
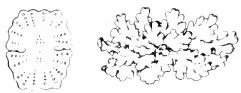


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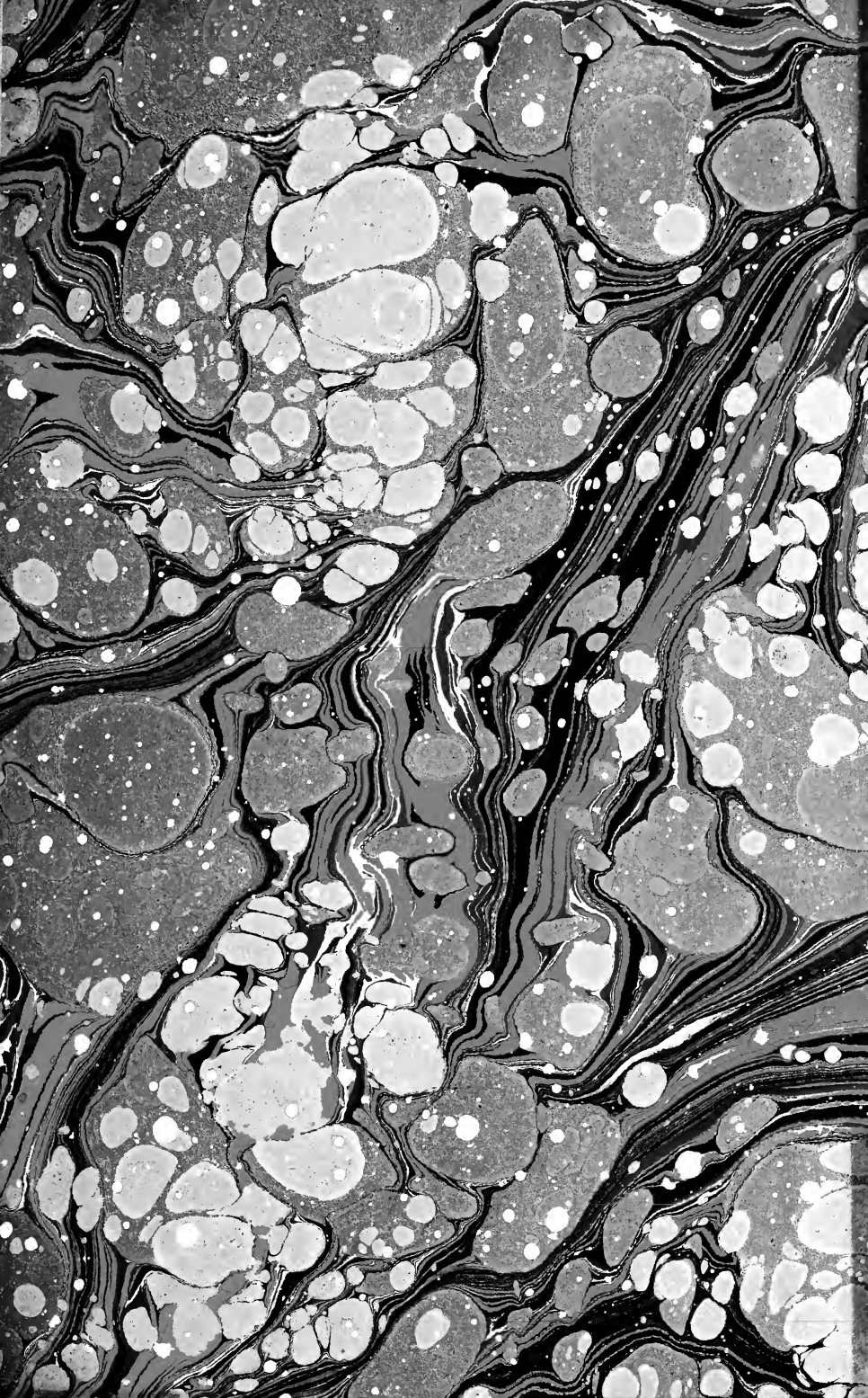

Grevillea,

A QUARTERLY RECORD OF

CRYPTOGAMIC BOTANY

AND ITS LITERATURE.

EDITED BY GEORGE MASSEE.

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Grevillea.

A QUARTERLY RECORD OF CRYPTOGAMIC BOTANY AND ITS LITERATURE.

CONTRIBUTION A L'ÉTUDE DES MUCORINÉES.

Avec Essai d'une Monographie de ces Champignons.

Par Dr. A. Dewevre.

Caractères généraux de la famille.—On comprend aujour-d'hui parmi les Mucorinées, tous les champignons unicellulaires* (au moins jusqu' au moment de la formation de leur renflement sporangial), terrestres, qui vivent sur les substances en decompositions, les excréments, parfois sur des champignons ou des écorces, plus rarement encore sur des végetaux phanérogames. Leur reproduction se fait sexuellement ou assexuellement par les procédés suivants.

La reproduction assexuelle, qui est la plus fréquente s'effectue principalement par des *spores*, petits corps reproducteurs endogènes, contenus dans une poche ordinairement arrondie, parfois elliptique ou allongée, que l'on nomme *sporange.* Ces spores sont toujours dépourvues de cils et sont toujours immobiles. Elle peut encore se faire, soit à l'aide de *chlamydospores*, amas de protoplasme intercalés entre deux cloisons sur le parcours des tubes aériens ou mycéliens, soit au moyen de *stylospores* ou *conidies* lesquelles sont d'origine exogène.

Ce dernier mode de reproduction assexuelle, de même que celui par chlamydospores et celui par bourgeonnement (formes levures des Mucorinées) ne se rencontrent que dans certains genres seulement; la reproduction sporangiale seule est commune à tous les genres.

La sexualité ou tout au moins ce que l'on considère comme telle est représentée par les *zygospores*, productions résultant de la fusion

* On définit souvent les Mucorinées commue étant des champignons unicellulaires, cela est inexact; elles ne restent ordinairement unicellulaires que pendant une partie de leur existence. Jusqu' au moment de la formations du sporange. Par l'âge ces cryptogames prennent presque toujours des cloisons, aussi bien dans le mycélium que dans les filaments. J'ai pu constater ce fait dans tous les genres à peu près, Mucor, Circinella, Piptocephalis, Syncephalis, Mortierella, etc., même chez certains Pilobolus.

d'une partie du protoplasme de deux rameaux dont les extrémités viennent se souder l'une à l'autre et dont les membranes se résorbent au point de jonction, pour permettre le mélange des protoplasmes.

Ce sont des masses, sphériques, à surface lisse ou hérissée de protubérances, parfois cachées par un chevelu de filaments, maintenues entre deux bras nommés suspenseurs.

Lorsqu'il n' y a qu'un seul bras l'on a une *azygospore*.

La reproduction par zygospores a été trouvée dans le plus grand nombre des genres de la famille, il en est toutefois, comme les genres Chætostylum, Circinella, Pirella, Helicostylum, Syncephalastrum, Herpocladium où l'on n'en a encore vu aucunes traces. Pour les autres genres il est un bien grand nombre d'espèces où la reproduction sexuelle n'a jamais été observée.

A part quelques exceptions peu nombreuses, on peut dire que la reproduction sexuelle est très rare.

Les causes présidant à la formation des zygospores ont été recherchées bien des fois, mais jusqu' à présent l'on n'est arrivé à rien de positif à ce sujet.

Les nombreuses recherches que j'ai faites pour tâcher de déterminer ces causes incitatrices m'ont amené a croire que leur production dépend surtout de questions de races.

L' Habitat des Mucorineés, leur structure et leurs modes de reproduction suffisent à les caractériser nettement et permettent de les séparer de tous les autres groupes de champignons.

Classement dichotomique des genres.

I. Champignons pourvus de sporanges ordinairement globuleux, jamais cylindriques allongés, toujours solitaires à l'extremité des rameaux.

A. Sporanges monosporés, petits, dépourvus de columelle, courtement pédicellés et insérés à quelques uns sur des rameaux plus ou moins élargis; rameaux stériles prolongés en pointe. *Chaetocladiées.*

B. Sporanges polysporés.

BB Sporanges pourvus d'une columelle bien nette, tout au moins dans les grands sporanges.

a. Champignons possédant à la fois des sporanges et des conidies, sur deux appareils différents. Ils vivent sur des plantes phanérogames . . *Chounéphorées.*

b. Champignons ayant des sporanges seulement, pas, d'appareil conidifère. Ils vivent sur des excréments des substances organiques en décomposition, parfois sur des cryptogames.

α. Tubes fructifères toujours simples, à sporanges s'ouvrant par une zône annulaire diffluente, située au point d'attache du sporange à la columelle. . . . . *Pilobolées.*

1. Tube fructifère toujours pourvu de deux renflements, l'un sous sporangial, l'autre basillaire ; sporange projeté à la maturité en entrainant avec lui sa columelle . . . . . *Pilobolus.*
2. Tube fructifère ne présentant jamais qu'un seul renflement situé à son sommet et encore celui-ci est caché à l'intérieur du sporange où il forme columelle, comme chez les Mucors. Après la déhiscence, la columelle devient apparente et reste attachée à la tige. Le sporange n'est pas projeté, mais grâce à une courbure du filament fructifère, il est amené contre le substratum sur lequel il adhère. . . . . *Pilaira.*

β. Tubes fructifères simples ou ramifiés, sporanges entièrement diffluents ou s'ouvrant par déchirure, mais jamais par diffluence d'une zône déterminée.

* Mucorinées dont la végétation est définie, c'est à dire que, arrivées à un certain degré de développement maximum, elles cessent de croître.

† Les sporanges sont d'une seule sorte.

1. Les filaments fructifères sont ramifiés dichotomiquement. Zygospores fréquentes, portées par les rameaux aériens . . . . . *Sporodinia.*
2. Filaments fructifères simples ou ramifiés, mais autrement que dichotomiquement.

a. Mycélium situé à l'intérieur du substratum, incolore, celui qui est à l'extérieur est brun, souvent épineux. Tubes fructifères simples, spores colorées ; zygospores fréquentes. . . . . *Spinellus.*

b. Mycélium jamais épineux, tubes fructifères simples ou rameux.

b[1]. Filaments fructifères grands, normalement simples colorés en verdâtre ou en olivâtre, brillants. *Phycomyces.*

b[2]. Filaments fructifères plus petits, souvent ramifiés, jamais verdâtres ou olivâtres. Zygospores sphériques, à surface garnie de mamelons, maintenues entre deux suspenseurs droits, sensiblement égaux. *Mucor.*

†† Les sporanges sont de deux sortes, les uns grands, les autres petits.

1. Spores semblablement conformées dans les deux sortes de sporanges.

a. Pédicelles des sporangioles, circinés . *Helicostylum.*

b. Pédicelles des sporangioles droits :

b[1]. Rameaux se bifurquant un certain nombre de fois et se terminant par un sporangiole oligospore, *Thamnidium*

b². Ramifications nonen dichotomie, branches principales ter minés en pointe stérile, vers leur milieu elles présentent ordinairement un renflement sur lequel viennent s'attacher des sporangioles oligospores . . . . . *Chætostylum.*

2. Spores différemment conformées dans les deux sortes de sporanges; celles des grands sporanges sont elliptiques, celles des petits sont réniformes, *Dicranophora.*

** Végétation indéfinie, sporanges d'une seule sorte.

a. Champignons pourvus de stolons qui s'allongent dans un plan parallèle à la surface du substratum. Membrâne des sporanges diffluente.

a¹. Stolons droits, rampant et produisant à leur extrémité un ou plusieurs filaments sporangifères. Spores ordinairement rayées longitudinalement . *Rhizopus.*

a². Stolons arqués, ne produisant des tubes sporangifères qu'au milieu de l'arc qu'ils forment. Spores jamais rayées . . . . . *Absidia.*

b. Champignons non stolonifères, s'accroissant en hauteur. Sporanges à membrâne non diffluente.

b¹. Ramification en sympode, rameaux circinés; columelle cylindro-conique ou plus ou moins piriforme, sporanges globuleux . . . . *Circinella.*

b². Ramification sympodique, avec rameaux circinés; columelle en forme d'urne renversée, sporanges piriformes . . . . . *Pirella.*

BBB. Sporanges dépourvus de columelle, une cloison peu marquée située à l'extrémité du tube fructifère en tient parfois lien *Mortiérellées.*

a. Sporanges situés à l'extrémité du tube principal ou de rameaux qui sont toujours dressés. Tube sporangifère plus large à la base qu'au sommet, parfois égal. Croissance du champignon limitée.

α. Mycélium formé de filaments blancs anastomosés, tube fructifère tantôt simple, tantôt ramifié en grappe ou en candélabre, mais jamais en ombelle . . . . . *Mortiérella.*

β. Mycélium non anastomosé, ramification en ombelle *Carnoya* (gen. nov.).

b. Sporanges situés à l'extrémité de rameaux latéraux recourbés ou spiralés, tube principal d'un diamètre égal dans toute son étendue, se terminant en une pointe stérile, champignons grimpant, à croissance indéfinie *Herpocladium.*

II. Champignons pourvus de sporanges cylindriques, allongés, très étroits, réunis souvent en très grand nombre à l'extrémité plus ou moins renflée des rameaux . . . . *Cephalidées.*

a. Champignons simples ou présentant une simple bifurcation à leur extrémité (une seule espèce est dans ce cas). Tubes fructifères fortement renflés à leur sommet en une vésicule globuleuse ou ovoïde, sur laquelle viennent s'insérer les sporanges . . . *Syncephalis.*

b. Champignons ramifiés.

α. Dichotomiquement, extrémité des dichotomies occupée par une cellule petite en comparaison du renflement des Syncephalis, sur laquelle s'attachent les sporanges . . *Piptocephalis.*

β. Autrement qu'en dichotomies, le renflement situé au sommet des rameaux est gros et ressemble à celui des Syncephalis. Mycélium ramifié, non anastomosé . . *Syncephalastrum.*

Affinités des genres de cette famille.

Tous les genres dont nous venons de donner les caractères principaux, présentent entre eux des points de ressemblance qui permettent de les rapprocher les uns des autres et de constituer ainsi un tableau dans lequel les divers genres sont groupés d'après leurs affinités plus ou moins grandes. Voici à mon avis comment ces rapports doivent être établis.

Le genre Mucor me parait être le groupe pivot auquel par l'intermédiaire de ses nombreuses espèces ou peut rattacher les divers genres qui constituent la famille des Mucorinées.

Les affinités de ces derniers ne sont pas toujours faciles à établir, ce qui est du à ce qu'un grand nombre de termes intermédiaires manquent, soit parce qu'ils ne sont pas encore connus, soit parce qu'ils n'existent plus ; mais tous, aussi différents qu'ils puissent être présentent cependant des caractères de parenté indéniables.

Une première tribu, celles des Pilobolées, groupe bien distinct, bien caractérisé vient se raccorder aux Mucors, par le genre Pilaira, surtout par le Pilaira Caesatii. Le Pilaira dimidiata marque une étape vers les Pilobolus, il se rapproche particulièrement du Pilobolus nanus.

Une autre tribu bien caractérisée, elle aussi, nous est présentée par les Cephalidées, comprenant les genres Syncephalastrum, Syncephalis et Piptocephalis. Des trois le genre qui a le plus de caractères mucoréens est celui des Syncephalastrum, dont le port, la ramification, le mycélium non anastomosé est identique à celui des Mucors. Une forme anormale du Syncephalastrum elegans trouvée par Mr. Em. Marchal * dans ses cultures rappelait, comme parallèlisme le champignon que j'ai dénommé Carnoya capitata.

Les Syncephalis ont un appareil fructifère identique à celui des Syncephalastrum ce qui établit entre ces deux genres un caractère de famille bien net.

Les Piptocephalis diffèrent assez fortement de ces deux genres ;

* Em. Marchal, 1892, Bull. Soc. Belge de Microscopie, Nos. VI. et VII., p. 124, fig. 1 à 4.

ils possèdent en commun avec eux l'appareil sporangifère et jusqu' à un certain point l'appareil sexuel. Par contre, leur ramification dichotome, leurs cannelures, etc., les en éloignent beaucoup, on peut toutefois faire remarquer que le Syncephalis furcata montre une bifurcation, ce qui indique que là aussi, la ramification (quand elle existe), a une tendance à se faire dichotomiquement.

Le genre Piptocephalis me parait avoir eu la même origine que les Syncephalis, mais dans la suite, les descendants ont évolué), séparément dans deux directions différentes, d'ou sont résulté les différences assez profondes que l'on observe entre ces genres.

Des Mucors simples, on peut faire dériver d'une part les Spinellus et les Phycomyces, d'autre part la tribu des Mortierellées comprenant les genres Mortierella, Herpocladium et Carnoya. Tout ce groupe étant quelque peu en relation avec les Syncephalis, par l'intermédiaire des Mortierella qui possèdent un mycélium diéchotomis et anastomosé, analogue à celui de ce genre. De tous, le plus rapproché des Mucors est le genre Spinellus qui, à part la couleur, a tout à fait leur aspect; à celui-ci se rattache directement le genre Phycomyces, également coloré et comme lui, ressemblant très fortement à un Mucor, à telpoint que jadis on l'y avait placé et dénominé comme tel. Ce qui distingue surtout ces deux genres des Mucors vrais, ce sont leurs zygospores, qui chez le Spinellus se produisent très facilement et sont d'une forme quelque peu differenté; celles du Phycomyces s'éloignent enormément de celles des Mucors, et de celles des Spinellus, elles se rapprochent beaucoup plus des zygospores des Mortierella et des Absidia, genres dont les organes reproducteurs d'origine sexuelle, sont construits à peu près d'après le même modèle, c'est à dire que c'est une sphère comprise entre deux bras et recouverte par des prolongements qui partent de ceux-ci.

Le genre Mortierella même a déja par lui-même d'assez grandes affinités avec les Mucors, mais les genres Carnoya et Herpocladium, ses voisins, en ont encore bien plus car leur mycélium ressemble à celui des Mucors; il n'est en effet ni anastomosé ni bifurqué comme celui des Mortierella.

Ce mycélium anastomosé existe aussi chez les Syncephalis ce qui crée un point de ressemblance entre ces deux groupes; par leurs zygospores les Mortierella ont des affinités avec les genres Phycomyces et Absidia.

Les Thamnidium ont comme quelques autres genres (Helicostylum, Chætostylum), conservés une partie de leurs caractères ancestraux, tel est le cas du gros sporange que porte l'extrémité du filament principal des Thamnidium; sporange qui est tellement semblable à celui du Mucor mucedo, que Mr. de Bary avait considéré ce champignon comme une forme du Mucor mucedo. Il possède de plus des rameaux verticillés se ramifiant dichotomiquement, particularité qui lui crée des relations avec les Mucors ramifiés en corymbe, en ombelle et en verticille, au même titre que le Chæto-

cladium. Les zygospores des Thamnidium sont du même modèle que celles des Mucors.

Enfin le genre Thamnidium possède encore de nombreux points de ressemblance avec les genres Chætostylum et Helicostylum.

Des Mucors rameux paraissent dériver un grand nombre de genres : il y a tout d'abord à citer la lignée Rhizopus et Absidia, deux genres présentant entre eux beaucoup de points de contacts.

Les zygospores des Absidia diffèrent toutefois beaucoup de celles du Rhizopus, elles sont du type Mortierella, tandisque celles du Rhizopus ont plutôt de l'analogie avec celles des Mucors.

Les Mucors formant la transition entre ces deux genres et les Mucors plus simples, sont des espèces telles que le Mucor corymbosus, etc., ainsi que les Mucors verticillés dont on ne connait pas jusqu, à présent de représentants. Certains rameaux de ces Mucors se seraient redressés et auraient constituté les filaments sporangifères, tandisque d'autres se seraient transformés en crampons. Les mêmes Mucors constitueraient aussi un des premiers pas vers les Chætocladiées, les autres intermédiaires nous étant encore inconnus. Cette tribu des Chætocladiées, n'a guère que des rapports extrêmement éloignés avec quelques rares genres ; son plus proche voisin est le genre Chætostylum.

Le Mucor bifidus me semble être le premier intermédiaire de la série qui a donné naissance au genre Sporodinia.

Les champignons de ce genre sont comme on sait très fortement dichotomisés et présentent de nombreux caractères mucoréens, je ne leur connais pas d'autres affinités.

Enfin le groupe assez bien fourni des Mucors circinés, pourrait bien avoir été la souche des Circinella et des Pirella, genres dout l'origine est vraisemblablement commune, mais qui dans la suite des temps ont évolué un peu différemment.

Les Circinella se rapprochent tellement des Mucors proprement dits, que certains auteurs, Schröter entre autres, les y fait rentrer. Entre le Mucor circinelloïdes et le Circinella simplex, il n'y ad du reste, pas une bien grande distance. Il serait intéressant de découvrir leurs zygospores, afin de voir si, de ce côté là aussi, leurs caractères sont ceux des Mucors.

Le genre Helicostylum a de nombreuses affinités ; son gros sporange terminal est identique à celui du Mucor mucedo, ses chlamydospores le rapprochent des Mucors, ses sporangioles ressemblent à ceux des Thamnidium et du Chætostylum ; par la circinellation des pédicelles de ses sporangioles, il fait penser aux Bircinella, aux Pirellà et aux Mucors circinés ; enfin l'Absidia repens s'interpose entre les Helicostylum et les Absidia vrais.

Le genre Dicranophora récemment indiqué par Mr. Schröter est encore si peu connu qu'il est fort difficile de déterminer exactement ses affinités. On peut tontefois dire qu'il est proche parent des Thamnidium, Chætostylum et Helicostylum car il posséde comme eux, deux sortes de sporanges ; seulement, ici au lieu que les spores soient égales dans les deux sortes de sporanges, elles sont

inégales. De plus ses zygospores ont deux bras très nettement inégaux, ce qui n'existe pas chez le Thamnidium, le seul des genres précités où les organes sexuels sont connus ; il s'en suivrait donc que ce genre serait plus élevé en origanisation que les autres. Mr. Fischer le rapproche du Mucor heterogamus de Vuillemin où la copulation se fait au moyen de deux branches inégales.

Il nous reste maintenant à parler d'un groupe fort intéressant celui des Choanéphorées qui par sa constitution, ses zygospores, ses chlamydospores et ses sporanges, appartient aux Mucorinées, mais qui par sa forme conidienne se rattache aux Mucédinées, et à certains Ascomycètes.

Affinités de la famille.—Les Mucorinés sont très proches des Chytridiacées terrestres, des Synchytrium notamment, avec lesquels elles ont de nombreux points de ressemblance.

Diverses Mucorinées rappellent certaines Mucédinées et Ascomycètes.

Enfin nous, savons que placés dans des conditions determinées, certaines espèces donnent naissance à des formes levures qui se multiplient par bourgeonnement comme les levures véritables.

(*a suivre.*)

LICHENES.

Index Lichenum Britannicorum.

By the Rev. J. M. Crombie, F.L.S.

PART III.

(Continued from Vol. xix., *p. 70.)*

Sub-Tribe V. **Lecideei,** *Nyl.*

Genus I. Lecidea (*Ach.*), *Nyl.*

A. Gyalecta, *Ach.*

Sp. 1 L. exanthematica (*Sw.*), *Nyl.*
2 L. cupularis, *Ach.*
3 L. ascaridiella, *Nyl.*
4 L. foveolaris (*Whlnb.*), *Nyl.*
5 L. geoica (*Whlnb.*,) *Nyl.*
6 L. carneolutea (*Turn.*), *Nyl.*
7 L. carneola, *Ach.*
8 L. truncigena (*Ach.*), *Nyl.*
9 L. Flotovii (*Krb.*), *Carroll.*
10 L. congruella, *Nyl.*
11 L. lutea (*Dicks.*), *Borr.*
f. sublobulata, *Cromb.*

12 L. pineti (*Schrad.*), *Ach.*
f. leucostigma (*Leight.*).
13 L. chrysophæa (*Pers.*), *Nyl.*
14 L. pallida (*Pers.*), *Nyl.*
β. Biatora (*Fr.*), *Nyl.*
a. Stirps, *L. luridæ.*
15 L. lurida (*Sw.*), *Ach.*
f. pallescens (*Fr. fil.*), *Cromb.*
16 L. globifera, *Ach.*
17 L. rhizobola, *Nyl.*
18 L. rubiformis, *Whlnb.*
19 L. testacea (*Hffm.*), *Ach.*
20 L. glaucolepidea, *Nyl.*
b. Stirps, *L. vernalis.*
21 L. cinnabarina, *Smmrf.*
22 L. mutabilis, *Fée.*
23 L. lucida, *Ach.*
f. theiotea, *Ach.*
24 L. clavulifera, *Nyl.*
f. subviridicans, *Nyl.*
25 L. quernea, *Ach.*
26 L. phæops, *Nyl.*
f. major, *Cromb.*
27 L. lithophiliza, *Nyl.*
28 L. coarctata (*Sw.*), *Nyl.*
f. 1, elacista (*Ach.*).
2, cotaria (*Ach.*).
β. glebulosa (*Sw.*), *Cromb.*
f. microphyllina (*Fr.*).
γ. ornata (*Smmrf.*), *Nyl.*
δ. ocrinata (*Ach.*), *Nyl.*
29 L. prærimata, *Nyl.*
L. Bruyeriana (*Schær.*), *Leight.*
30 f. ochrodes, *Nyl.*
31 L. arridens, *Nyl.*
32 L. atrorufa (*Dcks.*), *Ach.*
33 L. Taylori (*Salw.*), *Mudd.*
34 L. Walrothii, *Flk.*
35 L. decolorans (*Hffm.*), *Flk.*
β. desertorum (*Ach.*).
36 L. flexuosa (*Fr.*), *Nyl.*
f. æruginosa (*Borr.*), *Leight.*
37 L. gelatinosa, *Flk.*
38 L. viridescens (*Schrad.*), *Nyl.*
39 L. Lightfootii (*Sw.*), *Ach.*
β. commutata (*Ach.*), *Schær.*
40 L. uliginosa, *Ach.*
41 L. humosa (*Ehrb.*), *Nyl.*
42 L. fuliginea, *Ach.*, *Nyl.*

43 L. perobscura, *Nyl.*
44 L. epimarta, *Nyl.*
45 L. calcivora (*Ehrb.*), *Nyl.*
46 L. Metzleri (*Krb.*), *Nyl.*
47 L. chondrodes, (*Map.*), *Nyl.*
48 L. sanguineoatra, (*Ach.*), *Nyl.*
* L. atrofusca (*Sw.*), *Nyl.*
49 L. fusca (*Schær.*), *Nyl.*
50 L. valentior, *Nyl.*
51 L. indigula, *Nyl.*
52 L. ochracea (*Hepp.*), *Nyl.*
53 L. fuscorubeus, *Nyl.*
54 L. botryiza, *Nyl.*
55 L. paucula, *Nyl.*
56 L. subturgidula, *Nyl.*
57 L. deducta, *Nyl.*
58 L. vernalis (*L.*), *Nyl.*
59 L. meiocarpa, *Nyl.*
60 L. subduplex, *Nyl.*
61 L. tenebricosa, (*Ach.*), *Nyl.*
62 L. ochrococca, *Nyl.*
63 L. cuprea (*Smmrf.*), *Nyl.*
64 L. Berengeriana (*Mass.*), *Nyl.*
* L. cupreiformis (*E. Nyl.*), *Nyl.*
β. perilenciza, *Nyl.*
γ. lecanodes, *Nyl.*
65 L. sylvana (*Krb.*), *Nyl.*
66 L. amaurospoda (*Anri.*)., *Nyl.*
67 L. symmictella, *Nyl.*
68 L. Henrica, *Laubal.*
69 L. mæstula, *Nyl.*
70 L. submæstula, *Nyl.*
71 L. turgidula, *Fr.*
f. erumpens, *Nyl.*
β. pityophila (*Smmrf.*), *Nyl.*
f. endopella (*Leight.*), *Nyl.*
72 L. misella, *Nyl.*
73 L. semipallens, *Nyl.*
c. Stirps, *L. globulosæ.*
74 L. globulosa, *Flk.*
75 L. chlorotiza, *Nyl.*
76 L. holomoloides, *Nyl.*
77 L. denigrata (*Fr.*), *Nyl.*
f. pyrenothizans, *Nyl.*
78 L. hemipoliella, *Nyl.*
β. Semialbula, *Nyl.*
79 L. subnigrata, *Nyl.*
80 L. spodiza, *Nyl.*
81 L. Ehrhartiana, *Ach.*

82 L. erysiboides, *Nyl.*
83 L. prasina (*Fr.*), *Schær.*
84 L. prasiniza, *Nyl.*
85 L. micrococca (*Krb.*), *Nyl.*
86 L. sordidescens, *Nyl.*
87 L. lutcella, *Nyl.*
88 L. antrophila, *Larbal.*
d. Stirps, *L. intermixtæ.*
89 L. intermixta, *Nyl.*
90 L. atropurpurea (*Schær.*). *Nyl.*
91 L. atropurpurascens, *Nyl.*
92 L. subsphæroides, *Nyl.*
93 L. Arnoldi (*Krph.*), *Nyl.*
94 L. delutula, *Nyl.*
95 L. subviridescens, *Nyl.*
96 L. Stereocaulorum, *Fr. fil.*
e. Stirps, *L. cyrtellæ.*
97 L. cyrtella, *Ach.*
98 L. Bouteillei (*Desmarz.*), *Nyl.*
99 L. baeomma, *Nyl.*
* L. glaucocarnea, *Nyl.*
100 L. littorella, *Nyl.*
101 L. cæsiolepra, *Nyl.*
102 L. Griffithii (*Sw.*), *Cromb.*
f. limitata, *Cromb.*
103 L. tenera, *Nyl.*
f. explanatula, *Nyl.*
104 L. Heerii (*Hepp.*), *Nyl.*

(*To be continued.*)

Additions to the Lichen Flora of the West Riding of Yorkshire. A. Shackleton and T. Hebden, "The Naturalist," 1893, p. 165.—It is highly satisfactory to find that in Yorkshire we have two students so thoroughly interested in the study of lichens as the authors of the above-named article have proved themselves to be, one result of their researches being the addition of 118 species to the Lichen Flora of the West Riding. Many notes and points of interest in connection with the discrimination of species must have cropped up in preparing the work, and one cannot but regret that some of these were not introduced, as such give a ring of life to an otherwise bald list, and more especially when we call to mind the extreme brevity of many Nylanderian diagnoses.

FUNGI.

Revised Descriptions of Type Specimens in the Kew Herbarium.

Numerous species of fungi established by Berkeley and others, the types of which are deposited in the Kew Herbarium, were described at a time when external characters, habit, etc., were considered as being equally important, or even more so, than internal microscopic features; consequently, at this age, when the pendulum has swung to the opposite extreme, and characters are mostly founded on colour, size, and septation of spores, the old species are not recognized, the result being that many such are being again described as new species. The above are the principal reasons for redescribing old types, and it is much to be desired that everyone having an opportunity of examining types—by which is meant the actual specimen from which the original description was drawn up—would give a new description of such, in accordance with the usage of modern times, embodying not only microscopic features, but also external characteristics, habit, etc. Host, matrix, and microscopic measurements are undeniably very important factors in the discrimination of species, but their abuse in modern times has probably resulted in as great an evil as did their absence from the descriptions of the old authors.

Hysterium fusiger, *B. & C.*

Perithecia gregarious, usually irregularly grouped on a black patch or stain; black, 1-2 mm. long, elliptical, ends acute, straight, curved, or flexuous, median line not gaping, even after prolonged soaking, lips smooth; asci cylindrical or somewhat clavate, attenuated into a thin pedicel at the base, spores 8, irregularly biseriate, somewhat fusiform, 7-9 septate, very slightly constricted at the septa, sometimes curved, cells usually 1-guttulate, pale, dull brown, 50-60 × 8-10 μ; paraphyses numerous, equal to or slightly exceeding the asci in length, filiform, tip not at all incrassated, brownish.

Hysterium fusiger, B. & C., Grev., Vol. iv., p. 11; Sacc. Syll., Vol. ii., No. 5661.

On dead wood. New England. Sprague, No. 5830.

Hysterium capparidis, *B. & C.*

Hypophyllous; perithecia gregarious, erumpent, black, at first covered with bright brown powder, straight or rarely slightly curved, narrow, rather prominent, slit very narrow; asci subcylindrical, shortly stipitate, 8-spored; spores irregularly biseriate, cylindric-fusoid, uniformly septate; transverse septa 9-11, very close together, 36-40 × 6-7 μ, with a tinge of brown at maturity; paraphyses very numerous, wavy, filiform, septate.

Angelina capparidis, B. & C., in Herb.

On leaves of *Capparis Jamaicensis*. Cuba.

I am not aware of the existence of any previously published description of this species.

Glonium cyrillæ, *B. & C.*

Scattered, black, erumpent, broadly elliptical, usually laterally compressed towards the apex, up to 1 mm. long, slit very narrow, lips varying from striate to quite smooth ; asci broadly clavate, somewhat truncate at the apex, base abruptly narrowed into a short, oblique pedicel, 8-spored ; spores irregularly biseriate, cylindrical, slightly curved, ends very obtuse (sausage-shaped), 1-septate, the septum situated one-third the distance from the base, slightly or not at all constricted, colourless, with a hyaline border, 65-75 × 8-10 μ; paraphyses numerous, filiform throughout, often slightly wavy.

Hysterium cyrillæ, B. & C., Grev., Vol. iv., p. 11.

Glonium cyrillæ, B. & C., Sacc. Syll., Vol. xi., No. 5593.

Hysterium chlorinum, B. & C., Grev., Vol. iv., p. 12.

Glonium chlorinum, B. & C., Sacc. Syll., Vol. xi., No. 5595.

On twigs of *Cyrilla*, Car. Inf., and on twigs of *Quercus aquatica*, Alabama.

Examination of the type specimens proves the two species cited above to be identical. I have seen free spores agreeing in form and size with those described above, having 3 septa, and pale brown. This is probably the mature condition of the spores of this species, although I have not seen such in an ascus. The measurements of the spores given by Saccardo are erroneous, and furthermore are not correct translations of Berkeley's measurements. Ellis, N. Amer. Pyren., pp. 684-685, has apparently copied Saccardo's errors.

Glonium clusiæ, *B. & C.*

Gregarious ; often, but not always, in patches, producing no discoloration of the leaf ; perithecia immersed, blackish, linear, straight or curved, and sometimes triradiate, 1-1·5 mm. long ; asci cylindrical, base attenuated, 8-spored ; spores obliquely uniseriate, elliptic-oblong, ends very obtuse, 1-septate, not constricted at the septum or only very slightly, clear brown, 14-16 × 6 μ ; paraphyses linear, very slightly thickened upwards.

Hysterium clusiæ, B. & C., Journ. Linn. Soc., Vol. x., p. 372.

Glonium clusiæ, B. & Br., Sacc. Syll., Vol. ii., No. 5608.

On dead leaves of *Clusiæ parasitica*. Cuba.

Glonium tardum, *Berk.*

Gregarious ; perithecia broadly elliptical or often almost circular in outline, nearly plain, smooth and even, black, remaining for a long time intact, then opening by a very minute, short slit; asci broadly clavate, shortly stipitate, 8-spored ; spores irregularly biseriate, broadly elliptical with a medium septum, not at all constricted, colourless ; paraphyses not seen, probably absent.

Hysterium tardum, Berk., Fl. Tasm., ii., p. 281.

Glonium tardum, Berk., Sacc. Syll., ii., No. 5607.

On leaves of *Cyathodes straminea*, Tasmania. Described as *Hyst. tardum*, but entered as *Hyst. cyathodes*, B., in Berkeley's Herbarium.

Hypoderma rufilabrum, *B. & C.*

Gregarious, reddish-brown, sometimes, but not constantly, seated on a pale spot; perithecia commencing as circular patches beneath the epidermis, then elongating transversely to axis of branch, becoming elliptical, slightly or not at all convex, slit very narrow, lips thin, up to 1·5 × ·5 mm.; asci rather broadly clavate, narrowed into a slender pedicel; spores 8, irregularly bi-seriate or inordinate, cylindrical or very slightly fusiform, ends obtuse, straight or slightly curved, 14-17 × 1·5 μ, colourless; paraphyses filiform, rather closely septate, exceeding the asci in length.

Hysterium rufilabrum, B. & C., Grev., Vol iv., p. 12.

Hypoderma rufilabrum, Duby., Hyst., p. 40, t. 2, f. 21 (spores rather too thick); Sacc. Syll., ii., No. 5796.

On twigs of *Acer striatum*. Car. Inf.

Hypoderma variegatum, *B. & C.*

Innate; scattered or somewhat gregarious, sometimes becoming confluent, black; perithecia straight, rarely somewhat wavy or branched, smooth, lips very close together, slightly raised like a keel; asci clavate; spores fasciculate, filiform, ends abruptly obtuse, colourless, nearly as long as the ascus, 45-50 × 1·5 μ; paraphyses absent.

Hysterium variegatum, B. & C., Grev., Vol. iv., p. 12.

Hypoderma variegatum, Duby., Hyst., p. 43; Sacc. Syll., Vol. ii., No. 5786.

On twigs of *Andromeda acuminata*, Car. Sup. Also on *Andromeda coriacea*, and *Viburnum opulus*, Car. Inf., petioles of *Aralia spinosa*, Look Out Mt., Tennessee.

Lophodermium platyplacum, *B. & C.*

Gregarious in large clusters on pale patches on both sides of the leaf, but most numerous and often confined to the upper surface; perithecia black, straight or wavy, sometimes branching, 1-3 mm. long, often much larger and anastomosing when growing on the larger veins; disc with a brown or yellow tinge, slightly raised and gaping when old; asci narrowly cylindrical, 8-spored, base attenuated; spores fasciculate, filiform, tips slightly attenuated, 70-80 × 1·5 μ, colourless; paraphyses filiform, very numerous, tinged brown at the apex.

Hysterium platyplacum, B. & C., Journ. Linn. Soc., Vol. x., p. 372.

Lophodermium platyplacum, B. & C., Sacc. Syll., ii., No. 5812.

On dead leaves of *Clusia*. Cuba.

This species, on leaves of *Clusia*, occurs in Herb. Lindig, No. 2891. New Granada.

Lophodermium Petersii, *B. & C.*

Scattered, not seated on a discoloured spot; perithecia elongated and wavy, elliptical or circular in outline, at first covered by the cuticle, then bursting through, disc broadly open when moist, pallid, margin elevated, black, compact; asci cylindric-clavate, attenuated at the base, spores elongated, filiform, straight or very slightly curved, 55-68 × 1·5 μ, colourless; paraphyses very numerous, agglutinated together, filiform, straight, equal to the asci in length.

Hysterium Petersii, B. & C., Grev., Vol. iv., p. 13.

Lophodermium Petersii, B. & C., Sacc. Syll., Vol. ii., No. 5822.

On cedar. Alabama, Peters.

The perithecia are large, 4-5 mm. long when elongated, 2-3 mm. across when more or less circular.

Lophodermium velatum, *Berk.*

Gregarious, crowded on small pale spots; perithecia blackish, flattened and covered by the cuticle, smooth, about 5 mm. long, uniform in size, the long axis in all instances parallel to the long axis of the stem of host; asci broadly cylindrical, terminating abruptly in a very short, oblique stem; apex somewhat acute, 8-spored; spores fasciculate, nearly as long as the ascus, with a spiral twist, filiform, or with the apex slightly incrassated, 75-80 × 1-5 μ; paraphyses numerous, very slender; apex narrowly clavate, colourless.

Hysterium velatum, Berk. in Herb. This species has not been published before, I believe.

