

ascertained, much will be gained in the knowledge of this disease; and I have, in consequence, requested to be made acquainted with whatever may befall Benjamin Mason, whose recovery has suggested this idea.

A. BERRY.

Fort St. George, Nov. 26, 1811.

ON THE

VEGETATION OF HIGH MOUNTAINS.

Translated from a paper of Mr. Ramond's in the Annales du Museum.

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AN observing gardener, on ascending the high mountains of our temperate region, is immediately struck with the vigour and luxurious appearance of their vegetation. The plants he has seen in the adjacent plains are changed in size, aspect, and form, so that he hardly recognizes the most common. Their stems are elevated, their flowers larger, even the leaves of the trees have acquired a size, which makes him doubt the identity of the species. The woods are more impenetrable, the turf of the downs closer, and a green more lively, fresh and brilliant, colours every thing, from the depth of the valley, up to those heights, where the eye can discern nothing but naked rocks and eternal snows.†

* Hort. Trans. vol. I, appendix, p. 15.

† The first part of this sentence rather applies to purely mountainous plants, such as *aster alpinus*, *viola grandiflora*, *aquilegia vulgaris*, &c. than to all vegetables indiscriminately; the latter part I should explain by saying, that the foliage of the trees was rather diminished in the dry planes at the base of the *Pyrenees*, than enlarged by mere elevation, but along with elevation, to a certain extent, perpetual moisture and food are washed down to their roots; and such a situation in *France*, is probably the aboriginal one of the trees in question. *Sec.*

VOL. II.

22

Thus, endowed with a vigour elsewhere unknown, vegetables there hasten with increased energy through the various periods of their existence. Time, which to them moves slowly in the plains, in the mountains flies. There, every thing is done rapidly; meteors dart after each other, and the air is in perpetual agitation. From all these controlling causes, acting together in full force, germination, florescence, and fructification take place almost simultaneously. Sometimes, with a wind blowing from the south, with a heavy shower, or with a scorching sun, the face of the meadows, downs, and forests, in a moment changes, and the whole of a particular species seems to vanish; in fact, there, every fine day is a spring to some particular assemblage of vegetables, or to some of the inaccessible heights in which they grow.

To this picture, another succeeds. If we examine the mountains and vallies, every place has its peculiar soil, every different elevation its peculiar climate, and each of them its characteristic vegetables. In the plains, these vegetable assemblages occupy vast spaces, the limits of which are too extensive, and indeterminate, to be easily perceived. On the contrary, in the mountains, they are confined to narrow limits, which the eye often takes in at one view. In a gentle rising extended between two dales, in a pile of rocks, or in a cliff, which the traveller ascends in a few moments, he finds the perpetual barriers of those productions, which nature has been pleased to separate.

Among the various causes of these separations, one seems to reign predominant over all others; this is, elevation above the level of the sea. In every hundred inches in height, the temperature falls about half a degree of our thermometers. After that degree of cold, which generally puts a stop to all vegetation, an eternal frost prevails on the summit of these Alps, as at the poles, and every hundred metres of vertical elevation, corresponds nearly to one degree of the distance at which the mountain is placed from the pole.

By this scale, the various phenomena of different climates in our globe may be easily understood; circumstances may differ,

but the general results will be nearly the same. While the increase of cold is accompanied by a diminution of the column of air, it is also affected by the obliquity of the rays of the sun, and the distribution of vegetables, in all alpine countries, depends principally on these two causes.

Thus, in the *Swiss Alps*, and the *Pyrenees*, trees cease to grow at about twenty-four or twenty-five hundred metres of actual elevation, as they do about the 70th degree of north latitude; and that circle these gigantic vegetables occupy, is divided into several less bounds, which have each their peculiar characteristics. At the foot of the mountain we find the *oak*; in the middle region the *beech*; above these the *fir* and *yew* succeed, which soon give place to the *pine* (*Pinus sylvestris* L.) Along with this last mentioned tree, in the *Swiss Alps* the *larch* and *cembro* (*Pinus cembra* L.) also grow wild, which are unknown in the *Pyrenees*. The *cedar of Lebanon* would probably thrive as well on these mountains, as on those of Asia, had it been fixed there; but such is still the mystery of the original dissemination of vegetables, that nature seems by turns, indifferent to the similitude of places, or to the distance between them; sometimes bringing together in the same climate, plants of the most distant countries; and sometimes denying this conformity of vegetables to regions exactly alike, both in soil and temperature.

