fell continuously in such numbers as to make a sound like the patter of raindrops on the roof of my tent. *Nothofagus Menziesii* is slightly less xerophytic than *N. cliffortioides*, while *N. fusca*, with its thin leaves, is distinctly hygrophytic. Thus, according to increasing altitude the forest zones become more xerophytic, the strongly hygrophytic mixed taxad forest at 2,000 ft. altitude, with its tree-ferns, woody lianes, and epiphytic asteliads, offering a great contrast to the mountain-beech forest 1,500 ft. above, with its undergrowth of shrubs, many identical with those of the wind-swept subalpine scrub.

Leaving the zone of *N. fusca* out of the question for the present, the under-shrubs of the upper forest have frequently coriaceous leaves, and in addition certain of them are of the markedly xerophytic divaricating type already described in the case of the very typical *Suttonia divaricata*. Xerophily is likewise shown in the filmy fern *Hymenophyllum multifidum* having its leaves so frequently curled up, a condition I have already proved by experiment to be brought about directly by excessive transpiration. The elegant fern *Hypolepis millefolium* is truly herbaceous, the bright-green fronds dying to the ground in winter; and *Polystichum vestitum* and *Blechnum penna marina* have each coriaceous leaves. Also, it must be pointed out that where the same species appear as both forest and subalpine scrub or shrub-steppe plants, so different are they at times that they might be considered by one unversed in the flora as different species. How much shade-conditions can alter form I have shown elsewhere with regard to the South Island form of *Pittosporum rigidum* (5). This plant is, out in the open, of the most dense and divaricating habit conceivable, but in the forest its leaves are pinnatifid and not entire, thin and not coriaceous, and its habit is twiggy and open. Still more interesting is the behaviour of *Aristotelia fruticosa*. This, in its juvenile form, exhibits a most remarkable leaf-variation, but in the open usually it finally becomes a divaricating shrub with small leaves and leafless branch-apices which are semi-spiny. But almost invariably in the forests of the volcanic plateau the plant in question is found with comparatively broad leaves, and remains of a hygrophytic rather than a xerophytic form. So, too, with *Corokia Cotoneaster*, a very rare plant for this locality.

In contradistinction to the xerophytic form is the hygrophytic, which is exhibited by several of the commonest plants. Thus there is nothing xerophytic about *Coprosma fœtidissima* and *C. tenuifolia*. *In fact, the composition of the forests depends far more upon the history of the vegetation*—i.e., *upon the plants which by chance came to settle down on the new ground—than upon any special adaptations these may have possessed.* Probably, the main requisite was the physiological one of their frost-enduring limit. Any xerophily would, however, stand them in good stead on first settling down on the new and excessively porous ground, while when coming finally into moist forest-conditions they assumed at once, according to their plasticity, more or less hygrophytic forms.

The light-relation regulates the density of the undergrowth. This is well shown by the powerful crop of saplings wherever a few of the old trees have died. Where more light still can penetrate, the undergrowth at once becomes abnormally thick, and certain plants enter in which are usually uncommon in the formation, especially the liane *Rubus australis* (bush-lawyer) and the aggressive herb *Acæna Sanguisorbæ* (piripiri). Increase of moisture also changes the forest-character, a shady bank or the bottom of a gully having a richer vegetation, and there certain species may appear which are absent elsewhere.

The soil factor of course is of great importance regarding the undergrowth. Within the forest it consists of a surface layer 2 in. or more deep of fallen beech-leaves, partially or altogether decayed, mixed with rotted moss-cushions, decaying twigs, and so on. Beneath this is a sandy soil with little or no humus, in which the various elements pumice, scoria, and lava are mixed together, and beneath this again at a varying distance a certain amount of sandy clay and stones. Such a soil becomes excessively dry in summer. Even digging in a gully will usually fail to reach water. It is the capacity of the top layer of decayed and decaying vegetable matter to hold water on which the plants must in considerable measure rely, and this moisture, which is renewed even by the slightest shower, encourages the growth of low moss cushions or mats, these playing a notable part as soil-makers and water-conservers. One especially, dying and decaying as it grows, builds up broad low cushions of a yellowish-green colour, only the peripheral portion being alive for a trifling depth. Through such moss stoloniferous plants penetrate; young seedlings find there the moisture they require, and finally, acquiring sufficient vigour, can penetrate into the sandy ground, sending down long roots and growing eventually into thickets.

Regarding the flowers of the forest-plants, more than 70 per cent. have insignificant flowers, mostly of a dull colour, while about 66 per cent. have unisexual flowers. *Alseuosima macrophylla*, *Myrtus pedunculata*, *Nothofagus cliffortioides*, *Lagenophora petiola*, and *Styphelia acerosa* are the only members which can lay claim to any degree of showiness, and of these only the *Alseuosmia* and beech are highly coloured, the remainder being white and small. In many cases wind will play the chief part in cross-fertilisation, but in some instances—*Astelia montana*, *e.g.*,—flies will be the fertilising agent.

Heterophylly, so common a phenomenon amongst New Zealand plants, has been already discussed in the case of certain divaricatingly branched shrubs. *Nothopanax simplex* is another important example. This small tree is especially distinguished by its having two quite distinct juvenile forms. The more common of the two has a compound deeply cut leaf, which, to be sure, varies a good deal in form, depth of cutting, &c. The second form is a ternate or simple leaf with merely toothed leaflets. At one time I felt assured that the two forms were related, and that each would appear at a definite stage in the life-history of the plant. But this does not altogether appear to be the case, the two forms growing side by side and thus under the same environment.*

* Certain specimens which I collected, however, have simple-toothed, ternate-toothed, and ternate-pinnatified leaves on the same plant, these latter in some cases showing transitions towards a toothed margin. The toothed and cut leaves therefore are far from being fixed and constant structures.