

powerful grace accordingly." The assertion of moral truth on all fitting occasions is incumbent on all men, and therefore on Dr. Corfe; but we do not see the necessity there is, that, while he glorifies God, he should glorify himself and the Duke of Northumberland.

It is due to Dr. Corfe, that the apology he offers for his illiterate style should accompany our strictures; we therefore subjoin it:

"I have written by snatches, and often in moments when my mind was full of anxiety or hope as to the issue of many severe cases around me, together with the fulfilment of many duties, too minute to describe. Added to which, during the writing of these papers, the hospital was, for the most part, pulled down and rebuilt, and I had the honour to be consulted upon many improvements and alterations which were suggested, as well as upon those which were adopted from the suggestions of my own mind; for which, indeed, His Grace, the Noble Duke to whom this volume is dedicated, most condescendingly offered me his thanks in person, at the same time that he gave me, in the most obliging manner, the permission to dedicate it to himself. Under these circumstances, the indulgence of the reader is asked for, and it is now hoped that he has found the plain simplicity only of truth, robed in that language which best becomes a plain man and a Christian; and that the Lord, who gave the power of discernment, in whatever degree that power may be, may bless any aim, however feeble, which professes to have for its beginning, middle, and end the glory of Him in view, from whom every good and every perfect gift proceeds, is the fervent hope of his most unworthy servant." (p. 147.)

We ought to add, that the *alma mater* of this "most unworthy servant" is "the King's College and University of Aberdeen."

ART. X.

Views of Nature: or Contemplations on the Sublime Phenomena of Creation; with Scientific Illustrations. By ALEXANDER VON HUMBOLDT. Translated from the German by E. C. OTTÉ and HENRY G. BOHN. With a Frontispiece, from a Sketch by the Author, a Fac-simile of his Hand-writing, and a comprehensive Index.—London, 1850. Post 8vo, pp. 452.

THE history of this work is almost as remarkable as its contents. The first edition, published forty-six years ago, consisted of "a series of papers which originated in the presence of the noblest objects of nature,—on the Ocean,—in the forests of the Orinoco,—in the Savannahs of Venezuela,—and in the solitudes of the Peruvian and Mexican Mountains." Several detached fragments, written on the very spots which they described, were wrought into a whole; with an anxious endeavour, on the part of the gifted author, "to heighten the enjoyment of nature by vivid representations, and at the same time to increase, according to the present state of science, the reader's insight into the harmonious cooperation of forces." He was not insensible of the difficulties which oppose themselves to this æsthetic treatment of the grand scenes of Nature, the wonderful luxuriance of which can scarcely be expressed, but by the accumulation of separate images, such as disturbs the harmony and effect of a picture:

"The combination of a literary and purely scientific aim, the desire to engage the imagination, and, at the same time, to enrich life with new ideas, by the increase of knowledge, render the due arrangement of the separate parts, and what is required as unity of composition, difficult of attainment."

It is not too much to affirm that there is no living writer, by whom a task of this kind could have been so well conceived and so admirably executed. There is certainly none, whose personal knowledge of the various aspects of nature can approach that of our octogenarian *savant*; and if we sometimes look for a little more of that vividness of delineation, which is the result of a higher artistic power than he possesses, we must not forget the advantage we derive from the contemplation of Nature in her sober garb of truth, instead of decked out in the embroiderings of the imagination.

The second edition of the *Views of Nature* was published in Paris in 1826. Two papers were then added; one on the structure and mode of action of Volcanoes; the other entitled "Vital Force, or the Rhodian Genius." The latter has a special interest for us, not merely on account of its subject, but on account of the little history which attaches to it, and which brings us into connexion with one of the illustrious minds of a generation that to men of ordinary age has long since passed away:—

"Schiller," says our author, in remembrance of his youthful medical studies, "loved to converse with me, during my long stay at Jena, on physiological subjects. The inquiries in which I was then engaged, in preparing my work, 'On the condition of the Fibres of Nerves and Muscles, when irritated by contact with substances chemically opposed,' often imparted a more serious direction to our conversation. It was at this period that I wrote the little allegory on Vital Force, called the Rhodian Genius. The predilection which Schiller entertained for this piece, and which he admitted into his periodical, *Die Horen*, gave me courage to introduce it here." (Preface, p. xii.)

The third edition, prepared by Baron Humboldt in his eightieth year, has been entirely remoulded in accordance with his own more extended information, and the scientific demands of the age:

"I have indulged the hope," he says, "of stimulating the study of nature, by compressing into the smallest possible compass the numerous results of careful investigation on a variety of interesting subjects, with a view of showing the importance of accurate numerical data, and the necessity of comparing them with each other, as well as to check the dogmatic smattering and fashionable scepticism which have too long prevailed in the so-called higher classes of society."

In the interval between the second and third editions, Baron Humboldt had visited Northern Asia, in company with Ehrenberg and Gustavus Rose; and this expedition, he tells us, contributed to the enlargement of his views in all that concerns the formation of the earth's surface, the direction of mountain-chains, the connexion of the Steppes and Deserts, and the geographical distribution of plants according to ascertained influences of temperature. The fruits of this extension are amply displayed in the original essays; but still more in the notes and illustrations, which supply a vast mass of details upon points that are only glanced at in the text, and embody the latest information which is accessible, upon a variety of topics of great interest. It is indeed wonderful to see a man of eighty years of age, whose mind might be supposed to have attained that full development in which further progress is not to be expected, as eager for novelty as if he were just starting upon his travels in the vigour of youth; and displaying all that aptitude of reception, and that philosophical discrimination, which are the special characteristics of the matured yet still fresh intellect of the prime of manhood. And it must be most gratifying to him to witness the

gradual development of the science which he may almost be said to have called into being,—that of Physical Geography, in its connexion, on the one hand, with the geological structure which determines the surface-character of the land, and, on the other, with the various forms of organic life which this sustains.

The amplification of the “Illustrations,” beyond all proportion to the augmentation of the Essays themselves, has given a curious character to the contents of this volume; for out of the 436 pages of which it is composed (independently of the summary of contents, index, &c.) no more than 135 are occupied by what may be called the *text*, the remaining being taken up with the *notes*, some of which are longer than almost any one of the original essays. The principal part of the work is therefore quite fragmentary in its character; the only connexion between the mass of miscellaneous facts of which it is made up, being that afforded by the slender stem on which they all depend. Hence the book is by no means a pleasant one to read through at once, and we cannot recommend any of our readers to make the attempt. It should rather, in fact, serve as the *pièce de résistance* of a good many separate meals; each essay, with its “illustrations” being sufficient to stay a reasonably good digestion for some time. In the ‘Kosmos,’ every fact was kept in subordination to one grand idea; the evolution of principles, rather than the accumulation of details, was the writer’s constant object; and so skilfully were the latter introduced, that they served but to afford the colour and substance to the majestic outlines which had been sketched in by his master hand. Here, on the contrary, it is in the essays alone that any semblance of artistic “keeping” is preserved; and whilst the “Views” which they present may be studied and re-studied, as we should look at a panoramic representation, we turn to the Illustrations, as to a *catalogue raisonnée* of the objects we have been viewing, in which their names, descriptions, dimensions, &c., are duly set forth in the most prosaic style, and with matter-of-fact precision. The amount of information contained in the volume is very great, and the accuracy with which it is digested and presented to the reader, may of course be relied on; we can only regret that the mode in which the book has grown into its present form should have made it so little readable as a continuous whole.—We shall attempt, however, to convey some idea of the nature of its contents; and commencing with the first essay, *On Steppes and Deserts*, shall quote the beautiful passage with which it opens:

“At the foot of the lofty granitic range, which, in the early age of our planet, resisted the irruption of the waters on the formation of the Caribbean Gulf, extends a vast and boundless plain. When the traveller turns from the Alpine valleys of Caracas, and the island-studded lake of Tacarigua, whose waters reflect the forms of the neighbouring bananas,—when he leaves the fields, verdant with the light and tender green of the Tahitian sugar-cane, or the sombre shade of the cocoa groves,—his eye rests in the south on Steppes, whose seeming elevations disappear in the distant horizon.

“From the rich luxuriance of organic life, the astonished traveller suddenly finds himself on the dreary margin of a treeless waste. Nor hill, nor cliff rears its head, like an island in the ocean, above the boundless plain: only here and there, broken strata of floetz, extending over a surface of two hundred square miles (more than three thousand English square miles), appear sensibly higher than the surrounding district. The natives term them *banks*, as if the spirit of language would convey

some record of that ancient condition of the world, when these elevations formed the shoals, and the Steppes themselves the bottom, of some vast inland sea.

"Even now, illusion often recalls, in the obscurity of night, these images of a former age. For when the guiding constellations illumine the margin of the plain with their rapidly rising and setting beams, or when their flickering forms are reflected in the lower stratum of undulating vapour, a shoreless ocean seems spread before us. Like a limitless expanse of waters, the Steppe fills the mind with a sense of the infinite, and the soul, freed from the sensuous impressions of space, expands with spiritual emotions of a higher order. But the aspect of the ocean, its bright surface diversified with rippling or gently swelling waves, is productive of pleasurable sensations,—while the Steppe lies stretched before us, cold and monotonous, like the naked stony crust of some desolate planet." (pp. 1-2.)

"In all latitudes," continues our author, "nature presents the phenomenon of these vast plains; and each has some peculiar character or physiognomy, determined by diversity of soil and climate, and by elevation above the level of the sea." In Northern Europe, however, these are only represented by the heathy plains, of comparatively inconsiderable extent, extending from the extremity of Jutland to the mouth of the Scheldt. The vast deserts of the interior of Africa, covering an area nearly three times as great as that of the Mediterranean, may be regarded as a sea of sand, separating fruitful regions from each other, or inclosing them like islands; there is probably no part of the world, save the immediate neighbourhood of the poles, which is so absolutely sterile; and the explanation of this is to be found in the fact, that "neither dew nor rain refreshes these barren wastes, or unfolds the germs of vegetation within the glowing depths of the earth, for everywhere rising columns of hot air dissolve the vapours and disperse the passing clouds." Wherever springs burst forth, however, a carpet of verdure is thickly spread around them; the wild animals of the desert frequent their neighbourhood; and nomadic tribes of men descended from the ancient Libyans make these oases their temporary home. The remainder of the great desert, however, is uninhabitable by man, because it affords him neither food nor water; yet "on tracks whose undeviating course was determined by commercial intercourse thousands of years ago, the long line of caravans passes from Tafilet to Timbuctoo, or from Mourzouk to Bornou,—daring enterprises, the practicability of which depends on the existence of the camel, the 'ship of the desert.'" The great steppes of Central Asia, extending almost continuously in some directions over nearly three thousand miles, present a striking contrast to the arid plains of Central Africa. The difference in their geographical and geognostical position involves a vast difference in their capability of sustaining organic life; and we find some of them covered with grass, others with succulent evergreen, articulated, alkaline plants; others with flowering plants, of loftier stature, closely crowded together; and others, again, adorned with lowly but luxuriant white-blossomed shrubs; while many, on the other hand, are radiant with the effulgence of lichen-like tufts of salt, scattered irregularly over the clayey soil like newly-fallen snow.

