the South of Europe.

The Maguey plants are considered of great value in Mexico —as valuable as the vine is to Europeans; for not only a kind of wine is made from the sap, but a strong brandy, and the leaves supply the strongest hemp that is known. It was from the fibres of these leaves that the paper was made

on which the curious Mexican hieroglyphics were painted. The process of preparing the paper consists simply in leaving the green tissue of the leaves to decay away till the layers of fibres stick to each other. These plants are eight years before they flower, that is to say, when they are not prevented from blooming, as they are in a cultivated state, by a wound made in the plant at the time the flower-shaft begins to spring, "by cutting off the tuft of central leaves;" into the cavity which is thus created the sap runs, which was intended to nourish the growth of the flower-shaft.

There is another genus allied to the Maguey plant, called the Mexican Yucca, of which we may form some idea by imagining a lofty tree covered with a number of bell-shaped flowers, generally of a greenish-white colour, or very delicate yellow.

Another thing which excites our wonder a little, is the number of extraordinary-looking hedges we meet with, made of a most unshapely kind of Cactus, with many branches; we find them cultivated so extensively, that they form one of the most prevailing features of Mexico; but this is accounted for on discovering that it is on this kind of Cactus, called *Opuntia Tunas*, or *Opuntia cochinillifera*, that the Cochineal insect is bred. Formerly cochineal was exported

in great quantities from Mexico.—These Cactuses, which are fond of a barren dry soil, are also cultivated as supplying an abundance of firewood, and for the sake of their refreshing fruit, which is very much like a gooseberry, "not only in appearance, but in flavour, texture, and quality."

Having so recently seen something of the character of a tropical forest in the Sandwich Islands, we need not repeat the experiment in Mexico, except that we will venture into one again just so far as to make acquaintance with a curious tree, called the Hand-plant (*Cheirostemon platanoides*), peculiar to the Mexican forests, which has a large handsome flower about the size and shape of a tulip. This flower has no corolla, but the calyx, which is a large leathery cup, assumes the appearance of one; the filaments are united in a tube, and the five large bright scarlet anthers (from the peculiar character of which the Hand-plant has acquired its name) hang out of the flower, looking like fingers with claws at the end, in the midst of which grows the curved style.—It is with a feeling of pleasure that, as we look round us in these Mexican forests, we recognize an old acquaintance in the dark purple bells of the *Cobœa*, which we have often cultivated with care in our English garden, though we never thought it half so beautiful as it looks here, clinging and

hanging about the trees with that kind of ease which plants, as well as people, feel most of in their own home.

Before we leave America we make acquaintance in the territory of Honduras with the Mahogany-trees (*Swieteniæ*), which supply most of the Mahogany which is imported into England. And now, we hardly know what to do about the West Indies;—they are so altered by cultivation, that it is almost impossible to tell what their appearance originally was; there is indeed a rich store of Ferns and Orchises to be met with there, but with a lack of materials for a good general sketch, it would be almost useless to mention the names of some few plants (which we all know grow there, but which convey no general idea of the character which vegetation gives to the landscape); such, for instance, as those different trees of the Myrtle tribe; the one which produces a kind of wild Clove, *Eugenia Caryophyllus*, or that from which the berries called Allspice are gathered, *Myrtus Pimenta*, or another of the same beautiful tribe, from whose succulent berries Guava jelly is made. Besides these we know we should see the Cocoa-palm growing in the neighbourhood of the coast; and the hedges adorned with the rich scarlet flowers of the beautiful Barbadoes flower-fence (*Poinciana pulcherrima*); and great fields of rice, looking

very much as fields of barley do in England; and formal plantations of the Sugar-cane (which it may be mentioned, in passing, is not a native of the West Indies, but was introduced there more than three hundred years ago by the Spaniards); we will therefore pass on.

But taking the map in hand to sketch out some plan as to where we shall continue our excursion, we lay it down again in despair, for the Zahara (or the Desert), spreading over almost all the African part of this zone, is the prospect which lies before us. But though the Desert extends over by far the greater portion, Nubia, which lies on its eastern limit, shows in some parts a very different character; we therefore resolve to resume our journey there, as, in our privileged way of travelling, the nearly three thousand miles of sandy desert is an obstacle soon overcome. Profiting by the warning of travellers who have been there before us, we will keep clear of "backwoods and jungles (we wish they had told us the names of the trees), for to these elephants and lions generally confine themselves," though they sometimes take a fancy to see what human beings are like, and make an occasional call at some village in the neighbourhood. As to hyænas, we will take our chance about them, whilst we take a glance, for we can

do no more, at the new kind of country in which we have arrived.

Large trees of any kind we see but rarely, for the country is covered in many parts with nothing but shrubs; different kinds of Mimosas, seldom more than twenty feet high, being the tallest trees to be seen. Our road leads us sometimes through a thickly wooded valley, bordered by rocky hills, or near jungles filled with singing-birds, and we wonder at the bright rich green of the tropical vegetation, canopied by a sky of the deepest blue ("no description can convey any idea of the sensation which such sights create"), till our eyes ache with the glare of the sun and the orange-coloured sand, and we creep for shelter under a "natural bower, formed by the overspreading boughs of a Mimosa, whose yellow flowers emit a delicious fragrance."

On arriving at Souakim, on the coast of the Red Sea, the appearance of vegetation wears a very wretched aspect; a few stunted bushes rising out of the sand are all there is to be seen near the sea, and in the town itself stands one solitary Date-palm. Crossing over to the Arabian side of the Red Sea, and landing at Jedda, we find "an open tract of sand without a vestige of herbage," and a "scarcity of water." Travellers nevertheless relate that "the market

there is well supplied from the interior with fruit and vegetables, such as small Apricots, Lemons, Oranges, Pomegranates, Bananas and Dates, Water-melons, Pumpkins, Cucumbers, Sweet Potatoes, and Onions."*

As we travel further eastward, and pass through India and China, both of them so densely populated and so long cultivated, we must necessarily conclude, as we did with regard to the West Indies, that the original appearance of large portions of these countries has almost disappeared. One of the most remarkable features, both in India and China, seems to be the beautiful contrast formed in the landscape between the dark woods of the Chinese Pine (*Pinus Sinensis*) and "the airy groves of the Bamboo, which cover extensive tracts of country;" and in India, intermingled with these Pine-woods, grow Cypresses (*Cupressi*) and *Casuarinæ*, before described as being like a tree *Equisetum*.

There are forests of a very peculiar character in India, which grow a little way up the mountains, composed of Fig-trees (the Fig, it may just be mentioned, for the sake of

* Particulars of the botany of Arabia may be found in a work by Bové, called 'Relation abrégé d'un Voyage Botanique en Egypte, dans les trois Arabies, en Palestine et en Syrie.'

the association, is one of the many distinguished connections of the Nettle family); these forests are characterized by "imperviousness and gloom, and the density and height of the trees; the damp, close atmosphere within; the enormous thickness and irregular shape of the wide-spread branches; the uncommonly rapid growth, and the soft, often spongy substance of the trunk; the great variety of parasitical and climbing plants which are supported on the trees; the deep, porous, damp parent soil; the numbers of apes which leap screaming amidst the boughs, and the numerous choir of various birds." Climbing Pepper-plants hang about the trees, and amongst the parasitical plants which beautify the forest we again recognize some of the *Pothos* tribe; amongst the many foreign names of plants which compose the brush-wood, we only meet with one familiar one in the Nightshade (*Solanum*).

On the lower plains of India our eyes are refreshed by a green carpet,—not of Grass exactly, though the effect on the landscape is the same,—but of Sedges (*Cyperaceæ*); on the margins of streams too the green turf is generally formed by these; and even "beautiful lawns" of it are mentioned by Meyen as "one of the most charming objects in nature" when surrounded by elegant Bamboo-trees, "which, in tro-

pical countries, are planted to adorn the landscape, as the Weeping Willow is with us."

The freshwater lakes in India must be a very beautiful sight when partially covered with the green leaves and rose-tinted blossoms of the Lotus (*Nelumbium speciosum*), and bordered by some of those beautiful flowering trees of the Myrtle tribe, called *Barringtoniæ*.

In no sketch of Indian vegetation, however meagre, must two plants be omitted, which are perfectly essential to the comfort and happiness of East Indian natives, namely, the Areca Palm (*A. Catechu*) and the Betel Pepper. In all the coasts, especially throughout Malabar, and still higher up, there are vast plantations of the Areca Palm, which is "one of the most beautiful forms to be seen in India;" it is always planted wherever there are dwellings, growing side by side with the Banana. Extensive plantations of the other plant above named are pretty sure to be found in the same neighbourhood, for it is from the large, beautiful, heart-shaped leaves of the Betel Pepper, together with the nut of the Areca Palm, that a composition is prepared for *chewing;* the nut is cut into long, narrow pieces, and wrapped up in the leaves of the Betel Pepper, which is first striped, on one side, with moist chalk; when finished, these rolls are called

Buyos. The preparation of these Buyos is a leading feature in domestic economy, not only in India but in all the countries of that part of the world.

The general effect to the eye, of those parts of India where the Pepper plantations cover the ground, must be something like that of our English Hop plantations. They are generally planted on moderately high ground, and consist of a number of little beds, about six feet square, in the middle of each of which is placed either a pole or some slender tree; the latter is preferred, because the shade is valuable for the Pepper-plant, the branches being cleared away, and the foliage at the top cut into the shape of a fan. The slips of the Pepper-plant are set beside these poles, round which they climb till they are eight or twelve feet high, at which height they are three years in arriving, and not till then do they begin to bear fruit.

It is but seldom now that we are reminded of any English plant; we are therefore the more taken by surprise when exploring in the forests in the mountainous parts of Malabar, to discover a family connection between that humble little individual, the wild Verbena, and the magnificent Teak-trees. It is however perfectly true that the Teak-tree (*Tectona grandis*) belongs to the Verbena family, and is "by far the

most interesting plant of the order. It is an enormous tree, with deciduous leaves, covered with rough points." The wood, which is very much like coarse mahogany in appearance, is most valuable on account of its durability, and is perhaps the best in the world for ship-building.

We are surprised too in the same way to find a branch of the Spurge tribe (*Euphorbiaceæ*) in some beautiful trees in China, which are there cultivated in such extensive plantations that they materially affect the appearance of the country wherever they occur; they go by the not very nice name of the Tallow-tree (*Croton sebifera*), for the very good reason that the kernels are filled with a white, pulpy substance, which both looks and smells like tallow, and is used by the Chinese for making candles. These trees have yellow flowers, or, more properly speaking, the stamens and pistils are surrounded by yellow bracts, which look like petals; but the leaves constitute one chief beauty of the tree, by the manner in which they vary in colour at different seasons, "from a deep crimson to a rich purple tint." Of all the cultivated plants, whether in India or China, perhaps the most important is Rice, on which Eastern nations depend to a great extent for their subsistence. "In the South of China the rice-grounds occupy the whole of the level ground,

and ascend high up the mountains;" yet, even so, China cannot produce rice enough for its dense population, but imports it from all the fertile islands of the Indian Archipelago.

The country about Canton must be quite a paradise during summer, where the very hedges round the gardens and fields by the river-side are composed of the Orange, the Pomegranate, the Myrtle, and Banana, whilst the Palms add their own peculiar beauty to the scene, and the glowing Lotus (*Nelumbium speciosum*) clothes the water with its lovely blossoms. But the state of things in winter, in all the countries on the southern coast of China, is a good example of the effect of the monsoons. "When the north-east monsoon prevails, when the temperature (which in June, July, and August is always above 81° Fahr.) falls in November to 65°, in December to 61°, and in February even as low as 54°,—when all the clouds have disappeared, and for months not a drop of rain falls, this paradise vanishes as by enchantment. The fields are bare, the sides of the mountains are scorched, the dried-up vegetation becomes dust, and only the soil remains, without a trace of its former luxuriance."

Tropical vegetation wears nowhere perhaps so beautiful

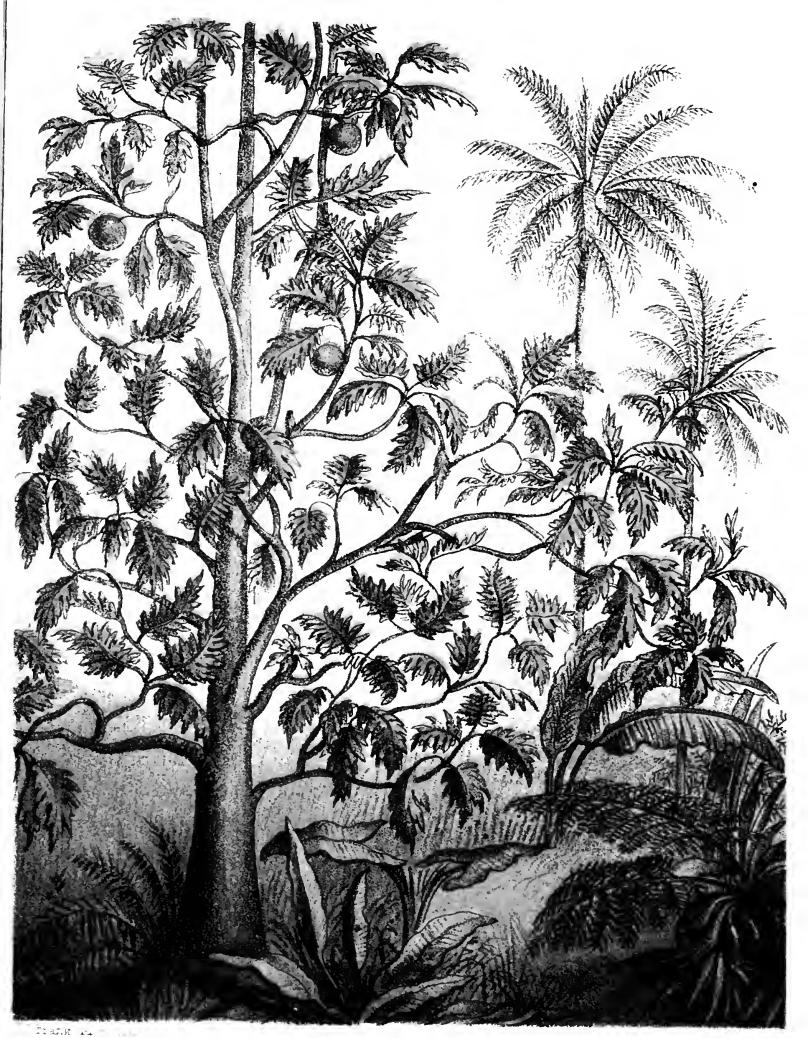
an aspect as it does in the islands which lie in these latitudes, where the intense heat is tempered by vapours from the sea. A description of one of the Ladrone Islands—Tinian—may serve as a specimen, where "almost constant cool breezes prevail, and copious dews and frequent gentle showers refresh the earth." Throughout large tracts of the island, alternate lawns, and woods of tall and spreading trees adorn the hills and valleys. Amongst the list of trees we find the Cocoa-palm, the Guava, the Orange, and the Lime (*Citrus Limetta*), the fruit of which resembles Lemons or Citrons. There is also a tree with which we shall before very long become better acquainted, called the Breadfruit-tree (*Artocarpus*). The Water Melon too appears to be a native here. The soil is rather sandy, and to this perhaps may be in great measure attributed the absence of that rank vegetation which characterizes so many parts of this zone. We even meet with many English names amongst the herbaceous plants, such as the Dandelion (*Taraxacum*), a kind of Purslane (*Peplis*), Scurvy-grass (*Cochlearia*), Sorrel (*Rumex*), and Mint (*Mentha*).

Yet this beautiful island, this "happy land," as it generally appears, is subject in summer to the most tremendous hurricanes, which sometimes occur there during the time

of the western monsoons; and amongst lesser evils, mosquitoes and other teazing little insects find constant opportunities of reminding those that visit it that the world was made for other creatures besides human beings; indeed, to judge by their "life and conversation," they appear to suppose that the human race exists expressly for their benefit.

In the islands which lie in the Southern Tropical Zone, we again find very much the same character;—Otaheite shall serve as an example. In some parts of the island the sides of the hills are covered with trees and the valleys with grass; many springs gush from the sides of the mountains, which also are very well wooded, the summits being clothed with Ferns. The soil even on the high lands is rich, and the Sugar-cane grows wild, as well as Ginger and Turmeric. This island too, which is everywhere interspersed with villages, produces "the Cocoa-palm, Bananas, Plantains, Yams, and, though last, by no means least, the Breadfruit-tree, and a variety of other fruits and vegetables, but no European fruits, garden stuff or pulse, or grain of any species."

The Breadfruit-tree (Plate XII.), which grows everywhere in the South Sea Islands, is a tree of the greatest importance, as it actually supplies the place of bread to the natives. Its botanical name is *Artocarpus incisa*, and it is



one of the many large trees allied to the Nettle tribe (*Urticaceæ*). It is about the size of a Horse-chestnut, and its leaves, which are nearly a foot and a half long, are very much like immense fig-leaves. The fruit, in size and shape, is not unlike a kind of melon. It is rough on the outside, and of a greenish colour, but the pulp in the inside is white or yellowish, and of the consistence of new bread; it is roasted before it is eaten, but has little or no flavour. Botanists describe the fruit as being "nothing more than a gigantic Mulberry (the Mulberry being also allied to the Nettle family, and consequently a near relation), in which farinaceous matter has taken the place of sugar and vegetable jelly."

An ingredient used in a very nice confection which the Otaheitans make—not unlike blanc-mange—is described as "looking like the flour of wheat," but is most likely some of the "farinaceous matter" contained in the Breadfruit. The recipe for this Otaheitan blanc-mange is short and simple, and in cooking-book phrase would run thus:—"To make an Otaheitan Blanc-mange.—Take a proper quantity of flour, mix in as much cocoa-nut milk as is sufficient, add a few hot stones, and stir the whole till it becomes a thick jelly."

The South Sea Islanders reckon the Breadfruit and the Cocoa-nut amongst their most precious treasures, not only in life, but in death also. The corpse of a departed relative is carefully supplied with these by the mourners, as well as with bunches of green leaves and a young Plantain-tree, being intended, as the natives explained to Sir Joseph Banks, as a propitiatory offering to their gods; a Cocoa-nut shell filled with fresh water is placed on the stem of a Plantain-tree, near the wicker-work shed where the corpse lies extended on a bier, and a little bag with some roasted pieces of Breadfruit is hung on a post close by: there are few things perhaps more touching to a Christian than the thought of such heathen funeral rites. Sir Joseph Banks was so anxious to witness them, that finding he could do so on no other condition, he even consented on one occasion to take part in them, and was very much complimented by the chief mourner on the discreet manner in which he conducted himself.

It is to the inner bark of three different trees that the natives are indebted for clothing—the Mulberry, the Breadfruit, and another, described as not unlike a wild Fig-tree—from which they manufacture three different kinds of cloth, by a long process of soaking it, of spreading it out in layers

one above the other (which when dry adhere to each other), and of beating it out with a mallet. The cloth is dyed of different colours, one of which (a red dye) is exceedingly beautiful, and composed of the juices of two vegetables mixed together. In one of the South Sea Islands we find the beautiful Cape Jessamine growing, with which the women tastefully decorate their hair; and in another they put a finishing stroke to their toilet by sprinkling the yellow pollen of the *Pandanus odoratissimus* over their hair, as English *belles* in former days improved their beauty by powder.

Before taking leave of the South Sea Islands, one word must be said about the Yam, which is so universally found there, and so important as an article of food. It is an elegant-looking climbing plant, belonging to the same family (*Dioscoreæ*) as our Black Bryony (*Tamus communis*), with a flower very much like it in appearance. The species used as a vegetable is *Dioscorea alata;* the root, or rather the tuber, which is the eatable part, is very much like that of the Dahlia in appearance.

We shall find as we proceed that the vegetation of the Southern Tropical Zone has by no means the same character throughout. On the western coast of South America, for

instance, the effect of the tropical heat, which in the South Sea Islands produces such luxuriance, is so neutralized by poverty of soil and want of moisture, that "the vegetation is the most miserable that can be imagined; a very few Palms, some Acacias and tropical fruit-trees are the only signs which betray the position of the country."

Yet, even at the height of 12,700 feet above the sea, on the Andes of Southern Peru, Meyen tells us of the fertility of the soil, and the perpetual spring which reigns in the extensive table-land of Chuquito, around the mountain-lake of Titicaca; and he speaks of maize being cultivated at the height of 12,800 feet, in an island of the same name, which is situated on the lake: the celebrated Temple of the Sun stood in this island, and an offering of some of the maize grown on it used to be made there by the Incas to their deity. The country which surrounds this lake is thickly peopled, "a great number of magnificent towns having been built at this immense height." Wood however is wanting there, and Meyen speculates as to the importance of finding the average temperature, with a view to ascertain what trees might be introduced; and thinks it may be considered certain, from observations which he and others have already made, "that the Fir, as well as the Birch and Alder, would

grow vigorously there. What prosperity (he adds) would result from the introduction of great forests, where every stick, every pole or plank, is counted riches, and where the sailor must commit himself to the stormy lake in a miserable bark woven of rushes!"

But let us pass on now to the other side of South America, and see whether the same "miserable vegetation," which characterizes its western coast in this Tropical Zone, is repeated on the eastern. Taking a glance at the map before we start on our fresh journey, we find that the line which marks the northern limit of this zone passes through the very heart of Brazil, and agreeable anticipations take possession of us at the prospect which lies before us; for the Brazilian flora is perhaps the most beautiful in the world, and the most beautiful part of the whole is that which lies within the limits of the Tropical Zone. We therefore propose to examine it somewhat in detail; for after having been so long engaged in watching the gradual development of perfection in vegetation, it is but fair that we should enjoy at leisure the full-blown beauty which it displays within the tropics.

As we shall thankfully tread in the footsteps of some of those great naturalists who have made known to us the

treasures of Brazil (not its gold or its diamonds, but its flowers), we ought to commence our tour at Rio de Janeiro, which lies just on the southern limit of this zone; but having passed over in a straight line from Chuquito and the Lake of Titicaca, we find ourselves, unfortunately with regard to this design, on the northern instead of the southern boundary of the zone, and far enough away from Rio de Janeiro.

Our only expedient in this dilemma will be to make our way at once to the shores of the Atlantic, and then coast along Brazil in a southerly direction,—a necessity which we do not regret, as we shall thus be able to contrast the coast vegetation of Brazil with what we have lately seen on the shores of the Pacific. And no greater contrast can there well be than that which we find to exist between the sterility which, for the most part, characterizes the western coast, and the luxuriant vegetation which now refreshes our eyes, and everywhere clothes the shores which are washed by the waves of the Atlantic.

