production of outgrowths seems to be a response on the part of the plant to insufficient transpiration.

Note.—Similar, but less well-marked, outgrowths were observed on the leaves of plants of *Ceratotheca triloba*. As in the case of *Hibiscus vitifolius*, they were not formed in a plant placed in the open ground.

Outgrowths which may prove to be of the nature of those in *Hibiscus vitifolius* have been described by Sorauer in *Dracaena (angustifolia, &c.)*, *Cassia tomentosa*, *Acacia (semperflorens, &c.)*.

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STEM-STRUCTURE IN SCHIZAEACEAE, GLEICHENIACEAE, AND HYMENOPHYLLACEAE¹.—There is a wide difference between the types of stem-structure shown by the different members of the *Schizaeaceae*². Thus *Lygodium* has a stele in which the xylem forms a solid mass in the centre of the stem, and is surrounded by a continuous ring of phloem, pericycle, and endodermis.

Ancimia Phyllitidis, on the other hand, has a ring of separate bundles (or steles), which may be compared with those of *Aspidium* or other *Polypodiaceae*; each of them consisting of a band of xylem surrounded by a phloem, pericycle, and endodermis of its own.

Mohria resembles *Ancimia Phyllitidis* in type. Certain species of *Ancimia*, e.g. *A. mexicana*, have in the internodes a complete ring of xylem bounded on the inner and outer side by a ring of phloem, pericycle, and endodermis, with a central pith, and thus resemble *Marsilia*. *Schizaea* has a ring of xylem surrounding a central pith, but no internal phloem or endodermis.

The above four genera, which make up the *Schizaeaceae*, agree in having a stem-protaxylem, which is not well-marked, as it consists of elements which are not annular or spiral, and are usually not specially small. *Lygodium*, *Ancimia*, and *Mohria* are exarch; in *Schizaea*, however, the relative position of the protaxylem has not been made out with certainty.

In their main points the types of stem-structure found in the *Schizaeaceae* agree with the structures shown at successive levels in the stem of a 'seedling' plant of *Polypodium*, i. e. at successive stages

¹ Abstract of paper read before the Botanical Section of the British Association, Dover, Sept. 1899.

The main structural points in this Order and the *Hymenophyllaceae* are described by Prantl, *Morphol. d. Gefässkrypt.*, 1, 1875, and 2, 1881, Leipzig.

in the ontogeny of such a fern¹. Hence the *Aneimia* type (which corresponds with that of a mature *Polypodium*) may be regarded as the more specialized type among the *Schizaeaceae*, and *Lygodium* (which corresponds in structure with the base of the stem of *Polypodium*) as the more primitive type.

The *Gleicheniaceae* and *Hymenophyllaceae* also include forms with a solid central mass of xylem, but differing in some details from *Lygodium*. The protoxylem is well-marked and composed of annular and spiral elements in both orders. *Gleichenia* is mesarch and closely resembles the fossil genus *Heterangium*.

In the *Gleicheniaceae* the only advance on the *Lygodium* type is found in *Platysoma* (a sub-genus of *Gleichenia*), in which there is a ring of xylem surrounding a central pith², as in *Schizaea*, but differing from the latter plant in having an inner endodermis.

In the larger species of *Trichomanes* there is a solid xylem-mass, but with a group of parenchyma in connexion with the one or two protoxylems, which are more or less centrally placed. In *Hymenophyllum* the corresponding parenchymatous mass is large in proportion to the amount of xylem. In the smallest species of *Trichomanes* the stele of the rhizome takes the form of a collateral bundle. The protoxylem of *Trichomanes spicatum*, unlike the other species examined, resembles that of the *Schizaeaceae*.

The solid stele may be regarded as primitive, the *Aneimia* type being derived from it by the following steps:—

1. Solid central xylem-mass surrounded by phloem, &c.
2. Ring of xylem surrounding a central pith.
3. Ring of xylem with internal phloem, endodermis, and pith.
4. Ring of separate bundles formed by the breaking up of the above vascular ring, owing to large leaf-gaps.

The *Aneimia* type thus explained would not be polystelic, in the morphological sense of the word, but the separate bundles would represent peripheral parts of an originally solid stele, in which the central part has been replaced by parenchyma, additional pieces of phloem and endodermis having been differentiated to complete the concentric bundles.

The full results of this investigation will be published subsequently.

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¹ Leclerc du Sablon, *Annales des Sci. Nat., Bot.*, sér. vii, t. xi, 1890.

² Poirault, *Ann. des Sci. Nat., Bot.*, sér. vii, t. xviii, 1893.