"These Mongolian and Tartar Steppes, which are intersected by numerous mountain chains, separate the ancient and long-civilized races of Thibet and Hindostan from the rude nations of Northern Asia. They have also exerted a manifold influence on the changing destinies of mankind. They have inclined the current of population southward, impeded the intercourse of nations, more than

the Himalayas, or the Snowy Mountains of Sirinagur and Gorka, and placed permanent limits to the progress of civilization and refinement in a northerly direction.

"History cannot, however, regard the plains of Central Asia under the character of obstructive barriers alone. They have frequently proved the means of spreading misery and devastation over the face of the earth. Some of the pastoral tribes inhabiting this Steppe,—the Mongols, Getæ, Alani, and Usüni,—have convulsed the world. If in the course of earlier ages, the dawn of civilization spread like the vivifying light of the sun from east to west; so in subsequent ages, and from the same quarter, have barbarism and rudeness threatened to overcloud Europe." (pp. 4-5.)

From the salt-steppes of Asia,—from the European heaths, smiling in summer with their scarlet, honey-yielding flowers,—and from the barren deserts of Africa, we return with our author to the plains of South America; the interest afforded by the contemplation of which must arise from a pure love of nature.

"No oasis here reminds the traveller of former inhabitants, no hewn stone, no fruit-tree once cultivated and now growing wild, bears witness to the industry of past races. As if a stranger to the destinies of mankind, and bound to the present alone, this region of the earth presents a wild domain to the free manifestation of animal and vegetable life." (p. 6.)

This steppe incloses an area of 256,000 geographical miles, and occupies, with some interruptions, the central band of South America, from the equatorial region nearly to its southern extremity. The Llanos, which form its northern or equatorial portion, repeat in a very remarkable manner the characters both of their African and their Asiatic prototypes. "Twice in every year they change their whole aspect; during one half of it appearing waste and barren, like the Libyan desert; during the other, covered with verdure, like many of the elevated steppes of Central Asia." The southern portion of the great South American steppe possesses a climate which presents a striking contrast, in point of humidity and coolness, with that of Africa; and on this condition, taken in connexion with its marked difference of mineral character (involving, of course, a corresponding difference of soil), depend that luxuriant and exuberant vegetation, and that richness of foliage, which are so peculiarly characteristic of the New Continent. Into Humboldt's lucid explanation of the causes of this climatic difference, we have not space to follow him; but shall simply observe that he first showed that they *are* explicable on simple physical principles, thus putting an end to those "geographical myths," as he aptly terms them, which sought to refer them to past events, instead of to the existing conditions of the two continents respectively.

The effect of the physical aspect of the South American steppe upon the distribution of animal life, and of the human race, is then graphically sketched:

"Although the South American steppe is covered with a thin crust of fruitful earth, is periodically refreshed by rains, and adorned with luxuriant herbage, its attractions were not sufficient to induce the neighbouring nations to exchange the beautiful mountain valleys of Caracas, the sea-girt districts, and the richly-watered plains of the Orinoco, for this treeless and springless desert. Hence on the arrival of the first European and African settlers, the steppe was found to be almost without inhabitants. The Llanos are, it is true, adapted for the breeding of cattle, but the primitive inhabitants of the new continent were almost wholly unacquainted with the management of animals yielding milk. Scarcely one of the American

tribes knew how to avail themselves of the advantages which Nature, in this respect, had placed before them. The American aborigines, who, from 65° north latitude to 55° south latitude, constitute (with the exception, perhaps, of the Esquimaux) but one sole race, passed directly from a hunting to an agricultural life, without going through the intermediate stage of a pastoral life." (pp. 10-11.)

It is curious that the use of milk and cheese, like the possession and culture of the cerealia, should have been originally restricted (with the exception of maize) to the Old World, in almost every region of which nations may be found who cultivate some kind of corn and rear milch cattle. And it would seem to be to the ignorance of this mode of life, among the primitive races of America, that we must attribute the original scantiness of human population which characterised the steppe. But this circumstance allowed freer scope for the development of the most varied forms of animal life. Agoutis, small spotted antelopes, the shielded armadillo (which, rat-like, terrifies the hare in its subterranean retreat), herds of the slothful chiguire (a large semi-aquatic rodent, known to European naturalists as the *capybara*, which is pursued in the water by the crocodile, and on land by the tiger or jaguar, and which runs so badly that it may be caught by the hands), beautifully striped viverræ, whose pestilential odour infects the air, the great maneless lion, the variegated jaguar (commonly known as the tiger) whose strength enables it to drag to the summit of a hill the body of the young bull it has slain,—these, and many other forms of animal life, roam over the treeless plain. Unable, through their ignorance of the art of culture, to turn the rich pastures to useful account, and indisposed to the use of animal flesh as food, the nomadic hordes who first chose this region as their place of settlement, became dependent upon the fan-palms (Mauritia) scattered over it; these trees becoming to them all, or yet more than all, that the date-palm is to the Arab, or the cocoa-nut palm to the Polynesian islander. The unsubdued tribe of Guaranés, who inhabit the marshy plains in the neighbourhood of the mouths of the Orinoco, build their huts on horizontal platforms supported by the stumps of felled palm-trees; and when the Delta is completely overflowed, they live almost entirely in spreading mats or hammocks, woven of the leaf-stalk of the mauritia, which they suspend from tree to tree.

"The mauritia not only affords a secure habitation, but likewise yields numerous articles of food. Before the tender spathe unfolds its blossoms on the male palm, and only at that peculiar period of vegetable metamorphosis, the medullary portion of the trunk is found to contain a sago-like meal, which, like that of the jatropa root, is dried in thin bread-like slices. The sap of the tree, when fermented, constitutes the sweet inebriating palm-wine of the Guaranés. The narrow-scaled fruit, which resembles reddish pine-cones, yields, like the banana and almost all tropical fruits, different articles of food, according to the periods at which it is gathered, whether its saccharine properties are fully matured, or whether it is still in a farinaceous condition. Thus, in the lowest grades of man's development, we find the existence of an entire race dependent upon almost a single tree; like certain insects which are confined to particular portions of a flower." (p. 13.)

The introduction of the domesticated quadrupeds of the Old World, however, has effected a great change in the distribution of the human population of the great South American steppe. Everywhere throughout these vast districts, the inhabitants have begun to rear cattle; whilst, here and there, towns have sprung up on the banks of the steppe-rivers, which

open lines of communication between the sea-board and the interior. The vast multiplication of the races of quadrupeds carried thither by the first European colonists, in spite of the numerous perils with which they have to contend, and the modifications in physical and psychical constitution which they have undergone, in the course of the three centuries and a half which have elapsed since their introduction, are phenomena of the highest interest to the philosophic naturalist, and more especially to the anthropologist; since they demonstrate the striking changes which may be impressed on a race, within a few generations, by the continued influence of the same modifying agency. To these, however, our author does not here advert; his object being to portray the most remarkable features of the country through which these animals are now so universally diffused. Of these he gives us two very striking pictures; the first of which, relating to the period of drought, we shall quote without abridgment; of the second, which describes the access of rainy season, a part will suffice:

“When, beneath the vertical rays of the bright and cloudless sun of the tropics, the parched sward crumbles into dust, then the indurated soil cracks and bursts as if rent asunder by some mighty earthquake. And if, at such a time, two opposite currents of air, by conflict moving in rapid gyrations, come in contact with the earth, a singular spectacle presents itself. Like funnel-shaped clouds, their apexes touching the earth, the sands rise in vapoury form through the rarified air in the electrically charged centre of the whirling current, sweeping on like the rushing waterspout, which strikes such terror into the heart of the mariner. A dim and sallow light gleams from the lowering sky over the dreary plain. The horizon suddenly contracts, and the heart of the traveller sinks with dismay as the wide steppe seems to close upon him on all sides. The hot and dusty earth forms a cloudy veil which shrouds the heavens from view, and increases the stifling oppression of the atmosphere; while the east wind, when it blows over the long-heated soil, instead of cooling, adds to the burning glow.

“Gradually, too, the pools of water, which had been protected from evaporation by the now seared foliage of the fan-palm, disappear. As in the icy north animals become torpid from cold, so here the crocodile and boa-constrictor lie wrapt in unbroken sleep, deeply buried in the dried soil. Everywhere the drought announces death, yet everywhere the thirsty wanderer is deluded by the phantom of a moving, undulating, watery surface, created by the deceptive play of the reflected rays of light, the mirage. A narrow stratum separates the ground from the distant palm-trees, which seem to hover aloft, owing to the contact of currents of air, having different degrees of heat and therefore of density. Shrouded in dark clouds of dust, and tortured by hunger and burning thirst, oxen and horses scour the plain, the one bellowing dismally, the other with outstretched necks snuffing the wind, in the endeavour to detect, by the moisture in the air, the vicinity of some pool of water not yet wholly evaporated.

“The mule, more cautious and cunning, adopts another method of allaying his thirst. There is a globular and articulated plant, the melocactus, which incloses under its prickly integument an aqueous pulp. After carefully striking away the prickles with his forefeet, the mule cautiously ventures to apply his lips to imbibe the cooling thistle juice. But the draught from this living vegetable spring is not always unattended by danger, and these animals are often observed to have been lamed by the puncture of the cactus thorn.

“Even if the burning heat of day be succeeded by the cool freshness of the night, here always of equal length, the wearied ox and horse enjoy no repose. Huge bats now attack the animals during sleep, and vampyre-like suck their blood; or, fastening on their backs, raise festering wounds, in which mosquitoes, hipposcopes, and a host of other stinging insects, burrow and nestle. Such is the

miserable existence of these poor animals when the heat of the sun has absorbed the waters from the surface of the earth." (pp. 14-16.)

When, after a long drought, the genial season of rain arrives, the scene suddenly changes. The deep azure of the hitherto cloudless sky assumes a lighter hue; some of the fainter celestial phenomena can no longer be distinguished; and the brightest stars shine with a flickering and less planetary light. Like some distant mountain, a single cloud "about the bigness of a man's hand" is seen rising perpendicularly on the southern horizon,—a sign, as to the prophet of old, of abundance of rain. Misty vapours collect and gradually overspread the heavens; while distant thunder proclaims the approach of the vivifying discharge. Then from all Nature bursts forth the jubilant chorus, "Thanks be to God, who laveth the thirsty land," words which will be rendered immortal by the sublime music to which they have been united by the greatest composer of our day, now, alas! no more.* But the chorus of Nature is not unmingled with strains that seem to us discordant.