Glad are we that we decided to approach Rio de Janeiro by sea. The range of wooded, undulating hills, which after we pass Cape Frio stretches for some seventy miles along the coast, crowned here and there with Palms, which stand

out in bold relief against the clear blue sky, is an earnest, as we hope, of still better things to come; and on no account would we have missed the sights and aromatic scents which greet us, when at last the lovely Bay of Rio de Janeiro breaks upon our sight, with all its "beautifully varied scenery,—scenery which is perhaps unequalled on the face of the earth, and on the production of which Nature seems to have exerted all her energies. As far up the Bay as the eye can reach, lovely little verdant and Palm-clad islands are to be seen rising out of its dark bosom; while the hills and lofty mountains which surround it on all sides, gilded by the rays of the setting sun, form a befitting frame for such a picture."* The city, with its white churches and houses, contrasts imposingly with the verdure which surrounds it; "rocks of grand forms rise boldly behind it, the declivities of which are clothed in all the luxuriant diversity of a tropical forest;" and to complete our happiness, in the midst of this beautiful scene, a rich odour of Orange-blossoms and other perfumed flowers is borne upon the breeze.

It is sad when pleasing first impressions are obliterated,

* The following particulars of Brazil and its flora are collected from the account of travels in that country by Spix and Von Martius, who explored it more than thirty years ago; and from the more recent 'Travels in Brazil' by Dr. Gardner.

—always painful to become *désenchanté* on a more intimate acquaintance with either people or places. But Rio de Janeiro, with its narrow and dirty streets and its gay shops with plate-glass windows, which, if it were not for the crowds of toiling Negroes, would possess quite a European appearance, is so far from improving on a closer acquaintance, that we turn with greater longing to sights which we know will never disappoint us, and pleasures which can never be exhausted; nor are we without reasons which console us for making our journey in imagination only, when we remember the dangers and fatigue which would have to be endured in its actual performance.

Following the guides under whose direction we have placed ourselves, we must first make acquaintance with some of the tropical plants which are to be found in abundance along the side of the great aqueduct, six miles in length, which supplies the city with water, and with the forest vegetation of the Corcovado Mountain (some two miles distant from the city), before we undertake our much-desired expedition to the Organ Mountains, which are part of a mountain-range situated about sixty miles to the north of Rio; so named from a fancied resemblance in their form to the pipes of an organ.

To the green islands in the bay we must also pay a visit. The vigour and luxuriance of their vegetation, occasioned by the low, damp situation, combined with great heat, excites our wonder. The trees are the same as those we meet with on the continent, but there is a far greater number of Palms in proportion, especially of the Cabbage-palm. In the midst of this luxuriance "the images of death and of the most vigorous life pass in rapid succession before the eye of the wanderer; new forms continually arising and flowering upon the remains of those that have fallen to decay. Upon and near the largest trunks, which, stretched out like enormous skeletons, suddenly return to the state of vegetable earth, a multitude of many-coloured *Fungi* spring up, an innumerable quantity of seeds shoot at the same time, and unfold themselves with incredible rapidity. The few spots which are clear of forest and which have not been brought into cultivation are marsh-lands or savannahs: the grass grows extremely thick, and attains a surprising height and juiciness."

One beautiful flower, belonging to the *Iris* tribe, which we often find growing amongst the bushes in these islands, must be mentioned, because it has now become an ornament of European gardens (though in England only a stove plant),

namely the *Moræa Northiana*, which was first found by Sir Joseph Banks, when he touched at Rio de Janeiro in company with Captain Cook. On the shores, where the rich soil has been washed away, and has left the bare granite exposed, we see thick groups of Aloes and of a prickly Cactus, the stiff leafless stems of which make a singular contrast with the varied forms of the forest. The huts of the country people are, for the most part, situated along the coast, and surrounded with plantations of Spanish Potatoes and Water Melons, with Guavas, Oranges, Jessamines, Roses, etc.

It is with but little hope of success that this attempt is made to sketch the beauty of the Brazilian flora. How can such feeble strokes as these convey any idea of it, when those who have made actual acquaintance with it, speak of its being "scarcely to be expected that a residence of but a few months can afford more than a very partial notion of the vegetable riches of that happy climate, where eternal spring and summer reign, and where, as almost every plant has its own season for the production of its flowers, every month is characterized by a different flora"?

Even situations which are remarkable for a very small quantity of soil,—rocks, for instance, on which scarcely a trace of earth is to be observed, are covered, owing to the

humidity of the atmosphere, the heavy dews of the dry season, and the continuous rains which fall at other times, combined with the heat of a tropical sun, with such plants as *Tillandsias, Melastomaceæ, Cactuses, Orchises, Ferns,* etc., all in the vigour of life;—what luxuriance then must be the result, when a rich soil, and moisture and heat, are all united!

But let us wander a little way from the town of Rio de Janeiro, and judge for ourselves—let us leave the sea-shore and its curious Mangrove-trees (Plate XIII.) and Avicennias (*A. tomentosa,* which, though belonging to a different family, the Brazilians call White Mangroves, on account of a similarity of habit)—let us leave these sea-shore sights and the level marshy ground—let us leave the noisy streets behind us, and make our way to the rich valley at the foot of the Corcovado Mountain, and wander up to the terrace-like level, along which the water of the aqueduct is brought from its source. The hedges near the town are gay with a scrambling kind of shrub called *Bougainvillea Brasiliensis,* the flowers of which are concealed within large rose-coloured bracts. It was first discovered by Commerson, and named by him in honour of his commander.

As we are apt to regret sometimes the custom of imposing Latinized names of persons on newly found flowers, it may

assist us in getting rid of this prejudice, to learn what kind of feeling was associated with this practice by Spix and Von Martius in the following passage, which occurs in connection with the *Bougainvillea*. "Nature always preserves her creations unimpaired by the influence of time, and they survive all the monuments of human greatness. It was therefore a very happy idea in botany to perpetuate the names and merits of distinguished explorers, by impressing them on flowers, whose races never become extinct."

Scarcely has the hum of the city died on our ears, when we find ourselves, as if by magic, though still in the immediate neighbourhood of a European city (as we may almost call it), surrounded by a rich tropical vegetation, and other sights which are always to be met with in company with it. "Sometimes our eyes are attracted by gaily-coloured birds, or splendid butterflies; sometimes by the singular forms of the insects, and the nests of wasps and termites hanging from the trees; or by the beautiful plants scattered in the narrow valley, and on the gently sloping hills."

We can scarcely distinguish at first what most excites our admiration, when at last we find ourselves within the covert of the forest; but perhaps our attention is chiefly attracted by the thickness of the trees, and the height to

which they rear their unbranched stems; by the immense size of the leaves of some of the exogenous trees, and their brilliant, conspicuous blossoms; so different from the comparatively small leaves and unobtrusive catkins by which this class of trees is generally distinguished at home. We are surrounded by lofty *Cassias* (trees of the Leguminous family, but not bearing papilionaceous flowers); with broad-leaved, white-stemmed *Cecropias* (belonging to the Bread-fruit tribe, *Artocarpaceæ*); with thick-crowned *Myrtles*, and *Bignonias* with large clusters of long scarlet blossoms opening at the end like the mouth of a trumpet; richly-flowering *Coronillas*, and beautiful *Passion-flowers* with their spreading tendrils, interspersed with the large, swelling, cask-like trunks of the *Bombax*, or Silk-cotton tree.

As we wander along in the cool shade of the dense forest which skirts the sides of the Corcovado Mountain, and follow the windings of a small stream which descends from its heights, we find many delicate species of Fern, and make acquaintance for the first time with several curious plants, called *Dorstenias* (allied to the Nettle family, *Urticaceæ*); with large deeply divided leaves, and little fruits imbedded in a flat fleshy mass, notched at the edge, and which consists of the expanded top of the flower-stalk. We cannot

help wondering at some peculiar-looking plants, allied to the Banana, called *Heliconias*, with rather astonishing flapping leaves, and numbers of flowers enclosed in a spathe, which is so large that it is a far more prominent feature than the flowers it protects, sometimes five or six inches long, and of a boat-like shape. *Begonias* too are growing intermixed, with which we are all familiar; whilst a little higher up the mountain, feathery Tree-ferns (Plate XIV.) and noble Macauba Palms gracefully wave their light foliage.

But now, having reached the level of the aqueduct, we will rest awhile before we explore any further, and contemplate from a distance "the harbour with its crowd of masts and various flags," and the city, stretched out at the foot of pleasant hills, with its houses and steeples glittering in the sun. Whilst pausing here, we recognize and exchange greetings with a very common English plant, growing here and there in damp and shady spots,—the common Watercress (*Nasturtium officinale*); though by no means peculiarly English, for go where we will, we meet with this little cosmopolite, and find it mixing in all kinds of society. In this locality we observe it growing side by side, on the most intimate terms, with strange-leaved Begonias and numerous Ferns.

As we continue our walk along the level ground, our path is often embowered by innumerable plants of delicate Mimosas, shining Myrtles, bushy Nightshades, and a countless number of plants with less familiar names, which form an impenetrable thicket around us. Nothing here disturbs our silent enjoyment of these majestic sights, and "nothing interrupts the repose and stillness of these woods but the buzz of the gay humming-birds, fluttering from flower to flower, or the singular notes of unknown birds and insects."

Leaving the aqueduct at a spot where the water falls in beautiful cascades over the granite rocks, we now mount higher up the mountain, and begin to observe a change in the character of the vegetation: it is still "uncommonly strong and luxuriant," but consisting chiefly of low trees and shrubs, and "the higher we ascend, large trees gradually become rarer, and Bamboos and Ferns more numerous," till having "made our way through the last thicket, we reach the green summit of the mountain, where single shrubs are all we find, with a few small species of the *Orchis* family, growing in the clefts of the rocks, and beautiful tuberous-rooted scarlet-flowered *Gesnerias*, the blossoms of which grow in clusters, and are something like those of the *Eccremocarpus* in size and shape.

Amongst the shrubs, some of the most singular are the Vellozias (*V. candida*), which are very common in Brazil; they vary very much in height, and not unfrequently attain the size of a small tree. They have a remarkably awkward and naked appearance; the trunks are closely covered with the remains of withered leaves, and the branches are bare and forked, with only a tuft of leaves quite at the extremity, out of which grows a beautiful flower, in appearance very much like our large white Lilies.

At the height we have now reached of some 2000 feet above the sea, we could almost fancy ourselves transported to a colder zone; the streams which flow from the highest ridge are "some degrees colder than the water in the aqueduct," and a chill air surrounds us as the clouds at the sunset hour settle on the mountain-top, and remind us of approaching night. But let us quicken our steps down the mountain as we will, we must now consent to pay the penalty for loitering so leisurely on our way up, by having to spend half an hour in the dark within the now sombre shade of the forest, till the moon once more shows us our path.

Perhaps we do not altogether regret this, for (though not the kind of concert we should like to listen to every

evening) we would on no account have missed hearing the strange mixture of not very musical sounds which now begin to fill the forest; "pre-eminent above all the others is that emitted by the blacksmith frog; every sound which he produces rings on the ear like the clang of a hammer upon an anvil, while the tones uttered by his congeners strikingly resemble the lowing of cattle at a distance. Besides these, the hooting of an owl, the shrill sound of the cicada, and the chirping of grasshoppers, form a continuous concert of inharmonious tones, while the air is lighted up by the fitful flashes of numerous fire-flies."*

In our various rambles in the beautiful neighbourhood of Rio de Janeiro, the conviction is often forced upon us, that a life might be spent in becoming acquainted with all the inexhaustible variety in which Nature is here clad, and which has supplied our gardens and hothouses with so many beautiful exotics. Some of these occasionally take us by surprise, when here we first catch sight of them in their own native land, made far more beautiful than we had ever thought them before, by all the wildness which surrounds them. How totally different is the sensation with which, as we stroll by the sea-shore, we first behold the deep blue blos-

* Gardner's 'Travels in Brazil.'

soms of the *Gloxinia speciosa*, covering the cool damp rocks in the greatest profusion, whilst nothing breaks the silence but the dash of the waves, to that with which we had hitherto seen it, ranged in formal rows in a hothouse, or in a crowded, heated tent at a flower-show, with a quadrille-band for an accompaniment. Growing in the same situation as the *Gloxinia*, we find a kind of wild Parsley; and twining among the bushes close by, we meet with a plant which we are sure is a kind of *Nasturtium*, or Indian-cress (*Tropæolum orthoceras*, Gardn.), though not quite so showy as the species which has now so long been the pride of English cottage-gardens that we have ceased to regard it as a foreigner.

On a neighbouring mountain we are attracted by some plants with rose-coloured flowers, growing in large patches together, which we find to be one of those beautiful large-flowered Orchideous plants which are so common in Brazil; this is *Cattleya labiata*, with broad leaves and very conspicuous blossoms. Here we again meet with the lily-like *Vellozia candida*, with its awkward bare branches adorned by a beautiful Orchideous plant, an *Epidendrum*, to which they serve as a resting-place; it is a foot or more in height, with small rose-coloured blossoms, and a few leaves arranged in pairs, quite at the bottom of the stalk.

In the same situation grow two different species of a shrub (or small tree) called *Echites*. It belongs to the same tribe as our Periwinkle (*Apocynaceæ*), and many of the family are very much like it both in leaf and blossom; but in Brazil a very peculiar character is to be observed in the leaves, the under surface of which looks as if it were lined with white flannel; in some, both the upper and under surface have this woolly appearance. The seed-pod grows to the length of half a foot, and is shaped something like that of the crane's bill.

But we must not forget that, in Brazil, large tracts of the country have long been brought into cultivation; that the wild beauties of Nature have been made to feel what the axe can do in the hand of "civilized man," and are retiring before his face towards the interior, like the red Indians themselves, to make room for orderly plantations. Still, these plantations are sometimes beautiful to look at, particularly those of the Coffee-plant, which generally occupy the slopes of hills, not being allowed to grow higher than ten or twelve feet. "Nothing is more beautiful than a Coffee-plantation in full bloom; the trees come into flower at the same time, but the blossoms do not last more than twenty-four hours. Seen from a distance the planta-

tion seems covered with snow, and the blossoms have a most delightful fragrance." They are small (not more than half an inch across), with five divisions, and are well set off by the contrast of the dark green leaves. Their structure places them, botanically, between Madderworts (*Rubiaceæ*), and Caprifoils. Above these Coffee-plantations we often see the hills covered with the Brazilian Pine (*Araucaria Brasiliensis*).

Another plant which we see extensively cultivated is the important Mandiocca, or Cassava, a shrub about eight feet in height, belonging to the Spurge tribe (*Euphorbiaceæ*). But we must find another opportunity for making acquaintance with the nature and uses of this and other cultivated plants, as now we are not disposed to be any longer detained from our promised expedition to the Organ Mountains. On our way thither we shall see enough of the Mandiocca, as the road, during the last part of the journey, winds round many low hills, the sides of which are covered with plantations of it.

But leaving these behind, we now fall into a path (if such it can be called) which leads through one dense forest to the height of some 4000 feet up the mountain; and even on the loftiest peaks, which are about 7500 feet above the

level of the sea, we are led to expect a vegetation so beautiful that it has been spoken of as "quite a flower-garden." The steep and difficult roads "have more the appearance of the bed of a mountain-torrent, many parts of which appear impassable;" but the mules, by the assistance of which the ascent is ordinarily made, pass along the worst portion of it surely but slowly.

The magnificence of this forest "cannot be imagined by those who have never seen it or penetrated into its recesses." We are here particularly struck by a feature which creates a marked difference between the forests of the Tropics and those of our colder zone. We generally see our European forests composed of but few different species of trees, each particular kind growing gregariously together; but in tropical forests the variety of species is so great that it is seldom two trees of the same kind are found growing near each other.

Trees of the most various natures here stand in the closest proximity, so that "these sovereigns of the forest may be almost every one of them distinguished from its neighbour in the total effect of the picture;" the large trees which here surround us consist chiefly of "various species of *Palm, Laurel, Fig, Cassia, Bignonia, Solanum, Myrtle,*

and *Melastomaceæ;*" here and there one of these giants has fallen to the ground, and lies stretched across our pathway, bedecked with wreaths of Orchises and Pothos-plants and Ferns; or, arrested in its fall, is leaning on an arm of some neighbouring giant still stronger than itself, which first perhaps has caused its death, and then like a courteous conqueror supports its fallen victim; for where "such a fulness of life and such a vigorous striving at development exists, even so rich and fertile a soil as this is not capable of furnishing the necessary nourishment in sufficient abundance; hence these gigantic trees are in a constant struggle for their own preservation, and impede each other's growth still more than the trees in our own forests. Even stems which have grown to a considerable height, and require a large supply of nutriment, feel the influence of their more powerful neighbours, and are suddenly checked in their growth by being deprived of the requisite juices. Thus we see the noblest trees, after suffering an atrophy of some months' duration, eaten away by ants and other insects, seized with decay from the root to the summit, till, to the terror of the solitary inhabitants of the forest, they fall down with a tremendous crash."*

* 'Travels in Brazil,' by Spix and Von Martius.

It is early morning when we enter the forest, and the same strange medley of sounds which we had before heard at the setting of the sun now greets his rising,—frogs and toads and chirping grasshoppers and locusts all joining in a harsh chorus with the howling monkeys. No sooner has the risen sun "dispelled the mists which preceded it, than all creatures begin to rejoice in the return of day. The ants and termites issue from their curious dwellings, and the wasps forsake their long hanging nests; gay butterflies flutter from flower to flower, or collect on the sunny sand-banks of cool streams; myriads of the most brilliant beetles buzz in the air, and sparkle like jewels on the fresh green of the leaves or on the odorous flowers; whilst agile, bright-coloured lizards, dark-coloured poisonous serpents, and harmless ones which exceed in splendour the enamel of the flowers, glide out of the leaves or the hollows of the trees, creep up the stems and bask in the sunshine whilst lying in wait for birds or insects. Squirrels leap from tree to tree; pigeons and other birds leave the branches and wander about on the moist ground; green, blue, and red parrots assemble on the tops of the trees, and fill the air with their screams; whilst the thrush, concealed in the thicket, pours forth her joy in a strain of beautiful melody."

But as the sun mounts upwards, all these living creatures seek shade and repose, these mingled sounds subside, and a solemn silence is diffused over the scene.

As this is not our first visit to a tropical forest, it is needless to detail again the wonderful history of climbing plants and epiphytes which check our progress, and make the axe a necessary accompaniment of our expedition; though here we are often able to dispense with its assistance, by following the paths which have been trodden by an animal called the tapir (*Anta*), which "though the largest South American quadruped, is not of greater size in the body than a calf six months old, and stands upon much shorter legs."

Free therefore from the fear of encountering any beasts of more formidable size, we can now at leisure make acquaintance individually with some of those trees we before mentioned in a group together. The large *Cassia*-trees are amongst the most striking; they belong to the Leguminous family, but not to the papilionaceous division. Both blossoms and leaves vary very much in the different species; in some they are both large; in others the leaves are about the size and shape of those of the Portugal Laurel, the blossoms being large and showy, and composed of five petals, which are either red or yellow; in others again the

foliage has quite a different character, and is not unlike that of the Acacia (*Robinia*).

As rivalling the *Cassia*-trees in number and beauty, we must next mention those of the *Melastoma* family, and amongst these especially the *Lasiandra Fontanesia*. The purple blossoms with large yellow anthers, grow in clusters together; but the leaves are perhaps its chief beauty,—they are not more than about five inches in length, but of the most symmetrical shape, with the beautiful curved ribs which distinguish the leaves of all the tribe.

One of the most magnificent trees is the *Chorisia speciosa*, allied to the Silk-cotton-tree, or *Bombax* (Nat. Ord. *Sterculiaceæ*). "It is a large tree, with a stem from five to eight feet in circumference, covered with strong prickles, and unbranched to the height of thirty or forty feet; the branches then form a nearly hemispherical top, which, when covered with its thousands of beautiful large rose-coloured blossoms of five wide-spreading petals (each about two inches and a half in length), has a striking effect when contrasted with the masses of green, yellow, and purple of the surrounding trees."

If earthly things could satisfy us we might be satisfied here, where we are surrounded on all sides by the most

luxuriant profusion, and "refreshed at the same time by European coolness;" whilst the air is filled with rich perfume from the small white blossoms of various species of the aromatic Laurel tribe.*

Nor are the blossoms of the plants which climb over these trees less beautiful than those of the trees which support them. Amongst the most splendid are the scarlet trumpet-flowered *Bignonias*, and a magnificent climber, called *Solandra grandiflora*, of the *Solanaceæ* family. The blossom is a large yellow cup full six inches in depth, with five not very deep divisions; in form not unlike an old-fashioned, bell-shaped tumbler. The climbing Fuchsias too are a lovely sight, especially *F. integrifolia*, Cambess., which often clambers "to the height of sixty or even a hundred feet, and then falls down in the most beautiful festoons," mingling its crimson blossoms with the green leaves of the tree on which it hangs.

Whilst lost in admiration of all this beauty, our eye suddenly falls upon a dark and rather unshapely figure climbing head downwards along the branch of a tree, which tree is

* Not the shrubs which commonly go by that name in England, but the true Laurels, only one species of which, the *Laurus nobilis*, or Bay-tree, grows wild in Europe.

itself distinguished from those around by a somewhat peculiar character. Our climbing friend comes along at such a respectable pace that we hesitate at first as to whether or no it can be a sloth; but we feel no doubt as to its identity when we remember that as respects the locomotive powers of this injured race, Buffon and others have been found guilty of defamation of character. Though not quite so nimble as some of his four-legged neighbours, he still contrives to "pass with considerable rapidity from branch to branch," hanging on all the time by his legs and feet. The leaves of the tree on which he is climbing, the *Cecropia peltata*, form his favourite food; this tree belongs to the same tribe as the Breadfruit (*Artocarpaceæ*). The long racemes of stameniferous blossoms hang down in clusters of about four together. The large leaves are perhaps the most remarkable feature of the tree; they are ten inches or more in diameter, and deeply cut into about eight divisions, the stalk being in the centre, and they are so white underneath, that, when agitated by the wind, the tree looks at a distance as if it were covered with white blossoms.

For miles our path now leads through a valley, along the side of a small river, fringed on both sides by beautiful herbaceous plants and delicate Ferns; whilst on its banks

grow likewise many large trees, whose stems are covered with *Bromelias, Tillandsias, Orchises, Ferns,* and climbing *Begonias.* Occasionally we see "a large plant of *Cactus truncatus* hanging from rocks, or from the stem of some of these large trees, covered with hundreds of beautiful pink blossoms;" then crossing over a hill, we find the top of it covered with plants of the *Orchis* family. In this situation too grows a lovely shrub of the Violet family (*Luxemburgia ciliosa*), with large corymbs of lemon-coloured flowers; and Bamboo, of two different species, here grows in such thickly tangled confusion, that "the getting through these is the most difficult part of our journey."