On *Festuca*. Madeira.

Hysterographium hiascens, *B. C.*

Scattered, externally black, smooth, margin strongly incurved when dry, expanded and exposing the concave, blackish-olive; disc when dry 1-1·5 mm. across; asci broadly cylindrical, tapering to a thin, oblique pedicel at the base, constantly 4-spored; spores elliptic-oblong, ends very obtuse, muriformly septate, transverse septa usually five, dark, clear brown, 30 × 15 μ; paraphyses very numerous, filiform, simple, or branched; apex olive-brown.

Hysterium hiascens, B. & C., Grev., Vol vi., p. 11.

On dry bark of *Quercus bicolor*, Car. Inf.; on *Celtis occidentalis*, Car. Sup.

Aulographum quadriæ, *Berk.*

Gregarious, forming small detached clusters of 6-10 individuals; perithecia black, linear, rather prominent, straight or very slightly curved, lips thick, smooth, slips narrow, up to ·5 mm. long; asci short, broadly clavate, 8-spored; spores inordinate, elliptic-oblong, ends obtuse, 1-septate, not constricted at the septum, colourless, 8-10 × 4-5 μ; paraphyses filiform, equal to or very slightly longer than the asci.

Hysterium quadriæ, Berk. in Herb. So far as I can ascertain this species has never been published.

On leaves of *Quadria heterophylla*. Chili.

Pseudographis depressum, *B. & C.*

Black, scattered to crowded; perithecia elliptical, flattened above, rugulose or irregularly striate, hymenium covering the entire upper surface; spores broadly cylindrico-clavate, with a very short, slender, oblique pedicel; spores irregularly bi-seriate, 7-11 septate (generally 9), not constricted at the septa, the fourth or fifth cell from the base usually swollen, straight or curved, colourless, 35 × 42 × 6 μ; paraphyses numerous, filiform, equal, or very slightly incrassated upwards, colourless.

Hysterium depressum, Berk. and Curt., Grev., Vol. iv., p. 10; Sacc. Syll., Vol. ii., No. 5660.

On dry exposed wood. Virginian Mountains.

Berkeley says, "Disc extremely narrow," but I find no trace of a slit, the naked hymenium covering the entire surface, neither is there a distinct border.

Gloniella drynariæ, *B. & Br.*

Gregarious, covering the entire under-surface of the frond; perithecia immersed, causing no discoloration, the slightly raised and ruptured cuticle resembling white lips, straight, curved, or rarely branched, 1-2 mm. long; asci cylindrical, shortly stipitate; spores obliquely uniseriate, cylindric-oblong, ends very obtuse, 3-septate, not at all constricted at the septa, colourless, 14-16 × 6 μ; paraphyses filiform, slightly exceeding the asci in length, numerous.

Hysterium drynariæ, B. & Br., Journ. Linn. Soc., Vol. xiv., p. 133; Sacc. Syll., Vol. ii, No. 5648.

On fronds of *Drynaria quercifolia.* Tropical Forests, Ceylon.

Very lichenoid in appearance, covering the whole under surface of the frond, accompanied by multitudes of pallid, minute perithecia filled with oblong spores ·0002in. long (*B. & Br.*).

There is no evidence of genetic affinity between the minute perithecia and the *Hysterium.*

Ostropa albo-cincta, *B. & C.*

Densely gregarious; conical or shortly cylindrical; disc black, plane, with a short, very narrow slit; lips smooth; sides densely clothed with white powder; asci sub-cylindrical, shortly stipitate, 8-spored; spores irregularly biseriate, somewhat fusiform, straight or slightly curved, 1-septate, very slightly constricted at the septum, dingy olive-brown; 30 × 6-7 μ; paraphyses numerous, linear, not incrassated upwards.

Ostropa albo-cincta, Berk. & Curtis, Journ. Linn. Soc., Vol. x., p. 372; Sacc. Syll., Vol. ii., No. 5856.

On dead bark. Cuba.

Commencing as densely crowded white knobs, which expand at the apex and form a broadly elliptical black disc, furnished with a short, very narrow slit.

AUSTRALIAN FUNGI.

By G. Massee.

Puccinia Kochiæ, *Mass.*

Amphigenous; sori discoid, plane, very compact, blackish-brown, about 1 mm. diameter, girt by the torn epidermis; teleutospores densely packed, elliptic-oblong, both ends very obtuse, or the apex with a slight indication of a papilla, which is often oblique, perfectly smooth, pale umber, 40-50 × 22-25 μ, wall about 3 μ thick; pedicel colourless, cylindrical, 70 × 6 μ.

On *Kochia sedifolia*, F. v. M. Near Dainboola, Victoria (F. Reader).

Very closely resembling *Puccinia alyxiæ*, Cke. & Mass., in habit and general appearance, but differing widely in the spore form and structure.

Xylaria (Xylodactyla) Readeri, *F. von Mueller.*

Black; head globose or broadly elliptical, 5-8 mm. long, crowned by a short spine, mealy with the white conidia; perithecia scanty, large, prominent; asci cylindrical, shortly pedicellate, 8-spored, spores obliquely uniseriate, subcylindrical, slightly curved, ends obtuse, 14-15 × 5-6 μ, pale purple-brown; stem 7-10 c.m. long, the greater portion buried in the sand, densely velvety downwards, simple, erect, springing at intervals from a whitish, horizontal rhizome.

Sandy desert. Wemmera, Victoria (F. Reader).

Resembling *X. pedunculata* in habit, but with very different spores.

Phoma uvicola, *B. & C. N. A. Fungi, No.* 382. *Sacc. Syll. No.* 887.

Sporules 7-8 × 3-4 μ.

Unfortunately this disease, known in the United States as "black rot," has been found on grapes from Victoria, but the ascigerous condition has not been detected in Australia.

Bibliography.

Hedwigia, 1893, p. 119.—Bresadola states that *Pleurotus abbreviatus*, Kalch. Grev. viii., 152, is equal to *Polyporus subpulverulentus*, B. & C. Pores ample, distorted when dry. This is stated on the faith of some specimen said to be derived from Kalchbrenner. It seems so absurd, on the face of it, that an experienced mycologist like Kalchbrenner did not know a *Pleurotus* from a *Polyporus* that we would much sooner believe in the specimen having a wrong name attached. A similar circumstance has occurred previously (Grev. xix., p. 53), when Bresadola contended, on the faith of some specimen, that *Polyporus pisiformis*, Kalch., was a Gasteromycete. It is improbable that any experienced mycologist would have made such elementary mistakes.—M.C.C.

Einige neue und interessante Pilze aus dan Königl. Botanischen Museum in Berlin. P. Hennings. Hedwigia, 1893, p. 61 (1 pl.).

The fungi described are certainly very interesting, but not altogether new. *Puccinia Schottmülleri*, P. Henn., is identical with *Puccinia corticioides*, B. & Br. (Journ Linn. Soc., Vol. xv., p. 52, pl. 2, figs. 7-8). These authors say of this species in a note :—"At first appearing under the form of little tawny specks; at length forming apricot-coloured patches, which assume the form of some *Corticium*. On the stem of some large graminea, probably *Arundinaria*. Kobê, Nippon, Japan."

Puccinia xylariiformis, P. Henn., is the same as *Puccinia splendens*, Vize (Grev., Vol. vii., p. 11). The last-named species was founded on a Californian specimen, "On *Obione* or rabbit bush," but unfortunately *Obione* became changed to "onion" in Grevillea, and this mistake is repeated in Sacc. Syll., vii., pt. ii., No. 2257. This species has also been collected in Mexico, on *Hymenoclea* and on *Tessaria*.

Omphalia Martensii, P. Henn., is a small phosphorescent agaric from Borneo, and is in all probability the species alluded to by Dr. Collingwood in Journ. Linn. Soc., Vol. x., p. 469.

The Saprolegniaceæ of the United States, with Notes on other Species. J. E. Humphrey; read before Amer. Phil. Soc., Nov. 18th, 1892 (7 pl.).

Dr. Humphrey's excellent work is not only of immense value to American students of the Saprolegniaceæ, but also to those of other countries. The introductory portion, dealing with morphology, etc., embodies the researches of previous workers in this group—carefully individualized—along with his own researches, and indicates what appears to be the true interpretation of the somewhat contradictory statements made by different observers. In the systematic portion the generic and specific characters are ample and clear; several new species and varieties are described. The plates are excellent.

New Species of Laboulbeniaceæ from Various Localities, Roland Thaxter, Proc. Amer. Acad. 1893, p. 156.

In the present contribution to a very interesting group of fungi, the author has added eight new genera and fifty-two new species, and the general nature of the work is such that, whatever modifications further research may necessitate, there will be no difficulty in being perfectly certain as to the identity of the organism the author had in view. In two of the new genera described the sexes are separated, and occur upon distinct individuals. An illustrated monograph of the entire group, which the author intimates is now in preparation, will be awaited with interest.

Fragmenta Mycologica x.L., P. A. Karsten, Hedw. 1893, p. 59.

Several new species are described, and, unfortunately for science, forms previously described as varieties are now raised to the rank

of species, thus *Stropharia Caput-Medusæ*, Fr., var. *alba*, Karst., Symb., ix., p. 47, becomes *Stropharia alba*, Karst.; *Psathyra permata*, Fr., var. *squamosa*, Karst. Symb., vi., p. 19, is now *Psathyra squamosa*, Karst. *Marsonia Rosæ*, Trail, Sacc. Syll. Suppl., p. 477, is said to be identical with *Actinonema Rosæ* (Lib.), Fr. *Diplonema*, Karst. Finl. Basidsw., p. 430, being previously used for a genus of Algæ, has been changed to *Amphinema*. Finally *Tomentella obducens*, Karst., is said to be the same as *Amphinema sordescens*, Karst.

On Two New or Imperfectly Known Myxomycetes, W. C. Sturgis, Bot. Gaz., 1893, p. 186 (1 pl.).—*Comatricha cæspitosa*, n. sp., characterised by the densely cæspitose habit, more or less permanent sporangial wall, and large asperate spores, 9·6 × 12·8 μ. The second species is what the author considers to be *Physarum sulphureum*, Alb. and Schw. This may be, but *Physarum chrysotirchum*, B. and C., is certainly not the same, differing in the long, thin internodes of the capillitium, and the much smaller, pale lilac spores.

NOTES.

G. Massee has been appointed Principal Assistant (Cryptogamic Department) at the Herbarium, Royal Gardens, Kew.

The annual Fungus Foray of the Yorkshire Naturalists' Union will be held at Howden on Wednesday and Thursday, Sept. 6th and 7th. Mycologists are cordially invited.

British Fungus-Flora.—The third vol. of this work, containing the remainder of the Basidiomycetes and the whole of the Hyphomycetes, will be ready in October. The remainder of the species will be published in uniform supplementary volumes.

MUSCINEÆ.

Muscologia Galbica, T. Husnot. The eleventh part of this important work is to hand, and deals with the following genera:—*Homalothecium. Camptothecium, Ptychodium, Brachythecium, Scleropodium, Hyocomium, Eurhynchium, Thamnium.* The specific characters are full and very clear, and the microscopic details in addition to the general habit of the plant, natural size, are given on ten well-executed plates.

Handbook of British Hepaticæ.—Under the above title a small volume is now in the Press, by Dr. M. C. Cooke, which is intended for the use of students and those who desire to commence the study of these plants. It will contain about 200 woodcuts, and seven outline plates, with descriptions of all known British genera and species, accompanied by figures. The price will be about five shillings, and it is expected to be ready in October. The publishers are Messrs. W. H. Allen and Co. (Limited), Waterloo Place, S.W.

NEW OR CRITICAL BRITISH ALGÆ.

By E. A. L. Batters, B.A., LL.B., F.L.S.

Lithothamnion roseum, *Nov. Spec.*

Fronds saxicolous, thin, dark pink (never purple), lighter when dry, forming incrustations of indefinite extent, which are at first orbicular and covered with minute wart-like excrescences, afterwards indefinite in outline, the excrescences arising into short, erect, more or less cylindrical, prominent knobs from 5-8 mm. high and from 2-3 mm. in diameter, either simple, or bifid, or trifid above with blunt apices. Tetrasporic conceptacles hardly perceptibly raised above the surface of the frond, much compressed, with numerous orifices. Spores large, 140-200 μ long, by 80-100 μ broad, two-parted.

Hab. Berwick. Cumbrae, St. Andrews (C. Howie and Dr. Axford.)

This species is referred to on page 140 of my "List of the Marine Algæ of Berwick-on-Tweed" as being probably distinct from *L. polymorphum*. At the time of writing that note (1889) I was uncertain whether my plant was identical with any described species, and consequently asked the opinion of Dr. Kjellman, who has devoted much time and attention to the study of this genus. He informed me that he regarded the plant as belonging to an undescribed species. I have, however, from various causes, been prevented from describing the plant till the present. My first specimens were gathered at Berwick-on-Tweed, where the plant is far from uncommon. Mr. Holmes informs me he has received specimens from St. Andrews, gathered by Mr. C. Howie and Dr. Axford, and I have little doubt that the species on further investigation will be found at many stations around our coast.

The plant grows on rocks and stones in deep pools, from half-tide level to below low-water mark of ordinary tides. It is usually accompanied by *L. polymorphum*, from which it may at all times be known by its colour, which is never purplish as in that species. At first the crusts are roundish and closely adherent to the substratum, but when old they form wide, irregular patches several feet in diameter, portions of which can easily be detached from the rock. The species appears to be nearly related to *L. colliculosum*, Foslie, and since Foslie only found specimens bearing cystocarps it might be questioned whether my *L. roseum* were anything more than the tetrasporic form of that species. I, however, have specimens of a *Lithothamnion*, dredged from deep water near Cumbrae and in other portions of the Clyde sea area, which agree even better with Foslie's description of *L. colliculosum*, in which the tetraspores are formed in prominent hemispherical or conical conceptacles with a single naked orifice, thus agreeing with the cysto-

carpic conceptacles of that species. *L. roseum* is moreover a much larger and thicker species, the fronds often attaining a diameter of several feet and a thickness of from 3-4 mm.; it also grows between tide-marks, while *L. colliculosum* appears to be a deep-water species. Specimens of *L. roseum* have been distributed in the sixth part of Mr. Holmes's excellent "Algæ Britannicæ Rariores Exsiccatæ," an account of which will be found below.

Pleurocapsa fuliginosa, *Hauck Meeresalgen Deutchland und Oesterrachs, p.* 515, *fig.* 231.

Cell division taking place in all directions; cells yellowish or reddish-brown, from 5-20 μ in diameter, spherical or irregular in shape, with a thin investing membrane, solitary or united in clusters of 2-7 individuals. Cell contents homogeneous, breaking up when mature into numerous spores.

At Berwick this plant forms a thin brownish layer on rocks at high-water mark, and is usually accompanied by *Calothrix scopulorum* and other small algæ.

Aphanocapsa marina, *Hansg. in Foslie Contrib. to Knowledge of Mar. Alg. of Norway.*, I., *p.* 169. *Hauck and Richter, Phykotheka Universalis*, X., *No.* 486.

Cells roundish, seldom more than ·5 μ in diameter, blue-green, solitary or united in twos, in a colourless jelly. Cell membrane very thin. Layer dirty green, darker when dry.

I have found this species at Berwick, where it appears to be not uncommon, growing on rocks at and above high-water mark, mixed with species of *Calothrix* and other small algæ.

Protococcus marinus, *Kütz. Phyc. Gener., p.* 169. *Tab. Phyc.*, I., *t.* 2.

Cells mostly solitary, roundish, from 10-30 μ in diameter. Cell contents brownish red, turning to a light greenish tint when dry.

Mixed with *Calothrix scopulorum*, on rocks near high water mark. Weymouth.

Protococcus ovalis, *Hansg. in Foslie Contrib.*, I., *p.* 159.

Vegetative cells oval or elliptical, more rarely roundish, mostly 5-10 μ broad by 10-12 μ long. Cell contents homogeneous, light green. Layer thin, dirty green.

Weymouth. On rocks and stones at high-water mark and between tide marks.

Plectonema terebrans, *Bornet et Flahault sur quelques plantes vivant dans le test calcaire des mollusques in Bull. Soc. Bot. de France, t.* XXXVI., *pl.* X., *figs.* 5 *and* 6.

Filaments very slender, elongated, flexuous, commonly sparingly pseudo-branched, pseudo-branches most frequently solitary. Sheaths hyaline, very thin, cylindrical, not turning blue when treated with chlorzinc iodine. Trichomata pale green, not torulose, 0·95 μ to 1·5 μ thick; joints longer than the diameter of the trichomata, 2 μ to 6 μ long; each dissepiment marked with two grains of protoplasm, apical cell rounded.

Mixed with various other species of perforating algæ in old shells from Cumbrae. I am indebted to the kindness of Dr. Bornet for the identification of this species. I find that the plant is far from uncommon on our shores, as I have also found it abundantly on old shells from Weymouth and elsewhere; externally the shells give no indication of the presence of the *Plectonema*, which is only brought to light when the chalk of the shell has been dissolved.

Symploca atlantica, *Gomont, Monographie des Oscillariées, Ann. Sc. Nat. Bot., t.* XVI., *p.* 109.

Cæspitose, black green. Fasciculi erect, reaching one centimetre high. Filaments closely interwoven, free, simple, strongly and angularly torulose. Sheaths thin, firm, turning blue when treated with chlorzinc iodine. Trichomata yellowish-green, 4-6 μ thick, constricted at the joints throughout their entire length, cells usually square or shorter than long, rarely longer than broad, 2-6 μ long, protoplasm scarcely granulose; dissepiments visible, pellucid, not granular; membrane of the apical cell thickened into a depresso-conical calyptra (n.v.)

Hab. Shores of Wales (Nordstedt).

The above description is translated from M. Gomont's description of the species. I have not had an opportunity of seeing a specimen, and record the species as British, on the authority of M. Gomont, who has received specimens gathered on the shores of Wales by Dr. Nordstedt. We are not told the exact locality in Wales where the plant was found.

Lyngbya lutea, *Gomont, Essai de classification des Nastocacées homocystées in Morot, Journal de Botanique,* IV., *p.* 354.

Stratum sub-gelatinous, coriaceous, yellowish-brown or olive-green, when dry often blackish violet. Filaments twisted, flexuous, closely interwoven. Sheaths hyaline, smooth, turning blue when treated with chlorzinc iodine, at first thin, when old up to 3 μ in thickness and lamellose. Trichomata olive-green, not constricted at the joints nor attenuated at the apices, 2·5-6 μ thick; cells quadrate or up to three times shorter than long, 1·5 μ to 5·5 μ long, protoplasm granular, dissepiments usually compactly drawn together. Apical cell furnished with a rounded calyptra.

In shallow puddles of salt water at high-water mark, Puffin Island and Cumbrae. This species greatly resembles *Lyngbya semiplena* in outward appearance, but, as M. Gomont remarks, is sharply separated from it by the smaller diameter of the filaments, the greater length of the joints, and the reaction of the sheath in the presence of iodine.

Phormidium fragile, *Gomont, Monographe des Oscillariées, l.c., p.* 163.

Stratum slimy, lamellose, yellowish or brownish-green. Sheaths dissolving to a fibrous, gelatinous mucus, which does not turn blue when treated with chlorzinc iodine. Trichomata more or

less flexuous, bright green, variously intertwined or sub-parallel, moniliform, attenuated at the apex, 1·2-2·3 μ thick; joints subquadrate, 1·2-3 μ long, protoplasm not granulose, apical cell sharply conical; no calyptra.

In shallow pools of brackish water, Point of Ayr, Flintshire.

Ascocyclus ocellatus, *Rke., Algenfl., p.* 46, *Atlas t.* 15.

Spots from 1-6 mm. in diameter. Basal disc composed of concentric zones. The central portion two layers thick is succeeded by a zone of frond composed of a single layer of cells; this is again succeeded by a two-layered zone, and so on. Vertical filaments and sporangia arise only where the frond is composed of two layers. Filaments about 8 μ in thickness, plurilocular sporangia lanceolate, stalked.

On the fronds of *Rhodymenia palmata.* Weymouth; local, but abundant.

This species bears a very striking resemblance to *Ascocyclus reptans,* Rke., from which it is sharply separated by the nature of the basal disc.

Myriotrichia repens, *Hauck, Beiträge zur Kenntniss der Adriateschen Algen, Œsterr. botan. Zeitschr.,* 1879, *p.* 242, *tab.* 4, *figs.* 1 *and* 2.

Fronds microscopical. Filaments 200-500 μ, creeping amongst the cortical filaments of *Mesogloeæ.* The primary threads irregularly branched, 6-8 μ thick; joints from as long as broad to twice as long. The upright filaments 9-15 μ thick, simple, the apices ending in two or more hairs; joints $1\frac{1}{2}$-4 times longer than the diameter. Unilocular sporangia 20-30 μ in diameter, borne either on the creeping or upright filaments. Plurilocular sporangia clustered at the apices of the erect filaments, more or less cylindrical, 30-40 μ long, 6-9 μ broad. Unilocular and plurilocular sporangia borne on the same individuals.

Weymouth. T. H. Buffham.

Mlle. Karsakoff has demonstrated that it is unnecessary to retain the genus *Dichosporangium,* founded by Hauck, for the reception of this minute species. I have, therefore, retained the earlier name conferred on it by its discoverer. Although up to the present Mr. Buffham has only found a single patch of this species on *Castagnea Griffithsiana,* we may anticipate that it will be found at many stations around our coast, its minute size having hitherto protected it from discovery.

Stilophora tuberculosa, *Rke. Algenfl., p.* 72, *Atlas* I., 37.

Very closely related to *Stilophora rhizodes,* J. Ag., but coarser in habit and darker in colour, and the bases of the branches thicker. The sori are so closely placed that they touch one another, thus covering the whole surface of the thallus, very little if any of the unaltered cortical layer of the thallus being visible in fertile specimens. The central filaments of the sori are longer

than those near their edges, thus giving to the frond a rough warted appearance. The unilocular and plurilocular sporangia are sometimes found on the same individual.

Swanage. E. M. Holmes.

Bibliography.

Algæ Britannicæ Rariores Exsiccatæ. Curante E. M. Holmes. Fasciculus IV., Nos. 126-150.

The contents of the sixth part of this excellent collection of exsiccata is, as the just confidence we place in Mr. Holmes' judgment and skill in the task of selection would have led us to expect, of exceptional interest to all those interested in the study of our marine flora. We note with pleasure that Mr. Holmes has introduced several improvements into the present part; for instance, the labels which accompany the specimens have each printed on them either at the top or side "Holmes' Alg. Brit. rar. Exsicc.," thus enabling those who distribute the specimens in large Herbaria to at once detect the source whence they were derived. The *Melobesiæ* and other lumpy specimens have also been placed in shallow boxes, which is a most decided advantage, as it prevents these brittle plants from being injured by the pressure of the specimens overlying them. With regard to the specimens themselves, No. 126 is certainly the *Ascocyclus orbicularis* of Magnus, Hauck, and Reinke; but whether or not it is the *Myrionema orbiculare* of J. Agardh I am unable to say. His description ("Species Algarum," p. 48) does not agree very well with our plant. The sentence "Ex strato hoc basali surjunt *sparsissima fila clavata*, intermixtis hyalinis confervoideis elongatis" is hardly applicable to the *A. orbicularis* of Magnus or Hauck. I am equally uncertain whether the *Myrionema orbiculare* of the Brothers Crouan and French authors generally is referable to the *Ascocyclus orbicularis* of Magnus. Reinke ("Algenflora der Westlichen Ostsee," p. 46) quotes the Crouans' figure ("Florule du Finistère," p. 25, 165, Fig. 7) as authority for saying that the plurilocular sporangia of *Ascocyclus orbicularis* are sessile. I presume, therefore, that he considers the *M. orbiculare* of the Crouans as identical with *A. orbicularis* of Magnus. Neither J. Agardh* nor the Crouans make any mention of the unicellular, thick-walled, hyaline utricles which are so conspicuous a feature in *A. orbicularis*, giving to the dried specimens a hoary appearance which alone renders them visible to the naked eye. A reference to the Crouans' plate shows that their plant much more nearly resembles *A. jucundus*, var. *seriatus*, Rke., if it is not actually identical with it. It may well be, then, that J. Agardh's *Myrionema orbiculare* is

* Agardh's "fila . . ., intermixtis hyalinis *confervoideis elongatis*" would seem to refer to the hyaline hairs, not the utricles which he would hardly have described as confervoid.

identical with the variety *seriatus*, Rke., of *A. fœcundus*, while Magnus's plant was unknown until the appearance of his description. In that case, unless the genus *Phycocelis* of Strömfelt be retained, the plant described by Magnus must receive a new specific name. No. 127.—*Ascopyllum Mackaii*, Holm. et Batt., var. *Robertsoni*, Batt. I am now of opinion that it would be better to raise this variety to specific rank, as it appears to be separated from *A. Mackaii* by more essential characteristics than those which separate *A. Mackaii* itself from *A. nodosum*.—No. 130. *Chordaria divaricata*. With the exception of the Irish specimens described by Harvey and those "found floating in Plymouth Harbour by Mr. F. Pascoe" (Johnstone and Croall., "Brit. Sea-weeds," p. 110.), I know of no specimens of this species having been found on the shores of these Islands previous to Mr. Holmes' "find" at Fairlie.—133. *Ectocarpus crinitus*, Carm. Mr. Holmes would keep this species distinct from *E. pusillus*, Harv. (*Akinetospora pusilla*, Born.), No. 136, as apart from the difference in habit between them the two plants grow in very different situations. *E. crinitus*, Mr. Holmes informs me, "was found growing in large masses covering a space of a square yard or more near high-water mark, over *Cladophora rupestris* and *Enteromorphæ*, and below *Rivularia Biasolettiana*, on the perpendicular face of a rock in the shade, over which moisture trickled, while *E. pusillus* was found in very shady pools forming isolated small tufts."—135. *Ectocarpus ovatus*, Kjellm. Although the specimens of this species contained in the fasciculus are small, they are amply sufficient for identification. The plant appears to be very rare, as up to the present only two specimens have been found, one at Weymouth and one at Ilfracombe. The specimens are very difficult to lay out, as the clustered fruits render the threads liable to catch in one another.—No. 137. *Ectocarpus Sandrianus*, Zan. The first British specimens of this species were found by Mr. F. W. Smith growing on a specimen of *Desmarestia aculeata* thrown upon the beach at Falmouth, and were communicated by him to Mr. Holmes. Since then the species has been found by Mr. and Mrs. Holmes at Studland, Ilfracombe, and Taunton.—No. 144. *Monostroma Blytii*, Wittr. This species was first found on our shores by Mr. Holmes in 1890 at Tayport, subsequently by myself at Cumbrae, and lately by Mr. J. T. Neave at Deal.—No. 149. *Schizothrix lardacea*, Gom. Although M. Gomont himself, we are informed, identified the specimens which are here distributed, he makes no mention of the plant occurring in England in his "Monographic des Oscillariées."—No. 150. This is *Myriactis Areschougii*, Batt.; the generic name is wrongly given as *Streblonema* on the label. The fasciculus contains several other species of interest, and Mr. Holmes is certainly to be congratulated on having got together a most interesting and useful set of specimens. *Phycological Memoirs*. Edited by Geo. Murray, F.R.S.E., F.L.S.

Although a longer period than is altogether desirable has elapsed since the appearance of the first part of the "Phycological Memoirs," the second part is none the less welcome, more especially as it fully sustains the reputation obtained by its predecessor. The plates, printing, and whole "get up" of the part are admirable, and the volume, when completed, will, we may anticipate, be worthy of the great institution within whose walls the researches, the results of which it records, have been made. The first paper in the present part deals with some obscure points in the morphology of the *Fucaceæ*, which had been left untouched in Oltmann's rather disappointing monograph of that order. *Coccophora Langsdorfii*, Grev., and *Seirococcus axillaris*, Grev., are figured, and their structure described in a very interesting paper by Miss Lorrain Smith, while a similar service is performed for *Xiphophora Billardierii*, Mont., by Miss Barton, for *Notheia anomala*, Bail. et Harv., by Miss Mitchell, and for *Sarcophycus potatorum*, Kütz, by Miss Whitting. The figures of these plants are well and accurately drawn, and the descriptions sufficient, and the papers are welcome as gathering together, in an easily accessible form, all the information we possess with regard to these little-known plants. Taken in conjunction with the paper on *Splachnidium rugosum*, Grev., by Miss Mitchell and Miss Whitting, these notes clear up much that was formerly obscure in this fucoid group. The next paper is devoted to the description of a new endophyte—*Chlorocystis sarcophyci*—which, together with the distorted tissues of the last plant, forms gall-like excrescences on the fronds of *Sarcophycus potatorum*, Kütz. These excrescences were first noticed by Mr. Bracebridge Wilson, who, finding they were caused by an unicellular alga, sent specimens for investigation to the British Museum. Miss Whitting has carefully examined the material sent, and has come to the conclusion that the endophyte belongs to the genus *Chlorocystis*, but to a species hitherto unknown. The diagnosis of the new species is as follows:—"Cellulis globosis oblongis vel irregularibus, 10-40 μ diam., in statu vegetativo viridibus, in matrice omnino inclusis, collo destituto, zoogonidia emittentibus. Hab. in *Sarcophyci* frondibus ad oras Novæ Hollandiæ propi Geelong. Coll. J. Bracebridge Wilson." The third paper, by Geo. Murray, deals with the closely related genera *Halicystis* and *Valonia*. After giving an account of the geographical distribution of *Halicystis ovalis*, Mr. Murray translates some very careful and interesting notes on that species, furnished by Professor F. Schmitz. Dr. Schmitz finds that the chromatophores of *Halicystis ovalis* are roundish or oval discs of somewhat varying size and rounded outline, never sharply angular or lobed, and wholly without pyrenoids. The nuclei are very numerous and minute, and are scattered amongst the chromatophores. Speaking of the characters which distinguish *Halicystis* from *Valonia*, Dr. Schmitz continues: "The nuclei of *Valonia* are much more compact and more evenly distributed at fairly regular distances in

the protoplasm. The chromatophores exhibit an irregularity of shape, being roundish, but angular, some of them with sharp angles, and of varying size; moreover, some of them are provided with pyrenoids, and these are of regular occurrence among the others which have no pyrenoids." He considers these differences in combination with the non-development of rhizoids, and the cell-membrane so little stratified as to exhibit no exfoliation completely justify the separation of *Halicystis* and *Valonia*. Dr. Schmitz, however, admits another species into the genus *Halicystis*. This new species, *H. parvula*, is smaller than *H. ovalis*, with a shorter and more blunt stalk, a more uneven surface, but differs from *H. ovalis* mainly in having larger chromatophores of a long spindle shape, and, judging from the figure, rather angular outline, "provided in the centre with a single clear pyrenoid." From the last sentence it would appear that Dr. Schmitz places no reliance on the presence or absence of pyrenoids in the chromatophores as a generic character separating *Valonia* and *Halicystis*. On the whole we think Mr. Murray is wise in preferring "the more cautious attitude of awaiting the story of the reproduction" of *Halicystis* before committing himself to full agreement with Dr. Schmitz's views as to its distinctness from *Valonia*. To us the real interest of the paper is to be found in the fact that Mr. Murray has found on *Valonia ventricosa*, J. Ag., what appear to be reproductive cells. These bodies, Mr. Murray says, have plainly arisen by free cell formation within the great mother-cell. They are of various sizes, and, while generally round, odd forms are to be met with, dumb-bell shaped in varying degree, and others suggesting a process of sprouting in yeast fashion." Attempts to cultivate them proved unsuccessful. The part also contains an interesting paper on the structure of *Hydroclathrus*, Bory, by Miss Mitchell, and one on the cryptostomata of *Adenocystis*, *Alaria*, and *Saccorhiza* by Mr. Murray, and finally a comparison of the marine floras of the warm Atlantic, Indian Ocean, and the Cape of Good Hope, by the same author. As we have already said, the papers in the present part are interesting and useful, and want of space alone has prevented us from dealing with them more fully, while the plates, paper, and printing are all that can be desired. We heartily trust that this work will meet with the encouragement which it deserves.

A Provisional List of the Marine Algæ of the Cape of Good Hope. By Ethel S. Barton ("Journal of Botany," February-July, 1893).

Miss Barton has performed a useful and much-needed work in preparing a list of the marine algæ of the Cape of Good Hope. The only other list dealing exclusively with the marine algæ of that region known to us is the already antiquated "Phycea Capenses" of Areschoug, published in 1851, and which is of course very incomplete, as much work has been done since then.

Miss Barton has had, at the outset, to meet an undoubted difficulty in studying the subject because of the great labour involved in the collection and verification of records, and she most certainly deserves the thanks of all algologists for the thorough manner in which she has performed her self-imposed task. We could have wished, however, that she had adopted a classification more in accord with modern research, and we must own that we entirely fail to see how the adoption of that course would "have presented difficulties in tabulating and comparing the Cape marine flora with other floras and destroyed the chief interest—that of geographical distribution—of such lists as the present." A reliable table of distribution can only be drawn up from a comparison of specimens collected in the regions the floras of which are to be compared. A table compiled from "lists" only is apt to be very misleading, as it is always more or less uncertain whether the *same species* is indicated by the *same name* when used by two different authors, resident, perhaps, in widely separated countries, who have had no opportunity of comparing their specimens with type or even authentic ones. Three new species are described in the list, but we fear few algologists are likely to recognize them from the descriptions, which are very incomplete. *Carpoblepharis minima* seems to be separated from *C. flaccida*, Kutz., simply by its minute size. The description of *Spermothamnion Schmitzianum* is equally applicable to several species of *Spermothamnia*, and one may be permitted to doubt whether it is really distinct from *S. repens*. Putting these minor points out of consideration, however, the work is well done, and we trust that before long Miss Barton will prepare a revised edition of her list.

Die Algen der Kieler Föhrde. By Th. Reinbold (from "Schriften des natur wissen schaftlichen vereins für Schleswig-Holstein").

The fourth and concluding part of Major Reinbold's valuable little book is a welcome addition to the literature dealing with the Baltic marine flora. It may be said to form an introduction to Prof. Reinke's "Algenflora," in which no descriptions of the species are given, and the size of which renders it unsuitable for everyday use. The descriptions are succinct and to the point, and the book will prove useful not only to Major Reinbold's own countrymen, but to Englishmen and others resident in countries where many of the new or little known species may be expected to occur.

Sur les Algues d'eau douce récoltées en Algérie. By M. C. Sauvageau ("Bulletin de la Société Botanique de France," Vol. xxxix.).

Although the Phanerogams and even the marine algæ of Algeria have attracted some sort of attention from botanists, no account, other than that given by Montagne, many years ago, is to be met

with of the fresh-water algæ of that district. M. Sauvageau's list to some extent supplies this want ; he mentions 60 species, some of which belong to new genera or species. The new genus *Synechocystis* differs from *Synechococcus* in possessing perfectly globular cells. *Tapinothrix*, n. gen., is thus described : "Fila heterocystis destitula, tenerrima, simplicia, a basi leviter incrassata attenuata apice in pilum articulatum non producta, vaginæ tennes, arctissimæ, continuæ, sæpissime sursum, hormogoniorum exitu, vacuæ." A single species, *T. Borneti*, with filaments 150-300 μ long, 4 μ broad at the base, and 1·5 μ above, is described. New species of *Entophysalis*, *Dermocarpa*, and *Synechococcus* are described. The paper is accompanied by an excellent plate.

MODERN MYCOLOGY.

By G. Massee.

In an article recently published by Professor Saccardo,* the total number of known plants is given as 173,706, distributed approximately as follows :—

Phanerogams	105,231
Filioes	2,819
Equisetaceæ, Marsiliaceæ, Lycopodiaceæ ...	565
Musci	4,609
Hepaticæ	3,041
Lichenes	5,600
Fungi	39,663
Algæ	12,178
Total	173,706

Confining our remarks for the present to the fungi, we find that, according to Streniz,† the number of known species in 1862 amounted to 11,890, whereas the number described in Saccardo's "Sylloge Fungorum," 1892, amounts to 39,663.

In endeavouring to account for this enormous increase in the number of species during the last thirty years, four factors are at once recognized as being of primary importance in this connection : (1) perfection of the microscope ; (2) exploration of new regions ; (3) imperfect descriptions of species ; (4) Saccardo's "Sylloge Fungorum."

Examined in detail, it is found that the four factors have

* "Il numero delle piante ;" Atti del Congresso Bot. Inter. di Genova ; p. 57 (1892).

† "Nomenclature des Champignons."

respectively influenced the study of systematic mycology somewhat as follows :—

(1.) The large sections of fungi known as the Pyrenomycetes and the Hyphomycetes were—when recognized at all by the old authors—classified according to naked eye, or, at the most, pocket lens characters. It has been shown in hundreds of instances, where external characters alone did not suggest a specific difference between two given organisms, that the compound microscope has clearly demonstrated differences which are accepted at the present day as being of generic or even ordinal value, and thousands of species belonging to the above-mentioned and other groups, coming under the category of micro-fungi, have been added during the last thirty years, resulting entirely from the modern perfection of the microscope. As would be expected, all this array of modern species are not equally good, and the abuse—as we consider—in the use of the microscope in connection with the tremendous increase of species will be considered at a later stage.

(2.) The attention paid to fungi by botanical collectors in almost every part of the world during late years has added materially to the number of previously known species. At the same time, it is perfectly certain that hundreds of species founded on dried specimens, too often received without a word of information as to habitat, structure, colour, etc., will never be recognized again from the necessarily meagre descriptions given, and hence will arise a duplication of names, the same species being received a second time under more favourable conditions as to preservation, accompanying information, etc., being found to present characters differing from any known form, will be described as a new species. This difficulty could be completely overcome by not founding species on imperfect material, but, apparently, all who have to deal with exotic collections received in a dry state do this to some extent, hence, in place of recrimination, the thing that suggests itself is—don't do it again.

(3.) So long as a specific diagnosis does not contain an absolute error, perfect and imperfect appear to be relative terms, depending entirely on personal opinion ; and brevity being considered by the great majority as a cardinal virtue, factors that are looked upon as being of minor importance are not unfrequently entirely omitted from a diagnosis. It not unfrequently happens that the one or more features considered as of prime importance by one person or clique are almost entirely ignored by the followers of a second system, and *vice versa ;* hence crops up a grave difficulty, each party is endeavouring to understand the species of the other by the use of one or more characters in the value of which, comparatively speaking, no confidence is placed. As an illustration of the above, the Friesian school of mycologists consider that for the correct identification of a species of Agaricus a detailed account of pileus, gills, and stems is necessary, the weak point—until quite recently

—being spore measurements. Bresadola,* on the other hand, in his bulky work on the Hymenomycetes, makes the spore the one crucial feature in a specific diagnosis, all other characters being treated in a very superficial manner. The illustrations, too, in the last-named work are very novel; the fact of their occurrences in a mycological work suggests that they are intended to represent fungi, otherwise in many instances there is no obvious reason for supposing this to be so. In the case of old authors dealing with micro-fungi, their diagnoses were incomplete from no fault of their own, but at the present day, whatever opinion is entertained as to the relative value of certain features, which could be emphasized by italics, it would be wise to carefully describe all the structural features possessed by a given species, the leading idea being that the specific character should enable the species to be recognized by any mycologist, and not only intelligible to a favoured few, who presumably have reached what may be termed the scientific astral plane of one particular clique. Most mycologists are undoubtedly ready to admit that hundreds of book-species do not exist in nature; also that there is a considerable duplication of names and general mixing up and confusion of species in almost every group of fungi, brought about by the reasons indicated above, also others, and it is becoming more and more obvious day by day that the present state of things cannot go on for ever, but that sooner or later the bull must be taken by the horns. We must endeavour as far as possible to redeem the study of mycology from its present corrupt condition, and place it on a sound basis. This, however, can only be the outcome of combination and of proceeding in a methodical manner. Bearing on imperfect description of species, the following ideas could be carried out:—(*a*) Careful new descriptions from the present stand-point of knowledge of all existing type-specimens, both ancient and modern, if it is felt that any points of importance have been omitted in the original diagnosis; (*b*) The discarding of all old names where the description is admittedly too meagre and imperfect for recognizing the species with certainty and no type-specimen exists; this will be considered as a cruel suggestion to a limited few mycologists, whose mixture of egotism and vanity prompts them to believe that they know in every instance exactly what species the old authors had in view; (*c*) let all future descriptions so thoroughly cover the species intended that under ordinary circumstances no doubt could be entertained as to the species the founder had in view.