"Scarcely is the surface of the earth moistened, before the teeming steppe becomes covered with *kyllingia*, with the many-panacled *paspalum*, and a variety of grasses. Excited by the power of light, the herbaceous *mimosa* unfolds its dormant, drooping leaves, hailing, as it were, the rising sun in chorus with the matin song of the birds and the opening flowers of aquatics. Horses and oxen, buoyant with life and enjoyment, roam over and crop the plains. The luxuriant grass hides the beautifully spotted jaguar, who, lurking in safe concealment, and carefully measuring the extent of the leap, darts, like the Asiatic tiger, with a cat-like bound on his passing prey.

"At times, according to the account of the natives, the humid clay on the banks of the morasses is seen to rise slowly in broad flakes. Accompanied by a violent noise, as on the eruption of a small mud-volcano, the upheaved earth is hurled high into the air. Those who are familiar with the phenomena fly from it; for a colossal water-snake, or a mailed and scaly crocodile, awakened from its trance by the first fall of rain, is about to burst from his tomb.

"When the rivers bounding the plain to the south, as the Arauca, the Apure, and the Payara, gradually overflow their banks, Nature compels those creatures to live as amphibious animals, which, during the first half of the year, were perishing with thirst on the waterless and dusty plain. A part of the steppe now presents the appearance of a vast inland sea. The mares retreat with their foals to the higher banks, which project, like islands, above the spreading waters. Day by day the dry surface diminishes in extent. The cattle, crowded together, and deprived of pasturage, swim for hours about the inundated plain, seeking a scanty nourishment from the flowering panicles of the grasses which rise above the lurid and bubbling waters. Many foals are drowned, many are seized by crocodiles, crushed by their serrated tails, and devoured. Horses and oxen may not unfrequently be seen, which have escaped from the fury of this bloodthirsty and gigantic lizard, bearing on their legs the marks of its pointed teeth." (pp. 16-17.)

It is not among the least remarkable consequences of the diffusion of the domesticated quadrupeds under the influence of man, that they are brought into relation in different regions, with a wonderful variety of animal and vegetable forms. "In the one region the northern birch, in the other the date-palm, protects the wearied ox from the noonday sun. The same species of animal which contends in eastern Europe with bears

* Reference is here made to the magnificent chorus which closes the first part of the oratorio of *Elijah*, certainly one of the finest pieces of descriptive music ever written.

and wolves, is exposed, in a different latitude, to the attacks of tigers and crocodiles." Among the enemies of the South American horse, the gymnotus is not one of the least formidable; and the vivid picture which our author has elsewhere given of the remarkable contest between the horses and the fish, is doubtless well known to most of our readers. The essay concludes with a brief notice of the condition of the human population inhabiting the borders of the steppes, and especially of that which is dispersed through the marshy plains of Guiana, between the rivers Orinoco and Amazon, and with some beautiful reflections suggested thereby:

"In this grand and wild condition of Nature dwell numerous races of men. Separated by a remarkable diversity of languages, some are nomadic, unacquainted with agriculture, and living on ants, gums, and earth, mere outcasts of humanity, such as the Ottomaks and Jarures; others, for instance the Maquiritares and Macos, have settled habitations, live on fruits cultivated by themselves, are intelligent, and of gentler manners. Extensive tracts between the Cassiquiare and the Atabapo are inhabited solely by the tapir and social apes; not by man. Figures graven on the rocks attest that even these deserts were once the seat of a higher civilization. They bear testimony, as do also the unequally developed and varying languages (which are amongst the oldest and most imperishable of the historical records of man), to the changing destinies of nations.

"While on the steppe tigers and crocodiles contend with horses and cattle, so on the forest borders, and in the wilds of Guiana the hand of man is ever raised against his fellow-man. With revolting eagerness, some tribes drink the flowing blood of their foes, whilst others, seemingly unarmed, yet prepared for murder, deal certain death with a poisoned thumb-nail. The feeblar tribes, when they tread the sandy shores, carefully efface with their hands the traces of their trembling steps.

"Thus does man, everywhere alike, on the lowest scale of brutish debasement, and in the false glitter of his higher culture, perpetually create for himself a life of care. And thus, too, the traveller, wandering over the wide world by sea and land, and the historian who searches the records of bygone ages, are everywhere met by the unvarying and melancholy spectacle of man opposed to man.

"He, therefore, who amid the discordant strife of nations, would seek intellectual repose, turns with delight to contemplate the silent life of plants, and to study the hidden forces of Nature in her sacred sanctuaries; or yielding to that inherent impulse, which for thousands of years has glowed in the breast of man, directs his mind, by a mysterious presentiment of his destiny, towards the celestial orbs, which, in undisturbed harmony, pursue their ancient and eternal course." (pp. 20-1.)

From among the "Illustrations" of this Essay we shall glean a few facts which will, we think, be of interest to our readers.—A considerable space is devoted to the discussion of the relative heights of the mountain-summits of the Old and the New World. Most of our readers will recollect the time when Chimborazo was reputed to be the peak of highest elevation, not only in the range of the Cordilleras, but in the known world. Some thirty years ago, however, it began to be reported in Europe that there are much higher summits in the Himalayan chain than in the Cordilleras; and this was subsequently verified by actual measurement. The height of Chimborazo, as trigonometrically measured by Humboldt, is 21,442 feet; whilst that of Djwahir has been ascertained to be 26,902 feet, that of Cinjinga, 28,174 feet, and that of Dhawalagiri still greater. It was asserted in 1838, however, by Pentland, that there are summits in the Andes considerably higher than

Chimborazo, and almost rivalling the Himalayan peaks ; but he has recently, by a correction of his calculations, considerably reduced the highest of these elevations, and he now gives as the height of the Sorata, 21,286 feet, and of the Illimani 21,145 feet ; still, however, ascribing an elevation of from 21,700 to 22,350 feet, to four summits of the western Cordilleras. All these, however, are surpassed by the volcanic Aconagua, to the north east of Valparaiso ; the height of which, according to the latest calculations, is 23,906 feet. The difference of elevation between the highest summits of the Old and New Continents, therefore, still remains more than 4000 feet in favour of the latter.—The difference in the height of the *snow-line* is a yet more remarkable phenomenon. Although, when it was first reported that fine corn-fields and fertile pasture-lands had been seen in the passes and on the plateaux of the Himalaya, at an elevation far exceeding the height of Mont Blanc, the announcement was received with incredulity, it has been fully confirmed by subsequent observations. A great part of these Alpine plains would lie buried through the whole year in snow and ice, were it not for a combination of circumstances which causes the snow-line to be elevated much above the level at which the latitude of this mountain-chain would lead us to expect it ; and the most remarkable proof of the existence of local influences is found in the fact, that the snow-line is much more elevated on the northern than on the southern declivity, but for which peculiarity of the distribution of heat in the upper strata of the atmosphere, the mountain-plain of Western Thibet would be rendered uninhabitable for the millions of men who now occupy it. The mean height of the snow-lines on the northern and southern declivities respectively, were stated by Humboldt, in his 'Asie Centrale,' at 16,626 feet for the northern declivity, and 12,981 feet for the southern ; giving a mean difference of 3645 feet. The following, however, are the results of the observations of Lieut. Strachey, as contained in a long extract from a recent memoir by that gentleman in the 'Journal of the Asiatic Society of Bengal,' which is appended by the editor of this translation.

"The snow-line or the southern edge of the belt of perpetual snow in this portion of the Himalaya is at an elevation of 15,000 feet, while on the northern edge it reaches 18,500 feet ; and on the mountains to the north of the Sutlej, or still further, it recedes even beyond 19,000 feet. The greater elevation which the snow-line attains on the northern edge of the belt of perpetual snow is a phenomenon not confined to the Thibetian declivity alone, but extending far into the interior of the chain ; and it appears to be caused by the quantity of snow that falls on the northern portion of the mountains being much less than that which falls farther to the south along the line where the peaks, covered with perpetual snow, first rise above the less elevated ranges of the Himalaya." (p. 80.)

It will be seen that the difference in favour of the northern declivity remains the same, although the actual height of the snow-line is raised by Lieut. Strachey's observations about 2000 feet. The source of the error of former observers is considered by Lieut. Strachey to lie partly in their want of distinction between snow and glacier-ice, and partly to their having looked for the boundary of perpetual snow at the beginning of the spring, instead of at the beginning of winter, when its elevation is the greatest. The greater elevation of the snow-line on the northern declivity is attributed by Humboldt chiefly to the force of the heat radiated from the Thibetian plains ; whilst the constant serenity of the sky, the

dryness of the atmosphere and consequently rare formation of snow, and the powerful solar heat peculiar to the eastern continental climate, keep the snow-line, even on the southern declivity, at a much higher altitude than that which it possesses on the Cordilleras, where the opposite conditions prevail. The immediate neighbourhood of the sea, on one side of that range, contributes to reduce its mean temperature; and this is still further kept down by the influence of the vegetation, both herbaceous and arboreal, which thickly clothes a large proportion of the interior of the South American continent. The grassy and cyperaceous plants which cover the Llanos of Venezuela and the Pampas of Buenos Ayres, must exert an important cooling influence, in virtue of their extraordinary power of emitting heat, long since demonstrated by Wells and Daniell to exist even in this climate, notwithstanding its inferior degree of transparency. The following extract details our author's views respecting a point of great practical importance, the influence of forest regions on the temperature of a country:

"The forest region acts in a threefold manner, by the coolness induced by its shade, by evaporation, and by the cooling process of radiation. Forests uniformly composed in our temperate zone of 'social' plants, belonging to the families of the Coniferæ or Amentaceæ (the oak, beech, and birch), and under the tropics composed of plants not living socially, protect the ground from direct isolation, evaporate the fluids they have themselves produced, and cool the contiguous strata of air by the radiation of heat from their leafy appendicular organs. The leaves are by no means all parallel to one another, and present different inclinations towards the horizon; and according to the laws established by Leslie and Fourier, the influence of this inclination on the quantity of heat emitted by radiation is such, that the radiating power of a given measured surface a , having a given oblique direction, is equal to the radiating power of a leaf of the size of a projected on a horizontal plane. In the initial condition of radiation of all the leaves which form the summit of a tree, and which partially cover each other, those which are directly presented towards the unclouded sky, will be first cooled.

"This production of cold (or the exhaustion of heat by emission) will be the more considerable in proportion to the thinness of the leaves. A second stratum of leaves has its upper surface turned to the under surface of the former, and will give out more heat by radiation towards that stratum than it can receive from it. The result of this unequal exchange will then be a diminution of temperature for the second stratum also. A similar action will extend from stratum to stratum, till all the leaves of the tree, by their greater or less radiation, as modified by their difference of position, have passed into a condition of stable equilibrium, of which the law may be deduced by mathematical analysis. In this manner, in the serene and long nights of the equinoctial zone, the forest air, which is contained in the interstices between the strata of leaves, becomes cooled by the process of radiation; for a tree, a horizontal section of whose summit would hardly measure 2000 square feet, would, in consequence of the great number of its appendicular organs (the leaves), produce as great a diminution in the temperature of the air as a space of bare land or turf many thousand times greater than 200 square feet. I have thus sought to develop somewhat fully the complicated relations which the action of great forest regions exerts on the atmosphere, because they have so often been touched upon in connexion with the important question of the climate of ancient Germany and Gaul." (pp. 98, 99.)

