

## **Synopsis of the lycopodiaceæ of Guiana and their allies / by G.S. Jenman.**

### **Contributors**

Jenman, G. S. 1845-1902.

### **Publication/Creation**

[Place of publication not identified] : [publisher not identified], [between 1880 and 1889?]

### **Persistent URL**

<https://wellcomecollection.org/works/g574g39x>

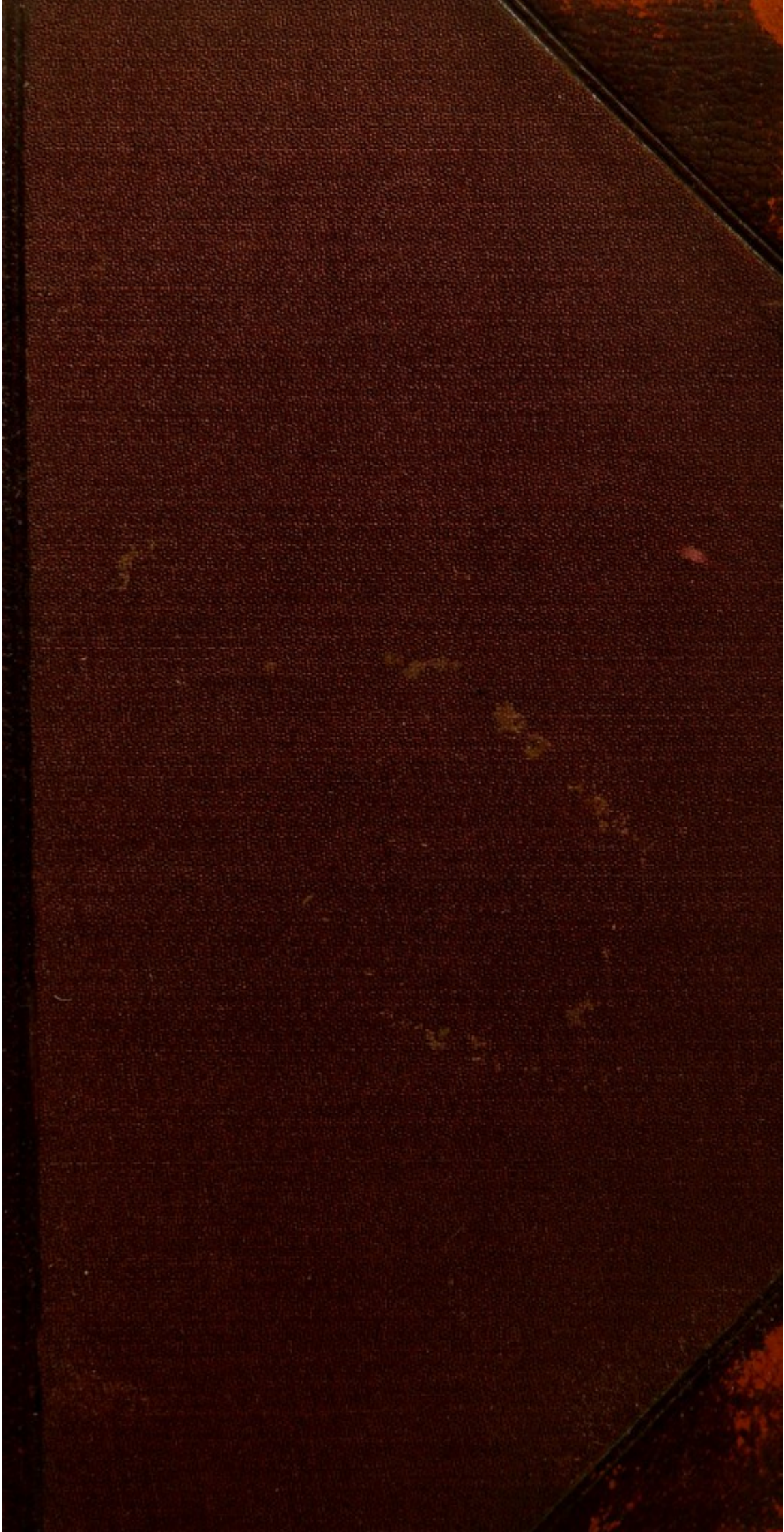
### **License and attribution**

This work has been identified as being free of known restrictions under copyright law, including all related and neighbouring rights and is being made available under the Creative Commons, Public Domain Mark.

You can copy, modify, distribute and perform the work, even for commercial purposes, without asking permission.



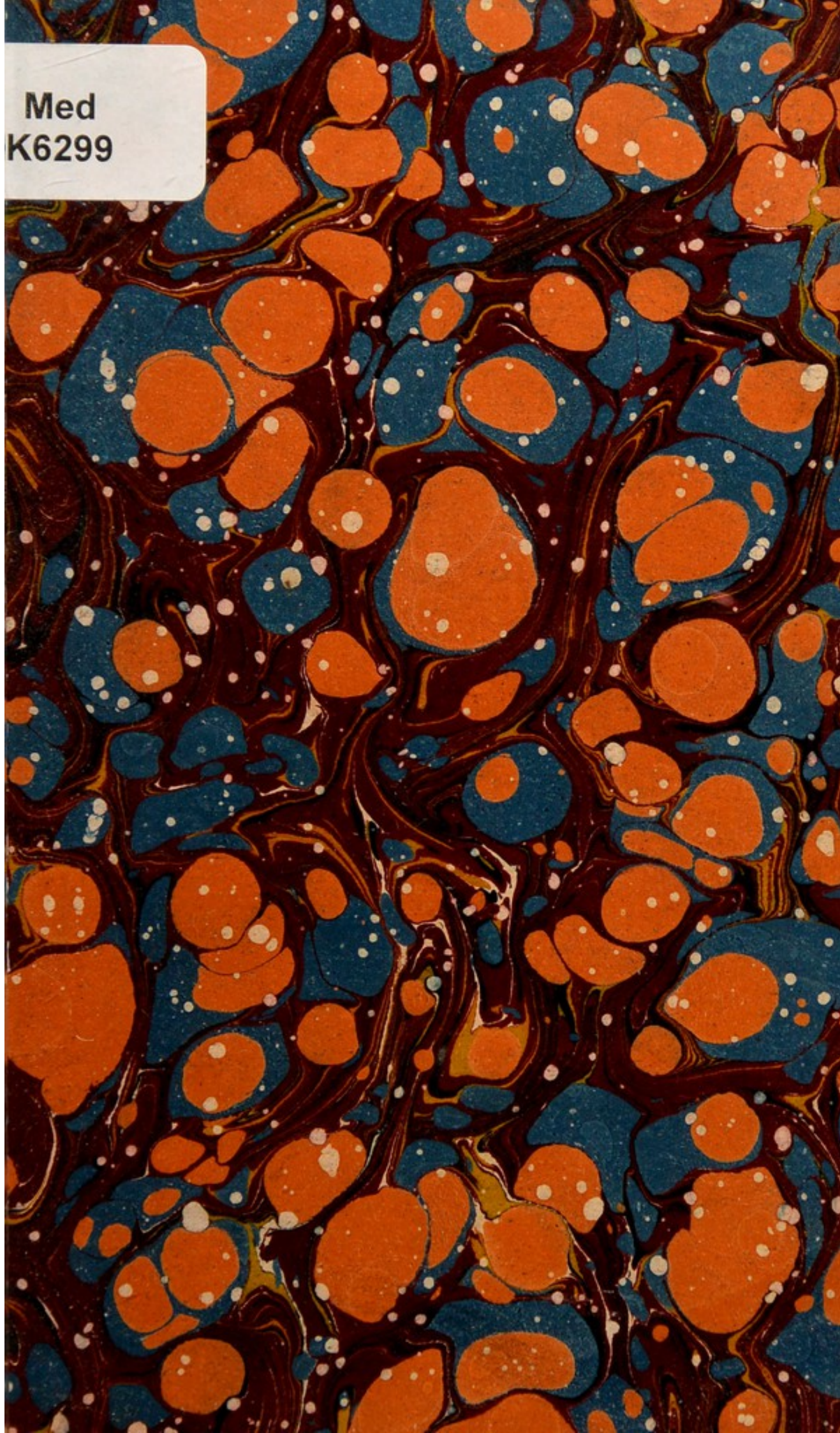
Wellcome Collection  
183 Euston Road  
London NW1 2BE UK  
T +44 (0)20 7611 8722  
E [library@wellcomecollection.org](mailto:library@wellcomecollection.org)  
<https://wellcomecollection.org>