(4.) The effects of Saccardo's stupendous work† are apparent in all recent works on mycology, and perhaps to the greatest extent in extra European countries. As indicated by the title, this work is supposed to contain a description of every known fungus up to the date of issue, and taking into consideration the great difficulties to be met in an endeavour to sweep up the

* "Hymenomyceten aus Südbayern."

† "Sylloge Fungorum omnium hucusque cognitorum," (1882—1892).

enormous accumulation of mycological literature, frequently published in periodicals having a very local distribution, there are comparatively few omissions, and many of these are in reality owing to no fault of the author, but to the practice of describing species in private or official publications which cannot be purchased in the usual way; as examples of such may be mentioned the many "reports" and "bulletins" emanating from the United States of America. Many of the imperfect references in the "Sylloge"—although not all—are due to the highly reprehensible practice of altering the original pagination in extracts, and omitting to state the volume or even the source of the extract; such omissions, apparently insignificant in themselves, are certain sooner or later to lead to mistakes and consume much time, and need not necessarily recur if a minimum amount of thought and care is exercised.

This same completeness has apparently led some mycologists to believe that what is not contained in Saccardo's work must necessarily be new and undescribed, and act accordingly; furthermore, this idea is probably to a very great extent true, but then arises the question, who knows exactly what is described? The diagnoses of many authors are more remarkable for brevity than lucidity, the result being that very often on the same page in the "Sylloge" we find one species described in the space of two or three lines, and in such a vague manner that in the absence of the type specimen it is an absolute impossibility to form any idea as to the nature of the fungus the author had in view. Following an example of the kind just indicated, we come across a diagnosis containing all the information the present state of knowledge enabled the author to put into it. This heterogeneous mixture is not due to any laxity on the part of the author, whose primary object was to bring together all published descriptions of fungi; and moreover, to our own knowledge, Saccardo has endeavoured and succeeded in obtaining revised descriptions of numerous species, where the original diagnosis was inadequate; yet unfortunately, hundreds of absolutely useless descriptions of species are yet included in the work, presumably because, owing to the absence of type specimens, amended descriptions could not be obtained. As already suggested, a good plan would be to expunge the names of all species from the list of fungi where the description is obviously imperfect, and no type specimen is known to exist, as it is as great an injustice to credit an individual with the founding of a species of which in reality he had no knowledge, as to deprive him of the credit of establishing a species undoubtedly his own.

Ellis and Everhart appear to have realized some of the difficulties stated above, as in the introduction to "The North American Pyrenomycetes," probably the best book on systematic mycology ever published, we read as follows: "In the present state of mycological knowledge, the classification

(*To be continued.*)

No. 102. December, 1893.

Grevillea.

A QUARTERLY RECORD OF CRYPTOGAMIC BOTANY AND ITS LITERATURE.

FUNGI.

Revised Descriptions of Type Specimens in Kew Herbarium.

By G. Massee.

Hysterographium putaminum (*Cke.*), *Sacc.*

Gregarious or scattered, innate, broadly elliptical, ends obtuse, lips smooth, not prominent, closed and having a very narrow slit, black, about $\frac{1}{2}$ mm. long ; asci subcylindrical or slightly clavate, narrowed at the base into a slender pedicel, 8—rarely 4—spored, spores irregularly biseriate when 8 in number, elliptical, ends obtuse, 3-5 septate with an occasional vertical septum, sometimes slightly constricted at the middle septum, pale brown, 22-25 × 10-12 μ; paraphyses numerous, filiform, colourless.

Hysterographium putaminum (Cooke), Sacc. Syll., No. 5782.

Hysterium putaminum, Cooke, Grev. VII., p. 48.

On the inside of old peach stones. Aiken, S.Car. (Ravenel.)

Gloniopsis orbicularis (*B. & Br.*).

Spots superficial and easily removable, black, 4-7 mm. in diameter, the perithecia elongated, crowded, circinating, of various lengths and arranged like a coil of rope, more or less convex, lips rather tumid, slit very narrow ; seated on a parenchymatous base, centre of the coil usually sterile ; asci cylindric-clavate, narrowed to an oblique pedicel at the base ; spores 8, biseriate, elliptical, ends obtuse, 3—then 5—septate and with a few vertical septa, colourless, 12-15 × 6-7 μ ; paraphyses numerous, very slender.

Glonium orbiculare, B. & Br., Journ. Linn. Soc., XIV, p. 133.

Gloniella orbiculare (B. & Br.), Sacc. Syll., Vol. II., No. 5731.

On bamboo stem. Ceylon. (Thwaites.)

The more or less circular patches of coiled perithecia are scattered on the stem, and readily fall away intact. Berkeley and Broome state in a note following the diagnosis :—" Sporidia ·0005 long, but scarcely mature." A careful examination of the type specimen revealed mature fruit as described above.

Gloniopsis sinuosa (*Cke.*), *Sacc.*

Perithecia gregarious, mostly parallel and lying between the fibres of decaying wood, black, opaque, linear-oblong, ends obtuse, lips rather prominent, close together, longitudinally striate, $\frac{2}{3}$-$1\frac{1}{2}$ mm. long; asci clavate, stipitate, wall much thickened at the apex, 8-spored, spores irregularly biseriate upwards, uniseriate below, elliptical, slightly constricted at the middle, 5-7 septate, muriform, hyaline, 25-30 × 12-14 μ, very refractive; paraphyses cylindrical, colourless, very numerous, agglutinated together and becoming indistinct at the tips.

Hysterium sinuosum, Cooke, Grev. IX., p. 15.

Gloniopsis sinuosa, Sacc. Syll., Vol. II., No. 5755.

On dry bleached wood. New Zealand.

Gloniella atramentaria (*B. & Br.*), *Sacc.*

Perithecia gregarious, mostly lying parallel, on an effused black stain, elliptic-oblong, ends obtuse, lips rather compressed, smooth, slit very narrow, up to ·5 mm. long, black; asci cylindrical, shortly stipitate, 8-spored; spores obliquely 1-seriate, hyaline, slightly clavate, 3-septate at maturity, 7-8 × 4 μ; paraphyses colourless, filiform, numerous.

Gloniella atramentaria (B. & Br.), Sacc. Syll. II., No. 5723.

Hysterium atramentarium, B. & Br., Journ. Linn. Soc., Vol. XIV., p. 133.

On dry wood. Ceylon. (Thwaites.)

Glonium fibritectum (*Schw.*).

Perithecia gregarious, mostly lying parallel, half buried in the loose fibres of the decaying wood, broadly elliptical, ends obtuse or abruptly acute, lips convex but flattened above, even, slit narrow at first, becoming more or less gaping with age, black, $\frac{1}{2}$-$\frac{3}{4}$ mm. long; asci cylindrical, somewhat stipitate, 8-spored; spores obliquely uniseriate, elliptic-fusiform, 1-septate, very slightly constricted at the septum, colourless, 12-14 × 4-5 μ; paraphyses numerous, filiform, distinct, colourless, not longer than the asci.

Hysterium fibritectum, Schwein., Syn. N. Amer. Fung., No. 2095; Sacc. Syll., Vol. II., No. 5679.

On old willow wood. Bethlehem, Pa. (Schweinitz.)

Described from a specimen from Schweinitz in Herb. Berk., Kew.

Lophodermium Fourcroyæ (*B. & Br.*).

Perithecia straight or curved, flattened, lips smooth, slit very narrow, elliptic-oblong, ends obtuse, very narrow, up to 1 mm. long, gregarious and blackening the leaf; asci narrowly cylindrical, narrowed at the extreme base into an oblique pedicel, spores 8, almost as long as the ascus, filiform, the ends acute, multiguttulate, colourless, 60-65 × 1·5 μ; paraphyses numerous, exceedingly slender.

Hysterium Fourcroyæ, B. and Br., Journ. Linn. Soc., XIV., p. 133.

Gloniella Fourcroyæ (B. & Br.), Sacc. Syll., Vol. II., No. 5730.

On leaves of *Fourcroya*, also on palm leaves. Ceylon. (Thwaites.)

An examination of the type specimen shows the spores to be linear, multiguttulate, and almost as long as the ascus, and are thus represented in two sketches made by Broome and attached to the specimens. The measurements given to these spore drawings are :—Specimen on *Fourcroya*, " 0·003 in. long," " on palm 0·004 in. long." Unfortunately in the diagnosis of this species, in giving the measurements of the spores of the form growing on *Fourcroya*, the decimal point is put in the wrong place, thus ·0003 instead of 0·003.

Tryblidium phormigenum (*Cooke*), *Sacc.*

Perithecia erumpent, scattered or more frequently closely gregarious, parallel, elongated, oblong, ends very obtuse, lips very thin, blackish brown, even, at first nearly closed, then widely gaping and exposing the plane, greyish or dingy ochraceous disc, 1-2 mm. long; asci cylindrical, 8-spored; spores obliquely uniseriate, elliptic-oblong, 1-septate, very slightly or not at all constricted, clear brown and translucent at maturity, 24-27 × 6-7 μ; paraphyses numerous, very slender, filiform, coloured and agglutinated together at the apex.

Hysterium phormigenum, Cooke, Grev., Vol. VIII., p. 64.

Tryblidium phormigenum (Cooke), Sacc. Syll., Vol. II., No. 5625.

On *Phormium tenax*. New Zealand.

Lembosia cæspitosa (*Cooke*), *Sacc.*

Perithecia blackish brown, rather prominent, keel-shaped, up to ·5 mm. long, slit very narrow, lips smooth, straight or slightly curved, epiphyllous, gregarious, in small crowded groups of 2-3 mm. diameter, seated on brown, septate, much branched mycelium; asci broadly clavate, short, 8-spored; spores irregularly biseriate, elliptical, 1-septate, not constricted at the septum, clear pale brown; paraphyses numerous, slender, equal in thickness throughout; colourless.

Ailographium cæspitosum, Cooke, Grev., Vol. VIII., p. 95.

Lembosia cæspitosa (Cooke), Sacc. Syll., Vol. II., No. 5627.

On undetermined coriaceous leaf. Belgaum, India (Colonel Hobson).

Gloniella scynophila (*Cooke*), *Sacc. Syll.* II., *No.* 7385.=Hysterium (Gloniella) scynophilum, *Cooke, Grev.*, XIV., *p.* 14.

The bark of living fig trees. S. Car. (Ravenel.)

This species is identical with *Opegrapha varia*, Pers.

Hysterographium stygium (*Cke.*), *Sacc. Syll., Vol.* II., *No.* 5775.= Hysterium stygium, *Cooke, Grev.*, XI., *p.* 107.

On bark of oak and *Nyssa*. Aiken, S. Car. (Ravenel.)

This species is identical with *Hysterographium hiascens*, B. & C.

Schizothyrium ptarmicæ, *Desm. Sacc. Syll.*, II., *No.* 5559.=Labrella ptarmicæ, *Desm.*

This species has the spores distinctly 1-septate at maturity, and should be called *Aulographum ptarmicæ* (Desm.).

Australian Fungi.

By M. C. Cooke.

Agaricus (Collybia) muscipula, *Cke. & Mass.*

Pileus fleshy, umbonate, smooth, mouse grey or brown, wrinkled, 3-4 in. broad, substance thin, tough, margin shortly incurved, stem elongated, stuffed, 8-9 in. long, $\frac{1}{2}$ in. thick, tapering downwards and rooting, longitudinally striate, often twisted; gills broadly adnate, very broad, scarcely crowded, spores whitish, subglobose, 14 μ diam., with a minute apiculus.

On the ground. Brisbane. (F. M. Bailey.)

Much resembling *Ag. radicatus*, but with very different spores. *Agaricus* (*Collybia*) *radicatus*, var. *superbiens*, Berk., has large elliptical spores.

Cortinarius (Dermocybe) Walkeri, *C. & M.*

Pileus about 1in. across, convex, then expanded, but the margin persistently incurved, and more or less wavy, somewhat umbonate, smooth, even, dry, minutely silky, pale green at first, becoming bluish-green with age; flesh thin except at the disc, white with a tinge of green; stem 1in. long, two lines thick, slightly thickened at the base, silky-fibrillose, reddish, stuffed; gills adnexed, rounded behind, about $1\frac{1}{2}$ line broad, thin, rather crowded, reddish, then powdered with the bright ferruginous spores, margin entire; spores elliptical, with an oblique apiculus, smooth, ferruginous, 10×5 μ.

On the ground. Blue Mountains, Australia. (Miss A. F. Walker; comm. Sir Ferd. Mueller.)

Agaricus (Mycena) epipterygius, *Scop., Cooke Illus., t. 208b.*

On the ground. Brisbane. (Bailey, 1012.)

Marasmius badius, *B. & C., Sacc. Syll.*, 1989.

On wood. Brisbane. (Bailey, 1013.)

Marasmius rhyssophyllus, *Mont. Sacc. Syll., No.* 1991.

On wood. Brisbane. (Bailey, 1014.)

Polyporus phlebophorus, *Berk., H. N. Zeal.*, II., 177.

On wood. Brisbane. (Bailey, 977.)

Helotium terrestre, *B. & Br., Linn. Trans., Handb. Austr. Fungi, p.* 267.

On the ground. Brisbane. (Bailey, 1003.)

By some error, apparently, this species was originally described as externally *villous*, and hence was transferred by Saccardo to *Dasyscypha*, and as such was recorded in "Handbook of Australian Fungi," but the specimens now received, as well as those in Herb. Kew, are externally smooth and naked, hence it should be restored to its original genus *Helotium*.

Asterina hoveafolia, *Cke. & Mass.*

Epiphyllous. Spots black, or with a brown centre, suborbicular, velvety (1-2 mm.). Perithecia usually arranged in a ring, or part

of a ring at the circumference, black, scutellate, fimbriate. Asci large ; pyriform. Sporidia subelliptical, uniseptate, brown, the upper cell the broadest (16 × 7 μ).

On leaves of *Hovea longifolia*. Queensland. (Bailey, 981.)

Calonectria Otagensis, *Linds. Sacc. Syll., No.* 6174.

On bark. Brisbane. (Bailey, 1015.)

Xylaria rhizophila, *Cke. & Mass.*

Stroma clavate, divided nearly to the base into 2 to 6 clubs, which are spathulate, flattened, mostly rounded at the apex, 3 to 5 cm. long, 5-7 mm. broad, bright brown, base rugose, smooth, rooting. Perithecia prominent, ostiola papillate black. Asci cylindrical. Sporidia uniseriate, subfusiform, obtuse, straight or curved, uninucleate, brown, 8-10 × 2-3 μ.

On grass roots. Queensland. (Bailey, 1007.)

Puccinia juncíphila, *Cke. & Mass.*

Sori ferruginous, pulverulent, elliptical or confluent, uredospores ovate, minutely echinulate, pale brown, 16-18 × 12-14 μ, teleutospores intermixed, elliptical, smooth, brown, slightly constricted at the middle, epispore thick, but thicker at the rounded obtuse apex (26-30 × 16 μ), on very long hyaline pedicels.

On *juncus*. Oakleigh, Victoria.

Quite distinct from *Puccinia junci* in the form of the teleutospores, of which the two cells are nearly equal in size and form.

Puccinia Carissæ, *Cke. & Mass.*

Hypophyllous. Uredospores not seen. Teleutospores. Sori small, gregarious on orbicular spots, forming rings which are at length confluent, rather compact, dark brown; spores elliptic, constricted in the centre, rounded at the ends, smooth, brown (20-22 × 16 μ), on short peduncles.

On living leaves of *Carissa ovata*. Brisbane. (Bailey, No. 987.)

Quite distinct from *Puccinia Alyxiæ*.

Uredo pallidula, *Cke. & Mass.*

Pustules pallid, convex, gregarious, splitting irregularly, and then girt by the ruptured epidermis, on both surfaces. Uredospores tawny in the mass, pulverulent, elliptical, smooth (12-14 × 8-10 μ), nearly colourless.

On leaves, twigs, and legumes of *Cassia*. Brisbane. (Bailey, 984, 990, 993.)

Melasmia Tecomatis, *Cke. & Mass.*

Perithecia on both surfaces, superficial, orbicular, rugose, black (1-2 mm.), then deficient above, and marginate, disc brownish. Sporules elongated, fusoid, continuous, hyaline, 16 × 2 μ.

On living leaves of *Tecoma jasminoides*. Queensland. (Bailey, 982).

Glæosporium Alphitoniæ, *Cke. & Mass.*

Epiphyllous. Spots irregular or confluent, pallid, pustules erumpent, small, gregarious on the spots, chiefly towards the

centre, darker, splitting above. Conidia cylindrical, rounded at the ends, 18-22 × 4 μ, hyaline, binucleate, mostly straight.

On dead leaves of *Alphitonia excelsa*. Brisbane, Q. (Bailey, 995.)

Darluca filum, *Cast. Sacc. Syll.* 2263.

Parasitic on *Uredo sorghi*, *Uredo rumicis*, and other Uredines. Brisbane. (Bailey, 988, 991.)

Physarum didermoides, *Rost. Mon., p.* 97. *Mass. Mon. Myx., p.* 291.

On grass, etc. Brisbane. (Bailey, 985.)

New or Critical British Fungi.*

By G. Massee.

SCHULZERIA, *Bres.*

Pileus regular, margin incurved when young, gills quite free from the stem; spores colourless (or greenish-blue); stem central, not furnished with a ring.

The present genus is closely allied to *Lepiota*, differing only in the absence of a persistent ring on the stem. A veil is present, which is torn clear away from the stem during the expansion of the pileus, and remains for some time attached in fragments to the margin of the pileus.

Schulzeria Eyrei, *Mass.*

Pileus up to 1 in. across, but usually less, campanulate, margin incurved at first, then expanded and plane or the margin a little upturned, broadly umbonate, disc ochraceous, minutely granular, remainder pallid and quite smooth, veil membranaceous, whitish, attached in fragments to the margin of the pileus when young; gills free, narrowed behind, 1-1½ line broad in front, thin, margin entire, crowded at first, then distant as the pileus expands, pale green at first, then deep bluish-green; spores elliptic-oblong, with an oblique apiculus at the base, bluish-green, 4·5 × 2·5 μ; stem about 2 in. long, 1-1·5 line thick, slightly flexuous, almost equal, smooth, even, minutely mealy at the apex, otherwise glabrous, pallid, hollow.

Gregarious; smell and taste none. On the ground among leaf *débris*, under the drip of a spruce fir.

Alresford, Hants. (Rev. W. L. W. Eyre.)

A very beautiful and distinct species, readily recognized by the decided blue-green colour of the gills. In this respect, however, the species is not unique. A Lepiota with green gills—*L. Morgani*, Peck—from the United States was described some years

* Coloured figures of some of the new species will be given in the next part; the specimens were received too late to get a plate executed in time for the present number.

ago ; this species, however, has a pileus 8-9 in. across, and is a true Lepiota, having a persistent ring on the stem. A third species—*Lepiota molybdites*, Meyer—from Brazil also has green gills. To be consistent, a new family of the Agaricineæ should be formed, which would naturally be called *Chlorosporæ*, as truly green-spored species cannot with propriety be included in any recognized family. The small number of known species with green spores seems to stand in the way, yet if spore colour is admitted to be of fundamental value, it would appear to be the right thing to do.

Agaricus (Tricholoma) amicus, *Fries.*

Pileus 2-3 in. across, somewhat campanulate, then expanded, obtuse or slightly gibbous, very regular, even, glabrous, not viscid, pale brown, not becoming pale when old ; flesh thin except at the disc, rather soft, white, with a tinge of brown under the cuticle ; gills rounded behind, without a decurrent tooth, 4-5 lines broad, thin, distant, white, sides not veined, persistently white ; spores elliptical, smooth, 6 × 4 μ; stem about 3 in. long, rather elastic, bulbous base up to 1 in. across, remainder cylindrical, equal, about half-inch thick, fibrously striate, solid, white.

Ag. (Tricholoma) amicus, Fries. Mon. Hym., i., p. 88 ; Icon. tab. 36 (upper figs.).

Smell none, taste insipid.

In woods. Tetsworth. (Rev. D. C. O. Adam.)

Agaricus (Tricholoma) ionides, *Bull.*

This very beautiful agaric has occurred in abundance among short grass in the arboretum, Kew Gardens, after the recent heavy rains.

Agaricus (Clitocybe) molybdocephalus, *Bull.*

Pileus $2\frac{1}{2}$-4 in. across, campanulate and broadly gibbous, then expanded and the margin spreading ; smooth, even, grey, smoky grey, disc ochraceous-tan, becoming paler when dry ; flesh very thin except at the disc, soft, white when dry ; gills adnate and often with a minute decurrent tooth, rather crowded, more or less connected by veins, 5-8 lines broad, intermediate ones numerous, plane, margin quite entire, dingy horn-colour, then pallid ; spores colourless, globose, with a minute apiculus, 5 μ diameter ; stem $1\frac{1}{2}$-5 in. long, up to $\frac{3}{4}$ in. thick, solid, usually more or less narrowed towards the base, pallid, fibrillosely striate, minutely squamulose towards the apex.

Agaricus molybdocephalus, Bull. Champ., 523 ; *Agaricus molybdinus*, Fries. Hym. Eur., p. 89.

Cæspitose or solitary. The present interesting addition to our flora answers admirably with the figure and description given by Bulliard, the only point of difference consisting in the somewhat shorter stem in the British specimen.

On the ground amongst leaves, under beeches.

Tetsworth. (Rev. D. C. O. Adam.)

ANNULARIA, *Schulz.*

Pileus regular, fleshy; gills free from the stem, and with the spores flesh-coloured at maturity; stem central, furnished with a persistent ring; volva absent.

Known at once among the Rhodosporæ by the ringed stem.

Annularia levis (*Kromb.*), *Schulz.*

Pileus about 2 in. across, convex, thin, expanded, very obtuse, pure white or the disc with a brownish tinge, even, either perfectly glabrous or broken up into very minute squamules; flesh 2-3 lines thick, rather firm, white; gills free and distant from the stem, 2-3 lines broad in front, thin, margin entire, rather crowded, for a long time white, then salmon-colour; spores broadly elliptical, with a basal apiculus, smooth, 1-guttulate, salmon-colour, 6-7 × 4 μ; stem about 2 in. long, base clavate, attenuated upwards, 3-4 lines thick at the apex, often incurved, hollow, even, smooth, silky, pure white, ring rather distant, persistent, becoming loose, white, the erect margin rather timid.

Annularia levis, Schulzer, Verb. Œster. Zool. Bot. Gesell., 1868, p. 49.

Agaricus levis, Krombh., pt. iv., p. 16, tab. 26, f. 16-17.

The species described above agrees with Krombholz's figure and description in every respect, except that the surface of the pileus was in some specimens broken up into minute, more or less, squarrose squamules. In other specimens, however, it was absolutely glabrous, hence the remark by Fries that the present differs from *Agaricus cretaceus* in the absolutely glabrous pileus requires qualification; the spores of *A. cretaceus* are, however, smaller, of a different shape and colour, the gills also become brown.

The figure of *Lepiota Schulzeri*, Fries, in Kalchbrenner's "Icon. Sel. Hym. Hung.," Tab. 2, Fig. 2, corresponded so accurately with my specimens when the gills were white, as did also the accompanying text, that I had no hesitation in referring my specimens to that species, and was very much astonished to find two days afterwards that the gills in my specimens had become pink, and that a copious mass of salmon-coloured spores had been shed. The gills in the above quoted figure are of a decided yellowish pink, but this point is not noted by Fries, although this specific character was drawn up from those figures. The spores in *S. Schulzeri* also agree with those of *S. levis* according to the measurements given by Kalchbrenner. Certainly quite distinct from *A. cretaceus*.

On the ground among shrubs. Kew Gardens.

Agaricus (Flammula) rubicundula, *Rea.*

Pileus 4-6 cm. broad, fleshy, convex, then plane, often splitting at the margin, viscid at first and innately fibrillose, soon becoming smooth, yellow, then tinged with red and at length tawny orange; margin at first veiled, veil white then yellowish, finally reddening like the rest of the pileus; stem 5-6 cm. long, $1\frac{1}{2}$-$2\frac{1}{2}$ cm. thick,

solid, whitish, then tinged with red, yellowish at the base, fibrillose below the veil and becoming red, white, mealy at the apex; flesh of both pileus and stem bright yellow, then lighter; gills adnate with a sinus or adnato-decurrent, often forming a marked ring-like zone at the apex of the stem and occasionally breaking away naturally, crowded, 3-4 mm. broad, at first light ochre, then ferruginous; margin unequal and tinging red with age or when bruised; trama orange and then lighter; spores ferruginous, 9-10 × 4-5 μ; smell none, taste acrid.

Growing on the ground in woods under scrub oak. Whole plant reddening when touched and with age. Allied to *Ag.* (*Flammula*) *astragalinus*, Fr., from which it differs (1) in the pileus being viscid and innato-fibrillose; (2) in the veil not being appendiculate; (3) in the stem being solid and stouter, and with no fibrillose scales; (4) in the flesh being bright yellow and never turning black when wounded; (5) in the absence of a floccose margin to the gills; (6) in its growth on the ground.

Wyre Forest, July, 1893. (C. Rea.)

Lactarius violascens, *Fries.*

Pileus about 2 in. across, convex at first, soon becoming expanded and, more or less depressed at the disc, no trace of umbo present, even, glabrous, dry, grey or pale brown with darker zones; flesh thick, white, firm; gills slightly decurrent, crowded, white, about 1½ line broad; stem 2 in. long, ½ in. and more thick, equal, even, glabrous, solid, greyish white, milk white, becoming violet on exposure to the air, mild (becoming acrid?).

Lactarius violascens, Fries., Epicr., p. 342.

Agaricus violascens, Otto, Pers., 34, No. 30, Carn. Germ.; Krombh., t. 14, f. 13-14.

Reported from Deeside in Ann. Scot. Nat. Hist., Oct., 1893.

It is much to be regretted that an independent detailed description of this rare and interesting fungus did not accompany the record, as such would probably have cleared up certain doubtful points, added spore dimensions, etc.

Caldesiella ferruginosa, *Sacc.*

In "British Fungus-Flora," Vol. i., p. 166, some doubt is expressed as to whether the present species belong to the Basidiomycetes. An examination of living material, collected at the last Y. N. U. annual foray, revealed the presence of large typical tetrasporous basidia scattered amongst the loose hyphæ forming the downy spines.

Fomes roseus, *Fries Hym. Eur.*, 562.

Pileus corky, then woody, hard, triquetrous, even, rather banded, externally and internally rosy, externally becoming sooty brown, or blackish grey, internally floccosely fibrous; pores minute, round, rose-coloured pink.

On rotten wood. Essex Field Club. First English record.

Perennial. 1-2 in. broad, 1 in. high, becoming stratose. Edge of hymenium barren.

Clavaria (Syncoryne) dissipabilis, *Britz.*

Solitary, or usually in small clusters, but quite distinct at the base, simple, elongato-clavate, and tapering downwards, apex most frequently quite obtuse and rounded, rarely subacute; circular, or not unfrequently compressed and channelled, otherwise even and glabrous, clear, deep orange-yellow, not becoming powdered with the spores, solid, collapsing, fragile; 3-7 cm. high, 2-4 mm. thick near the apex; spores globose, with rather long scattered spines, colourless, or with a tinge of canary yellow, 5-6 μ diam. (excl. spines).

Clavaria dissipabilis, Britzelmayr, Hym. aus Sudb., Clavariei, p. 289, fig. 28.

Among short grass in pastures, roads in woods, etc.

A very distinct species, not at all uncommon, and previously mixed up with *C. fragilis,* from the yellow form of which it differs in the deeper orange colour and spinulose globose spores. The usual form is clavate and obtuse above, becoming narrowed into a slender stem.

Halifax. (C. Crossland.) Specimens are in the Kew Herbarium under *C. fragilis,* from Lyndhurst, Kew, Coed Coch, and near Edinburgh.

Gyrodon rubellum, *McWeeney.*

Pileus 1-1½ cm. across, convex, even, smooth, dry, red, with a tinge of purple at the disc, becoming yellowish towards the margin; flesh firm, yellow, not changing colour when broken; pores about 1 mm. long, pale yellow, openings linear, elongated, sinuous, dissepiments thick, edge bright yellow; spores cylindric-fusiform, with a minute oblique basal apiculus, greenish olive, 10×4 μ; stem 1 cm. long, 3 mm. thick, equal, smooth, even, solid, bright yellow, as is also the flesh.

A minute, but very distinct species, and quite mature, as shown by the abundance of coloured spores.

Among moss on the ground.

Powerscourt, Dublin. (Dr. McWeeney).

QUELETIA, *Fries.*

Peridium subglobose, wall rather thin, even, glabrous, rigid, fragile, and breaking away in irregular patches at maturity, composed of a single layer except at the base, where it is double; the inner basal layer, which extends upwards as a slightly convex columella, elongates downwards into a long stem, bursting through the outer layer, which forms a loose, torn sheath round its apex; gleba forming a powdery mass at maturity, capillitium present; spores borne on tetrasporous basidia.

Queletia, Fries, Ofvers. Vetenskaps-Akad., 1871, p. 171, pl. 4.

The present genus was established by Fries for the reception of a gastromycetous fungus discovered in France by Dr. Quélet. The peridium in very young specimens is continuous and homogeneous above, but double below, the outer layer is protective, and simply

increases in size to accommodate the rapid increase in size of the gleba, etc. The basal inner layer grows rapidly, its upper surface remaining compact and developing into a broad, slightly convex columella, arching into the cavity of the gleba; the under surface becomes very spongy and cavernous, and is the commencement of the future stem, yet enclosed by the continuous outer layer of the peridium. During this period the gleba, which when quite young exactly resembles the gleba in a young Lycoperdon, becomes mature; when the spores are fully formed the hymenial elements deliquesce, producing the well-known moist stage in the gleba of a young Boletus or Lycoperdon when water can be squeezed out of the gleba; after becoming dry the spores become coloured, and finally form a powdery mass mixed with numerous capillitium threads. Up to this stage the whole structure is buried in the ground, the size varying from $1\frac{1}{2}$-$2\frac{1}{2}$ in. across, but when the spores are ripe the pent-up stem bursts through the outer basal wall of the peridium, and rapidly elongates into a stem 3-5 in. high, thus elevating the peridium into the air, where its mass of ripe spores may be dispersed by the wind. The above sequence of development is practically the same in the genus *Tulostoma*, and I am not convinced that the two genera are not too closely allied. In some species of *Tulostoma* there is a definite stoma or mouth to the peridium, but again in others the dehiscence is by an irregular breaking up of the peridium, as in *Queletia*. In some species of *Tulostoma* the outer layer of the peridium is carried away by the elongating stem when it bursts through, and remains as an irregular volva at the base of the stem.

Fries compares *Queletia* with the genus *Claviceps*, Welw. and Currey, but I have shown elsewhere that the one species included in the last-named genus is a true species of *Battarrea*.

Queletia mirabilis, *Fries*.

Peridium subglobose, $1\frac{1}{2}$-2 in. across, whitish, wall brittle and breaking irregularly at maturity; stem 2-4 in. long, up to 1 in. thick at the base, lacunose, surface broken up into large more or less squarrose shreds of tissue with the free ends pointing upwards, girt at the apex by a loose, irregularly torn, free collar, formed by the outer ruptured wall of the peridium; mass of capillitium and spores cinnamon, then tawny brown; basidia tetrasporous, spores globose, with a very short pedicel, and densely covered with rather large warts, 7-9 μ diameter; threads of capillitium rarely branched, very long, contorted, almost colourless, septa very rare, 8-10 μ diameter.

Queletia mirabilis, Fries, l.c., p. 171, tab. iv.

Gregarious. On the ground among heaps of rotten leaves. Herbarium Grounds, Kew.

A very interesting addition to our fungus flora, but is it indegenous? A box full of specimens belonging to this species was received from Trexlertown, United States, earlier in the season, and the loose spores and broken fragments were deposited near to

where the specimens appeared; nevertheless, it is not usual for members of the Gastromycetes to come up from spores, not at least when the spores are sown with the hope of producing the fungus. Its discovery in other parts of Great Britain will be necessary, we presume, to remove it from the list of "probably introduced species," which it will at present figure in.

Neottiella microspora, *C. & Mass.*

Cæspitose, cups fleshy, subsessile, regular or deformed by mutual pressure, subglobose, then expanded, immersed at first nearly to the margin, externally whitish, clad with minute, flexuous, septate, hyaline hairs; disc concave, then plane, greenish sulphur colour. Asci cylindrical, spores eight, uniseriate, elliptical, smooth, hyaline, 7 × 3½ μ; paraphyses filiform.

On a dunghill. Scarborough.

Cups 2 mm. to 1 cm. broad. External hairs 50 μ long, 3-5 μ thick. Base of the cups a little obconical, immersed.

Orbilia flexuosa, *Crossl.*

Scattered, sessile, 1-2 mm. broad, disc at length plane, pale, then dark reddish amber, similarly coloured externally; margin raised, usually lobed and wavy, composed of narrowly clavate, closely septate hyphæ; asci cylindrical, narrowed towards the base, spores eight, uniseriate, elliptic-fusiform, usually biguttulate, smooth, colourless, 8-10 × 4-5 μ; paraphyses numerous, filiform.

On decaying bark. Horny when dry; margin sometimes even and almost plane.

Lightcliffe, near Halifax. (Crossland, No. 53.)

Orbilia inflatula, *Karsten* = Calloria inflatula (*Karst.*), *Phill., Brit. Disc., p.* 335.

This species has been found by Mr. Rea in abundance on the inside of birch bark in Wyre Forest. Owing to a slip, the measurement of the spores in Brit. Disc. is given as 4-7 × 5 μ, instead of 4-7 × ·5 μ.

Patinella macrospora, *Mass.*

Scattered, 1-1·5 mm. across, sessile and broadly applanate, margin slightly raised at first, often becoming quite plane with age, blackish, somewhat coriaceous; marginal cells erect, densely packed, slightly clavate, closely septate; asci cylindrical, narrowed below the sporiferous portion into an oblique pedicel, spores eight, uniseriate, broadly elliptical, ends rather acute, usually 1-guttulate, colourless, smooth, 11-12 × 6-7 μ; paraphyses numerous, cylindrical, septate, about 1-5 μ thick.

On rotten wood. Halifax. (Crossland, No. 20.)

Verticillium Rexianum, *Sacc.*

Forming a pure white, minutely velvety layer; sterile hyphæ creeping, branched, septate, much interwoven, 4-5 μ diameter; fertile hyphæ numerous, erect, straight; 80-125 × 3-4 μ, septate, the upper two-thirds furnished at intervals with spreading branches, opposite or rarely in threes, tips of branches with 1-3

acute branchlets, each bearing at its tip a single colourless, smooth, elliptical conidium, 4·5-5 × 3 μ.

Forming a very delicate white bloom on the peridia of old specimens of *Physarum leucopus*.

Dublin. (Dr. McWeeney.)

Mortierella candelabrum, *Van Tiegh.*

Mycelium white, scanty, dichotomously branched; fertile hyphæ erect, 1-1·5 mm. high, colourless, base incrassated, becoming very slender upwards, branches usually corymbose, incrassated at the base and tapering to a point, sporangia apical, globose, spores subglobose, variable in size, colourless, 4-10 μ diameter; chlamydogonidia interstitial or terminal on short lateral branches of the mycelium, spherical, elliptical, or irregular, up to 40 μ diameter.

Mortierella candelabrum, Van Tieghem & Mon., Ann. Sci. Nat., Ser. 5, Vol. XVII., p. 348, Pl. 24, figs. 99-102.

On pileus of *Cantharellus* (H. T. Soppitt). A variety of the present species has been described as British, but the type form has not, I believe, been previously recorded.

Some Observations on Puccinia Bistorta, *Str.*

By H. T. Soppitt.

In July, 1892, Messrs. J. Needham and H. Pickles, of Hebden Bridge, were successful in finding for the first time in Yorkshire a uredine infesting the leaves of *Polygonum Bistorta*, a plant which occurs in profusion in the woods and fields of the Hebden Valley. A few weeks later (August 28th), while visiting the locality, I collected a quantity of the fungus for the purpose of study, and on examination determined the plant to be *Puccinia Bistortæ*, Str. (= *P. Bistorta*, D.C.). With a view to making observations on the life-history of the fungus, I established in my garden a number of healthy plants of *Polygonum Bistorta*, and by a series of careful experimental cultures have convinced myself that this species affords a somewhat remarkable illustration of metœcism, which has been fully borne out by numerous observations made in the field.

My first experiment was on April 25th of the present year, on which date the teleutospores were in a state of germination; these were applied, together with promycelial spores, to the leaves of *Polygonum Bistorta*, and covered with a bell-glass for several days. This I repeated on May 9th, using additional plants, but in neither case was there the slightest result. On May 6th the botanists above mentioned, during a ramble in the Hebden Valley, met with an Æcidium infesting the leaves and stems of *Conopodium denudatum*, and they particularly noticed that the fungus only occurred on plants that grew among or near to *Polygonum Bistorta*.

Whilst at Yeaden, near Leeds, on May 14th, I also found the same Æcidium, and this was confined to Conopodium that grew amongst Bistort; no trace of the fungus could I find elsewhere, although the host was not uncommon.

For the purpose of testing whether there was any connection between the two forms I applied teleutospores of the Puccinia to *Conopodium denudatum* on May 9th. A result was obtained on May 21st, on which date a discoloured swelling was observable near the base of the stem, and on this æcidiospores appeared on May 30th.

On May 9th I applied germinating æcidiospores from Conopodium to several plants of the same species, but not the slightest result followed. The æcidiospores artificially produced were in a state of germination on June 1st, and on that date were applied to the leaves of *Polygonum Bistorta*, *P. Brunoni*, *P. persicaria*, and *P. aviculare*. The first sign of a result was on June 10th, when yellowish spots began to appear on the upper surface of the leaves of *P. Bistorta*, and on July 16th the rufous sori of uredospores were conspicuous on the under surface, immediately below the spots. No result ensued on *P. Brunoni*, *P. persicaria*, or *P. aviculare*.

With the uredospores thus produced I infected *P. Bistorta* on June 22nd. Yellowish spots appeared on the upper surface on June 30th, and uredospores were evident on July 3rd. These were applied to other plants of Bistort on July 12th, and reproduced themselves on July 23rd. On July 17th germinating uredospores were applied to the leaves of *Polygonum viviparum* and *P. Bistorta*, but not the slightest result ensued on the former, while uredospores were copiously developed on the latter by August 4th.

In every case the uredospores were succeeded by teleutospores, which invariably appeared in the same spot as the uredospores eight or ten days after the latter were mature.