There is a large and elegant species of Bamboo (*Bambusa Togoara*) which grows at an elevation of 2000 feet on these mountains, the stems of which are often eighteen inches in circumference; the height of this gigantic Grass, which bends downwards at the top in a graceful curve, varies from fifty to a hundred feet. Palms and Tree-Ferns, too, we meet with in numbers about half-way up the mountain, some of the latter reaching to the height of forty feet.

But far different are the emotions which the Tree-Ferns here excite, from those we experienced when we first made acquaintance with them in Tasmania, where their light

feathery canopies were associated in our thoughts with all that is joyous. Those however which we meet with here convey a totally different impression, and are also "in entire contrast with the general aspect of the flora of Brazil. There is something truly sad and gloomy in the appearance of these Ferns, whether we regard the sombre colour of their trunk, and the unusual coating of dry husky scales which invests the stems; the spines with which both the stems and petioles of many species bristle; the uniform but dull greenness of the fronds—indicative rather of decrepitude than of the freshness of youth—and spreading loosely in all directions from the trunk; or lastly, that peculiar odour which distinguishes Ferns from flowering plants in general.

"It would seem as if these Ferns were, in a manner, relics of an ancient period, when the *Elephas primigenius*, the *Megatherium*, and other large animals wandered slowly through thick woods composed of this class of plants; and that the latter are aliens, as it were, to the vegetation of the present world, and belong to quite a different system of creation. At present their peculiar and favourite station is in the depths of the primeval forests, where they grow detached from one another like hermits, in solitary and sombre

retirement, being never gregarious or collected into large groups."*

It is not till we have forsaken the region of these sombre Ferns that we can forget their saddening influence; but the wonderfully luxuriant vegetation which, as we mount higher, we find surrounding us at an elevation of some 4000 feet, soon wins us back to a happier mood; as we follow the windings of a stream at the foot of a waterfall (the bed of which is now nearly dry), we still see the trees, which here are of a middle size, festooned with crimson-flowered Fuchsias; and to whichever side we look some sight of beauty meets our eyes. On a slanting bank by the side of the fall grows a dark red-blossomed *Amaryllis*, and, near the same spot, several bushes of a plant called *Pleroma*, of the *Melastoma* family: the symmetry of its leaves and beauty of its flowers are peculiarly gratifying to the eye; the curved nerves of the perfect-shaped leaves are very strongly developed, and the large, deep violet blossoms are formed of five most regular petals, each about an inch in length; no description can convey an idea of its beauty. Here too a red-blossomed *Esterhazya* (belonging to the *Scrophulariaceæ*) is contrasted by the large white flowers of "a

* Von Martius.

broad, thick-leaved species of *Clusia* (*C. fragrans*, Gardn.), which loads the air with a delightful fragrance."

Leaving this beautiful scene behind us as we climb higher, we reach a part of the mountain which is of a perfectly different character, where we are no longer surrounded by trees, and see nothing around us but "bare portions of rock, with occasional masses of low shrubs and herbaceous plants." But mounting higher still, we arrive at a flat and comparatively wooded spot, where we feel peculiarly sensible of the advantages which attend our method of travelling; as, when Dr. Gardner made this excursion in a more literal manner, he partly made the ascent of this last steep part of the mountain, up the gently sloping face of a granite rock, upon his hands and knees; but even here a hand was found disengaged when a Sundew (*Drosera*) was met with, or an *Eriocaulon* growing in moist ground, or the curious *Burmannia bicolor*.

As we now meet with a less distracting variety, we shall be better able to examine individual plants; the two last of those above named deserve particular attention. The *Burmannia bicolor*, though possessing regular blossoms, is said by learned botanists to be related to the Orchis tribe, on account of similar peculiarities in the seeds and seed-

vessel, and is considered moreover as a connecting link between Orchises and Irises: it has slender leafless stalks, with hanging tubular blossoms at the upper end. The *Eriocaulon*, or Pipe-wort, is also an interesting plant; though spoken of as allied to glumaceous plants, its construction shows a higher degree of development; when magnified, something approaching to the nature of a corolla is visible, in the shape of a little membranous tube within the glumes, enclosing the stamens or pistils, for it is a dicœcious plant. Only one species grows in Great Britain, (in lakes in the Isle of Skye) and in the west of Ireland; but this little grass-like plant, with globular heads of minute white flowers, is very unlike these foreign ones, in which the heads of flowers look like a stiff brush made of long bristles, with a little downy ball stuck on the end of each, the corolla-like tube being fringed with white down. They also grow to a height of from four to six feet in Brazil, and may almost be called small shrubs. "One remarkable circumstance connected with these strange plants is the fact that the greater number of the Brazilian species do not inhabit water, in the manner of our native British one, but grow in the most dry and arid portions of mountainous declivities; many others also grow in parched, flat,

sandy places, which are flooded in the wet season. The truly aquatic Brazilian kinds more or less resemble our own in habit."

Having finished our examination of these curious plants, we must make one more effort to reach the end of our long journey. Above the flat, wooded spot before mentioned we encounter "another steep, rocky place, almost entirely covered with a large Pine-apple-like *Tillandsia*, above which rise a few plants of a fine large scarlet-flowered shrubby *Salvia* (*S. Benthamiana*, Gardn.), and a pale-blossomed *Virgularia*." The latter flower not only belongs to the same tribe (*Scrophulariaceæ*) as our large red Snapdragon (*Antirrhinum majus*), but is exceedingly like it in appearance; in some, however, the corolla is fringed at the edge, whilst a peculiar character is given to others by the large protruding anthers, which are curiously enveloped in a woolly substance. On a nearly bare portion of the rock grow several patches of a large herbaceous plant belonging to the Gentian tribe, *Prepusa connata*, Gardn.; the blossom rises prettily out of the purple-tinged, inflated calyx, which stands out all round it like a little balloon.

A wooded tract again succeeds to the rocky one we have just passed, and here, at the height of about 6000 feet, we

find "a slanting Sphagnum bog," in which grow some very alpine-looking shrubs;" our old friend the Whortleberry (*Vaccinium*) for instance, and an *Andromeda;* a *Pleroma,* and a plant of the *Melastoma* tribe, called *Lavoisiera imbricata,* "remarkable for its large flowers and small leaves," which are delicately fringed and laid close over each other. And growing amongst the moss, "in great profusion," we greet with a sensation of pleasure a Butterwort (*Utricularia*), with heart-shaped leaves and purple flowers.

A steep ascent covered with low shrubs surmounts this Sphagnum bog. This accomplished, our toil is at an end, and we may enjoy at leisure the cool refreshing air and soothing silence, whilst our eye first contemplates the "little flower-garden" which here surrounds us,—a pretty *Fuchsia,* in full flower, trailing over the bare rocks; a handsome *Amaryllis,* growing in the clefts, and numerous flowering shrubs on all sides,—and then wanders on over the interminable "mass of conical-shaped hills" which everywhere cover the country below.

Of the nature of the vegetation in this lower country we ought next to get some notion. So far as we have seen at present, not one of all the different lands we have visited in the course of our various wanderings appear to possess

so beautiful a flora as Brazil; and we are desirous of extending our acquaintance with it, with a view to ascertain whether further experience will confirm this impression.

Nearly the whole of the province of Minas Geraes lies in this tropical zone, some part at least of which we must explore; it is divided from north to south by a mountain-chain, in which lie the gold and diamond mines; to the east side of this chain the country is mostly covered with primeval forest, whilst that to the west is lower, and consists chiefly of pasture-lands. As we have lately seen so much of forest scenery, we mean, by way of contrast, to make our journey through the more open country on the western side of the mountain-range, and will now bend our steps towards the City of Diamonds. It will not be our object to tarry where cultivation has altered the face of the country; neither will we spend our time on those tracts of land which, having been formerly cleared and cultivated, have been again abandoned and suffered to relapse into a half wild state, till now they are completely overgrown with a kind of Brake (*Pteris caudata*), very much resembling the species which is so common in England.

The first wild part of the country we pass through is a wooded marsh, and the first thing which here arrests our

attention—far too uncommon a sight to pass by unnoticed—is a large species of *Equisetum* (Horsetail), growing abundantly all around, which measures about fifteen feet in height, and three inches in circumference at the lower part of the stem—a giant compared to the ordinary height of the race—though even these dimensions are puny compared with those "which are found in a fossil state in the coal strata, known to geologists under the name of Calamites, with stems as thick as a man's body."

For many a league we now travel on through thinly-wooded country; nor are we much tempted to step aside from the object of our journey by the dull, deserted-looking little towns or large villages we sometimes pass, (called into existence by the discovery of gold, and since the mines have become nearly exhausted, allowed to fall into neglect,)—but we hasten on to a part of the country which is both more thickly wooded and more thickly inhabited, which, by the similarity of its vegetation, renews agreeable recollections of the Organ Mountains, and inclines us to think that our former impression was correct. "In humid, shady places" the Tree-ferns reach the height of thirty or forty feet, and on rising ground we meet with many large trees belonging to the Composite family, called *Vernonias;* many

of these attain a height of forty feet or more; the brush-like heads of white flowers grow together in large clusters, whose perfume scents the air and mingles with that of other neighbouring trees (of the Myrtle family), called *Myrcias*. In all the varied, undulating country which characterizes this part of Brazil, each different situation affords new objects of interest, and has its own appropriate vegetation. One tree must be particularly mentioned, which shows a preference to marshy spots, namely, the South American species of Magnolia called the *Talauma*. The specimens with which we here make acquaintance are fine large trees, with large blossoms, not inferior in fragrance to those of North America.

No two countries could differ more in appearance than Brazil differs from itself, however, at different times of the year. For months together not a drop of rain refreshes the thirsty soil, to which succeed as many months of continuous rainy weather, during which there are scarcely two consecutive days without heavy showers. If we were to travel in Brazil towards the end of the dry season, instead of being surrounded on all sides with luxuriant vegetation, we should find the country as we journeyed on "bare and arid." Still we might travel on and on, and still meet

with nothing but "bare, grassy hills, a few small woods only existing in the hollows," and everything our eye rested on would be "burnt up from the want of rain." In some parts of the interior of Brazil this is more or less the character of the country at all times; and owing to a deficiency of moisture, the vegetation we meet with in crossing the mountain-ridges (called *serras*), though of an interesting character, has nothing of the luxuriance which surrounded us on the Organ Mountains.

In ascending these serras we find the rough red-coloured soil thinly covered with a few bushes of the Composite family, a *Baccharis*, or a *Lycnophora*. *Lycnophora Martiana* has immensely thick woolly stalks, which are surmounted at the top by a great ball of leaves.

On the grassless stony surface of the ground we find numerous species of *Orchis*, (among them "a beautiful *Lælia* with yellow flowers,")—a very prickly, procumbent species of *Cactus* also, and (crowding the rocky parts of the serra) numerous large water-bearing Tillandsias from which we may quench our thirst, as "the base of the leaves contains a large quantity of water, an ordinary sized plant yielding about a pint."

On the top of these serras, sometimes at the height of

5400 feet, grow many handsome shrubs; amongst these are some of the Cassias, and others (belonging to the natural tribe of *Malpighiaceæ*) not unlike the Portugal Laurel in general appearance, both from the shape of the leaf, and the long clusters of little blossoms. Several Ferns grow also in such situations, and a few Mosses and Lichens. Occasionally, in passing along the flat top of one of these mountain-ridges, we travel for a long distance through a rich and beautiful vegetation, where our path leads us through large open grassy tracts, abounding in numerous kinds of the curious *Eriocaulon* and species of the Composite family; where we again meet with a small *Virgularia*, with its pale rose-coloured, snapdragon-like flowers; with a profusion of a purple *Vellozia*, and one of the Gentian tribe (*Lisianthus*), with beautiful scarlet flowers and excessively yellowish-green stalks and leaves; amongst other plants, too, we here meet with a blue-flowered Lupine. As we travel on, our way leads through "rugged tracts thinly wooded with small shrubs, amongst which are numerous *Melastomaceæ*, many of them with small imbricated leaves and large rose-coloured blossoms, forming the most elegant little bushes imaginable; in general habit not unlike Heaths. During two days' journey the whole surround-

ing country, owing to the beauty of these shrubs, is like one vast flower-garden."

It would be wearisome to detail the ever-recurring interchange which characterizes this part of the interior of Brazil,—of hilly grassy country destitute of trees, and high serras, some of them "arid and desolate," whilst others are covered with shrubs, such as those already mentioned, and with occasional clumps of Vellozias. It would be endless to tell of broad, thinly wooded valleys, on which the burning rays of the sun stream down with unmitigated power, alternating with wooded or bushy *campos*. But though it is impossible to enter into detail, it may safely be asserted that so beautiful is the general character of vegetation in this country, that even in the most unpromising situations we are often agreeably surprised by some lovely flower, hitherto unknown to us, springing up in our path, or by the unexpected appearance of some old hothouse acquaintance—such for instance as the really beautiful *Mutisia campanulata*, which we find growing on high land where there are few plants of any kind to be met with: it is a plant of the Composite family, beautiful both in form and colour, and with a pretty peculiarity in the leaf, the midrib being elongated and twisted into a curling tendril.

One characteristic of Brazil (which, though not a botanical one, we must not omit to mention) we often observe while passing over an upland *campo*, in the neighbourhood of some of those large clay nests of the white ant so often to be met with in these situations,—namely the great ant-eater, whose operations we cannot refrain from watching, although at a respectful distance. We feel tolerably sure indeed that he would consider us beneath his notice, but still we have no wish to venture too near such a formidable-looking individual; though even should he take a fancy to follow us, we are certain we could beat him in a race, as he "runs very slowly, owing to the peculiar formation of his fore feet, two of the claws, which are very large, being doubled up when he walks or runs, so as to cause one side of the foot to rest on the ground." These claws however are most useful tools to him in scratching an opening in the side of an ant-hillock, through which he thrusts his long, slender, slimy tongue, and then draws it back again within his little mouth, covered with myriads of ants. What a contrast to his captive brother in Regent's Park, reduced to dining on the white of eggs, and altogether deprived of the agreeable excitement of using his own claws in making preparations for dinner!

These creatures are no cowards, and, when pursued, do not decline to do battle. Dr. Gardner relates a formidable encounter which he had with a large anteater (or ant-bear), which was six feet long without the tail, the tail itself and the long hair with which it was covered measuring four feet more. Being pursued by Dr. Gardner with intent to kill, and finding himself unceremoniously seized by his long snout, he suddenly rose on his hind legs, and clasping his antagonist with a bear-like hug, refused to loose his hold till struck on the head with a stick by one of the men who accompanied the expedition; and though frequently stunned by the blows he received, he as often got up and ran off again, till at last Dr. Gardner despatched him by a pistol-shot.

It must not be imagined that because forests have been less frequently spoken of since we started on our excursion into the interior, than during the first part of our journey in Brazil, that we have altogether taken leave of them; on the contrary, though the undulating surface of the country is comparatively open, it is in many parts richly clothed with primeval forests, forming a striking contrast to other large tracts which are covered with extensive plantations of Indian-corn, and betoken the neighbourhood of

some little inland town or village. Some of these towns (or rather cities) are places of considerable pretension; but the large houses and fine churches and well-paved streets and public fountains seem out of keeping with the stagnation which exists in whatever concerns human interests; and the stillness which prevails there as we wander through them, occasions a sensation of oppression and loneliness which we never felt in the silence of the forests.

Even the City of Diamonds itself (*Cidade Diamantina*) has few attractions for us, in spite of its imposing appearance from a distance; being built on the acclivity of a *serra*, its "handsome churches and fine stone-built houses" are all displayed to the eye at once, "rising gradually one above the other along the steep mountain-side." "The most elevated portion of the city is about 4000 feet above the level of the sea, and the climate is consequently mild, the thermometer ranging in July (which is one of the coldest months) between 54° and 60° Fahr. at noon. The hottest months are November, January, and February, during which period the thermometer varies from 74° to 88°, but mostly only reaches 84°."

The streets, like those of Rio de Janeiro, are narrow and badly paved, though abounding in gay shops; we are not

tempted however to forget the object of our journey either by the gay shops, or by the novel (though anything but gay) costume of the ladies we meet in them, muffled up in dark cloth cloaks with large capes, surmounted (Welsh fashion) by a man's hat; but we will hasten to acquaint ourselves with the nature of vegetation in the surrounding country.

This task will detain us but too short a time; for no contrast could be greater than that which exists between the magnificent appearance of the City of Diamonds, surrounded with plantations of Orange-trees and Bananas, and the usual productions of a tropical country, interspersed with many fine trees of the large grotesque Brazilian Pine (*Araucaria Brasiliana*), and the rocky and absolutely bare country which surrounds it on all sides, "which is perhaps one of the most rugged and arid regions in Brazil." Here, truly, the treasures all lie underground; for as far as the eye can reach, nothing is to be seen but hundreds of bare hills, whose barren tops are whitened by the numerous Lichens with which the rocks are covered; not even the mountains in the highlands of Scotland have a more arid aspect than those which frown down on us on either side of a flat bushy valley through which we pass as we pursue our journey.

But vegetation again assumes a more pleasing aspect when we reach the banks of a little rivulet, where our attention is engaged by a shrub (or small tree) belonging to a very curious race of plants, called a *Vochysia*, with long showy clusters of very irregular, bright yellow flowers, and Magnolia-like leaves. A kind of Bramble (*Rubus*) also grows in the same situation, the fruit of which, when ripe, is green, and has somewhat the flavour of a Strawberry. Another plant which attracts our admiration while traversing a bushy *campo* is one of the Composite family, *Chresta sphærocephala* of De Candolle. This handsome plant, which "beautifully adorns" such situations, reaches the height of about five feet; it is much branched at the top, each branchlet terminating in a large globular compact head of purple flowers; the leaves, stem, and branches being all covered with a white woolly substance.

One very singular feature in the vegetation of this part of Brazil, and different to any we have hitherto mentioned, we meet with in travelling along the top of a mountain-range, where the country, which for the most part is open and undulating and barren, is studded here and there with "island-woods," composed chiefly of such trees as different species of *Myrcia*, *Eugenia*, which is near akin to the Clove,

Vochysia, Anona, Laurus, Styrax, etc., intermingled with climbing shrubs, such as *Bauhinia, Paulinia*, etc. But we refrain from any attempt at botanizing in these island-woods, for two excellent reasons; in the first place, the soil in which these trees grow is so swampy that it is difficult to get near them; and in addition to this, we have had a hint that such localities are very favourite haunts of boa-constrictors. They abound indeed throughout the whole province, not only in marshy places and amongst Palm-groves in swampy valleys, but they disturb our peaceful pleasure in strolling along the wooded margins of lakes and streams, by the preference they show for such beautiful spots; they are of prodigious size too, "sometimes attaining the enormous length of forty feet." Being thus repelled by fear from haunts which attract us by their beauty, we next select a path which leads through a flat country of a still different character, and unlike any we have as yet seen, which is covered almost everywhere by a tall Grass (a species of *Andropogon*), measuring from six to twelve feet high, where all day long we hear the loud yelp-like cry of a large bird, called in Brazil the *Seriema*, which lives concealed amongst this grass; a bird which rivals the ostrich and emu in the rapidity of its pace.

One chief characteristic of the interior of Brazil we have not once mentioned,—those singular forests, called *Catingas,* which shed their leaves in summer; but with these (though common in this province), and with the nature of the country near the Rio San Francisco, we must defer making acquaintance till we traverse that part of Brazil which lies in the Equatorial Zone. Though in the course of our long excursion we have nearly reached the great river, the northern limit of this Tropical Zone warns us to advance no further, and with regret we say adieu to the country in its neighbourhood at which we had just arrived, which, though a flat and thinly-wooded tract, attracts us by the beauty of the bushes which cover it; such as different kinds of *Mimosa* and *Acacia, Bauhinia, Cæsalpinia,* etc., besides an immense number of Lemon-trees loaded with fruit, which, though not indigenous, have become quite naturalized in Brazil.

We must not forget however that other lands lying in the Tropical Zone still remain to be visited before we can form a correct notion of its general character; if all we hear is true, there are sights in store for us in the African portion of this zone, which form a sad contrast to the rich luxuriance which characterizes so large a portion of Brazil,

and a poverty of vegetation which equals, if it does not surpass, the "miserable" character of that which we remember on the western coast of South America.

We have also a curiosity to touch at St. Helena on our way thither, which lies nearly half-way between these two great continents, that we may see what effect is produced on vegetation when tropical heat is mitigated by the influence of the surrounding sea.

We will therefore now retrace our steps through the mining district to Rio de Janeiro; not diverted from our object by either gold or diamonds, though regretting a little the havoc which has been occasioned in the search for gold, by the turning up of the ground; and amused sometimes in spite of ourselves, though saddened again by reflection, at the curious sight we so often see, of a party of diamond-washing Negroes with their wooden bowls, all sitting in a row upon a bench in a shallow pond, above their ankles in water; narrowly watched all the time by an overseer who is seated under a shelter which looks like a thatched parasol or a magnified mushroom, and patiently consigning the treasures which are to make others rich to the greedy bag of a superintending director.

Gladly we greet again the beautiful bay of Rio de Ja-

neiro; and with regret we look back, as we spread our sails, on all its green islands, and watch the wooded hills along the coast, becoming less and less distinct, till at last they die away from our sight.

And now we unfold the map, and try to turn our thoughts to what is to be done next, and begin to reflect that after all, when we reach St. Helena, we shall not be able to gain any very satisfactory knowledge as to its natural productions, since from its being a regular place of call for ships on their way to and from the East Indies, so much of this little island is now brought into a cultivated state for the sake of supplying their wants, that many of the indigenous plants are beginning to disappear altogether; a result which might be expected in so small an island, no more than thirty miles long and twenty-four in breadth. Accounts written long ago are therefore the more valuable; such, for example, as one we find in the relation of a voyage undertaken in Queen Elizabeth's time by Captain Cavendish, from which we learn that "there are Fig-trees which bear fruit continually and very plentifully; for on every tree you may see blossoms, green figs, and ripe figs all at once, and it is so all the year long. The reason is, that the island standeth so near the sun. There is also great store of Lemon-trees, Orange-

trees, Pomegranate-trees, Pomecitron-trees, and Date-trees, which bear fruit as the Fig-trees do, and are planted carefully and very artificially, with pleasant walks under and between them; and the said walks are overshadowed with the leaves of the trees; and in every void place is planted Parsley, Sorrel, Basil, Fennel, Anise-seed, Mustard-seed, Radishes, and many very good herbs. The island is altogether high mountains and steep valleys; . . . there are much more fruits growing on the tops of the mountains than below in the valleys, but it is very toilsome and dangerous travelling up unto them and down again, by reason of the height and steepness of the hills." It is worth remarking as a negative peculiarity of the flora of St. Helena, that the almost ubiquitous Leguminous tribe are entirely wanting there.