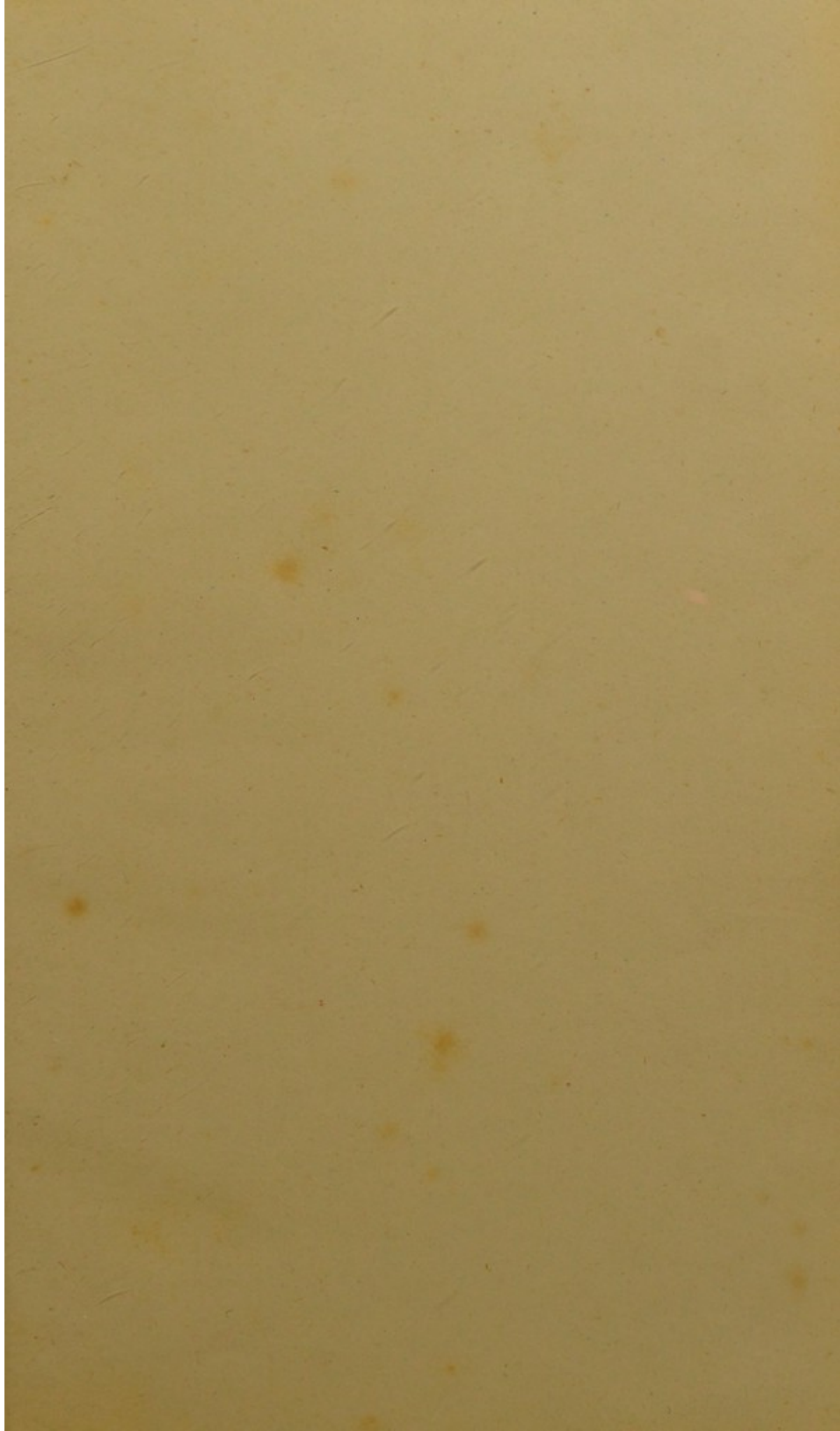


22500064934

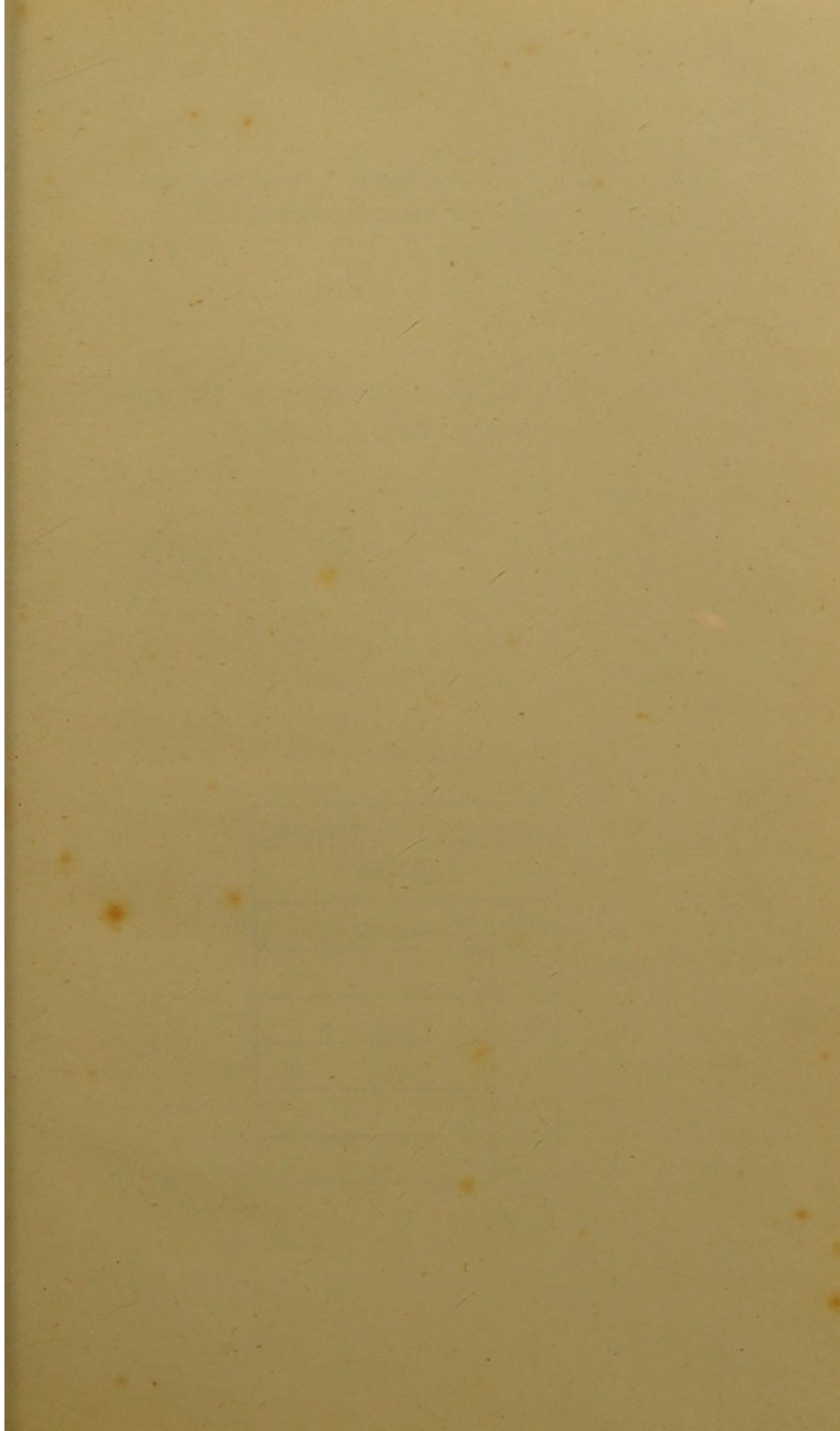
Med  
K6299











31792 639


|                               |          |
|-------------------------------|----------|
| WELLCOME INSTITUTE<br>LIBRARY |          |
| Coll.                         | WelMOmec |
| Coll.                         |          |
| No.                           | QL       |
|                               |          |
|                               |          |
|                               |          |

[Reprinted from "Timehri," The Journal of the Royal  
Agricultural and Commercial Society.]

---

*Synopsis of the Lycopodiaceæ of Guiana and  
their Allies.*

By G. S. Fenman, F.L.S., *Government Botanist of British Guiana.*

N the following paper I purpose to describe, excluding ferns, all the known vascular cryptogamia of Guiana, so far as it has come under my notice. While at Kew last year I turned over the great collection there, which a few years ago was worked out and arranged by Mr. BAKER, for those species gathered by previous collectors which I have not myself discovered in my journeys in the interior. These orders have not before been worked out in Guiana.

The fact is, that unless fore-warned by special study, the collector is liable to miss a good many species in his travels. Especially among the Selaginellaceæ there prevails a close general resemblance in the more closely allied plants that is often to the casual observer misleading. The eye, too, does not very readily carry the distinctions even where, on comparing the plants together, they are obvious. Judging from my own experience in collecting, the species which inhabit the belt of country lying between the sandstone region and the sea are generally well-known. But we appear not to be so well acquainted with those which inhabit the more elevated sandstone region. In the great alluvial belt alluded to I have found but one new

species, and those that occupy it are fairly widely distributed. I mean widely distributed locally, for Selaginellas have, in nearly all cases, a relatively very limited range. With regard to the species of the sandstone region on the other hand, most of those I gathered a few years ago near the Kaieteur Fall were new, and of the four gathered by Mr. IM THURN since at Roraima, all were new. I infer from these facts that several, possibly many, species still await discovery in that little explored region. The plants of the other orders here treated appear to be better known, for no new species has been turned up by any collector of late years, though a few not before known as belonging to the colony have been gathered.

The contemporary plants of these orders have no uses of any consequence which enter into the economy of our lives. Some of the species of Lycopodium, where gregarious, are often very abundant, and are useful, when cut, for stable litter or packing material, as a substitute for straw. In these gregarious cases some produce an immense quantity of spores, which rise in yellow dust-like clouds about one's legs and body in walking through the herbage when it is dry. The spores are very inflammable, and those of *L. clavatum*, one of the commonest and widest spread species, are said to be used sometimes in the manufacture of certain kinds of fireworks. Members of all the genera are cultivated as ornamental plants, most of all the Selaginellas. The capsules of a species of *Marsilia* are eaten by the natives of Australia (savages of the lowest degree who wander about living on roots and herbage) and they once saved the lives of a party of ill-fated exploring naturalists.

The Lycopodiaceæ are of interest for the part their progenitors held in the vegetation of the earth in the past far distant carboniferous age, when, compared to their descendants of to-day, they bore gigantic proportions, as the Calamites, Lepidodendrons and other fossil genera of the coal measures attest.

KEY TO THE ARRANGEMENT.

Series I.—*Spores all of one kind—Microspores.*

Order I.—*Lycopodiaceæ.*

„ II.—*Equisetaceæ.*

Series II.—*Spores of two different kinds—Microspores and Macrospores.*

Order I.—*Selaginellaceæ.*

„ II.—*Marsileaceæ.*

„ III.—*Salviniaceæ.*

*Series I.*

**Order I.—Lycopodiaceæ.**

Stems erect prostrate or pendent, with terete or flattened branches, which are more or less repeatedly dichotomous (except in *Phylloglossum*) and leafy throughout. Leaves relatively small, often minute, simple or forked, one-nerved, many-seried and irregularly whorled, or, rarely, distichous; usually linear or subulate, close and imbricating or more apart, rarely distant. Sporangia bi- or tri-valved, single, sessile and axillary in the leaves of the normal or modified branches, or in special spikes. Spores of one kind, abundant and dust-like.

Four genera comprise this order, but only two of them are represented in Guiana. The others—*Phylloglossum* and *Tmesipteris*—are confined almost entirely to Australia and the adjacent islands, *Tmesipteris* reaching to California.

**Genus I.—Lycopodium. Linn.**

Sporangia reniform, one-celled, bivalved, axillary in the normal or modified leaves of the outer parts of the branches, or in the imbricating scales of special spikes. Leaves of one or two kinds, multifarious, rarely

#### 4 LYCOPODIACEÆ OF GUIANA AND THEIR ALLIES.

---

distichous or biserial, generally close and often imbricating. Stems and branches mostly terete, dichotomously or pinnately branched, leafy throughout.

These are the true club-mosses, and their aspect, except in a few instances, is very different from that of their allies the Selaginellas, from which they are technically distinguished by having only one kind of spores and spore-capsules. They number about a hundred species, which are spread over the torrid and warmer regions of the globe, but most concentrated in the equatorial belt. Some of the species range widely in both the old and new worlds. They are divided in their habits of growth into two divisions—terrestrial and epiphytal. The former in Guiana grow in moist ground generally, either open to the direct sunlight or in forest shade. Two or three species, however, appear to prefer well-drained ground. Both are erect, or prostrate in growth, and more or less gregarious. Of the epiphytal, some are strictly pendent, others have a tendency to be pendent with the gradual lengthening of their weak flexible branches, while still maintaining vertical growth. These generally grow in forests on the branches of trees.

§ *Fructification in dense catkin-like terminal spikes.*—Species 1-4.

† *Spikes on long slender stems.*—Species 1-2.

\* *Branches flattened, with a distinct upper and under side.*—Species 1.

1. LYCOPODIUM CAROLINIANUM, LIN.—Fl. Brasil, p. 115. *L. repens*, Sw. *L. affine*, Bory.—Stems prostrate, rooting at intervals, extending and shortly branched. Leaves of two kinds; lateral larger and spreading horizontally in a single series on each side, the intermediate in a line with the rachis, to which they are appressed, 3-serial, linear-lanceolate, and much smaller, the former 2-2½ li. l., ½-¾ li. b., linear-oblong, decurrent on the rachis at the base, curved on the upper margin. Spikes 1-2½ in. l., on slender distant simple erect stems 3-15 in. l. which are very laxly

clothed with small subulate leaves 1-1½ li. l. Scales of spikes ovate, tapering to a spinulose point, the margins often faintly denticulate.