A similar series of cultures were conducted, commencing with Æcidiospores, collected at Hebden Bridge, on *Conopodium denudatum*. These were in an active state of germination on May 9th, and applied to leaves of Bistort. The first sorus of uredospores appeared on May 22nd, and teleutospores on June 1st.

Uredospores produced from the last mentioned applied to Bistort, on May 28th, were reproduced by June 8th, the teleutospores beginning to appear on June 18th.

Uredospores were applied to other Bistort leaves on June 19th, and the rufous sori of uredospores appeared on June 30th. On July 10th these were again applied to the leaves of another Bistort plant, and the first sorus of uredospores was evident on July 21st, and teleutospores on August 6th.

Many times during the summer the teleutospores were placed in water, but in not a single instance did I observe any attempt at germination.

It may also be stated that in every case where the Æcidium was observed in spring the Bistort was afterwards attacked with the uredo and teleutospores, so that this Puccinia is undoubtedly an heterœcious species, and its mode of development is similar to that of the well-known *Puccinia graminis*.

In some respects the Æcidiospores bear a resemblance to *Æcidium Bunii*, D.C., but at present I cannot convince myself that they are identical.

Fungus Forays.

The annual foray promoted by the Yorkshire Naturalists' Union was held at Pocklington on September 6th and 7th, and may fairly be said, from every point of view, to have been the most successful of any foray conducted under the auspices of the Society. More mycologists were present than on any previous occasion, and realizing that the guests were experts, the old hands felt it expedient to say but little and seldom, having in view the reputation of the Society, also the commendable ambition to make the Yorkshire foray the centre of attraction for mycologists of the present day; and thus, to some extent at least, take the place of the Hereford meetings of bygone days. The advantage of the Yorkshire foray consists in selecting a new locality for the meeting each year, and, naturally, everything depends on a suitable place being selected, hence it will be well for the Council of the Society to listen to the advice of those competent to give an opinion as to the place where the forthcoming foray is to be held, and to act on it. The official programme announcing the locality and date of the foray is sent out only a few days before the event. This notice is too short, especially for those who are not members, and an official invitation, with date and locality, might with advantage be sent to mycologists at least a month in advance, and would be more polite than the usual programme, which, for some unexplained and uncalled-for reason, states that of the two days the one not being the fungus foray *is most important*. As a matter of fact, mycologists attend to their own special work on both days, and some of the more enthusiastic members assemble for work two or three days before the official date. When the above trifling shortcomings are rectified—and I am convinced it is the desire of everyone officially representing the Union to promote the study of every branch of natural science—the prospect of a strong mycological section is very favourable, indeed certain.

To return to the foray, fungi were comparatively scarce, owing to the dry season, and not to the locality selected; this, however, is always an advantage, as the specimens are certain to be more critically examined than when the numbers to be arranged for the "show" are so numerous that the whole time available is spent in

naming and arranging well-known species, while the critical forms are neglected. Over 180 species were collected, including many new to the county list, and owing to the exceptional season many unusual species afforded material for debate during the evenings and early morning meetings before the day's ramble commenced.

The annual meeting in connection with the Hertfordshire Natural History Society took place at Ayot on October 14th. Owing to the previous heavy rain, fungi were abundant, 154 species being collected during the day, including many unusual and interesting forms.

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*Fungus-Gardens of some South-American Ants.**

In Belt's "Naturalist in Nicaragua" a graphic account is given of certain leaf-cutting ants, and from careful observations the author was led to believe that the ants were "in reality mushroom growers and eaters." This supposition has been proved to be correct by Herr Möller, the author of the work under consideration. The observations were made in the neighbourhood of Blumenau, in the Province of Santa Catharinea, Brazil. The commonest species of ant is *Atta* (*Acromyrmex*) *discigera*, Mayr. *A. hystrix*, Latr., is also common. The ants form narrow, roofed streets many yards in length, leading from their nest to the trees whose leaves are used by the ants.

The nests of the two species of ant mentioned are below the surface of the ground, and are often more than a yard in diameter. The nest is filled with a cavernous mass, resembling a coarse sponge, and of a greyish colour. This is the fungus-garden, and is composed of leaves that are cut up into small pieces and carried into the nest along the street already mentioned, an ant carrying a load many times heavier than itself. When the ant arrives at the nest with its load each fragment of leaf is masticated until it is reduced to a pulp so thoroughly that not a single cell is left entire; during this process it is formed into a rounded ball, and the spongy mass of the fungus-garden consists entirely of pellets formed in this manner. On examination these fungus-gardens are found to be impregnated with a dense weft of fungus mycelium. The hyphæ on the surface of the garden, except the newest portion, bear numerous minute white lumps, each smaller than the head of a pin, consisting of numerous smaller vesicles borne at the tip of a hypha, and termed kohl-rabi clusters by Möller. These clusters form the principal food of the ants, consequently the gardens are held in high esteem. If a nest is

* Die Pilzgärten einiger südamerikanischer Ameisen.

broken into, the younger parts of the garden are carefully covered up at once by the ants to protect the mycelium from light. The garden material is carried along when the ants migrate to form a new nest, very little of the material containing the mycelium being sufficient to impregnate the whole of a new garden with the fungus.

When the ants are removed from a nest and the fungus left to grow it is found that the mycelium sends up a mass of hyphæ into the air, and a second form of conidia is developed, the kohl-rabi form disappearing. When only a few ants were left in a nest it was observed that they did all in their power to keep down the aerial hyphæ by biting them off. Möller considers that the kohl-rabi formation is not normal to the fungus, but the result of cultivation and selection by the ants. Some of the ants are told off to weed the fungus-garden, and this is done so thoroughly that a portion placed in a nutrient solution yielded a perfectly pure culture, not even containing bacteria.

Pure cultures with the various forms of conidia failed to give any clue as to the nature of the perfect form of the fungus to which the mycelium belonged. However, a densely-tufted agaric, with a purplish, scaly pileus, from 10-16 cm. across, was discovered growing out of an old nest, and cultivation of the spores clearly proved this to be the fully-developed form of the kohl-rabi producing fungus of the ants.

The fungus, according to the Friesian classification, would belong to the genus *Pholiota;* Möller, however, calls it *Rozites gongylophora.*

*Romance of Low Life Amongst Plants.**

For some unexplained reason the great mass of English people possess a very limited knowledge of what is generally included under the phrase "Natural History;" in other words, the general structure and mode of life of animals and plants. Nevertheless, in this respect we are improving, and this improvement is in great part due to the untiring energy of Dr. Cooke, who acts on the principle of getting in the thin edge of the wedge first. We are not overwhelmed with modern theories propounded in what he would term fantastic language, but introduced at once to some such subject as the "Scythian Lamb," whose very mystery proves so fascinating that the reader is introduced to the true explanation of the matter, and has assimilated certain facts without realizing that he is studying the rudiments of Natural History. This is the principle followed in the present volume, and expressed as follows in the preface:—"It is not so much to the results of new or recent investigations that I have desired to give predominant interest as to the general influence which increased knowledge of the structure and history of these minute and obscure plants has had upon the

* "Romance of Low Life Amongst Plants," by M. C. Cooke, M.A., S.P.C.K. (4s. 6d).

romantic beliefs and unsubstantial theories of a less enlightened age." It is also felt that "some will come as revelations of the Master's work in the most minute of His creations." The work, as its title suggests, deals with Cryptogams only, and in addition to the romantic side there is a considerable amount of up-to-date information relating to structure and mode of life, which will prove of service to those who wish to know something about the lower plants, and yet shrink from the task of obtaining it from what they consider to be a scientific book. The numerous figures will be of great assistance in making clear the various subjects touched upon.

On the Siliceous Deposit in the Cortex of Certain Species of Selaginella, Spr.—R. J. Harvey Gibson; Ann. Bot., Vol. vii, p. 355, 1 pl.

Previous to the appearance of the present work, the presence of silica had only been recorded in one species of *Selaginella*. We now learn that silica is present in sixteen species. In *S. Martensii*, Spr., var. *compacta*, A. Br., which was examined in detail, as illustrating the usual mode of mineralization, the silica occurs in the form of irregular, colourless plates on the cortical wall of the lacuna of the stem; it is also present both in the walls of the innermost cortical cells and on the swollen cells of the compound trabeculæ. From a careful analysis it is concluded that oxide of silica is taken up by the plant as a soluble silicate of magnesia or of lime, or possibly as a double silicate of these bases.

NEW OR CRITICAL BRITISH ALGÆ.

By E. A. L. Batters, B.A., LL.B., F.L.S.

Mr. E. M. Holmes, F.L.S., has kindly sent us some British marine algæ for confirmation, three, at least, of which have not previously been recorded as occurring on the shores of Britain.

Entophysalis granulosa, *Kütz. Phyc. genr., p.* 177.

This most interesting alga, which Mr. Holmes found on rocks near high-water mark, mixed with *Calothrix scopulorum*, *Symploca hydnoides*, and other algæ, near Portland, is the representative of a genus new to our shores. It forms more or less gelatinous glæocapsa-like layers, of a blackish-brown colour, over rocks at high-water mark. The cells of which the layers are composed are united into colonies which assume a more or less dendritic form, the plant thus differing from *Glœocapsa*, which it resembles in every other respect. The layers are cartilaginous, warty, and of a brownish or yellowish-black colour, and very brittle. The cells are from 3-6 μ in diameter. The cell-walls thick and occasionally lamellated.

Lyngbya gracilis, *Rabenh. Flor. eur. Algar.*, II., *p.* 145.

Mr. Holmes informs us that he found this plant in shallow pools between Portland and Ferry Bridge. It was growing over plants of *Rhizoclonium riparium* and other algæ, and as it is of a deep red or violet colour when fresh Mr. Holmes at first mistook it for the reflection of the setting sun in the water. The plant is of interest as being the only representative of the sub-genus *Leibleinia*, Gom., the members of which are attached by the middle instead of one end of the filament, found on the shores of Britain. The filaments, as has been already mentioned, are epiphytic. They are very slender, being from 5-8 μ in diameter and seldom more than 15 or 20 mm. in length. The sheath is very thin, and almost invisible. The trichomata are torulose, and are not attenuated above, the joints are square or rather shorter than the width of the filament. The apical cells are rounded and slightly thickened. Judging from the dry specimens the filaments appear to form prostrate layers of no very great size.

Monostroma quaternarium, *Desmaz. Pl. crypt. Fr. (nouv. sér.)*, *No.* 603.

Fronds of irregular shape, from 6 inches to a foot or more in diameter, of a bright, clear green colour, at first attached in the middle by a small disc-like root, but usually found unattached and floating on the surface of the water. In section the frond is from 20-25 μ in thickness. The cells when viewed from above are roundish and usually collected into twos, threes, or fours. In section they are oval or semi-circular, usually from 15-17 μ high.

In pools of brackish water near the old Castle, Portland. (E. M. Holmes.)

Symploca atlantica, *Gom. Monog. des Oscill.*, *p.* 129.

Dr. O. Nordstedt has very kindly sent us a specimen of this plant gathered by him at Ferryside, near Carmarthen, in 1885, this, of course, being the locality where it was first found. Mr. E. M. Holmes has also sent us some fine specimens of this plant from Portland. The species is easily recognized by its clear blue-green colour, all the other British species of marine *Symplocæ* being of a deep steel grey or black colour.

Microcoryne ocellata, *Strömf.*

We are glad to be able to state that Mr. Holmes has also found this species at Portland, on the stems of *Chorda filum*, the host plant on which it was originally found by Strömfelt. As already stated in this Journal our specimens were found on *Castagnea Griffithsiana*; we have also found it on *Rhodymenia palmata* and a variety of other host plants.

Lyngbya confervoides, Ag. Syst. Alg., p. 73.

Tufts large, soft, and slippery, from one to two inches in length, yellowish-brown or blackish-green, often turning to a violet colour when dry, prostrate, or erect. Filaments intricately interwoven, straight, rather stiff. Sheath hyaline, never turning to the yellowish tint so apparent in old specimens of *L. æstuarii*. Trichomata olive or bright green, not constricted at the joints, not

attenuated above, 9-20 μ in diameter. Joints from twice to four times shorter than the diameter of the filament. Apical cell rounded. Calyptra absent.

In shallow pools near high water mark. Weymouth. (E. A. B.)

Dr O. Norstedt has kindly furnished us with the following list of Algæ found by him during his stay in Great Britain :—

Phormidium minutum, Gom.; *Oscillatoria unçinata*, Ag., et *Oscillatoria limosa*, Ag. Penzance, in running water near Hey Moor, May 30, 1885.

Phormidium uncinatum, Gom.; Ballachulish, July 18, 1885.

Phormidium autumnale, Gom.; near Penzance, June 1, 1885.

Phorm. Retzii, Gom. non Kütz. Torrent Walk, near Dolgelly, June 25, 1885.

Oscillatoria limosa, Ag. non. Kütz. (*O. Frœlichii*, Kütz.) Esher, May 9, 1885.

Symploca muralis, Kütz. Between Penzance and Hey Moor, May 30, 1885.

Symploca muscorum, Gom.; Cirencester. (Legit. W. Joshua).

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Monographie des oscillariées (Nostocacées homocystées). Par M. Maurice Gomont.

The completion of M. Gomont's invaluable Monograph of the *Oscillariaceæ* marks an epoch in the history of this interesting, but neglected, group of algæ. Few and ill-defined as are the characters which can be utilised for classifying the other groups of the *Nostochaceæ*, they are more and better marked than those which can be used in grouping the *Oscillariaceæ*. In this group neither hair, heterocysts, nor chromatophores are to be found, and the presence of nuclei has never been clearly demonstrated. M. Gomont has consequently taken the nature of the sheath—an organ hitherto very imperfectly understood—and the comparative number of the trichomata enclosed in it as the basis of his classification.

He divides the *Homocysteæ* into two great tribes, the *Vaginarieæ*, in which, with the single exception of *Porphyrosiphon*, two or more trichomata are contained in a common sheath, which is, in most species, tinged with a brownish, red, or blue colour, and the *Lyngbyeæ*, in which a single trichoma is contained in each sheath, which is very seldom tinged with brown, never with red or blue.

The *Vaginareæ* are then divided into two sections, in the first of which few loosely packed trichomata are present in each sheath, which in most species is coloured. This section contains four genera—*Schizothrix* with 27 species, *Porphyrosiphon* one species, *Hydrocoleum* 10 species, and *Dasyglœa* with a single species. The second section contains genera in which very numerous closely-

packed trichomata are present in each sheath, which is always clearly defined and hyaline, never lamellose. This section contains but two genera, *Sirocoleum* with two species, and *Microcoleus* with ten.

The *Lyngbyeæ* are also divided into two sections, the first containing those species in which the trichomata are multicellular, the other those in which they are unicellular.

The first of these sections containing those genera with multicellular trichomata is again divided into two sub-tribes—the *Lyngbyoideæ*, in which the filaments are simple or pseudo-branched, the sheath firm, in some species yellowish-brown, the apices of the trichomata constantly straight; and the *Oscillarioideæ*, in which the filaments are always simple, the sheath thin, always hyaline, mucous, more or less diffluent, absent, or not detected in many pieces. Apices of the trichomata not infrequently curved.

The *Lyngbyoideæ* contains three genera, *Plectonema* with eight species, *Symploca* eleven species, and *Lyngbya* twenty-one species.

The *Oscillarioideæ* contains five genera, *Phormidium* with twenty-nine species, *Trichodesmium* three species, *Borzia* one species, *Oscillatoria* thirty-eight species, and *Arthrospira* three species.

The second section of the *Lyngbyeæ*, containing those genera in which the trichomata are unicellular, consists of a single subtribe, *Spirulinoideæ* with a single genus, *Spirulina*, which contains nine species.

M. Gomont's monograph is prefaced by an interesting and exhaustive account of the group taken as a whole. Every species, a specimen of which M. Gomont has been able to examine, is described in detail, and at the end of each genus a list of the doubtful and excluded species is given. A glance at the list of those plants which were once considered as distinct species of *Oscillatoria*, but which must now, according to M. Gomont, be relegated to the limbo of synonymy, will give some idea of the immense amount of labour entailed by a work of this sort. M. Gomont is most heartily to be congratulated on the completion of his invaluable work, which, besides forming the basis of all subsequent works on the subject, will, we may hope, fix the classification of this interesting but intricate group, at least, for some years to come.

The Norwegian Forms of Ceramium. By M. Foslie (reprinted from "Det. Kgl. Norske Videnskabers Selskabs Skrifter.," 1893).

M. Foslie gives us in a paper of some twenty pages, illustrated by three photographic plates, the results of his study of the Norwegian *Ceramia*. The paper is of especial interest to British algologists as all the species and most of the forms mentioned by the author are to be met with in more or less abundance on our own shores. The author's account of the Norwegian *Ceramia* is based on an examination of the collections, now pre-

served in the Botanical Museum of the University of Christiania, made by the late Professors F. C. Schübeler and M. N. Blytt, supplemented by an examination of smaller collections made by Prof. Willie and MM. Gran and Hansteen, the author's own rich Herbarium and a small collection belonging to the Museum of Bergen having also furnished material for study.

The first species dealt with is *C. tenuissimum*, Lyngb., of which the author mentions three forms, *i.e.*, f. *arachnoidea*, J. Ag., f. *typica*, and f. *divaricata*, Foslie, the last of which M. Foslie considers identical with *C. divaricatum*, Crn. We think it is still open to doubt whether the plant mentioned by M. Foslie is really the same as that described by the Crouans, more especially as in the "Florule du Finistère" *C. divaricatum* is placed in the section of the genus bearing immersed sub-prominent tetraspores. We are, of course, aware that *Gongroceras pellucidum*, Kütz., a plant now usually recognized as identical with *C. tenuissimum*, is also placed by the Crouans in the same section, but their figure (tab. 12, fig. 87 *bis*.) would lead us to suppose that their *C. divaricatum* was a very much smaller plant than *C. tenuissimum*, with a different ramification. Both Major Reinbold and Mr. Holmes understand Crouan's plant differently from M. Foslie. The *C. divaricatum* of Holmes is seldom an inch high, and comes nearer *C. diaphanum* or *C. strictum* than *C. tenuissimum*. Until the type specimen described by the brothers Crouan has been examined it is impossible to say whether *C. divaricatum*, Crn., is a distinct species, or only a form of some other. Of *C. diaphanum*, Roth., the author admits four forms, f. *stricta* = *C. strictum*, J. Ag.; f. *typica* = *C. diaphanum*, J. Ag.; f. *patentissima*, and f. *Capri-Cornu* = *C. Capri-Cornu*, Farlow. With regard to the first of these we cannot agree with the author that it is desirable to unite *C. strictum* with *C. diaphanum*. In most cases the two species are easily distinguishable by their different ramification, and truly intermediate forms are very rarely met with. As we have seen no authentic specimens of *C. Capri-Cornu*, we can, of course, give no opinion as to whether it is distinct or otherwise. *F. patentissima* is a new form characterised by its patent ramuli, otherwise it resembles *C. strictum*.

Five new forms of *C. circinatum*, Kütz, are mentioned.

f. *tenuis*, described as "much branched, lateral branches usually numerous, subdichotomous, the lower part of the thallus 200-300 μ, the upper 100-150 μ thick, attenuated, internodes below and above corticated, elsewhere partly corticated or naked."

f. *genuina*. "Lateral branches few, of uniform diameter, subdichotomous; internodes in the lower and upper part of the thallus corticated, in the middle portion marked by a narrow diaphanous band."

f. *rigida*. "Sparingly branched, lateral branches few, simple; lower portion of the thallus 400-500 in diameter; internodes (in the lower and upper part of the thallus) either corticated or

marked by a narrow diaphanous band in the middle, for the most part semi-corticated."

f. *divaricata*. "Segments patent, often divaricate; apices slightly forcipate, lateral branches few, for the most part simple; internodes in the lower part of the thallus almost naked, towards the apices slightly corticated."

f. *borealis*. "Principal branches 450-650 μ in diameter below, lateral branches of slightly different diameter, beset with subdichotomous or simple ramuli; internodes in the lower part of the thallus either thinly corticated or with a narrow band, in the upper part and the ramuli nearly naked.

All these forms with the exception of f. *genuina* are illustrated in the Plates, and they appear to be fairly well marked and easily recognisable. They may all be expected to occur on the shores of Britain. Of *C. rubrum* the author recognises no less than 10 forms as found on the coasts of Norway; none of them, however, are new to science.

The paper is fully illustrated, but the figures lack clearness.

En Norsk form af Ectocarpus tomentosoides, Farlow. By H. H. Gran (Christiania Videnskabs-Selskabs Forhandlinger for 1893, No. 17).

The account of *Ectocarpus tomentosoides*, Farlow, given by Herr Gran in this very interesting paper, is by far the most complete and accurate that has appeared up to the present time. The author considers his specimens belong to a new form, β. *norvegicus*, which he thus describes:—

Fronds brownish-yellow, flaccid, up to 1 cm. high, covering the fronds of *Laminaria saccharina* with a coating of very slender threads.

Primary filaments branched, creeping in the cellular membrane and muciferous canals of the *Laminaria*, secondary filaments arising singly or in bundles from the primary filaments, erect, 6-7 μ in diameter, below occasionally sparingly branched, above simple or furnished sparingly here and there with short, divergent, secund ramuli.

Cell-walls thin; chromatophores platter or occasionally ribbon-shaped, 1-3 in each cell.

Plurilocular sporangia 50-110 μ long, cylindrical, sometimes sparingly branched, consisting of a single row of superimposed cells, 6-7 μ in diameter, terminal or lateral, more rarely intercalary. Unilocular sporangia obovate-cylindrical, occasionally pyriform, 20-30 μ long, 7-10 μ in diameter, terminal or lateral on the shorter erect filaments, sessile, sometimes arranged in a terminal series of 2-4 cells.

The form here described is the one usually found on the shores of the British Islands. We have seen specimens from Weymouth and Cumbrae, and also from Howth, in Ireland. At first the plant forms small roundish or oval Ascocyclus-like patches on the

fronds of the host plant. If a section be cut through these patches it will be seen that the primary threads penetrate deeply into the substance of the host plant, usually creeping along the muciferous canals. In this ascocyclus-like stage of its development the secondary erect filaments of the plant are simple, and usually terminate in sporangia. As will be seen from Herr Gran's fig. 3 the plant at this stage greatly resembles *Ascocyclus balticus*, Rke., only differing from it in the absence of the basal disc. At a later stage the circular patches become confluent, and patches of considerable size are formed, covering the fronds of the *Laminaria* with a thick short fleece of very slender, yellowish-brown filaments. In the more advanced stages of development the erect filaments are usually more or less branched.

At one time we were inclined to consider the form of the species here described as a distinct variety, and sent specimens to some of our correspondents under the manuscript name *E. tomentosoides*, f. *punctiformis*, a name which of course must give place to Herr Gran's published one of *β. norvegicus*. Now, however, we feel far from certain that what we took for a variety is not the normal form of the plant. Farlow when he drew up his description of the species apparently had not seen the plant in its earlier stages of development.

Herr Gran's paper is accompanied by a good plate.

Algevegetationen i Tönsbergfjorden af H. H. Gran. (Christiania Videnskabs-Selskabs Forhandlinger for 1893, No. 7).

In his paper on the Algal Flora of Tönsberg Fiord Herr Gran describes several new plants. *Elachista fracta* is thus described: 'A yellowish-brown species growing on dead leaves of Zostera. Erect filaments abruptly tapering to the base, gradually tapering to the apex, joints at the growing point half, in the rest of the filament from twice to four times as long as broad. Plurilocular sporangia partly cylindrical, sometimes sparingly branched arising from the base of the filaments, partly conical, arising from the upper cells of the filaments, which themselves are divided into a few compartments. Unilocular sporangia unknown.

The new species appears to differ from *E. stellaris* in the branched sporangia and the rather more abruptly attenuated bases of the assimilation threads. According to the author this species and *E. stellaris* bear plurilocular sporangia on the upper cells of the assimilation threads as well as at their bases. These sporangia are much like those borne on the filaments of *Leptonema*, and on this account Herr Gran would unite the two genera *Elachista* and *Leptonema*. We have seen bodies similar to those described by Herr Gran on specimens of *Elachista stellaris* (epiphytic on *Spermatochnus paradoxus*) from Orkney, kindly communicated by the Rev. J. H. Pollexfen, but as the specimens had been dried we were, of course, unable to say whether they were really plurilocular sporangia. If we have rightly understood the genus

Leptonema, it appears to be quite distinct from *Elachista*. The plurilocular sporangia on British specimens are formed by transformation of the upper cells of the assimilation filaments; in none of our specimens do they form Ectocarpoid-like sporangia as figured by Herr Gran, but they very closely resemble Reinke's figure ("Atlas," Tab. 10, Figs. 6 and 8). And our plant certainly appears to belong to the same genus as the specimens of *Leptonema fasciculatum*, kindly sent to us by Prof. Reinke himself.

The new genus *Phæocladia*, which in more than name appears to resemble the new genus *Phæostroma*, Kuckuck ("Reinbold's Die Phæophyceen der Kieler Föhrde, iv., p. 43), is thus described by the author:—

"Thallus composed of creeping filaments bearing branches at and below the apex, the older portions forming a pseudoparenchymatous crust of 1-3 layers of cells, without any erect filaments. Unilocular sporangia arising from transformation of the vegetative cells. Plurilocular sporangia unknown."

Ph. prostrata.—Thallus of irregular outline 1-3 mm. in diameter, 20-30 μ thick, near the edge formed of a single layer of cells, the central portion being made up of two or rarely three strata. Vegetative cells elliptic, sometimes rounded, or 4-many angled, 10-20 μ in diameter. Unilocular sporangia hemispherical or ellipsoidal, about 20 μ in diameter, formed from the cells of the upper strata in various places and forming wart-like excrescences.

The paper is of interest as dealing with the flora of a district which, although so near Christiania, has attracted so little notice from algologists. The plates are clear and appear to be accurate.

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By the Rev. J. M. Crombie, F.L.S.

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(*To be continued.*)

Bibliography.

Lichens of the Isle of Man. By W. H. Wilkinson, "Midland Nat.," Nov., 1893, p. 245.

We have in this number indicated a first instalment of the list. Each species is accompanied by a short diagnosis, also habitat and locality. Leighton's "Lichen Flora of Great Britain" has been followed in the arrangement and descriptive portion. There is very little, if any, advantage in reproducing specific characters already existing in a manual, whereas original notes, supplementing the comparatively meagre characters given in the work referred to, would have been of value. The only figure given is presumably intended to represent the spore of *Collema pulposum*, although we are not told so. Underneath the said figure occurs the following: "Spore ·02 × ·01 mm." The figure, however, is exactly one-third longer than wide. Which is right?

On the Structure and Biology of Lichens. By Dr. A. Minx, "Abhandl. Zool. Bot. Gesell.," Wien, 1893, p. 377.

The author's explanation of the dual nature of lichens differs from the view propounded by Schwendener, in considering that the relation of gonidia and lichen matrix is not one of parasitism, but what is termed syntrophism. The gonidium element may be looked upon as a lodger (Miether), inhabiting the lichen matrix as a place adapted to its requirements, and giving something of value to its host in return. The influence exercised by the lodger on its host varies in different species, and is usually most pronounced where the syntrophism is of long standing. Many lichens never have gonidia during any stage of their development.

The above idea is in the main in accord with the generally received notion, that the relation between the gonidia and the lichen is one of mutualism or symbiosis. It is true that Schwendener, who first propounded the idea of the dual nature of lichens, considered the gonidia as being seized upon by the fungus, thus implying parasitism, but this view has been corrected long ago, and the two elements constituting a lichen are now considered to be an alga and a fungus, living together in a state of mutualism.

Dr. Minx, however, appears to consider that lichens, without gonidia, are distinct from fungi. This difference we should be pleased to see satisfactorily explained.

MUSCINEÆ.

Illustrated Guide to British Mosses.

British muscologists are being well cared for at present, and if ample choice of really good modern works on the subject can to any extent promote the study of a most fascinating branch of cryptogamic botany, we can look for an increase in the number of students interested in the study of mosses. Hobkirk's useful "Synopsis of the British Mosses" has played a most useful part in keeping us in touch with the important advances made in the study of mosses since the publication of Wilson's classical work. Braithwaite's magnificent and exhaustive monograph is gradually approaching completion; and now we have a volume which, owing to its excellence, will be simply indispensable to all those desirous of combining practice with precept; in other words, the object of the volume under consideration is to take the novice by the hand, and demonstrate by means of carefully worked out analytical keys and excellent figures a ready means of ascertaining the genus and species to which any given moss may belong. The introductory part of the book includes short chapters on—I. The Moss Plant in General; II. The Stem and its Appendages; III. The Leaves; IV. The Capsule, etc.; V. The Spores; VI. The Inflorescence; VII. Practical Examination of Specimens. In these preliminary chapters the student will find a mine of information, explanation of terms, practical hints, etc. Then follows a key to the genera, succeeded in turn by a key to the species. The various generic characters are given in some detail, the prominent features being duly emphasized, points of agreement and of divergence with allied genera being noted, as are also the characters of aberrent species. Finally, we have 59 plates containing over 2,400 figures, illustrating every known British moss. The magnified portions, as leaves, cell-structure, capsule, etc., are all drawn to one uniform scale. The figures from an artistic point of view are excellent, and the fact of their having been drawn direct from nature by means of a camera lucida is sufficient guarantee of their accuracy. We learn that all the figures were drawn on stone by the author, and most of them also printed by him; hence the reason why such a beautifully illustrated and altogether well got up volume can be offered at so reasonable a price.

Finally, the book is published by the author, H. G. Jameson, M.A., 6, College Road, Eastbourne, of whom copies may be had, price 7s. 6d.

PLANT DISEASES.

During recent years plant diseases appear to have increased very considerably both in number and virulence; or, possibly, what was in early times attributed to atmospheric influence or some similar vague source has recently been traced to a specific cause,

the bulk of disease affecting economic plants being mainly due to the attacks of fungi, insects, or bacteria.

Realizing the importance of tracing the cause of disease by exact scientific methods, with the object of successfully combatting the same, State aid has been rendered in several European countries; special laboratories have been constructed and placed under the charge of trained scientific men, whose entire time is devoted to the investigation of those diseases most prevalent in their respective countries. Already the outcome of this line of action has resulted in the publication of an enormous amount of information, the most successful portion of which up to the present deals with the cause rather than the cure. Yet this is what should be; we cannot by any exact method cure a disease, the cause of which is unknown.

France, Germany, and Italy can boast of possessing the above advantages, and may well be proud of the very excellent text-books and periodicals dealing with the subject.

The most extensive researches, however, in connection with this subject are carried on in the United States of America, where, under the direction of the Department of Agriculture, numerous laboratories and experiment stations are scattered throughout the country, the work being carried on under the supervision of a considerable number of skilled specialists; and although there is evidence of external pressure over which the author has no control in the premature production of some of the reports, yet on the whole the enormous amount of solid information contained in the published accounts of investigations, some of which have extended over several years, speak highly for all concerned, and although the results from the ultimate object in view may in the opinion of some not justify a continuation of the work, yet there can be only one possible outcome from such an accumulation of exact investigations, and we sincerely hope that no party feeling will at any time be sufficiently powerful to cripple in the least degree the work which must eventually compel the whole world to admit their indebtedness to the United States.

The following extracts will indicate the line of work carried on, which, after being worked out on scientific principles, is couched in language simple and intelligible to those for whom it is intended.

Experiments in the Treatment of Rusts Affecting Wheat and Other Cereals.*

By T. B. Galloway.

Introduction.

No plant diseases have attracted as widespread attention as the rusts of cereals. For more than a hundred years scientists and practical men all over the world have made these parasites the subject of study and thought, but as yet nothing definite is known as regards a practical and efficient means of preventing them. At

* "Journ. Mycol.," Vol. viii., No. 3

the present time the rust of wheat is probably attracting more attention in Australia than any other country. The whole colony is alarmed at the ravages of the rust pest, which it is estimated causes a loss of over 10,000,000 dollars annually. At a recent rust conference held in Sydney delegates were present from Victoria, South Australia, Queensland, and New South Wales. Some knowledge of what was done at this gathering may be gained when it is stated that it lasted five days, and that the report of its proceedings embodies over fifty thousand words. The delegates were a representative body of men, and the report shows them to be thoroughly conversant with nearly all known facts bearing upon this important subject. In this country rust has of late attracted no great amount of attention. This is not due to a diminution in the amount of damage it occasions, but is owing to the fact that the annual drain upon the farmer's income, which it causes, has come to be regarded as a matter of course. Year after year the crop in nearly every field is cut short by rust, so that it is difficult to say just how much damage results simply because there are no figures for comparison.

The average yield of wheat in the United States in 1891 was only 15·3 bushels per acre,* an amount insignificant when compared with some countries that do not have half the natural advantages. This abormally low yield is, of course, due to several causes, rust being one of them. By better methods of farming, such as the improvement of varieties, crop rotation, the prevention of rust and smut, proper use of plant foods, etc., the average yield could in all probability be raised to 20 bushels per acre at comparatively little additional expense. Such an increase would mean to our farmers more than 170,000,000 dollars annually. The rust problem, so far as it concerns the yield of grain, probably exerts as great an influence as any one thing over which there is a possibility of control. It is important, therefore, that all phases of the subject be fully investigated, as it is by this means only that proper conclusions in regard to prevention can be reached.

Plan of the Work.

In planning the work on rust it seemed desirable at first to limit the investigations to two lines of research. These may be briefly summarized as follows:—

(1.) Experiments in spraying with various chemicals and in treating the soil and seed in various ways in the hope of preventing the disease.

(2.) Comparative studies of several so-called rust-resisting and non-rust-resisting varieties, to determine whether they possess more or less constant anatomical or physiological characteristics which may explain susceptibility or non-susceptibility to the disease.

This paper, as the title indicates, will deal with the first problem, *i.e.*, experiments in spraying and in soil and seed treatments to

* "Report U.S. Department of Agriculture," 1891, p. 29.

determine their effects on rust. At the outset it was decided to make an attempt to prevent rust without any special regard to expense, it being thought that the latter question could be considered later as a distinct problem. It is proper here to acknowledge the valuable assistance rendered by W. T. Swingle, P. H. Dossett, and D. G. Fairchild. The experiments would doubtless have been largely under the supervision of Mr. Swingle but for the fact that more immediately important labours called him elsewhere. With but one exception all the treatments at Garrett Park, Md., were made by Mr. Dossett. He also collected the specimens at each treatment, made the many necessary tedious counts of plants, and harvested and threshed the grain. Mr. Fairchild aided materially in making out the formulæ for fungicides and also assisted in other lines of work.

In order that the work might be carried on under as widely different conditions of soil and climate as possible, Maryland and Kansas were selected as the States in which to make the experiments. In Maryland the work was carried on under the supervision of the writer, while in Kansas a part was entrusted to J. F. Swingle, of Manhatten, and a part to E. Bartholomew, of Rockport, 160 miles north-west of the former place. The experiments at the three stations were in most respects similar, but for the sake of convenience they will be described under different heads.

Before taking up the experiments in detail, it may be said that they were designed primarily to determine :—

(1.) The effect on winter wheat of treating the soil with various chemicals before planting.

(2.) The effect of treating the seed, previous to planting, with chemicals and with hot water.

(3.) The effect of spraying and dusting the plants every ten days from the time they appeared above ground until harvest, using various preparations having known fungicidal value and others that had never been tested in this respect.

(4.) The effect of spraying and dusting the plants every twenty days, beginning and ending the same as in (3), and also using the same preparations.

(5.) The effect of spraying and dusting the plants every ten days, combined with soil treatment alone and with both soil and seed treatments.

(6.) The effect of spraying and dusting every twenty days combined with the other treatments, as in (5).

(7.) The effect on spring planted wheat, oats, and rye of spraying and dusting with various fungicides and other preparations at intervals of two, ten, and twenty days respectively.

From the foregoing it will be seen that there were soil and seed treatments, spraying and dusting at intervals of two, ten, and twenty days, and a combination of these various methods. In all cases it should be borne in mind that the word "effect" is here used in a broad sense, that is, it includes the influence of the various treatments on rust, as well as on the soil, seed, and plants.

(To be continued.)

No. 103. March, 1894.

Grevillea.

A QUARTERLY RECORD OF CRYPTOGAMIC BOTANY AND ITS LITERATURE.

FUNGI.

Elvela auricula, Schæff.

By G. Massee.

The receipt of fine specimens of an ear-shaped Peziza from Rogate, in Sussex, appeared to necessitate a critical investigation of the species of *Otidea*, as at present understood. The following is the result :—

Otidea auricula, *Mass.* (*non Bresad.*)

Somewhat cæspitose or solitary, rather fleshy, elongated on one side, the short side cut down, narrowed below into a more or less distinct stem-like base, the two margins involute and approximate when young, then expanding into the form of a hare's ear, or sometimes shorter and blunter ; coriaceous when fresh, becoming rigid when dry, 3-6 cm. high, and 3-4 cm. across ; disc yellowish-brown, with a flesh-coloured tinge, externally similar or a shade paler; excipulum parenchymatous, cells very large, mostly elongato-hexagonal, 35-50 × 25-30 μ, becoming suddenly small, but yet parenchymatous towards the surface; asci cylindrical, base narrowed into a slender, usually flexuous pedicel, apex truncate, 8-spored ; spores obliquely 1-seriate, hyaline, continuous, smooth, eguttulate, 25-30 × 12-14 μ; paraphyses scanty, equal in length to the asci, slender, septate, the upper third gradually expanding into a clavate tip 5-6 μ broad, hyaline.

Elvela auricula, Schæffer, Icon., t. 156.

Peziza (*Cochleatæ*) *auricula*, Cooke, Mycogr., p. 124, Fig. 213 ; Phil., Brit. Disc., p. 54.

Exsic. Cooke, Fung. Brit. Exs., No. 473.

On the ground. Britain ; France ; Germany ; Switzerland.

We consider the fungus figured by Cooke, in Mycographia, Fig. 213, called *Peziza* (*Cochleatæ*) *auricula*, to be identical with the plant in Schæffer's Icon., t. 156, called *Elvela auricula*, notwithstanding the remarks of Bresadola and Rehm to the contrary. Schæffer's description commences with "Est fungus unicolor," which is true of Cooke's fungus, whereas the fungus upheld by Bresadola and figured in Fungi Tridentini, Tab. lxxiii., is described

as being externally " Ex albido-luteola, marginibus ochraceis, disco *laete fulvo-ochracea*, demumque badio-fulvo." Rehm has the same species in view as Bresadola, and in the comments of his Ascom., Fasc. xiv., in " Hedwigia," 1883, p. 34, has "652, *Otidea auricula* (Cooke sub Peziza) ; *cfr.* Cooke Mycogr., Pl.54, f. 213 (" Farbe der Perithecien etwas zu hellbraun "). Rehm evidently considers that his fungus is the same as Cooke's, but that the latter differs in being the same colour all over. A few lines further on Rehm, in giving the synonymy of his supposed *Otidea auricula*, says, " Minime, Cooke, f. Brit., i., 473 (Jod intensive †)," hence we see that Rehm accepts Cooke's figure of *Otidea auricula*, but rejects the specimens from which the figure was drawn. If either Bresadola or Rehm had made a comparative examination of the tissue of Cooke's fungus with their own they would have found out at once that they were dealing with two distinct species. Finally, *Otidea auricula*, as understood by Cooke and described above, is characterized by being everywhere yellowish-brown ; excipulum parenchymatous, cells very large ; paraphyses clavate, straight, equal in length to the asci. Among near allies *O. onotica* differs in the smaller spores, *O. leporina* in the paraphyses being curved at the tips ; and the somewhat distantly allied fungus, confused by Bresadola and Rehm with the true *O. auricula*—which may be called *Otidea neglecta*—is sharply distinguished by the bay brown disc, and the excipulum consisting of densely interwoven septate hyphæ that become arranged in a parallel series towards the outside.