When speaking, in his original Essay, of the dispersion of the human races along the western coast of America, our author throws out the suggestion that other migrations may have taken place from the eastern part of the Asiatic continent, besides that (across Behring's Straits) which is usually

regarded as having been the primal source of the American population ; and in a note to this passage he carries out this idea more fully. In his work on the Monuments of the American Primitive Races, he had essayed to prove, by a comparative examination of the Mexican and Thibetian-Japanese calendars, by a correct determination of the position of the scansile pyramids, and by the evidence of tradition, that the western nations of the New Continent maintained relations of intercourse with those of Eastern Asia, long before the arrival of the Spaniards. These observations have subsequently derived additional weight from the discovery of architectural remains in Central America, which indicate a yet higher degree of civilization to have prevailed in that region, and a yet closer conformity to Old World types, than has been elsewhere seen. On these grounds, continues our author,—

“I regard the existence of a former intercourse between the people of Western America and those of Eastern Asia as more than probable, although it is impossible at the present time to say by what route and with which of the tribes of Asia this intercourse was established. A small number of individuals of the cultivated hierarchical castes may perhaps have sufficed to effect great changes in the social condition of Western America. The fabulous accounts formerly current regarding Chinese expeditions to the New Continent, refer merely to expeditions to Fusang or Japan. It is, however, possible that Japanese and Sian-Pi may have been driven by storms from the Corea to the American coasts. We know as matters of history that Bonzes and other adventurers navigated the Eastern Chinese seas in search of a remedial agent capable of making man immortal. Thus under Tschin-chi-huang-ti three hundred young couples were despatched to Japan in the year 209 before our era, who, instead of returning to China, settled on the Island of Nipon. May not accident have led to similar expeditions to the Fox Islands, to Alaschka, or New California? As the western coasts of the American continent incline from north-west to south-east, and the eastern coasts of Asia from north-east to south-west, the distance between the two continents in the milder zone, which is most conducive to mental development (45° lat.), would appear too considerable to admit of an accidental settlement having been made in this latitude. We must therefore assume that the first landing took place in the ungenial climate of 55° and 65°, and that cultivation, like the general advance of population in America, progressed by gradual stations from north to south. It was even believed in the beginning of the sixteenth century, that fragments of ships from Catayo, i. e. from Japan or China, had been found on the coasts of the Northern Dorado, called also Quivira and Cibora.

“We know as yet too little of the languages of America entirely to renounce the hope that, amid their many varieties, some idiom may be discovered, that has been spoken with certain modifications in the interior of South America and Central Asia, or that might at least indicate an ancient affinity. Such a discovery would undoubtedly be one of the most brilliant to which the history of the human race can hope to attain! But analogies of language are only deserving of confidence where mere resemblances of sound in the roots are not alone the object of research, but attention is also directed to the organic structure, the grammatical forms, and those elements of language which manifest themselves as the product of the intellectual power of man.” (pp. 132-3.)

In the second essay, on *The Cataracts of the Orinoco*, our author, confining himself to a more limited circle of phenomena, aims at portraying in brighter tints the cheerful picture of a luxuriant vegetation, and fluvial valleys with their foaming mountain torrents. We shall not attempt, however, to follow him through his description ; but shall limit ourselves to his account of the cavern of Atarupe, the burial place of an Indian

race, of which the people and the language are alike extinct. The surrounding scenery has a grand and solemn character, which accords well with the feelings excited by such a scene. The cave (which is properly not a cave but a vault formed by a far-projecting and overhanging cliff, which was obviously hollowed out beneath by the action of water) is situated on one side of a cauldron-shaped valley, bounded by precipitous granitic rocks, whose rounded summits bear huge granite boulders, measuring from forty to more than fifty feet in diameter; and appearing to be so poised on a single point of their surface, that the slightest trembling of the earth would hurl them down. From the summit of one of these, the foaming bed of the river is seen in the distance, with hills richly crowned with woods rising from its banks; while beyond its western bank, the eye rests on the boundless Savannah of the Meta. On the horizon, the mountains of Uniamá loom like threatening clouds; whilst in the deep ravines of the valley beneath, no living thing moves, save where the vulture and the whirring goat-sucker wing their lonely way, their heavy shadows passing fitfully across the face of the barren rock. Of the cemetery itself, the following description is given; and with the reflections suggested by it, the essay is brought to a conclusion:

"We counted about six hundred well-preserved skeletons, placed in as many baskets, formed of the stalks of palm-leaves. These baskets, called by the Indians *mapires*, are a kind of square sack varying in size according to the age of the deceased. Even new-born children have each their own *mapire*. These skeletons are so perfect, that not a rib or a finger is wanting.

"The bones are prepared in three different ways: some are bleached, some dyed red with onoto, the pigment of the *Bixa Orellana*; others, like mummies, are anointed with fragrant resin and wrapped in banana leaves.

"The Indians assured me that the corpse was buried during several months in a moist earth, which gradually destroyed the flesh; and that after being disinterred, any particles of flesh still adhering to the bones were scraped off with sharp stones. This practice is still continued among many tribes of Guiana. Besides these baskets or *mapires*, we saw many urns of half-burnt clay, which appear to contain the bones of whole families. The largest of these urns are upwards of three feet in height and nearly six feet in length, of an elegant oval form, and greenish colour; with handles shaped like crocodiles and serpents, and the rims bordered with flowing scrolls and labyrinthine figures. These ornaments are precisely similar to those which cover the walls of the Mexican palace at Mitla. They are found in every clime and every stage of human culture,—among the Greeks and Romans, no less than on the shields of Otaheitans, and other South Sea islanders,—in all regions where a rhythmical repetition of regular form delights the eye. The causes of these resemblances, as I have explained elsewhere, are rather to be referred to psychical conditions, and to the inner nature of our mental qualifications, than as affording evidence in favour of a common origin and the ancient intercourse of nations.

"Our interpreters could give us no certain information regarding the age of these vessels; but that of the skeletons did not in general appear to exceed a hundred years. There is a legend amongst the Guareke Indians, that the brave Atures, when closely pursued by the cannibal Caribs, took refuge on the rocks of the cataracts,—a mournful place of abode, in which this oppressed race perished, together with its language! In the most inaccessible portion of the Raudal, other graves, of the same character, are met with; indeed, it is probable that the last descendants of the Atures did not become extinct until a much more recent period. There still lives, and it is a singular fact, an old parrot, in Maypures, which cannot be understood, because, as the natives assert, it speaks the language of the Atures!.....

"We turned from the grave of a departed race with feelings of deep emotion. It was one of those clear and deliciously cool nights, so frequent beneath the tropics. The moon stood high in the zenith, encircled by a halo of coloured rings, her rays gilding the margins of the mist, which, in well-defined outline, hovered like clouds above the foaming flood. Innumerable insects poured their red phosphorescent light over the herb-covered surface, which glowed with living fire, as though the starry canopy of heaven had sunk upon the grassy plain. Climbing Bignonias, fragrant Vanillas, and golden-flowered Banisterias adorned the entrance of the cave, while the rustling palm-leaves waved over the resting-place of the dead.

"Thus pass away the generations of men!—thus perish the records of the glory of nations! Yet, when every emanation of the human mind has faded—when, in the storms of time, the monuments of man's creative art are scattered to the dust—an ever new life springs from the bosom of the earth. Unceasingly prolific Nature unfolds her germs,—regardless though sinful man, ever at war with himself, tramples beneath his foot the ripening fruit!" (pp. 171-3.)

The third Essay, on *The Nocturnal Life of Animals in the Primeval Forest*, chiefly consists of passages from the author's journal, descriptive of the scenes which he actually witnessed; and this "plain unvarnished tale" is to us far more picturesque than it could be rendered by the most elaborate amplification. Thus, he tells us that, in ascending the river Orinoco, the bed of the river contracted in one part to less than 1000 feet, and formed a perfectly straight canal, which was inclosed on both sides by thick woods. In front of the almost impenetrable wall formed by the colossal trunks of the trees of which these forests are chiefly composed, there rises, with the greatest regularity, on the sandy bank of the river, a hedge of Sauso, a Euphorbiaceous shrub, about four feet high, with gate-like openings at considerable distances from each other, undoubtedly formed by the large four-footed animals of the forests, for convenient access to the river. At sunset, and more particularly at break of day, the American tiger, the tapir, and the peccary may be seen coming forth from these openings, accompanied by their young, to give them drink. When they are disturbed by a passing Indian canoè, and are about to retreat into the forest, they do not attempt to rush violently through these hedges of sauso, but proceed deliberately along the bank, between the hedge and the river, affording the traveller the gratification of watching their motions for sometimes four or five hundred paces, until they disappear at the nearest opening.—During *seventy-four days* of almost uninterrupted river-navigation, for 1520 miles, up the Orinoco, in a small canoe, our author witnessed this remarkable spectacle at many different points, and always with renewed gratification. There came to drink, bathe, or fish, groups of creatures belonging to the most opposite species of animals,—the larger mammalia, with many-coloured herons, palamedeas with the proudly-strutting curassow,—carrying back the thoughts of the good old Indian steersman, who had been brought up in the house of an ecclesiastic, to the conception he had acquired of Paradise, but reminding the cockney reader of the "happy family," of Waterloo-bridge and Trafalgar-square notoriety. In these natural "zoological gardens," however, mutual confidence and forbearance do not altogether prevail; for the several races stand apart, watch, and avoid one another; and, as elsewhere, the unlucky capybara occasionally falls a prey, both to his terrestrial and aquatic enemies.—The following description of a night spent on the bank of the Apure, on a sandy flat, skirted by the impenetrable forest, gives a

vivid picture of the "nocturnal life" of the animals whose more peaceful condition during the day is so forcibly expressed by the facts just referred to :

"The air was bland and soft, and the moon shone brightly. Several crocodiles approached the bank; and I have observed that fire attracts these creatures as it does our crabs and many other aquatic animals. The oars of our boats were fixed upright in the ground, to support our hammocks. Deep stillness prevailed, only broken at intervals by the blowing of the fresh-water dolphins, which are peculiar to the river network of the Orinoco (as, according to Colebrooke, they are also to the Ganges, as high up the river as Benares); they followed each other in long tracks.