APPUN, n. 1027, Cako Creek. PARKER, Sand Hills. JENMAN, n. 374, Corentyn River; n. 4174, Kaieteur Savannah. Terrestrial in wet swampy ground, on the surface of which the stems extend, the slender terete fertile ones being thrown up stiffly erect at right angles. The minute leaves of the fertile stems are arranged in a sub-verticillate manner, and spread a little from the stem. There are no leaves on the underside of the prostrate stems. A very distinct species, that grows in swamps in humus, in which the stems are often found embedded by the fresh deposits.

*General distribution*—Madagascar, Hongkong, Ceylon, Bourbon, Mauritius, Florida, Reunion, South Africa, New Guinea, Angola, and Tropical America from the United States to Brasil, but only Guadeloupe of the West India Islands.

\*\* *Branches terete, with the leaves verticillate.*—Species 2.

2. LYCOPODIUM CLAVATUM, LINN.—Fl. Brasil, p. 114. Gr. Fl. B. W. I., p. 646. Plumier t. 165, B.—Stems repent, rooting here and there and branching laterally, 2-3 ft. l. cylindric. Leaves lax, showing the stem freely between. Branches erect, freely again branched, repeatedly so, but not in a dichotomous manner. Densely clothed with leaves, which are in several series, rather stiff, subulate, ¼ li. w., 1½-2 li. l. with a hair-point, incurved. Fertile branches 1-3 in l., slender, terete, erect, with minute verticillate leaves at intervals. Spikes in pairs or alternate, 2-6 in all to a branch. Bracts ovate-acuminate, attenuated, undulate-margined, somewhat spreading.

A very stiff species both in stems and leaves, but variable in its degree of branching: in some cases lax, in others very dense, and having the branchlets short.

The stems of the spikes are several inches high and decrescent in size upwards, and thinly clothed with minute subulate leaves. The spikes have shorter pedicils from  $\frac{1}{2}$ -2 in l. The leaves quite conceal the stems of the ordinary branches, though not of the primary and final ones.

*General distribution*—Widely spread over most of the tropical and temperate regions of the world; particularly abundant in the West Indies and South America.

†† *Spikes sessile on normal branches.*—Species 3-4.

3. LYCOPODIUM ALOPECUROIDES, L.—Fl. Brasil, p. 114.—Stems prostrate, repent, rooting here and there, branching at intervals and spreading laterally, densely clothed with linear acuminate plain or ciliate edged leaves which form several series, all of one kind, overlapping and more or less spreading, 2-3 li. l.  $\frac{1}{4}$ th- $\frac{1}{2}$ th li. w. Fertile branches, simple, erect cylindric, 6-10 in. long, clothed like the barren stems but less densely the leaves rather small. Fertile spikes single at the top, the leaves of which are the same in character (not changed into bracts) only longer. Sporangia copious, concealed under the leaves.

APPUN, n. 1197, Roraima 5000 ft. IM THURN, n. 146 Roraima. This is a peculiar species, intermediate between the pinnate and dichotomously branched species. It has the habit of growth of the former, but resembles the latter by having its leaves all of one kind. Even the spikes are composed of leaves unchanged only that they are longer. It varies a good deal in the length of the leaves and consequently in diameter (or apparent diameter) of the branches. The unmodified leaves of the fertile portions give this a claim to be placed in the last division. Terrestrial on wet ground, like *L. carolinianum*.

*General distribution*—United States to Brazil, and Buenos Ayres, but not yet found in the West Indies.

4. *LYCOPodium CERNUUM*, LIN.—Fl. Brasil, 114. Gr. Fl. B.W.I., p. 647. Plumier, t. 165.—Stems cylindric, strong, repent, thinly clothed with small linear-acuminate leaves, and throwing up at intervals erect pyramidal or plumose fertile branches, which are 1-1½ ft. high, with numerous tiers of spreading branches alternate in direction to each other, thus forming the plumose habit; these branches again freely branched with spreading branchlets, which are fertile at their tips. Leaves in several series, dense, not flat, spreading and up-curved, ½ li. w., 1 li. l. seta-like, main rachis clothed sparsely like the primary stem. Spikes from a line to an inch l., 1-1½ li. diameter. Bracts ovate-acuminate, the margin fringed.

JENMAN. n. 375, Corentyn River; n. 1657, Pomeroon River. Readily recognised by its pyramidal or plumose habit, resembling young fir trees, each branchlet terminated by a pale coloured recurved catkin. These vary in length in the plants from different countries. In the local state they are from 1-4 li. l. so far as I have seen, but may be in some cases more, as species from Venezuela and Brazil have them in some cases from ¾-1 in. l. It grows both in shaded and exposed places, and on both wet and dry ground.

*L. curvatum*, SWARTZ, is a stronger species with stiffer and flatter leaves, found in Martinique, Guadeloupe and Dominica and other parts of the world.

*General distribution*—Tropical and subtropical regions throughout the world.

§§ *Fructification on much modified thread-like terminal branches.*—  
Species 5-6

5. *LYCOPodium AQUALUPIANUM*, SPRING.—Spr. Mon. Lycop. 1. p. 68.—Pendent, repeatedly dichotomous, 1-1½ ft. long including the fertile part. Stems slender 4-gonal, reddish. Leaves flat, spreading, ovate, 4 serial, ¼ inch long 1½ li. w., blunt-acute, the base narrowed in the same way, even-edged. Texture firm; colour dark green. Fertile por-

tions, 4-6 inches long; terminal, 2-3 dichotomous, about 1 li. diameter, angular. Bracts folded, keeled, 3-serial, a li. or less l., very acuminate.

APPUN, n. 1388 Roraima. JENMAN, n. 1476, Potaro River, above the Kaieteur Fall, on branches of trees. Readily recognised by the flat, oblong-ovate, spreading leaves, equal at both ends, and firm though hardly stiff slender tassel-like fertile part. The bracts are keeled and folded more sharply than in the next species.

*General distribution*—Trinidad, Porto Rico, Guadeloupe, Cuba, New Grenada.

6. LYCOPODIUM SUBULATUM, DESV.—Encyc. Suppl. iii, 544.—Pendent, slender, pliant, repeatedly dichotomous, 2-3 ft. l. including the fertile portion. Branches stramineous, 3-gonal, hardly thicker than thread. Leaves 3-serial, often in whorls, spreading, about  $\frac{1}{4}$  in. apart, and always shewing the slender stem between, linear-lanceolate, pointed, the base rounded,  $\frac{1}{4}$ - $\frac{1}{3}$ rd in. l., 1-1 $\frac{1}{2}$  li. w. Texture rather flaccid; colour pale or straw green. Fertile branches as long as the barren part, repeatedly forked. Bracts sharply acuminate, keeled. Sporangia copious.

IM THURN, n. 230, base of the cliff, Roraima. This species resembles in general aspect that preceding it a good deal, and closely in habit, but is more slender and much more pliant and flaccid, the leaves more apart, narrower and more acuminate, and pale in colour, and it seems to grow very much longer,—no doubt, from the branches of trees.

*General distribution*—Tropical America, widely spread.

§§§ Fertile branches not modified, but conform with the barren part.—Species 7-13.

7. LYCOPODIUM FUNIFORME, BORY.—Spring Mon. Lycop. I, p. 50.—Branches long, simple or occasionally dichotomous, pendent or prostrate, 2-3 ft. l. Leaves crowded, several-serial, not spreading, straight and stiff, contracted laterally or convolute,  $\frac{1}{4}$ - $\frac{1}{3}$  in. l.  $\frac{1}{4}$ - $\frac{1}{2}$  li. w., freely

overlapping, sharp, even-margined. Sporangia reniform,  $\frac{1}{2}$  li. w., the lips closed, visible between the narrow leaves.

This species is peculiar for its long tail-like branches, which only infrequently fork, and that reach from 1-3 ft. l. When on trees it is strictly pendent, but it grows also on the ground, in leaf-mould and in other rubbish, and then the stems become constricted here and there and root at the place. The leaves remain fixed in a line with the rachis, not at all spreading, and their convolute condition gives them a very narrow stiff and sharp appearance.

*General distribution*—Cuba, Porto Rico, Guatemala and Nicaragua.

8. LYCOPODIUM REFLEXUM, LAM.—Fl. Brasil, p, 109. Gr. Fl. B. W. Ind. p. 147. Plumier, t. 166. L. reversum, Presl.—Branches erect, from  $\frac{1}{2}$ -1 $\frac{1}{2}$  ft. high, repeatedly dichotomous, close and parallel, strong and rather stoutish, ribbed. Leaves plain-edged or faintly serrated, reflexed,  $\frac{1}{4}$  in l.  $\frac{1}{4}$ rd- $\frac{1}{2}$  li. w., broadest at the rather rounded base, linear subulate, crowded, in several series. Sporangia abundant, exposed, reniform  $\frac{1}{4}$ - $\frac{1}{2}$  li. w., much expanded.

A terrestrial species, growing on open banks and other grassy places. The stems are erect, but as they bifurcate and lengthen they curve and rest on the ground. It is a stiff species, but the stems are not rigid, being fleshy. While green they are 1-2 li. thick without the leaves.

*General distribution*—West Indies southward to Brasil and Peru.

9. LYCOPODIUM INTERMEDIUM, SPRING.—Fl. Brasil, p. 111. L. reflexum, Presl.—Branches slender, ribbed, distantly dichotomous few or several times, reaching 2 ft. long, the divisions relatively few, parallel or spreading more or less, not decrescent. Leaves recurved throughout 7 or 8-farious, linear-subulate, 2-2 $\frac{1}{2}$  li. l.  $\frac{1}{4}$  l. w., very laxly arranged on

the ribs; margins even or slightly serrated. Sporangia about 1 li. w. reniform.

SCHOMBURGK n. 1192.—A more slender species than *L. reflexum*, with longer inter-branches, and smaller more recurved and laxer leaves. The branches are the same size and the leaves the same length from the primary stem to the ends of the branches. The top of the recurved leaves is turned quite round to the base, and thus they form nearly a circle.

*General distribution*—Andes of Ecuador, SPRUCE, n. 4793.

10. LYCOPODIUM MANDIOCANUM, RADDI.—F. Brasil, p. 110. *L. dichotomum*, Hook et Grev. Icon. Fil. t. 22.—Branches strong, leafy from the base, once to several times dichotomous, parallel or divaricating, firm and erect or spreading, ribbed. Leaves 8-farious, close, rather crowded, linear-subulate, straight, or curved, spreading variously,—horizontally, deflexed or up-curved, often falcate,  $\frac{1}{3}$ rd- $\frac{1}{2}$  li. w.  $\frac{3}{4}$ -1 in. l., even-edged, purple at the base, not decrescent upwards, the outer ones often seeming longer but really not so. Abundantly fertile, the sporangia cordate, much exposed.

