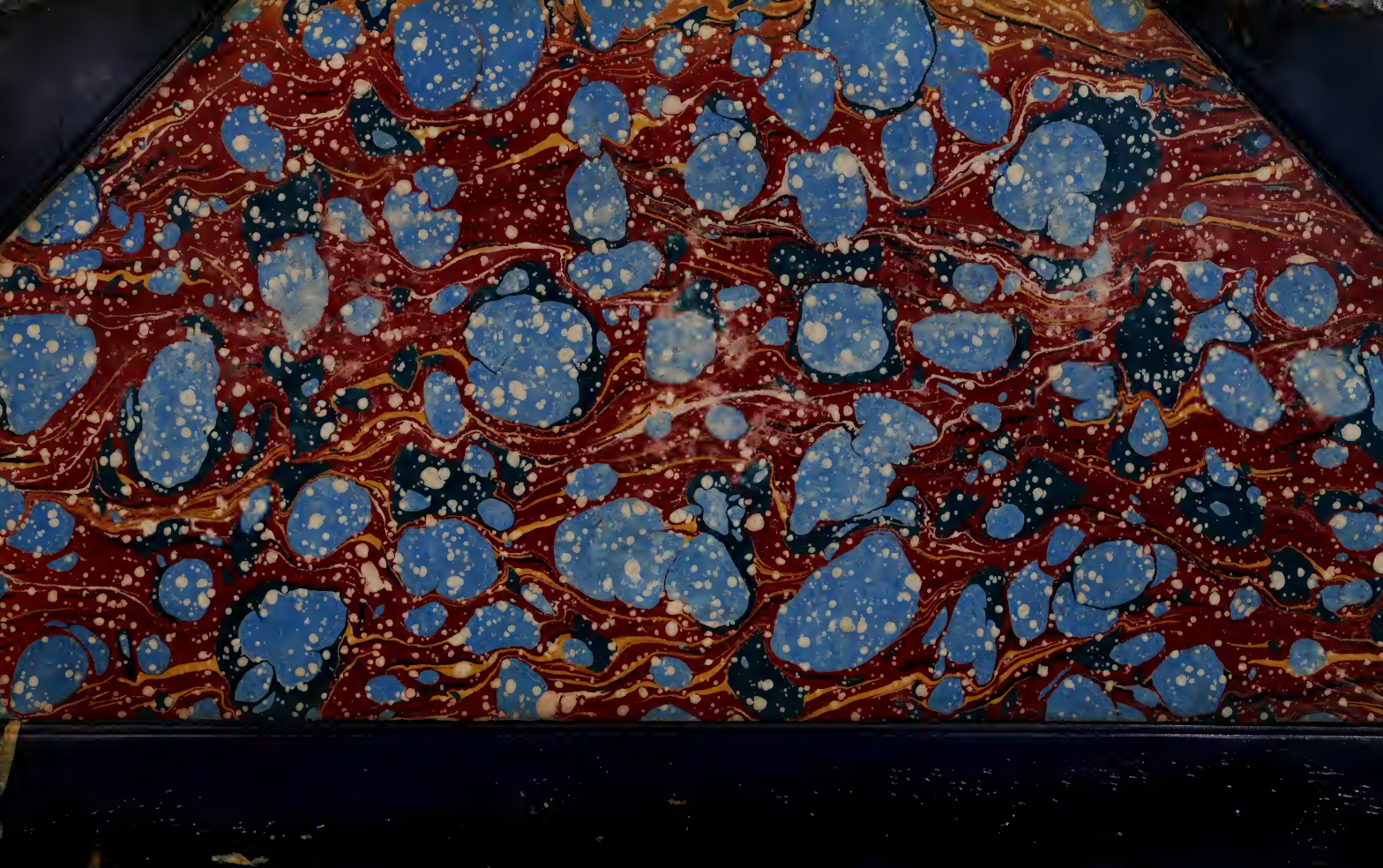

THE

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OBITUARIES.

