Travers, lately of Christchurch, who is well known to all students of New Zealand botany, as one of its most zealous and active promoters, to place at my disposal, the result of his observations in this direction. Mr. Travers has botanized both in Nelson and Canterbury; and to his explorations among the mountains of both Provinces the scientific world is indebted for the discovery of some very beautiful and remarkable novelties. I cannot do better than append to this Essay of mine the letter which he has kindly written me on the subject.

I forward also an account which I have received from Dr. Hector, of the most striking features of the Flora of the Province of Otago, more especially having reference to the grouping of plants in certain zones, shown to be dependent on climatic conditions. These, in their turn, dependent upon altitude above the sea level, and the position and arrangement of the mountain masses, as affecting, above all, the amount of humidity in the atmosphere. I am sure that this communication will be read with great interest. The ground it enters on has been hitherto untrodden; and the well merited reputation of the author not only as a distinguished Geologist, but an acute and accurate observer in every department of Natural Science, must give to his remarks a more than ordinary interest, and be a guarantee for their scientific accuracy.

REMARKS ON A COMPARISON

OF THE

GENERAL FEATURES OF THE FLORA OF THE PROVINCES OF NELSON AND MARLBOROUGH WITH THAT OF CANTERBURY.*

IN A LETTER ADDRESSED TO SIR DAVID MONRO,

By W. T. L. TRAVERS, Esq., F.L.S.

I FEEL some hesitation in entering upon so difficult a subject, as a comparison of the Floras of the Provinces of Nelson and Marlborough, on the one hand, and that of Canterbury on the other; and, but for the fact, that you permit me to confine myself to the question in its very broadest aspects, I should at once have pleaded my inability to enter upon it.

In the remarks I am about to offer, I propose to treat the united Provinces of Nelson and Marlborough as the "Nelson District," and the Province of Canterbury as the "Canterbury District;" and in order to make my remarks intelligible, I must briefly sketch the physical features of each District.

* This letter, by Mr. Travers, was furnished by Sir David Monro, as supplementing the foregoing Essay.—Ed.

Upon dividing the Nelson District longitudinally, we find the western half covered with dense forest, whilst the eastern may be considered as almost exclusively a grass country; but the whole district is composed of mountain spurs, radiating from the Spencer mountains, with small intervening valleys, the ranges on each side of the dividing line presenting a considerable uniformity in altitude.

The western part of the Canterbury District is also composed of mountain chains, continuous with the Spencer mountains, the eastern slopes of which are almost entirely grassed, whilst the western slopes, like those of the Nelson District, are also covered with dense forest. But, at the foot of the Canterbury mountains, on the east side, and at a short distance south of the boundary between the two Districts, we find extensive plains, apparently level, bounded by the sea shore, and having an average breadth of about thirty miles. These plains extend, from north to south, about one hundred and fifty miles, and are succeeded by low undulating downs and occasional flats, until we reach the Waitaki River, at the southern extremity of the District. At the northern end of the plains, we also find low downs, stretching from the Kowai River (where the plains properly commence), to the Hurunui; after crossing which, and entering the Nelson District, we almost immediately come upon mountain ranges of considerable altitude.

In drawing this short description of the two Districts, I must not omit to notice Banks' Peninsula, which, as you are aware, is composed almost exclusively of volcanic rocks, contains about 260,000 acres of land, all mountains and hills, much broken in character, in some parts attaining an elevation of four thousand feet, and nearly equally divided into forest and pasture land.

As you are also aware, the plains above referred to are intersected by great rivers, flowing from the mountain ranges; and it has been ascertained, as the result of carefully taken levels, that these rivers fall at rates varying from twenty-eight to thirty-five feet per mile, between the foot of the mountain ranges and the sea. These plains, therefore, although apparently level, are actually, as a rule, one thousand feet above sea level at the base of the mountain range, falling away very gradually from that altitude to the level of the sea.