Otidea neglecta, *Mass.*

Gregarious, coriaceous and tough, constantly hare's-ear shaped, narrowed downwards into a short, usually grooved whitish stem-like base ; margins at first involute and approximate, then expanding and becoming sometimes almost plane, rigid when dry, 4-7 × 3-5 cm. ; disc deep tawny-ochraceous or bay-brown ; externally whitish, with a tinge of yellow or ochraceous ; excipulum composed of hyaline, sparsely septate, and densely interwoven hyphæ (4-6 μ thick), which run out to the circumference as parallel, closely packed, septate, obtuse, subclavate hyphæ, 10-14 μ diam. ; asci cylindrical, narrowed at the base into a flexuous pedicel ; 8-spored ; spores obliquely 1-seriate, smooth, hyaline, continuous, usually 1-guttulate, elliptical, ends obtuse, 18-24 × 12-14 μ ; paraphyses straight, septate, apex clavate, brownish, 6-8 μ diam.

Otidea auricula, Rehm, Hedwigia, 1883, No. 3, p. 34 ; Sacc. Syll., No. 351 (non Cooke).

Peziza (*Otidea*) *auricula*, Bresadola, Fungi Tridentini, p. 67, Tab. lxxiii. (non Cooke).

Exsic. Rehm, Ascom., Nos. 652 and 652*b* ; Rabh., Fung. Eur., No. 512.

On the ground. Britain (Rogate, Aboyne) ; France ; Germany ; Switzerland ; Hungary.

On account of the peculiar structure of the excipulum, and the somewhat cartilaginous consistency of the species here called *Otidea neglecta*, Boudier has made this species the type of a new genus, *Wynnella*, but for the following reasons I do not think it advisable to adopt this idea. In the British species of *Otidea*, Pers., the leading feature of which is the oblique, more or less hare's-ear shaped ascophore, we find that the following species have the excipulum composed of densely interwoven, hyaline hyphæ which become abruptly converted, close to the outside, into a more or less coloured cortex, consisting of somewhat parallel, septate hyphæ, which sometimes adhere laterally and form an approach to a parenchymatous tissue; the external cells are arranged in irregular groups, thus producing the scurfy or pulverulent outer surface; *Otidea neglecta*, *O. leporina*, *O. apophysata*, *O. phlebophora*, *O. pleurota*. A second type of structure is illustrated by *O. auricula* and *O. micropus*, and consists of the excipulum being entirely parenchymatous, the cells very large and irregularly polygonal; cortex as in the previous type. Finally, *O. onotica* exhibits a type of structure exactly intermediate between the two previously described; the hypothecium and the broad cortical layer are truly parenchymatous, whilst a central zone consists of densely interwoven, hyaline hyphæ.

EXOTIC FUNGI.

By G. Massee.

Cintractia eriocauli, *Mass.*

Developing in the ovary; at first compact, finally becoming dusted over the entire inflorescence; spores remaining in irregular groups of variable size for some time, at length free, irregularly angular from lateral pressure, finally globosely angular (12-16 μ diam.), epispore pale brown, smooth, about 2 μ thick.

Parasitic in the ovary of *Eriocaulon fenestratum*. Boger, Central Madagascar. (Baron.)

A very distinct species, brought to my notice by Sir Joseph Hooker, who detected it during his investigation of the genus *Eriocaulon* for the "Flora of India."

Chætostroma sacchari, *Mass.*

Gregarious; forming circular or slightly elongated jet-black minutely velvety patches up to 2 mm. diameter; sterile hyphæ, erect, conico-subulate, septate, rigid, straight, dark brown and almost opaque, 80-150 × 7-12 μ; conidia globose or somewhat angularly globose, smooth, continuous, dark brown, becoming almost opaque at maturity, 10-12 μ diam.; conidiophores cylindrical, simple, aseptate, hyaline, 15-20 × 3 μ.

On fading leaves of sugar-cane.

Barbados. (Bovell.)

A very distinctly marked species, forming minute black patches on the leaves, which under a pocket-lens are seen to be velvety. Closely allied to *Chætostroma aterrimium*, Cke., which differs from the present species, in the smaller conidia having the epispore distinctly verruculose, although this point is not noted in the diagnosis of this species.

Phyllosticta anibæ, *Mass.*

Perithecia immersed, black, submembranaceous, rather prominent, conical, ostiolium minute; about $\frac{1}{3}$ m.m. across, usually gregarious on a pale spot sharply circumscribed by a black line, even when the perithecia are solitary the black circumscribing line is present; spores cylindrical, ends obtuse, straight or very slightly curved, continuous, hyaline, 7-9 × 1·5 μ; sporophores cylindrical, simple, hyaline, 5-6 × 1 μ.

On decaying fruit of *Aniba perutilis*, Hemsl.

Antioqua, N. Grenada.

The delicate black lines bounding the infected areas, and the minute black ostiolæ of the perithecia give a marbled or variegated appearance to the surface of the fruit.

AUSTRALIAN FUNGI.

By M. C. Cooke.

Hypoxylon (Sphæroxylon) atrosphæricum, *C. & M.*

Stroma erumpent-superficial, subglobose, 2 m.m. diam., separate, rarely connate, gregarious, black, externally papillate, perithecia peripherical, in one series, ovate, mamillate, asci cylindrical, sporidia fusiform, straight or curved, unequal-sided, rather acute at the ends, narrow, clear brown, 22 × 6 μ (rarely 8 μ).

On bark. Queensland. (Bailey, 959.)

Externally somewhat resembling *H. cohærens*, but the stroma are seldom connate, smaller than *H. argillaceum*, and black; the sporidia also are about equal in length, much narrower, and acute at the ends. There is no other species amongst the black series of *Sphæroxylon* with which the sporidia could be confounded, and no form of *H. multiforme* or *H. majusculum* to which it could be referred.

Belonidium parasiticum, *Cke. & Mass.*

Parasitic, white. Cups very minute, glabrous, concave or nearly plane, attacked by a central papilla, scarcely visible to the naked eye. Asci clavate, sporidia 8, subfusoid, straight, triseptate, scarcely constricted, hyaline, 22 × 4 μ. Paraphyses filiform.

On subiculum of *Asterina* growing upon leaflets of *Torrietia trifoliata*.

Barrow River. Q. (Bailey, 980.)

Near *Belonidium minutissimum*, but cups much smaller, sessile, and sporidia different.

CONTRIBUTION A L'ÉTUDE DES MUCORINÉES.

Par le Dr. A. Dewèvre.

(*Suite de la page* 8.)

Partie Descriptive.

La classification adoptée est celle de Mr. Van Tieghem, c'est à dire la division de la famille des Mucorinées en six tribus qui sont:—

les **Pilobolées.**
les **Mucorées.**
les **Chætocladiées.**
les **Choanéphorées.**
les **Mortiérellées.**
les **Céphalidées.**

Je n'ai admis que les genres certains, ceux que les recherches modernes ont fait connaitre comme appartement indubitablement à la famille des Mucorinées. Tant qu'aux descriptions elles sont faites d'après les auteurs qui ont décrit les espèces et d'après mes propres observations, j'ai en effet cherché à voir le plus grand nombre de types possible et chaque fois que je l'ai pu, jai complété l'examen microscopique par des cultures sur différents milieux.

Ière Tribu.—PILOBOLÉES.

Les champignons qui rentrent dans cette tribu ont les tubes fructifères généralement renflés en sphère à leur extrémité supérieure, tantôt le renflement reste à l'extérieur du sporange (Pilobolus) tantôt il y pénètre presque complétement (Pilaira); leurs sporanges sont d'une seule sorte, ils s'ouvrent par une zône diffluente située à leur face inférieure, là où la membrane sporangiale s'attache au renflement précité. Il n'y a jamais qu'un seul sporange par individu. Leur mycélium n'est jamais anastomosé.

Cette tribu comprend actuellement le genre Pilobolus et le genre Pilaira.

Genre **Pilobolus,** *Tode,* 1784 (*Schrift. Naturf. Freunde Berlin, t.* v., *p.* 46).

Ce genre est caractérisé ; par des tiges fructifères simples, présentant toujours un renflement à chacune de leur extrémité (base et sommet) ; le renflement supérieur supporte un sporange multisporé à membrane hétérogène, c'est à dire formée d'une calotte supérieure cuticularisée et d'une zône inférieure diffluente, moins colorée et moins cuticularisée ; le mycélium n'est pas anastomosé.

A la maturité le sporange est toujours projeté brusquement à une certaine distance et il entraine avec lui sa columelle; cette dernière est ordinairement petite. Il n'y a pas de conidies. On a indiqué les zygospores d'une espèce.

Pilobolus crystallinus (*Wiggers*, 1780). *Tode*, 1784. *Fungi. Meckl. Select.* I., *p.* 41.

Syn.—*Mucor obliquus*, Scopoli, 1772, Fl. Carnioli, ii., p. 494.

Hydrogera crystallina, Wiggers, 1780, Primitiæ Floræ Holsat., p. 110.

Mucor urceolatus, Dickson, 1785, Fasc. Plant. Crypt., i., p. 25, tab. iii., fig. 6. Bulliard, Champignons, i., p. iii., pl. 480, fig. 1.

Pilobolus urceolatus, Purton, 1821, Midland Flora, iii., p. 325.

Pilobolus crystallinus, Coemans, 1861, Mémoires des savants étrangers. Acad. Belgique, t. xxx., p. 57.

Pilobolus microsporus, Klein., Brefeld, 1881, Untersuchungen, iv., p. 70.

Pilobolus crystallinus, Bainier, 1882, Étude, p. 41. Grove, 1884, Midland Naturalist, p. 34. Schröter, 1886, Schles. Krypt. Flora, iii., 1, p. 212. Berlèse et de Toni, 1888, Saccardo Syll. Fungorum, vii., 1, p. 185. Zopf, 1888, Nova acta acad. Leop., t. L. ii., p. 352. Fischer, 1892 (Rabenhorst, Kryp. Flora, 49 lief., p. 260, fig. 45, c.).

Le *Pilobolus crystallinus* ressemble beaucoup comme aspect au *Pilob. Kleinii*, mais il en diffère surtout par ses dimensions qui sont un peu plus fortes. Voici les mensurations que j'ai constaté le plus fréquemment :—

Largeur du sporange, 450 μ.

Hauteur du sporange, 170 μ.

Largeur du renflement, 600 μ.

Hauteur du sporange et du renflement, 920 μ.

Largeur du filament fructifère, 170 μ.

Les mensurations données par Mr. Fischer ne concordent pas exactement avec les miennes, elles sont tantôt un peu plus fortes, tantôt un peu plus faibles ; elles varient d'ailleurs assez bien.

La taille de cette Mucorinées est parfois très considérable, jai trouvé des individus qui mesuraient jusqu' à près de 2 centimètres de hauteur ; habituellement cependant ils n'ont que de 7 à 10 millimètres.

Le renflement basillaire est jaune, divisé en deux compartiments et presque toujours caché dans le substratum.

Les principales différences qui existent entre le *P. Kleinii* et le *P. crystallinus* sont :—

1°. La surface supérieure de son sporange au lieu d'être uniformément d'un noir bleuâtre, est marquée de lignes blanches s'anastomosant de façon à former des polygones groupés autour d'un polygone central.

D'après Mr. Grove ce caractère ne serait pas spécifique, car il se rencontrerait aussi chez le *Pil. Œdipus ;* j'ai vu beaucoup de *P. Œdipus*, mais jamais je ne leur ai rémarqué cette particularité, tandisque je l'ai toujours observée sur le *P. crystallinus*.

2°. Les spores du *Pil. crystallinus* sont elliptiques, un peu aplaties latéralement, moins colorées que celles du *Pil. Kleinii*, légèrement jaunâtres lorsqu'elles sont isolées et jaunes verdâtres

lorsqu'elles sont agglomérées en masse ; elles mesurent de 7 à 11 μ de longueur sur 4 μ 5 à 7 μ de largeur.

3°. La columelle du *P. crystallinus* est conique, d'un bleu-noirâtre.

Tous mes essais pour obtenir la germination des spores de cette Mucorinées, en cellule, dans diverses décoctions ont été infructueux, mais semées sur crottins stérilisés, elles poussaient très bien. Les zygospores de ce champignon ont été indiquées et figurées par Mr. Zopf (*loc. cit.*). D'après cet auteur elles se montrent à la suite de mutilations produites par de petites Chytridiacées parasites (Pleotrachelus) qui viennent s'installer dans les jeunes sporanges, ou sous l'influence de Syncephalis parasites. J'ai eu beau chercher et bien des auteurs avant moi, à trouver ou à provoquer cette reproduction sexuelle, mais je n'ai jamais rien obtenu ; j'ai pourtant examiné des Pilobolus placés dans toutes espèces de conditions, je les ai martyrisés de toutes les manières, sans jamais arriver à obtenir leurs zygospores.

Ces zygospores sont des sphères ayant de 67 μ à 293 μ de diamètre ; avec des épaisissements d'un jaune brun, maintenues entre deux suspenseurs, dressés.

On trouve ce Pilobolus sur toutes sortes d'excréments, principalement sur ceux de cheval.

D'après Mr. Zopf (Nova Acta Acad., Leop., lii., p. 358) ce champignon posséderait des formes levures.

Messrs. Roze et Cornu (Bull. Soc. Bot. France, 1871, t. xviii., p. 298) ont indiqué des chlamydospores, étoilées. Mr. Marchal de Bruxelles à retrouvé ces mêmes corps qui, de l'avis de Mr. Cornu lui même sont bien, identiques à ce qu'il a décrit jadis comme chlamydospores. De nouvelles recherches sur les divers modes de reproduction de cette espèce sont à souhaiter.

Pilobolus roridus (*Bolton*, 1789), *Persoon*, 1801, *Synops. Fung.*, *p.* 117.

Syn.—*Mucor roridus*, Bolton, 1789, Hist. Fung., iii., p. 168, tab. 132, fig. 4.

Pilobolus roridus, Coemans, 1861, Bull. de l'Acad. Royale de Belgique, 1859, p. 770, et Mem. de l'Acad. de Belgique, Année, 1861, p. 61.

Pilobolus microsporus, Klein, 1872, Jahrb. fur Wissench. Bot., t. viii., p. 360, tab. xxvii. et xxviii., fig. 53 à 67.

Pilobolus roridus, Van Tieghem, 1875, Ann. Sc. Nat., 6^{e} Ser., t. i., p. 46, tabl. i., fig. 7 à 73. Bainier, 1882, Etude, p. 44. Grove, 1884, Midl. Nat., p. 36, tab. vi., fig. 4 à 6. Schröter, 1886, Schles. Krypt. Flora, iii., 1, p. 272. Berlèse et de Toni, 1888, Saccardo Sylloge, t. vii., p. 185. Fischer, 1892, Rabenhorst Krypt. Flora, lief. 49, p. 264.

Cette espèce se rapproche beaucoup du *Pilobolus crystallinus*, c'est pourquoi je la décrit après lui.

Ce Pilobolus est caractérisé par ses filaments fructifères isolés, dressés, légèrement jaunâtres, provenant d'un renflement dont il

ne sont séparés, par aucune cloison. Sa hauteur est de 1 ou 2 centimètres.

Le renflement sous sporangial est courtement elliptique, presque sphérique, incolore.

Son sporange est hémisphérique comprimé, très petit, haut de 200 μ, c'est à dire qu'il a le $\frac{1}{3}$ du renflement à peu près ; il est noir, sans dessins, formant avec le renflement sous jacent un tout ayant l'aspect d'un œil.

La columelle est à peine bombée en verre de montre et ne pénétre que très peu à l'interieur du sporange ; sa couleur est d'un bleu-noir faible.

Les spores sont elliptiques, très légèrement jaunâtres quand elles sont réunies en masse ; leur longueur est de 6 μ à 8 μ ; leur largeur de 3 μ à 4 μ. Il a été trouvé sur divers excréments (chien, cheval, lièvre, etc.).

Il se rapproche assez bien du *Pilobolus crystallinus ;* mais en diffère, surtout par la forme de son renflement sous sporangial, par son petit sporange, sa columelle peu marquée, l'absence de dessins, etc. Mr. Van Tieghem est parvenu à faire germer ce champignon en cellule, dans diverses décoctions et en grand sur du crottin de cheval bouilli.

Pilobolus Kleinii, *Van Tieghem*, 1876 (*Ann. Sc. Nat.*, 6^{e}. *Sér.*, *t.* IV., *p.* 337.)

Syn.—*Pilobolus roridus*, Currey, 1857, Journ. Lin. Soc., i., p. 162, tab. ii.

Pilobolus crystallinus, Klein, 1872, Jahrb. Wiss. Bot., viii., p. 360. Brefeld, 1881, Untersuch., iv., p. 70, tab. iv., fig. 15.

Pilobolus Kleinii, Bainier, 1882, Étude sur les Mucorinées, p. 43. Grove, 1884, Midland Naturalist, p. 35. Schröter, 1886, Schlesien Krypt. Flora, iii., 1, p. 312. Berlèse et de Toni, 1888. Saccardo Sylloge Fungorum, t. vii, 1, p. 185. Fischer, 1892. Rabenhorst Krypt. Flora, fasc. 49, p. 262.

Le *Pilobolus Kleinii* est un petit champignon qui se rencontre très fréquemment sur les crottins de moutons et de chevaux. Par son port, ainsi que par sa taille il se rapproche beaucoup du *P. crystallinus*, avec lequel on le confond très souvent.

Comme hauteur je lui ai ordinairement trouvé 10 ou 12 millimètres ; Mr. Van Tieghem lui attribue la même hauteur que le crystallinus, c'est à dire de 5 à 7 m.m. ; d'après Mr. Fischer (*loc. cit.*, i., 262) sa taille serait seulement de 2-5 m.m. à 5 m.m.

Il est constitué par une tige dressée, hyaline, large de 100 μ, renflée à son sommet en une sorte de réservoir elliptique, hyalin, parfois un peu rosé dont la largeur peut atteindre 450 μ et même 500 μ (Mr. Fischer indique même 700 μ et comme hauteur de 500 μ à 850 μ) ; on y constate assez souvent la présence de deux bandes colorées, l'une placée à l'étranglement qui sépare le renflement du sporange, l'autre localisée à la base de la dilatation, au point de jonction du renflement avec le tube sporangifère ; à ce même endroit l'on observe parfois une cloison.

Le sporange qui surmonte cette dilatation est noir, sans dessins, hémisphérique, large de 250 μ et plus (jusqu' à 360 μ d'après Mr. Fischer et de 170 μ à 260 μ de haut); il renferme de très nombreuses spores elliptiques, jaunes isolées, d'un jaune brunâtre plus ou moins foncé quand elles sont en masse; leur longueur varie entre 8 μ et 12 μ, leur largeur est souvent de 8 μ à 8·5 μ. Mr. Van Tieghem dit qu'elles ont en moyenne 15 μ sur 8 μ, mais qu'elles peuvent avoir jusqu' à 20 μ de longueur sur 10 μ de largeur, il ajoute que leurs dimensions sont très variables. Ces spores sont contenues dans une matière gélatineuse.

Elles sont séparées du renflement par une columelle légèrement bleuâtre ou incolore en forme de cône qui parfois est étranglée au milieu; à la partie terminale de ce cône, l'on voit souvent des spores fixées.

La portion basillaire du filament est occupée par un bulbe jaune orangé qui, tantot est enfoncé dans le substratum, tantot au contraire affleure à la surface du milieu nutritif.

Ce bulbe est inégalement divisé par une cloison en deux, parties inégales, l'une, celle qui se trouve sous le filament est la cellule mère, l'autre (l'apophyse) qui est plus petite, fait partie du mycélium. Mr. Fischer donne au renflement basillaire les dimensions suivantes: de 150 μ à 300 μ pour la hauteur et de 550 μ à 800 μ pour la longueur.

J'ai essayé en vain de faire germer les spores de ce champignon en chambre humide, mais j'ai ai obtenu des cultures en grand, en les semant sur crottins stérilisés de cheval ou de mouton.

Ce Pilobolus permet de constater que les organismes de ce genre sont héliotropiques; il suffit en effet d'exposer une culture à la lumière pour voir au bout d'un certain temps toutes les petites tiges se diriger de façon à placer leur axe vers les rayons incidents.

J'ai également utilisé cette espèce pour observer l'action de la lumière sur la croissance. De même que pour les végétaux supérieurs, on constate que cet agent retarde la croissance des Pilobolus. On peut très bien observer le phénomène au moyen de la petite expérience suivante; on prend un large tube à réactif, on y met un crottin de mouton assez volumineux et l'on stérilise après avoir bouché avec un tampon de ouate.

Le tube ainsi préparé est ensuite ensemencé, puis placé près d'une fenêtre; après une huitaine de jours les champignons se sont développés et l'on peut voir, que tandisque ceux qui reçoivent la lumière directe sont petits, ceux qui sont placés derrière le crottin, là où la lumière arrive difficilement, ont pris un allongement beaucoup plus considérable, de façon à venir mettre leur tête à la lumière.

Variations du Pilobolus Kleinii.—Le *Pilobolus Kleinii* paraît avoir le faculté de se présenter sous diverses formes ou variétés; ainsi, j'ai trouvé très fréquemment sur crottins de moutons un petit Pilobolus que je considère comme une variété naine du *P.*

Kleinii, c'est pourquoi je l'appelle *P. Kleinii* var. minor, en voic la description.

Hauteur totale du champignon 1 m.m. ; tige relativement longue par rapport au renflement sous sporangial incolore que surmonte un petit sporange noir bleu.

La base du tube sporangifère est occupée par un renflement incolore ou très peu coloré, situé dans le prolongement du tube et non pas obliquement, divisé en deux parties inégales de chacune desquelles partent des filaments mycéliens incolores.

Les sporanges sont très petits, hémisphériques, d'un noir bleu, à surface externe munie de petites pointes d'oxalate de chaux ; ils mesurent de 110 μ à 150 μ de diamètre, sur 60 μ de hauteur.

Les spores qui s'y trouvent sont elliptiques, grisâtres en masse, incolores isolées : elles mesurent 12 μ de longueur sur 7 μ de largeur. Certaines de ces spores étaient bien nettement d'un jaune orangé.

Le renflement sous sporangial à 150 μ de largeur sur 210 μ de hauteur.

La columelle est incolore, conique, d'une hauteur de 25 μ environ.

Ce champignon se rapproche beaucoup du *P. Kleinii*, toutefois sa taille exiguë, ses dimensions moins fortes dans toutes ses parties, ses spores peu colorées, enfin la forme et la couleur de son bulbe l'en éloignent; comme je ne trouve cependant pas que ces caractères soient suffisants pour l'élever au rang d'espèce et comme c'est du *P. Kleinii*, qu'il est le plus voisin, j'en fais une variété de cette espèce.

Les divers champignons, qui suivent sont rattachés par Mr. Fischer et par Mr. Grove au *Pilobolus Kleinii*, soit comme identiques à cette espèce, soit comme constituant des variétés de ce Pilobolus.

a. *Pilobolus Kleinii*, var. *Sphærospora*, Grove, 1884 (Journ. of Bot., t. xxii., p. 132, tabl. 245, fig. 5).

Syn.—*Pilobolus lentiger*, Corda, var. *macrosporus*.

Berlèse et de Toni séparèrent cette variété du *P. Kleinii* pour en faire sous le nom de macrosporus une variété du *P. lentiger* Corda.

Mr. Fischer ne maintint pas cet arrangement, jugea que le *Pil. lentiger* était identique à la variété sphærospora et replaça cette dernière comme variété du *Pil. Kleinii*.

Ce champignon se distingue du *P. Kleinii* typique surtout par ses spores arrondies, de 12 à 20 μ.

Il parait que sur un substratum frais il se produit des spores arrondies, mais que plus tard des spores elliptiques font leur apparition.

b. *Pilobolus lentiger*, Corda, 1837 (Icon. Fung. i., p. 22, tab. vi., fig. 286).

Syn.—*Pycnopodium lentigerum*, Corda, 1842 (Ic. v., p. 18).

Ce champignon a été considéré, par Mr. Grove d'abord, puis par Mr. Fischer, comme une forme maladive du *P. Kleinii*, laquelle

doit être placée à côté du *P. Kleinii* var. sphærospora. Je suis du même avis qu'eux et je regarde même ce Pilobolus comme identique au vrai Kleinii.

c. Pour Mr. Grove le *Pil. Œdipus*, variété intermedia Coemans, 1863 (Bull. Acad. Belg., ii^e^ Série, t. xvi., p. 71), est un *Pil. Kleinii* var. sphærospora dont les spores ont de 14 μ à 16 μ de longueur sur 11 μ à 14 μ de largeur.

d. Il en serait de même du *P. intermedius* de Karsten (Myc. Fenn. iv., p. 71). Ici je ne suis pas tout à fait du même avis, car la hauteur 2 à 5 c.m., indiquée pour ce champignon, me parait l'en éloigner pour le rapprocher plutôt du *P. longipes;* des renseignements suffisamment détaillés pour permettre une détermination exacte manquent.

e. Je considère comme un *P. Kleinii* voisin de celui que j'ai décrit précédemment sous la dénomination de variété minor, le Pilobolus signalé sous le nom de *Pilobolus minutus* par Spegazzini (Fungi Argentini, Ann. de la sociedad cientif. Argent. entrega iv., tomo ix., p. 176). Voici du reste son signalement: Hauteur du champignon 2 à 5 m.m., sporange petit, lenticulaire, noir, de 125 μ à 145 μ ; spores elliptiques ou presque sphériques de 7 μ à 8 μ verdâtres.

Pilobolus longipes, *Van Tieghem*, 1876 (*Ann. Sc. Nat.*, 6^e^ *Sér.*, *t.* iv., *p.* 338, *tab.* x., *fig.* 11 *à* 15).

Syn.—*Pilobolus roridus*, Brefeld, 1881, Untersuchungen, t. iv., p. 70, tab. iv., fig. 17.

Pilobolus longipes, Bainier, 1882, Etude p. 46, tab. ii., fig. 11 à 13. Grove, Midl. Naturalist, p. 35, tab. vi., fig. 1. Berlèse et de Toni, 1888. Saccardo Syll. Fung. vii., 1, p. 185. Fischer, 1892 (Rabenhorst, p. 264).

Cette curieuse espèce est surtout remarquable, par son renflement basillaire qui est d'un beau jaune d'or, rampe à la surface du sol et est excessivement long, c'est un cylindre atteignant parfois, 1½ à 2 m.m. de longueur et une épaisseur d'un ½ millimètre à peu près, sur lequel divers petits rameaux latéraux viennent s'insérer; ce renflement est séparé de l'apophyse mycélienne par une cloison. De ce renflement part un filament sporangifère dressé, filiforme, haut de 2 à 5 c.m., parfois de 7 c.m., terminé par une dilatation ovoïde supportant un sporange.

Le renflement sous sporangial est elliptique ou plus ou moins sphérique, d'une largeur égale à 1 m.m. La columelle est largement conique, légèrement bleuâtre ; les sporanges sont hémisphériques, noirs, sans dessins, d'un diamètre de 500 μ.

Les spores sont presque sphériques, jaunes, à membrane épaisse, cartilagineuse, légèrement bleu-noirâtre ; elles mesurent de 10 μ à 12 μ de longueur sur 12 μ à 14 μ de largeur.

Cette espèce à été trouvée sur des excréments de chiens et de chevaux.

D'après Mr. Van Tieghem ses spores ne germent ni dans les décoctions de crottins, ni sur les crottins mêmes, d'où il déduit

qu'elles doivent passer au travers du tube digestif d'un animal pour qu'il leur soit possible de germer.

Pilobolus Œdipus, *Montagne*, 1828 (*Mem. Soc. Linn. de Lyon, p.* 1).

Syn.—*Pilobolus crystallinus*, Cohn, 1851, Nova acta Leop., t. xv., tab. Li. et Lii.

Pilobolus Œdipus, Coemans, 1861, Mem. savants étrangers, Acad. Bruxelles, t. xxx., p. 59. Van Tieghem, 1875, Ann. S. Nat., 6e Sér., t. 1, p. 43.

Pilobolus reticulatus, Van Tieghem, 1876, Ann. Sci. Nat., 6e Sér., t. iv., p. 336.

Pilobolus Œdipus, Bainier, 1882, Etude, p. 43, tab. ii., fig. 1 à 10. Grove, 1884, Midl. Nat, p. 33, tab. iv., fig. 14 et 15. Schröter, 1886, Krypt. Flora iii., 1, p. 212. Berlèse et de Toni, Saccardo Sylloge, t. vii., 1, p. 186. Fischer, 1892, Rabenhorst, Krypt. Flora, fasc. 49, p. 265.

L. Hydrophora vexans d'Auerswald, dans la collection Fuckel (Fungi Rhenani 2204), est aussi un *P. Œdipus*.

Contrairement aux Pilobolus précédemment décrits ; cette espèce est trapue, petite, haute de 1 à 2 m.m., rarement elle atteint 5 m.m., malgré sa petite taille, ses autres dimensions sont souvent beaucoup plus considérables que celles des mêmes parties, chez les autres espèces. Voici les mensurations les plus fréquentes :

Hauteur du sporange 200 μ (jusqu' à 250 μ d'après Mr. Fischer), largeur du sporange 300 μ à 450 (Mr Fischer indique 550 μ), largeur du renflement sous sporangial 300 à 500 μ. Mr. Fischer donne comme dimension maximum 660 μ.

Hauteur de ce renflement 500 μ à 800 μ, largeur du filament fructifère 140 à 150 μ. Ses caractères particuliers sont :

1°. Sa petite taille et son aspect trapu.

2°. Ses spores sphériques, parfois, légèrement elliptiques, très inégales dans un même sporange ; elles sont pourvues d'un épispore très épais, leur contenu est toujours granuleux, coloré fortement en jaune, leurs dimensions sont comprises entre 4 μ 5 et 14 μ 28 de longueur.

3°. La columelle conique, incolore, peut avoir jusqu' à 200 μ de hauteur.

On rencontre ce Pilobolus sur des excréments humains, de cheval, d'éléphant, de porc.

J'ai fait sur ce champignon un grand nombre de recherches, les unes ayant pour objet l'obtention des zygospores, que je n'ai jamais pu rencontrer, les autres dans le but de faire germer les spores.

D'après Mr. Van Tieghem, les spores de ce cryptogame germent avec une très grande facilité ; toutefois, malgré les nombreux essais que j'ai faits, avec toutes sortes de liquides (décoctions de crottins, de pruneaux, de potirons, moût de bière, etc.) à différentes époques, et en prenant des *Pilobolus Œdipus* différents, je ne suis jamais parvenu à constater la moindre trace de germination.

Existe-il des races de *Pilobolus Œdipus* germant facilement et d'autres ne germant pas ?

Semées sur crottins ces spores germent très bien. J'ai pu suivre le développement complet de ce champignon depuis la formation du bulbe jusqu' à la naissance du sporange. Mes observations confirment ce que Mr. Van Tieghem ja dit enadis. Les autres modes de reproduction de cette espèce sont peu connus ; ses zygospores n'ont pas encore été trouvées. Sous le nom de Mycogone ancipitem Mr. Coemans à décrit autrefois des corps qui d'après MM. Berlèse et de Toni ne sont autre chose que des chlamydospores d'Œdipus.

Mr. Fischer dit que l'on observe parfois un réseanu blanc sur le dos du sporange ; je n'ai jamais rien vu de semblable.

Le Pilobolus reticulatus, Van Tieghem, 1876 (Ann. S. Nat., 6e Sér., t. iv., p. 336), serait d'après, Mr. Fischer, un *Pil. Œdipus.*

Le Pilobolus Œdipus var. intermedia, Coemans, 1863 (Bull. Acad. Belg. 2e. Sér., t. xv., p. 71), serait d'après le même auteur une forme du *P. Kleinii.*

Pour Mr. Fischer le *Pil. Kleinii* var. sphærospora de Grove est presque identique au *P. Œdipus*, il n'en diffère guère que par ses spores, dont la membrane est mince.

Pilobolus exiguus, *Bainier*, 1882 (*Etude sur les Mucorinées, p.* 47, *tab.* II., *fig.* 17, *et Ann. Sc. Nat.*, 6e *Sér.*, *t.* 15, *tab.* v., *fig.* 5, *à* 6).

Ce petit champignon est très proche parent du *P. Œdipus*, il en a le port trapu, est formé, d'un filament fructifère isolé, dressé présentant à sa base un renflement assez volumineux, enfoncé dans le substratum. Le renflement sous sporangial est plus petit que le renflement basillaire. Son sporange est hémisphérique, noir, transparent. Ses spores sont très grosses, de 14 à 21 μ de diamètre, très inégales, jaunes, mais assez faiblement.

Il à été rencontré sur du fumier. Il diffère surtout du *P. Œdipus* par ses grandes spores ; quelques renseignements en plus et des mensurations auraient été d'une très grande utilité.

Je suis très disposé à le considérer comme une forme maladive du *P. Œdipus.*

Pilobolus nanus, *Van Tieghem (Ann. Sc. Nat.* 6e *Sér.*, *t.* IV., *p.* 340, *tab.* X., *fig.* 16 à 22) *et aussi ; Grove*, 1884, *Midl. Naturalist, avec tab.* VI., *fig.* 2. *Fischer*, 1892, *Rabenhorst Krypt. Flora, fasc.* 49, *p.* 267.

Ce Pilobolus est très différent des autres ; il est constitué par des filaments fructifères groupés, par 2 à 5 sur un renflement unique, mais divisé en autant de cellules qu'il y a de tubes ; ce renflement est presque incolore, très légèrement jaunâtre, enfoncé dans le substratum.

Les tubes fructifères sont dressés, courts, ne dépassant guère 1 m.m. de hauteur. Le renflement sous sporangial est incolore et presque sphèrique. Le sporange est globuleux, petit, jaune, à membrane incrustée de petites pointes d'oxalate de chaux. La

columelle est aplatie ; les spores sont sphériques, très petites, incolores, lisses, de 3 μ 5 à 4 μ de diamétre.

Mr. Van Tieghem a decrit sous le nom de chlamydospores de petites sphères jaunâtres, pédicellées, ayant de 15 μ à 20 μ de diamètre. D'après Mr. Fischer ces petites masses ne seraient pas des chlamydospores, mais bien des azygospores, je suis du même avis.

Le même auteur fai encore remarquer que les zygospores décrites par Mr. Bainier pour le Mucor tenuis, ont aussi beaucoup d'analogie avec ces prétendues chlamydospores. Ce Pilobolus a été trouvé sur des crottins de rats.

Espèces à supprimer.

Pilobolus pestis bovinæ, Hallier, 1872 (Zeitschr. f. Parasitenk, p. 57).

Syn.—*Pilobolus Hallieri*, Rivolta Parass. Scy., ed. ii., p. 497, fig. 220. Cette espèce est à rayer, c'est à peine si l'ou en connaît quelques mots. Mr. Fischer (*loc. cit.*) la considère comme étant le *P. Kleinii*, var. sphærospora, Grove.

Pilobolus minutus, Spegazzini, Fungi argentini, pugillus primus in Ann. de la sociedad cientif. argent entrega iv., tomo ix.

Ce champignon est certainement du *P. Kleinii*, probablement la variété que jai décrite sous le nom de *Pil. Kleinii*, var. minor.

Pilobolus argentinus, Spegazzini, Fungi argentini, pugillus primus in Ann. de la socied. cientif. argent. entrega iv., tomo ix.

Cette espèce est à rapprocher du *P. Œdipus*.

Pilobolus roseus, Spegazzini, Fungi argentini (*loc. cit.*). C'est encore une fois une variété du *P. Kleinii*, le sphærospora probablement.

Affiinités des espèces du genre Pilobolus.

Dans de genre Pilobolus formé de champignons bâtis essentiellement d'après le même type, nous distinguons deux groupes principaux ; l'un comprenant les espèces à spores elliptiques, l'autre les espèces à spores sphériques.

Les champignons du premier groupe, ont entre eux de nombreux points de ressemblance et bien certainement ils doivent avoir une commune origine ; nous constatons aussi que le *P. minutus* supprimé par Mr. Fischer, a de très grandes affinités, avec le *P. Kleinii*, dont il n'est à mon avis qu'une variété établissant le passage entre les espèces du premier groupe et celles du deuxième.

Une autre forme de transition entre ces deux catégories, nous est fournie par le *P. Kleinii*, var. sphærospora.

Les espèces de la deuxième section ont moins de ressemblance entre elles.

L'espèce principale, le *Pilobolus Œdipus* a des caractères spécifiques bien tranchés ; sa taille et sa coloration peuvent toute fois varier plus ou moins, d'où existence de diverses formes et variétés dont quelques-unes avaient été considérées jadis comme espèces.

Le *Pilobolus longipes* et le *Pilobolus nanus* possèdent tous deux des caractères très nets.

Le *Pilobolus intermedius*, Coemans, est à mon avis un *Pil. longipes*.

Le genre Pilobolus, se rattache au genre Mucor par l'intermédiaire du genre Pilaira.

Les espèces qui indiquent le mieux la parenté des genres Pilobolus et Pilaira sont : du côté des Pilobolus, le *P. nanus*, du côté des Pilaira, le *Pilaira dimidiata*.

BIBLIOGRAPHY.

Netherlands Fungus Flora.

Professor Oudemans, of Amsterdam, has just published the first volume of his revision of Netherlands Fungi,* which is chiefly of interest to us as enabling us to contrast our own Fungus Flora with that of continental countries in the closest proximity. The present volume is quite an imposing book of 638 imperial octavo pages, with excellent typography, but without any illustrations. It includes the Hymenomycetes, Gastromycetes, and Hypodermeæ, following the arrangement of Saccardo's Sylloge. The total number of species recorded is, for—

Netherlands Hymenomycetes, 859
,, Gastromycetes, 39
,, Hypodermeæ, 190

Comparing this with Lambotte's Fungi of Belgium we find—

Belgian Hymenomycetes, 1056
,, Gastromycetes, 31
,, Hypodermeæ, 155

We may also compare the Hymenomycetes with the Hymenomycetes of France, published by Gillet, in which are recorded, Hymenomycetes, 1898.

This leads us to the records of our own islands, and we find them to be—

British Hymenomycetes, 1950
,, Gastromycetes, 78
,, Hypodermeæ, 257

The inference, therefore, is that Britain has more than double the number of Hymenomycetes that are found in the Netherlands, nearly double those of Belgium, and, assuming that the list is a complete one, a little in excess of those inhabiting France. We have no full record of the Gastromycetes of France, but those of Britain are more than double the number found either in the Netherlands or in Belgium. The Hypodermeæ are also in excess.

It is equally interesting to compare also the Agaricini in these

* "Revision des Champignons des Pays-Bas." Vol. i.: Hymenomycetes, Gasteromycetes, and Hypodermées. Par C. A. J. A. Oudemans. Amsterdam, 1892.

countries. In the Netherlands they number 595, in Belgium 718, in France 1406, and in Britain 1400. Undoubtedly France runs us very closely in all aspects, and probably would beat us if the French lists were equally exhaustive and complete.