GEORGE OGILVIE-FORBES, eldest son of John Charles Ogilvie, M.D., physician in Aberdeen, and grandson of George Ogilvie of Auchiries, Aberdeenshire, was born at Aberdeen, in 1820. He was educated at the Grammar School and the University of Aberdeen (Marischal College), where he gained various prizes, and took the degree of A.M. in 1839. He studied medicine at Edinburgh, where he took his M.D. in 1842.

Having spent two years in travel and farther study at London, Paris and Vienna, and in other parts of Europe (in company with his brother, the late Dr. John Forbes Ogilvie of Alexandria, Egypt), he returned to Aberdeen in 1844, and there entered upon practice. Shortly afterwards, he was appointed Lecturer on Physiology in the Medical School of King's College, Old Aberdeen. In 1849, he was transferred to the corresponding post in Marischal College: and, on the fusion of the two universities in 1860, he was appointed Regius Professor of the Institutes of Medicine (or Physiology) in the University of Aberdeen, a position which he occupied until 1877, when he resigned in consequence of failing health. His tastes had always led him to prefer study and research to practice; and on his appointment to the Chair of Physiology, he withdrew from practice entirely.

In 1876, he succeeded (under a deed of entail which required him to assume the surname of Forbes) to the estate of his mother's family, the Forbeses of Boyndlie. At this place, he resided from the date of his retirement from the professorship until his death, on the 25th of June of last year. During these, his latter years, being debarred by the state of his health from active mental exertion, he followed the quiet pursuits of a country life; and in particular indulged his life-long taste for botany by devoting himself to the planting and culture of trees.

In 1849, Dr. Ogilvie-Forbes married Jane, daughter of the late Robert Cordiner of Peterhead. Mrs. Ogilvie-Forbes survives him; and he leaves also a son and a daughter.

ZOOLOGY.

REPORT ON THE FISHES OF THE NORTH-EAST OF SCOTLAND.

By JAMES C. HOWDEN, M.D.

THE following list, compiled from Dr. Day's Work on British Fishes, includes all known British species. Those marked thus (*a*) have been taken in the North Sea, off the East Coast of Scotland, or in the rivers or lakes embraced in the District of the East of Scotland Union.

I have thought it desirable that the local museums or private collections where specimens are preserved, should be noted. Unfortunately these collections are few, and, with the exception of that of Mr. Sim, far from complete. The collection in the Arbroath Museum is interesting, in so far as it was made by the late Dr. John Fleming, and contains specimens from which the descriptions were taken for his "British Animals." The Museum of the Montrose Natural History and Antiquarian Society contains a very fair collection, in which are many rare and interesting species, amongst which may be specially noted a fine specimen of the Blade Fish (*Trachypterus arcticus*), from which Day's description and figure are taken. As the specimen was somewhat altered and decayed, owing to imperfect preservation, when Dr. Day saw it, I append a description with measurements which I made from the fish while it was fresh, and which was published in the Report of the Directors of the Montrose Natural History and Antiquarian Society for 1872, (App. B).

Mr. Edward's list of the Fishes of Banffshire includes many species which have not been found by any other observer, but as the specimens are not, so far as I am aware, preserved in any collection there is no means of verifying its accuracy.

Signs and contractions used :—

a, Species observed in District.
M, Specimens in Montrose Museum.
S, in Mr. Geo. Sim's collection.
P, in Peterhead Museum.
A.U, in Aberdeen University Museum.
l. n., local names, in East of Scotland.

SUB-CLASS—TELEOSTEI.

Order 1.—Acanthopterygii.

Group A.—Perciformis.

Family 1.—**Percidæ.**

*a*Perca fluviatilis. Rond.....Perch (l. n. Perch).....S.
*a*Labrax lupus. Cuv.....Bass.....M.S
Acerina vulgaris. Cuv.....Jack-ruffe.
Serranus cabrilla. Cuv.....Comber. Gaper.
S. gigas. Cuv.....Dusky Perch.
Polyprion cernium. Val.....Stone Basse.
*a*Dentex vulgaris. Cuv.