Ebony-trees are mentioned by Captain Cook as a natural production of St. Helena; but even in his day he tells us "there had not been many of them within the memory of any person then living;" his account corresponds in almost every respect with the one above quoted, and he adds that "if properly cultivated, this island would produce the trees, fruits, plants, and flowers of all the different parts of the world:" the prophetic words which follow are too interest-

ing to be omitted. "It would be delightful (he says) living in this island, were it larger or more frequented; but the confinement in so small a place in the middle of a vast ocean (a thousand miles from any land), so remote from all communication with the rest of the world, renders the residence there so lonely, that it has rather the appearance of living in exile than in a land of freedom." There is, as we learn from Meyen, an avenue near Napoleon's residence formed by trees called *Conyza arborea*, one of the Composite family, on which a reddish variety of the Lichen called *Usnea barbata* grows in such quantities that this hanging drapery is the first thing which attracts the traveller's eye." On the roadsides, he tells us, "Agaves are often planted, which, when in flower, have even at a great distance a beautiful effect."

Passing from hence to Africa, we shall be able to form a pretty good idea of at least a small portion of that belt of it included in this zone from the interesting account given by a recent traveller there,* who has explored a considerable tract of the country hitherto unknown to Europeans. Our previously formed expectations of what we shall meet with are in some respects fulfilled, whilst in others we are often

* Francis Galton, Esq.

agreeably surprised. When we land on the western coast, between 18° and 19° south latitude, our eye travels over a vast grassy plain, over which we might wander for days without reaching the end; for it runs very far into the interior, the whole surface being entirely devoid of anything like a tree. To the south of this, between 20° and 21° south latitude, and extending from 15° to 20° east longitude, lies a large district called Damara Land, which possesses indeed but little botanical interest; as four very thorny Mimosas "form the vegetation of this country, to the exclusion of nearly every other tree or bush;" only two timber-trees are to be seen in this part of Africa; one which looks something like an Elm, and goes by the name of the *Unna*, and the Camel-thorn (*Alhagi Maurorum*), which, like the other, is a fine tree, but more gnarled. For some distance we travel over a crisp, sandy desert, which increases by contrast the delight with which we hail the sight of a river-bed (called the Swakop) lying in a deep hollow, green with grass, and as smooth as a lawn, bordered by a thick fringe of high reeds, with clumps of Camel-thorn-trees clustered here and there. But we must consent, if we wish to see the more pleasing aspect which African vegetation wears somewhat further to the north, to "push our

way thither through thick thorns" during a journey of some hours, when, to our surprise, the bushes suddenly cease, and as we emerge from them "the charming corn-country of Ondonga lies yellow and broad as a sea before us." The corn is of two different kinds, "one being the Egyptian Doura, or very like it, and the other a kindred kind to the Indian Badjera; its head is cylindrical, and full of small grey seeds, which, though not larger than those of the Millet, are so numerous that each head contains a vast deal of nutriment. Both kinds of corn grow to about eight feet in height; and in harvesting the reapers bend down the stalks and only cut off the heads."

"As we journey on, our surprise at the agricultural opulence of the country is in no way decreased. The Ovampo tribe (as the inhabitants are called) plant Beans and Peas as well as corn, but adopt no systematic rotation of crops;" whilst part of the land is reserved for pasturage. After roving at will over the plains of Africa, the traveller here feels very much as a savage would do in England when particularly requested to keep to the pathways. The trees are "nearly all of a magnificent size, as large as those in any English park, whose foliage is so dense and green that a real shade from the sun may be found beneath them."

These however (of whose names and natures we have no particulars) are "sparingly scattered over the country;" but not so with the Palms, which "grow in great numbers here; their fruit, too, is excellent, while that of Palms growing many miles further south is bitter." Palms do not extend very far south in this part of Africa, as they find their limit in this thirsty land within 20° south latitude.

The character of the Ovampo tribe very much increases our respect for the much-despised Negro race. "They are very national in their feelings, and proud of their country; and though almost naked savages, are a kind-hearted, cheerful people, and very domestic; everybody seems well to do, and the few very old people are treated with particular respect and care." In sad contrast to this race we should find the natives on the western coast of the Australian part of this zone; but we have not sufficient materials to make a journey through that large portion of Australia intelligible. Those however who have landed on the coast describe it as dry and sandy, and without running water. Of the "divers sorts of trees" which grow there, the most prevalent are the Dragon-trees (*Dracænæ*); but none of the trees are large, nor do they grow very closely together in

the woods, and there appear to be no fruit-trees of any kind.

Neither herbs, roots, pulse, or grain of any sort are to be seen, so that the inhabitants depend for their subsistence on fishing. These poor Australian brothers of ours seem to be some of the most depressed of the human family; they have nothing in the shape of comfort or convenience, and are without either house or clothing. They are particularly ungainly, too, in their appearance; for though they are tall and straight built, the smallness of their limbs is out of harmony with their large heads, and their coal-black faces and half-closed eyelids have anything but a pleasing aspect.

CHAPTER VIII.

THE EQUATORIAL ZONE.

INCLUDING 15° OF LATITUDE ON EACH SIDE OF THE EQUATOR.

THE feeling with which we meditate a botanical tour over this broad burning belt of land is something akin to those emotions of mingled awe, and curiosity, and anxiety, and bewilderment, with which, as children, we took our first glance round the interior of a menagerie of wild beasts. Then the feeling of bodily fear was perhaps the most predominant; but now, if we only find ourselves in the somewhat analogous case of walking through a hot-house of tropical plants, it is a sense of mental fatigue mingled with delight which we experience at the glimpse which such sights let in upon us of a grand, and beautiful, and unknown world. Types, these sights are, of those forms which, massed and grouped together in their own land,

"determine" the character of the vegetation. They are sights which help us to create some faint notion of those primeval forests where the overarching trees shut out the sky and exclude the very beams of the sun, whilst they cast a soft green light over the matted and interlaced vegetation below.

We are, however, not altogether strangers now to the nature of tropical forests (Plate XV.), and do not forget that the dense underwood with which they are choked up will make it necessary to "hew out a path axe in hand;" but this is not so distinguishing a feature of the forests in the Equatorial Zone as that dense tangle of climbing plants, covered with leaves and flowers, which twine round each other, and run from tree to tree in all directions, by hundreds of different shoots. Having originally sprung from the ground, they ascend the trees, adhering to them by their under surface, till, the original root becoming exhausted, or insufficient to supply these plants through all their immense length, they afterwards forsake their parent soil, and send down air-roots, which, as they hang suspended in the hot, damp atmosphere of these forests (filled as they often are with watery vapour), draw in the necessary supply of nourishment. And in this way these climb-

ing plants not only exist, but thrive; not only stretching their shoots from one tree to another, but descending to the earth like tight-drawn cords, from which they again ascend, so that "it is in vain to search for the ends of these twining stems."

Another remarkable feature of these forests is formed by the parasitical flora, which here shows all its greatest wonders. Rooted on the boughs of the loftiest trees, the handsome race of Pothos plants send up their large, gleaming white flowers amidst the rich green foliage; and mingled with plants of the Pine-apple family, called Tillandsias, and others, "strange and large-blossomed Orchises of all kinds of freakish shapes and every colour grow in the angles of the branches, and fill up every crevice in the bark of the tree." But amongst all the parasitical plants, none perhaps possess so pleasing a character as the Ferns, which are "of the most elegant forms, sometimes belonging to our well-known genus *Polypodium*, but chiefly to the more tropical genera *Hymenophyllum*, *Trichomanes*, etc. (some of the last named have a remarkably elegant feathery appearance); they either climb the trunks of trees, like our Ivy, or grow in tufts upon the branches, making a peculiar contrast with the surrounding foliage," and harmonizing beautifully with

the soft, subdued, green light. It is in imitation of this light that we sometimes see hothouses which contain collections of tropical Ferns glazed with a green-tinted glass, which produces a "counterfeited gloom," and greatly helps out the mental picture of a tropical forest. Nor is the quiet and silence of a hothouse without a resemblance to the stillness which reigns within the tropics at the noontide of an unusually sultry day, when nothing is heard but "the dull muffled sound of the buzzing and humming of insects close to the earth, when the larger animals retire within the deep recesses of the forest, or 'get them away together, and lay them down in their dens,' and the birds nestle beneath the foliage of the trees."

These trees are many of them the same as those to which we were introduced in the last zone; but here they reach the very perfection of development. The Palms are the crowning beauty of all; the other trees which form the leading features being still Bananas and Plantains (*Musaceæ*), the Bamboo (*Bambusa*), Sugar-cane (*Saccharum*), and other tree-grasses. The *Pandani* and *Scitamineæ* still appear amongst the *dramatis personæ*, and play a very important part in the scene.

But some of the great grandees of all belong to a dif-

ferent race altogether, with many of which we have already made acquaintance in the Tropical Zone, namely, those gigantic dicotyledonous trees with large leaves (unlike the tender green foliage they wear in colder climates) and trunks of enormous thickness, amongst which some of the first in importance are the great unshapely Silk Cotton trees (*Bombaceæ*). "From their excessive development of pith they increase prodigiously in thickness, till they lose the common cylindrical shape, and resemble instead huge casks, thirty or forty feet in height, and of proportionate circumference."

Rivalling the Silk Cotton trees in their swelled gigantic trunks, stand the peculiar-looking tropical Fig-trees. Before mentioning any others, we must remember that, grandees as they are, these two giants have some very near relations whose names are "household words" with us; the Silk Cotton trees, from the valvate calyx and columnar stamens of their blossoms, are closely allied to the Mallow tribe; and the Fig-trees, for equally good reasons, as has been mentioned before, must own that they are near akin to the race of Nettles. But the greatest of the vegetable world, in point of size, are the monster Baobab-trees (*Adansonia digitata*), which, though they belong to a tribe called *Ster-*

culiaceæ, must also acknowledge a near connection with the Mallow family. As, however, we shall not meet with any of them till we visit Africa, or the Cape de Verd Islands, we need say no more of them at present.

In the New World there are other trees "not less astonishing for their height and bulk" amongst the Mahogany-trees (*Swieteniæ*); and some others which, like the Mimosas, belong to the Leguminous family, without having papilionaceous flowers, called *Hymeneæ* and *Cæsalpinieæ*. Some of the latter, called Locust-trees, which grow in South America, are represented by Von Martius as of such enormous size that fifteen Indians, hand in hand, with outstretched arms, could but just encircle the trunk. These are but a few indeed of the many unfamiliar names which appear in the list of trees which compose the New World forests; whilst in the Old World we find Ebony-trees (*Ebenaceæ*), Bread-fruit-trees (*Artocarpus incisa*), a tribe called Soap-berry-trees (*Sapindaceæ*, whose berries yield a natural soap, and are often used for washing in those countries where they grow),—besides the tribe of Laurels (*Laurineæ*), and many others, the bare names of which it would be useless to repeat.

There is a plant called the Nipa Palm, which was formerly included in the Palm family, though now referred by most

botanists to the *Pandanaceæ*, or family of Screw-pines, whose peculiar manner of growth we may observe to advantage in some of the islands of the Indian Archipelago. These Nipa Palms grow low on the ground in great numbers together, appearing shorter than they really are from their stems being entirely concealed in the morass, the leafy part only being visible to the eye. Supposing we were sailing through the Indian Archipelago, we should see the coasts of some of the islands there covered for miles together with social masses of these dwarfish trees. In the marshy parts of the Philippines, in some of the other large islands, and in the Moluccas, there are wide tracts entirely covered with them.

If we run up a creek, or sail up the mouth of a river in these islands, we often see the Nipa Palms succeeded by extensive forests of the singular Mangrove-trees (*Rhizophoræ*), those trees which delight in mud; and we should also find large portions of marshy ground covered with Rice-crops, for, as we know, China depends on these islands to supply her deficiencies; Mountain Rice too is grown upon the elevated ground of many of them.

Though furnished with but few particulars of the vegetation of these well-watered and generally fertile islands, it

will be worth while, now we are there, to spend a little time on some few of the plants, so well known by name, which we find there. The spice-bearing trees are naturally our first association, particularly with the Moluccas and Banda Isles. The Clove of commerce (*Caryophyllus aromaticus*), the unexpanded flower-bud of which is the part which is used as a spice, is one of the Myrtle tribe; the culture of it is entirely confined by the Dutch to the island of Amboyna; and, in the same way, the Nutmeg is only grown to perfection in the Banda Isles. The Nutmeg-trees (*Myristica moschata*) form a distinct family by themselves (*Myristicaceæ*), the flowers of which are very small and without petals. Mace is produced by the same tree; it is an integument wrapped round and round the Nutmeg, and before it is removed it looks something like a kind of trellis-work encircling the nutmeg, which may be seen lying within.

Cinnamon (*Cinnamomum verum*) is the bark of a tree belonging to the aromatic Laurel tribe, and though chiefly the produce of the island of Ceylon, is likewise a native of Java. In this island we are tempted to stay for the sake of seeing how luxuriantly the Vine grows there, which is an unusual sight so near the equator; the Grapes are even said to be "so large and beautiful that they equal the best

kinds from Portugal." The Pepper-plant too, which has so often been mentioned before, grows in great abundance both in Java and Sumatra; plants likewise of the interesting *Cycas* tribe are found in numbers in some of these islands, and impenetrable Bamboo-forests of great extent and beauty everywhere form a feature in the landscape.

One very remarkable feature of vegetation in the Island of Java is the poisonous Upas-tree (*Antiaris Toxicaria*), allied to the Nettle tribe (*Urticeæ*); but let us beware, whilst exploring the island in search of it, how we approach the limits of a mournful valley, near the town of Batur, called the Valley of Death, or Poison Valley (*Guevo Upas*). As we learn from Dr. Daubeny's work on Volcanoes, there is "an abundant evolution of carbonic acid gas" issuing from this valley, which exerts a deadly influence on animal life. "Every living thing that enters this fatal valley is arrested there by instant death; and as the same fate awaits any one who may go to the rescue, the ground is covered with the bleached bones of numerous animals, as well as of men, who have from time to time approached the precincts. By combining the accounts given of this valley with those respecting the malignant qualities of the Upas-tree, a monstrous fable has been concocted, to which cur-

rency has been given by those well-known lines in Darwin's 'Botanic Garden,' beginning :—

> 'Fierce in dread silence on the blasted heath
> Fell Upas sits, the Hydra tree of death.' "

That the effects above mentioned are erroneously attributed to the Upas-tree has been proved by the observations of a philosophical traveller, M. de la Condamine, who asserts that "its vicinity is not injurious to animals, as he has seen lizards and insects on its trunk, and birds perched upon the branches."* The virulent poison which resides in the bark of the tree is however painfully felt by persons who are sensitively constituted, whilst others are not at all affected by it. M. de la Condamine relates that a Javanese whom he commissioned to bring him down some flowering branches of a Upas-tree, which was a hundred feet in height, found it necessary to make notches in it to enable him to climb ; but he had hardly got up so high as twenty-five feet from the ground, when he was taken ill, and was compelled to descend. He became swollen, and continued sick for several days, suffering from vertigo, nausea, and vomiting ; while another Javanese who climbed to the very top and

* The following particulars of the Upas-tree are gathered from the 'Companion to the Botanical Magazine.'

brought down the branches was in no way incommoded. The inner bark also of the young trees, which is employed by the poorer class of people in making a coarse stuff, which they wear when working in the fields, developes properties of a very irritating nature when exposed to the rain; so that persons clad in this dress find their flimsy covering almost insupportable under these circumstances.

It is the milky juice which exudes from the bark when wounded which is used by the natives as an ingredient in the deadly poison in which they steep their arrows; the preparation of it is an art belonging exclusively to the inhabitants at the eastern extremity of the island; it appears to be one of the most virulent of all poisons; animals on which its strength has been tested having died in the most dreadful convulsions. The Upas is one of the largest trees in the forests of Java, with a cylindrical, perpendicular stem, rising completely bare of branches to the height of sixty, seventy, and even a hundred feet. It has large, deciduous leaves, oblong-oval, sometimes approaching to ovate; the fruit is a purple, velvety, oval drupe.*

* The Teak-tree is also a native of Java; and it is a most noticeable phenomenon in its geographical distribution, that though it inhabits Java and the neighbouring isles, it has never been found in Malacca.

There are some other vegetable curiosities with which we feel a great desire to make acquaintance before we leave the Indian Archipelago; those monstrous productions, namely, which are to be met with there amongst the parasitical plants, which grow on the roots of other plants and at a distance look like gigantic flowers, though on a nearer acquaintance we think they are more like mushrooms in masquerade. One of these, called the Giant-flower (*Rafflesia Arnoldi*), is three feet in diameter, the great thick petals (if they may be called so) measuring twelve inches from the tip to the base, the centre twelve inches, and the petals on the other side twelve inches, the general colour being brick-red or salmon-tint. The one whose dimensions are here given was seen in Sumatra by Dr. Arnold, and named after him and Sir Stamford Raffles, who also witnessed this wonder. There are also other kinds of these singular productions to be met with here, called *Brugmansiæ*.*

As we sail on through the Spice Islands, the aroma which fills the air, combined with the glaring sun, is overpowering to our unaccustomed senses; but before we leave this part of

* As there are two distinct and very opposite genera of the same name, it may be as well to add, that the parasitical plant here spoken of is *Brugmansia* (Blume).

the world altogether we mean (in spite of the heat), when we reach the Philippine Islands, to land for a little while in Luzon. Here again we are struck with the beauty of the Tree-ferns, so universal within the tropics; the slender stems of the different kinds of one genus, called *Cyathea*, we here find growing side by side with the glossy shafts of the Arrow-root plant (*Maranta*), from the tubers of which the Arrow-root of commerce is obtained. The burning sun indeed beats on us still, go where we will; but the excitement of the new sensations we experience keeps us up, whilst we gaze with wonder at the bright green foliage of the forests. Nature here looks altogether different to what she does shrouded under a haze, as we generally see her at home; so we gaze until we can gaze no longer, and then, covering our eyes with our hands from the glare and heat, we plunge for shelter within the impenetrable shade of the forest.

We need not go through a long description of the appearance of this forest, as the general character of what we meet with there has so often been sketched; still, there are a few things we must especially look after; so having amused ourselves for a time with watching the apes and tiger-cats whilst they practise tight-rope dancing on the slanting

Lianas, we will begin our observations with that very remarkable kind of Palm which grows in the tropical forests of the Old World called the Cane Palm, or the Rattan Cane (a species of *Calamus*); they are "thorny climbers," which, like the other Lianas, "twine up the trunks of the trees to the very top, pass to the next tree, and descend its stem to the ground, from which they again run up. Attempts have been made to measure them, and though perhaps their greatest length has never been ascertained, some have been found four hundred, five hundred, and even six hundred feet long. The beautiful feathery leaves of these Cane-palms, which are twined with the stem round the trunks of the trees, assist not a little in enlivening and adorning these forests;" and they are no less useful than ornamental, for these are the kind of canes which are used in trade for manufacturing the seats of chairs, the backs of carriages, etc.

In the forests of Luzon we meet with Fig-trees too, growing in a most extraordinary manner; "flattened Fig-trees, which grow like a trellis, or sort of network, over the thickest trunks of other trees." There is a very large and handsome Fern also, a kind of *Polypodium*, which we have heard of as growing in the forests of the Philippines, which

strikes us when we see it as being very much like *Polypodium quercifolium.* "It sometimes entirely covers a large part of the branch on which it grows with its thick, bright brown, scaly roots; this beautiful plant, the fronds of which are two and three feet long, the sooner attracts the eye, as its root, leaves, and indeed all the barren fronds, are of a bright yellow colour, contrasting very peculiarly with the reddish-brown roots and the dark green around."

So inexhaustible are the forms and different manners in which the luxuriant vegetation developes itself, that even on the leaves of the parasitical plants themselves grow other and smaller parasites, "the beauty of which the microscope often first reveals." The leaves of the *Orchises* we rarely find without little *Jungermanniæ* growing upon them; even Lichens and Ferns are overgrown with them, and "if any little spot on the bark of the tree is left vacant, Lichens, Mosses, and *Jungermanniæ* fasten on it." Often and often as we loiter here a brilliant flower fallen to the ground betrays us into a vain attempt to ascertain from which of all the tangled mass it fell; and so the short day wears quickly on, till, in the midst of our speculations, it begins to show sudden symptoms of coming to an end. It is well we had ventured no further into the forest; for even now, as we

reach its limit, the sun is gone, and, but for the timely aid of the glowing full moon, we should have found ourselves in the dark.

After the oppressive heat of the day, how reviving is the delicious coolness of the night, so often a characteristic of the tropics! The moon, high overhead, is encircled by a halo of coloured rings; and here we see, what only in this part of the world it is possible to see, "the glorious spectacle of *all* the stars of the southern and northern heavens revealed at one glance;" our old friend the Great Bear, and the other northern constellations, assume "a remarkable and almost fearful magnitude, owing to their low position." And here, as we cast our eyes to earth again, a scene of far softer beauty than the interior of the forest is revealed to us by this flood of golden light. There is a river running by, the margin of which is fringed by the borders of the forest, which here abruptly terminates. Not coarse and rank is vegetation here, like that from which we have just emerged, but far more beautiful. The mass of verdure is still "adorned by splendid climbing plants;" an elegant species of Fern too here first attracts our attention; a "large-leaved *Lygodium* hanging down from the tops of the trees in festoons forty or fifty feet long;" and side by side

with it, the red trumpet-like blossoms of the *Bignonia grandiflora* "are suspended from the flower-stalks in clusters two or three feet in length." We will take such a scene away with us, to muse over in fancy on the long, long voyage of some nine thousand miles across the Pacific Ocean, which must be endured ere we shall hail the first sight of the Andes, on the coast of Peru.

Perhaps no earthly sight is so overpowering to the mind as a lofty range of mountains. The region to which our eyes and thoughts are raised whilst we contemplate them, is so far above the turmoil of this lower world, that quietness and awe and reverence raise us, for the time, to a better and more peaceful state of existence; even when partly shrouded from the sight in clouds, they read their own peculiar lesson to those who understand their language. No one, without seeing the Andes, can form any worthy notion of them; and as our imaginary voyage draws to a close, fancy is baffled whilst we try to make some picture to ourselves of their first shadowy outline as we near them from the sea. But though we can form no adequate notion of them as a whole, we may yet get some idea of them, bit by bit, from the descriptions which Meyen and other travellers on the Andes have given of different parts of them.

After all our high-raised expectations, truth nevertheless obliges us to own that disappointment is our prevailing sensation when we land on the coast of Peru. Instead of anything like the luxuriance of a tropical vegetation, sterility characterizes these shores of the Pacific Ocean; and except where the hand of man has brought portions of land into cultivation, Nature refuses to yield her produce. And so, in our disappointment we wander on, wishing that here and there, at least, the stern heights of the mountains were softened by green forests. But throughout the greater part of this western side of the Andes, so dried up and parched for want of water, our eyes are unrefreshed by sights like these.