"After eleven o'clock, such a noise began in the contiguous forest, that for the remainder of the night all sleep was impossible. The wild cries of animals rung through the woods. Among the many voices which resounded together, the Indians could only recognise those which, after short pauses, were heard singly. There was the monotonous, plaintive cry of the Aluates (howling monkeys), the whining, flute-like notes of the small sapajous, the grunting murmur of the striped nocturnal ape (*Nyctipithecus trivirgatus*, which I was the first to describe), the fitful roar of the great tiger, the cuguar, or maneless American lion, the peccary, the sloth, and a host of parrots, parraquas (*Ortallides*), and other pheasant-like birds. Whenever the tigers approached the edge of the forest, our dog, who before had barked incessantly, came howling to seek protection under the hammocks. Sometimes the cry of the tiger resounded from the branches of a tree, and was then always accompanied by the plaintive, piping tones of the apes, who were endeavouring to escape from the unwonted pursuit.

"If one asks the Indians why such a continuous noise is heard on certain nights, they answer, with a smile, that 'the animals are rejoicing in the beautiful moonlight, and celebrating the return of the full moon.' To me the scene appeared rather to be owing to an accidental, long-continued, and gradually increasing conflict among the animals. Thus, for instance, the jaguar will pursue the peccaries and the tapirs, which, densely crowded together, burst through the barrier of tree-like shrubs which opposes their flight. Terrified at the confusion, the monkeys on the tops of the trees join their cries with those of the larger animals. This arouses the tribes of birds who build their nests in communities, and suddenly the whole animal world is in a state of commotion. Further experience taught us, that it was by no means always the festival of moonlight that disturbed the stillness of the forest; for we observed that the voices were loudest during violent storms of rain, or when the thunder echoed and the lightning flashed through the depths of the woods. The good-natured Franciscan monk, who (notwithstanding the fever from which he had been suffering for many months) accompanied us through the cataracts of Atures and Maypures to San Carlos, on the Rio Negro, and to the Brazilian coast, used to say, when apprehensive of a storm at night, 'May Heaven grant a quiet night, both to us and to the wild beasts of the forest!'" (pp. 198-200.)

There can be no doubt, that animals are often strangely sensitive to atmospheric conditions, which produce little or no effect upon ourselves; and we should therefore be disposed, with Humboldt, to attribute such commotions to a general excitability having this origin.—A singular contrast to these scenes is presented by the stillness which reigns within the tropics, at the noontide of a day unusually sultry; and we shall quote our author's account of a scene of this kind at the Narrows of Baraguan, where the Orinoco forms for itself a passage through the western part of the mountains of the Parime, which is, however, a basin almost 5700 feet in breadth :

"With the exception of an old withered stem of *Aubletia* (*Apeiba Tiburba*), and a new *Apocinea* (*Allamanda Salicifolia*), the barren rocks were only covered with a

few silvery croton shrubs. A thermometer observed in the shade, but brought within a few inches of the lofty mass of granite rock, rose to more than 122° Fahr. All distant objects had wavy, undulating outlines, the optical effect of the *mirage*. Not a breath of air moved the dust-like sand. The sun stood in the zenith; and the effulgence of light poured upon the river, and which, owing to a gentle ripple of the waters, was brilliantly reflected, gave additional distinctness to the red haze which veiled the distance. All the rocky mounds and naked boulders were covered with large, thick-scaled iguanas, gecko-lizards, and spotted salamanders. Motionless, with uplifted heads and widely extended mouths, they seemed to inhale the heated air with ecstasy. The larger animals at such times take refuge in the deep recesses of the forest, the birds nestle beneath the foliage of the trees, or in the clefts of the rocks; but if, in this apparent stillness of nature, we listen closely for the faintest tones, we detect a dull, muffled sound, a buzzing and humming of insects close to the earth, in the lower strata of the atmosphere. Everything proclaims a world of active organic forces. In every shrub, in the cracked bark of trees, in the perforated ground, inhabited by hymenopterous insects, life is everywhere audibly manifest. It is one of the many voices of nature revealed to the pious and susceptible spirit of man." (pp. 200-1.)

The Fourth Essay, modestly entitled *Ideas for a Physiognomy of Plants*, possesses a strong interest for the naturalist and physiologist. It opens with some observations on the almost universal diffusion of living beings,—a class of facts, with which we may presume our readers to be familiar. We may stop, however, to notice one point, which is specially dwelt on by our author, both here and in his other works; namely, the capacity possessed by the Condor, of soaring to heights far above those at which any other known animal can put forth muscular exertion, and of then rapidly descending through the successive strata of the atmosphere, apparently without any discomfort from the extremes of difference in its density, as well as in its temperature, to which it will thus be subjected, even within a few seconds. The region which may be regarded as the common resort of the condor, begins at the elevation of Mount Etna, and embraces atmospheric strata which are from 10,000 to 19,000 feet above the level of the sea. But these birds may be continually seen at an elevation much greater than this; thus, from their known size and from the measurement of the visual angle at which they are seen, when not too far removed from the eye, Humboldt estimates, that, on one occasion, when he was himself at a height of nearly 16,000 feet above the surface of the Pacific, a condor, which he saw directly above his head, must have been 7330 feet from him, or at an absolute height of 23,273 feet. But he has seen the condor, when himself at nearly the same elevation, appearing as a mere black speck on the clear blue sky, its visual angle being too small to be measured; so that its absolute height must have been much greater than that just stated. It appears to soar at these extraordinary elevations for the purpose of looking out for its prey, especially the vicunas, which herd, like the chamois, upon the snow-covered pastures. As a proof of the extraordinary distance at which objects can be discerned in the clear mountain air of the equatorial region, Humboldt mentions, that the white *poncho* of a horseman may be distinguished with the naked eye at a horizontal distance of 89,664 feet, or more than *sixteen miles*, and therefore under a visual angle of thirteen seconds. "It was my friend Bonpland," he tells us, "whom we observed, from the pleasant country-seat of the Marques de Selvaegre, moving along a black rocky

precipice on the volcano of Pichinca." There is, therefore, every probability that the condor not unfrequently soars at an elevation not inferior to that of the highest Himalayas, and nearly double that of Mont Blanc. It is well known how much inconvenience is experienced by those who have ascended this last height, in consequence of the rarity of the atmosphere, and the consequent impossibility of taking in the amount of oxygen which is requisite to keep up the power of muscular exertion. And the same inconvenience is experienced by other animals. Thus, the English greyhounds, which were taken out to hunt hares on the high table-land of Mexico, where the barometer stands habitually at a height of nineteen inches, were found unable to support the fatigues of a long chase in this attenuated atmosphere, and would lie down, gasping for breath, before they could come up with their prey; their offspring, however, became naturalized in this new condition, and showed no inferiority in fleetness to their parents. So, again, when the wild bull is hunted on the great mountain plateau, which surrounds the volcano of Antisana, at a height of 13,473 feet above the Pacific, blood flows from its mouth and nostrils. And it has been remarked by Von Tschudi, that, on the Cordilleras, at elevations of more than 12,000 feet, delicate breeds of dogs and the European domestic cat, are exposed to a particular kind of mortal disease.

"Innumerable attempts," he informs us, "have been made to keep cats as domestic animals in the town of Cerro de Pasco (lying at an elevation of 14,100 feet above the sea's level); but such endeavours have been invariably frustrated, as both dogs and cats have died in convulsions at the end of a few days. The cats, after being attacked by convulsive fits, attempt to climb the walls; but soon fall to the ground, exhausted and motionless."

Such being the case, it is not a little remarkable that the condor should be able to maintain the actions of flight at an elevation where the barometer falls to 13 inches or less; more especially when it is borne in mind, that the amount of muscular effort needed for the support and movement of the body in the atmosphere must be augmented in proportion to its rarefaction; since the wings must of course act at less advantage, the less resistance their strokes meet with. There must be some remarkable adaptation in the constitution of the condor, to enable it to fly with apparently equal facility under a pressure of 13 and of 30 inches, and to bear a rapid transition from one degree to the other; and also, as Humboldt remarks, to prevent the membranous air-sacs from bursting by the inflation they will undergo at heights of 23,000 feet and upwards, after being filled in the lower regions of the atmosphere.

After noticing the various conditions which are chiefly concerned in forming the character of the different regions of the earth, our author concludes that,—

"However much the total impression may be influenced by the outline of mountains and hills, the physiognomy of plants and animals, the azure of the sky, the form of the clouds, and the transparency of the atmosphere, still it cannot be denied that it is the vegetable covering of the earth's surface which chiefly conduces to the effect. The animal organism is deficient in mass, while the mobility of its individual members, and often their diminutiveness, remove them from the sphere of our observation. Vegetable forms, on the other hand, act on the imagination by their enduring magnitude—for here massive size is indicative of age, and in the vegetable kingdom alone are age and the manifestation of an ever-renewed vigour linked

together. The colossal Dragon-tree, which I saw in the Canary Isles, and which measured more than sixteen feet in diameter, still bears, as it then did, the blossoms and fruit of perpetual youth. When the French adventurers, the Bêthencourts, conquered these Fortunate Isles, in the beginning of the fifteenth century, the Dragon-tree of Orotava, regarded by the natives with a veneration equal to that bestowed on the olive-tree of the Acropolis at Athens, or the elm at Ephesus, was of the same colossal magnitude as at present. In the tropics, a grove of *Hymenææ* and *Cesalpinia* is probably a memorial of more than a thousand years." (p. 220.)

In this conclusion, any one who has witnessed the extraordinary diversity of effect produced by the vegetation of tropical and temperate climates, in the midst of scenes in other respects similar, will be prepared to acquiesce. He then points out, that the prodigious number of species of flowering-plants which botanists have now collected and described, may be ranked under a few typical forms; these forms, on whose individual beauty, distribution, and grouping, the physiognomy of a country's vegetation depends, not being always such as the systematist will select as his types, but those from whose magnitude or peculiarity of configuration, the total impression of a district chiefly derives its character of individuality. Thus, even scantily-dispersed examples of the groups of the Arborescent Grasses (Bamboos, &c.), the Aloe form, the species of Cactus, Palms, acicular-leaved trees, Mimoseæ, and Bananas, determine the character of a district, and produce a lasting impression on the mind of the unscientific but susceptible beholder. "Other forms, perhaps more numerous and preponderating, may not appear equally marked, either by the shape or position of the leaves, the relation of the stem to the branches; luxuriant vigour, animation, and grace; or even by the melancholy contraction of their leaf-organs." Whilst it is from the characters of the reproductive apparatus, that the systematist derives his indications of the affinity or the remoteness of the several tribes of plants, it is chiefly in the vegetative or nutrient organs that those features present themselves, which strike the ordinary observer. Hence it has been, that,—

"In all European colonies, the inhabitants have been led by resemblances of physiognomy to apply the names of European forms to certain tropical plants, which bear wholly different flowers and fruits from the genera to which these designations originally referred. Everywhere in both hemispheres, the northern settler has believed he could recognise Alders, Poplars, Apple, and Olive trees; being misled, for the most part, by the form of the leaves and the direction of the branches."