Family 2.—**Mullidæ.** Swainson.

*a*Mullus barbatus. Linn.....Red Mullet.....S.
*a*M. surmuletus. Linn.....Striped Red Mullet.....S.

Family 3.—**Sparidæ.** Cuvier.

*a*Cantharus lineatus. Flem...Black Sea Bream.
Box vulgaris. Cuv.....Bague.
Pagrus vulgaris. Cuv.....Sea Bream.
P. auratus. Steind.....Gilt-head.
*a*Pagellus centrodontus. Cuv.Common Sea Bream (l.n. Sea-Perch).....M.S.
P. bogaraves. Cuv.....Spanish Bream.
*a*P. Owenii Günther.....Axillary Bream.
*a*P. acarne. Cuv.
*a*P. erythrinus. Cuv.....Pandora. King of the Breams.

Family 4.—**Scorpænidæ.**

*a*Sebastes norvegicus. Cuv...Bergylt (l.n. Norway Haddock, Jerus'lem Haddie).M.S.

Family 5.—**Cottidæ.** Day.

Cottus gobio. Linn.....Miller's Thumb.
*a*C. scorpius. Linn.....Father-lasher (l. n. Gundie, Sutor).....M. S
*a*C. bubalis. Euphrasen.....Long-spined Cottus (l. n. Gunney, Lucky-proach). M. S.
*a*C. quadricornis.....Four-horned Cottus.....M.
*a*var. Grœnlandicus.
*a*Trigla lineata. Gmel.....Streaked Gurnard.
*a*T. cuculus. Linn.....Cuckoo Gurnard.....M. S.
*a*T. hirundo. Linn.....Tub-fish, Sapphirine Gurnard.....S.
*a*T. Gurnardus. Linn.....Gray Gurnard (l. n. Gowdie, Crooner).....M. S.
*a*T. lyra. Linn.....The Piper (l. n. Piper).
*a*T. obscura. Linn.....Long-finned Captain.....M.

Family 6.—**Cataphracti.** Muller.

*a*Agonus cataphractus. Blv...Pogge (l. n. Pluck, Noble)..M. S.
*a*Peristethus cataphractum, Kaup. Armed Gurnard.....M.

Family 7.—**Pediculati.** Cuvier.

*a*Lophius piscatorius, Linn. Angler (l. n. Kethie or Toad-fish).....M. S.

Family 8.—**Trachinidæ.** Risso.

*a*Trachinus draco. Linn.....Great Weever (l. n. Muckle Stanger).....M. S.
*a*T. vipera. Cuv.....Lesser Weever (l. n. Stanger) M. S.

Family 9.—**Scombridæ.** Cuvier.

*a*Scomber scomber. Linn....Mackerel.....M. S.
*a*S. colias. Gmel.....Spanish Mackerel.
*a*Orcynus thynnus. Lütken..Short-finned Tunny.....S.
Orcynus germo. Lütken....Albacore.
*a*Thynnus pelamys. Cuv.....Bonito.....M.
*a*Pelamys sarda. Cuv.....Belted Bonito.....M.
*a*Auxis Rochei.....Plain Bonito.
Echeneis remora. Linn.

Family 10.—**Stromateidæ.** Swainson.

Centrolophus britannicus. Günther.

*a*C. pompilus. Cuv.....Black-fish.
Schedophilus medusophagus. Cocco.

Family 11.—**Coryphænidæ.** Swainson (in part).
*a*Brama Raii. Blv.....Ray's Bream.....M, A. P.
*a*Lampris luna. Risso.....Opah. King-fish.....M. P.
Luvarus imperialis. Rafin...

Family 12.—**Carangidæ.** Günther.
*a*Caranx trachurus. Lacep...Scad (l. n. Horse-mackerel). M. S.
*a*Naucrater ductor. Cuv.....Pilot-fish.....M.
Pammelas perciformis, Günther...Snipe-nosed Mullet.
Lichia glauca. Risso.....Derbiso.
*a*Capros aper. Lacep.....Boar-fish.