It will be palpable to you, then, that, although the two Districts under consideration, present certain marked distinctions, as well as resemblances, in physical character, and might, if separated by an effectual barrier to free distribution, have presented some differing conditions of life, yet, as the whole area is continuous, and the physical conditions of each District graduate away somewhat insensibly into those of the other, we cannot expect to find any more material differences in their natural productions, than such as may be attributed to modifying influences produced by difference of climate.

The Canterbury plains, before alluded to, are generally well grassed, and contain, here and there, extensive tracts of, what is termed, swampy land, covered with a luxuriant growth of *Phormium tenax*, various species of Junceæ and Cyperaceæ, and other plants common in similar localities all over the island, whilst in moist but less swampy places, we find clumps of *Cordyline australis* breaking the otherwise absolute monotony of the scenery.

The plains, as a rule, are destitute of timber, although to the north of Christchurch, and in the neighbourhood of Timaru, we still find small patches of forest. In the swampy lands bordering the sea, moreover, at depths varying from four to twenty feet, a vast amount of buried timber is found, evidently the remains of forests once continuous with the isolated patches still growing; but it is remarkable that although amongst this buried timber considerable quantities of Pukatea *(Antherosperma Novæ Zelandiæ)* occur, I was unable to find a single tree of that species in any part of the living forest. The latter, however, still comprises *Elæocarpus Hinau*, *Podocarpus feruginea*, *P. spicata*, *P. dacrydioides* and *P. Totara*, scarcely inferior in size or general appearance to the same trees in the Nelson District. Banks' Peninsula also produces an abundance of the same timber, but the wood is found to be coarse in texture, and applicable only to the commoner uses; carpenters and cabinet-makers rejecting it in favour of wood from the northern parts of the Colony.

But whilst these trees produce inferior timber, we find the *Edwardsia grandiflora* (which in the Nelson District is merely a small tree), attaining on Banks' Peninsula, the dimensions of a timber tree, yielding valuable wood, remarkable for its durability, particularly when used for fencing and other purposes exposing it to the action of the weather. In the small trees and the general undergrowth of the forest, we are not struck, at first sight, with any very marked change, but closer examination reveals the entire absence of some genera, and that those which are common to both districts, are not represented in that of Canterbury, by so many species as in that of Nelson.

For example, while the *Nesodaphne Tawa*, and some of the more beautiful species of Malvaceæ, are common in the warm wooded valleys of the Nelson District, we do not find the former, and only different species of the latter, in the Canterbury woods. *Myoporum lætum* which grows to a large size (twenty-five feet high, and twenty inches in diameter) in the northern parts of Nelson, is reduced almost to a shrub, growing only in warm sheltered spots on Banks' Peninsula. Araliaceæ, Pittosporeæ, and Rubiaceæ, are little represented as compared with the numbers of species and varieties in the Nelson District. Many Veronicas, usually found at considerable elevations in the latter, are frequent in the lower grounds of Canterbury. The number of Composite plants of the same species is apparently more equal, and little, if any difference is to be found in a large proportion of Myrtaceæ, which are common to both districts. The *Areca sapida* grows in some parts of Banks' Peninsula, but by no means in the numbers, or so luxuriantly, as in the Palm groves of Wakapuaka or Massacre Bay. Of the Tree ferns, *Cyathea medullaris* is not found there, and I was particularly struck by the absence of all those beautiful species of Trichomanes and Hymenophyllum, which abound in, and adorn, the warm sheltered woods of the Nelson valleys.

In these remarks I have confined myself to the forest vegetation of the eastern parts of the two districts, and, indeed, it is chiefly in these localities, that we detect any very marked differences in that portion of the two Floras. As before observed, the western sides of the mountain chains in each district, are covered with dense forest, and, except that in

Canterbury, the line of the Fagus does not reach a greater altitude than about four thousand two hundred feet, whilst in Nelson, it attains, if it does not even exceed, five thousand, the only difference I observed in the forest, as we proceed to the south is, that it becomes more homogeneous in character, various species of Fagus, with occasional, but rare, patches of *Metrosideros* and *Dacrydium cupressinum*, there forming the greater bulk of the whole. A line of a species of Dracophyllum (the specific name of which is unknown to me) stretches from the Mount Arthur spur on the western side of Blind Bay, down to the Teremakau Saddle in the Canterbury District, the trees, however, gradually diminishing in size to the southward, notwithstanding a gradual diminution in the altitude at which they grow.