JENMAN, n. 373, Corentyn River; n. 2059, Canje River; growing on the branches of trees. The leaves are very close and spread in various directions, the outer part of the branches often appearing to have longer ones than the inner parts, but it is only in appearance and due to the angle at which they spread. The species is a characteristic one, variable in its extent of branching, with a more or less upright (not pendent) but ultimately, as in *L. reflexum*, spreading growth. The leaves also vary in width, some plants from this cause having a much finer aspect than others.

*General distribution*—West Indies and tropical mainland of America to Peru. Also Madagascar.

11. LYCOPodium TAXIFOLIUM, LINN.—Gr. Fl. B.W.I. p. 647.—Stems ribbed, leafy from the base, pendent, spreading, or more or less erect, repeatedly dichotomous, from 6 in. to 2 ft. l., primary divisions spreading, or close and parallel as in the final branches, all decrescent or not outward. Leaves close but not crowded, straight, linear-acuminate, even-edged, erecto-spreading, several serial, flat, firm, but not stiff, 1-1½ li. w., ½-¾ in. l. very little narrowed at the transversely attached base. Final branches fertile. Sporangia reniform, copious.

var. L. PASSERINOIDES, H.B.K. Branches longer usually between the forking, more supple, always pendent, from 1-6 ft. l., decrescent outwards. Leaves of inner stems as large, outer ½-¾ in. l. ½-¾ li. w., all linear-lanceolate; branches fertile often a considerable length.

Nearest *L. linifolium*, but with much stiffer and thicker stems and firmer stiffer leaves. The habit of the type varies a good deal. Young plants are quite erect, and grow either on the ground or trees, though generally on the latter; older plants have laxly spreading branches, while others again are quite pendent. The primary stems are ½ in. thick, and have 5-7 ribs, and consequently the leaves as they are attached to the ribs number the same series. The var. is marked by its more uniformly pendent habit, often much greater length, (I have gathered it myself 6 ft. l., though not in Guiana) and branches decrescent outwards, while some of its forms touch *L. taxifolium* on the one hand others pass quite into *L. linifolium* on the other.

*General distribution*—Tropical America, both Islands and mainland, both states.

12. LYCOPodium GRAMINEUM, SPRING.—Mon. Lycop. ii. p. 19.—Branches firm, erect or sub-erect, or at length pendent, repeatedly

dichotomous, reaching at length 6-12 inches, the spaces between the forkings  $1\frac{1}{2}$ -2 or 3 inches long. Leaves crowded, many-farious, erecto-spreading, usually straight, linear-subulate,  $\frac{1}{4}$  to  $\frac{1}{2}$  inch long, often slightly falcate laterally, even-edged. Branches parallel or spreading. Sporangia copious on the outer branches, reniform,  $\frac{1}{4}$  to  $\frac{1}{2}$  li. w.

Collected by DRAKE in British Guiana. This is something like a small state of *passerinoides*, of erect habit and short branches. It is several times forked, but the whole plant reaches only generally 6 to 8 inches high, so that the space between the bifurcations is relatively very short. It is a terrestrial species.

*General distribution*—Guatemala and Ecuador.

13. LYCOPODIUM LINIFOLIUM, LINN.—Fl. Brasil, p. 113, Gr. Fl. B. W. Ind. p. 647, Plumier, t. 166, C.—Branches ribbed, very slender, leafy from the base of the primary stem, flaccid, repeatedly dichotomous, pendent, reaching 2 feet long or over, final branches few or many, often very numerous. Leaves lax, 3-serial, spreading, linear-subulate, often rather falcate,  $\frac{1}{4}$ — $\frac{3}{4}$  or 1 li. w.,  $\frac{1}{2}$ — $\frac{3}{4}$  inch long., herbaceous in texture, even-edged. Abundantly fertile, often from the inner furcations. Sporangia fully exposed, reniform.

APPUN, n. 960, Cucuy Creek. JENMAN, n. 1475 Kaie-teur Savannah. IM THURN, n. 192, Upper slope Roraima. This differs from the two preceding species by its slender, thread-like in size, branches, having the leaves only 3-farious, the flaccid texture, and loosely arranged leaves, between which the stem is visible from  $\frac{1}{8}$  to  $\frac{1}{4}$  inch. The var. of *L. taxifolium*, *passerinoides*, as I have before pointed out, in some of its states comes near it, but in that the stems are never so slender or flaccid, nor the leaves so few in series or so loosely placed on the ribs. The specimen from APPUN, quoted above, has nearly 100 final branches, all developed by repeated forking from a single primary stem.

*General distribution*—Tropical America abundant, from the West Indies to Brazil

NOTE.—The following given in Schomburgh's *Reisin in Britisch Guiana* I have not seen Guiana specimens of:—*L. aristatum*, H. B. K., *L. dendroideum*, Spring., *L. jussiaei*, Desv., *L. robustum*, Klotzsch.

### Genus II. *Psilotum*, Swartz.

Sporangia sub-globose, trilobed, axillary in the minute distant leaves. Branches very slender, repeatedly dichotomous, trigonal or flattened. Leaves simple or bifid.—*Bernhardia*, Willd.

This small genus consists of only two species, which however make up for the paucity of type in their abundance and wide distribution. They are small and twiggy plants; starting from a simple base, and repeatedly forking till they become a broom-like fascicle of twigs, with distant and very inconspicuous leaves. Only one of them, the commonest, has yet been found in Guiana.

#### § § *Branches trigonal.*

1. *Psilotum triquetrum*, Swartz.—*Fl. Brasil*, p. 133. *Gr. Fl. B.W.I.p.* 648.—Rootstock composed of few wiry deeply penetrating roots. Stem few inches to a foot long, strong, erect or pendent, cylindric below, ribbed and angular above approaching the first furcation. Branches triquetrous, with sharp angles, repeatedly dichotomous, forming a brush like head, slender, virgate, short and stiff or longer and very flexible. Leaves minute, simple or forked, at intervals in dentation on the edges of the branches. Capsules in the axils of the leaves, 3-lobed.

A more repeatedly branched bushy and stiffer species than the other, easily recognised by the three cornered branches. It was first gathered in this country by SCHOMBURGK. It grows on banks, in the fissures of rocks, and between the roots of trees. At the Botanic Gardens, where it has never been cultivated, it comes up frequently in the plant pots.

*General Distribution.*—America, from Cuba to South Brasil; tropical Africa, Asia, and Polynesia.

### Order II. Equisetaceæ.

Rootstock creeping. Stems erect, cylindrical, longitudinally furrowed, jointed at intervals, hollow except at the joints, which terminate in a completely circular monophyllous dentate margined sheath. Branches simple, springing through the lower part of the sheaths, whorled and spreading. No distinct leaves. Fructification terminal, on simple stems, in cone-shaped heads, which are composed of several horizontal tiers of peltate stipitate scales that bear on their underside 6-9 pale membranous micro-sporangia that open longitudinally in a slit on the inner side. Spores minute, green, united to elastic wool-like threads (elaters) that are spontaneously irritant while dry.

A single genus represents this order, numbering about thirty species, the principal part of which are spread through the north temperate zone, where they are in several European countries common and well known marsh plants, which in Britain go by the name of horse-tails and paddock-pipes. They form no leaves proper, but these organs are represented by the membranous sheaths of the joints. The branches are produced after the stems have developed, and they grow through the base of the sheaths. There is but one known Guiana species.

#### Genus I. Equisetum. Linn.

For characters refer to the order.

1. *Equisetum bogotense*, H.B.K.—*E. pratense*, Hook. *E. flagelliferum*, Kunze. *E. chilense*, Presl. *E. quitense*, Fée.—Rootstock free-creeping, throwing up at intervals tufts of slender, virgate, stiffish shoots, which are 6-12 or 15 in. l. hardly a li. thick; ribs 4-6 or 7. Teeth of the sheaths acuminate, dark-coloured, scariose edged, as many as the ribs of the stems. Spikes terminal,  $\frac{1}{2}$ - $\frac{3}{4}$  or 1 in. l.

Gathered by APPUN, but his label bears no number or locality. It is a very slender species, with small twig-like branches, which are usually simple from the

base, but occasionally are branched verticillately from one or more of the joints. The slender rootstock extends freely in the ground, and the tufts of shoots are thrown up at intervals of an inch or so. The fertile shoots are the same in character as the barren.

*General distribution.*—Abundant from Mexico to Chili.



### *Series II.*

#### **Order I.—Selaginellaceæ.**

SPORANGIA of two kinds, larger and smaller; the former, macrosporangia, containing macrospores; the latter, microsporangia, containing microspores; borne separately in the axils of normal or modified leaves, in which they are single, and free or partially embedded; the macrosporangia being inferior in situation to the microsporangia.

This order consists of two very dissimilar genera if only the physiognomy or conformation of the respective members be regarded. They are associated however by the character which they possess in common, of the sporangia and spores being of two kinds, one larger than the other, generally considerably larger; each kind of the spores possessing separate sexual potentiality, generation resulting from the interaction of the contents of the cells that are produced on their germination; if this union is not effected the antecedent germs perish.

#### **Genus I.—Selaginella, Beauv.**

Sporangia bivalved, uniform, orbicular, or subglobose. Macrosporangia inferior, usually few, containing few large macrospores. Microsporangia superior, usually numerous, containing multitudinous minute microspores, borne in modified 4-gonal spikes, at the end of the branches. Leaves small or minute, generally of two kinds—rarely of one—major and minor, each kind bi-serial, imbricating or slightly apart, the larger series lateral and spreading from the axis obliquely or horizontally, the smaller intermediary, more or less in a line with and

dorsal on the axis and appressed thereto. Fronds generally pinnately divided, rarely simple, often decomposed. More or less copiously leafy throughout. Prostrate, sub-erect, erect or scandent.

Selaginellas differ from their allies the club-mosses by possessing two kinds of sporangia and spores, the generally distichous arrangement of the leaves, which gives the stems a flattened appearance, their more or less prostrate or subscandent habit of growth, their uniformly communal association and, as a rule, terrestrial location. Three or four Lycopodia have a somewhat similar arrangement of their leaves, and a considerable number are terrestrial, and some too are communal, but among the Selaginellas these are nearly constant characteristics. In a few species, none of which are natives of this country, the leaves are all of one kind and multifarious, the stems being consequently convolute, as is the rule in the Lycopodia. In nearly all the species there is some variation of shape in the fronds, and in many this is considerable. Some by their habit of rooting along the rachis as the growth extends grow to an indefinite length and many species are more or less modified in size and outline by this habit. In some the leaves are the same distance apart on all the branches, but in the majority they are widest on the primary stem or rachis, being gradually closer on the outer ramifications. The ciliation or serration of the leaves is generally quite microscopical. They are moisture and shade-loving plants, and grow principally in forests on damp soils or moist ground, forming patches or dense carpets or banks of exquisite and, in the different species, variable shades of green; though a few species prefer some degree of exposure. In Europe and

North America Selaginellas are largely cultivated as decorative and ornamental plants in Fern houses. Their habit of growth enables gardeners to propagate the great majority of them rapidly and with ease by subdivision. This is the only use to which they are turned or which they are known to possess. All except three or four species have a very limited geographical range, and according to Mr. BAKER only three species are common to both the Old and New Worlds. Two-thirds of the species here described are confined to Guiana, so far as is at present known; the rest extend only to Brazil and some of the nearly adjoining countries.