Family 13.—**Cyttidæ.** Kaup.
*a*Zeus faber. Linn.....John-dory (l. n. Johney dory) M. S.

Family 14.—**Xiphiidæ.** Agassiz.
*a*Xiphias gladius. Linn.....Sword-fish.

Family 15.—**Sciænidæ.** Cuvier.
*a*Sciæna aquila. Risso.....Shade-fish or Hair-tail..... M. S. A. U.

Family 16.—**Trichiuridæ.** Günther.
Trichiurus lepturus. Linn....Blade-fish.
Lepidopus caudatus, White. Scabbard-fish.

Family 17.—**Gobiidæ.** Cuvier.
*a*Gobius Ruthenspari, Euph. Double-spotted Goby.....S.
*a*G. paganellus. Gmel.
*a*G. niger. Linn.....Rock Goby.
G. minutus. Gmel.....Spotted Goby (l. n. Donlie).
G. pictus. Malm.
*a*G. Parnellii. Day.....Little Speckled Goby.....S.
G. quadrimaculatus. Cuv.
Aphia pellucida. Moreau.
*a*Crystallogobius Nilssonii. Günther.

Family 18.—**Callionymidæ.** Richardson.
*a*Callionymus lyra. Linn.....Yellow Skulpin (l. n. Leries, Balle'erie).....M. S.
C. maculatus. Rafin.....

Family 19.—**Discoboli** (Part.) Cuvier.

*a*Cyclopterus lumpus. Linn...Lump-fish (l. n. Cock-paddle).....M.S.

*a*Liparis vulgaris. Flem.....Sea-snail (l.n. Little Sucker)M.S.

*a*L. Montagui. Cuv.....Net-work Sucker (l.n. Little Sucker).....S.

Family 20.—**Gobiesocidæ.** Bleeker.

*a*Lepadogaster Gouanii. Lacep. Cornish Sucker.....M.S.

L. Decandolii. Risso.....Connemara Sucker.

*a*L. bimaculatus. Flem.....Doubly Spotted Sucker.

Family 21.—**Blenniidæ.** Swainson.

*a*Anarrhichas lupus. Linn....Sea-wolf (l. n. Cat-fish).....M.S.

*a*Blennius gattorugine. Bloch. Tompot.

*a*B. galerita. Linn.....Montague's Blenny.....M.S.

*a*B. ocellaris. Linn.....Butterfly Blenny.....M.

*a*B pholis. Linn.....Shanny.....M.S.

*a*Carelophus Ascanii, Collet. Yarrell's Blenny (l.n. Crested Cat-fish).....M.S.

*a*Centronotus gunnellus. Blv..Butter-fish (l. n. Saw-eel, Stane-checker).....M.S.

*a*Zoarces viviparus. Cuv.....Eel-pout (l. n. Gray-dog, Guffer, Green-bane).....M.S.

Family 22.—**Cepolidæ.** Bleeker.

*a*Cepola rubescens. Linn.....Red Band-fish.....M.

Family 23.—**Trachypteridæ.** (Part.) Swainson.

*a*Trachypterus arcticus. Nilss. Deal-fish.....M.

*a*Regalecus Banksii. Cuv....Ribbon-fish or Bank's Oar-fish.....S.

Family 24.—**Atherinidæ.** Günther.

*a*Atherina presbyter. Jenyns. Atherine.

A. Boyeri. Risso.....Boyer's Atherine.

Family 25.—**Mugilidæ.** Cuvier.

*a*Mugil capito. Cuv.....Gray Mullet.....M.

*a*M. chelo. Cuv.....Lesser Gray Mullet.....M.S.

Family 26.—**Gasterosteidæ.** Artedi.

All the species of this family are locally known as Bandies or Bandstickles.

*a*Gasterosteus aculeatus. Linn. Three-spined Stickleback..S.

