

Fig. 34.—*Orthotrichum arctum*.

1. Capsule.
2. Calyptra.
3. Inner perichæatial leaf.
4. Upper stem leaf.
5. Lower stem leaf.

Fig. 35.—*Orthotrichum parvithecum*.

1. Capsule.
2. Peristome.

3. Inner perichæatial leaf.
4. Outer perichæatial leaf.
5. Upper stem leaf.
6. Middle stem leaf.

Fig. 36.—*Orthotrichum latifolium*.

1. Capsule.
2. Inner perichæatial leaf.
3. Outer perichæatial leaf.
4. Outside the perichæatial leaf.
5. Upper stem leaf.

PLATE XLII.

Fig. 37.—*Orthotrichum subulatum*.

1. Capsule.
2. Peristome.
3. Inner perichæatial leaf.
4. Outer perichæatial leaf.
5. Upper stem leaf.
6. Middle stem leaf.
7. Lower stem leaf.

Fig. 38.—*Orthotrichum erectum*.

1. Capsule.
2. Inner perichæatial leaf.
3. Outer perichæatial leaf.

4. Upper stem leaf.
5. Middle stem leaf.

Fig. 39.—*Orthotrichum robustum*.

1. Capsule.
2. Inner perichæatial leaf.
3. Outside the perichæatial leaf.
4. Upper stem leaf.

Fig. 40.—*Orthotrichum curvatum*.

1. Capsule.
2. Inner perichæatial leaf.
3. Outer perichæatial leaf.
4. Upper stem leaf.
5. Middle stem leaf.

ART. LV.—*On the Growth of Ferns; and on a New Fern now first reported.*

By H. C. FIELD.

[Read before the Wellington Philosophical Society, 17th October, 1894.]

ON the 2nd March I received a letter from Mr. James Patterson, of the Thames, informing me that some miles inland, and at an elevation of 1,725ft. above sea-level, he had found a tree-trunk covered to the height of 12ft. or 14ft. by an *Asplenium*, which climbed by means of fleshy creeping rhizomes similar to those of *Polypodium billardieri*. He also stated that he had found what he believed to be the same variety close to the coast, and at an altitude of only about 50ft. As no such widely-creeping *Asplenium* had been reported in the colony I was naturally interested in the discovery, and a few days later I received a parcel of specimens of the fern. On inspecting them I found that their long, straight sori, and the peculiar dark bluish-green colour of the

fronds, seemed to mark them unmistakably as *Asplenium obtusatum*, var. *lyallii*, particularly of that form of it with indented edges, approximating to *A. bulbiferum*. The specimens had no rhizomes attached, and I therefore felt doubtful whether there had not been some mistake about them—whether, in fact, they might not have belonged to some other fern. I wrote to several fern-collectors, and found that they knew nothing of such a plant, and Mr. Cheeseman, in particular, thought there was a mistake about it. The matter, however, was settled by my receiving from Mr. Patterson several weeks ago half a dozen live plants, with unmistakable creeping rhizomes, such as he described, and one of them with a lateral rhizome branching out from the main one. Mr. Patterson stated that he obtained them from off the face of a sloping rock, about 15ft. high by 12ft. broad, which was covered with them. Var. *lyallii* has never, I believe, been hitherto reported from any locality north of Wellington. It is usually an exclusively terrestrial plant, and has less of the creeping tendency than any other form of *Asplenium obtusatum*; in fact, it usually produces only a crown of fronds on the top of an erect rhizome, though in very old plants it is not unusual to find lateral crowns surrounding the main one. In every case, however, each year's fronds grow close together, and closely on top of the dying fronds of the previous year. The root-fibres, too, start from below the original crown, though it is possible that in some cases where soil has accumulated round the rhizome further fibres may be produced above the level of the earliest fronds. In the plants sent me by Mr. Patterson, however, the fronds grow singly, $\frac{1}{2}$ in. to 1 in. asunder, and only from the upper or outer half of the circumference of the rhizome; while the root-fibres (rather long ones) grow from the other half. Such a strange departure from the usual habit of the plant has naturally set me considering the whole question of the growth of ferns, and I have arrived at some conclusions which I think are new, and may therefore be worth stating. This is not the only instance in which there seems a change of habit of growth in these plants according to the conditions under which they are found. The other forms of *Asplenium obtusatum*, as I have mentioned, all have a tendency to creep slightly and slowly, and this development of the habit in var. *lyallii* indicates that the plant was properly classed, which had till now been doubtful. *Asplenium umbrosum* also creeps slowly, and the small variety of it reported from Nelson several years ago by Mr. Kirk, sen., spreads very distinctly and rapidly. *Lomaria procera* and *Polypodium pennigerum* also creep occasionally. I used to fancy that the rhizomes had been bent down by accident, and so forced to grow more

or less horizontally. In February, 1892, I found, in a patch of bush behind Waikanae, a number of plants of *Nephrodium glabellum*, which had unmistakably assumed the creeping habit of growth; and I thought that they, or the original plant from which they sprang, might have been hybridized with *Nephrodium decompositum*, which is plentiful in the vicinity. Last week, again, in removing the dead fronds from a plant of *Nephrodium velutinum*, I found that it had travelled several inches from where it was planted, and had nearly reached the side of the pot. *Alsophila colensoi* and *Dicksonia lanata* seem unquestionably also occasionally to assume erect habits of growth, instead of their ordinary creeping one, though I myself have never met with any examples which did so.