So among the Marsupial Mammals of Australia, the European settlers have found their hyæna, wolf, rat, squirrel, &c. &c.; the least resemblance to forms previously familiar having been seized upon in the bestowal of these appellations.

It might have been anticipated, *à priori*, that variations in the leaf-system and in the reproductive apparatus would present some degree of mutual accordance, if not of interdependence; but such accordance has only been observed in a very small number of families, as Ferns, Grasses, Cyperaceæ, Palms, Coniferæ, Umbelliferæ, and Aroideæ. We observe a strong physiognomical resemblance between the *Palms* and *Cycadææ*, although the latter are exogenous gymnosperms; between the *Cuscuta* (broom-rape), belonging to the *Convolvulaceæ*, and the leafless *Cassytha*, a parasitical *Laurinea*; between *Equisetum*, a Cryptogamic form, and

Ephedra, a Coniferous tree. On the other hand, the *Grossularææ* (goose-berry and currant tribe) are so nearly allied to the Cactus family, as to their inflorescence, that it is difficult to separate them; yet how wide their physiognomical diversity! And the family of the *Asphodeleæ* comprises the gigantic Dragon-tree (*Dracæna Draco*), the common *Asparagus*, and the coloured flowering *Aletris*, three extremely diverse forms. The distinction between simple and compound leaves is one which establishes a marked physiognomical difference; yet it is one of no systematic value, since it may present itself not merely in the different genera of the same family, but even in the different species of the same genus; and even, as we have ourselves witnessed, in the different branches of the same individual. The elegant form of the doubly-pinnate leaf, which constitutes so great an adornment of the torrid zone, is most frequently met with in the order *Leguminosæ*, but not equally in all sections of it; for it is restricted to the *Mimosaceæ* and *Cesalpineæ*, never having been observed among the *Papilionaceæ*; and in this large and important order, the accordance between inflorescence and physiognomical character is so far from being constant, that we meet with an extreme diversity of aspect among its members, although they are all united by a marked correspondence in fructification. —These are a few of the examples, which show us how little a systematic view of the geographical description of the Natural Families of Plants can serve, when taken alone, to indicate the physiognomical character of a region.

Before proceeding, with our author, to notice his leading physiognomical types, we shall briefly follow him in the inquiry which is appended, in the form of a long note, to this portion of this Essay, into the probable number of species of Flowering-Plants at present in existence upon the earth's surface. Such an estimate may be based on two sets of data. In the first place, it may be inquired, how many species of flowering-plants have already been collected and described, and what proportion of the earth's surface may be regarded as having its Phanerogamic Flora completely or partially represented in existing collections; from which it may be computed how many additional species may be expected from regions whose botany has been imperfectly or not at all explored. Or the same kind of comparison may be pursued with certain families, whose relation to the whole Phanerogamic Flora of different regions has been carefully determined. In making such estimates, it is desirable, as Humboldt justly remarks, to seek rather for the numerical limit, *below* which we cannot fix the sum; rather than to attempt to fix the actual number. The estimate of the number of species known and described is not so easy as it might at first sight appear. No one herbarium contains by any means the whole of them; and it would only be by the laborious comparison of different herbaria, that the species peculiar to each could be selected from among those common to both, and the actual number included in the two be thus ascertained. In the great Paris Herbarium, collected by Benjamin Delessert, and given up by him to free and general use, the number of species at the time of his death was 86,000; but we learn, from a recent enumeration, that it is now not less than 120,000. The whole number of flowering plants in the Great Royal Herbarium of Berlin is estimated at 74,000 species. Allowing for probable deficiencies in the former, we might not be far wrong in estimating the number of known

species at 150,000. And this corresponds with the estimate formed by Humboldt upon the basis of the numbers of particular families of plants cultivated in the Botanic Garden of Berlin, in relation to the whole number of described species of those families. Thus, of the very large families of Compositæ, Leguminosæ, and Grasses, he finds that 1-7th, 1-8th, and 1-9th, respectively, of the described species are grown there; the proportion is greater for some of the smaller families, as those of Labiatæ and Umbelliferæ, but it is much lower for many of the families which are most abundant in tropical climates. Hence, taking an average of 1-8th for the whole, and estimating the number of species in simultaneous cultivation in European gardens at 20,000, the number of known species may be considered to be 160,000. But this estimate is probably too low; since good authorities estimate the number of Phanerogamia already known as 213,000 species; and, as a recent enumeration of those in cultivation raises their number to 35,600, the number of known species, would rise, in the same proportion, to above 250,000.—Now, from a comparison of what we know of the existing Flora, with what we are probably ignorant of, it is considered by Humboldt (and there is no higher authority), as next to certain, that we must *double* our estimate of the number of species already collected, in order to represent the total amount. It is especially urged by him, that the regions whose botany has yet been least explored, are those in which there is the greatest variety of phanerogamic vegetation, or the largest number of species on an equal area,—namely, in the tropical and sub-tropical zone.

“It is, therefore, the more important to bear in mind, that we are almost wholly unacquainted, north of the Equator, in the new continent, with the floras of Oaxaca, Yucatan, Guatimala, Nicaragua, the Isthmus of Panama, the Choco, Antioquia, and the Province de los Pastos; while, south of the Equator, we are equally ignorant of the floras of the boundless forest region between the Ucayale, the Rio de la Madura, and the Toncantin (three mighty tributaries of the Amazon), as well as of those of Paraguay and the Province de las Misiones. In Africa, we know nothing of the vegetation of the whole of the interior, between 15° north and 20° south lat.; and in Asia we are unacquainted with the floras of the south and south-east of Arabia, where the highlands rise to an elevation of 6400 feet; as also with the floras between the Thian-schan, the Kuen-Lün, and the Himalaya; those of Western China; and those of the great portion of the countries beyond the Ganges. Still more unknown to botanists are the interior portions of Borneo and New Guinea, and of some districts of Australia.” (pp. 292-3.)

The total number of Cryptogamic plants hitherto described, has been estimated at somewhat beneath 20,000; but this estimate must receive considerable augmentation from the microscopic species of the families *Desmidiæ* and *Diatomaceæ*, which most physiologists now seem agreed to refer to the vegetable kingdom, and from many other microscopic organisms which will probably have to be transferred thither from among the Infusory tribes. And it is obvious, that, as the Cryptogamia, excepting perhaps the Ferns, have not been collected with nearly the same care that has been bestowed upon the flowering-plants, a much larger allowance must be made for the unknown species. We should certainly be within the mark, therefore, in setting down 50,000 as the *lowest possible* number of existing Cryptogamia.

It may be interesting to our readers, if we subjoin to these calculations an estimate of the same kind, which we have lately taken some pains to

form, in regard to the probable number of existing species of animals. The total number of existing species of *Mammals* known to naturalists is about 1700; and it is probable that scarcely more than 300 remain to be discovered. Of *Birds*, about 8000 species are certainly known; and to these we may perhaps add 4000 for those not yet discovered, or not yet clearly distinguished. Of *Reptiles*, about 1200 species are known; but it is probable that the proportion not yet discovered is larger, and that for this we should add at least 800 species. Of *Fishes*, about 8000 species are known; and to these, also, numerous additions may be expected, probably at least 4000 species. Thus of Vertebrated animals alone, nearly 19,000 species are known, and 9000 more are probably in existence. The number of *Mollusks* has been hitherto chiefly reckoned by that of the *shells* contained in collections, no account being taken of any but the testaceous species. Of these about 15,000 species have been collected; and it is next to certain that at least as many more are unknown to the conchologist. But the number of naked or shell-less mollusks is undoubtedly extremely large; and of these it is probable that the number already known bears but a very small proportion to the whole. Thus of the tribe of Nudibranchiate Gasteropods, only about a dozen species were formerly known as inhabiting the coast of Britain; but in the beautiful 'Monograph' of Messrs. Alder and Hancock (in course of publication by the Ray Society) more than a hundred British species will be described. The class of *Insects*, however, far outnumbers all the preceding, both as to the number of species already known, and still more as to the number of whose existence we have presumptive evidence. It is certain that at least 150,000 species are at present to be found in collections; and that these do not by any means include the total number existing even in the countries whose entomology has been best explored. For example, the number of known British insects has been raised within the last few years from 9000 or 10,000 to 15,000; and we are assured that at least 5000 more species are known, though as yet undescribed; whilst new species of the minuter tribes are being discovered almost daily. Now if we take the number of species of indigenous flowering plants in this country (where it is scarcely possible that a dozen more remain to be discovered) at 1500, and the British insects at 15,000, we have *at least* TEN species of insects to every flowering plant; and looking at the continual discovery of new forms of this class, we seem justified in saying that the number of British Insects is really *from twelve to fifteen* times that of the British Phanerogamia. Taking the lowest estimate, however, and ranking the total number of existing Phanerogamia at the low estimate of 300,000, it is obvious that the number of existing species of insects cannot be less than *three millions*; whilst if we take a higher estimate of the number of existing Phanerogamia, and of the proportion which insects bear to them, the probable number of species of the latter will amount to *five millions*, or even more! With respect to other Articulata, and the whole subkingdom of Radiated animals, we have not yet sufficient data to form even an approximative estimate.

Returning to the "Physiognomy of Plants," we find that Humboldt indicates sixteen* principal forms, as those on which the character of a

* According to our reckoning, the number of principal forms enumerated by Humboldt amounts to *nineteen*.

region chiefly depends. As to these, however, he remarks with philosophic caution :

“I merely enumerate such as I have observed in my travels through the old and new world during many years’ study of the vegetation of different latitudes, between the parallels of 60° north and 12° south. The number of these forms will no doubt be considerably increased by travellers penetrating further into the interior of continents, and discovering new genera of plants. We are still wholly ignorant of the vegetation of the south-east of Asia, the interior of Africa and New Holland, and of South America from the Amazon to the province of Chiquitos. Might not a region be some day discovered in which ligneous fungi, *Cenomyce rangiferina*, or mosses, form high trees? *Neckera dendroïdes*, a German species of moss, is in fact arborescent, and the sight of a wood of lofty mosses could hardly afford greater astonishment to its discoverers than that experienced by Europeans at the aspect of arborescent grasses (bamboos) and the tree-ferns of the tropics, which are often equal in height to our lindens and alders. The maximum size and degree of development attainable by organic forms of any genus, whether of animals or plants, are determined by laws with which we are still unacquainted. In each of the great divisions of the animal kingdom, as insects, reptiles, crustacea, birds, fishes, or mammalia, the dimensions of the body oscillate between certain extreme limits. But these limits, based on the observations hitherto contributed to science, may be enlarged by new discoveries of species with which we are at present unacquainted.” (pp. 221-2.)

Of his graphic delineation of these types, we shall endeavour to combine the most important features with some facts drawn from the Illustrations.