*a*var. a, trachurus.....Rough-tailed Stickleback...M.S

var. b, semiloricatus.....
*a*var. c, semiarmatus.....Half-armed Stickleback.....S.
*a*var. d, gymnurus.....Smooth-tailed Stickleback.
var. e, trachycentrus.....Four-spined Stickleback.
*a*var. f, spinulosus.....M.
*a*Gasterosteus pungitius. Linn...Ten-spined Stickleback.
*a*G. spinachia. Linn.....Fifteen-spined Stickleback. M.S.

Family 27.—**Centriscidæ.** (Part.) Bleeker.
Centriscus scolopax. Linn...Snipe-fish.

Family 28.– **Labridæ.** Cuvier.
*a*Labrus maculatus. Blv.....Ballan Wrass (l.n. Sea-swine) M.S.
*a*var. a, Donovani.....
*a*var. b, lineatus.....Green Wrass.
*a*L. mixtus. Linn.....M.
*a*Crenilabrus melops. Cuv...Baillon's Wrass.
var. a, rone.
var. b, Pennantii.
*a*var. c, norvegicus.
*a*var. d, cornubicus.
var. e, Couchii.
*a*Ctenolabrus rupestris, Linn. Pink Brame.
Acantholabrus Palloni, Cuv. Scale-rayed Wrass.
*a*Centrolabrus exoletus, Günth. Rock Cook.
*a*Coris julis. Günther.....Rainbow Wrass.....A.U.

Order 2.—Anacanthini.

Family 1.—**Gadidæ.**
*a*Gadus morhua. Linn.....Cod (l.n. while young it is called Codlin, or Rock Cadie).....M.S.
*a*G. æglefinus. Linn.....Haddock (l. n. Haddies, Gamerls. Small ones, Rockies).....M.S.
*a*G. luscus. Linn.....Bib (l.n. Siller-fish, Jack-downies).....M.S.
*a*G. minutus. Flem.....Power-cod (l. n. Skelchie, or Skelach).....M.S

*a*G. merlangus. Flem.....Whiting (l. n. Whittin or Fittin).....M.S.

*a*G. poutassou. Günther.....Couch's Whiting.

*a*G. virens. Linn.....Coal-fish (l. n. Colmey. Saith. Half-grown. Podelly, young.) ..M.S.

*a*G. pollachius. Linn.....Pollack (l. n. Lythe).....S.

*a*Merlucius vulgaris. Cuv.....Hake (l. n. Herring Hake).M.S.

*a*Phycis blennioides. Gmel...Greater Forked-beard.....M.S.

*a*Molva vulgaris. Flem.....Ling (l. n. Kellin, Lahan)...S.

*a*Lota vulgaris. Cuv.....Burbolt.....S.

*a*Motella mustela. Nilss.....Five-bearded Rockling.....M.S.

*a*M. glauca. Couch.....Mackerel Midge.....S.

*a*M. cimbria. Nilss.....Four-bearded Rockling.....S.

*a*M. tricirrata. Nilss.....Three-bearded Rockling...M.S.

*a*M. septemcirrata.*

*a*Gadiculus argenteolus.....Silvery Gade.....S.

*a*Raniceps raninus. Collet...Lesser Forked-beard (l.n. Paddock).....M.S.

*a*Brosmius brosme, White.....Torsk.....M.S.

Family 2.—**Ophidiidæ.** Müller.

Ophidium barbatum. Linn..Bearded Ophidium.

*a*Fierasfer dentatus. Cuv.....Drummond's Echiodon.....S.

*a*Ammodytes lanceolatus. Günther ‡.....S.

*a*A. tobianus. Linn.....S.

A cicerellus. Rafin.

Family 3.—**Macruridæ.** Richardson.

*a*Coryphænoides rupestris. Collet.

Family 4.—**Pleuronectidæ.** Risso.

*a*Hippoglossus vulgaris. Flem. Holibut (l. n. Turbut, Blacksmiths, or Berdis).,.....M.S.