In this zone of trees, the *rhododendron ferrugineum* L. a little shrub peculiar to the mountains of *Europe* solely, is very abundant. It never descends into the plains, and can hardly be cultivated in a garden, demanding its native air, soil, water, nay snows, and even there only occupies particular spots. Nothing is more beautiful when in flower, but nothing is more untractable. In the *Pyrenees* it first appears at exactly sixteen hundred metres of elevation, stopping at precisely twenty-six hundred metres, and within these limits, is so abundant and vigorous, that it would be as difficult to extirpate it there, as it is to cultivate it elsewhere.*

* No shrub is more plentiful, or easily cultivated in the gardens about *London*, if planted in light sandy peat under a rock, or north-west wall, and watered plentifully in dry weather. *Sec.*

The *juniper* traverses far beyond this circle, up to the elevation of twenty-nine hundred metres, but this shrub, as it ascends, gradually loses the habit and appearance, which distinguish it in our plains; there, it resembles the *juniper* of *Sweden* and *Lapland*, with a low spreading stem, prostrate on the ground, seeking an asylum, as it were, by instinct on those sides of the rocks exposed to the south or west, against which it spreads out its branches into an espalier, with a regularity which art can seldom attain.*

In a more elevated region, we find the rigour of the climate will not permit the existence of any shrub whatever, which the first snows do not entirely cover. Still higher, even this shelter is insufficient, and nothing but a few herbs, with perennial roots actually under the earth, subsist. Nature has almost entirely banished from such places annual plants; where the whole summer is reduced to a few days, nay, sometimes a few hours; where often a storm of wind, or dripping fog, will destroy the flowers which have scarcely blossomed, and, bringing back winter, terminate the year.

On the contrary, hardly any elevation seems to stop the progress of some perennials, which on the approach of severe cold, shelter themselves under the double protection of the earth and snow, forming their buds underground, and springing up the first fine day of the succeeding year. Their duration exhausts the chances of all times and seasons, till, sooner or later, they also ripen seed, by which they are multiplied.

Thus the vegetable zone of our alps has in fact no other limits, than those of the earth or soil covering them. The *Pic du Midi*, which I have ascended twenty-six times, is three thousand metres above the level of the sea, but I never once found the thermometer there rise to the temperate point. Yet, on a nearly bare rock, I have there gathered as many as forty-eight species of vegetables, excluding cryptogamous plants; of these, one only, which perhaps I may never find again, was annual.

* Two distinct species are probably here confounded, an opinion in which I was confirmed by the late Mr. Dryander.—*Sec.*

At *Nieuville*, a place two hundred and fifty metres higher than the *Pic du Midi*, where the thermometer in summer never rises to more than 8 degrees, I have, in five journies, collected twelve different perennials. On the top of *Mont Perdu*, at an elevation of thirty-five hundred metres, even in the bosom of permanent snows, but on rocks the sloping situation of which had cleared them of snow, I have seen six different plants very vigorous. Here, in one of the hottest days of a summer remarkable for its heat, the thermometer only rose 5.5° above the point of congelation, and it undoubtedly falls in winter to 25 or 30 : nor is it certain, that those six plants, found in a season which melted more snow than usual, are regularly uncovered every year. Besides, I have seen some of them on the borders of the perpetual snow, with only half of their stems exposed and vegetating, the other half buried in it,* and it is probable, that many of them do not see the light ten times in a century, running through the whole course of their vegetation in a few short weeks, and doomed afterwards to sleep through a winter of many years.