§ *Leaves of two kinds, major and minor. Spikes 4-gonal; bracts uniform.*—Species 1-22.

† *Fronde prostrate.*—Species 1-9.

\* *Species not exceeding a line wide across rachis and leaves.*—Species 1-4.

1. SELAGINELLA VALDEPILOSA, BAKER, Syn. Gen. Selaginella, p. 11.

—Fronde delicate, pale green, quite prostrate, very slender; linear and repent, simple or with few short branches, 1 li. w. over the leaves, terminating in a depauperated tail, having only small leaves, in shape like the minor series. Major leaves spreading, not quite horizontally, ovate, acute, subequilateral, the margin freely ciliated, most so on the upper side,  $\frac{1}{2}$  li. l., less w., with half their own width between them. Minor leaves also ovate, equilateral or nearly so, acute, but not spinulose pointed, hardly  $\frac{1}{2}$  li. l. and less wide, both margins pubescent. Spikes a line or over 1.; bracts keeled.

JENMAN, n. 1484. Gathered in the deep ravines in the forest near the top of the Kaieteur Fall. Marked by its little branched, very narrow, linear fronds, which are 1-1 $\frac{1}{2}$  in. l., terminating in a depauperated tail. The colour is exceedingly pale. The under side looks very pubescent, from the long marginal hairs of the rather auricled upper base of the lateral leaves which overspread

it. The pale colour is probably due to the little light that can penetrate to the deep chasms between the rocks in which it grows. Measured across the leaves, the diameter is the same throughout, from the base of the plant outwards, and the rachises are all of the same size and strength.

*General distribution*—Endemic.

2. SELAGINELLA DENDRICOLA, JENMAN, Gard. Chron. vol. 2, 1887.—Fronds prostrate, few to several inches long, consisting of a slender thread-like rachis and short, distant, usually simple or casually forked branches,  $\frac{1}{4}$ – $\frac{3}{4}$  in. l. Leaves extending to the base of the primary rachis; major ones  $\frac{1}{4}$ – $\frac{1}{2}$  li. each way, hardly pointed, the base subequally slightly cordate, nearly orbicular, horizontal, all except the outer ones more or less apart or distant; the latter contiguous or imbricated, and becoming gradually oblong in shape; minor leaves very minute, ascending, distant, ovate, acute. Spikes often crowded at the end of the frond,  $\frac{1}{2}$ – $1\frac{1}{2}$  in. l., 4-gonal; bracts sharply keeled, acuminate, and finely denticulate.

JENMAN, n. 2323. Gathered on decaying logs in the forest opposite Bartica, Essequibo River, growing among, and often more or less concealed in, moss. It is a slender delicate species, apparently nearest *S. rotundifolia*, Spring. and *S. minima*, Spring. It has a curious duplex habit, the long main rachis having lax or distant leaves, which are nearly round, while the short branches and apex of the frond, which are fertile at the ends, have close or crowded oblong leaves. At the top of the frond the spikes are peculiarly long, a dozen often extending forward side by side; those of the distant lateral branches are shorter. The colour is a very pale green.

*General distribution*—Endemic.

3. SELAGINELLA DIMINUTIFOLIA, JENMAN, Gard. Chron. vol. 2, 1887.

—Fronds 1-2 or 3 in. l., half as wide or less, rooting chiefly at the base, but also frequently from the joints, two or three times pinnate, the branches short, alternate, contiguous or subdistant,  $\frac{3}{4}$ -1 li. w. over all, the outer ones hardly narrower than those of the main axis; firm in texture, dark green. Major leaves spreading obliquely, contiguous, the outer ones imbricating, obliquely ovate, obtuse,  $\frac{1}{2}$  li. l., less broad, plain edged, the base obliquely cordate, much deeper on the superior rounded base, the auricle of which laps over the rachis. Minor leaves ovate, acute, equilateral, subcordate, imbricating on the outer branches but not at the base of the stems, or hardly so,  $\frac{1}{4}$  li. l., nearly as wide, slightly convex. Spikes not seen.

JENMAN n. 1481. Gathered on rocks at the foot of the Kaieteur Fall, a situation that if closely examined would probably yield several other species, new or old. On my visit, unfortunately, I had temporarily lost my sight from an attack of ophthalmia, which compelled my leaving the situation quite unexplored. Of this group of diminutive species this is most compact in its leafage, and most freely branched.

*General distribution*—Endemic.

4. SELAGINELLA MINIMA, SPRING., Mon. Lycop. p. 86. Baker, Syn. Gen. Selaginella, p. 60.—Fronds small, about 1 in. l., simple and linear, or simply and shortly branched, 1-1 $\frac{1}{2}$  li. broad over all. Major leaves spreading, ovate-oblong, sub-acute, deeper on the upper side, the rounded auricle ciliate and lapping over the rachis, other parts of the margins bare,  $\frac{1}{2}$  li. l., rather less wide, lax or subdistant in the lower part, but in the outer close or slightly imbricating. Minor leaves nearly equilateral, but obliquely attached, ovate, acuminate or rather cuspidate, the margins faintly echinate, overlapping each other at the top of the fronds. Spikes 1-1 $\frac{1}{2}$  li. l., as wide as the frond or wider; bracts rather loose and spreading, hardly keeled, resembling the minor leaves of the fronds.

LEPRIEUR, Cayenne. This is the dwarfiest of the known Guiana species, and in other respects, as well, a very distinct little plant. On the lower part of the stem

the leaves are separate, while in the outer part or in the short branches they are close or crowded. The spikes are generally wider than the fronds, the bracts spreading rather openly, only half folded, in shape like the intermediary leaves. The ciliation of the auricle of the lateral leaves is rather long, and gives the underside a pubescent appearance.

*General distribution*—Endemic.

\*\* *Rachises exceeding a line wide over the leaves.*—Species 5-9.

5. *SELAGINELLA KAIETEURA*, JENMAN, Gard. Chron. vol. 2, 1887.—Fronds quite prostrate, rooting freely along the axis, herbaceous, dark-green, 3-4 or 6 in. l., with pinnatifid, sub-distant, short branches, which are usually again shortly branched in like manner. Rachis firm, stramineous, leafy to the base, 1½-2 li. w. over all. Major leaves oblique, contiguous, most apart at the base of the stem, imbricating on the outer branches, 1-1½ li. l., 1 li. w., very inequilateral, obliquely ovate-deltoid, obliquely cordate at the base, the auricled superior side very disproportionately deep, point obtuse; margins plain. Minor leaves ovate, the bases slightly overlapped, cordate and nearly equilateral, acute, ¾ li. l., and nearly as w. Spikes short, bracts convex or keeled, acute.

JENMAN, n. 1480. Gathered on the rocks at the foot of the Kaieteur Fall. This has some resemblance to *S. platyphylla*, but the branches are nearer, the leaves close, broader in relation to the length, the upper side being so disproportionately wide as to produce an obliquely deltoid outline, though those at the ends of the branches, which are crowded and imbricating, are more equally cordate, and in all cases the one at the base of each branch is strictly heart-shaped, both sides being equal, as is the case in some other species. My specimens are only slightly in fruit, and it is probable the spikes are longer than I have described.

*General distribution*—Endemic.

6. *SELAGINELLA POTAROENSIS*, JENMAN, Gard. Chron. vol. 2, 1887.—Fronds quite prostrate, with delicate filiform roots at the joints, 2-4 in. long, with short distant alternate branches, which are simple or again shortly branched, flaccid and delicate. Rachises very slender, and thread-like, brightly stramineous, leafy to the base, 2-2½ li. w over all. Major leaves spreading, distant, becoming gradually contiguous, but not touching, on the outer parts; obliquely ovate, broadly acute, obliquely cordate, but narrowed at the base, the superior base very slightly auricled, 1¼ li. l., ¾ li. b., the margin plain; colour light straw green. Minor leaves much reduced, distant, situated at the base of the major, inequilateral, attached by the inner side of the base obliquely ovate, cuspidate, about ¼ li. l. Bracts ovate-lanceolate, imbricating but slightly open.

JENMAN, n. 1818. Gathered in ravines in the forest near the Kaieteur Fall. A species well marked by its bright straw colour, very slender, conspicuous, yellow rachises, distant, ovate, lateral leaves, which seem at sight, though they are not really, narrowed equally each way, and very minute medial ones. The latter are so small that they can only be seen by the aid of a lens. When a frond is looked at on the under side with a lens they are seen projecting like a small auricle against the inferior base of the major leaves. In the longer spikes, some of which are nearly half-an-inch long, the bracts are imbricated moderately firmly; but in the shorter ones, a line or so long, they are lax, and seem, as is often the case in that state, somewhat disposed to be, but are not, resupinate.

*General distribution*—Endemic.

7. *SELAGINELLA PRODUCTA*, BAKER, Syn. Gen. Selaginella, p. 33.—Fronds prostrate or suberect, rooting at the base, and on the stem at intervals as well, an inch or two to a foot l., oblong, lanceolate or ovate, with contiguous, nearly uniform, erect-spreading branches, 1-2 or 3 in. l. Major leaves oblong, spreading horizontally, deeper and auricled on the upper side at the base, the lobe overlapping the rachis beneath, 1-1½ li. l., ½ li. or over w., very faintly spinulose-ciliate on the rounded

base, those of the rachises a little apart, of the final branches close but not imbricating. Minor leaves ovate, cuspidate, somewhat keeled, and partly overlapping,  $\frac{1}{2}$ -1 li. l., less w., the margins spinulose-ciliate. Spikes square, copious, often crowded round the frond,  $\frac{1}{4}$ -1 in. l.; bracts densely imbricated, not or little spreading.

APPUN, n. 196 and 198; DRAKE; JENMAN, 783 and 1483. A very common species, growing by the banks of rivers and in damp places often submerged, forming dense patches or beds. The lateral leaves are rather broad, oblong or ovate-oblong, spreading horizontally. The intermediate ones are freely cuspidate with spinulose margins. I have gathered it on the banks of most of the rivers of the colony that I have visited.

*General distribution*—Northern Guiana to the Brasils.

8. SELAGINELLA GUYANENSIS, SPRING, Mon. Lycop. II. 134. Baker, Syn. Gen. Selaginella, p. 34.—Stems decumbent, above a foot long, subterete, copiously pinnate, the branches but little compound. Major leaves spreading, linear-oblong, middle sized, sub-obtuse, three times as long as broad, nearly equilateral, serrulate, subcordate, and shortly ciliate on the upper side at the base. Minor leaves very small, cordate-ovate, with a large cusp. Spikes square,  $\frac{1}{2}$  in. l.; bracts ovate, cuspidate, strongly keeled.

French Guiana, LEPRIEUR. This I have not seen.

*General distribution*—Endemic.