Novelty in the only kind of vegetation which contrives to exist here, is the chief compensation for the absence of verdure; for very far removed from anything European in appearance are the different kinds of *Cactus* we now see everywhere; which, though some species are to be met with in more temperate climates, seem to reach their greatest perfection in this zone, and to delight in the intense heat and the dry barren soil, where scarcely anything else could live: they grow too at all elevations, "extending from the level of the sea almost to the limit of perpetual snow."

The species of the genus *Cereus* strike the eye as something strange, from their singular "pillar-like stems, some branched, others unbranched, the stem in some being three, four, five, six, seven, and many-cornered, in others more or less round;" sometimes indeed they creep on the ground, but when upright they have the appearance of columns, which stand collected together in larger or smaller groups. In Peru (and also in Chili) "there are wide plains, which, for vast distances, are covered solely by such groups of *Cerei*, and thus present a singular and striking, though cheerless, prospect;" particularly when, as often happens, some of these columns are dead, and still continue to stand after all their fleshy covering has disappeared,—straight, white, woody pillars in the midst of the green columns surrounding them, frequently adorned, and almost concealed, by a profusion of flowers seven or eight inches long.

The wood of the *Cactus* is applied to various purposes in the treeless regions of the western coast of South America; as it is very light it is easily carried up the mountains, and on the plateaux, which lie "far above all arborescent vegetation, doors and beams are made of it without any previous working." Some of the most beautiful of these columnar Cactuses were found by Meyen, close to the equator, above

the height of 7000 and 8000 feet. Another splendid species, which grows in a candelabra-like form, was found by him "clothing the sides of the mountains in a singular manner" on the Andes of Tacna and Arequipa, where scarcely a trace of any other vegetation was to be seen; "only here and there rose one of these strange *Cerei*, the stem of which divided, at the height of eight feet and upwards, into a number of branches—from eight to twelve in number—which were round, and twisted in various directions, sometimes upwards, sometimes downwards, or from side to side."

But the globular Cactuses, though not so showy, are some of the most curious of the tribe. "They are often of enormous size, with warts and thorns regularly distributed over the surface," and are seated directly on the barren ground or in the clefts of bare rocks. Their fleshy substance possesses, in a most extraordinary degree, the property which resides in all the tribe, of retaining a quantity of watery sap from one rainy season to another; so that when everything else is dried up, they look "fresh and green, and seem to thrive best in the most desert regions. They are eagerly sought after and sucked by the wild asses and other thirsty animals which roam over the dry deserts of South

America. In kicking off the prickly coat, these animals often injure themselves so much that they can no longer move about, and at last die. At times when there is a want of water, travellers usually open these juicy plants, which have been called the springs of the desert, with their knives, and thus enable the animals to enjoy the sap without danger."

One more species must be mentioned, which is found on the plateau of Southern Peru, near the limit of vegetation. "On this plateau there are seen mounds a foot or a foot and a half high, of a reddish-yellow colour, which are often mistaken from a distance for crouching deer." The reddish-yellow tint is produced "by thorns of that colour, two or three inches in length, which colour the whole surface of the mound."

These varieties of the Cactus have been mentioned more particularly, as being amongst the most peculiar features of the face of Nature on this side of the Andes; but as we have gradually advanced from the coast towards the interior, the increasing elevation of the mountains, and consequent diminution of heat, are indicated by corresponding changes in the vegetation, from tropical to that of the temperate zones, succeeded next by alpine plants.

In vain (as Humboldt reminds us) do we dwellers in the northern parts of the globe desire to see the foreign forms of warmer lands—the Palms and Bananas, Tree-ferns and Mimosas; but the inhabitant of this equatorial region may, if he will, pass through almost every variety of climate and every form of vegetation, as he ascends the Andes; and at certain elevations he may find "mountain plains covered with Cypresses, and Oaks, and Pines, with Barberry shrubs and Alders, nearly allied to our own species." He may look in vain, indeed, for our mountain Rhododendrons; but he will find representatives, nearly allied, and very much like them, called *Bejariæ*, above the height of 10,000 feet, and most probably at other and lower elevations as well, in company with an evergreen shrub called the *Escallonia*, which, with Oaks, etc., forms a mountain region here (it is something between a Currant and a Cranberry), and is found at different heights, from 6000 to 14,760 feet. Here too, at the height of some 9000 feet above the level of the sea, grow several kinds of the pretty Calceolarias.

Near the northern extremity of the coast chain of the Andes, between Barbula and the Lake of Maracaybo, we constantly meet with natives returning home with brimming pails of milk, concerning which we are thrown into a state

of great perplexity, since, so far as we can make out, no cows, or any other animals, are at all concerned in its production. Being determined to clear up the mystery, we resolve to watch the proceedings of these natives; and the next time they appear with their empty pails we follow at a little distance, till, to our still greater perplexity, they begin to collect round particular trees, in the bark of which they proceed to inflict deep gashes, from which, to our no little surprise, the milk pours forth into the pails.

And now the conviction darts through us that these must of course be the curious Cow-trees (*Galactodendrum utile*) of which we have so often heard, allied to the Nettle family; in South America they go by the name of Palo de Vaca. As Humboldt tells us, these trees appear to be peculiar to this locality; the Andes hereabouts lie between 8° and 10° north latitude. The milk has "an agreeable taste and aromatic smell; it is glutinous, tolerably thick, and destitute of all acrimony." Cheese also, or at least "a substance resembling it, forms on the surface when exposed to the air."

Having crossed the summit of that chain of the Andes nearest the coast, vast plains (here called *punas*) break on our view, the level of which is often higher than the tops of

the highest mountains in Europe.* These immense plateaux may be described as high valleys, connecting the two lines of the Andes, which run like a double chain from the northern extremity of South America to nearly four degrees south of the equator, where the inner chain ceases, and the plateau which united it to the coast Andes becomes lower. Throughout these level regions we may travel whole days and weeks without meeting with a single tree growing spontaneously; the nearest approach to such a thing (and this only at immense intervals) is an occasional miserable-looking shrub, called a *Polylepis* (one of the Sanguisorb tribe); or, more rarely still, the stunted trunk of another shrub, called a *Büttneria*, of the Natural Order *Calycanthaceæ*, which in structure comes nearer to the Rose tribe than to any other; it has square stems, with opposite simple leaves, and chocolate-coloured flowers of aromatic fragrance.

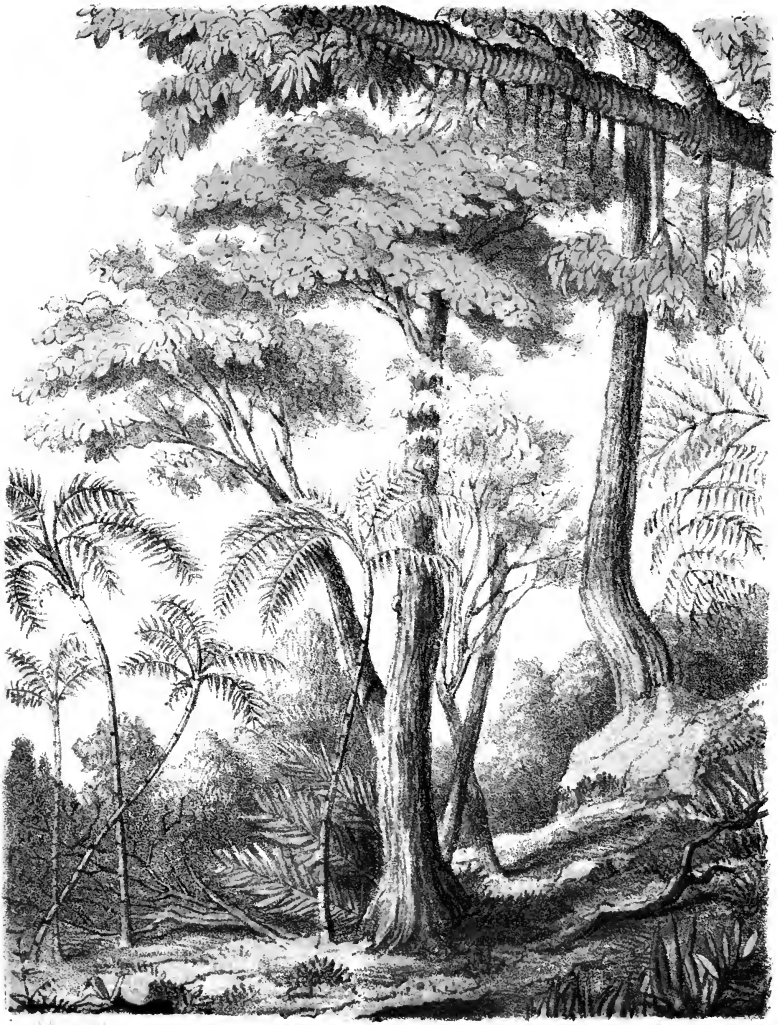
But even here our path may be sometimes said to be strewed with flowers, for the ground is often covered like a carpet with little Verbenas, in the same sort of way as the

* One, which occurs between Pelechuco and the Lake of Titicaca, lies at an elevation which is about 164 feet higher than the summit of Mont Blanc. The thermometer there sometimes stands at 14° Fahr., even in the sunshine.

beautiful purple flowers of the wild Thyme cover large spaces of our sandy districts at home; and interspersed with these grow tufts of *Bolax*, and a few other plants. Often whilst we pluck these flowers, as we rest awhile on our long journey, we raise our eyes to the still distant inner chain of the Andes, and wish ourselves on the other side, amongst all the beautiful sights which we know we shall meet with there.

The descent on the eastern side of this chain is fearfully precipitous till we reach the region of forest-trees, where it becomes more gradual, and from hence we may observe in the distance how the last mountain-ridges mingle with and subside into the undulations of the plains in the interior. Here, in this forest region, we are rejoiced with the sight of a combination of all those majestic forms and brilliant colours which Nature only wears within the tropics. Perhaps no region on the mountains can surpass in elegance that of the Tree-ferns, with which we first again renew our acquaintance at the height of some 3800 or 3600 feet.

On this side of the Andes "innumerable streams descend from the snow on the summits, and dash hastily down the precipitous mountain-sides; these are the first origin of the principal rivers of the continent. At first, like a milky



Vincent Brooks Imp.

Peruvian Bark Tree, p 291

thread, they tumble from rock to rock, or creep through the turf-like patches of Arctic plants; then, joining company with other springs, the stream becomes a torrent, which makes a deep bed for itself down the side of the mountain, till, lower down still, many of these ravines unite to form deep valleys, which are enclosed by rocky ramparts of many hundred feet in height.* Now, it is on the immense ridges which separate these valleys from each other that the *Cinchona*, or Peruvian bark-tree, is found growing in the midst of thick forests." The bark is chiefly obtained from the varieties of four different kinds—the grey, red, yellow, and white Cinchonas. The Cinchona belongs to the Natural Order of Madderworts (*Rubiaceæ*); it is very European in its appearance, and makes a striking contrast to the tropical forms around it. (Plate XVI.)

"The Indians who are employed in collecting the bark are often exposed to considerable danger," says Humboldt, "in climbing to the summits of the highest forest-trees, in order to obtain an extended view, from which they may distinguish the scattered, slender, and aspiring trunks of the Cinchona, by the reddish tint of their large leaves."

* "Plusieurs centaines de mètres d'élévation." A metre is rather more than three English feet.

There is reason to fear, as it occupies a very limited vertical region on the Andes, that as the life of the tree is necessarily sacrificed in taking the bark, the true Cinchona may become extinct within the next fifty years.

The upper limit of this narrow region is coincident with that of the high forest vegetation; the lower one is a little above the level of the plain; its extreme limits extend from about 3937 to 10,728 feet, the average height being somewhere between 5249 and 7874 feet. The mean temperature of this important forest region varies from 60° to 68° Fahr.

As a counterbalance to these narrow vertical limits, the horizontal range of the Cinchona region, which is chiefly on the eastern side of the inner chain of the Andes, may be traced like a narrow belt, more or less winding, from just beyond 10° north latitude to 19° south latitude; thus it extends over 29° of latitude. Near Loxa, at 4° south latitude, where the inner chain of the Andes disappears, the Cinchona approaches towards the sea.*

* The facts connected with the Cinchona, and most of those about the Andes, are taken from Dr. Weddell's 'Histoire Naturelle des Quinquinas.' The accompanying figure of the Cinchona, stripped of its bark, is also borrowed from this source.

The damp, hot valleys, shut in by the immense mountain-ridges upon which the Cinchona grows, must be those in which the tribe of Orchises grows in such rich profusion. "An entire life," Humboldt says, "would not suffice to enable an artist, although limiting himself to the specimens afforded by one circumscribed region, to delineate all the magnificent *Orchideæ* which adorn the deeply-excavated mountain valleys of the Peruvian Andes, sometimes resembling winged insects, sometimes birds, which the perfume of the honey has allured."

One great feature of the South American portion of this zone is formed by the pampas of Peru and the savannahs on the Orinoco. We must not imagine that their appearance is exactly the same as that of our own grass meadows on a larger scale. Extensive tracts indeed they are of green grass, but this is only in the rainy season; and the grasses, instead of forming a uniform covering, "are distributed in larger or smaller patches," and consist of different kinds to those we have in England. These wide plains are often wanting in the bright verdure of our meadows, "or it lasts but a short time, unless they are overflowed on the margins of lakes and rivers." An English eye too misses all the band of Buttercups and Marsh Marigolds, and Ladies'-

smocks, or Cuckoo-flowers; nor is there anything to take their place, except that in the wet season elegant little Mimosas grow in vast numbers together on the savannahs of the Orinoco, as well as some other plants, which are a kind of Sedge, with the less familiar name of *Kyllingiæ*.

How beautiful a contrast to these pampas and savannahs is the vegetation near the great river Amazon, and throughout that great tract of country watered by the numberless small rivers which flow into it, where excessive moisture and excessive heat combine to produce the perfection of luxuriance! A leading feature in the forest vegetation is formed by the Brazil-nut trees (*Bertholletia excelsa*). The water-plants are also very magnificent, if we may judge by the *Victoria regia*, specimens of which have of late been so successfully cultivated in some few choice hothouses of tropical water-plants, where it has been brought to flower beautifully in great tanks of tepid water. Though its appearance is now familiar to many, it is still too great a stranger to most to make a description unnecessary.*

The flower of the *Victoria regia*, which opens its petals at the close of day, plainly bespeaks it to be one of the

* This flower "was first discovered A.D. 1837, by Sir Robert Schomburgk, in the river Berbice, in British Guiana."—*Humboldt's 'Aspects of Nature.'*

Water Lily tribe (*Nymphæaceæ*); it has the same general character as our White Water Lily (*Nymphæa alba*), but is two or three times larger; the white petals deepen into a beautiful salmon tint at the base, the outer ones being reflexed, whilst the inner ones, which are narrower than the others, and of a rose-colour, stand erect, so as to form a kind of crown in the centre of the flower. The leaf is the most wonderful part of the plant when full-grown, not only on account of its great size—the diameter being sometimes above six feet—but for the prodigious strength of its nerves, which on the lower surface are developed in an extraordinary manner, and have a strong membrane attached to them, so that if the leaf, as it floats on the water, is turned up so as to show the under surface, the spaces between the crossings and recrossings of the nerves look like a number of cells—each about an inch or two deep—distributed regularly over the whole leaf; these, when filled with water, give support to the leaf throughout all its immense surface. When fully grown the margin of the leaf is turned up, so as to form a rim all round, of an inch or two in depth, which gives it an appearance which has been, not inaptly, compared to an old-fashioned circular tea-tray. The strength of the leaf is so great, that a little

child might stand on it with perfect safety, supposing some flat surface were first placed on it to prevent the feet from going through the green tissue in the spaces between the nerves.

Beautiful examples may be found in the part of the world where we now are, of the very various forms (before alluded to) which are to be seen in the Palm. "How majestic must be the Jagua Palms, which grow round the granite rocks of Atures and Maypures!" The falls of Niagara attract many a wanderer to North America, and we hear of this wonder of the world till we fancy we know exactly what it looks like; "let them live upon their praises;" but those who will come with us to South America, and join our excursion to the falls of Atures and Maypures, will be satisfied at heart with the wild grandeur of the scene. We must sail up the river Orinoco,—as far as we can, that is to say,—for our course is checked when we have made a hundred miles of our voyage, not by one, but by a series of cataracts, which render all further navigation up the river next to an impossibility.

Unlike the falls of Niagara, which are formed by one enormous mass of water precipitated from a height of a hundred and fifty feet, the cataracts of Maypures consist of

a countless number of small cascades, succeeding each other like steps, the highest of which are between nine and ten feet in height, the depth of the entire fall scarcely amounting to more than thirty or thirty-two feet. The peculiar and wonderful feature of these falls is not their height, but "the foaming surface, of several miles in length, intersected with iron-black masses of rock, projecting like battlemented ruins from the waters. Every islet and every rock is adorned with luxuriant forest-trees;" and here let us take our stand, where, amidst all the roaring and dashing of the waters over the granite rocks, rise up majestically the smooth slender trunks of the Jagua Palms to the height of seventy and eighty feet, towering like ranges of columns above the other trees of the forest; their erect foliage pointing heavenward with its gigantic leaves, which, seldom more than seven or eight in number, shoot up perpendicularly to a height of fourteen and sixteen feet, and pierce through the clouds of vapoury spray which clothe the troubled waters in a perpetual mist. The day wears away whilst we linger and gaze and listen, till at last the rays of the glowing evening sun fall upon the mist; and beautiful rainbow tints break forth, and add one more feature to all the grandeur and beauty that was there before. It is good to

dwell on scenes like this, for though seen only in imagination, they

> "Haunt us till they become a cheering light
> Unto our souls; . . . . .
> Nor do we merely feel these essences
> For one short hour."

And now, constrained at last to take our leave, how different to the Jagua Palms we have just left, but still how beautiful, is the luxuriant spreading foliage of the Fan-palms, which, just before the Orinoco plunges into the ocean, we see standing so thickly together on the banks, that they form a perfect forest. At times of inundation a strange scene takes place here; the natives are then indebted to these Palms for their safety, when "they live like apes upon the trees, in huts constructed upon mats, firmly bound to contiguous branches,"* canoes being their only means of locomotion.

Forests of Bamboo-reeds are another feature of the river-side vegetation in the Equatorial Zone. In New Granada they are spoken of by Humboldt as "growing uninter-

* According to Humboldt, the accuracy of this long-believed notion seems doubtful; Father José Gumilla, who twice visited the natives as a missionary, speaks indeed of pendent habitations supported by high pillars, but makes no mention of platforms attached to still growing trees.

ruptedly along the river Magdalena, in company with some Banana-leaved plants, called *Heliconiæ*." On the shady banks of this river too that curious climbing plant, *Aristolochia cordifolia*, was discovered by him, the wonderful flowers of which "are four feet in circumference, and are often worn in play as caps by the Indian children." But we must not loiter too long to admire individual flowers, however beautiful, as we have yet to learn something of the northern half of Brazil, and are anxious to see if it equals (for we are sure it cannot surpass) the southern provinces.

As we pass on thither, through the British territory of Demerara, we often traverse large tracts of land covered with forests of Cacao-trees, from the kernel of which chocolate and cocoa are prepared. The trees are small, with large leaves and little blossoms, constructed something like the Mallow, but belong to a tribe called *Büttneriaceæ*.

From Demerara we will take ship, and having passed the coasts of Guiana, we must sail up an arm of the Amazon, and land at Pará, just at that point where the Rio Guama flows into it, as from Pará we can readily make our way to the interior of the northern provinces of Brazil.

As we follow the course of the Rio Guama and observe the vegetation which clothes its banks, we cannot refrain from the

thought that even in the southern extremity of Brazil we saw no sights more beautiful than those we see here; for no less beautiful than peculiar is the appearance of the whole rows of Macauba Palms (*Acrocomia sclerocarpa*) which skirt the river-side, covered by a most beautiful climbing plant, called *Clusia alba*, which, like the flattened Fig-trees in Luzon, forms a cylindrical tube round the stems of these Palms to the height of thirty feet, from the surface of which spring the leaves and short branches, bearing beautiful white blossoms, as large as the white Camellia, and very much like it in appearance, the whole overshadowed from above by the noble crown of the spreading Palm.*

Such sights at the beginning of our journey raise high expectations, and we hopefully bend our steps in a southerly direction, through the province of Goyaz. We find much of the land brought into cultivation, and covered with plantations of Sugar, Rice, and Mandiocca (or *Cassava*); and

* The Clusias (*Guttiferæ*), though sometimes spoken of as parasites, like the tropical Ferns and Orchises before mentioned, are equally undeserving of the epithet in its strict sense, because they are by no means rooted, like parasites, upon the substance of the trees which support them, thriving at their expense on the nourishment they extract—repaying benefits by injury; on the contrary, the Clusias simply cling to the nobler tree, like a trusting and inseparable friend, bestowing beauty in return for strength and support.

where, still in its natural state, the character of the country is very varied. On the upland are dry grassy plains, thinly covered with *Vellozias*, and a beautiful little shrub of the natural tribe of *Lythraceæ* (or Loosestrifes), called *Diplusodon*, with a profusion of small rose-coloured flowers.

The Grasses on these upland *campos* are of various species, "nearly all of which are coarse and rank, and not well suited for pasturage;" they do not form a close turf, as ours do, but grow in scattered tufts, the intervals of bare soil being greater than the extent of grass-covered surface. This, however, is not apparent at first sight, for the culm is generally long, and when ripe and seen from a distance the *campos* appear as if covered with wheat or oats.

Besides such plants as that just before mentioned (the *Diplusodon*), many other flowering shrubs and beautiful herbaceous plants are found growing amongst the Grasses. One of the most ornamental is a bushy plant called *Kielmeyera;* one species (*K. rosea*, Mart.), which grows to about a foot and a half in height, produces numerous large rose-coloured flowers of five petals, which have gained it the beautiful name of *Rosa do Campo;* it belongs to the same tribe (*Ternstrœmiaceæ*) as the Camellias and the Tea-plant, and is more distantly related to the Clusias.

Amongst the herbaceous plants growing in such situations "the most beautiful are those belonging to the Gentian tribe; one of these, a species of *Lisianthus*, has large, blue, bell-shaped blossoms, not unlike those of the Foxglove (*Digitalis*) in shape;" and towards the end of the rainy season the fields are gaily adorned with two other flowers of the same tribe, which are both species of *Callopisma*. Amongst other field flowers there is a conspicuous one with spikes of large rose-coloured blossoms, belonging to the Orchis tribe (an *Epistephium*), which is a fine plant, about two feet high.