*a*H. limandoides. Günther...Long Rough Dab. (l. n. Bastard Sattie).....M.S.

*a*Rhombus maximus. Cuv...Turbot (l. n. Bonnet Fluke, Roden Fluke).....M.S

* The only specimen found by Mr. Sim at Aberdeen Bay and sent to Mr. Couch, has been lost.

‡ This and the next species are locally named San'lins, San'ils, or Ornals.

*a*R. lævis. Günther.....Brill (l. n. Siller Fluke).....S.
*a*Zeugopterus unimaculatus. Day...Topknot*.....M.
*a*Z. punctatus. Collet.....Müller's Topknot.....M.S.
*a*Arnoglossus megastoma. Day. Whiff (l. n. Sail Fluke Witches' Fluke.). M.S.
A. laterna. Günther.....Megrim (l. n. Scald fish).
*a*Pleuronectes platessa. Linn. Plaice (l. n. Plash Fluke).-M.S.
*a*P. microcephalus. Don.....Smear Dab. Lemon Sole (l. n. Mary Sole, Sole Fluke).....M.S.
*a*P. cynoglossus. Linn.....Long Flounder (l. n. Pole Fluke, Craig Fluke).....M.S.
*a*P. limanda. Linn.....Common Dab (l. n. Suttie, Sun-dab).....M.S.
*a*P. flesus. Linn.....Flounder (l. n. Black-backed Fluke.....M.S.
*a*Solea vulgaris. Risso.....Sole.....M.S.
*a*S. lascaris. Risso.....Lemon Sole. Sand Sole.
S. variegata. Flem.....Variegated Sole.
*a*S. lutea. Bon.....Little Sole.....S.

Order 3.—Physostomi.

Family 1.—Sternoptychidæ.

Argyropelecus hemigymnus, Günther.
*a*Maurolicus Pennantii. Day. Argentine.....S.

Family 2.—Salmonidæ. Müller.

*a*Salmo salar. Linn.....Salmon, after spawning, is locally called Black-fish or Kelts.....S.
*a*S. trutta. Linn.....Salmon trout (l. n. Sea-trout) S.
*a*var. a, albus. Wabl.....Whitting (l. n. Phinock).
var. b, cambricus, Donov.....Bull-trout.
*a*Salmo levenensis. Yarr.†
*a*S. fario. Linn.....River-trout (l. n. Yellow-trout).....M.S.

* This and Z. punctatus are locally known as Little, black, hairy Flukes.
† Six thousand of this species were put into the Lunnan by Col. Blair Imrie, last May.

var. a, orcadensis.
var. b, ferox.
var, c, cornubiensis.
var, d, nigripennis.
var. e, estuarius.
var. f, stomachicus.
var. g, Swaledale trout.
var. h. Crassapuill trout.

Salmo alpinus. Linn.
var. a, Perisii.
var. b, Willughbii.
var. c, Killinensis.
var.d, Grayii.
var. e, Colii.

Salmo fontinalis. Günther.

*a*Osmerus eperlanus. Lacep. Smelt (l. n. Sand Smelt).

Coregonus oxyrhynchus. Cuv. Houting.

C. clupeoides. Lacep.....Powan (l. n. Fresh-water Herring).

C. vandesius. Günther.....Vendace.

C. pollan. Günther.....Pollan.

*a*Thymallus vulgaris. Nilss. Grayling.

Argentina sphyræna. Linn..

Family 3.—**Escoidæ.** Day

*a*Esox lucius. Linn.....Pike (l. n. Jack or Gade)...M.S.

Family 4.—**Scomberesocidæ** Day.

*a*Belone vulgaris. Flem.....Gar-fish (l. n. Green-bane)...M.S.

*a*Scomberesox saurus. Flem. Saury-pike (l. n. Gowdnook) M.S.

Exocœtus volitans. Linn....Flying-fish.

E. evolans. Günther.

*a*Paralepis coregonoides. Risso.