9. SELAGINELLA BREYNI, SPRING, Mon. Lycop. II, 119. Baker Syn. Gen. Selaginella, p. 23.—Fronds prostrate, with long straight roots at intervals beneath, 1-1 $\frac{1}{2}$  ft. l. dark-green, herbaceous, oblong, with two or three frond-like divisions often springing from a common base the same shape and size, branched alternately throughout, the primary rachis stiffish. Branches contiguous but not close, 2-3 in. l. with shorter alternate branches. Major leaves spreading horizontally, linear-oblong, close or imbricating, inequilateral, the upper base auricled and deeper than the lower, overlapping, and very faintly pubescent, concealing the rachis beneath, 2-2 $\frac{1}{2}$  li. l.  $\frac{3}{4}$  li. w. the point sub-acute. Minor leaves, ovate, cuspidate, the margin finely serrate, inequilateral,

attached obliquely, the outer rounded side being much deeper than the inner, the two series close and slightly overlapping in the lines, rather keeled toward the freely cuspidate point. Spikes  $\frac{1}{2}$ -1 in. l., 4-gonal often 2 to a final branch, or forked ; bracts densely imbricated, sharply keeled and pointed.

SCHOMBURGK n. 982. A large species most like *S. epirhizos* and *S. affinis* in its flat spreading parts, the leaves of which lap one over the other on the under surface and spread horizontally. The intermediate leaves are very unequal sided, run direct with the rachis, and are attached on the narrow or inner side of the base. The long slender white roots from the joints are numerous. Both above and below the rachises are quite concealed by the foliage. Gathered by LE PRIEUR as well as by SCHOMBURGK.

*General distribution*—Guiana and Brazil.

10. SELAGINELLA RORAIMENSE, BAKER, in Journ. Pro. Lin. Soc.—Fronds sub-erect or more decumbent, rooting only at and near the base, bi-tri-pinnate, leafy to the base, 3-5 in. l. 1-2 $\frac{1}{2}$  in. br. Branches spreading laterally or converging forward, 2 $\frac{1}{2}$  li. w. over the leaves, the major series of which are close or with as much as their own width between, nearly horizontal, acute, the base unequally sub-cordate, the upperside auricled, overlapping the rachis, and faintly spinulose, 1-1 $\frac{1}{2}$  li. l.  $\frac{1}{2}$  li. w. Minor leaves  $\frac{1}{2}$  li. l. equilateral, cordate, the point acuminate, but not cuspidate, the margins faintly spinulose. Spikes square,  $\frac{1}{4}$ -1 $\frac{1}{4}$  in. l., often copious. Bracts keeled.

Roraima, IM THURN, n. 122. Gathered near the foot of the slope ; most abundant on the banks, which it covers, of the upper part of Macouria River ; JENMAN, n. 2324. A very near ally of *S. radiata*, for which without close comparison it might be mistaken, but a stiffer and more erect species. The range in altitude of the two localities above mentioned is the widest known of any of the local species.

*General distribution*—Endemic.

11. SELAGINELLA RADIATA, BAKER, Syn. Gen. Sellaginella, p. 62. *S. increscentifolia*, Spring, Mon. Lycop., II., 106. *Lycopodium radiatum*, Aublet.—Fronds rooted at the base, with scattered leaves and no branches in the lower part; above this lanceolate, ovate or radiate, 2 or 3 times branched; branches 1-2 in. l., contiguous, erecto-spreading, 1-2 li. w. over all. Major leaves erecto-spreading or more patent, contiguous or with once or twice their own space between them on the branches and often more on the main rachis, subovate, acute, widest at the unequal base, the upper side rather auricled and lapping on the rachis, the rounded part freely ciliate (or both sides of the more equal sided leaves found at the axils), 1-1½ li. l., ½ li. w. Minor leaves ovate, rather cuspidate the point weak and hair-like, inequilateral but not conspicuously so, attached by the inner base, apart, showing the rachis freely between them, ½ li. l. including the awn; both margins ciliate, but variable. Spikes square, very abundant, 2-6 li. l.; bracts ciliate margined, keeled, but little open.

A relatively small, much branched species, weakly and flaccid in substance, varying in the degree of ciliation, some plants being quite naked. It is 4-8 in. l., the stem often devoid of branches half the length, above which it spreads in a variable, lanceolate or broader form.

*General distribution*—Trinidad, Ecuador and Surinam to Brazil.

12. SELAGINELLA MARGINATA, SPRING, Mon. Lycop., II, 211. Flora Brasil, p. 127 Baker, Syn. Gen. Selaginella, p. 38.—Fronds with slender but firm and stiffish stems, rooted at the base, jointed, stramineous, with laxly scattered leaves, several inches to a ft. or over l. with sharp subdistant or distant 1-2. pinnated branches, which are 2 li. w. over the leaves; rachises terete, much exposed between the scattered leaves. Major leaves oblong, spreading nearly horizontally, with their own width or more between them, not cordate or auricled at the base, the upper side rather deeper than the lower and faintly ciliated on the edge, acute pointed, ¾-1 li. l. ½ li. w. Minor leaves minute, ovate-lanceolate, acuminate, inequilateral, slightly overlapping on the final branches. Texture firm; colour light green. Spikes very short, hardly more than 1 li. l.; bracts keeled, slightly open.

This seems to be in growth a semi-erect species, which

probably supports its slender fronds on other vegetation. The branches are rather distant, always short in relation to the length of the fronds, varying from 1-3 in. l. The habit of growth is probably that of *S. puberula*.

*General distribution*—Guiana and Central Brazil.

†† *Fronds sub-prostate*.—Species 10-18.

\* *Rachises not exceeding 2½ lines wide over the leaves*.—Species 10-13.

13. SELAGINELLA FLAGELLATA, SPRING, Mon. Lycop II. 208, Baker, Syn. Gen. Selaginella.—Fronds trailing, intermatted, half-a-foot long, the lower parts copiously compound, the branches excurrent and whip-like at the end. Major leaves ovate-lanceolate, very acute, above a line long, pellucid, bright green, more produced on the upper side of the mid-rib, rounded at the base, shortly ciliated, and imbricated over the stem. Minor leaves one-third as long, ovate-acuminate, falcate, convergent. Spikes ½-½ in. long, bracts very acuminate, strongly keeled.

French Guyana, on rocks on the banks of the streams of the Upper Oyapok; LEPRIEUR. This I have not seen, and have quoted from Mr. BAKER'S Synopsis.

*General distribution*—Endemic.

\*\* *Rachises 2½-3 lines wide over the leaves*.—Species 14-15.

14. SELAGINELLA CAUDORHIZA, BAKER, Syn. Gen. Selaginella, p. 36.—Fronds, rooted at the base, 8-18 or more in. l. ovate, with contiguous pinnæ in the lower part, but extending above into a lax narrower state, having short distant branches, the lower of which (not lowest which are less) 2-5 in. l., erecto-spreading, repeatedly pinnate. Major leaves of main rachises spreading, about 1¼ li. l. ¾ li. w. acutely pointed, rounded and nearly equal-sided at the base, with once to twice their own width between them. Minor leaves cuspidate, attached obliquely, the margins very faintly ciliate. Leaves of the branches the same shape but only half the size, close but not imbricating. Spikes 2-3 li. l.; bracts keeled, somewhat spreading

Surinam only, collected by HOSTMAN, in 1841. The growth seems to be sub-erect, as there are no roots along the frond between the base and the outer elongated part,

where they occur at the joints. The minor leaves are quite in a line with the rachis, and have sub-lateral attachment. The primary rachis is  $3\frac{1}{2}$  li. across the leaves, the others are reduced branch by branch, till the final ones are only 2 li. w.

*General distribution*—Endemic.

15. SELAGINELLA MACROCLADA, BAKER, Syn. Gen. Selaginella, p 38. —Growth more or less prostrate, with simple thread like roots a few in. l. springing at intervals from the jointed flexuose rachises. Branches very long and attenuated, having contiguous erecto-spreading branchlets at the base about 1 in. l., which gradually become distant and less than a  $\frac{1}{2}$  an in. l. in the extended outer part. Breadth over all  $2\frac{1}{2}$ -3 li. Rachises ribbed or angular, exposed beneath. Major leaves oblique or in cases nearly horizontal, oblong, the under margins up-curved at the acute point, base subcordate, deeper on the upper side than the lower, margins not ciliated, 1-1 $\frac{1}{2}$  li. l. and half as w. imbricating. Minor leaves lanceolate-acuminate, inequilateral, attached on the inner side, the outer side with a rounded auricle developed below this point; margins plain or very faintly serrated; texture firm; colour light green. Spikes short, bracts keeled.

APPUN n. 802. There is only one specimen, in the Kew Herbarium, on which no locality is stated by the collector. The species is well marked by the long attenuated character of the primary branches, secondary ones being all short. The specimen in question is over 2 ft. l. was apparently gathered near its base, and has about half a dozen of the long branches all of which run much in the same line. From the upcurved under margin the lateral leaves have the appearance of being slightly falcate.

*General distribution*—Endemic.

\*\*\* *Rachises 3-4 li. over the leaves.*—Species 16-17.

16. SELAGINELLA AFFINIS, A. BR. Baker, Syn. Gen. Selaginella, p. 40. S. Poeppigiana, Spring, Mon. Lycop. p. 217,—Fronds 1-1 $\frac{1}{2}$

l. branched alternately nearly from the base, sub-prostrate, throwing out long simple thread-like roots from the joints, which like the rachises are stramineous and bright. Branches  $2\frac{1}{2}$ -3 or 4 li. w. over the leaves; herbaceous in substance, and rachises weakly, though thickish. Leaves distant on the main rachises, but close or slightly imbricating on the branches; major ones linear-oblong, spreading sub-horizontally, the base not cordate, the under margin up-curved at the acute point, the upper side very little deeper than the lower,  $1\frac{1}{2}$ -2 li. l.,  $\frac{3}{4}$  li. d., the margins naked. Minor leaves ovate-lanceolate or lanceolate, with a rounded auricle at the base of the longer outer margin, the point rather cuspidate. Spikes  $\frac{1}{4}$ - $\frac{1}{2}$  in. l. rachises enlarged at the base by the macrospores.

JENMAN, n. 551, 1479, 2061, 2134. Very close to *S. epirhizos*, but in that species the stems are not stramineous and bright, and the leaves on the primary rachises are close and all, including the minor ones, are broader than in this, with the rachises articulated at the joints, which this does not show. It is a very common species, forming large beds in the forests which border most of the rivers of the country.

*General distribution*—Endemic.

17. SELAGINELLA EPIRHIZOS, SPRING. Mon. Lycop. II. p. 218. Baker Syn. Gen. Selaginella p. 57.—Fronds sub-ascending, rooted at the base, and with long simple threadlike roots upwards some distance at the joints, 8-12 or more in. l., 2-3 in. br.; branches short and again shortly branched, or some developing into branches as large as the primary fronds. Major leaves spreading horizontally, oblong, acute or sub-acute at the point, the base deeper on the upper side but not auricled to lap over the rachis, except in the final branchlets, and the margins quite plain,  $1\frac{1}{2}$ - $2\frac{1}{2}$  li. l.  $\frac{3}{4}$ -1 li. w. at the base, apart on the main rachis, but becoming gradually imbricating on the final ones. Minor leaves 1- $1\frac{1}{4}$  li. l. obliquely ovate, unequal sided, acute pointed, attached on the inner side at the base of the narrower half, slightly overlapping; margins quite plain. Rachis broad and prominent, flexible, fully exposed on the under side; texture herbaceous; colour dark green. Spikes 2-5 li. l. decrescent, much bulged out at the base with the macrospores, which are unusually large.