It is not stated whether the Netherlands Flora is to extend beyond another volume, but evidently the work is in good hands, and it is refreshing to see that the letterpress is in French instead of low Dutch. We observe also that Professor Oudemans does not appear to have much faith in spore measurements, as there is no attempt at giving them for the Hymenomycetes.

M. C. C.

On Nuclear Division in the Hymenomycetes. By Harold Wager, Ann. Bot., Vol. vii., p. 489.

Until quite recently the presence of indisputable nuclei in the Basidiomycetes has not been demonstrated. In the present paper the author has not only detected these structures in the basidia of *Agaricus stercorarius* and *Agaricus muscarius*, but has also shown that their division is karyokinetic, resembling, generally, that which takes place in the higher plants, with only slight differences of detail; a well-marked spindle-figure is formed. A single nucleus, formed by the fusion of two or more pre-existing nuclei, is present in the young basidium; this nucleus divides into two, each of the daughter nuclei dividing in turn. The four nuclei thus formed finally arrange themselves one at the base of each of the four sterigmata, and presumably pass through the sterigma into the spore at its apex, although the actual entrance of the nuclei into the spores was not observed. Some interesting and novel ideas are discussed respecting the behaviour of the nuclei towards red and blue stains, a subject which is just now attracting considerable attention. We trust the author will continue his investigations on this subject, and, in due course, give us the result of his investigations of the transversely septate basidia met with in the genera *Pilacre*, etc., constituting Brefeld's Protobasidiomycetes. Three beautifully executed plates illustrate all the points indicated in the text.

On Trichosphæria Sacchari, Mass., *a Fungus causing a Disease of the Sugar-cane.* By G. Massee, Ann. Bot., Vol. vii., p. 515 (one double plate).

A detailed account of the life-history of the fungus is given.

Lichenologische Ausflüge in Tirol, xxv., *Der Arlberg*. By Dr F. Arnold, Verhandl. der K. K. Zool.-Bot. Gesell. in Wien. 1893.

There is a genuine smack of nature embodied in the description of these rambles; the author, while naturally paying most attention to lichens, does not fail to record the presence of mosses and

also phanerogams. The systematic and geographical information relating to lichens is very valuable. We should be very pleased to receive similar contributions for publication relating to British lichens, or even to learn that a young lichenological student did actually exist in Great Britain.

Fungi Fimico Polonici. By Stanislaw Chelchowski, Physiograph. Deukschr., Warschau, xii. Band.

This very interesting paper gives an annotated list of all Polish fungi growing on dung, including one new species having the following characters :—

Coprinus equinus, *Chelch.*—Pileus very delicate, without a distinct pellicle, gaping along the line of the gills, ovate, thin, campanulate, at length expanded ; greyish-white, covered with darker scurf and flocci, disc darker, 3-15 m.m. broad ; gills free, whitish, becoming black ; stem slender, glabrous, base somewhat bulbous, furnished with a large volva, 18-35 m.m. long ; spores subglobose or broadly elliptical, 5-8 × 4-5 μ. On horse dung.

A very good plate is appended.

The Myxomycetes of the Miami Valley, Ohio. By A. P. Morgan, Journ. Cincinn. Soc. Nat. Hist., January and April, 1893.

The primary object of the present contribution is the enumeration of the species indigenous to a specific region ; nevertheless, species outside such area are incorporated, and with the characteristic figures given, the work, when complete, will be a valuable synopsis of the Myxogastres of the United States. The generic and specific characters are ample and clear.

Club-root of Cabbage and its Allies. New Jersey Agric. Coll. Expt. Station, Bull. 98 (1893).

We have a lucid description, well-illustrated, of *Plasmodiophora brassicæ*, Wor. Two additional hosts for this fungus are noted, *Bursa pastoris*, L., and *Sisymbrium vulgare*, L. ; these, in common with other weed hosts, should not be countenanced where cruciferous plants are grown. Lime added to the land, seventy-five bushels to the acre, has proved effective in checking club-root.

Artificial Production of Mushroom-spawn.

In a very interesting pamphlet entitled " Sur un noveau procédé de culture du Champignon de couche," by MM. J. Costantin and L. Matruchot, we have an account of the method by which the spawn of the edible mushroom can be produced wholesale. The pure spores are collected and sown in a special sterilized nutrient solution, and forms a pure white cord-like mycelium. This mycelium is placed on sterilized dung, where it develops abundantly for some weeks. At this stage it has the appearance and

odour characteristic of natural spawn, and when placed in a mushroom-bed grows and produces mushrooms normally. The advantages of this method are :—

I.—*The production of a pure mycelium*, free from the many diseases, the germs of which are introduced along with the spawn as at present produced.

II.—*Choice of varieties.* It is well known that certain varieties, especially the one having the cap entirely white, is most esteemed in the market. By the method described it is alone possible to perpetuate any variety in a pure state.

III.—*Permanent production of spawn.* At present the production of spawn is intermittent ; by the culture process spawn can be produced throughout the year, an evident advantage.

The authors hope to apply the same method of cultivation to other edible species of fungi, as the Morel, Boletus, etc.

Di due specie interessanti di fungi della Flora Micologica Italiana. Ab. G. Bresadola, Atti dell' T. R. Acad. degli Agiati in Rovereto, 1893.

In the present paper two species of fungi are described and accompanied by good coloured figures. The first is *Hygrophorus Marzuolus* (Fr.), Bres., the old *Agaricus Marzuolus*, Fries, Syst. Myc., i., p. 84, and Hym. Eur., p. 93. The second species is as follows :—

Odontia Pirottæ, *Bres.*—Subiculum broadly effused, membranaceous, *white*, seceding, preceded by rhizomorpoid strands, margin himantoid; spines terete, $1\frac{1}{2}$-2 m.m. long, apex pruinately fimbriated, bright *golden-orange ;* spores ovoid, straw-colour (sub micr.), $4\frac{1}{2}$-5 × $3\frac{1}{2}$ μ ; basidia clavate, 20-25 × 5-6 μ ; subhymenial hyphæ hyaline, septate, 3 μ thick.

Hab.—On damp walls, Royal Botanical Garden, Rome.

Allied to *Odontia fimbriata.*

PLANT DISEASES.

(*Continued from p.* 64.)

The foregoing general summary of the objects of the work will, it is to be hoped, enable the reader to understand the details which will now be taken up.

[Lack of space forbids giving in detail the results of numerous careful experiments conducted in various widely separated districts, also the tables giving results following different modes of treatment, kind and strength of fungicide used, method of application, etc. The summary, however, is given, showing the general outcome of the experiments.]

Conclusion.

The work described in the foregoing pages, carried on under widely different conditions of soil and climate, seems to clearly indicate that treating the seed and soil previous to planting with various chemicals and with hot water is of no value whatever so far as the prevention of rust is concerned. This accords with our knowledge of the life-history of the rust fungi attacking cereals, and bears out the generally accepted belief of those who have studied the matter. Many of the soil and seed treatments were positively injurious, diminishing the crop to a far greater extent than all the diseases observed combined.

The spraying treatments did, in some cases at least, diminish the amount of rust, and seemingly increased the yield of straw and grain. A slight increase of yield in an experiment of this kind, however, must be looked upon with a good deal of suspicion, as there are many things that might influence the matter one way or another. On the whole there seems no good reason for believing that spraying, even with the most improved methods with which we are now familiar, would be practical or profitable on a large scale. At Garrett Park, where this kind of work was done with the greatest care, and where every precaution was taken to make the various preparations cover the foliage, rust was just as abundant on the sprayed as on the unsprayed wheat. A critical study of the plants in the field afforded what seems a satisfactory explanation of the foregoing fact. On examining the leaves immediately after they had been sprayed in the most careful manner it was found that fully one-half of the surface was wholly free from any signs of the liquid put on.

The shape of the leaf, its position on the stem, manner of growth, and waxy covering all conspire to render it exceedingly difficult to wet, and unless thoroughly wetted or covered by the fungicide there is little hope of preventing the reproductive bodies of the rust fungi from gaining an entrance.

Finally, it may be said that while improved machinery and fungicides and improved methods may make it possible to profitably spray our cereals, with our present means this cannot be done. The work, however, should not be abandoned; on the contrary, it should be continued until the matter is definitely settled one way or the other. At the same time the far more promising work of breeding rust-resisting varieties should be taken up and carried forward along such lines as offer the most promising results.

The following, taken from "Farmers' Bulletin, No. 7, U.S Department of Agriculture," illustrates the kind of practical information communicated to American fruit growers :—

Treatment of Apple Scab.

For this disease, either modified eau céleste or ammoniacal copper carbonate, preferably the former, may be used. At least

four sprayings should be made, the first just as the flowers are opening, the second twelve or fourteen days later, and the third and fourth at similar intervals. In case the season is wet one or two additional treatments will undoubtedly pay. For trees 15 to 18 feet high the cost of four sprayings with either of the fungicides mentioned need not exceed 20 cents per tree. When the work is done on a large scale 16 to 18 cents per tree will cover the cost of four treatments. Two additional treatments will add to the cost from six to eight cents per tree.

Treatment of Pear Scab, Cracking, and Leaf Blight.

These diseases, caused by two different species of fungi, are now successfully combated by one line of treatment. In most sections all three diseases are found associated. Bordeaux mixture has given the best results in this work, although ammoniacal solution has proved almost as effective. The only objection to the latter is that it sometimes gives the fruit a rusty appearance, which is not at all desirable. The first spraying for these diseases should be made when the trees are in flower. In ten or twelve days a second treatment should be made, followed by a third and fourth at the expiration of two and four weeks respectively. In the nursery pear leaf blight is often exceedingly troublesome. It may be almost entirely prevented by spraying five or six times with the Bordeaux mixture, making the first application when the leaves are about one-third grown, and the others at intervals of ten or twelve days throughout the season.

The cost of treating full-grown standing trees with the Bordeaux mixture, as indicated, will average from 12 to 14 cents per tree. For dwarf trees the cost will range from 8 to 12 cents each. The cost of treating with the ammoniacal solution will be considerably less, probably not exceeding 10 cents for standard and eight cents for dwarf trees. In the nursery pear seedlings can be treated six times with the Bordeaux mixture for 50 cents per thousand.

Treatment of Leaf Blight of the Cherry, Plum, and Quince.

The disease, which seriously damages the trees both in the nursery and orchard, may be held in check by the proper use of either Bordeaux mixture or the ammoniacal solution. In the orchard and nursery the directions laid down for the treatment of pear scab, cracking, and leaf blight are applicable here.

Does it Pay to Spray?

This question is in large part answered by the facts already given. No work that did not carry merit with it could have such a phenomenal growth. To give a more direct answer, however, it may be stated that last season two hundred and fifty grape growers in different parts of the country made a series of observations with a view of obtaining some definite information as to the value in

dollars and cents of the recommendations made by the Department in the treatment of grape diseases. The facts reported by these men show conclusively that the actual profit to them over all expenses resulting from the treatment of black-rot and downy mildew was in round numbers 37,000 dollars.

Thirteen thousand dollars of this sum was reported from the State of New York alone.

Other examples equally as striking could be given, but this is sufficient for our purpose. Of course every one is not successful, but where failure is reported it is usually easy to locate and remedy the trouble.

MODERN MYCOLOGY.

By G. Massee.

(*Continued from p.* 31).

and the description of the species of North American Pyrenomycetes is attended with many difficulties, chief among which is the fact that many of the published diagnoses are too imperfect to enable one to recognize the species, of which many of the types are either lost or practically inaccessible. Coming to the species described by Berkeley and Curtis, the case is no better, but as far as specimens are concerned, even worse, the types being entirely beyond the reach of the ordinary student. The above quotation also touches on the type question; most mycologists consider, that however complete a diagnosis may be the type specimen is of yet greater value; there are some, however, whose localization forbids to a great extent the consultation of type specimens, and who consequently swear by diagnoses, and the general student is of necessity bound to depend on the latter, as a given type can only be located in one place, and consequently beyond the reach of many students. The more exact and perfect a specific diagnosis the less necessity for consulting the type specimen.

In looking over the specimens in the Kew Herbarium it is not unusual to come across specimens from Montagne, Fries, Greville, Klotzsch, and others sent to Berkeley with a paragraph, of which the following is typical:—"I believe this is new. I enclose description of specimen. Kindly give me your opinion and criticism."

I don't think many of us do this at the present time; perhaps if we did we should have fewer and better species. When the present rush for individual glorification gives place to the genuine love for science entertained by the older mycologists, who really never cared a pin about priority in nomenclature, nor who never took the trouble to pose as martyrs for the purpose of obtaining their idea of justice for the pioneers of botany, then, and not before, we may hope for better work.

The person who can suggest a good practical substitute for the present custom of placing the author's name after a species would confer a boon on botanists, the value of which would become more and more obvious as time rolls on.

The modern reformer, burning with shame at the injustice done to the fathers of mycology, commences work with the motto *palmam qui meruit ferat* uppermost in his mind, compares new books with old ones—examination of specimens being deemed superfluous—and soon becomes thoroughly convinced in his own mind that *Agaricus palus*, Mass. (1893), is no other than *Agaricus dubius*, Xen. (1730); further examination of books shows clearly that the fungus in question is certainly not an Agaric at all, but the type of a new genus to be called *Tomsonia*—after a mycological friend—and as there is but one species in the genus, and that one very typical, the old specific name is inapplicable, and *gloriosa* suggests itself; in due time a full description of *Tomsonia gloriosa*, Brey, along with another new genus and species simultaneously discovered by the friend and called *Breyia superba*, Tom., appear in print, the poor old fathers of mycology along with *palmam qui meruit ferat* having faded from the memory of Brey and Tomas.

The above sketch is not an exaggeration, but typical of numerous instances where the modern reformer simultaneously adds to synonymy and confusion, without advancing the study of mycology in the least possible degree.

Returning to Saccardo's "Sylloge," we have no hesitation in saying that the worst feature of the work is the wholesale way in which new genera are established on the slightest amount, or in numerous instances without the slightest amount of justification.

The method of procedure appears to have been as follows:—All available specific diagnoses belonging to a particular group having been brought together, certain features were selected as constituting a generic character, and diagnoses embodying all or the mean of such characters selected out; by this method the great bulk of species were disposed of, but in every group there occurred one or more genera consisting of species whose original diagnoses were of such a nature as to forbid their incorporation into any preconceived scheme; such is apparently the nature and origin of many of the new genera established in the "Sylloge."

The above method of procedure might perhaps be justifiable on the part of a person who had previously acquired a good knowledge of the group under consideration, the outcome of work done with actual specimens; and with the further qualification that the collection of diagnoses to be manipulated were individually fairly complete; but as already stated the material at Saccardo's command was not of this nature, but the very opposite, and the founding of genera or even rearrangement of species, based on such meagre and heterogeneous evidence, is, to say the least, not in accordance with modern ideas of science, and hence whilst some genera established in the "Sylloge" are excellent, and will doubtless

be universally accepted, there are many that cannot possibly be accepted, and I venture to think would not have been founded by Saccardo had he but examined the material on which such are founded.

It will be generally admitted that the more genera we possess the more we require; in other words, the narrower the limits of generic characters are the less chance is there of placing a new species in an established genus; a departure in the colour, number of septa, or form of a spore often excluding a species from a genus with which it agrees in all other features. There appear to be two primary reasons for this state of things: (1) Individual conception as to what constitutes a genus; (2) Establishing genera with a limited knowledge of the general structure and range of variation of allied forms. It may be said that there is no generic limitation in nature, a view I personally endorse; then it will probably be an advantage to err on the side of latitude in the formation of generic sections established for convenience, as I believe it will be generally conceded that our modern sharply and artificially circumscribed genera do not, as a rule, indicate more clearly natural affinities, nor more readily facilitate "running down a species" than the genera of older times. Of course, the rabid modern genus—founder may retort, "You would probably prefer the good old time when all the brown seaweeds were *Fucus*, and all the gill-bearing agarics were included in *Agaricus*." I do not mean this, but I do think that the truest conception of a genus, as generally understood, cannot be obtained from microscopic characters entirely, where the organism is large enough to exhibit other features.

Exsiccati. In olden times, when an author issued a set of dried specimens it was felt that the material illustrated his mature views, and as such were of scientific value, apart from the specimens themselves, nowadays the case is too frequently—not always—different; it is not unusual for the youthful aspirant for a post to intimate his capability for fulfilling such by the issue of a fasciculus of fungi, consisting mostly of Uredines, thus announcing to the world his knowledge of plant diseases, the most likely subject to lead to an appointment, also being most readily named, as it is only considered necessary to get some friend to name the host plant. In other instances, where a post is not the object in view, the duplication of the same species under the same or different names, or the issue of a second series, consisting mainly of duplicate species issued in the first series, suggests the object in view.

Finding fault with the existing state of things is admittedly much easier than suggesting a remedy; however, it is clear that before a "Genera Fungorum" of any real value can be written three things must be done: (1) The hundreds of imperfect specific diagnoses, which from their inaccuracy and brevity are absolutely useless, and lacking type specimens of the same, should

be henceforth omitted from mycological works ; (2) In the case of imperfect descriptions where authentic material exists, emended descriptions should be published; (3) Uniformity in specific diagnoses. This could be accomplished by accepting the opinion of specialists as to the features of most value in their respective groups.

Finally, during recent years enormous advances have been made in our knowledge of the life-history of fungi, and the true affinity in many instances demonstrated between forms which were previously placed in widely separated genera or even orders. This knowledge would have to be taken into consideration in the reconstruction of genera; but to what extent? Undoubtedly *Æcidium berberidis*, *Uredo linearis*, and *Puccinia graminis* would be described as phases in the life-cycle of one species ; but on the other hand, should all the varied forms of development and conidial formation produced by cultures, in what may be termed an artificial manner, as in many of the higher fungi, be allowed to influence a generic character? I think not, remembering the ease with which very varied results may be produced by sowing similar spores or conidia in slightly different nutritive media ; such observations, carefully conducted and duly corroborated, are of great value in illustrating the elasticity of a given species under varied conditions, but it has yet to be proved whether those variations indicate affinity, that is whether they occur spontaneously in nature as parts in the normal life-cycle of a species, or simply illustrate the possibilities of a species under exceptional conditions.

Systematic mycology, as a means to an end, deals with what we for convenience designate genera and species, and accepts as such all groups and individuals that retain their individuality at the present time ; and to tamper with this idea, by introducing comparatively isolated researches on development under exceptional conditions, would defeat the main aim of the systematist.

MUSCINEÆ.

British Hepaticæ.*

It is somewhat surprising, when we remember the number of distinguished British hepaticologists that have been working continuously for the past twenty-five years or more, to find that it is just over sixty years since the British Hepaticæ were last dealt with in detail, and even then were included in a general Flora—Hooker's English Flora, Vol. v., 1833. It is true that the author of the work under consideration issued since the above date a libretto containing brief descriptions, accompanied by out-

* "Handbook of British Hepaticæ," by M. C. Cooke, M.A., LL.D., A.L.S. London: W. H. Allen and Co. 6s.

line figures of all known British species, and although the author speaks of this as being "little more than an illustrated catalogue," yet many cryptogamists would doubtless readily acknowledge their indebtedness to it.

It is well known that Dr. Cooke has for many years devoted the greater part of his time to the Fungi, and clearly explains his position as follows, after yielding to the frequently expressed desire on the part of many that he would expand his previous work into a manual :—"I have felt diffidence, since for many years another branch of the Cryptogamia has absorbed so much of my time and attention, that I have been unable to collect and study the Hepaticæ in the field, and therefore have to be content with the chronicle of the labour of others rather than my own."

The attempt to bring together the scattered literature of the last half century is a decided success ; British students of this most interesting group of plants have now at their command an excellent text-book, well up to date ; all sources of information, British and foreign, have been sifted, and every point of importance incorporated. The introductory chapter deals with structure and affinity. A concise diagnosis is given of each species, followed by a full synonymy, and, lastly, copious notes indicating general structure, points of agreement and of difference with allied species, are given. The outline figures, illustrating every species, add greatly to the value of the work. The type is bold and clear, and the general finish of the book good.

ALGÆ.

A New Species of Enteromorpha.

By E. M. Holmes, F.L.S.

Enteromorpha rhacodes, *n. sp.*

E. pallide viridis, fronde membranaceo-papyracea, hic illic irregulariter dilatata, densissime ramosa, ramis linearibus, patentibus, tortis, per totam longitudinem ramulos longiores vel breviores, simplices vel ramulosos, patentes, curvatos, aculeatos, emittentibus.

Fronde diplostromatica, ætate separante, cellulis polyhedris, rectangularibus vel quadratis, sine ordine positis, endochromate subconforme majorem partem cellulæ occupante, instructis.

Hab. Mouth of the Kowie River, S. Africa. Dr. H. Becker.

Judging from the specimens received, the plant appears to form floating masses like *E. percursa*. The long slender branches, covered with curved spine-like branchlets, are almost inextricable, and, owing to their fragility when moistened, it is nearly impossible to mount a perfect specimen. For the same reason the base of the plant has not been observed. In some pieces the frond appears to be dilated into an ulvoid expansion, but in these portions the two layers of cells separate, as in *Enteromorpha Linza*.

A similar dilatation in *E. ramellosa*, Kütz., from Kerguelen's Land, is figured in Kütz., Tab. Phyc., Vol. vi., p. 41, f. 3.

In some respects the plant bears a superficial resemblance to *Letterstedtia insignis*, but I have not observed any trace of the mode of development of branches characteristic of that plant, viz., from lateral fissures in the main frond, and the cells are not, as in *L. insignis*, vertically twice as long as broad and densely packed with endochrome, but are often twice as broad as long, with the endochrome not filling the cell. The cell-walls of *E. rhacodes* appear to swell in fresh water and give a gelatinous appearance to the plant, which, however, disappears in drying. This plant seems to bear the same relation to *E. clathrata* that the *E. subsalsa* of Kjellman (Alg. Arct. Sea, p. 292, Tab. 31, f. 1) bears to *E. micrococca*, Kütz.

NEW BRITISH MARINE ALGÆ.

By E. A. L. Batters, B.A., LL.B., F.L.S.

Pleurocapsa amethystea, *Rosenv., Grönlands Havalger* (*Særtryk af Meddelelser om Grönland*, III.), *p.* 967.

Colour dirty violet, vegetative cells at first solitary, round, or by the mutual pressure of adjacent cells angular, when seen from above, 10-13 μ in greatest diameter, hemispherical, compressed or subglobose. By repeated vertical and horizontal division of the cells hemispherical or subglobose families, 45 μ or more in diameter, are formed. By the final divisions minute spores, 1-2 μ in diameter, are formed.

Hab. On the fronds of *Rhizoclonium riparium*.

The above description, which is a translation of Rosenvinge's diagnosis of the species, exactly describes a plant which we gathered in June, 1890, at Puffin Island, off the coast of Anglesey. The plants grew on and over the filaments of *Urospora flacca*, *Rhizoclonium riparium*, and other high-water species, either singly or in small groups, and were of a dirty violet colour. The habit of the plant and its colour at once distinguish it from *Pleurocapsa fuliginosa*. We have received specimens, also from Puffin Island, of what appears to be the same species from Mr. Harvey Gibson.

Rhodochorton membranaceum, *Mag., f.* **macroclada,** *Rosenv., l.c., p.* 794.

M. Rosenvinge has given this name to those specimens of *R. membranaceum* in which the tetraspores are borne on free exserted filaments, sometimes consisting of as many as 40 cells, 6-8 μ in diameter. The specimens of this species mentioned as occurring at Berwick (Batters, List Mar. Alg., Berwick, p. 101) are referable to this variety, as are also the specimens from Brighton in my copy of Holmes' Algæ Britannicæ Rariores exsiccatæ, part vi. On the other hand, specimens gathered at Cumbræ are certainly

referable to the typical form, in which the tetraspores are borne on very short filaments, usually consisting of from one to three cells, and consequently only just appearing through the tissues of the *Sertularia*. The difference between specimens of the typical form and those of the variety is so great that one can at first sight hardly believe they belong to the same species.

Leptonema fasciculatum, *Rke., f.* **subcylindrica,** *Rosenv., l.c., p* 879.

As has already been remarked in this journal, No. 102, p. 57, British specimens of *Leptonema fasciculatum* do not produce the projecting Ectocarpoid sporangia figured by Dr. Reinke and Herr Gran, the portion of a fertile filament bearing plurilocular sporangia being only slightly thicker than the sterile portion, the beaks of the several chambers only slightly projecting. To this variety Herr Rosenvinge has given the above name.

Ectocarpus Stilophoræ, *Crouan.* Var. **cæspitosa,** *Rosenv., l.c., p.* 892.

Plurilocular sporangia collected into dense tufts, linear, 4-6 μ in diameter, uniseriate.

Mr. T. H. Buffham has very kindly sent us for examination a slide of an *Ectocarpus* (gathered at Weymouth), which appears to be identical with this variety of *Ect. Stilophoræ,* described by Rosenvinge.

Mr. E. M. Holmes, F.L.S., has kindly sent us the following note on another New British Marine Alga :—

" Vaucheria coronata, *Nordst.*

This species was found by Mr. J. Jack, at the Mason's Cove, near Arbroath, bearing fructification in May, 1893. It forms a dense cushion about $\frac{1}{3}$ inch in height, but extending for many inches. It grows near high water mark.* This species has not hitherto been detected in Britain, but has probably been overlooked, owing to the fruit not being regularly scattered over the tufts, but abundant in one part, and entirely absent in another. I have seen apparently the same plant both at Berwick-on-Tweed and near Sidmouth, but have never before been able to detect oogonia. I have generally met with it in small caves or on damp, rocky ledges near the shore of the open sea, where it would be somewhat shaded from the sun, but exposed to the wash of high tide, and possibly to fresh water draining through sandstone rock. Probably like many other *Vaucheriæ,* it fruits both in spring and autumn. When in fructification it is one of the most easily recognized species, owing to the oogonium being surmounted by a minute crown of 3-6 small tubes, but which in a dried state appear like folds or plaits rather than tubes.

The original description is given in " Botaniska Notiser," 1879, pp. 177, 178. For the benefit of those British algologists who may not have access to that publication, the description is here transcribed.

* Dr. Nordstedt describes the plant as growing in damp, grassy places about Oresund, fruiting in the autumn.

Vaucheria coronata, *n.sp.*, *Tab.* I., *Fig.* 1-9.

V. (piloboloidea) antheridiis in apice ramulorum breviorum lateralium rectis apice truncato-rotundatis, sub-apice tubulo lato fœcundationis præditis, e parte basilari ramuli cellula inani discretis, singulis vel sæpius binis (uno apicali, et altero laterali vel rarius, ut videtur binis apicalibus); oogoniis singulis, subsessilibus, superiori parti ramuli antheridium sustinente, rarius thallo insidentibus, obovatis vel oblique obovatis, apice corona tuborum minorum 3-6, fecundationis ornatis ; oosporis globosis vel subglobosis oogonium non plane complentibus, membrana oospori naturi crassa subtilissime scrobiculato-punctata. Diametr. thalli, 48-70 μ; lat. oogon, 124-145 μ, long. 145-180 μ; lat. oospor, 116-136 μ, long. 116-145 μ; lat. anther. sin. tub. fœcund. 30-40 μ; crass. membr. oosp. ad 5 μ."

Bibliography.

Studier öfver Chlorophycéslägtet Acrosiphonia, J. G. Ag., och dess Skandinaviska arter, af F. R. Kjellman, Med. 8 Taflor (Bihang till K. Svenska vet.-akad. Handlingar, Bd. 18, Afd. iii., No. 5), pp. 1-114.

The genus *Acrosiphonia*, J. G. Ag., is adopted by Professor Kjellman in preference to the older name *Spongomorpha*, Kütz., for a section of the genus *Cladophora*, the plants of which are characterized by growing gregariously in dense tufts furnished with root-like branches, which can act as stolons and give rise to new individuals, and which have the cells thinner and more elongated. He prefers the Agardhian name, since Kützing includes some species, *e.g.*, *C. vaucheriaformis*, in his section *Comosæ*, but which properly belong to *Acrosiphonia*. Twenty Scandinavian species of the genus are enumerated, of which number thirteen may be regarded as new, a detailed description of each being given. Several of these have been hitherto confounded under the names of *C. arcta* and *C. uncialis*. To clear up the intricate synonymy, as far as Scandinavian species are concerned, a list of the species of *Acrosiphonia*, occurring in the Exsiccatæ of Areschoug, and of Wittrock and Nordstedt (pp. 101-104) is given, in which they are identified with the species now described by Kjellman, so far as this is possible.

Hitherto the fructification of the species of *Cladophora* has been very imperfectly known. In the genus *Acrosiphonia*, however, the grouping of the species is made to depend, in the first place, on the character of the fertile cells, and in the second on the arrangement of them in the branches.

Dr. Kjellman describes two sub-genera. In the one, *Melanarthrum*, the zoospores are minute and very numerous, and so densely packed as to render the fertile cells opaque ; in the other, *Isochrous*, the zoospores are larger and laxly disposed in the fertile cells, which are consequently not opaque. The first sub-genus is divided

into three sections. The first, *Speirogonicæ*, has the fertile cells scattered, one, two, or three together; the second, *Zoniogonicæ*, has the fertile cells in series of 10-30 or more, intercalated in the branches; and the third, *Acrogonicæ*, has the fertile cells forming a terminal series in the branches.

Other characters which are employed to distinguish the species are the presence of hooked branchlets, or of others of a short, spiny character, the presence of a distinct basal stratum, or of stoloniferous branches, the diameter of the branches, and the more or less compact character of the tufts.

References to dried specimens in published exsiccatæ,* or to published illustrations in the present work or in those of previous authors, is given in every case, except in that of *A. hemispherica*, Kjellm. MS.

The different species are found in fructification at definite periods in the year between April and September.

There can be little doubt that most if not all the species will be found on the northern coasts of Britain, if carefully searched for, and specimens in fructification selected. It should be observed that the species bearing falcate branches are more compact in habit, and present an appearance as if battered or old, owing to the interweaving of the branchlets, and that others may be recognized in the sea by their different degrees of laxity or compactness of the tufts.

Dr. Kjellman is to be congratulated on having made a beginning in the very difficult task of arranging the large group of Cladophoræ on a scientific basis, and in pointing out a method of classification which may be utilized in rearranging the species of this much-neglected genus. E. M. H.

Supplementary Notes on the Marine Algæ of the Orkney Islands. By G. W. Traill (Proceedings of the Botanical Society of Edinburgh?).

In this short paper Mr. Traill gives an account of the species of Algæ collected by him in the summer of 1891 when staying at South Ronaldsay. The author, who, we regret to say, has been obliged to give up collecting owing to delicate health, informs us that he gathered 115 species, of which four, viz., *Calothrix pulvinata*, *Calothrix scopulorum*, *Corallina Mediterranea*, and *Dictyosiphon hippuroides f. fragilis*, were new to the Marine Flora of Orkney. The last of these, a form new to Britain, although not to Ireland, is illustrated by a characteristic figure. Harvey's *Dictyosiphon fragilis* (a description of which first appeared in Kützing's "Species Algarum," p. 485) was founded on specimens gathered at Kilkee, on the West Coast of Ireland, having a somewhat different habit from *D. fœniculaceus*, and "differing in having their spores collected in clusters, as in *Striaria*, but not disposed in

* Apparently by a printer's error. Fasc. 23 of Wittrock and Nordstedt is repeatedly mentioned, when the number should be 22.

transverse bands." No mention is made of this grouping of the spores in the description of the plant given by Kützing. Harvey mentions the plant in "Phycologia Britannica," but "from an unwillingness to multiply doubtful species" omits all mention of it in his "Synopsis" and subsequent works on British Algology. Prof. Kjellman in his "Algæ of the Arctic Sea" makes it a variety of *D. hippuroides*, but whether or not the Arctic plant is really the same as the Irish one I am unable to say. E. A. B.

Grönlands Havalger. Af L. Kolderup Rosenvinge (Særtryk af Meddelelser om Grönland, iii., pp. 765-981).

This paper is an important contribution to our knowledge of Arctic Algæ and will prove of exceptional interest to British Algologists, as many new species and forms likely to occur on the coast of Britain are described in it. The northern seas are rich in species of *Lithothamnia* and *Lithophylla*, and therefore one is not surprised to find two new species of the former genus described in Herr Rosenvinge's paper. The first of these species, *L. flabellatum*, consists of a bright rose-coloured expansion, closely adherent to its substratum, from the surface of which flabellately-branched, compressed, or cylindrical branches arise. The conceptacles are slightly raised, and the spores two-parted. The other species, *L. tenue*, appears to outwardly resemble *Lithophyllum Lenormandi*; figures of both species are given. Prof. F. Schmitz gives the description of two new plants belonging to the *Squamariaceæ*. The first of these, *Peyssonellia Rosenvingii*, Schmitz, somewhat resembles *Cruoriella Dubyi*, Schmitz = *Peyssonellia Dubyi*, Crn., in appearance, differing from it chiefly in its marginal growth, the rows of cells of the decumbent stratum regularly radiating from a point, while in *Cr. Dubyi* the decumbent stratum is formed by the union of numerous lobes, the cell rows of which are arranged flabellately. From *Peyss. rupestris*, Crn., *Peyss. Harveyana*, Crn., and *P. atropurpurea*, Crn., it differs by having thicker, shorter-jointed erect filaments, and a softer substance. The other plant, *Cruoria arctica*, Schmitz, forms a connecting link between the genera *Cruoria* and *Hæmatophlæa*, having sporangia like the former and structure and consistence like the latter, but differing from both by possessing numerous glandular cells. Herr Rosenvinge is of opinion that only one *species* (*A. plumula*, Thur.) of the genus *Antithamnion* is found on the coast of Greenland, and to this species he refers as mere varieties *A. boreale*, Kjellm., *A. Pylaisæi*, Kjellm., and *A. floccosum*, Kjellm. Prof. F. Schmitz furnishes notes on the new genus *Turnerella*, Schmitz (founded on *Iridæa Mertensiana*, Post. et Rupr.), to which he refers *Kallymenia Pennyi*, Harv., *K. rosacea*, J. Ag., and *K. septemtrionalis*, Kjellm., and on a new species, *C. sanguinea*, Schmitz, of *Callymenia*.

By dividing the *Rhodophyceæ* into two sections—*Floridee* and *Bangioideæ*—Herr Rosenvinge has avoided placing the genera *Porphyra* and *Bangia* in the *Floridee* without at the same time

removing them from among the red sea-weeds. The author has united the genera *Diploderma*, Kjellm., with the much older genus *Porphyra*, Ag., as he does not regard the diplostromatic nature of the frond, a character on which the genus was founded, as constant. He also regards *D. amplissima*, Kjellm., *D. tenuissima*, Strömf., and *P. abyssicola*, Kjellm., as simply forms of one polymorphic species, *P. miniata*, Ag.

A new species of *Laminaria*—*L. grœnlandica*—which may, however, prove to be only a young state of *L. caperata*, De La Pyl., and a new *Myriocladia*—*M. callitricha*—characterized by the frond being thickly clothed with long, simple or branched, coloured hairs are also described. The author has been fortunate enough to discover plants belonging to no fewer than four new genera, the diagnoses of which are given in his book. Three of these, *Cœlocladia*, *Omphalophyllum*, and *Symphyocarpus* belong to the *Phœophyceæ*, the remaining one (*Chætobolus*) to the *Chlorophyceæ*.

In the first of these genera, *Cœlocladia*, the frond is filiform, branched, and hollow ; the growth trichothallic. The plurilocular sporangia shortly cylindrical, covering the whole surface of the frond, usually 1-4 laterally connate. The genus contains one species, *C. arctica*.

The second genus, *Omphalophyllum*, is thus diagnosed. Frond most probably at first saccate, then torn and plane; when old shortly umbilicately stalked. Membranous, composed of 1-2 strata of cells ; hairs wanting. Unilocular sporangia scattered, of the same form as the vegetative cells. The single species described is *O. ulvaceum*. In *Symphyocarpus*, the other new genus of *Phœophyceæ*, the frond forms an incrustation composed of a basal stratum, from which erect filaments arise. Basal portion formed of a single layer of creeping filaments, at first free and arranged in an irregularly radiating manner, then confluent. Erect filaments very short, of equal length, simple or subdichotomous, free, but very closely packed together. Each cell contains a single disc-shaped apical chromatophore. Plurilocular sporangia, oblong-ovate, situate at the apices of the erect filaments, 2-4, laterally connate, opening at the apex. The genus contains a single species, *S. strangulans*.

The new genus *Chætobolus* is thus described. Frond epiphytic, usually nearly hemispherical, more rarely sub-globose. Cells divided in all directions. In the hemispherical fronds the basal margin is composed of a series of sub-radiating cells. The superficial cells (with the exception of the marginal ones), if not covered with other algæ, are drawn out into a long inarticulate apical tube, which is not separated by a septum from the cell which bears it. Propagation, most probably, by zoospores formed in the superficial cells. *Ch. gibbus* is the only species.

In addition to the genera above mentioned Herr Rosenvinge forms a new genus, *Gayella*, for the reception of the *Schizogonium radicans* of Foslie, and the *Ulothrix discifera* of Kjellman. The

author is induced to do this by the fact that the frond in these two species, which at first is filiform and simple, or very slightly branched, and composed of a single row of cells, then longitudinally divided in many directions, always remains filiform, and is never flat and ribbon shaped. In all other respects the genus agrees with *Schizogonium*.

Besides the new genera and species already mentioned, two new species of *Ectocarpus—E. pycnocarpus* and *E. œcidioides;* a new species of *Urospora—U. Hartzii;* two new species of *Ulvella—U. confluens* and *U. fucicola;* two new *Monostromæ—M. leptodermum* and *M.* (?) *grœnlandicum;* a new *Chlorochytrium, Ch. Schmitzii;* and a new *Pleurocapsa, P. amethystea,* not to mention several new forms and varieties of other species, *e.g.,* a new and interesting variety ? of *Pogotrichum filiforme,* Rke., are described and figured for the first time in this paper.

The paper is fully illustrated, and is well worthy of careful study, and the author is certainly entitled to the thanks of all algologists. E. A. B.

Om en ny organisationstyp inom slägtet Laminaria. Af F. R. Kjellman, Med. 1 Tafla, Stockholm, 1892, pp. 1-17. (Bihang till K. Svenska vet.-akad. Handl., Band 18, Afd. iii., No. 7).

In this paper Dr. Kjellman points out that a new method of arranging the genus *Laminaria* is possible, dependent upon the character and position of the sori. He recognizes eight types, and divides them into two groups, the one having the sori occupying the central portion of the frond, and the other the lateral portion. The following species are chosen as the types :—

1. *L. Agardhii,* Kjellm.—Sorus developed about or above the middle of the frond.

2. *L. longipes,* Bory.—Sorus developed at the base of the leaf before the new leaf appears.

3. *L. bullata,* Kjellm.—Sorus developed at the base of the leaf after the new leaf has appeared.

4. *L. hieroglyphica,* J. Ag.—Sorus arising from the union of several partial sori, and occupying the centre of the frond.

5. *L. digitata,* Lamour.—Sori usually numerous on each division of the frond.

6. *L. angustata,* Kjellm.—Sori, one or few, on each margin of the leaf, and on one surface only, and developed before the new frond is formed.

7. *L. Rodriguezii,* Born.—Sori on both sides of the frond, developed after the new frond is formed.

8. *L. gyrata,* Kjellm., MS.—Sori branched, numerous on each side of the leaf.

The last species is now described for the first time, and is figured on Tafl. 1. It apparently bears some resemblance to *L. hieroglyphica,* but has a short stem, and the sori do not become confluent, and a central band is left quite free from sori. It has no muciferous lacunæ. E. M. H.