On careful consideration, it seems to me that the apparently divergent habits of growth in ferns may possibly be merely modifications of a common habit, rather than really different ones. All ferns on emerging from the prothallus stage produce their first fronds from a bud, which rapidly assumes the form of a short, erect rhizome. Some seem to retain this habit all through their lives, or only produce lateral crowns around the main one on attaining age. In other cases the erect rhizome becomes elongated into a caudex, sometimes of considerable height, with the crown of fronds on top. Some of these tree-ferns, particularly in certain localities, often become branched, and produce several crowns. The late Mr. J. Buchanan some years ago reported one near Dunedin with no less than sixteen branches and crowns. Others again, and particularly *Dicksonia squarrosa*, often have lateral crowns growing out from the sides of their caudices. I used to think that these were separate plants which had grown from spores that had lodged in the fibrous outer surface of the caudex; but I am now more disposed to think that they are actual lateral growths from the parent plant. Other ferns, even from what may be called their seedling stage, produce lateral creeping rhizomes, which throw out secondary rhizomes, and by thus branching soon overspread considerable areas. It seems to me, therefore, that the ramifying habit of growth is really the normal one, though it, in many species, only becomes developed at a late stage in the life of the plant—that, in fact, the branches and lateral crowns are merely developments of the creeping habit, which have been produced at too late a stage and too high above the ground for actual creeping to occur. It is a point that is worth study by those who have time and opportunity, and therefore I mention it. In this case the separate solitary fronds which grow from creeping rhizomes at short distances merely represent those which

grow closely together so as to form crowns on top of erect rhizomes; and the aerial roots which surround the caudices of tree-ferns are merely the counterparts of those which, in creeping varieties, descend into the soil and sustain the life of the plant.

In the letter which I received on the 2nd March Mr. Patterson also sent me a pinna and an impression (evidently produced by a copying-press and then traced round with a sharp pencil) of a small frond of what he thought was a *Lygodium*. He said that he had received the specimens from a Mrs. Wilson, of Christchurch, who had gathered them at Rotorua. On writing to that lady she informed me that she first saw a specimen of the plant twined round the hat of a Maori in the telegraph-office at Rotorua; that she got him to allow her to examine it; and that a few days later she and her daughter found the plant growing plentifully in a locality at Waiwera, which she described. I naturally concluded that Waiwera was some part of Rotorua, or close to it, though I did not know any place thereabouts bearing the name, and people who had lived at Ohinemutu for several years were equally ignorant of it. I have since learnt that Mrs. Wilson meant the watering-place north of Auckland. Along with her reply she most kindly sent me a specimen of the fern—a spray nearly 2ft. long, from which I found that there could be no question as to the plant being a *Lygodium*, and different from any described in the "Synopsis Filicum." Mrs. Wilson said that she found the plant about eleven years ago, and only gathered specimens to press, but that she afterwards procured three plants, one of which she gave to Mr. Patterson, and still had the other two. She has since sent me a rooted offset from one of her plants, which is now producing two fresh fronds. Mr. Patterson also writes that there are three new fronds on his plant, so that the present existence of the species is beyond doubt. It is rather remarkable that, of so small a class as *Lygodium*, a second species should turn up in New Zealand, and that both should be quite distinct from any found elsewhere. The only one described in the "Synopsis Filicum" which at all resembles the new one is *L. palmatum*, of the eastern States of North America; but even this differs in the length of the secondary petioles; in the shape of the ultimate pinnules, these being wider than they are long, while those of the new plant are the reverse; and in being merely pinnate, while the new one is very distinctly bipinnate in the lower and larger pinnæ. The plant seems to vary a good deal in the relative proportions of its several parts. Generally stated, however, the primary petioles are short, the secondary ones long (sometimes more than an inch), and the third ones short or medium: these, as well as

the centre stem of the frond, or rather spray, are of a yellowish-brown colour. The pinnae divide generally into three pinnules—two lateral ones placed alternately and stalked or narrowly webbed, and a terminal one. These pinnules are from $1\frac{1}{4}$ in. to $1\frac{1}{2}$ in. long by $\frac{3}{4}$ in. broad, palmately and very deeply cut into long, narrow, ovately-pointed lobes. Their edges are very finely and rather deeply serrated; the veins numerous, free, and forked; texture extremely thin, and almost diaphanous; colour, shining yellowish-green.

Mr. Cheeseman seems very doubtful whether the plant is really a native of New Zealand, and I have sent him the specimen given me by Mrs. Wilson, in order that he may ascertain whether such a fern is known to nurserymen and others at Auckland, or to persons who have visited the Pacific Islands. The reason for his doubt appears to be the improbability of so lovely a plant having escaped notice, in localities so much visited as Rotorua and Waiwera, and, if it occurs at places so wide asunder, its not having been met with in the intervening country. But then the question naturally arises, If it is not a New Zealand plant, whence has it come? Mrs. Wilson, in a postscript to her first letter to me, says that it was mentioned by Mr. Dobie, in his book published several years ago, under the name of *Pteris dichotoma*; but no fern of that name is described in the "Synopsis." Unfortunately, neither of the specimens which I have seen, or of which I can obtain particulars, is fertile; so that I am unable to describe the fructification, which, however, judging by the resemblance of the fern to *Lygodium palmatum*, will probably consist of merely linear divisions, carrying the capsules on their sides.

The accompanying specimen is a very shabby one, but it is the best which I have available; and, at all events, it will serve to show the character of the fern, which is of a different family of *Lygodium* from *L. articulatum*.