French Guyana, LEPRIEUR; Surinam, HOSTMAN; British Guiana, JENMAN n. 645, Mazaruni and Issororo Rivers. The branches are very flat, and measure 4-5 li. over all. As in *S. caudorhiza*, the lateral leaves do not lap on the upper base over the rachis, except in the outer branches, where the character is soon lost. The bulging out of the bracts at the base of the spikes with the large macrospores is a good feature. It is one of the limp weakly species, though the parts are relatively large.

*General distribution*—Endemic.

††† *Fronds upright*.—Species 18-21.

\* *Fronds rigid*.—Species 18.

18. SELAGINELLA VERNICOSA, BAKER, in Lin Soc. Jour.—Fronds rooted at the base, stiff, 3-6 or more in. l. with short alternate distant or sub-distant divaricating branches on which the fertile branches are produced in a similar and divaricating manner. Primary rachis 1½ li. across the leaves, the branches 1-1½ li. across; convex on the under side, concave on the upper. Major leaves densely imbricating, obliquely spreading, auricled and deeper on the upper side, the end rounded, the upper margin much curved and finely spinulose-serrate, the under naked and nearly straight, about ½ li. l. less w. Minor leaves very densely imbricating, the two lines also laterally overlapping, ovate, acute, equilateral, both margins freely ciliate, about ¼rd li. l. Spikes 3-4 li. l. terminating all the branches; bracts keeled, rather open.

VAR. SIMPLICIFRONS.—Branches erect, all reaching forward parallel with each other; rather narrower. Margins of the leaves less ciliated. Spikes firmer and more angular.

IM THURN, n. 226. Roraima, base of the cliff. This is a stiff rigid species, with densely imbricating leaves that entirely enclose and conceal the rachises. The physiognomy is quite different from that presented by any of the other species. The variety, IM THURN, n. 381, was gathered lower down near the encampment. It has no spreading lateral branches like the type, they

ascend side by side, are simple, and are forked when divided, the shorter ones being fertile. Possibly it is a distinct species.

*General distribution*—Endemic.

\*\* *Fronds scandent.*—Species 19.

19. SELAGINELLA PUBERULA, KLOTZSCH.—Spring Mon. Lycop. II. 160. Baker Syn. Gen. Selaginella, p. 76.—Stems repent, throwing up close ascending stems which are terete, stramineous or brown below and glossy with scattered appressed leaves, and no branches for a space 3-6 in. from the base. Fronds much elongated, 1-2½ ft. or more l. 2-4 or 5 in. broad, but generally about 2-3 only; rachis like the stems, terete. Branches alternate, 1-2 in. l. as much apart, erect-spreading, again branched, final ones 1-1½ in. l. 1½-2 li. w. over all. Major leaves imbricating, spreading nearly horizontally, slightly curved to the acute point, broadest at the base, cordate and rather auricled, the upper side wider, and ciliate-edged, ½-¾ li. l. about half as wide; the minor leaves imbricating, minute, sub-equal-sided, attached by the rather shorter inner base, ovate, mucronate, ½ li. l. Spikes 4-stichous ½-1¼ in. l. enlarge at the base or not with the macrospores.

RICH. SCHOMBURGK, n. 979. This is clearly a semi-scandent species. It varies slightly in the ciliation or nakedness of the leaves, and in the stem being puberulous or not. It has a repent stem from which the fronds are thrown up at short intervals apart. These have a petiole clear of branches, a few inches long, above which the narrow fronds extend 1½-2 ft. or more, supported on bushes, or other surrounding growth. The slender terete main rachis is exposed to the top, but furnished with scattered leaves, which are in three series and appressed to the surface, in a line with the rachis, and therefore distinct in character from the lateral spreading leaves.

*General distribution*—Guiana, Brazil and Peru.

\*\*\* *Fronde spreading more or less flabellately and decompose.*—

Species 20-21.

20. SELAGINELLA HÆNKEANA, SPRING, Mon. Lycop. p. 187. Baker, Gen. Selaginella, p. 76.—Stems erect, strong, angular clothed with scattered leaves. Fronds erect, regularly pinnate or flabellate, 5-8 in. each way, firm, dark green above, silvery beneath. Pinnæ numerous, much branched and crowded, so that the habit is often plumose in growth; rachises 3-4 li. w. over all. Final branches  $1\frac{1}{2}$ -2 li. b. Leaves of the former apart, of the latter close, spreading obliquely, oblong, acute, the base cordate and rather auricled, the rounded and upper side ciliate, the larger  $1\frac{1}{2}$ -2 li. l. and  $\frac{3}{4}$ -1 li. w. the smaller half that size. Minor leaves minute, ovate, terminating in a hair-like awn, rather inequilateral, the margins faintly serrate. Spikes very small, a li. l. with small, laxly spreading, bracts which are hardly keeled.

Cayenne, gathered by LEPRIEUR and SAGOT. Well marked by the much-branched, crowded habit. Mature fronds when pressed have the parts lying one over the other. The beautiful silvery underside, and very short loose spikes in which the bracts are hardly changed in character from the intermediary leaves, and the sporangia are fully exposed, are also good distinguishing characters. It resembles most in the outline of the fronds the next species.

*General distribution*—Guiana and Brazil, Bolivia and Chili.

21. SELAGINELLA PARKERI, SPRING, Mon. Lycop. p. 226. Baker, Syn. Gen. Selaginella, p. 79. *S. lucidinerva*, Spring. *Lycopodium Parkeri*, Hook et Grev. *L. plumosum*, Aublet.—Stems strong, quite erect sub-angular, or quadrate upwards, stramineous, jointed at intervals, sparsely furnished with appressed leaves, and spreading by stoloniferous shoots which spring from the joints and trail on the ground or ascend banks, rocks, or the base of trees, 6 in.-1 ft. or over l. Fronds spreading from the top of the stems, digitato-pedate or flabellate, 4-10 in. each way, composed of numerous forked, spreading pinnate branches, with a flexuose rachis  $3-4\frac{1}{2}$  li. w. over all. Major leaves spreading horizontally, close, in the final branches imbricated, oblong, the under

margin curved upwards at the acute point, nearly equal sided, the base semi-cordate, with a small auricle on the lower side,  $1\frac{1}{2}$ -2 li. l.  $\frac{3}{4}$  li. w. not expanded within; margins plain or faintly serrate on the rounded but unenlarged upper side. Minor leaves lanceolate-acuminate, or on the main rachises subovate, attached by the base of the inner side, that of the outer being extended below this into a small auricle,  $\frac{1}{2}$ - $\frac{3}{4}$  li. l.; margin not ciliated. Texture firm; rachises stiff; colour bright green. Spikes 2-5 li. l. enlarged at the base with the large macrospores; bracts keeled, edges naked, slightly spreading.

Var. *S. STELLATA*, Spring, Mon. Lycop. II, p. 228. Fl. Brasil, p. 129.—Branches rather narrower, and the leaves consequently smaller. Fronds more regularly pinnate than flabellate, the main rachis extending into a long radicant tail. Spikes 4-6 li., l. quadrate.

Var. *PEDATA*, Klotzsch, in Linnæa xxviii, 521.—Leaves rather smaller and the branches consequently narrower, spikes quadrate, from  $\frac{1}{4}$ -1 in. l.

Gathered by all collectors. Well marked by its erect, flabellate, or often digitate habit, zigzag rachises, and the leaves of both kinds slightly auricled on the outer side at the base. As the leaves do not overlap the rachises, the latter are exposed beneath, but above they are quite concealed in all the outer branches. The short spikes are often bent aside by the large macrospores being on one side, and when very short are as broad as long, looking nut-like at the ends of the branches. Sometimes the fronds or stems produce depauperated branches with small, lax, rather rounded leaves, which look like a totally different species. None of the states of this species is quite constant to a fixed outline of frond, and in any good set of specimens it varies from digitate or flabellate, to regularly pinnatifid. The varieties have the same range as the type.

*General distribution*—Guiana and the Brasils.

§§ *Leaves of two kinds, major and minor. Bracts also of two kinds*

*the larger series following the smaller normal leaves, and the smaller the larger leaves.*—Species 22-24.

\* *Rachises not exceeding one line wide over the leaves.*—Species 22.

22. SELAGINELLA RHODOSTACHYA, BAKER in Lin. Soc. Trans.—Fronds prostrate with fine descending roots along the main and other rachises, leafy to the base, slender, the lower part not branched, 6-9 in. l.,  $1\frac{1}{2}$ -2 in. w., 3-pinnate, the branches distant, and irregular in length. Major leaves spreading, with two or three times their own space between them, ovate, rounded at the end, equilateral, the margins faintly ciliate or naked,  $\frac{3}{4}$  li. l.,  $\frac{1}{2}$  li. w., delicate but firm in texture, very pale green; minor series similar in shape, but acute, hardly at all or little or much reduced, close, distant or sub-distant, the margins also slightly ciliate or naked. Spikes very short, 1-1 $\frac{1}{2}$  li. l., the bracts conform with the leaves, lax, those of the upper side not much enlarged, slightly ciliate on the edges. All the rachises quite terete and stiffish.

IM THURN, n. 226; base of cliff, Roraima. This by the variation in its leafage in the same fronds is a peculiar species. In some of the specimens the lateral and intermediary leaves are exactly alike in form and size; in others the lateral are slightly larger; and in others again very decidedly so. The only modification seen in the bracts is that in some instances they are slightly keeled, and the superior series are not much larger than the inferior, but the difference is decided and obvious. Though very slender, the species has a firm, rather wiry look.

*General distribution*—Endemic.

\* *Rachises exceeding one line wide over the leaves.*—Species 23-24.

23. SELAGINELLA ANOMALA, SPRING. Mon. Lycop. II., p. 247. Baker Syn. Gen. Selaginella p. 95. Lycopodium Hook and Grev.—Fronds prostrate or sub-prostrate, forming overlapping patches in growth, leafy from the base, rooting or not along the rachis, varying from oblong to broadly ovate-deltoid or flabellate in outline, 2-3 or 4 in. each way, 2-3 times pinnately branched, the final branches in the

larger and broader fronds often crowded. Major leaves spreading nearly horizontally, the inferior ones contiguous, the outer imbricating, 1-1½ li. l., ½-¾ li. w., acute, broadened at the base, which is unequally cordate, broadly auricled and overlapping the rachis on the upper side; the margin plain or faintly spinulose. Minor leaves ascending, imbricating, ovate-lanceolate, acuminate-cuspidate finely spinulose-edged. Spikes 2-8 li. l.; bracts in two series, those of the upper side twice as long as the under ones, the latter especially spinulose-edged.

JENMAN, n. 2322. Gathered in wet places in the forest opposite Bartica, Essequibo River. Well distinguished from *S. platyphylla* by its more compound and broad-spreading fronds, and smaller closer leaves. The leaves are so crowded and imbricated on the outer branches (which also are crowded in the larger fronds) that on the Herbarium sheets they have quite a spinulose aspect on the upturned underside. It was gathered in Cayenne by LÉPRIEUR and SAGOT.

*General distribution*—Endemic.