No. 104. June, 1894.

Grevillea.

A QUARTERLY RECORD OF CRYPTOGAMIC BOTANY AND ITS LITERATURE.

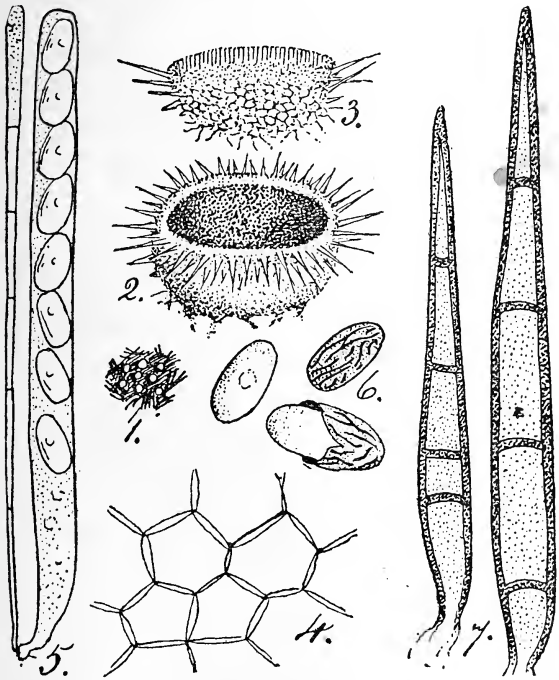
FUNGI.

New or Critical British Fungi.

By G. Massee.

Ascobolus barbatus, *Mass. & Crossl.*

Ascophore up to 1 m.m. diameter, gregarious or crowded, hemispherical at first, then almost or quite plane; excipulum parenchymatous; cells irregularly polygonal, large; disc varying from deep orange-red to bright crimson; externally yellowish, pilose, hairs brown, thick-walled, septate, conical, pointed, smooth, 80-130 × 10-12 μ, largest and most abundant near the margin; asci cylindrical, apex rounded, narrowed at the base to a slender pedicel, 8-spored;



Ascobolus barbatus, Mass. & Crossl. 1, group of fungi, natural size; 2, 3, entire fungus and section, × 75; 4, cells of excipulum; 5, ascus with spores and paraphyses; 6, spores in various stages of development; 7, marginal hairs; figs. 4-7 × 500.

spores obliquely 1-seriate, elliptical, ends obtuse, smooth and hyaline for a long time, then the epispore becomes violet and finally violet-brown, and marked with delicate anastomosing lines, 16-18 × 9 μ; paraphyses straight, septate, the upper half gradually increasing in thickness, tips about 5 μ broad, orange.

A remarkable species, intermediate between *Ascobolus* and *Lachnea*, agreeing with the former in having the epispore violet, then brownish, and minutely more or less longitudinally rugulose at maturity, the asci, however, so far as I have observed, do not project beyond the surface of the disc at maturity; the large-celled parenchymatous excipulum also agrees with *Ascobolus*. In the early stage, while the spores are yet hyaline, the fungus would pass for a species of *Lachnea*.

Mostly closely allied to *Ascobolus brunneus*, Cke., but clearly distinguished by the narrowly cylindrical asci, and 1-seriate, smaller spores.

Ascobolus marginatus, *Mass.*

Ascophore sessile, at first almost globose, then becoming narrowed at the base, apex truncate, disc at length quite plane, bounded by a slightly raised, blunt margin, soft and pellucid, almost hyaline or with a slight tinge of olive, quite glabrous; $\frac{1}{2}$-1 m.m. across; excipulum parenchymatous, cells almost regularly hexagonal, 10-16 μ diameter; asci clavate, apex slightly narrowed, pedicel short, slender, 8-spored, slightly projecting above the surface of the disc at maturity, 8-spored; spores irregularly 2-seriate, elliptical, ends rather acute, continuous, epispore persistently smooth, pale rosy-violet, then purple-brown, 15-16 × 6-7 μ; paraphyses hyaline, septate, about 2 μ thick, apex not thickened; hypothecium minutely parenchymatous.

On dung of ass. Kew.

Distinguished by the small size of the spores and by the epispore remaining perfectly smooth, and without marks or lines at maturity.

Geopyxis Bloxami, *Mass.*

Ascophore stipitate, hemispherical, then expanding and becoming saucer-shaped, or sometimes nearly plane, thin, rather flexible, margin entire, $\frac{3}{4}$-1$\frac{1}{2}$ c.m. across; externally smooth and even; stem $\frac{1}{2}$-1 c.m. long, about 3 m.m. thick, equal, smooth, even; every part pale tan (in the dry state); excipulum formed of slender, hyaline, thin, intricately interwoven hyphæ; these pass near the surface into a parenchymatous cortex composed of polygonal cells, 6-8 μ diameter; asci cylindrical, apex truncate, narrowed at the base into a slender pedicel, 8-spored; spores obliquely 1-seriate, hyaline, smooth, continuous, elliptic-oblong, ends obtuse, 34-38 × 8-9 μ; paraphyses septate, about 2 μ thick, apex not thickened, sometimes branched.

On the ground. Oxford (Baxter).

Allied in the form and size of the spores, and also in the structure of the excipulum, to *Geopyxis coccinea*, but distinguished by colour, being glabrous externally, and in growing on the ground.

Orbilia Scotica, *Mass.*

Gregarious, at first subglobose and closed, then expanding and becoming almost plane, with a slight central depression, margin entire, glabrous, thin, almost translucent when moist, irregularly contracted when dry, deep rose-red, sessile, and attached by a central point, up to $\frac{3}{4}$ m.m. across; excipulum parenchymatous, cells irregularly polygonal, 5-7 μ diameter; hypothecium tinged red; asci clavate, apex rounded, base slender and usually crooked, 8-spored; spores irregularly 2-seriate above, 1-seriate below, hyaline, continuous, elliptic-oblong, ends obtuse, 4×1 μ; paraphyses about 1 μ thick, tips subglobose.

On rotten wood. Aboyne, N.B.

The type specimen is in Herb. Berk., Kew, under the name of *Peziza vinosa* (=*Calloria vinosa*), from which it differs in the very much smaller, differently shaped spores, although superficially the two species closely resemble each other.

Peziza reticulata, *Grev.*

A batch of this rare and beautiful species has been received from Mr. E. W. Swanton, Wincanton, Somerset. The largest specimen measured five inches across, hymenium very much waved and contorted, coarsely nodulose and reticulated, brittle; hypothecium and excipulum composed entirely of densely interwoven, hyaline, septate hyphæ, 5-7 μ thick. Smell very slight.

Revised Descriptions of Type Specimens in Kew Herbarium.

By G. Massee.

In endeavouring to stereotype certain species that have been more or less inadequately defined in the first instance, it has been considered advisable to retain the name under which the species was first described; later ideas as to the position of the species will be gathered from the synonyms appended :—

Peziza cruenta, *Schw., Syn. Fung. Amer. Bor., No.* 943, *p.* 177 (1834).

Gregarious, sometimes confluent, sessile, fixed by a point, at first closed, then becoming widely open, margin often wavy, slightly raised; up to 1 m.m. across; substance soft and thin; disc slightly concave, crimson or orange-red, externally paler, the margin and for a short distance below furnished with small projecting tufts of clavate or obtuse hyphæ, $25\text{-}35 \times 5\text{-}6$ μ; these tufts are usually agglutinated together by amorphous, honey-coloured lumps; cells of cortex polygonal, 7-9 μ, near the margin; asci small, narrowly clavate, pedicel long, slender, crooked, 8-spored; spores irregularly 1-seriate, or sometimes 2-seriate above, hyaline, continuous, cylindric-oblong, ends obtuse, $4\text{-}5 \times 1\cdot5$ μ; paraphyses hyaline, slender, clavate or lanceolate at the tips.

Peziza cruenta, Sacc. Syll., VIII., No. 1183.

Peziza (*Mollisia*) *fibriseda*, Berk. & Curt., Notices of North American Fungi, No. 737, in Grevillea, Vol. III., p. 157 (1875).

Pseudohelotium fibrisedum, Sacc. Syll., VIII., No. 1243.

Peziza (*Mollisia*) *saccharifera*, Berk., Notices of North American Fungi, No. 738, in Grev., Vol. III., p. 157 (1875).

Pseudohelotium saccharifera, Sacc. Syll., VIII., No., 1242.

Peziza rufula, Schw., Syn. Fung. Amer. Bor., No. 945, p. 177.

Pezizella rufula, Sacc. Syll., VIII., No. 1177.

Peziza regalis, Cooke & Ellis, Grev., Vol. VI., p. 91 (1878).

Pezizella regalis, Sacc. Syll., VIII., No. 1182.

Exsicc.—Ellis & Everhart, N. Amer. Fung., ser. ii., No. 2326; Ellis, N. Amer. Fung., No. 438.

On bark of *Ulmus Americana*. Virginian Mountains (No. 3311, no collector's name on label). On *Liquidambar*. Alabama (Peters, No. 5208).

Specimens from Schweinitz, also Berkeley's type specimens examined.

Soft and inclined to be gelatinous when moist, rigid and somewhat pellucid when dry; the margin is usually incurved when dry, leaving a narrow slit or often a triangular opening. The margin is irregular, due to the projecting tufts of hairs, as is also the outside for some distance down; the amorphous lumps adhering to and probably secreted by the tufts of hyphæ give the appearance of being "externally clothed with sugar-like granules."

It would be interesting to ascertain whether *Peziza conchella*, Schw., is identical with the above. However, there is no material at Kew from Schweinitz; perhaps some American mycologist will settle this point.

Peziza chlora, *Schwein., Syn. Fun. Car. Sup., p. 96, No. 1235* (an extract from *Soc. Nat. Cur. Lips.*, 1822).

Gregarious, sessile, soft, and rather fleshy, at first globose and closed, then expanding, but remaining slightly concave; usual colour of the entire fungus pale yellowish-green, but sometimes passing through pale yellow to orange; externally glabrous but minutely wrinkled, 1-2 m.m. across, hypothecium and excipulum composed of closely interwoven hyphæ, these become tinted and thicker where they form the cortex; asci narrowly clavate, apex rounded, base narrowed into a slender, crooked pedicel, 8-spored; spores obliquely 1-seriate, hyaline, continuous, sausage-shaped, often slightly curved, 5-6 × 1-5 μ; paraphyses hyaline, slender, slightly clavate at the tip.

Chlorosplenium Schweinitzii, Fries, Summa Veg. Scand., p. 356; Sacc. Syll., VIII., No. 1328.

Peziza crocitincta, Berk. & Curt., notices of North American Fungi, No. 749, in Grev., Vol. III., p. 160 (1875); Grev., t. 1, fig. 5 (the orange form).

Pezizella crocitincta, Sacc. Syll., VIII., No. 1193.

On decayed wood, and inside of bark. U.S. America.

Authentic specimen from Schweinitz examined.

The present species appears to be not uncommon in the United States, being represented in the Kew Herbarium from Carolina (Schweinitz) ; North Greenbush (C. H. Peck) ; Cotoosa Springs, Georgia (Ravenel, No. 1730) ; Pennsylvania (Dr. Michener, No. 3602); Newfield, N.J. (J. B. Ellis, No. 2886).

The range of colour from yellowish-green through clear yellow to orange or saffron is often shown in the different plants in the same group. When dry the margin is incurved and more or less wrinkled.

Peziza rhaphidospora, *Ellis, Bull. Torrey Bot. Club, Vol.* VI., *p.* 107 (1876).

Gregarious or sometimes more or less confluent, sessile, subglobose when young, soon becoming plane or even slightly convex, rather fleshy, minute, up to $\frac{1}{2}$ m.m. across, milk-white or subfuscous ; cortex as seen from the outside composed of irregularly parallel, septate hyphæ radiating from base to margin ; brownish at the base, becoming paler and running out into crowded, parallel, free hyphæ at the margin ; externally and the margin downy, due to the presence of numerous spreading, hyaline, septate, thin-walled hairs, which are often more or less bulbous at the base, 80-120 × 5 μ ; asci clavate, apex abruptly narrowed to a point, base continued into a slender pedicel, 8-spored ; spores very long and slender, apex blunt, base pointed, hyaline, smooth, at first multi-guttulate, then multi-septate, usually more or less curved, arranged in a parallel bundle in the ascus, 65-75 × 3 μ ; paraphyses slender, becoming slightly thickened at the tip.

Erinella rhaphidospora, Sacc. Syll., VIII., No. 2101.

On old decaying pine stump and on decaying wood of *Castanea.* Newfield, New Jersey (Ellis).

Authentic specimen from Ellis examined, also specimen in N.A.F., 842.

When treated with iodine solution the septation of the spores is very distinct. The external hairs are thin-walled and soft, but in form resemble the stout, rigid hairs characteristic of *Lachnea,* being more or less bulbous at the base, and becoming thinner towards the point. The following note accompanied Ellis's specimen sent to Dr. Cooke, which is now in the Kew Herbarium :— " Peziza (Dasysc.) rhaphidospora, *Ellis.* On an old pine stump, Newfield, N.J., Nov., 1875. Gregarious, minute, nearly plane, subconfluent, milk-white or subfuscous, woolly. Asci clavate, paraphyses thickened above, sporidia linear-lanceolate, nearly as long as the asci, nucleate.—J. B. E."

Peziza rhaphidospora, *Berk. & Curt., Fungi Cubenses No.* 683 *in Linn Soc. Journ., Vol.* X., *p.* 368 (1869).

Gregarious ; sessile, at first globose and closed, then expanding and becoming plane with a slightly raised, rounded margin, 1-2 m.m. across ; disc dingy reddish-orange or rufous (when dry), externally pale, minutely but densely downy, due to the presence of numerous thin-walled, septate, obtuse, hyaline hairs, 50-80 × 4-5 μ, generally rough with minute particles of lime, margin

similar; excipulum entirely composed of interwoven hyaline hyphæ, 4-5 μ thick, these run parallel and form a pseudo-parenchymatous cortex; asci clavate, 8-spored; spores very long and slender, both ends rather pointed, hyaline, smooth, for a long time continuous and with granular contents, then 1-septate, and finally distinctly 3-septate, 30-35 × 3-3·5 μ; paraphyses numerous, cylindrical, tip not usually thickened, 3 μ thick, agglutinated together.

Erinella rhaphidospora, Sacc. Syll., VIII., No. 2100.

On rotten wood and bark. Venezuela.

This species also occurs in Cuba, where it was collected by Wright, No. 364, in Herb. Berk.

Type specimen, also Cuban specimen examined.

Peziza lobata, *Berk & Curt., Fungi Cubenses, No.* 663, *in Linn. Soc. Journ., Vol.* x., *p.* 365 (1869); *Cooke, Mycogr., p.* 155, *fig.* 265 (spores represented as being minutely warted).

Scattered or gregarious, sessile and attached by a central point, at first closed, soon expanding and becoming almost or quite plane, margin usually more or less lobed and wavy, thin, $\frac{2}{3}$-$1\frac{1}{2}$ c.m. across; disc often with a few raised, anastomosing wrinkles, rufous, externally paler, glabrous or nearly so; excipulum very dense, consisting of interwoven hyphæ, which pass into parenchyma to form the cortex, which is also dense and not much differentiated, external cells 8-12 μ diameter; asci cylindrical, apex obtuse, 8-spored; spores globose, hyaline, permanently smooth (?), 1-seriate, 11-12 μ diameter; paraphyses septate, gradually becoming clavate towards the tip.

Peziza sarmentorum, var. *geophila*, B. & Br., Enumer. Fung., Ceylon, No. 921, in Journ. Linn. Soc., Vol. XIV., p. 102 (1875).

Barlæa lobata, Sacc. Syll., VIII., No. 446.

Exs.—Fungi Cubenses Wrightiani, No. 663.

On the ground. Cuba (Wright, No. 652); Ceylon (Thwaites, No. 1055).

All the above quoted specimens examined.

In Mycographia, Fig. 265, the spores of the present species are represented as being minutely verrucose. In all the specimens that I have had an opportunity of examining the spores are perfectly smooth, often with minutley granular contents, which might possibly be mistaken for a verruculose surface. Nevertheless, remembering how rarely the ultimate condition of epispore marking is observed in the case of certain species that are known to have ornamented spores, it will be well to leave the question open for the present.

Peziza Cucurbitæ, *Gerard, Bull. Torrey Bot. Club, Vol.* v., *p.* 26 (1874).

Scattered, globose when young, then expanding and becoming almost or quite plane, scutellate, margin entire, fleshy, up to 1 m.m. across; disc pale tan colour, externally paler, glabrous; hypothecium and excipulum alike in structure, formed of very compactly interwoven, septate, hyaline hyphæ, the basal portion of

the ascophore furnished with numerous hyaline, aseptate hyphæ about 3 μ thick, which attach the fungus to the substratum; asci cylindrical, apex rounded, base narrowed, 8-spored; spores obliquely 1-seriate, hyaline, continuous, smooth, elliptical, ends obtuse, 8-9 × 5 μ; paraphyses numerous, hyaline, septate, cylindrical, apex not thickened, about 2 μ thick, sometimes branched.

Pezizella Cucurbitæ, Sacc. Syll., VIII., No. 1187.

On dry rind of squash (Cucurbita). Poughkeepsie, U.S.A. (Gerard).

Authentic specimen from Gerard examined.

When dry, contorted, somewhat horny, and disc dark purple-brown (Gerard).

Peziza exasperata, *Berk. & Curt., Grev., Vol.* III., *p.* 152, *fig.* 55 (1875) *Cooke, Mycogr., fig.* 21 (warts on the spores too numerous and too minute).

Ascophore sessile, subglobose at first, then becoming almost plane, margin persistently more or less upraised or incurved, up to 1 c.m. across; deep crimson-lake or almost scarlet, disc slightly concave, margin even, externally covered with small warts; excipulum composed of interwoven hyphæ, passing into parenchyma at the cortex, cells polygonal, 10-16 μ diameter, growing out in groups to form the external warts; asci cylindrical, apex rounded, base narrowed to a slender pedicel, 8-spored; spores 1-seriate, hyaline, globose, rather distantly studded with minute, subglobose warts at maturity, 13-14 μ diameter; paraphyses septate, gradually becoming clavate upwards, the orange-red tip being 5-6 μ broad.

Barlœa exasperata, Sacc. Syll., VIII., No. 420.

On burnt ground. Alabama (Peters).

Type specimen examined.

Peziza epitricha, *Berk., Hook Journ. Bot., Vol.* II., *p.* 10 (1843).

Gregarious or crowded, subglobose and closed at first, then becoming nearly plane, sometimes slightly marginate, fleshy, 1-4 m.m. across, entirely dark red; externally smooth except near the base, where the large cortical cells give origin to numerous stout, septate, brownish hyphæ that fix the fungus to the substratum; excipulum of densely wefted hyaline hyphæ, which pass into a coloured parenchymatous cortex, the external cells 15-25 μ diameter; asci cylindrical, rather shortly stipitate, 8-spored; spores obliquely 1-seriate, hyaline, smooth, continuous, elliptical, ends obtuse, 18-20 × 8 μ; paraphyses septate, apex broadly clavate and 6-8 μ thick.

Humaria epitricha, Sacc. Syll., VIII., No. 460.

On rotten wood. Uitenhage, Cape of Good Hope. (Zeyher, No. 58, "On putrified wood; colour dark-red.")

Peziza epitephra, *Berk., Flora Tasm., p.* 275 (1860).

Gregarious on the under surface of dead leaves; sessile, deeply cup-shaped, base slightly narrowed, substance thin and dry, entirely

snow-white, margin at first incurved, soon quite erect, entire; externally minutely granular, due to the presence of a deep coating of crystals of oxalate of lime, otherwise glabrous, $\frac{1}{2}$-$\frac{3}{4}$ m.m. across; excipulum composed of parallel, sometimes branched, rows of hyaline, septate hyphæ, 6-8 μ thick, which run from the base to the margin; asci cylindric-clavate, pedicel short and stout, 8-spored; spores irregularly 2-seriate, hyaline, smooth, continuous, cylindrical, ends obtuse, straight or very slightly curved, 4-5 × 1·5-2 μ; paraphyses very slender, about $1\frac{1}{2}$ μ thick, tips not thickened.

Tapesia epitephra, Sacc. Syll., VIII., No. 1573.

On the under surface of dead leaves.

The interwoven, brown, curled hairs mentioned by Berkeley belong to the leaf, and do not represent a subiculum as interpreted by Saccardo, who has consequently placed the fungus in the genus *Tapesia*.

A very beautiful little species, does not change colour in the least, nor yet becomes contracted during drying, but remains quite open and erect, probably due to the external coating of particles of lime, which give an amount of rigidity the contraction of the cup is unable to overcome.

Type specimen examined.

Peziza funerata, *Cooke, Grev.*, VI., *p.* 142 (1878); *Cke., Mycogr., fig* 380; *Sacc. Syll.*, VIII., *No.* 306.

Ascophore at first subglobose and closed, then expanding and becoming deeply cup-shaped with the margin irregularly split and spreading; flesh thin, brittle; disc pale brown or with an ashy tinge, externally brown, downy, and densely covered with particles of sand, 1-2 c.m. high and broad; excipulum parenchymatous, cortical cells polygonal, 20-25 μ diameter, giving off numerous brownish, septate hyphæ; the base of the ascophore is sometimes rounded, at others contracted into a very short, stem-like base; asci cylindrical, apex truncate, 8-spored; spores 1-seriate, slightly oblique, continuous, hyaline, smooth, broadly elliptical, ends obtuse, 17-20 × 8-10 μ; paraphyses septate, about 4 μ thick at the slightly thickened tip.

Immersed among sand. Gainsville, Florida. (Ravenel, Dec., 1877.)

Ravenel, in a note accompanying the specimens, says the plants are at first globose, closed, and completely buried in the sand, then the cups open and the margin becomes split and spreads flat on the sand, the cups remaining buried.

Specimens in every detail identical with the above have been received at Kew from sandy ground near Clarendon, N. S. Wales.

Peziza earoleuca, *B. & Br., Fung. Ceylon, No.* 943, *in Journ. Linn. Soc., Vol.* XIV., *p.* 105 (1875).

Ascophores usually densely gregarious, sessile or with a very short stem-like base; at first almost clavate or subglobose, then expanding, the disc becoming plane or slightly convex, fleshy; snow-white, the disc having a tinge of yellow when dry, externally

and the margin downy, the down consisting of slender hin. walled, septate hyphæ, 3-4 μ thick, which spring from the cortical cells, margin formed of slender, parallel hyphæ of irregular length, $\frac{1}{2}$-$\frac{3}{4}$ m.m. across; asci narrowly clavate, apex rounded, 8-spored; spores obliquely 1-seriate, hyaline, smooth, continuous, cylindric-oblong, ends obtuse, straight or very slightly curved, 4-5 × 1-1$\frac{1}{2}$ μ; paraphyses hyaline, about 1$\frac{1}{2}$ μ thick, tips not thickened.

Trichopeziza earoleuca, Sacc. Syll., VIII., No. 1685.

On dead wood, branches, etc. Berkeley says also on herbaceous stems, but I do not find such in his herbarium.

This species appears to be not uncommon in the United States; No. 631, Ravenel, Fung. Amer. Exs., is exactly typical.

Type specimen examined.

Peziza (Sarcoscyphæ) melanopus, *Berk. & Curt., Fungi Cubenses, No.* 674, *in Linn. Soc. Journ., Vol.* X., *p.* 367 (1869).

Ascophore very shortly stipitate, clavate and closed at first, then expanding and becoming only slightly concave; disc yellow, externally whitish and downy, due to the presence of numerous cylindrical, septate, hyaline, obtuse, straight or slightly wavy hairs, 40-50 × 4-5 μ, rough with minute particles of oxalate of lime; hairs of margin similar, parallel; excipulum parenchymatous, cells small, much elongated radially (*i.e.*, from base to margin); 2-3 m.m. across; stem-like base very short, blackish; asci cylindric-clavate, apex rather narrowed, 8-spored; spores arranged in a parallel fascicle, hyaline, continuous, very long and slender, curved, ends rather pointed, 38-47 × 3-3·5 μ; paraphyses hyaline, cylindrical, apex not thickened, about 2$\frac{1}{2}$ μ thick.

Sarcoscyphus melanopus, Sacc. Syll., VIII., No. 634.

On wood among *Jungermanniæ*. Cuba. (Wright, No. 365.)

Type specimen examined.

Peziza harmoge, *B. & Br., Fungi of Ceylon, No.* 931, *in Linn. Soc. Journ., Vol.* XIV., *p.* 104 (1875).

Ascophore stipitate, closed at first, then opening and becoming almost or quite plane, rather thin and tough, flesh white, $\frac{1}{2}$-$\frac{3}{4}$ c.m. across; disc mulberry-colour, externally pale tan; stem about $\frac{1}{2}$ c.m. long, 2-3 m.m. thick, equal, pale greenish-yellow with a tinge of rose, smooth; hypothecium and excipulum formed of compactly interwoven, hyaline hyphæ, 3-6 μ thick, running out at the margin into parallel, septate hyphæ; asci cylindrical, rather thick-walled, apex thinnest, 8-spored; spores hyaline, smooth, continuous, elliptical, ends obtuse, 18-21 × 10 μ; paraphyses septate, slightly and gradually thicker up to the tip, hyaline.

Geopyxis harmoge, Sacc. Syll., VIII., No. 212.

On very rotten, fallen twigs. Ceylon. (Thwaites, No. 1061.)

Type specimen examined.

I find the spores to be shorter and broader than figured by Cooke in Mycogr., Fig. 282.

Peziza montiæcola, *Berk., Flora N. Zealand, Vol.* II., *p.* 201 (1855).

Sessile, globose at first, soon becoming plane, rather fleshy, pitch-brown when moist, black when dry, up to $\frac{1}{2}$ m.m. across, glabrous; cortex parenchymatous, cells almost regular in size, polygonal, sooty-brown, 8-10 μ diameter; asci clavate, apex slightly narrowed, base produced into a slender pedicel, 8-spored; spores irregularly 2-seriate above, 1-seriate below, hyaline, smooth, continuous, narrowly elliptical, ends obtuse, 1-2 guttulate, 11-13 × 4-5 μ; paraphyses numerous, very slender below, more or less forked, tips brown, thickened up to 7-8 μ broad.

Mollisia montiæcola, Sacc. Syll., VIII., No. 1348, clusters of 2-3, nestling in the axis of the leaves.

On dead plants of *Montia fontana.*

Eastern coast of New Zealand (Colenso).

Type specimen examined.

Peziza (Mollisia) sclerogena, *Berk. & Curt., Fungi Cubenses, No.* 695, *in Linn. Soc. Journ., Vol.* X., *p.* 369 (1869).

Gregarious, sessile, globose at first, then expanding until almost flat, margin remaining slightly raised and incurved, $\frac{1}{2}$-1 m.m. across; rather fleshy, soft when moist, rigid when dry; everywhere pale yellow, glabrous externally and at the margin; cortex truly parenchymatous, cells hexagonal-oblong, slightly elongated radially, 15-20 × 10-12 μ, becoming smaller upwards, and running out at the margin into closely-packed, parallel hyphæ; asci clavate, wall rather thick, 8-spored; spores irregularly 2-seriate, elongated, narrowly fusiform, ends somewhat pointed, usually slightly curved, smooth, hyaline, guttulate, finally 3-septate, 30-36 × 5-6 μ; paraphyses hyaline, slender, apex not thickened.

Belonidium sclerogenum, Sacc. Syll., VIII., No. 2053.

On palm petioles. Cuba. (C. Wright, No. 754.)

Type specimen examined.

Peziza (Hymenoscyphæ) soleniiformis, *Berk. & Curt., Notices of North American Fungi, No.* 748, *in Grev., Vol.* III., *p.* 160 (1875).

Pezizella soleniiformis, Sacc. Syll., VIII., No. 1159.

The type specimen of the above proves to be a species of *Cyphella,* having smooth, hyaline, subglobose spores 4-5 μ diameter.

On rotten wood. Alabama. (Peters.)

Helotium alutaceum, *B. & Br., Fungi of Ceylon, No.* 956, *in Journ. Linn. Soc., Vol.* XIV., *p.* 107 (1875); *Sacc. Syll.,* VIII., *No.* 1020.

Gregarious; sessile or attached by a very short, narrowed base, closed when young, then expanding and becoming almost plane, margin whitish, minutely downy, often rather wavy; disc pale tan-colour, externally whitish, attached to the matrix by white down springing from the base; excipulum minutely parenchymatous, the cells very narrow and elongated radially—from base to margin—becoming larger towards the outside, cortical cells polygonal, 8-11 μ diameter, passing into parallel hairs at the margin; asci cylindrical, 8-spored; spores 1-seriate, obliquely arranged, con-

tinuous, hyaline, smooth, elliptical, ends obtuse, 11-12 × 7 μ; paraphyses numerous, very slender, hyaline, 2 μ thick, slightly or not at all thickened at the tips, which are sometimes bent.

On dead branches.

Peradenya, Ceylon (Thwaites).

Type specimen examined.

Peziza rutilans, Fr., and Peziza polytrichi, Schum.

By G. Massee.

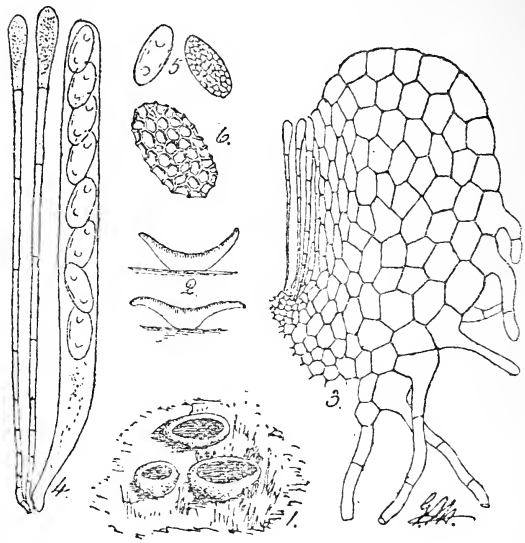
Judging from an examination of specimens in the exsiccati of various authors, and from herbarium specimens, there appears to be a diversity of opinion as to the species to which the names forming the heading of this note were respectively applied by the original authors. As in numerous similar instances, where the most constant and important characters depend on features revealed by the microscope, the brief descriptions furnished by early authors are not sufficient for certain identification, and modern descriptions of such supposed species do not help in any way to elucidate matters, as in many instances the external characters given in the original description apply to allied species having very different microscopic characters. As an illustration of this may be noted Cooke's conception of *Peziza polytrichi*, Sch., as figured in "Mycographia," fig. 50, with smooth, globose spores 11-13 μ diameter. This view of the species is adopted by Phillips, Brit. Disc., p. 87, and by Saccardo, Syll., VIII., No. 423. On the other hand Roumeguére, Fung. Gall., No. 4045, Rabenhorst, Herb. Myc., Ed. II., No. 310, and others, accept as *Peziza polytrichi*, Schum., a species having the spores elliptical, ends acute, 1-guttulate, minutely warted at maturity, 25-28 × 11-12 μ. Finally the species with elliptical spores last mentioned is accepted in Britain as *Peziza rutilans*, Fries. Other species are involved, as *Peziza humosa*, Fries, *Peziza leucoloma*, Hedw., etc.

There is a specimen in the Kew Herbarium, sent by Fries to Berkeley, named "Peziza rutilans, Fries," and it is somewhat curious that this specimen did not influence Cooke in preparing his figure of this species for "Mycographia." This specimen I have accepted as the true *P. rutilans*, Fr., and, as the exsiccati quoted show, is also accepted by several authors. Book synonymy is not attempted, as in looking over various diagnoses the original description of the external aspect of the fungus is found tacked on to such dissimilar forms of spore that it appears to be sheer waste of time attempting to correct the mistakes of others, and in addition, probably adding one more misinterpretation to the list,

besides which I do not wish to encroach on the domain of the rising sect who swear by books and swear at specimens.

Peziza rutilans, *Fries, Syst. Myc., Vol.* II., *p.* 68 (1823).

Ascophore sessile, attached by a very short central point, subglobose and closed at first, then expanding and becoming quite plane, fleshy, margin entire, sometimes slightly raised, at others somewhat drooping; ¼-1 c.m. across; disc orange-red or sometimes almost crimson, externally paler and below the margin very minutely downy; excipulum parenchymatous, cells irregularly polygonal, large, cortical cells 12-16 μ diameter; asci cylindrical, narrowed at the base into a slender, often curved pedicel, 8-spored; spores obliquely 1-seriate, hyaline, continuous, elliptical, ends blunt, often 2-guttulate, at first smooth, finally very minutely reticulated, 13-15 × 8-9 μ; paraphyses septate, slender, apex rather abruptly clavate, 6-8 μ thick, containing orange granules.



Peziza rutilans, Fr. 1, group of fungi, natural size; 2, sections, natural size; 3, section of excipulum; 4, ascus with spores and paraphyses; 5, free spores in various stages of development; 6, spore showing structure of epispore at maturity; figs. 3-5, × 400; fig. 6, × 800 (drawn from specimen named by Fries).

Specimen named by Fries, and now in Kew Herbarium, examined.

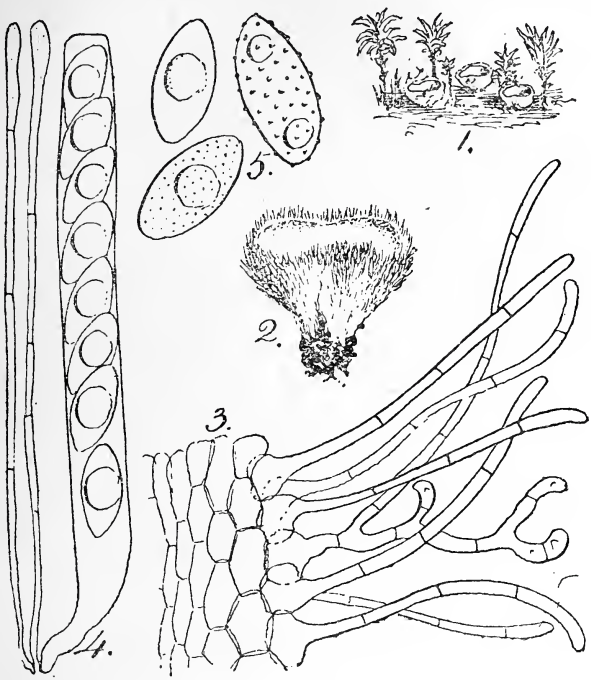
On the ground among moss, etc.

Sometimes solitary, at others gregarious, fleshy, brittle. Fries placed *P. rutilans* in his tribe Humaria, of which he says, "Cupula nec pruinosa, neque vere villosa," Syst. Myc. II., p. 67, hence it is somewhat remarkable that it should have been confounded with the species called in this article *P. polytrichi*, which is truly villose.

Exsicc. Thüm., Fung. Austr., No. 521 (called *Leucoloma rutilans*, Fckl.).

Peziza polytrichi, *Schum., Enum.plant. Saellandiæ, Sept. et. Or., p.*423 (1803).

Ascophore turbinate and closed when young, contracted below



Peziza polytrichi, Schum. 1, small specimens, natural size; 2, specimen, × 5; 3, section of portion of excipulum, × 400; 4, ascus with spores and paraphyses, × 400; fig. 5, spores in various stages of development, × 800.

into a short stem-like base, becoming broadly open but not plane with age, rather fleshy, not very brittle, 4-8 m.m. across; disc deep orange, externally whitish, distinctly downy, the down forming a delicately fringed margin composed of hyaline, septate, cylindrical, thin-walled hyphæ that are sometimes branched, 80-100 × 6-7 μ, the hyphæ are often arranged in little bundles; excipulum parenchymatous, cells elongated in the direction from base to margin; cortical cells irregularly polygonal, 12-18 μ, giving origin to the external hairs; asci cylindrical, apex slightly truncate, base rather suddenly narrowed into the pedicel, 8-spored; spores obliquely 1-seriate, hyaline, continuous, ends acute, with one large median oil-globule, for some time quite smooth, finally minutely warted, 24-28 × 11-13 μ; paraphyses septate, slender below, becoming slightly clavate at the tip, which contains orange granules.

Peziza (Sarcoscyphæ) albo-cincta, Berk. & Curt., Notices of N. Amer. Fungi, No. 726, in Grev., Vol. III., p. 154 (1875). Type examined.

Neottiella ovilla, Sacc., var. *flavodisca*, Cke. & Mass., Grev., Vol. XXI., p. 70.

Exsicc.—* Called *Peziza polytrichi.*

Rab., Herb. Myc., Ed. II., No. 310.

Roum., Fung. Gall., No. 4045.

** Called *P. rutilans.*

Cooke, Fung. Brit. Exs., Nos. 188 and 475.

Phil., Elv. Brit., No. 15.

Thümen, Myc. Univ., No. 522 (British specimens, sent by Plowright).

Roum., Fung. Gall. Exs., No. 774.

Oudem., Fung. Neerl., No. 288.

Fckl., Fung. Rhen., No. 1222.

Karsten, Fung. Fenn., No. 527.

*** Called *P. humosa.*

Cooke, Fung. Brit., No. 476.

Roum., Fung. Gall., No. 3247.

Rabenh., Fung. Eur., No. 715 (first called *P. fibrillosa*, Curr., afterwards a new label sent as *P. humosa*).

**** Called *Humaria albocincta.*

Rehm, Ascom., No. 453.

***** Called *Leucoloma corallinoides*, Rehm MS.

Sydow, Myc. March, No. 441.

****** Called *P. vivida*, Nyl.

Syd., Myc. March., No. 277.

On the ground among moss, especially species of *Polytrichum.*

The synonyms and quotations of exsiccati—so far as the specimens present in the Kew sets are concerned—are identical, and to my mind represent *Peziza polytrichi*, Schum. *Peziza vivida*, Nyl., as represented in Syd., Myc. March, No. 277, and the British specimens from Rannoch only differ from the typical *P. polytrichi*, as here interpreted, by the somewhat longer stem-like base; the spores and internal structure are identical. The fact that in *P. polytrichi* the spores remain for a long time smooth, and the external down to a greater or less extent disappears with age, has probably caused confusion. I can find no specimens agreeing with the fungus figured as *Peziza polytrichi* by Cooke in "Mycographia," fig. 50, and described by Phillips in Brit. Disc., p. 87.

Bibliography.

The 46th Report New York Mus. Nat. Hist., 1893.

As usual Prof. Peck has described many new species of fungi, and has, in addition, given a revised description of the "New York species of *Galera*," including twelve species, six of which

are confined to the United States. We were surprised to see the following note under *Polyporus sulphureus*, Fr.: "If taken when fresh and young, before the pores have formed, and carefully cooked, this fungus makes a very palatable dish." This may be quite true, but I do not think it will induce anyone in Britain to try the experiment on what we call *Polyporus sulphureus*, Fries.

The genus Ravenelia. P. Dietel, Hedwigia, 1894.

An ideal monograph. The thoroughness in every part disarms criticism, and whatever is afterwards added to our knowledge of the genus will only be supplementary to the present work. Twenty-eight species are known and distributed as follows:—

India and Ceylon, six species.
Abyssinia and East Africa, two species.
Cape of Good Hope, six species.
South America, seven species.
Central America, one species.
North America, six species.

The work is divided into two sections; in the first part a detailed account of the morphology and life-history, so far as is known, is given. The second part contains a description of each species. The five well-executed plates, drawn by the author, very clearly illustrate the structure peculiar to this interesting genus.