The trees on the upland *campos* are mostly small, consisting chiefly of the beautiful Sicupira (*Commilobium polygalæflorum*), of the Leguminous family, and with papilionaceous flowers, and of several of the very curious family of *Vochysiaceæ* (before mentioned in the last chapter), of which it is difficult to convey any idea, as they are unlike anything we are acquainted with in England; they are remarkable for the beauty of their large, gaily-coloured, and sweet-scented flowers. Perhaps one of the most beautiful of them is the *Salvertia convallariodora;* one of the divisions of the calyx is spurred; the corolla is composed of five petals, within which there is but one perfect stamen

and one pistil. Two other species of the same beautiful tribe grow in the same situations, *Qualea grandiflora* and *Q. parviflora;* besides Cecropias, a *Panax*, and many others, amongst which are several kinds of Mimosa.

The Mimosas however attain to a much larger size in the forests at the base of the *serras*, where one species, called *Angica*, is one of the largest of the trees. The pretty little Marmoset monkeys carry on their frolics amongst its branches, being attracted thither by a gum which this tree secretes, and which is a favourite kind of food with them.

There are some peculiarities and beauties in the vegetation of this part of Brazil, which are only revealed in the darkness of the night.—Being surprised by the sudden close of day whilst wandering in the neighbourhood of some elegant little dwarf Palms, and soon overtaken by darkness, our attention is attracted by a bright phosphorescent light of a pale greenish hue, which at first we of course suppose to be emitted by fire-flies, but soon discover to be produced by a phosphorescent kind of Fungus, of from one to two inches and a half in diameter, which grows on the decaying leaves of these Palms; the Brazilians call it *Flor do Coco*. "The light given out by a few of these Fungi in a dark room is sufficient to read by." The species belongs to the

genus *Agaricus*, and having been first discovered by Dr. Gardner, is named after him *Agaricus Gardneri*.*

But however beautiful vegetation may be in some parts of Brazil, we cannot travel far into the interior without discovering that perpetual verdure is by no means the universal rule. In those regions where the atmosphere and the soil are destitute of the proper degree of humidity, the fall of the leaf takes place as in our colder zone. There is, however, "a striking change in the relations of the different seasons;" for the trees, instead of appearing leafless in winter, there shed their leaves in summer: the same effect which lack of heat produces upon the trees in our forests is there occasioned by want of moisture. Nor is it only the trees which lose their leaves, for even "the herbs vanish, without leaving a trace of their existence." The light forests of Brazil, called *Catingas* (Plate XVII.), exhibit this phenomenon; so beautiful a description of them is given by Von Martius, that a part at least of it must be here borrowed from him.† "Everything around us," he says,

* "There are other species of the same genus which exhibit a similar phenomenon, namely, *Agaricus olearius* of De Candolle, and another very large one, occasionally found in Australia, which is described in Hooker's 'Journal of Botany,' vol. i. p. 215."

† As quoted by Meyen.

" was stamped with a peculiar and, to us, a strange character, and filled the mind with sadness. The thick forest appeared to us like a vast tomb, for the dry season had stripped from it all the leaves and flowers; only here and there thorny species of *Smilax*, or long shoots of *Cissus*, bearing a few leaves, climbed on the trees; or the stately blossoms of the Pine-apples (*Bromeliæ*) rose up amongst the branches like gigantic arms, in the dark blue ether. . . . Myriads of ants had hung on the trees their dwellings full of labyrinths, which were several feet in circumference, and by their black colour singularly contrasted with the bright grey of the leafless branches. The autumn-like wood resounded with the cries of various birds, chiefly araras and paraquitoes. Shy armadillos and ant-eaters met us amongst the high mounds thrown up by the busy ants, and sloths hung stupidly on the white branches of the Ambauba (*Cecropia peltata*), whilst troops of apes appeared in the distance."

But these forests are a far different scene during the cooler season, on account of the beauty of their foliage. Amongst the many large deciduous trees with beautiful blossoms which grow in these Catingas is one called *Caryocar*, belonging to the small family of *Rhizobolaceæ* (allied

to the *Clusias*). This tree is found only in the hottest parts of South America; the leaves are jointed, the shape of the leaflets being similar to the leaves of the Portugal Laurel, and the blossom, which has five most regular petals, each an inch in length, looks like a beautiful large star, or rather like a star in a mist, for a peculiarity which distinguishes it is a multiplicity of hair-like stamens, twice the length of the petals, which extend on all sides far beyond the corolla.

Some of the species of a tree called *Gomphia* (Natural Order *Ochnaceæ*), with dense clusters of flowers, are also easily distinguished from the rest by the size and symmetry of their magnificent elliptical leaves, sometimes as much as seven inches long and four broad. One more tree (belonging to the *Verbena* family) must also be mentioned for the beauty of its leaves,—the *Vitex*. The blossoms, which grow in axillary clusters, are not very large; neither are the leaves (which are trifoliate) remarkable for their size; but, in one species, the beauty of their colour and texture gives them the appearance of the softest light green velvet.

One of the commonest trees of all in these Catingas is the *Magonia glabrata*, St. Hil. (Nat. Ord. *Sapindaceæ*). This tree exhibits the propensity which so rarely exists in the tropical woods and forests, to grow gregariously, to the

exclusion of almost everything else; it covers the country for miles together. "Like many of the other inhabitants of the Catingas, its flowers appear before the leaves; they are of a greenish-yellow colour, and of a very sweet scent, and grow in large panicles. The fruit is a large, dry, triangular capsule, filled with broad flat seeds, from the kernels of which a kind of soap is manufactured by the natives."

Not only do strange contrasts exist in the appearance of vegetation at different periods of the year, owing to the alternation of long rainy and dry seasons; but in the country round the great Rio San Francisco, during the period of its inundation, the strange anomaly presents itself to the eye at one glance, of a scorched-up vegetation on the upper country, surmounting the most luxuriant verdure on the level plain below. The reason is, that the rainy season is not simultaneous in the different provinces of Brazil; so that during the dry season in Bahia and Pernambuco,—between which the widest part of the Rio San Francisco rolls,—the southern provinces, where the springs of the great river rise, are daily deluged with rain, which for some six months together gradually swells the river, till, at the widest part of all, it floods all the country round.

But however fertile the country may be near the banks of the river, "the greater portion of the interior of central Brazil is of a desert nature;" "a dry arid tract," from which we turn in disappointment to seek for more pleasing sights in the neighbourhood of the sea-coast. Even there our road sometimes leads through marshy country, or, by way of contrast, through a dry sandy hollow, where not a breath of air is to be felt, and where we are oppressed and almost suffocated with the heat which is occasioned by the reflection of the rays of the midday sun from the white sand.

The marshy tracts however are not without botanical interest, for some of the pools we meet with there "are gay with the yellow flowers of *Limnanthemum Humboldtianum*" (of the Gentian tribe), a plant not unlike our own *Villarsia*, or Fringed Bog-bean; whilst others, "under the shade of a thicket of giant Palms, are quite covered over with *Pistia stratiotes*, a plant nearly related to the Duckweeds of England, but of a much larger size." The water-plants in the lakes are very beautiful. There is a lake near Olinda, the surface of which is "covered with thousands of the splendid large white blossoms and broad floating leaves of a Water Lily (*Nymphæa ampla*, DC.), and intermingled with

them grow the yellow flowers of *Limnocharis Commersonii* (Nat. Ord. *Butomaceæ*), and a large Butterwort (*Utricularia*)." But some caution is necessary in securing specimens of these flowers, as we cannot reach out our hand to pluck one without running the risk of being snapped at by one of the many alligators with which this lake abounds.

There is a very curious water-plant called *Cabomba aquatica* found growing in little streams of clear water, "which to the botanist is a most interesting plant, as, both in habit and structure, it forms a transition link between the *Ranunculus* family and that of the Water Lilies;" the flowers are very much like a Buttercup in character, and the leaves are of two kinds, in which it resembles the Water Ranunculus: the floating leaves are nearly round, with the stalk in the centre, the submersed leaves being cut into fine segments. In the same situation we likewise find a pale blue-flowered *Pontederia*, and some Cryptogamic water-plants called *Marsilea*.

Amongst the plants we meet with whilst travelling along level roads is a Sensitive Plant with "delicate pink heads;" "several different kinds of this curious plant grow very abundantly all over the northern parts of Brazil." Another plant which we constantly find growing by the roadside is

one of the Composite family, "the thistle-like *Ampherephis aristata*;" and our path is also "gay with the large pale yellow flowers of *Turnera trioniflora*," one of a small and curious tribe of plants, rather resembling the *Cistus* tribe in point of habit, but differing considerably from them in their structure; they have also a degree of resemblance to the Mallow in the twisted arrangement of the corolla.

As we approach the most eastern part of the Continent, "which is fully exposed to the influence of the trade-winds all the year round," we are refreshed by the "cool climate" which prevails there; though even there, where the country is flat and the soil sandy, the dry season tells on the appearance of the herbaceous vegetation. The *Mimosa* hedges in the neighbourhood of Olinda, like those at Rio, are grown over with "a slender kind of Jessamine (*Jasminum Bahiense*, DC.)," and wreathed with climbing plants, among which the most abundant is one of the Leguminous Order (*Stizolobium urens*); and the most singular, perhaps, a large species of Dodder (*Cuscuta*), with long, yellow, cord-like branches.

"For many miles round the town the Cocoa-nut and other large Palms grow in the greatest profusion, mixed with fine trees of the Cashew-nut (*Anacardium occiden-*

tale), the Orange, the Bread-fruit, and the Jack (*Artocarpus integrifolia*)." And on the high bushy hills in this neighbourhood a wild fruit-tree grows plentifully, which the Brazilians call the Mangaba (*Hancornia speciosa*); "it is a small tree of the Natural Family *Apocyneæ*, the small leaves and drooping branches of which give it somewhat the appearance of the Weeping Birch. The fruit is about the size of a large plum, of a yellow colour, but streaked with red on one side, and is of a delicious flavour."

We must however spend no more time on the Brazilian flora, as we have to learn something of the African portion of the Equatorial Zone before we arrive at the conclusion of our long travels; of the sea-coast plants in this part of South America we can therefore mention but few, such as "those curious mossy Cacti (*Melocactus depressus*, Hook.)," and two shrubs which are "common all along the coast of Brazil," *Sophora tomentosa*, of the Leguminous family, with foliage like the North American Acacia (*Robinia*), and a kind of wild Clove, *Eugenia Michelii*.

As a matter of course we find Mangrove-trees growing in numbers on the muddy shores, but we shrink from too near an approach to them, as such situations abound with mosquitos. As Mangroves are amongst the last sights we

see on leaving South America, so, after we have crossed the Atlantic, are they the first we behold on the coast of Africa; and still, as we sail up an African river, we have Mangroves for some distance along the shores. Here, instead of seeing everything burnt and dried up by the excessive heat, we are agreeably surprised by the sight of beautiful green savannahs bordering the river, and interspersed with clumps of trees.

We are soon reminded on what quarter of the globe we have set our feet, for as our eyes wander over the grassy plain we observe in the distance something like a dark cloud gradually crossing it, and drawing nearer and nearer, and we experience quite a novel sensation on discovering that this cloud, when we see it closer, is nothing more or less than a herd of huge African elephants coming down to drink.

If it were not for the heat, which prevents our enjoying existence here, there are sights of beauty without number to make us happy; after the rains especially, when the open plains are richly strewed with the flowers of different bulbous plants. The Cocoa-palms too here give their own peculiar tone to the scenery, and as long as we stay near the coast we find them everywhere.

As we wander on we now for the first time gaze with wonder at some monster trees, which can be no other than the mighty Baobabs (*Adansonia digitata*), commonly called Monkey-bread-trees, which are supposed by some to be as old as the world itself, and whose trunks are said to be the largest in the world in circumference; the measurements given by different writers range between seventy-seven and one hundred and four feet, the height being not more than thirty, which disproportion must give them a very uncommon appearance; the branches extend in every direction, and are covered with thick foliage. The Baobab belongs to a family called *Sterculiaceæ*, but they are relations of the Mallows. The blossoms, which are bright white, and immensely large, are extremely beautiful; as soon as day dawns they open their petals, and close them again when night comes on. The fruit, which is about nine inches in length, is protected by a greenish kind of shell or husk; withinside there is a quantity of yellowish-white cakey powder, of a sweet acid taste, attached by fibres to the seeds, which are imbedded in pulp like the seeds of a Cucumber. The fruit however is not so cylindrical as a Cucumber; but bulges a good deal on one side, and ends almost in a point. The leaves of this tree are a beautiful cinquefoil. But the root

is perhaps the most wonderful part; as reason would lead us to suppose, the underground foundations are proportioned to the size of the tree above ground, to enable it to stand against the tremendous force of the hurricanes which so often occur in its native land. The principal root is supposed to descend even deeper into the earth than the trunk ascends above; and from this main root branch out other smaller ones in all directions, often as much as three feet in diameter and a hundred feet in length. When these trees attain a certain size the trunk almost always begins to decay, and becomes hollow; and the caverns thus formed are so large that several Negro families sometimes take up their abode in them; and they frequently make use of them as a place of common resort, where they meet to smoke and chat.

Banyan-trees are also said to be natives of West Africa, which, as they are a species of Fig, must also be added to the list of the Nettle's grand relations; very little reliance can, however, be placed on this assertion, as no mention is made of them in Hooker's 'Niger Flora.'*

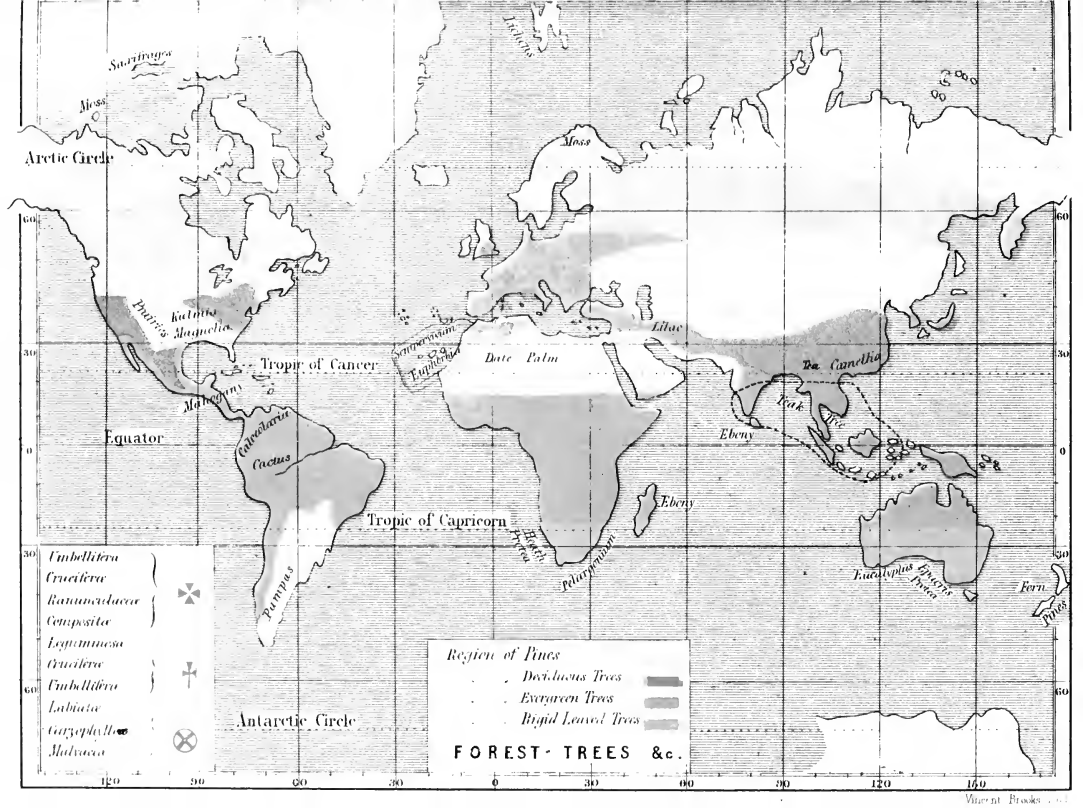
* In that part of Dr. Hooker's Introductory Essay to the 'Flora Indica' which alludes to the relation of the Indian flora to that of tropical Africa, he specifics, indeed, the tribe of Figs amongst several others which are common to both, but says nothing of the Banyan (*Ficus Indica*); "few cases," he adds, "of specific identity are known to us, bnt we confidently believe that many will be found to exist."

The scenery in some of the open tracts of this part of Africa surprises us by its park-like character. It is described by travellers as "exquisite, presenting hill and dale, distant mountains, streams, and verdure; picturesque but small villages, patches of Indian corn, and clumps of shrubs and trees interspersed through a green plain." The Mimosa-trees, with their finely-cut foliage, form a beautiful feature in the vegetation; and the whole is enlivened by singing-birds, some of them not unlike the nightingale. Round the Negro villages Millet, Maize, and Yams are cultivated; and Rice seems to be commonly seen growing wild in the hottest parts of Africa.

As to the African forests, it is impossible to think without a little sinking of the heart about venturing into them; we should be so haunted with the possibility of being obliged to form a more intimate acquaintance than we wished with all kinds of wild beasts, from elephants and lions to hyænas and chimpanzees, that to attain sufficient composure for botanizing, would require an unusual degree of nerve; and in this land of snakes it is not an impossible contingency, that, having sat down to rest, as we think, on the fallen branch of a tree, we might discover that we had taken a seat by mistake on a boa-constrictor in an after-

dinner state of repose. Besides, a violent hurricane might chance to come on, and to be in one of these forests during a hurricane is said to be more awful than being exposed to a storm at sea. All Nature utters a cry of distress at the approach of these tornadoes; "the boisterous wind catches the tops of the gigantic trees, and shakes the branches and trunks against each other; the air is filled with a fearful rushing, thundering, rattling, and crashing; even the strong Lianas are torn asunder, and the broken branches and stems fall to the ground. Great numbers of the parasites are thrown down from their lofty situations, and the trees are stripped of their fruit, which, generally cased in a hard shell, falls to the ground with a loud crash. The rain, at first warded off by the thick canopy of foliage, now falls in so much the greater masses, and adds to the horrors of the moment; almost all the inhabitants of the forest betray their fear by mournful howling and crying; the apes, the large bats, and the whole host of birds, call loudly all together, and the croaking of the tree-frogs and others of this family, sometimes like the sound of a drum, discloses the great misery of the moment;* . . . the serpents creep for shelter under the fallen leaves, or disappear among the bushes, hiss-

* Meyen.


Saxifrages
Moss
Arctic Circle
Lichens
Moss
Pinus
Kalmia
Magnolia
Tropic of Cancer
Sarracenia
Lupinus
Date Palm
Lilac
Tea
Camellia
Peak
Aloe
Ebony
Mahogany
Equator
Cabbage tree
Cactus
Ebony
Tropic of Capricorn
Heath
Proteas
Pelargonium
Eucalyptus
Grass Trees
Fern
Pines
Pampas
Umbellifera
Cruciferæ
Ranunculaceæ
Compositæ
Leguminosæ
Cruciferæ
Umbelliferæ
Labiatæ
Caryophylleæ
Malvaceæ
Region of Pines
Deciduous Trees
Evergreen Trees
Rigid Leaved Trees
FOREST-TREES &c.
Antarctic Circle
60
30
0
30
60
120
90
60
30
0
30
60
90
120
150
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ing as they go; the monkeys huddle together on the trees; the rhinoceros grunts loudly as he forces his way into the thickest part of the jungle; the sloth, unable or unwilling to move, utters loud cries of distress; whilst the panthers, leopards, and hyænas crouch down, and the lion walks uneasily from place to place; and all in the common danger seem to forget to be at enmity;"* . . . "the insects only, which long before announced the coming uproar, are now silent, and keep close on the under surface of the leaves until all is over, and the sun shines brightly out again."

In the interior of the forest, even if we ventured into it, we should again find the same dense kind of vegetation which characterizes all the tropical forests; the lofty Palms, the elegant Tree-ferns, the many-coloured Orchises and epiphytical Pothos plants, the twining Passion-flowers and Aristolochias, and a tangled web of many other climbing plants, with bright-coloured flowers, all luxuriating in the damp, hot atmosphere and soft green light; so that we will but wander round the edge, or content ourselves with straying a little way into it, admiring the luxuriance of the aromatic Jessamine as "it sweeps the ground from the tops of the highest trees," overpowering us with its wide-scat-

* From the 'African Wanderers,' by Mrs. R. Lee.

tered scent. Pine-apples too (*Bromeliæ*) we may gather if we will; not like the hothouse Pine-apples, but a reddish kind. And here, in this African heat, as parched with thirst we pluck an orange from the tree or taste the cooling Tamarinds, we adore the goodness of God, which has arranged such fitness between the hot climate and its refreshing fruits.

Botanizing a little as we go, we find the Tamarinds belong to the Leguminous family; and presently we fall in with a tree of the Myrtle tribe, which we find is the Guava. On the outskirts of the forest we are attracted by "bright green Plantains, and the slender Palm, shooting up from the dark foliage of the neighbouring fruit-trees,"—a sure index that we are near human dwellings; and, to our surprise, we suddenly come upon a large wide street of well-built Bamboo-houses with gable ends, thatched with Palm-leaves, and stained with red and yellow ochre. Here and there huge trees cast a vast shade across the street, affording a cool retreat from the sun; their trunks enwreathed with the Convolvulus-like *Ipomœæ* in full blossom, pale blue or deepest violet, mingled with the yellow flowers of a climbing plant called *Thunbergia*, the calyx of which is two-lipped, and the corolla more or less irregular.

It is very interesting to trace, in the accounts which travellers give of some parts of the eastern side of Africa which are included in the Equatorial Zone, a general resemblance in the vegetation to that of the western portion. One remarkable difference is however to be noticed, in our finding the Vine growing wild at a place called Axum, in Abyssinia, about 14° 10′ north lat. and 38° 45′ east long.; the grapes grow "in sufficient quantities for making wine, and might succeed admirably if cultivated, from the nature of the climate and soil."*

The same kind of park-like appearance which characterizes some parts of Western Africa occurs sometimes on the eastern side. We read of the country to the west of that just mentioned being "generally hilly and tolerably well wooded, of shady valleys and extensive cornfields, of a road running through hilly and rocky country, and winding through woods of Acacias and other shrubs; then, by way of contrast, sandy districts occur, covered with large bushes, —sometimes scattered, sometimes thick together,— and forming an almost impassable jungle; or a vast, open, grassy plain is described, the grass of which is like dry hay, with "apparently a great variety of flowers growing amongst

* From 'Life in Abyssinia,' by Mansfield Parkyns, Esq.

it," only one of which is specified, namely, a scarlet Aloe, which, like our Gorse, appears to flower at all seasons; and the many varieties of Mimosas, with their different-coloured flowers—pink, yellow, and white,—appear to be spread over the whole face of the country,—whether rock or plain, hill or valley; when in blossom emitting a fragrance so powerful as to perfume the whole neighbourhood.