24. SELAGINELLA PLATYPHYLLA, BAKER, Syn. Gen. Selaginella, p. 95.—Fronds prostrate, rooting along the rachis, leafy from the base, 4-6 in. l., linear-oblong, 2-pinnately branched, the branches short, sub-distant, alternate, longer primary ones ½-1½ in. l., secondary ones ¼-½ in. l. Rachises weakly, the primary 3 li. w. over the leaves, secondary 2-2½ li. w. Major leaves spreading horizontally, from once to twice their own width apart on the main rachis, becoming contiguous at the top, obliquely ovate-oblong, 1½-2 li. l., ¾ li. b., obtuse-acute, inequilateral, the upper base auricled, broadly rounded and ciliate, quite overlapping the rachis, the margin whitish and scariose. Minor leaves alternate, edged like the major, ovate, cuspidate, rather obliquely cordate at the base, but nearly equilateral, quite in line with the rachis. Spikes very short, lax. Bracts dimorphous the larger lanceolate, the smaller ovate, hardly keeled, open, revealing the sporangia.

Var. *laxa*.—Major leaves more ovate, wider apart throughout, the auricled base quite plain. Texture thinner, and rachises slenderer and weaker.

JENMAN, n. 1482, ravines near the Kaieteur Fall; and

Mt. Ray-wa, n. 2131. Nearest to *S. producta*, but much less and more laxly branched, with more distant leaves, and quite different fruit spikes, which are only 1-2 li. long. The habit is flaccid, and it spreads quite flat on the ground or other surface that it may be growing on. The variety is a lax form (my n. 1819) also from the Kaieteur Fall region; a region abounding in ravines and great fissures between rocks, in which Selaginellas are plentiful. In this and the two preceding the bracts are of two kinds, larger and smaller, in which the order observed in the leaves is reversed, the smaller ones following on the larger leaves, and the larger on the smaller leaves.

*General distribution*—Endemic.

#### Genus II.—*Isoetes*, Linn.

Leaves herbaceous, from a few inches to a foot or more high, springing in a dense rosette from a thickened corn-like rootstock, acaulent, the expanded base clasping, tapering thence upwards to the acuminate, often convolute, point. Sporangia contained in the axils of the leaves, partly immersed in the interior of the base, the macrosporangia in the inferior and the microsporangia in the superior ones. Macrospores spherical; microspores 3-gonal.

These, the Quillworts of Britain, are herbaceous bog or aquatic plants, with numerous leaves, appressed together at their expanded bases, from whence they taper rapidly to the much reduced point, the height varying with the different species, forming a dense rosette. Sporangia are concealed in the clasping bases, and must be sought for by removing the leaves. I have seen no Guiana species, but it is possible the genus may be represented in the higher regions as it is in the countries around, for which reason I include it. There are about fifty species. They chiefly

inhabit temperate regions, the great majority being distributed through North America and Europe, and in less abundance in Australasia, but only sparingly over the equatorial belt. There are five tropical American species, found mostly at high altitudes, extending from Cuba to the Andes of Peru. In the Journal of Botany for 1880 Mr. BAKER published a Synopsis of the genus, and described forty-six species.

#### Order II.—Marsileaceæ.

Rootstock free-creeping, slender, vernation circinate. Leaves linear-filiform, or 4-foliate, at the summit of slender erect petioles. Capsules scattered or serial on the rootstock or the base of the petioles, globose or ovate-oblong, coriaceous, 2-4-valved, dehiscent, sporangia membranous, indehiscent. Spores of two kinds, macrospores and microspores.

This order like the preceding contains two dissimilar genera. One, *Pilularia*, is confined to temperate regions, the other, *Marsilea*, to tropical, and it is here represented.

#### Genus I.—Marsilea, Lin.

Capsules stipitate, 1-2 li. diameter, serial on the rootstock or the base of the petioles, coriaceous, dehiscent, bivalved, containing numerous sack-like membranous transverse sporangia which contain both macrospores and microspores. Rootstock creeping. Leaves 4-foliate, at the summit of slender erect petioles.

These are small herbaceous plants that grow gregariously in still fresh water, floating on the surface, and are distributed through the tropical and the warm and cool temperate regions of the world. About forty or fifty species are known. The capsules are small pea or bean-like bodies, leathery in substance, containing a series of pale thinly membranous transverse sack-like cells, in which the spores stand lengthwise, 3-serial, the larger oblong, macrospores, forming one series, the central, and the smaller (microspores) two. The former are several

times larger than the latter, which, till removed, they quite conceal.

1. MARSILEA POLYCARPA, HOOK AND GREV., BAKER, Jour. Bot. vol. 24, p. 276.—Rootstock thick as small cord, free-creeping, naked, with filiform long descending roots, and scattered ascending petioles, that are slender, 4-8 in. l., naked. Leaves 4-foliolate, terminal on the summit of the petiole. Leaflets wedge-shaped, the outer edge rounded, at first folded together, spreading subsequently;  $\frac{3}{4}$ -1 $\frac{1}{4}$  in. diameter each way, sessile, membranous, herbaceous. Venation reticulated, fine, with no primary ribs, anastomosing, forming narrow elongated linear meshes. Sporangia subglobose 1 $\frac{1}{2}$  li. diameter, serial on the lower part of the stipes above a vacant space at the base, shortly stipitate, few or numerous, densely, tomentose, but becoming eventually naked.

Common in estates trenches, and other still water, covering the surface densely, with oxalis, or clover-like foliage, and spreading over large areas. The local form is larger than usual.

*General distribution*—From Cuba southward to Brasil.

### Order III.—Salvinie.

Annual aquatic floating herbaceous plants, of small or diminutive size, with imbricating or pinnatifid fronds and membranous major and minor capsules, which are situated in the axils of the leave beneath, or in inferior clusters on branched filiform threads, and that contain, separately, sporangia of two kinds.

These are, in size, inconsiderable aquatic herbs, but they exist usually in great abundance, floating on the surface of still water, and are especially common in this country. The known species are about a score or more, which are spread through the torrid and the warm temperate regions of both hemispheres.

### Genus I.—Salvinia, Schreb.

Small floating aquatic herbs, communal in habit, with serial fronds on a more or less shortly-extended rachis, entire, flat or partially folded

with close parallel pinnatifid veins, and tufts of numerous, descending, simple, villous roots. Capsules membranous, indehiscent, globose, clustered in descending panicles, singly at the end of short pedicels, borne among the roots, the smaller, which are fewer, superior, and on longer pedicels, containing few reticulated macrosporangia; the larger, inferior, more numerous, on shorter pedicels, containing multitudinous, reticulated microsporangia.

Like the next, all the plants of this genus bear a common general resemblance, differing mainly in the degree of elongation of the axis, and size, form, colour and vestiture of the leaves, &c. The capsules are globose, and hang in loose clusters among the leaves, each one on separate pedicels which radiate more or less from the common axis. Those containing the macrosporangia, though situated above, reach out beyond those containing the microsporangia, which are larger, having pedicels twice or more as long. The fruit, roots, and fronds all spring from the joints in the rachis, which is the thickness of moderately thin string, the intervening space being destitute.

1. *SALVINIA AURICULATA*, AULET. Guian. ii. 969, t. 367. BAKER Jour. Bot. vol. 24, p. 99.—Rachis horizontal, cord-like, nearly a line thick, puberulous with slight scales, extending a few inches and branching. Fronds contiguous or apart, two at each joint, spreading at right angles, on petioles  $\frac{1}{4}$ - $\frac{1}{2}$  in. l. which are clothed like the rachis, the blades folded at first, rounded, cordate at the base with rounded auricles,  $\frac{1}{2}$ - $\frac{3}{4}$ ths. in. each way, herbaceous, cloudy-green, pubescent beneath densely strigose above with elongated glands that are divided into three or four filaments at the end, and mixed with finer ones; veins very close and numerous. Capsules of microsporangia nearly 1 li. diameter about 2-6 in number, those of the macrosporangia half the size and about 1-3; both pubescent.

Var. *S. OLFERSIANA*, Klotzsch.—Fronds crowded, sessile, half as large. Veinlets fewer.

Most abundant throughout the coast region of Guiana,

covering and quite concealing the still water in which it grows. In estates' trenches, ponds and ornamental waters, this plant is a pest, from the freedom with which it multiplies and the multitudinous number of the individuals. The capsules are two to nine in number, or perhaps more, about from one to three (sometimes none) of each cluster containing macrosporangia. The variety is from Cayenne, gathered by PORTEAU and SAGOT, n. 745, and I have not seen it.

*General distribution*—The type from Cuba to Brasil, and the var. French Guyana, South Brasil, and Paraguay.

2. SALVINIA RADULA, BAKER, Jour. Bot. Vol. 24 p. 98.—Rhizome horizontal, cord or thread-like, 1-2 or more in. l., branching, puberulous-scaly. Fronds in pairs, at right angles with the axis, shortly petioled, rather oblong, rounded, cordate at the base, but not deeply, the auricles rounded,  $\frac{1}{2}$ - $\frac{3}{4}$ th in l., less w., herbaceous, under side pubescent, upper striglose, colour metallic-green, veins close, numerous, no fruit seen.

This I gathered (JENMAN n. 1114) in the lake where the *Victoria regia* is growing wild in the forest of an island above the falls on the Essequibo River. The rhizome seems to extend less than in the preceding species, the leaves are more oblong, and the vestiture of the upper surface and the veins fewer, and the colour more of a glaucous green than in that species.

*General distribution*—Guiana to South Brasil.

#### Genus II. *Azolla*, Lam.

Very small communal floating weeds, branched, with minute imbricating leaves in a double series, sessile with no veins, a central rib only in each, the inferior smaller than the superior, and descending filiform simple villous roots, capsules situated in the axils of the leaves beneath, of two kinds, membranous, indehiscent; the larger, globose, containing

very numerous microspores ; the smaller ovoid, containing a solitary macrospore.

The members of this genus also are communal in habit, and form a sheet over water, often quite concealing the surface. They are exquisite little plants in structure and colour, with minute imbricating leaves, varying from green to dark purple in colour, branched in the form of little prostrate trees. The species are about half-a-dozen, tropical and sub-tropical, found in America, Asia, Africa and Australia.

AZOLLA CAROLINIANA, WILLD., BAKER Jour. Bot. vol. 24, p. 100,—Entire plant  $\frac{1}{2}$ - $\frac{3}{4}$  in. each way, deltoid or flabellate in outline, pinnate or bipinnate, obtuse, lower branches longest, the lowest shortly branched again at the ends. Leaves all united at the axis, biserial on each side, those of the upper series larger, more fleshy, brighter coloured, more erect and less appressed, subovate,  $\frac{1}{2}$ - $\frac{3}{4}$  li. l. less broad ; those of the under side gray, appressed one on the other.

Very abundant through the coast region, covering the surface of trenches and all still waters, on which, like *Salvinia*, it is an expensive subject for estates to keep down. The colour varies from light green to dark purple, but there seem to be two varieties—green shading to pink, and pink shading to deep purple, the former being larger in both plant and leaves. My specimens are not in fruit and I can obtain none in fruit as I write.

*General distribution*—Southern United States to South Brasil.