The Flowering Plants of Western India. Rev. A. Kyd Nairne.*

Although not dealing with Cryptogams, we are always glad to welcome any attempt to popularize the study of botany, and undoubtedly the present work will prove of great service to Europeans and others desirous of becoming acquainted with the Flora of Western India. The book is written more especially for those having little or no previous knowledge of botany, the few technical terms used being fully explained in an introductory chapter. Interesting notes relating to structure, habit, and distribution, culled from different sources, are appended to most of the species.

NOTES.

A small but interesting collection of fungi from Usambara, E. Africa, has been received at Kew from the Berlin Museum. The following corrections require to be made in the nomenclature:—

Nos. 2327 and 3235, *Lenzites repanda*, Mont. = *Lenzites applanata*, Fr.

No. 2543, *Thelephora caperata*, Berk. & Mont. = *Stereum caperatum*, Mass., Journ. Linn. Soc. (Bot.), Vol. xxvii., p. 161 (1891).

* Messrs. W. H. Allen and Co., Waterloo Place, London (7s. 6d.).

No. 2515, *Polyporus Telfairii*, Klotzsch, appears to be an undescribed species. The type specimens of *P. Telfairii*, from which Klotzsch drew up the diagnosis published in "Linnæa," Vol. VIII., p. 484 (1833), are in the Kew herbarium, and in a very good state of preservation. The pileus is very thin, shrinking and becoming incurved when dry; pores large, irregular, dissepiments very thin and becoming torn; altogether closely resembling the pores in *Polystictus abietinus*. The words "poris minutissimis" can only be regarded as a slip of the pen, and such slips are very rare in Klotzsch's work.

Mr. C. Rea, who is desirous of making an exhaustive examination of the Russulæ, would be greatly obliged if British and Continental mycologists would kindly aid him in the study by forwarding fresh specimens to 34, Foregate Street, Worcester, during the present and succeeding seasons.

MUSCINEÆ.

The British Moss-Flora, Part XV. By R. Braithwaite, M.D., F.L.S.

The fifteenth part of this excellent work concludes the descriptions of the species of Bryum, and contains the whole of the Bartramiaceæ. The genus Bryum is divided into 38 species, as against 37 admitted in the last edition of Hobkirk's synopsis. Of the reductions of species we note the following:—

Bryum origanum, Bosw., becomes *Bryum pallens*, Swtz.
Bryum Barnesi, Schpr., becomes *Bryum argentium*, L.
Bryum obconicum, Hornsch., becomes *Bryum capillare*, var. *obconicum*, Huebn.
Bryum Schleicheri, var. *latifolium*, becomes *Bryum turbinatum*, var. *latifolium*.

The synonomy (as in previous parts) has been worked out in detail, and has resulted in many changes of nomenclature. Of these some are due to the working of the law of priority, but it is doubtful what advantage can be derived from changing *Bryum Donianum*, Grev., into *Bry. Donii*, which, although "Grev." is placed after it, should be "Braithw." Again, *Bryum roseum*, Schreb. (1771), gives place to *Bry. proliferum*, published by Sibthorp twenty-three years later, the name having been used by Linnæus in 1753 in a varietal sense only as *Minum serpyllifolium*, var. *proliferum*, L. Changes like these tend to confuse rather than elucidate.

The Bartramiaceæ are divided into five genera, viz., Conostomum, Bartramia, Philonotis, Brentelia, and Catoscopium. Here it has not been found necessary to introduce much change of nomen-

clature, so that *Bartramia pomiformis*, Hedw., and *Philonotis fontana*, Brid., retain their familiar names.

The descriptions are lucidly drawn up, and the plates give just the features necessary for the determination of the species. The forthcoming part will conclude the Acrocarpi.

New Zealand Mosses. R. Brown, Trans. N. Zeal. Inst., 1892.

In two very interesting articles, illustrated by thirteen plates, we have first an account of the New Zealand species of the genus *Andraea*, which we are somewhat surprised to learn are twenty-one in number, of which sixteen are described as new. The second article deals with a new genus, *Hennedia*, including three species.

Hennedia.—Annual or perennial plants. Capsule erect or inclined, ovate or ovate-oblong, symmetrical, narrowed towards the mouth. Operculum short, stout, conic, straight. Calyptra mitriform, large, covering the whole capsule, confluent at the base, commonly ruptured at the middle by the lateral growth of the capsule ; when maturing very persistent. Peristome none.

Most nearly related to *Encalypta*, yet differing from that genus in having a *short, stout*, straight beak, instead of a *long, slender*, straight beak, while the calyptra, instead of being inflated as in that genus, closely encloses the capsule, and is confluent at the base.

Muscologia Gallica.—This excellent work is now approaching completion ; the present part deals with the genera *Plagiothecium*, *Amblystegium*, and *Hypnum* in part. A very praiseworthy feature is the frequent occurrence of what may be termed cross-references ; in other words, in the case of allied species the points of agreement and of difference are clearly stated. Such notes are of great value to a beginner, and often give a clue to the species when the more technical diagnosis fails to do so. The eight plates are excellent. The work when completed will form a useful companion volume to Braithwaite's Moss-flora, giving British students an idea of Southern forms.

LICHENES.

Lichens of the Isle of Man. W. H. Wilkinson.

We gladly welcome any attempt to popularize the study of Cryptogamic Botany, and more especially Lichenology, for although there are a few students in Britain, yet it must be admitted that the number falls short of what might be expected, taking into consideration the richness of our Lichenological Flora, the great beauty of the objects themselves, also their important bearing on biological problems. The present descriptive and illustrated list of the lichens of the Isle of Man, including some

sixty species and varieties, probably the first compiled for the district, will prove a valuable nucleus, which we trust may be speedily followed by a complete Lichen Flora of the island.

The Rev. W. Johnson, F.L.S., a well-known lichenologist, announces that he is preparing to issue a few copies of "A North of England Lichen Herbarium," containing specimens from the counties of Cumberland, Durham, and Northumberland. For particulars address, Rev. W. Johnson, Shildon, *via* Darlington, Durham.

New or Critical British Algæ.

By E. A. L. Batters, B.A., LL.B., F.L.S.

Urospora collabens, *Holmes et Batters Annal. of Bot., Vol.* v., *p.* 73. *Conferva collabens*, Phyc. Brit., p. 327. *Ulothrix collabens*, Thur. in Lee Jol. Alg.; Cherb. No. 159.

I have received some beautiful specimens of this very rare British species from Mr. David Robertson, the veteran naturalist of Cumbrae, who has done so much for the flora and fauna of the Clyde sea-area.

The plant was found at the end of last March, growing in company with *Ulothrix flacca* and *Urospora isogona* on a wooden buoy in the little harbour of Cumbrae.

It grew in large slippery tufts of a clear glossy green colour. The filaments are from 3 to 5 inches long, the cells, varying in diameter from 70-450 μ, and from 100-700 μ in length, are of very various shapes and sizes. I have seen in the same filament a nearly globular cell 200 μ in diameter, followed by an oblong one 700 μ long by 200 μ wide. Usually the cells are cylindrical, and from once and a half to twice as long as broad below, and oval, globular, or oblong, very much constricted at the joints above. The following measurements were taken from a fertile filament from the middle of a tuft:—Cells at base 100 μ long by 120 μ wide, in the middle of the filament 400 μ long by 220 μ wide, while a few cells below the apex, to which the filament slightly tapered, 500 μ long by 370 μ in diameter.

Mr. Robertson very kindly sent me some fresh specimens in a tube of sea water, and I was able to watch the exit of the zoospores. I saw both the elongated zoospores prolonged at one end into a long point, while the four cilia are situated at the other broader end, and the smaller more oval form. The former were large—about 24 μ long by 9 or 10 μ at the broad end, but in every way resembled the swarmspores of the other species of the genus *Urospora*. There are several nuclei and pyrenoids in each cell,

and the plant undoubtedly belongs to the genus *Urospora*, which, before Mr. Robertson's discovery, was only presumed to be the case.

The Cumbrae plant agrees in every way with the type specimen (gathered by Sir W. Hooker in 1808, and now preserved in the herbarium of Trinity College, Dublin), from which both Dillwyn's and Harvey's descriptions were drawn up. The cells in the small portion of the type which I examined varied in diameter from 10-420 μ, but probably thicker filaments were present in the tuft, and were just as various in form as are those of the Cumbrae specimens.

Out of Britain this species has been recorded from the North Sea by Kützing, from Cherbourg by Le Jolis, and from Nahant, Mass., by Farlow. It was "with considerable doubt" that Prof. Farlow referred the American specimens, gathered by M. F. Collins, to *U. collabens*; and judging from the specimens which have since been distributed in the Phykotheka universalis (No. 431), I am inclined to think they are referable to the *Conferva bangioides* of Harvey rather than to his *C. collabens*. Harvey founded his *Conferva bangioides* on some specimens gathered at Torquay by "Mrs. Griffiths, to whom belongs the merit of having determined its characters correctly." I have examined these specimens, and find that they agree in almost all respects with M. Collins's Nahant plant. The filaments are from 5 to 6 inches long, and of a deep green colour, the cells 30-150 μ in diameter (usually 40-90 μ), and from 50 to 230 μ long, usually twice or thrice, but occasionally 5 times longer than broad, the nodes slightly constricted. These measurements were, of course, made from a remoistened specimen; those taken from fresh plants would probably be slightly greater.

Both Farlow (Mar. Alg., New Eng., p. 45) and Hauck (Meeres Alg., p. 443) give the diameter of the filaments of *U. collabens* as 50-180 μ, which is very nearly the same as in the type specimens of *U. bangioides*, with which their descriptions agree in other respects.

Kützing (Spec. Alg., p. 383) gives the measurements of his *Hormotrichum collabens* as 50 μ at the base, and 115-150 μ at the apex. On the other hand, he gives the diameter of the filaments of *H. Younganum* (=*Urospora isogona*) and *H. bangioides* as 28-75 μ.

Mrs. Griffiths's Torquay specimens of *U. bangioides* are mixed with *Urospora isogona* (=*H. Younganum*), as is usually the case with that species, and it is probable that the specimen sent by Harvey to Kützing was principally composed of *U. isogona*, and that Kützing examined only filaments belonging to that species; this would account for his doubting whether *H. Younganum* and *H. bangioides* were really distinct, for he certainly was not, as a rule, given to "lumping." On the whole, it appears to me that the *Ulothrix collabens* of Farlow and Hauck, and the *Hormotrichum*

collabens of Kützing are referable to *Urospora bangioides*, Holmes and Batters, and that the *H. bangioides*, Kutz., is a synonym of *U. isogona*.

Urospora collabens seems to be more nearly related to *U. Wormskioldii*, Rosenv., than to either *U. isogona* or *U. bangioides*; indeed, Rosenvinge's figures (Grönl. Hav. Alg., p. 921) of *U. Wormskioldii* might have been drawn from a fertile thread of the Cumbrae plant. It is not improbable, therefore, that *U. collabens* is only a form of the Greenland plant.

With regard to *Urospora isogona*, I would note that although there may be some doubts as to whether Areschoug's *U. mirabilis* is the same plant as Roth's *Conferva penicilliformis*, there can be none as to its being the *Conferva isogona* of English Botany, tab. 1930, authentic specimens of which are still in existence; the specific name *isogona* must therefore be retained.

Ectocarpus luteolus, *Sauvageau, Journal de Botanique, Vol.* VI. (1892), *p.* 89 *t.* II., *fig.* 14-19.

Mr. T. H. Buffham has kindly sent us specimens of this species, a short account of which will be found in a former number of this Journal (Grevillea, No. 98, p. 56), gathered at Brighton in March, 1894; we have also seen specimens from Weymouth and Swanage.

Giffordia fenestrata, *Batt., Grevillea, Vol.* XXI., *p.* 86.

We have received from Mr. Buffham some beautiful specimens of an *Ectocarpus*, which appears to be identical with Berkeley's *Ect. fenestratus*. It was gathered at Bude in September, 1893, growing in loose tufts on *Ascophyllum nodosum*. Although undoubtedly closely related to *G. Lebelii*, it differs from that species in several respects, more especially in the absence of the elachista-like habit and the zone of short deeply-coloured cells, succeeded by longer, very faintly-coloured ones, so characteristic of that species.

We must congratulate Mr. G. Brebner on his fortunate discovery of *Scaphospora speciosa* on the shores of Britain. He has most kindly placed the following interesting note on the species at our disposal :—

Scaphospora speciosa, *Kjellm., Algenv. Mur. Meer., p.* 29.

This plant was found on a stone which had been taken at low water from the shelving shore near the Lion Rock, Cumbrae, on the 21st March, 1894. The three genera of the *Tilopteridæ*—*Tilopteris*, *Haplospora*, *Scaphospora*—are thus found to be represented in British waters, as was expected by our algological experts, *vide* note on *Haplospora globosa*, by Mr. Batters, in Grevillea, June, 1893. The two specimens obtained were small, not longer than 1in., but the ultimate ramifications were literally covered with the characteristic reproductive organs, antheridia, and large uni-nucleate sporangia, or "zoosporangia" and "oosporangia" respectively. The plants differed but little

from *Haplospora* in appearance, being simply bushier or more corymbose in the ultimate ramifications, and of a somewhat more brilliant brown when fresh, but turning the same olive green colour on drying. Microscopically, as far as the histological details are concerned, there is absolutely no recognizable difference. Good opportunity for comparison was afforded owing to young plants of *Haplospora* growing from the same mass of rhizoids as the *Scaphospora*, and, indeed, in such a manner as to make it impossible to decide where the respective plants really originated. Reinke came to the conclusion that *Scaphospora* was simply the sexual condition of *Haplospora* (Ein Fragment aus der Naturgeschichte der Tilopterideen, Bot. Zeit., Feb. and March, 1889, pp. 101, 125, and 155), and the Cumbrae specimens seem to support his views. It is quite a common experience with algologists to find in particular localities only the asexual condition of algæ, which are known likewise to have a sexual condition, or at any rate excessively small quantities of the latter as compared with the former. A most careful and prolonged search yielded only two specimens of *Scaphospora*, whereas hundreds of specimens of *Haplospora* were met with. The same locality affords a striking example of this in regard to another alga, *Antithamnion floccosum*, Klein. The tetrasporangiate form is found in great abundance, but not a scrap of its sexual condition could be obtained, although very careful search was made for the latter, both last year and this.

Bornet, in a note on some Ectocarpi, *Haplospora Vidovichii* and *Tilopteris Mertensii* (Bulletin de la Soc. Bot. de France), argues in favour of the *Ectocarpacean* affinities of the *Tilopterideæ*, whereas Reinke thinks they show affinities with the *Dictyotaceæ*, near which latter indeed the *Tilopterideæ* have provisionally been placed (*cf.* A Revised List of the British Marine Algæ, Holmes and Batters, p. 85 *et seq.*)

Ectocarpus tomentosoides has now likewise been found on the east coast of Scotland (*cf.* Grevillea, Vol. xxi., pp. 20 and 98). Besides the common plurilocular a few examples of *apparent* unilocular sporangia were observed. These are somewhat clavate in shape, and the contents, which are, however, not clearly differentiated into spores, were in several cases found to have been discharged.

G. B.

Bibliography.

Om Fucoidéslägtet Myelophycus, Kjellm. Af F. R. Kjellman, Med. en Tafla, Stockholm, 1893, pp. 1-11. (Bihang till K. Svenska vet.-akad. Handl., Band 18, Afd. iii., No. 9).

This paper consists of a description of a Japanese alga, which is possibly identical with the *Chordaria simplex* described by Harvey (Perry Expedition, Vol. ii., Washington, 1856, pp. 331-332).

Dr. Kjellman considers that it should be placed in a separate genus, and names it *Myelophycus cæspitosum*, Kjellm. He is of opinion that it should be placed in the family *Encœliaceæ*, between *Coilodesme* or *Soranthera* and *Asperococcus*. The fronds have the habit of *Scytosiphon*, but the internal structure bears so considerable a resemblance to *Chordaria*, and the unilocular sporangia are so similarly placed among the paraphyses that it is easy to understand why Professor Harvey referred it to that genus. The fertile surface is, however, apparently not continuous, and the axis or central portion consists of large thin-walled cells. E. M. H.

Pogotrichum hibernicum, Sp. Nov. By T. Johnson, D.Sc., F.L.S. (Scientific Proceedings of the Royal Dublin Society, Vol. viii., n.s., Part I., No. 1.)

The diagnosis of this new species of *Pogotrichum* is thus given :—" Unbranched, tufted filamentous thalli, 1 c.m long, of radially constructed cross-section, and intercalary growth. Basal cells of filaments rhizogenous, and penetrating *Alaria* thallus to give new tufts by endophytic hyphæ. Filaments hairy, each one assimilative and reproductive, solid or subsolid. Chromatophores granular, 4-20, parietal.

" Sporangia unilocular and plurilocular in same tuft, but not in same filament, chiefly in upper parts of filaments, which part may become entirely converted into reproductive cells. Sporangia formed intercalarily, from individual joint-cells of thallus in uniseriate filaments, or from superficial cells, or from all the cells of multiseriate filaments. Fate of zoospores unknown.

" Habitat.—On *Alaria esculenta*, Grev. (young plants) at Kilkee, co. Clare, in September.

" Affinities.—Very near to, if not identical with, *Litosiphon Laminariæ*, Harv."

From an examination of authentic specimens of Harvey's *Litosiphon Laminariæ*, preserved in the Herbarium of Trinity College, Dublin, Prof. Johnson came to the conclusion not only that his Kilkee plant is closely, perhaps too closely, related to that species, but also that the genera *Litosiphon* and *Pogotrichum* were one and the same. Prof. Reinke, when he founded the genus *Pogotrichum*, pointed out that it might eventually have to be degraded to the rank of a sub-genus of *Litosiphon*, and perhaps that would be the best course to adopt, since the fructification of the species of both genera appears to be similar. We have, through the kindness of Prof. Johnson, been able to examine specimens of *Pogotrichum hibernicum* with both kinds of fruit, and we are inclined to think that although undoubtedly closely related to *L. Laminariæ*, it is specifically distinct from it. *Litosiphon Laminariæ* is a larger plant than *P. hibernicum*, with proportionately smaller superficial cells, and a curious subarticulate appearance, when fresh, which is quite wanting in the latter; moreover, *fertile* uniseriate filaments are very frequently met with in the tufts of *Pogotrichum hibernicum*,

whereas they are never met with in *L. Laminariæ*, although very occasionally a sterile one is present in the tufts of that species.

Special interest attaches to that portion of Prof. Johnson's valuable paper which deals with the vegetative reproduction of the new species. The author says :—"Though the filaments of a tuft are unbranched, and, to this extent, unconnected with one another, they are, at their lower ends, in close contact with one another, and more or less fused into a compact body of a sub-parenchymatous nature. There are, too, to be observed, growing out from the superficial cells at the base of the filaments, rhizoidal septate hyphæ which come into contact with the surface of the *Alaria* thallus, and can, no doubt, give rise to new *Pogotrichum* filaments. On making a vertical section through the anchorage of *Pogotrichum hibernicum* it is seen to be not merely applied to the surface of the *Alaria*, *i.e.*, epiphytic, as a root-disc of a *Fucus* is to a stone, on which it grows.

"The individual filaments of *P. hibernicum* penetrate into the *Alaria* thallus, creep and ramify between both its cortical and medullary cells, the limiting layer of the *Alaria* being frequently obliterated during the process. A close examination of the sections gives every indication that these endophytic or intra-cortical hyphæ can, after creeping for some distance in the *Alaria* thallus, emerge at either surface to form new *Pogotrichum* tufts."

Even supposing *P. hibernicum* is identical with *L. Laminariæ*, a supposition we are not prepared to admit, we think Dr. Johnson is to be congratulated on his very interesting discovery of this vegetative reproduction by means of stoloniferous endophytic hyphæ in the genus *Litosiphon*. The paper is illustrated by a good plate, giving figures of the fructification, etc., but unfortunately not of the endophytic hyphæ. E. A. B.

On the Antheridia, etc., of some Floridecæ. By T. H. Buffham, A.L.S. (Journal of the Quekett Microscopical Club, Vol. v., ser. ii., pp. 291-305, October, 1893).

This is really a continuation of Mr. Buffham's paper on the same subject, which appeared in October, 1890, and contains full descriptions of the antheridia, the discovery of which was then mentioned. The paper is both interesting and valuable, as it contains two plates, on which 44 separate figures illustrating antheridia, etc., are drawn, and the author assures us that with two exceptions, indicated in the proper place, he has drawn nothing which has been figured before. The first antheridia mentioned are those of *Choreocolax Polysiphoniæ*, Reinsch, which may be distinguished as bright circular spots about 12 μ in diameter, scattered over the surface of the dark frond. The cells bearing pollinoids form a bunch of short incurved threads arising from a base of branching cells. Between the bunches are longer filaments forming a kind of involucre. This discovery of the antheridia of the species, coupled with Mr. H. M. Richard's

excellent account (Proc. American Acad. of Arts and Sciences, Vol. xxvi.) of the tetraspores and cystocarps, completes our knowledge of the reproductive organs of this interesting parasite.

The male plants of *Harveyella mirabilis*, Schmitz et Rke., the next plant mentioned, may be distinguished by their uniform brown colour, and by being surrounded by a semi-translucent yellowish border. A short distance below the surface of the lobes numerous smaller cells appear, and from these arise tubes about 10 μ wide, and the pollinoids are arranged in these in single or double rows of four to six, and as they are discharged fresh pollinoids appear to be formed from the brown cells at the base of the tubes.

The antheridia of *Phyllophora rubens*, Grev., are subspherical, stalked, white bodies visible to the naked eye. The globular bodies contain several cavities, from the sides of which spring minute filaments bearing pollinoids at their extremities.

In *Cystoclonium purpurascens*, Kütz., according to the author, the antheridia are formed from cells just below the ordinary cortical cells, which divide vertically to form the cells containing the pollinoids.

In *Sphærococcus coronopifolius*, Stackh., small clear spots rather larger than the ordinary cortical cells were noticed, a section showing "the usual structure of a simple antheridium, in which a basal cell produces four smaller cells above it, and these may, either at once or by again dividing vertically, produce the elongated bodies that actually put forth the pollinoids."

The author then proceeds to describe the antheridia of *Gracilaria confervoides*, Grev., and *Rhodymenia palmata*, Grev., both of which have been figured and described by Bornet and Thuret. With regard to the antheridia of *R. palmata*, however, the author states that he considers they have "no fecundating corpuscles, and they may, indeed, be a case of degradation from progenitors possessing the necessary capacities."

In *Nitophyllum Gmelini*, Grev., Mr. Buffham found groups of antheridia of the ordinary type, not only in elongated patches near the margin of the plant, but also in minute narrow processes springing from the margin.

In *Delesseria alata*, Lamour., antheridia very similar to those of *Nitophyllum* are found in "minute leaflets, arising from the apices of the plant, and especially in groups from the axils."

In *D. ruscifolia*, Lamour., the antheridia occur on all the leaflets in groups lying on each side of the midrib.

In *Hydrolapathum sanguineum*, Stackh., the antheridia are found on minute leaflets arising from the denuded midribs of the "leaves."

In *Odonthalia dentata*, Lyngb., antheridia are found on tufts of paler-coloured leaflets arising from near the axils of the fronds.

The antheridia of *Laurencia obtusa*, Lamour., are formed in a cup-like hollow at the apex of each branchlet. The hollow con-

tains 10 or 12 dense masses of male cells. "Each has a peduncle which branches out on all sides, and this is repeated at such short intervals that there results an almost globular mass, 120-150 μ in diameter." Antheridia of *Bonnemaisonia asparagoides*, Ag., *Polysiphonia urceolata*, Grev., *P. Brodiæi*, Grev., and *Spermothamnion hermaphroditum*, Näg., are mentioned, but as they are of the usual types, no special interest attaches to them.

In *Halarachnion ligulatum*, Kütz., the antheridial cells occur singly or in couples amongst the ordinary cortical cells. A section through one of them exhibits a cell which "produces four male cells above, and these emit the pollinoids, which are minute."

Turning from the male to the female organs of reproduction, Mr. Buffham has carefully examined a number of the so-called nemathecia of *Ahnfeldtia plicata*, J. Ag., his results agreeing well with the following note, which he quotes from one made at Cherbourg, in 1857, by Dr. Bornet:—"Dans *l'Ahnfeldtia plicata*, J. Ag., les articles superieures des filaments articulés dont sont composés les tubercules se transforment en spores. Chaque article laisse échapper une spore globuleuse assez petite."

The paper concludes with an interesting note on the cystocarps of *Plumaria elegans*, Schmitz.

These bodies are usually described as "naked or involucrate," but Mr. Buffham has, we think, conclusively proved that the so-called "naked" favellæ are really asexual "polysporangia." These organs are certainly the same as those figured by Pringsheim (Beiträge zur Morph. der Meeresalg.), but no trichogyne or procarp has been observed. The contents of a sporangium in the early stages divide into two or four, and as the sporangium continues to enlarge the division goes on till at maturity 16 spores, irregularly ovoid, 45-48 μ in length, and possessing a cell wall even before discharge, are formed.

Mr. Buffham regards the polysporangia as an independent kind of asexual reproductive organs, and not merely polysporic tetraspores.

The paper is not only an interesting, but an important addition to the literature dealing with the reproductive organs of the Florideæ, and we trust that Mr. Buffham will continue his investigations, which have so far been eminently successful.

E. A. B.

On the Classification and Geographical Distribution of the Laminariaceæ. By W. A. Setchell. From the Transactions of the Connecticut Academy, Vol. ix., March, 1893, pp. 333-375.

In this paper the author first reviews the history of the classification of this group of marine algæ, and then proposes a new arrangement of the genera founded on the different modifications of the region of active growth in the fronds. His method of classification differs slightly from those of Agardh, Kjellman, and

Kützing, in the omission of the genus *Adenocystis* (which the author has not been able to examine) and the unusual position given to *Alaria*.

There are three tribes, viz., the *Laminariideæ*, *Lessoniideæ*, the *Alariideæ*, the first subdivided into the sub-tribes *Laminarieæ* and *Agareæ*, the second into *Lessonieæ* and *Macrocysteæ*, and the third into *Ecklonieæ*, *Egregieæ* and *Alarieæ*. These contain the following genera respectively :—

Laminarieæ.—*Chorda*, *Saccorhiza*, *Laminaria*.

Agareæ.—*Cymathœre*, *Costaria*, *Agarum*, *Thalassiophyllum Arthrothamnus*.

Lessonieæ.—*Dictyoneuron*, *Lessonia*, *Postelsia*, *Nereocystis*.

Ecklonieæ.—*Ulopteryx*, *Ecklonia*, *Eisenia*.

Egregieæ.—*Egregia*.

Alarieæ.—*Pterygophora*, *Alaria*.

The author gives as his reason for retaining *Chorda* in the *Laminariaceæ* that the paraphyses resemble those of *Saccorhiza*, although he admits that it bears hardly any other resemblance to the *Laminariideæ*, and practically acknowledges that Reinke has good grounds for placing it in a sub-family near the *Scytosiphoneæ*. *Cymathœre* forms the link between *Laminaria* and the *Agareæ*, by the possession of longitudinal folds, which bring it near *Costaria*, and *Arthrothamnus* forms the link between the *Agareæ* and the *Lessoniideæ* by the unrolling of the base of the lamina as in *Agarum* and the tendency of the stem to fork as in *Lessonia*. *Pelagophycus* of Areschoug is sunk under *Nereocystis*, as the author considers there is not sufficient difference between them in the mode of fissure of the fronds at the region of active growth.

In the *Alariideæ* the sub-tribes are founded on the positions of the sporophylls, viz., (1) on the blade; (2) on both blade and stem; (3) or on the stem only. This seems to be scarcely a natural arrangement, since *Ulopteryx*, which has a midrib and cryptostomata, is thus placed with the ribless *Ecklonia*, and *Alaria*, which has also a midrib and cryptostomata, is placed with *Pterygophora*, which has neither.

The author has had quite exceptional opportunities of examining the rarer species of the family, and therefore speaks with some authority, and his opinion must receive due consideration. It may be hoped, however, that he will be led by further researches to revise the *Alariideæ* and devise a more natural mode of grouping them. The author's remarks on the geographical distribution of the *Laminariaceæ* are extremely interesting, and show that there is need of further records concerning the distribution of the genera, more particularly of the forms met with on the Pacific Coast and in the direction of North and West Australia, the Cape of Good Hope, and in the direction of the Society Islands, etc., in the Middle Pacific Ocean, and also as to the distribution of the genera on the Western Coast of Africa and the Western Coast of

South America. Excellent tables of the distribution of the species, so far as is known, are given, and indicate, as does indeed the whole of the paper, that the author has spared neither time nor labour in working out his subject. His investigations point to the conclusion that the distribution of the family as a whole is much influenced by the temperature of the water, and to a certain degree by its salinity, but that some species are much more tolerant than others in these respects.

His discussion of this subject forms very interesting and instructive reading.

E. M. H.

Analecta Algologica, Observationes de speciebus algarum minus cognitis earumque dispositione, cum tab. II.; *Continuatio* I. J. G. Agardh, Lund, 1894, Ex. Actis Soc. Physiograph. Lund, tom. xxix.

As in the previous part, many new species are described, and their examination under the microscope has led in some cases to the rearrangement of the species or to new views concerning their affinities.

In the *Dictyotaceæ*, the discovery of species possessing organs present also in the *Cutleriaceæ* has led Dr. Agardh to the conclusion that the characters supposed by modern algologists to distinguish the *Dictyotaceæ* from the *Cutleriaceæ* can no longer be maintained as distinctive, and that further observations will probably show that the two families form a natural and connected series.

He now divides the *Dictyotaceæ* into four sub-orders, viz., *Zonarieæ*, *Padineæ*, *Spatoglosseæ*, and *Dictyoteæ*. In the *Zonarieæ* three new genera are described—(1) *Gymnosorus*, to receive *Zonaria variegata*, Mert., *Z. collaris*, C. Ag., and *Z. nigrescens*, Sond. (2) *Homœostrichus*, to include *Z. multifida*, J.Ag., *Z. Sinclairii*, Hook. et Harv., and *Z. stuposa*, R. Br. (3) *Chlanidophora*,* comprising only *Z. microphylla*, Harv. These new genera depend chiefly on the mono or pleio-stromatic character of the frond and the position of the cortical cells relatively to those beneath them.

Under the *Padineæ* two new genera are described, viz., (1) *Microzonia*, to which *Z. velutina*, Harv., is referred, and (2) *Lobophora*, of which only one species, *L. nigrescens*, is known. It approaches *Zonaria* in structure, but *Padina* and *Taonia* in fructification. The genus *Stypopodium* of Kützing, also included in the *Padineæ*, is now reduced so as to include only the forms near to *Zonaria lobata*, in which the fructification more resembles that of *Taonia* and *Padina* than that of *Zonaria*. One new species is added to the genus *Taonia*, viz., *T. australasica*.

* Written *Chlanidote* on p. 6, apparently by a *lapsus calami*.

Under the *Spatoglosseæ* the genus *Spatoglossum* of Kütz. is retained, reserving in it, however, only those species in which the uppermost layer of cells radiate in a flabellate manner towards the margin. Two new species from Australia, viz., *Sp. cornigerum* and *Sp. grandifolium*, and one from Ceylon, *S. asperum* (Ferguson, Alg. Ceylon, No. 54 in Herb. Ag.), are added, and the *Sp. Schræderi* of Kützing becomes *Sp. Areschougii*, the name of *Sp. Schræderi* being retained for Merten's plant (*Ulva Schræderi*, Mert., in. Mert. Pl. Crypt., Tab. ii., fig. 3), which has a firmer frond, more coarsely toothed. The genus *Dictyota* is now divided into four sub-genera and eleven tribes, the former characterized by different arrangements of the fructification, and the latter by differences in branching and in the presence of a more or less distinct stem.

In the first sub-genus, *Platydictyon*, the organs of fructification are scattered over the frond; in the second, *Pleiadophora*, they form oases with larger spaces between; and in the third, *Strigocarpus*, they are arranged in a more or less regular interrupted line with single fertile cells interspersed; and in the fourth, *Neurocarpus*, they form a nerve-like line in the middle of the frond. Eight new species are described, six from Australia, one from New Zealand, and one from California. These are *D. alternifida*, *D. apiculata*, *D. bifurca*, *D. fenestrata*, *D. latifolia*, *D. robusta*, *D. vittarioides*, *D. ocellata*, *D. Binghamiæ*.

Two of Harvey's species receive new names, *D. dichotoma*, Harv. Alg. Aust. exs., No. 70 (partim), becoming *D. apiculata*, and *D. nævosa*, Harv., Phyc. Aust., tab. 186 (*non* Suhr.), being identified with *D. Diemensis*, Lond. A new genus, *Pachydictyon*, is formed to receive *D. furcellata*, Harv. (Phyc. Aust., tab. xxxviii.), *D. minor*, Lond, and *D. paniculata*, Auct. To the genus *Dilophus* five new species are added, viz., *D. fasciculatus*, *D. tæniæformis*, *D. moniliformis*, *D. foliosus*, and *D. tener*, all of which are Australian.

In the *Siphoneæ*, a subgenus of Codium is formed under the name of *Raphioplea*, to receive the species in which the utricles of the outer layer of the frond are elongated and cylindrical, with a stricture below the apex forming a subglobose head. This section receives *C. spongiosum*, Harv., and a new species from Australia, viz., *C. pomoides*. One new *Halimeda*, *H. rectangularis*, allied to *H. monile*, Lam., and *H. cylindracea*, Desne., but differing in having rectangular articulation, $\frac{1}{2}$ inch long and 2-3 lines broad, is added to this genus. A new genus, *Bracebridgea*, which includes a single species, is remarkable as forming a link between *Valonia* and *Siphonocladia*, whilst resembling *Codium tomentosum* or *Caulerpa papillosa* in form, but having articulated filaments. The genus *Anadyomene* is increased by one new Australian species, *A. circumsepta*, distinguished by its nearly entire, subcorticate frond, with the veins arranged in a manner resembling that of the corticated species. To the genus *Microdictyon* two new species are added—*M. obscurum* from New Caledonia and *M. crassum* from the

Bahamas. One species, *M. clathratum*, Mert., is removed from the genus and placed in that of *Cystodictyon*, J. E. Gray, together with *Anadyomene Leclancherii* and a new species from Florida, named *C. pavoninum*. To the genus *Pterodictyon*, J. E. Gray, Dr. Agardh refers the *Struvea anastomosans* of Murray and Boodle (*Cladophora anastomosans*, Harv.) as well as the *Struvea delicatula* of Duchassaing and Mazé, as he considers that the genus *Struvea* should include only species characterized by a well-marked, tubular, more or less annulated stem and a lamina of definite outline. The danger of mistaking analogy for affinity is often overlooked. In a new genus of *Ectocarpaceæ*, named *Xanthosiphonia*, the structure resembles *Polysiphonia*, and the greenish colour of the plants might suggest an affinity to the *Chlorophyceæ*, but the fruit is that of *Ectocarpaceæ*. In the sterile state the colour is greenish, like that of *Ectocarpus virescens* or *E. viridis*, but in the fruiting state it is yellowish. Of the two new species, one, *X. Wattsii*, comes from Australia, and the other, *X. Halliæ*, from Florida.

One new Australian species of *Ecklonia*, *E. stenophylla*, is added to the *Laminariaceæ*, and a new genus, *Encophora*, to the *Fucaceæ*, both from Australia, but the imperfect state of the specimens received does not permit of a complete description, although it is sufficient to indicate that they are distinct and new. To the *Ceramiaceæ* have been added *Antithamnion nigrescens*, *Spongoclonium scoparium*, and *S. fasciculatum*, all from Australia. The old name *Dasythamnion*, being free, has been used for a new genus, including one new species, *Dasythamnion setosum*, from Australia. It possesses a remarkable similarity in habit to *Wrangelia clavifera*, but differs from that plant in its fructification, and in its more distichously pinnate ramification, and in the ramenta being of almost uniform diameter from base to apex. When dry the plant has not the blackish colour of *W. clavifera*, but a rufescent hue. A new *Ballia*, intermediate between *B. callitricha* and *B. scoparia*, is described. The specimens examined were remarkable for their rusty tint.

Under *Griffithsia*, Dr. Agardh records the discovery of the antheridia of *G. elongata*, the characters of which vindicate his previous removal of the plant from the genus *Callithamnion*.

Under *Gulsonia*, a description of the cystocarpic fruit is given, from which it appears that the affinity of the genus is nearer to *Wrangelia* than *Crouania*, near which it has been placed by Dr. Schmitz. A new species of *Spyridia* from Florida, *S. ceramioides*, is referred to the biannulate group of the genus, but has shorter articulations than either *S. biannulata* or *S. breviarticulata*.

Referring to the close resemblance between *Rhabdonia* and *Erythroclonium* in habit and structure, Dr. Agardh observes that although in the sterile state it is difficult to distinguish *E. augustatum* from *R. charoides* or *E. Mulleri* from *R. verticillata*, except by the presence of a central tube in *Erythroclonium*, yet

having recently been able to examine the cystocarps of *E. augustatum* he thinks that the two genera are analogous rather than closely related.

Other new species of *Rhodophyceæ* are *Areschougia intermedia*, which comes between *A. Stuartii* and *A. ligulata*, having fronds only half the diameter of the latter, with attenuate apices.

A new Australian plant resembling *Bindera*, having tetraspores dispersed, and not in sori, but of which the cystocarps are unknown, is provisionally named *Bindera? ramosa*, and a new species of *Chrysymenia*, also from Australia, and bearing a considerable resemblance in habit to *Gigartina pinnata*, receives the name of *C. Husseyana*. Another new Australian plant having cystocarps resembling those of *Curdiæa*, but situated within, not on the margin, of the frond, and of which the tetraspores are unknown, is provisionally named *Curdiæa? Irvineæ*.

Dr. Agardh having recently had the opportunity of examining the fructification of *Heringia? filiformis*, Harv., is able to state that Harvey rightly referred the species to that genus, and thus its position is confirmed.

A new species of *Plocamium*, intermediate between *P. procerum* and *P. corallorhiza*, in which the curious little tufts of ramuli, so abundant on the species referred by Harvey to *P. nidificum*, are present. These tufts often occur not only on plants with cystocarps, but also on those with tetraspores. They do not afford any evidence of being antheridia, and should, in Dr. Agardh's opinion, be regarded rather as an abnormal organ, intended to propagate the plant, after the manner of other algæ (as in *Sphacelaria*), by fixing themselves on other plants. Concerning the genus *Wrangelia*, it is suggested that the differences met with in the reproductive organs and their appendages in different species should lead to their grouping into sub-genera, but owing to our imperfect knowledge of the fructification of many species this cannot be thoroughly done at present. A new subgenus, *Ornithopodium*, might, however, be formed for the reception of *W. Wattsii*, and *W. clavigera* should probably be separated as a distinct genus under the name of *Kalidiophora*. It will thus be seen that the algal flora of Australia is by no means exhausted, and that much remains to be done in biological work connected with the *Dictyotaceæ*.

Dr. Agardh must be congratulated on the immense amount of work he gets through and the variety of important observations he is able to contribute, which at his advanced age is simply marvellous.

E. M. H.

INDEX.

ORIGINAL ARTICLES.

ERRATA.

P. 24, line 18 from bottom, for *surjunt* read surgunt.
P. 25, line 14 from bottom, for *Taunton* read Saunton.
P. 51, line 10 from bottom, and p. 51, line 17 from bottom, for *Portland* read Studland.