Most of the trees are thorny, and chiefly of the *Mimosa* tribe; the thorns of some are about two inches and a half long, and as thick at the base as a large nail; in others they are short and curved, growing in pairs, "which catch you like the claws of a hawk." Where a beautiful stream runs through the plain the grass is bright green, and on the margin are copses and plantations, in which "the effect of mass and colour is so well distributed, that you might imagine it carefully arranged by a landscape-gardener of the most exquisite taste." Next we meet with "a well-wooded ravine, with a brook running through it;" and near the river Mareb, on the southern limit of Nubia, we are again put in fear of our lives, by traces in the sand on the water's edge of every species of animal, from the elephant, the lion, and the buffalo, to the tiny hoof-print of the gazelle; trails of snakes and serpents too there are of every size, from a boa-constrictor to a small viper.

Here too, in many parts, we again find the Jessamine growing in profusion, but principally on the hills; and a beautiful parasitical creeper, called *Æschynanthus*, with bright, dark-green, fleshy leaves, and brilliant scarlet flowers; and out of the mingled rock and bush on the slopes of the mountains, "where the soil is far from fertile," some of the monster Baobabs (here called *Dima*-trees) rear their ancient heads, whilst watercourses murmur through the valleys below.

Let us rest under the shade of one of these Baobab-trees, let us hide from the glare of the sun, let us cease from our wanderings, let us tell over in memory the things we have seen, and trace out in thought the gradual development we have watched,—from the time when we wondered at the miniature Willows in the Polar Regions, to this hour when we sit sheltered under the gigantic Baobab.

But, after all, what we have seen seems but to have given us a glimpse of an inexhaustible world of wonder; and when we remember the two hundred thousand different plants, including known and unknown, which, according to a computation made by Meyen,* are distributed over the

* It will be remembered that 50,000 has been before mentioned, on high authority, as the most probable number of *known* plants.

earth, the few with which we have made acquaintance are indeed like a drop in the ocean. Whilst lost in all these thoughts, our fingers have been busily at work pulling to pieces one of the large white Baobab blossoms; it certainly reminds us, in many respects, of a common English Mallow, a connection which surprises us no less than the discovery we formerly made, that the great tropical Fig-trees and Breadfruit-trees and Banyan-trees are all relations of the Nettle; and we apologize mentally, but sincerely, to all the English wayside Mallows and Nettles, for not having respected them, as of course we should have done, if we had known what noble blood was flowing in their veins: and we get quite into an allegorical train of thought, the general drift of which is, that even so in the human family, true nobility of nature is often indiscernible by the multitude, when wanting the outward appliances of rank and riches. But, as we wake from our reverie, our eyes are still resting on the Mallow-like flower from which this train of thought arose; and from Mallows and Nettles our thoughts now wander on to other English sights, and to English scenes,—to the green fields and meadows, wild woods and wild flowers; and there our thoughts shall rest, while we give thanks that our lot has been cast in the land of the Beech-tree, the Oak, and the Elm!

CHAPTER IX.

DISTRIBUTION OF BRITISH PLANTS, AND THEIR RELATIONS WITH THE DIFFERENT FLORAS OF THE CONTINENT.

Reflecting as we cannot but sometimes do now all our travels are over, on the many strange lands we have visited, and all the new forms we have seen, it is, we own, with a slight sense of self-reproach that we remember how in traversing the Colder Temperate Zone "we sailed by the white cliffs of Britain," in our haste to see new lands, without setting foot on the shore,—as if there were nothing in our own country which could be either new or interesting!

And, truly enough, to have then stayed to investigate the distribution of our native flowers would have excited some feelings of impatience, when we were bent on visiting foreign lands; but now we look round at their familiar faces again, with the quiet sense of enjoyment which we

feel in the society of old friends, when we know we can enjoy it at leisure; and acknowledge that whilst we have been making grand acquaintances in foreign lands, we may have seemed neglectful of the treasures which lay at our feet.

New things we little thought of too, we have to learn of their history, or rather old things—wonderfully old, though new to us. For learned men who read the earth we live on, as other men read books, have lately interpreted some interesting pages, which tell strange tales about the ancestry of our flowers, and prove their origin to be so remote, that the human race itself, compared with them, is modern.

And other things as strange, if not more strange than this, they tell; about how their ancestors passed over dry land to England and Scotland and Ireland, from France and Germany and other lands (some even boast a Spanish origin); and how, after several colonies of them had settled in different parts, the land broke up and left them on an island. Since which time a remarkable exclusiveness has been observed by most of the families of different origin; so that the French flowers have kept to their own circle, and but seldom, if ever, mix up with the Spanish ones; and, in the same way, the Scandinavian families have always

been cold and distant to those that came from the Channel Islands.

Some of the colonists which migrated from Central and Western Europe,—such, for instance, as Daisies and a species of Crowfoot, the Primrose and the Little Celandine,—have indeed broken down this exclusiveness in some measure, and have contrived to make themselves so welcome everywhere, that, let them wander where they will, they always seem at home.

It has been well said that "geology gives us the same sort of bewildering view of the abysmal extent of time, which astronomy does of space;" and when we hear the strange things which geologists tell us, about the previous history of our own island, and the antiquity of its flora, we realize the truth of this saying. There is a curious old picture of the Deluge, in a mansion belonging to the Montmorency family, in which a remote ancestor of that ancient house is represented as swimming after the Ark, with a roll of parchment in his mouth, containing the family genealogy. But though we smile at the boasted antiquity of the race of Montmorency implied in this picture, we must be prepared to listen as to something much more like sober truth, when we are told of long eras before man was created on the earth, during which the ancestors of the flowers which now

clothe our island were blooming and filling the air with their odour.

By a recent theory which has been put forward by the late lamented Professor Edward Forbes, he supposes that England is proved, by the identity of the species both of its animals and its plants (its fauna and flora) with those of adjacent countries, to have been at some previous time united to them. As flowers are the subject with which we are concerned, we will confine our attention to them. As a necessary basis of this theory, it is first assumed that all the individuals of each distinct species have descended from a single flower, or, in the case of monœcious and dicœcious plants, from a single pair; and it is stated that the very idea of a species implies that the individuals which compose it are thus related to one another. This is called the existence of a *specific centre*.

To show, by contrast, the probability that plants of the same identical species have been thus disseminated from one original centre, Professor Forbes points to the fact that species which are found in situations so remote (for instance in opposite hemispheres) as to forbid all idea of any pre-existing connection, are *not* found to be exactly alike,—they are not *identical*, that is to say, but only representative.

He then points to another fact, namely, that the same

kind of difference is known to exist in species discovered in a fossil state, when found at wide distances from each other, which, like those last named, are not identical, but only representative.

And then attention is drawn to the opposite truth, that when certain conditions, suited to particular plants, may be traced over a continuous area (whether in the present state of the surface of the globe, or, by the assistance of geology, in some previous and far different one) species which *are identical* range throughout.

The inference which is drawn from these three facts is, that when we find plants of positively *identical* species growing in lands which are near to, but severed from, each other, these lands must at some time have been connected; and that over the continuous area which they formed, plants gradually spread from one original centre.

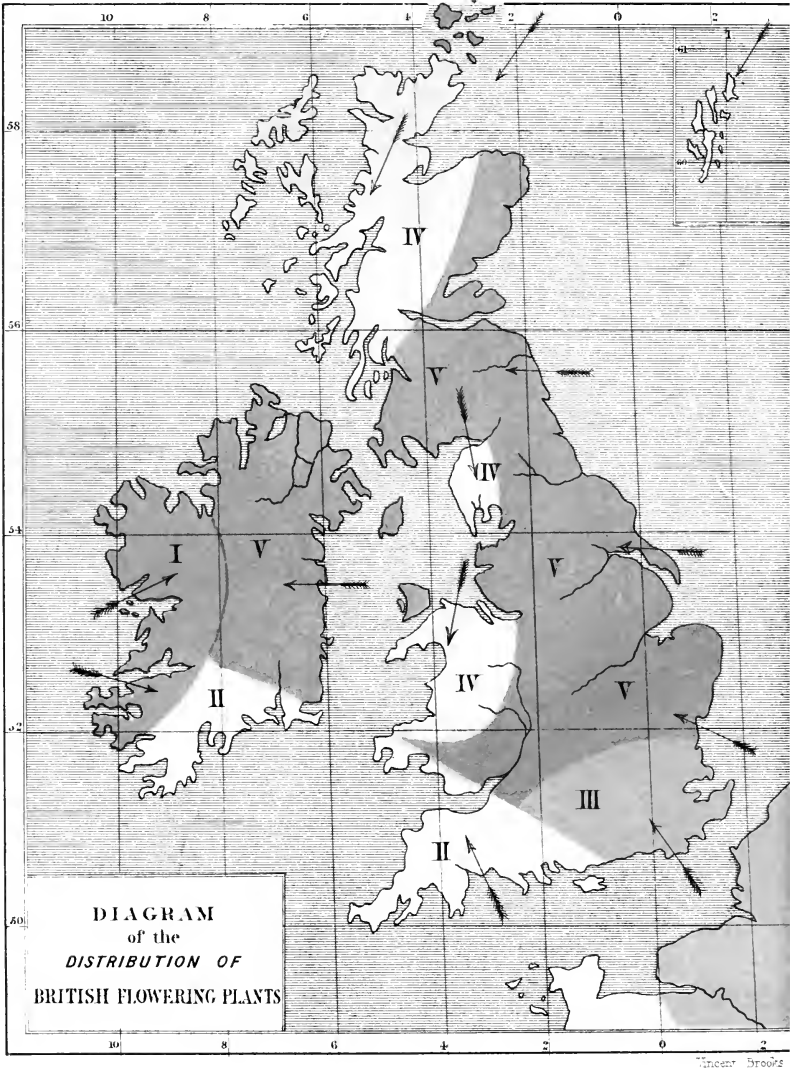
There are many naturalists who, though they regard species as permanently distinct, nevertheless account for their extensive distribution by a plurality of parents, or original centres; but the contrary opinion, as was said before, is a necessary basis of Professor Forbes's theory.

He further thinks that, in the first place, the character of the English flora is not distinctive enough to warrant a

belief that England possessed within its own limits a special flora, created originally within those limits; and we are moreover reminded that its species are *identical* with those of the Continent.

There is, indeed, another manner in which an area of land often becomes gradually covered with plants, namely, by the means of transport with which they are provided; such, for instance, as seed-down, or by the agency of currents of water which convey the seed, or by that of birds. But with regard to some portion of the British flora, such a method is considered unlikely; first, because the plants themselves are not adapted by their nature for such transport; and, secondly, because certain groups of plants on which the theory rests are not *universally* dispersed over our islands,—as we may conclude they would have been (had they been transported), by the same means which first introduced them,—but are "congregated in such a way as to form distinct regions or provinces, which have remained unchanged as long as we have any record," sketched out moreover "in the likenesses of distant and distinct lands."

As neither of these two methods—original creation within the island, or that of transport into it—appears adequate to account for the distribution of plants which now exists, a



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third is suggested as being the most probable one,—that, namely, of migration over land, which implies that a continuous surface must formerly (though perhaps at different times) have connected the British Isles with different parts of the adjacent countries.

The arguments on which the theory rests are chiefly geological and zoological, and are only to be fully appreciated by those who are skilled in those sciences; but without attempting to follow the reasoning through all its mysterious windings, it will be enough for the present purpose to convey the result to which it leads.

In the botanical part of the argument Professor Forbes has illustrated his theory by a modification of certain botanical provinces into which the British flora has been mapped out by Mr. Hewett Watson, who "first drew attention to the various elements of which the flora is composed, and grouped the species into botanical provinces." A classification of the British mountain flora, with regard to different zones of elevation, has been likewise worked out by the same learned botanist.

There are five distinct regions in which particular plants are grouped (Plate XIX.), which, as was stated before, "have their likenesses in distant and distinct lands:"—

I. The mountainous districts of the west and south-west of Ireland are characterized by the presence of a few prolific species. "The nearest point of continental Europe, where these plants are native, is the north of Spain."

II. In the south-west of England and south-east of Ireland the flora includes a number of species not elsewhere seen in the British Isles, and is intimately related to that of the Channel Islands and the neighbouring part of France.

III. In the south-east of England, where rocks of chalk most predominate, the vegetation corresponds with "the opposite coast of France."

IV. The species which compose the British mountain flora are, with one exception, identical with many of those on the mountains of Scandinavia.

V. "The general flora of the British Isles, which is everywhere present, alone or in company with the others, is identical as to species with the flora of Central and Western Europe," and is styled *Germanic*.

Before telling over the names of all the different species, which respectively characterize these five distinct provinces, we ought to have some notion of the various changes which the surface and outline of the countries in question have undergone, and of the different epochs during which the

different floras are supposed to have migrated. It will assist us in forming such a notion to take a glance at a map of Europe, across which we must imagine a line drawn, intersecting England and Ireland in the middle, and continued eastward till it strikes against the Ural chain. During an epoch, called the glacial epoch, which is said to have been immediately antecedent to the present state of our globe, all the immense space on the north of this imaginary line is supposed, from the remains which it still contains, to have formed one vast icy sea, of which the Ural Mountains, which were then a sea-side chain, formed the eastern boundary; the mountainous parts of Scotland, Wales, and part of Ireland forming groups of comparatively low islands in this glacial sea. It is believed to have been of a very similar nature to that which now bounds "the north-eastern coast of America, within the line of summer-floating ice." Over this icy medium the mountain (or Alpine) flora is supposed, from the peculiarities of its character, to have migrated from Scandinavia.* The climate of the whole of Northern and part of Central Europe was then very different from what it is now, and far colder, which is "indubit-

* The peopling of the Scotch mountains by means of iceberg transport of seeds is however objected to by Dr. Hooker.

ably proved by the remains of the marine animals found in the strata deposited in that sea."

Having thus accounted for the Alpine flora, we must next conceive that, in the course of time, the bed of this great glacial sea was upheaved, till at last, that which before had been sea, became dry land. The islands were by this process connected with each other, and converted into mountains; and the plants of a sub-arctic character, which before had been growing at the water's edge, now found themselves on the tops of these mountains. It is over the land thus formed that the plants of the Germanic flora (from central and western Europe) are now supposed to have migrated; which is thus proved to be of more recent date than the mountain flora.

It will be remembered that of the two floras which characterize, one of them the south-east of England, and the other the south-west of England and the south-east of Ireland, the first is said to have had its origin in the opposite coast of France, and the other in the Channel Islands and neighbouring coast of France. Their arrival is very simply accounted for by a theory, the truth of which "no geologist doubts," according to which the two sides of the English Channel were anciently united; and, as the south of Eng-

land and of Ireland are thought to have remained "in all probability unsubmerged during the glacial epoch, they may have come over either before, or during, or after that period. There are strong reasons for believing they migrated before."

At a subsequent period to the introduction of the four floras already mentioned, they became isolated by a fresh remodelling of sea and land, when the formation of the English Channel separated England from France, and cut off the flowers which had travelled thence from their original connections; when also the other coasts of England were shaped by the formation of the German Ocean, which separated it from the rest of the Continent; and, by the reconversion of land into sea, by which it was separated from Ireland, the Irish Sea being "scooped out" of the dry and choked-up bed of the old glacial sea.

But much older than any of these floras is that one supposed to be, which characterizes the mountainous districts of the west and south-west of Ireland, and corresponds, as we are told, with that of the north of Spain. By Professor Forbes's theory, there was at an ancient period (anterior to that of any of the floras already considered) a close approximation, if not a connection, of Ireland with Spain; which is a startling suggestion when we remember the immense dis-

tance which lies between them. One of the grounds alleged for this opinion is the discovery of beds of marine deposits "at elevations from 2000 to 6000 feet" in a part of the Taurus chain of mountains now included in the Turkish province of Anatolia,—the Lycian Taurus of ancient geography. From their nature and position it is inferred that at the close of a particular epoch, called the miocene (of a still earlier date than the glacial epoch), the bed of a vast sea, corresponding to the Mediterranean of the present day, and to that part of the Atlantic which washes the western shores of Europe, became "uniformly elevated," and thus converted from sea into dry land.

Another argument adduced is the position of a great semicircular belt, formed by a kind of Seaweed, called Gulf-weed (*Sargassum bacciferum*), ranging between the 15th and 45th degrees of north latitude, and constant in its place; which, being apparently an irregular form of a Seaweed well known to be a coast-line plant (*Sargassum vulgare*), is supposed to indicate the line of coast of an ancient land, once extending "far into the Atlantic—past the Azores," over which that part of the Irish flora here spoken of "might with facility have migrated.* And not only is the existence

* Dr. Hooker dissents from this way of accounting for the origin of the Gulf-weed.

of this intermediate land, as was said before, said to have been prior to the glacial epoch, but its destruction is likewise supposed to have taken place before that period.

Additional reasons for believing this part of the Irish flora to have migrated over land are afforded; first, by the fact that the few species (not amounting to twenty) which compose this flora are all members of families whose seeds are not well adapted for flight through the air; and, secondly, by the circumstance that no marine currents set in such a direction as to have conveyed them by water to the coast of Ireland. "The remarkable point concerning these plants is, that they are all species which at present are forms either peculiar to, or abundant in, the great peninsula of Spain and Portugal, and especially in Asturias. The probability of the ancient existence of a land extending far into the Atlantic is further borne out by the fact that the flowers of the groups of islands between the Gulf-weed bank and the mainland of the Old World are all members of *one* flora."

These changes in the relative position of sea and dry land, which were probably gradual, and effected during the course of long ages, are all dated by geologists, it must be remembered, as previous to the time when man became an inhabitant of the globe, when the period called "the

historical epoch" commenced. We are further told, that during the earliest stages of this historical period vast forests probably covered a great part of the area now occupied by the British Isles, out of the remains of which the great peat-bogs are partly formed. It surprises us to hear of ancient forests of the Spruce Fir (*Pinus Abies*) having existed on the coast of Norfolk, which tree is now no longer an inhabitant of our island, but is only to be found in the far north.

In the days of those forests such animals as hyenas and tigers, rhinoceroses and others, were natives of these islands, and the reindeer ranged nearly as far south as 52° of latitude.

If our minds have been accustomed to contemplate the almighty power of our Creator with awe and reverence, when we read in Holy Scripture what it has pleased Him to reveal to us of a portion only (as we must believe) of His doings,—revealed, as it would seem, as being more particularly connected with the history of the human race, —how greatly are these feelings increased when we hear of traces still remaining of many remodellings of the earth, each different state lasting through long ages, and one following another in an almost intelligible succession.

This is a long and rather singular introduction, perhaps, to a list of some few of our British plants; but it will be with a new and deep interest that we shall now read over their names, and next time we meet with them we shall, at all events, find them more suggestive than they were to the unreflecting mind of Peter Bell.

As a proper mark of respect to the most ancient group of the British flora (No. I.), we will first look through the list of flowers supposed to be of Spanish origin, which characterize the mountainous districts of the west and south-west of Ireland, as modified by Professor Forbes from Mr. Hewett Watson's 'Remarks on the Geographical Distribution of British Plants.' It must be borne in mind that in all the five different groups only those species are included which, by their peculiarities, give a distinct character to each. Those which distinguish this ancient Irish flora are very few in number, though widely spread.

Of these few plants the majority consists of Saxifrages and Heaths. There are no less than six different species of Saxifrage:—*Saxifraga umbrosa, S. elegans, S. hirsuta, S. Geum, S. hirta,* and *S. affinis.* The first-named of these, *Saxifraga umbrosa,* is very familiarly known to us all under the name of London Pride, though with regard to its sub-

posed origin, it might have been more suitably named "Spanish Pride." *Saxifraga hirsuta*, which has yellowish blossoms dotted with purple, has the same kind of general character, except that it is longer in the stalk, and has fewer blossoms; the leafstalks too are longer, and it is altogether a less luxuriant-looking plant. *Saxifraga Geum* bears a still closer resemblance to London Pride, the chief difference being in the leaves, which are nearly round, and thinly besprinkled on the upper surface with white hairs; there is something very beautiful in the regularity of the little rounded scalloping of the leaves.

There are four different species of the Heath family in this small assemblage; namely, *Erica Mackaiana*, *E. Mediterranea*, *Arbutus Unedo* (the Strawberry-tree), and *Dabœcia polifolia*, which last belongs to the tribe *Andromedidæ;* it is the same as *Andromeda Dabœcii* or *Menziesia polifolia*. The little hard leaves, with which it is thickly covered, are white underneath, and the conspicuous four-cleft blossoms are much larger than those of any of our English Heaths.

There are only two more flowers in this group, one of the *Cruciferous* family, called Fringed Rock-cress (*Arabis ciliata*), and one of the Butterworts (*Pinguicula grandiflora*), which is exactly the same in appearance as the common Butterwort, except that it is rather larger.

The next group of flowers (No. II.), which characterize the south-west of England and south-east of Ireland, though "not met with elsewhere in the British Isles," are "intimately related, it will be remembered, to those of the Channel Isles and the neighbouring part of France." Before enumerating them, Professor Forbes gives the following list of plants which do not extend further than the Channel Isles, but amongst which the group of plants to be afterwards named are found growing interspersed. Such, for instance, as a species of Crowfoot (*Ranunculus ophioglossifolius*); Wallflower Mustard (*Sinapis Cheiranthus*); *Erucastrum incanum*,—the same flower with a new name, as *Sinapis incana*, a rare plant, found in Jersey and Alderney by Mr. Babington. One of the Leguminous family comes next, Sand Joint-vetch (*Arthrolobium ebracteatum*); one of the *Compositæ* family, called the Jersey Star-thistle (*Centaurea Isnardi*); a species of Toadflax, *Linaria Pelisseriana;* a kind of Viper's Bugloss, *Echium violaceum*, strongly resembling *Echium vulgare*, with its prickly leaves and pretty pinkish-blue bell-blossoms, except that it is rather a larger plant, with the stem branched, instead of simple, and the upper leaves heart-shaped and slightly clasping the stem; the blossoms too, as the name implies, are of a more violet-

like tint. There are besides an Orchis (*Orchis laxiflora*); a species of Garlic—Small Round-headed Garlic (*Allium sphærocephalum*); and two Ferns which have been recently found there,—*Gymnogramma leptophylla* and *Ophioglossum Lusitanicum*.