Plants subjected to so singular a mode of existence are not among the species which grow in the plains of our temperate regions ; they belong exclusively to such as grow on the summits of mountains, or near the poles. *Norway, Lapland, and Greenland*, furnish plants analogous to those of the *Swiss Alps* and *Pyrenees* ; but few, or possibly none of them, are seen in *Siberia, Kamschatka*, or even in the polar regions of *America*. One would hardly have supposed so great a diversity of vegetable productions in countries so much alike and near each other, nor on the other hand, so great a conformity as exists among the plants of these countries, and the plants of some alpine regions distant from them 40 degrees.

In fact, we learn from actual observation, that the dissemination of vegetables is not always regulated in parallel distances

* A similar case occurred in a vine at *Chapel Allerton*, planted in the open air, at some distance from the stove ; a branch of which, however, being introduced into the stove early in January, was loaded with clusters of grapes, before any of the buds exposed to the open air, shoot out. *Sec.*

from the equator ; that if a certain number of plants, confined by their constitution to a peculiar climate, are to be found to a certain distance under the same latitudes, many others, on the contrary, have been scattered over different countries in the direction of their meridians. Towards the south, *America*, *Africa* and *Asia* ; towards the north, *Europe*, *Asia*, and *America*, are far from producing the same vegetables under the same parallels ; while many plants, growing wild in each of these grand divisions of the globe, brave every obstacle opposed to them by a diversity of climate, and propagate themselves in a geographical direction quite contrary to that which a similar climate would confine them to.

Thus, for example, many of the curious plants of *Sardinia*, *Sicily*, and *Italy*, mount up the *Swiss Alps*, and then descend again into the lower parts of *Germany*, without being allured by our fine climate to *France*. Thus, likewise, the *Pyrenees* receive from *Spain* a great number of the plants of *Barbary*, scattering them over the western provinces of *France*. The *merendera*, which grows in the north of *Africa*, is found in *Andalusia*, *Castile*, *Arragon* ; when crossing the *Pyrenees* it descends as far as the *Landes de Bourdeaux*. The *narcissus bulbocodium*,* and *hyacinthus serotinus*, grow wild in the same places, and follow the same route. The *anthericum bicolor* of *Algiers*, traverses the same chain of mountains, and arrives in *Anjou*. The *scilla umbellata* and *crocus nudiflorus*, have migrated from the *Pyrenees* even into *England*. Yet not one of the above mentioned vegetables have been disseminated lat-

* Here the celebrated author confounds three very distinct species. The plant of the *Pyrenees* is the *N. Bulbocodium* L. with erect leaves, very hardy, and brought forced to *Covent-garden* in abundance every spring. The plant of *Barbary* and *Andalusia*, which I received from the late professor Broussonet, is more dwarfish, with leaves spreading flat on the ground, and so tender, that it will only live here through winter, in very warm sandy soils, close to a wall. The plant of *Castile* grows also near *Oporto*, and differs from both the others, in having a six-lobed plaited crown, with very narrow leaves ; it is not very tender, but requires a dry sandy soil. *Sec.*

erally, 'to meet those southern ones which have crossed the *Swiss Alps*.

But it is in the great vallies of the *Pyrenees*, extending from north to south, that these vegetable galaxies become most striking and singular. The *dianthus superbus* runs through the whole valley of *Campan* and *Gavarnie*, without ever entering any of the side ones. The *verbascum Myconi*, that beautiful and scarce plant, which does not belong either to the genus in which LINNEUS has placed it, or perhaps to any natural order yet defined, and which has so exotic an appearance, that it distinguishes itself like the *kingfisher*, among our indigenous birds, invariably keeps to the same direction. Nothing is more abundant in all the great vallies of the *Pyrenees*, in every soil and exposition; yet the very same soil and exposition never attract it to any of the collateral ones. I could cite a multitude of similar examples, but it is sufficient at present, to mention one more, the *box tree*. This shrub, so very robust, is affected by elevation like the most delicate ones. At the base of the *Pyrenees*, both on the *French* and *Spanish* side, it covers every hill; thence it enters the great vallies, running from the north-east towards the south, but never quits them; in vain do the numerous branches of these vallies offer it an asylum; passing their openings, it keeps to its first direction, stopping on the crest of the chain at about two thousand metres above the level of the sea, and appearing again on the other side at a similar elevation, and in a similar direction, from which it never deviates.