1. The *Palms*; the loftiest and most stately of all vegetable forms, their unbranched stems rising, like slender columns, to the height of 200 feet or even more. “To these, above all other trees, the prize of beauty has always been awarded by every nation; and it was from the Asiatic palm-world, or the adjacent countries, that human civilization sent forth the first rays of its early dawn.” The palm diminishes in size and in beauty as it recedes from the equatorial towards the temperate zone; and Europe owns among its indigenous trees only one dwarfish species.

2. The *Scitamineæ* and *Musaceæ*; of which the Plantains and Bananas are the type. These, too, are nearly restricted to the inter-tropical zone, to the natives of which their fruits are among the most important articles of food. The contrast between these and the *Cerealia*, in their physiognomical aspect, is strikingly put by Humboldt. “Whilst the cereals, spread by culture over the northern regions, in monotonous and far extending tracts, add but little to the beauty of the landscape, the inhabitant of the tropics, on the other hand, is enabled, by the propagation of the banana, to multiply one of the noblest and most lovely of vegetable productions.”

3. The *Malvaceæ* and *Bombaceæ*; the arborescent forms of both which orders are almost exclusively tropical. The former are represented in the northern part of the temperate zone by herbaceous forms only; but larger species occur in Italy, and contribute to impart to its vegetation a more southern character. The latter, to which belong the gigantic *Adansonia*, or Baobab tree, and the Silk-cotton tree, one of the most beautiful of all Exogens, is restricted to the neighbourhood of the tropics.

4. The *Mimoseæ*, *Acaciæ*, &c., possessing delicately pinnate leaves, whose feathery foliage may be regarded as peculiarly characteristic of tropical vegetation, although some representatives of this tribe may also be found

without the tropics. This beautiful form is most abundant in the New World, where, under equal parallels of latitude, vegetation is more varied and luxuriant than in Europe. "An extremely picturesque effect is produced by the deep blue of a tropical sky, gleaming through the delicate tracery of their foliage."

5. The *Heaths*; with which group are to be associated physiognomically the Epacridæ and Diosmeæ, many Proteaceæ, and even the Australian Acacias, which have *phylloдия*, or flattened leaf-stalks, in place of true leaves. The arborescent heaths of Africa and the South of Europe give an aspect of luxuriance, very different from the idea of drought and barrenness that are associated with the forms with which the inhabitants of tropical regions are familiar. There are some very remarkable peculiarities attending the geographical distribution of the true Heaths. The common heath, *Calluna vulgaris*, covers large tracts of country from the Atlantic coasts of Europe to the western declivity of the Ural; northwards it passes into Scotland, Norway, and even into Iceland and Newfoundland, although not hitherto discovered in Greenland. But it ceases abruptly on the Uralian ridge, not presenting itself on the eastern declivity, nor in any part of Siberia or Central Asia. No other true Heath has yet been found in the whole of the New World; the order being there represented by the Rhododendron, Gualtheria, &c., which, although *botanically* replacing the heaths, do not do so *physiognomically*. The natural family of the Ericaceæ is almost entirely wanting in Australia, where its place is supplied, both botanically and physiognomically, by the Epacridæ. The metropolis of the true heaths, as is well known, is in Southern Africa, where several hundred species are met with; and of these only a single one extends into Northern Africa and Southern Europe.

6. The *Cactus* form; which, unlike the preceding, is almost peculiar to the New Continent, and attains its greatest development between the tropics, although certain species are found in temperate regions, and high up on mountain declivities. It is unnecessary to dwell on the strange contrast presented by this remarkable group of plants to all others; and on the peculiar character which they must impress on the physiognomy of a region in which they are abundant. The only plants of the Old World, whose aspect in any degree approximates that of the Cacti, are certain of the African Euphorbias. The Cacti are remarkable for their power of growing in the most arid spots, in virtue of the succulence of their texture, and the thickness of their cuticle; whereby they are able to drink in an enormous quantity of moisture when it is abundant, and to retain it in the most desiccating atmosphere. Thus they form green oases in the parched and arid plains of South America; some of the wild animals of which have learned to tear open the Melon Cactus, in spite of its thorny covering, in order to refresh themselves with the juices of its interior.

7. The *Orchideæ*; a tribe of plants very widely diffused over both the Old and the New World, but presenting a remarkable diversity of aspect according to climate and situation. In the temperate and cold zone, we find only terrestrial Orchideæ, some of which are quite alpine in their habit, shedding beauty over the most desolate rocky clefts. But in addition to these, multitudes of species are found in tropical regions, and especially in the dense forests of South America, clinging to the trunks of

trees, imparting the most brilliant and variegated hue to their surfaces, seared and discoloured as these are by the action of light. "An entire life would not suffice to enable an artist, although limiting himself to the specimens afforded by one circumscribed region, to depict the splendid Orchideæ which embellish the deep alpine valleys of the Peruvian Andes." No fewer than 3545 species of Orchideæ have been enumerated; and of these as many as 2360 are in cultivation in the single collection of Messrs. Loddiges, to whose zeal we owe much of our increased knowledge of these remarkable plants.

8. The *Casuarineæ*; a very remarkable form, more singular than beautiful, peculiar to the islands of the Pacific and to the East Indies. Like the Cactus tribe, the Casuarineæ are leafless; but their aspect is altogether different, their branches being thin and thread-like, so that some of them present a strong resemblance to Equisetaceæ, and others to Coniferæ. Traces of this type may be found among other natural orders, and in various parts of the world.

9. The *Coniferæ* and other acicular-leaved trees; a form which produces an important influence on the physiognomical character of the northern temperate, and even of polar regions. "Their evergreen foliage enlivens the gloom of the dreary winter landscape, while it proclaims to the natives of the polar regions that, although snow and ice cover the surface, the inner life of plants, like the Promethean fire, is never wholly extinct on our planet." This tribe is more remarkable for its *individual* multiplication, than for the number of its *species*, which are very few in proportion to the important part they perform in the economy of Nature. The number of existing species of Coniferæ already described is not much above 300; which is not equal to the number of species of Palms already known to botanists. Whilst the latter grow, however, in almost solitary grandeur,—associating only into groves or clusters,—the Coniferæ are social in their habit, the same species extending itself continuously in densely-packed forests over vast areas. The preponderance of Coniferæ in the northern hemisphere is very remarkable; more than three fourths of the species already described being restricted to it. Between the tropics, the acicular-leaved trees are only found at considerable elevations; and consequently would have remained wholly unknown to the inhabitants of that zone, but for the rise of certain parts of the surface of the earth in those regions. The heights at which the pines and oaks begin to grow, on the Mexican highlands, are hailed with joy by those who come from the sea-coast; because they announce a climate not yet invaded, as far as experience has hitherto shown, by yellow fever. The lower boundary of the oak vegetation, in that region, is from 2500 to 3000 feet above the sea-level; that of the pine-growth is from 4000 to 6000 feet. The superior boundary of the oaks, on the declivities of the Mexican mountains, is about 10,400 feet; that of the pines nearly 13,000 feet, or 2000 feet higher than the summit of Etna. In a few rare instances, pines and palms are seen together, both in the Old and New Worlds; as in the valley of Dudgeon in Nepal, where the *Pinus longifolia*, or Tschelu Fir, was found by Dr. Hoffmeister, in a forest mingled with the lofty stems of the *Chamærops martiana*; and on the road from Acapulco to Chilpanzingo, where this intermixture was first observed by Humboldt. Indeed we learn from Peter Martyr Anghiera, the friend and contemporary of

Columbus, that this interspersion of the *pineta* and *palmeta* excited the astonishment of the early discoverers of these regions.—The distribution of the subdivisions of the Coniferous tribe is extremely remarkable. According to the latest determinations, it appears that out of the 114 species now known of the genus *Pinus*, there is not a single one in the whole southern hemisphere; although several are found very near the equator on its northern side. The Juniperinæ, Cupressinæ, and some other forms, are likewise restricted to the northern hemisphere. On the other hand, the *Araucaria* and several other important genera are equally restricted to the southern hemisphere, and sometimes to particular islands. The loftiest Coniferæ are found in the temperate regions of both hemispheres, and on the parts of tropical mountain slopes which correspond to them; the greatest height yet measured is attained by the *Pinus trigona* of the Rocky Mountains, of which one stem was 300 feet high, and without branches for the first 192 feet; the *Pinus Douglasii*, in the same region, and near the Columbia river, has been seen to attain a height of 245 feet, and a circumference of $57\frac{1}{2}$ feet at three feet above the ground; the *Araucariæ* of Norfolk Island and of Brazil frequently attain the height of from 200 to 260 feet; whilst the loftiest red and white pines of Europe reach an altitude of 160 or 170 feet. In most striking contrast with these giants of the vegetable creation, is a little flowering plant that grows in the beautiful climate of the southern tropical region. “While crossing the Rio Clairó in the Brazilian province of Goyaz,” says Auguste St. Hilaire, “I perceived on a stone a plant, the stalk of which was not more than *three lines* high, and which I considered at first to be a moss. It was, however, a phanerogamic plant, supplied with sexual organs like our oaks, and those gigantic trees which raised their heads around.” Among the curious physiological phenomena presented by the Coniferæ, is the development of woody excrescences from the roots of the *Taxodium distichum*, a cypress-like tree common in Mexico and in the southern states of North America, which attains the height of 128 feet, and the enormous diameter of from 30 to 40 feet. These excrescences are sometimes conical and rounded, and sometimes have a tabular shape, projecting from three to five feet above the ground; they have been compared to boundary-posts, or to the grave-tablets in a Jewish burial-ground. They are probably to be regarded as analogous to the adventitious buds which spring from the roots of other trees; their development being checked by some cause which obstructs their perfect evolution. Another remarkable phenomenon is observable in the ordinary white pine; the stumps of which, if left in the ground after the trunks have been felled, continue to form new layers of wood during several successive years, without throwing out shoots, leaves, or branches. At the conclusion of a long note on the geographical distribution of the Coniferæ, our author mentions the “singularly painful impression” which the first sight of a pine-forest made on one of his travelling companions, who, born at Quito under the equator, had never seen acicular-leaved trees. “The trees appeared to him to be leafless; and because we were journeying towards the cold north, he thought he recognised already, in the extreme contraction of the organs, the impoverishing influence of the pole.”

10. In striking contrast with the foregoing are the *Aroidææ*, or Pothos-plants; which, like the parasitical Orchidææ, yield a graceful covering to

the aged stems of forest-trees in the tropical world, like the parasitic mosses and lichens of our own climes. They are for the most part succulent herbaceous plants, without stems, and having only aerial roots; remarkable for their broad expanded leaves, and for the flower-like spathes which envelope their true blossoms. The order contains a few arborescent species; but it is by the herbaceous forms that its influence on the physiognomy of a country is chiefly determined. This influence is almost exclusively confined to the tropics, and is but little manifested in temperate regions; the extension of the Arum around the Mediterranean, however, contributes to give a luxuriant southern character to the vegetation of Spain and Italy.