It is found, too, that except in very favorable localities, the size and durability in its economical applications, of the Fagus timber, is far less in the Canterbury District, than in the northern parts of Nelson.

On the whole, however, it may be said, that with the exception of such variations as are likely to be due, indirectly, to the influences of climate, the great forests on the western side of the two districts, present very little difference in composition or other character.

There is also a specific identity in the principal grasses, and in many other of the herbaceous plants found in the pastoral lands of both districts, considered in regard to horizontal or latitudinal distribution, though in respect to vertical or altitudional range there are, exclusive of those presented by Alpine plants, peculiarities which it is difficult to account for. For example, we find on the Canterbury plains, so high as the latitude of Christchurch, large well-developed specimens of the narrow-leaved variety of *Aciphylla squarrosa*, a plant only found at truly Sub-alpine elevations, in the Nelson District; whilst, on the other hand, *Discaria australis* is common, as a low, straggling shrub, to the dry, low grounds of both districts, presenting perfect similarity in each, and yet attaining, in Sub-alpine regions, where it is mixed with the same grasses and the same variety of Aciphylla, the dimensions of a small tree. Except in this and analogous cases, and in the presence of some plant in the one district, not found in the other, there is little difference in their respective herbaceous vegetation, at the lower levels.

In the Alpine vegetation, above the forest line, however, much greater differences are found, but I may here remark, that I have not (nor so far as I am aware, has any other explorer), ascended our mountain ranges beyond 7000 to 7500 feet. My observations, therefore, must be deemed to apply to the Alpine vegetation below these altitudes.

In our mountains, too, we find the same peculiarities, in distribution, which characterize the Alpine vegetation of other mountains of great elevation. Some plants extend over the whole system, others, again, have a more limited longitudinal range, and still others are confined to single localities. As examples of the first, in the districts under consideration, I may mention species of Gaultheria, Dracophyllum, Veronica, Celmisia, Ranunculus, Anisotome, Senecio, Eurybia, and others; of the second class, other species of each of these genera, and more particularly *Ranunculus Lyallii*, found by me on the Canterbury side of the Hurunui, and common throughout the Alpine and Sub-alpine districts of that Province, but not found further north; and of the third class, a beau-

tiful Ranunculus, also found by me, associated with *R. Lyallii* on the Canterbury side of the Hurunui, and never yet found elsewhere, and a handsome Celmisia, hitherto only found on a spur of the range bounding the upper Waiau valley.

Seeing then the apparently arbitrary distribution of merely Alpine plants, it is useless to attempt any comparison of that section of the Floras of the two Districts. I may, however, remark, that whilst in the southern parts of the Nelson District, a luxuriant forest vegetation is often found to the height of 5000 feet, succeeded by dense, but large growing, scrub for several hundred feet more; on the other hand, in the mountains of the Canterbury District, a stunted and strictly Alpine vegetation almost always occurs, when we reach an altitude exceeding 4200 feet.

In summing up, I may say, that whilst neither of the two districts possesses species, genera, or families of plants, giving it any distinctive features not common to the other, each, nevertheless, possesses species attaining a more full development in the one than in the other,—each possesses distinct species belonging to genera common to both,—and in each we find species belonging to natural orders not at all represented in the other. In each we find the native vegetation apparently well adapted to the surrounding physical conditions, but in both we see symptoms which lead us to the supposition, that the peculiar native vegetation will one day disappear and be replaced by foreign plants, under precisely the same circumstances which have led to such changes in the Canary and other Islands long colonized by Europeans.

Nelson, October 17, 1864.