Family 5.—**Cyprinidæ.**

Carassius vulgaris. Nord.....Prussian Carp.

C. auratus. Linn.....Gold-fish..... .....M.

Cyprinus carpio. Linn.....Carp,

Barbus vulgaris. Flem.....Barbel.
Gobio fluviatilis. Flem.....Gudgeon.
Leuciscus rutilus. Flem.....Roach.
L. cephalus. Flem.....Chub.
L. vulgaris. Cuv.....Dace, Graining.
L. erythrophthalmus. Flem...Rudd
*a*L. phoxinus. Cuv.....Minnow. (l. n. Minnann)...M.S.
Tinca vulgaris. Cuv.....Tench.
Abramis brama. Flem.....Lake Bream.
A. blica. Agass.....White Bream.
Alburnus lucidus. Günther...Bleak.
Cobitis tænia. Linn.....Spined Loach.
*a*Nemacheilus barbatula Günth Loach.

Family 6.—**Clupeidæ.** Cuvier.

*a*Engraulis encrasicholus. Cuv. Anchovy.
*a*Clupea harengus. Linn.....Herring.....M.S.
*a*C. pilchardus. Flem.....Pilchard.....S.
*a*C. sprattus. Linn.....Sprat.....S.
*a*C. Alosa. Linn.....Rock Herring.....M.S.
*a*C. finta. Cuv.....Twait Shad.....S.

Family 7.—**Muraenidae.** Müller

*a*Anguilla vulgaris. Turt.....Sharp-nosed Eel.....M.S.
*a*Conger vulgaris. Cuv.....Conger Eel.....M.S.
*a*Muræna helena. Linn..... Murry.

Order 4.—Lophobranchii.

Family 1.—**Syngnathidae.** Day

*a*Siphonostoma typhle. Yarr...Broad-nosed Pipe-fish.....S.
*a*Syngnathus acus. Linn.....Greater Pipe-fish.....M.S.
*a*Nerophis æquoreus. Günth...Snake Pipe-fish.....M.S.
*a*N. ophidian. Yarr.....Straight-nosed Pipe-fish....S.
*a*N. lumbriciformis. Kröyer...Worm Pipe-fish.
*a*Hippocampus antiquorum Leach...Sea-horse.....M.

Order 5.—Plectognathi.

Family 1.—**Sclerodermi.** Day.

Balistes maculatus. Gmel.....M.

B. capriscus. Gmel.....M.

Family 2.—**Gymnodontes.** Day.

*a*Tetrodon lagocephalus. Linn. Globe-fish.

*a*Orthagoriscus mola. Flem....Sun-fish.....M.S.

*a*O. truncatus. Flem.....Oblong Sun-fish.

SUB-CLASS.—CHONDROPTERYGII.

Order 1.—Ganoidei.

Family 1.—**Acipenseridae.** Day.

*a*Acipenser sturio. Linn.....Sturgeon.....M.S.

Order 2.—Elasmobranchii.

Sub-order Holocephala.

Family 1.—**Chimaeridae.** Day.

*a*Chimæra monstrosa. Linn....Arctic Chimæra.

Sub-order 2.—Plagiostomata.

Family 1.—**Carchariidae.** Day.

*a*Carcharias glaucus. Cuv....Blue Shark.....M.

*a*Galeus valgaris. Flem.....Tope, or Penny dog.....M.S.

*a*Zygæna malleus. Shaw.....Hammer-headed Shark.

*a*Mustelus vulgaris. Müller...Smooth Hound.....M.

Family 2.—**Lamnidae.** Day.

*a*Lamna cornubica. Cuv.....Porbeagle.....M.S.

*a*Alopias vulpes. Bonap.....Thrasher.....M.S.

*a*Selache maxima. Cuv.....Basking Shark.....M.S.

Family 3.—**Notidanidae.** Day.

*a*Notidanus griseus. Cuv.....Six-gilled Shark.

Family 4.—**Scylliidae.** Day.