Thus it is, that in high mountainous countries we discover the strongest traces of the original design of nature; there, each order of vegetables is confined within narrower bounds; there, local influence more powerfully resists every other. Nevertheless, the lapse of ages and especially the presence of man, has here introduced many modifications; for, in traversing the immense deserts of these high mountains, among the rare plants which form their herbage, some few of the commonest here and there occur. If the verdure takes a deeper tint than usual, contrasted with the gayer colour of the

alpine turf, the ruins of a hut or a rock blackened by smoke, explain the mystery. Around these asylums of man, we find naturalized the common *mallow*, *nettle*, *chickweed*, common *dock*. A shepherd had possibly sojourned here some weeks, and, hither, in driving his flocks here, had also attracted without knowing it, the birds, the insects, the seeds of the plants of his lowland cot. He may possibly never return, but these wild spots have received in an instant the indelible impression of his footsteps; so much weight has a being of his importance in the scale of nature.

In other places, by destruction he has signalized his presence. Before he approached the mountains, the immense forests which covered their bases have fallen under his axe, for woods are not the abodes of man; he avoids the circuitous paths of so vast a labyrinth, suspecting danger under their shades; he there mourns the absent sun, an object which every day renovates his delight; and therefore it is seldom that he penetrates a forest without fire and sword in hand.

Accordingly the seeds of woodland plants become dormant in a soil now dried by the sun and wind, and no longer suitable to their germinating. Other vegetables take their places, the climate itself changing; for the temperature rises, the rains are less frequent, but more copious, the winds more inconstant and impetuous, deep gullies are formed in the sides of the acclivities by torrents, and rocks are deprived of the earth which covered them, and, at the same time, of the plants which ornamented them, by falls of immense loads of melting snow; thus the face of the globe, where man inhabits, is more changed in one century than in twenty where he is absent.

After all in Alpine countries, the different soils, and their productions, retain most of their aboriginal character; there, the primitive distribution of vegetables has been least disturbed; their localities can be easily traced, the influence of the air is most perceptible; there the contiguity of objects exhibiting more forcibly their similitudes and dissimilitudes, the eye of the observer takes in, at one glance, every trait which is interesting; and if it is necessary for the geologist to visit these grand chains

of mountains, to study the structure of the earth and those catastrophes, which have imprinted its present form, it is still more so for the horticulturist, who wishes to penetrate the mysteries of the primary dissemination of vegetables and their subsequent propagation, hoping thence to derive hints for their successful cultivation and improvement, in the paradise surrounding his dwelling.

DESCRIPTION OF A

BANK FOR ALPINE PLANTS.

By M. Thouin, abridged from his paper in the Annales du Museum.

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PLANTS from alpine and frozen countries are cultivated in the *Jardin des Plantes* at *Paris*, in a *bank*, sixty feet long, placed against the wall of a terrace, ten feet high, which faces the south-east so much, that the sun ceases to shine upon it between 10 and 11, A. M. This bank is divided into five steps, one foot wide, by nailing planks of oak, ten inches deep, to the top of as many rows of strong posts, charred at the bottom, and driven firmly into the ground; the taller posts are still further secured in their places by cross bars let into the wall.

Through the whole length of this *bank* runs a ditch, two feet deep, but sloping gradually towards the front up to nine inches in height, under the general level of the ground; and in making this ditch, its sides were plastered six inches thick with mortar of brick mould and chopped straw; filling up all the cracks which appeared during the week it was left exposed to the air. After nailing the planks to the posts, the natural soil, which is

* Horti. Trans. vol. I. appendix, p. 24.