11. The *Lianes* or creeping-plants, constitute a very remarkable feature in tropical vegetation, especially in the southern hemisphere. The form thus designated contains species from many different orders, which have a common habit of growth. Our own tendrilled hops, vines, and bind-weeds remind us of this form, which exhibits the utmost luxuriance of vegetation in the tropical bignonias, passion-flowers, &c. The genus *Bauhinia* is one of the most remarkable examples of its peculiar growth; for it not only climbs lofty trees, but sends down leafless branches, which hang perpendicularly like ropes, until they either reach the ground and take root there, or are driven by the wind in the direction of some neighbouring trunk or branch, around which they coil. The various kinds of *lianes* exercise a most important influence in rendering the forests of the regions in which they prevail impenetrable by man, but most accessible and habitable to the arboreal mammalia, such as the whole monkey tribe, and the smaller felines; for they afford to whole flocks of gregarious animals an easy means of rapidly ascending lofty trunks, of passing from one tree to another, and even of crossing brooks and rivulets. Some of the tropical climbing-plants are gigantic arboreal representatives of our trailing grasses; thus, both in the eastern and western hemispheres, bamboos are found twining round large trunks of trees, which are adorned at the same time with flowering Orchideæ.

12. In striking contrast with the pliant climbing *lianes*, with their fresh and brilliant verdure, is the self-sustaining form of the *Aloe* tribe; which, however, is exhibited also by certain genera of several other orders, such as Liliaceæ, Asphodeleæ, Pandaneæ, Amaryllideæ, and Euphorbiaceæ, all of these, with the exception of the last, being Monocotyledonous. The physiognomical character of these plants is derived from their almost branchless stems, springing from a crown of succulent, fleshy, long-pointed leaves, which radiate from a centre; the stem very commonly developing, at its summit, a magnificent crown of blossoms, whose flower-stalks have a candelabra-like arrangement. The lofty-stemmed aloe does not grow in clusters, like other social plants; but stands isolated in the midst of dreary solitudes, with an air of solemn repose and immobility, imparting to the tropical landscape a peculiar melancholy character.

13. The *Grass* form, on the other hand, when fully developed, is expressive of buoyant lightness and flexible slenderness; and constitutes one of the most beautiful adornments of tropical vegetation. In both the Indies, we have arched and shady walks formed by bamboo-groves; yet these are, for the most part, generically different, the genus *Bambusa* being restricted to the Old World, that of *Guadua* to the New, whilst that of

Arundinaria occurs in both continents, although differing specifically in each. These arborescent grasses advance into temperate climates, and show themselves in the corresponding zones of mountain-districts between the tropics; as far north as Italy we find the *Arundo donax* raising itself from the ground, and making itself visible by its height on a general survey of the country. On the other hand, as the herbaceous grasses mark the boundary of phanerogamic vegetation as we pass towards the northern and southern polar regions, so do we find them, with some few herbaceous dicotyledons, constituting the highest phanerogamic zone on the snow-crowned summits of intertropical mountains. It is a curious fact, established by the researches of Dr. J. D. Hooker, that the grasses approach nearer by $17\frac{1}{2}^{\circ}$ to the north than to the south pole. The most antarctic flowering plant yet discovered is in one of the South Shetland Islands, lat. 62° S.; in other islands of the same group, a degree or two farther south, only cryptogamia have been discovered; and Cockburn's island, lat. $64^{\circ} 12'$ S., appears to be the Ultima Thule of antarctic vegetation. On the other hand, Walden Island (lat. $80\frac{1}{2}^{\circ}$ N.) still possesses ten species of phanerogamia:

“Antarctic phanerogamic vegetation is also poorer in species at equal distances from the pole; thus Iceland has five times more phanerogamia than the southern group of Auckland and Campbell Islands; but the uniform vegetation of the antarctic regions is, from climatic causes, both more succulent and more luxuriant.”

14. The form of the *Ferns*, like that of Grasses, also assumes nobler dimensions in the tropical regions; specially preferring, however, not the hottest localities, but those approaching the temperate character, such as mountains that rise 2000 or 3000 feet above the level of the sea, or islands whose extreme heat is moderated by the comparative coolness of the surrounding ocean; and being most abundant where the atmosphere is most constantly and uniformly charged with moisture. The arborescent Ferns, which are somewhat palm-like in their aspect, sometimes attain a height of 40 feet; their stem is thicker, shorter, and more rough and scaly than that of the palm; the leaf is more delicate, of a loose and more transparent texture, and sharply serrated on the margins. The tree-ferns extend much further from the equator on the southern side, than they do on the northern; being found in New Zealand and Van Diemen's Land, and even as far as the Straits of Magellan and Campbell Island; that is, in a southern latitude as high as the northern latitude of Berlin. Where they are abundant, they give to the vegetation a very peculiar physiognomy. The geographical distribution of this form is peculiar in this respect, that, whilst it is universally diffused, the numerical ratio which it bears to phanerogamic vegetation is subject to a most remarkable variation. In the islands of St. Helena and Ascension, the number of species of Ferns is nearly equal to half that of the Flowering Plants; in many of the South Sea Islands, it is 1-4th; in the mountainous districts of tropical continents, it is from 1-6th to 1-8th; in the other portions of these continents, 1-20th; whilst, as we recede from the tropics, we find the proportion of the ferns to diminish to 1-35th (as in North America and the British Islands), 1-58th (as in France), and 1-84th (as in Greece). The proportion rises again, however, as we advance further towards the poles, in consequence of the greater rapidity of diminution in the number

of species of *Phanerogamia*, than in that of the ferns; thus the number of species of Ferns in Lapland is 1-25th that of the Flowering Plants; in Iceland 1-18th; and in Greenland, 1-12th.

15. The *Liliaceous* form, with their flag-like leaves and splendid blossoms, is chiefly characteristic of Africa; there the greatest diversity prevails; and there it forms masses, which constitute important features in the physiognomy of the region. Some magnificent forms are found, it is true, in the New Continent; but these are more diffused, and of less social habits, than the European and African *Liliacæ*.

16. The *Willow* form is indigenous in all climates, save Australia and the neighbouring islands; and everywhere presents a similarity of foliage, of ramification, and of the whole physiognomical conformation, as remarkable as that of the *Coniferæ*. The metropolis of this group, however, is the northern temperate region; the number of species, and the varieties of form, being the greatest in Northern Europe, between 46° and 70°. Those which are found between or near the tropics are at high elevations, as on the plateau of Mexico, or on the declivities of the Himalayas.

17. The *Myrtle* form imparts a peculiar character to three regions of the earth; viz. to Southern Europe, and more especially the islands in the Mediterranean Sea; to the great island-continent of New Holland; and to an intertropical region in the Andes of South America, part of which, lying at an elevation of from 9000 to 10,000 feet above the sea-level, is entirely covered with trees having a myrtle-like aspect. The tribes which present this form in Australia have a peculiar disposition of the leaves, the two surfaces being vertical, instead of horizontal; and this, taken in connexion with the absence of leaves in the *Acacias* of that country, gives a distribution of light and shade which is wholly unknown in the Old World, these two forms constituting nearly one half of the whole arborescent vegetation. The *Myrtaceæ* of the Southern Hemisphere recede much further from the Equator than do those of the Northern; the limit of the former being 50½° S., whilst that of the latter is 46° N.

18. The *Melastomaceæ* of tropical America are so limited in their distribution, as not to require particular notice.

Lastly, 19, the *Laurel* form is especially abundant in South America; but is physiognomically represented in the East Indies by trees of other orders.

“It would be,” says Humboldt, “an undertaking worthy of a great artist to study the character of all these vegetable groups, not in hot-houses, or from the descriptions of botanists, but on the grand theatre of tropical nature. How interesting and instructive to the landscape painter would be a work that should present to the eye accurate delineations of the sixteen principal forms enumerated, both individually and in collective contrast! What can be more picturesque than the arborescent Ferns, which spread their tender foliage above the Mexican laurel-oak! what more charming than the aspect of Banana-groves, shaded by those lofty Grasses, the *guadua* and bamboo! It is peculiarly the privilege of the artist to separate these into groups; and thus the beautiful images of nature, if we may be permitted the simile, resolve themselves beneath his touch, like the written works of man, into a few simple elements.” (pp. 229-30.)

We have thus endeavoured to glean for our readers the most interesting facts crowded together in this remarkable Essay, and in its illustrative

notes, the latter of which are altogether just six times as long as the original text. We have dwelt specially upon it, because the "View of Nature" which it presents is not only most attractive in itself, but because it is such as (for the reasons already named) could not be found in the formal treatises, either of Systematic Botany, or of the Geography of Plants. Of the remainder of the volume, it will be enough for us to do little more than mention the contents. The Fifth Essay is on the *Structure and Mode of Action of Volcanoes*; and however interesting to the geologist, has nothing to fix the attention of the physiologist. This is followed by the short Essay, entitled *Vital Force, or the Rhodian Genius*; which was intended by the author to embody, in an allegorical form, the idea, that the "vital forces" subtract particles from the domain of inorganic nature, overcome for a time their original affinities, and hold them together in new combinations, until they are themselves exhausted, after which these particles return to their former state. With these views, physiologists of the present day are sufficiently familiar; but the author himself appears to abandon them for the idea, that the supposed "vital forces" are but modifications of the ordinary forces of matter, acting under peculiar conditions. We shall take an early opportunity of entering upon this question more fully than we could do at present. The volume closes with a view of "The Plateau or Table-land of Caxamarca, the Ancient Capital of the Inca Atahualpa, and the First View of the Pacific Ocean from the Ridge of the Andes," which, though fully partaking of the interest of the previous Essays, presents nothing that particularly calls for our notice.

We have thus endeavoured to give to our readers such an idea of the contents of this remarkable volume, as may enable them to judge of its peculiar character. And we have only a few words to say, in conclusion, in reference to Mr. Bohn's translation. The greater part of this has been executed by Miss Otté, the lady who so well rendered the 'Kosmos' into English for the same spirited publisher; but, being prevented by indisposition from proceeding with it, the task has been completed by others, under the supervision of Mr. Bohn himself. The edition is distinguished by the same merits as those which we formerly noted in the 'Kosmos.' The translation is faithful, and at the same time good English; no small praise when a German work is the subject of it. We have noticed but a very few blemishes, and these are of the most trivial kind, such as the use of the term *church-yard* for the Jewish burial-ground. The scientific terms are, as far as we have observed, accurately rendered throughout. All the foreign measurements have been converted; a point which we have uniformly insisted on, as essential to the completeness of a translation of a foreign scientific work. And the principal Latin, French, and Spanish quotations have been translated. As a frontispiece, we have an interesting view of Chimborazo (from a sketch by Humboldt himself), beautifully printed in oil-colours; and Mr. Bohn has also furnished a facsimile of Humboldt's hand-writing, in a letter to himself. When we add, that the book is furnished with an excellent index, we have said all that can be necessary in commendation of the mode in which it has been brought by Mr. Bohn before the English public.