A list of plants is then given, which are natives both of the Channel Islands and of Devonshire and Cornwall, but which do not extend beyond that corner of England. The plants included in this group are such as White Mountain Rock-rose (*Helianthemum polifolium*), which has nothing at all to do with Roses, as its name might mislead us to suppose, but is a shrub, with blossoms like those of the Gum Cistus on a small scale (except that the beautiful liver-coloured spot is wanting), and with a multiplicity of little hoary leaves rolled up at both edges. The elegant French Tamarisk (*Tamarix Gallica*) and a St. John's-wort (*Hypericum linearifolium*) are peculiar to this part of England; also a yellow-blossomed Wood-Sorrel (*Oxalis corniculata*), with a branching stem spreading upon the ground; a kind of Bird's-foot Trefoil (*Lotus hispidus*); one of the Knot-grass tribe, Sand Strapwort (*Corrigiola littoralis*), a little delicate-looking plant spreading on the ground, with clusters of minute blossoms at the end of the stalks; a plant called

All-seed (*Polycarpon tetraphyllum*), of the Natural Order *Paronychieæ;* a species of Hare's-ear (*Bupleurum aristatum*); Cornish Lovage (*Physospermum Cornubiense*), and Acrid Lobelia (*Lobelia urens*), a most elegant plant, rather more than a foot high; the leaves, which are large and inclined to egg-shaped at the bottom of the stem, gradually become lance-shaped towards the top; the blue two-lipped flowers are arranged at a little distance from each other at the upper end of the stem, the corolla projecting far out of the calyx. Another very beautiful plant is *Erica ciliaris*, which grows to the size of a shrub; the blossom is rather large, but its chief beauty consists in the multiplicity of its minute but symmetrical leaves; they are egg-shaped, and edged with a fringe of hairs so fine that they would scarcely be perceived till looked at close. A wild Sage (*Salvia clandestina*) stands next in the list of these rare plants, which includes only two more, the Autumnal Squill (*Scilla autumnalis*), which differs chiefly from the Vernal Squill in having no bracts and in the flowers being rose-coloured instead deep blue; and last of all, though not least rare, the yellow Crocus-like *Trichonema columnæ*, though, properly speaking, it belongs to a different division of the family of Irids. It is the same plant under another name as *Ixia Bulboco-*

dium; the very narrow leaves, which are tightly rolled up, stand up twice the height of the flowers. *Trichonema Bulbocodium* is another name for the same flower, the only difference being that the blossoms are pale purple.

These Devonshire and Cornwall plants are mentioned by Professor Forbes in connection with a particular kind of snail (*Helix revelata*), which is found within the same geographical limits, and thrives in the same mild climate. He then names a few additional plants which inhabit both the south-east of Ireland and the south-west of England, though the number of plants of this type to be met with in Ireland is small.

These are, a wild Stock (*Matthiola sinuata*), with the leaves toothed here and there irregularly; a kind of Cress (*Senebiera didyma*); one of the Medicks (*Medicago denticulata*), with spirally-twisted pods, which however is also found on the coasts of Kent and Norfolk; Wild Madder (*Rubia peregrina*), the flowers of which are very like those of the common yellow Bedstraw, but the leaves, which grow about four in a whorl, are of a beautifully-defined elliptical shape, and are very rough at the edge; the small Snapdragon (*Antirrhinum Orontium*), which is also found, to say the truth, in many parts of England; a kind of Toadflax (*Linaria*

Elatine), which, it must be owned, is equally common, and *Linaria Italica;* the Balm-leaved Figwort (*Scrophularia Scorodonia*), Cornish Moneywort (*Sibthorpia Europæa*); the Cornish Heath (*Erica vagans*), which grows to the size of a shrub, with rose-red blossoms; one of the Gentian family, *Cicendia filiformis*, or *Gentiana filiformis*, a little plant from two to six inches high, with a small blossom at the end of the slender, thread-like stalk. Water Germander (*Teucrium Scordium*); this also, though a rare plant, is to be found in other parts of England as well; it grows in the neighbourhood both of Oxford and Cambridge. Water Featherfoil, or Water Violet (*Hottonia palustris*), which is also to be met with elsewhere, though not common; it grows at Oxford in the ditch surrounding Christ Church meadow. This plant, "which vies in beauty with many of the most admired exotics," would have been more appropriately named the Water Primrose; in a dried state it looks like a cluster of Primroses on a long stalk, springing out of a bunch of finely-cut seaweed; but in its living state these finely-cut leaves are under water, the lilac-coloured blossoms alone rising above the surface. Such are the plants, which, with some others, have their favourite *habitat* in the south-east of Ireland and the south-west of England.

The plants which characterize the next group (No. III.), and are said to be common to the chalky parts of the south-east of England and to the opposite coast of France, are a species of Shepherd's Purse (*Thlaspi perfoliatum*).* A kind of Flax, with blue flowers (*Linum perenne*). The beautiful golden-blossomed Broom (*Genista pilosa*), which, with that disregard for theories which some flowers seem determined to show, is also the glory of some of the lofty hills in Wales. The crimson-blossomed Saintfoin (*Onobrychis sativa*). The elegant red-berried Bryony (*Bryonia dioica*), not uncommonly found elsewhere. A kind of Bur-parsley (*Caucalis daucoides*), which from its similarity when in blossom to most others of the Umbelliferous family, is difficult to identify, but may be easily known in fruit by the array of hooked prickles with which the ribs of the fruit are armed (which constitute its resemblance to the Carrot), as well as by its carrot-like, finely-cut leaves. The small Teasel, or

* This plant, indeed, is only found at the present time in Oxfordshire and Gloucestershire, where it still survives, having once spread probably over a much wider district. This is an example of what Professor Forbes expressly states respecting the so-called chalk-growing plants,—that "the attachment of such plants to chalk *is an accident*, and not an essential habit of the species; the preference is simply for calcareous districts."

Shepherd's Staff (*Dipsacus pilosus*). A species of Fleabane (*Inula Conyza*). One of the Knapweeds (*Centaurea Calcitrapa*) called the common Star Thistle, which, with the contempt of rules before alluded to, is to be found in various parts of England. Round-headed Rampion (*Phyteuma orbiculare*). The handsome but rare Marsh Gentian (*Gentiana Pneumonanthe*), with large deep-blue blossoms, which, though included in this list, is also to be met with in Norfolk and in the north of England. Three of the Mulleins, *Verbascum Lychnitis*, or white Mullein, which, though more rare, is much less showy than some of the family, from the small size of its blossoms; the common *Verbascum Thapsus*, or Great Mullein; and *V. Blattaria*, Moth Mullein. Meadow Sage (*Salvia pratensis*). Yellow Bugle (*Ajuga Chamæpitys*). The common Box-tree (*Buxus sempervirens*). Black Bryony (*Tamus communis*), which is by no means peculiar to this part of England. Many species of *Orchis*, and the beautiful climber, with a name as beautiful—Traveller's Joy (*Clematis Vitalba*), which is mentioned as belonging both to this group and to the last.

It is remarkable that this group of flowers, like the last, is found in company with several different species of snails, and other mollusca, which characterize this district; and

that a corresponding peculiarity exists in the species of insects.*

The plants of which the group is composed which characterizes the British mountain flora (No. IV.), and which are identical in species with those on the mountains of Scandinavia, are found in the greatest number on the mountains of Scotland, a "progressive diminution of Alpine forms" being observed towards the south. The first plant of this northern stamp which "disappears southwards," called Norwegian Sandwort (*Arenaria Norvegica*), is "confined to the most northern of the Shetland Isles." The plant next mentioned is a beautiful little Primrose (*Primula Scotica*), which grows in the Orkney Islands and on the northern shores of Scotland, but extends no further southward; but in Norway it was discovered growing in abundance by Professor Forbes. The blossoms of this pretty little Primrose grow about five in a cluster, on a stalk not more than three or four inches long; the colour is a pale violet. The calyx and the leaves

* "Les animaux doués d'une faculté de locomotion peu développée, comme les mollusques terrestres, ceux qui vivent dans les eaux douces, et les insectes particuliers à certaines plantes, out une distribution géographique basée sur les mêmes lois et les mêmes conditions que les végétaux."—*A. De Candolle's 'Geographie Botanique Raisonnée.'*

on the under side look as if they were tinted with a painting brush of a delicate greenish-yellow.

The following is a list of plants which are all found on the Scotch mountains, but are not to be met with on those of England; namely, a species of Whitlow Grass (*Draba rupestris*), *Lychnis alpina,* or red Alpine Campion, which, from the dense head in which the rose-coloured flowers are clustered together, rather differs in character from the rest of the *Lychnises.* A kind of Milk Vetch (*Astragalus alpinus*); one of a singular-looking tribe, from the comfortable-looking covering of silky down with which most of them are covered, as if for protection from the cold; those which grow on the mountains are armed at all points with a fierce array of long and very sharp thorns, sometimes four inches long, as if defying any one to pluck the blossoms; we have made acquaintance with it before in the Arctic Zone. The little Red Sandwort (*Arenaria rubella*), *Sibbaldia procumbens,* the rare drooping bulbous Saxifrage (*Saxifraga cernua*), and the little Alpine Brook Saxifrage (*S. rivularis*); we remember them both in the Polar Regions. A small shrub of the Heath family, called Black Bearberry (*Arbutus alpina,* or *Arctostaphylos alpina*); the fruit looks very much like a cranberry: this too we met with in the Arctic Zone, and it

is one of the many hardy old friends we expected to meet with again on the mountain-tops. Another shrubby plant of the Heath family, *Phyllodoce cærulea*, called also *Menziesia cærulea ;* a shrubby little plant, though not more than four or five inches high, with blue blossoms, and thickly-set yew-like leaves. *Azalea procumbens*, another Arctic Zone plant; it belongs to the Rhododendron section of the Heath family. The little blue-flowered Alpine Gentian (*Gentiana nivalis*), a Scorpion Grass (*Myosotis suaveolens*), Alpine Speedwell (*Veronica alpina*), and Rock Speedwell (*V. saxatilis*). A small shrubby Willow (*Salix arenaria*), and a little dwarf Birch (*Betula nana*), seldom more than two feet high.

Besides these, there are several species of Rushes, Reeds, and Sedges; and a few other plants are named, "which, though less truly Alpine, are not found south of Scotland;" such as *Pyrola uniflora*, a yellow-flowered Butterwort (*Pinguicula alpina*), a species of Bugle (*Ajuga pyramidalis*), an Orchis of the section *Neottieæ* of Lindley, which is so unfortunate as to possess three different names, *Goodyera repens*, R. Br., *Neottia repens*, Swartz, and *Satyrium repens*, Linn. Another of the same family, called Coral-root, of the tribe *Arethuseæ* (Lindley), and in the same sad predicament, being

known under the different names of *Corallorhiza innata*, *Cymbidium corallorhizum*, and *Ophrys corallorhiza*.

A few more plants of the same Scandinavian type reach the north of England, as Dwarf Cornel (*Cornus Suecica*) another Arctic Zone plant; the involucre which surrounds the little blossoms looks like a corolla of four petals; *Linnæa borealis*, which we have also met with before, and one which we remember in the forests of Siberia, called Chickweed Wintergreen (*Trientalis Europæa*), a rare and beautiful flower of the Primrose family.

Only a few plants of this type are found on the Welsh mountains, but amongst these few are some of the most characteristic, as Alpine Rock-cress (*Arabis petræa*), a Mouse-ear Chickweed (*Cerastium alpinum*), with blossoms rather large in proportion to its humble height of some three or four inches, the rare orange Alpine Cinquefoil (*Potentilla alpestris*), Hairy Stonecrop (*Sedum villosum*). Two Saxifrages, *Saxifraga muscoides*, a starved-looking little plant, with but a few flowers on a very short stalk, the leaves lying close to the ground; and *S. nivalis*, which, in contrast to the last, has clusters of blossoms on a stalk sometimes eight inches high; Alpine Fleabane (*Erigeron alpinum*), two little Willows only two or three inches high (*Salix reticulata*

and *Salix herbacea*); the last of the two, it will be remembered, is one of the few plants to be met with in the Polar Regions; and besides these, two species of Rush (*Juncus filiformis* and *J. triglumis*).

A few plants of the Scandinavian connection are also to be found, we are told, in Ireland; and the same kind of confirmation of the theory is said to be derived both from the presence and the absence of particular species of animals.

One more group remains to be spoken of,—the Germanic (No. V.), the commoner species of which, as was before stated, are to be met with everywhere, such as the Daisy (*Bellis perennis*), the common Primrose (*Primula vulgaris*), upright Meadow Crowfoot (*Ranunculus acris*), the small Celandine (*Ficaria ranunculoides*), Hairy Cardamine (*Cardamine hirsuta*), and all our most common trees and shrubs.

But the westerly direction in which the plants of this group are supposed to have migrated is thought to be more clearly indicated by observing the localities of its rarer species, some having never advanced beyond the eastern counties of England, and others, though stretching over considerable tracts of England and Scotland, having never found their way to Ireland.

Those plants limited to the east of England are such as the Pasque-flower (*Anemone Pulsatilla*), common Mouse-tail (*Myosurus minimus*), Tower Mustard (*Turritis glabra*), a plant called Smooth Sea Heath (*Frankenia lævis*), though not in any way connected with that family. Jagged Chickweed (*Holosteum umbellatum*), with flowers arranged in umbels of four or five together; it grows on walls and roofs about Norwich and at Bury. A species of Knawel (*Scleranthus perennis*), rather a poverty-stricken little plant which grows in sandy fields; a species of Southernwood (*Artemisia campestris*), Crested Cow-wheat (*Melampyrum cristatum*), two of the Speedwells (*Veronica verna* and *V. triphyllos*), and the Water-soldier (*Stratiotes aloides*), that pretty flower, with its pure white blossoms, and its bunches of leaves looking like so many heads of Pine-apples floating on the water; by no means confined however to the eastern counties, being also found in Cheshire and Yorkshire. One more flower is mentioned as limited to the east of England; a two-leaved Orchis, which (still more unfortunate than the one before mentioned) has had no less than seven different *aliases* imposed upon it, to the great mystification of its identity, and the extreme confusion of inexperienced botanists. As those who know it under one name might fail to recognize it under

the rest, it will be best to give them all, as follows:—*Sturmia Loeselii*, *Liparis Loeselii* (Rich.), *Malaxis Loeselii* (Swartz), *Cymbidium Loeselii* (Swartz), *Ophrys Loeselii*, (Linn.), *O. liliifolia* (Hudson), *O. paludosa* (Fl. Dan.).

The flowers next mentioned are those which have travelled far across England, but have failed to find their way to Ireland. A kind of Meadow Rue (*Thalictrum majus*), a large straggling plant, with pretty deep blue-green, triply pinnate leaves, which grows on bushy hills; the Hairy Crowfoot (*Ranunculus hirsutus*); *Diplotaxis tenuifolia*, one of the Cruciferous family, and strongly marked with the family likeness, Alpine Shepherd's Purse (*Thlaspi alpestre*), red German Catchfly, or Rock Lychnis (*Lychnis Viscaria*), Wood Stitchwort (*Stellaria nemorum*), a thorny kind of Broom (*Genista Anglica*), a Milk Vetch (*Astragalus hypoglottis*), the beautiful common Dropwort (*Spiræa Filipendula*), Spring Cinquefoil (*Potentilla verna*), Scottish Lovage (*Ligusticum Scoticum*), an Umbelliferous plant with more individuality of character than some of the family, from its handsome, well-developed leaves; small Marsh Valerian (*Valeriana dioica*), small Scabious (*Scabiosa columbaria*), clustered Bellflower (*Campanula glomerata*); the rare yellow Star of Bethlehem (*Gagea lutea*), more generally

known perhaps under its old name of *Ornithogalum luteum*, and the Sweet Flag (*Acorus Calamus*), which is an interesting plant, as being the only representative of the family (*Acoraceæ*), which is a native of Europe. It grows something in the same way as the Arums, except that the spike of flowers, or spadix, is not enveloped by a rolled-up leaf, or spathe, but grows bare and unprotected out of an opening in (what looks like) the stalk, but is properly speaking the spathe metamorphosed so as to look like one.

It would be a great omission if we were to quit the subject of the Geographical Distribution of British Plants, without becoming acquainted with the characteristics which distinguish the different zones of altitude on the British mountains, which we will do under the guidance of Mr. Hewett Watson, who, in his 'Cybele Britannica,' has reduced the result of his observations on many different mountains and hills to something like a systematic arrangement. The method adopted is this :—The order in which plants were observed to occur in succession in descending different mountains, and on different sides of the same mountains, is given in separate columns.

These lists of plants are then compared together, and a strong general correspondence is found to prevail amongst

them. Some of the more conspicuous species are thus ascertained to observe the same relative position to each other, though not always growing at the same absolute height. For instance, in comparing three of the lists together, the beautiful but common Heath, called Ling (*Calluna vulgaris*), is found at a greater elevation than the Juniper, and the Juniper higher up than the Cross-leaved Heath (*Erica Tetralix*). In the same way *Erica Tetralix* grows above the Broom (*Genista Anglica*), and *Genista Anglica* above the Sweet Gale (*Myrica Gale*), or the common Brake (*Pteris aquilina*).

These conspicuous plants, growing at different heights on the mountains, are then made use of as landmarks, which indicate the commencement of the different zones, each of which is characterized by the presence or absence of certain species.

As a specimen of the method pursued, we may be allowed to borrow one list of plants which was made on the highest, or nearly the highest, of the Grampian Mountains, Benmuich-dhu, the summit of which is said to be more than 4000 feet above the sea. The flowering plants which grew immediately round the cairn, which marks the highest point, are first mentioned in a separate group by themselves, being

only six in number of species, namely, Moss-Campion (*Silene acaulis*), a Sedge (*Carex rigida*), a species of Grass (*Festuca vivipara ?*), two kinds of Rush (*Luzula arcuata* and *L. spicata*), and the little Willow (*Salix herbacea*). The first-named of these plants, Moss-Campion, has rose-coloured flowers, and grows together in dense tufts and patches.

The plants are then given which are met with in succession, in descending from the cairn to the station occupied by *Calluna vulgaris*, at the height of 2690 feet, which marks the lower limit of this zone:—A Rush (*Juncus trifidus*); the shrub called Bilberry (*Vaccinium Myrtillus*), with handsome egg-shaped leaves, something like those of the Myrtle; Alpine Hair-grass (*Aira alpina*); a Violet (*Viola palustris*), with pale blue blossoms streaked with purple; common Crowberry (*Empetrum nigrum*); Alpine Ladies' Mantle (*Alchemilla alpina*), with a shining satin-like lining to the deeply-divided leaves; a Sedge (*Carex panicea*); a Saxifrage (*Saxifraga stellaris*); a little plant with small yellow blossoms, called *Sibbaldia procumbens;* common Sorrel (*Rumex Acetosa*); Marsh Marigold (*Caltha palustris*); another species of Bilberry, or Whortleberry (*Vaccinium uliginosum*); another Grass (*Aira flexuosa*); a

species of Club-rush (*Scirpus cæspitosus*); common Cotton-grass (*Eriophorum angustifolium*); a Willow-herb (*Epilobium alpinum*); Mountain Bramble (*Rubus Chamæmorus*); a species of Rock-cress (*Arabis petræa*); Scurvy-grass (*Cochlearia Grœnlandica* or *Anglica*); common Thrift (*Armeria maritima*); a kind of Hawkbit (*Apargia Taraxaci*); Field-rush (*Luzula campestris*); a Bedstraw (*Galium saxatile* or *procumbens*), not unlike the kind commonly called Cleavers; sweet Vernal Grass (*Anthoxanthum odoratum*), with only two stamens; and *Azalea procumbens*, where we reach the lower landmark of this zone, the common Ling (*Calluna vulgaris*, 2690).

In the next, and very limited zone, which lies between the *Calluna vulgaris* and *Juniperus communis*, only three species of plants are mentioned; namely, the rather singular-looking Grass (*Nardus stricta*), growing in dense tufts, with bristle-like leaves of some five inches long; Yellow Cow-wheat (*Melampyrum pratense*), and the *Potentilla Tormentilla*, with its pretty yellow blossoms; our next landmark, *Juniperus communis*, grows at the height of 2660 feet.

The next zone lies between the *Juniperus communis* and the Cross-leaved Heath (*Erica Tetralix*), and contains the following species:—Mountain Cudweed (*Gnaphalium dioi-*

cum), a cottony plant, with white or rose-coloured composite flowers; a Hawkweed (*Hieracium alpinum*); the Round-headed Sedge (*Carex pilulifera*); *Orchis maculata;* common Butterwort (*Pinguicula vulgaris*); Dog Violet (*Viola canina*); a Crowfoot (*Ranunculus acris*); the pretty Eye-bright (*Euphrasia officinalis*); the shrub, so often mentioned before, called Cowberry (*Vaccinium Vitis-Idæa*), with myrtle-like leaves and clusters of drooping bell-shaped blossoms; a species of Grass (*Molinia cærulea*); the little blue Harebell (*Campanula rotundifolia*); Great Wood-rush (*Luzula sylvatica*), and *Juncus squarrosus;* another kind of Cotton-grass (*Eriophorum vaginatum*); Meadow-rue (*Thalictrum alpinum*); Yellow Rattle (*Rhinanthus Crista-galli*); the pretty Milkwort (*Polygala vulgaris*); Red Bearberry (*Arbutus Uva-ursi*); and here the *Erica Tetralix* shows us that we have reached the lower limit of this zone (2370 feet).

The species observed in descending from the station of *Erica Tetralix* to that of the Thorny Broom (*Genista Anglica*) are, first of all, a Sedge (*Carex flava*); Bog Asphodel (*Narthecium ossifragum*); a species of Rush (*Juncus supinus*); the Sundew (*Drosera rotundifolia*), that curious little plant so well known to many by description, but

which all have not the luck to find; Scottish Asphodel (*Tofieldia palustris*), of the Natural Order *Colchicaceæ;* one of the Orchis family (*Habenaria albida,* or *Satyrium albidum,* or *Orchis albida,* or *Platanthera alba*), the Orchis blossoms, on a very minute scale, make it a pretty and interesting plant; the Lousewort (*Pedicularis sylvatica*), with pretty rose-coloured blossoms (which is specified as growing upon the mountain on which this list of flowers was made at the height of 1838 feet); another Sedge (*Carex pauciflora*); another species of Sundew (*Drosera Anglica*); Golden-rod (*Solidago Virgaurea*); the Scotch Fir (*Pinus sylvestris*); a species of Cat's-ear (*Hypochæris radicata*), with large yellow composite flowers; and, marking the boundary between this zone and the next, we find the Thorny Broom (*Genista Anglica*).

In the next zone, which lies between *Genista Anglica* and the Sweet Gale (*Myrica Gale*), only two species of plants were met with,—the common Heath (*Erica cinerea*) and a kind of Bitter Vetch (*Orobus tuberosus*), the Sweet Gale (*Myrica Gale*) being found at the height of 1400 feet.

Below this limit, or at about this limit, the face of Nature has been changed by the land being brought into cultivation.

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