*a*Scyllium canicula. Cuv.....Small Spotted Dog-fish (l. n. Hund-fish, Blin'ees).....M.S.

*a*S. catulus. Cuv.....Large Spotted Dog-fish (l.n. Nurse-hound, Bounce)...M.S.

*a*Pristiurus melanostomus. Yarr..Black-mouthed Dog-fish

Family 5.—**Spinacidae.** Day.

*a*Acanthias vulgaris. Risso...Picked Dog-fish (l. n. Sea dog, Boney dog).....M S.

Centrina Salviani. Risso.

*a*Læmargus microcephalus. Day...Greenland Shark.....S.

*a*Echinorhynchus spinosus. Bl. Spinous Shark.....A.U.S.

Family 6.—**Rhinidae.** Day.

*a*Rhina squatina. Rafin.....Monk-fish. Angel-fish.....A.U.

Family 7.—**Torpedinidae.** Day.

*a*Torpedo nobiliana. Bonap...Torpedo. Cramp-fish.

T. marmorata. Risso

Family 8.—**Raiidae.** Day.

*a*Raia batis. Linn.....Skate (l. n. Dinnan, Blunt-nose).....M.S.

*a*R. macrorhynchus. Rafin...Flapper Skate.

*a*R. alba. Lacep.....Burton Skate (l. n. White Skate, Doctor).

*a*R. oxyrhynchus. Linn.....Long-nosed Skate.....S.

*a*R. fullonica. Linn.....Shagreen Ray (l. n. Long-nosed Dinnan).....S.

*a*R. clavata. Linn.....Thornbacked Ray (l. n. Thorny-maids, Maiden Skates).....M.S.

*a*R. maculata. Mont.....Spotted Ray (l.n. Eel-pot).S.

*a*R. microcellata. Mont.....Painted Ray

*a*R. radiata Donov.....Starry Ray.....M.S.

*a*R. circularis. Couch.....Cuckoo Ray. Sandy Ray.M.

Family 9.—**Trygonidae.** Day.

*a*Trygon pastinaca. Cuv.....Sting Ray.

Family 10.—**Myliobatidae.** Day.

*a*Myliobatis aquila. Cuv.....Whip Ray, or Eagle Ray.. In Banff Museum.

Cephaloptera giornæ. Day..Horned Ray.

SUB-CLASS C.—CYCLOSTOMATA.

Family 1.—**Petromyzontidae.** Day.

*a*Petromyzon marinus. Linn..Sea Lamprey.....M.S.

*a*P. fluviatilis. Linn.....Lampren, or Silver Lamprey M.S.

*a*P. branchialis. Lacep.....Planer's Lamprey.....M.S

Family 2.—**Myxinidae.** Day.

a Myxine glutinosa. Linn.....Glutinous Hag.....M.S.

SUB-CLASS D.—LEPTOCARDII. DAY.

Family 1.—**Cirrostomi.** Day.

a Branchiostoma lanceolatum. Gray.....S.

APPENDIX A.

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APPENDIX B.

DESCRIPTION OF TRACHYPTERUS ARCTICUS, OR DEALFISH.

Body elongated, compressed; head and body covered with a silvery epidermis, which comes off easily (when handled); skin consisting of round, hard, and

shagreen-like tubercles ; dorsal fin, commencing above gill cover, extends the whole length of the body, colour a sort of brick red ; ventral fin absent. Tail slightly rising off the direction of the long axis of the body. A row of small spines, projecting forward, runs along the lateral line. At the junction of the tail with the body, underneath, there is a small wart, and in front of it a strong sharp spine, projecting forwards. The scales on the upper half of the body are so disposed as to give a ribbed appearance : two rows of larger scales run from the origin of each dorsal spine ray towards the lateral line.

Number of rays in dorsal fin, ...	158
,, ,, caudal, ...	7
,, ,, pectoral, ...	5
,, ,, branchiostomous,	6
Teeth in lower jaw, ...	4
,, upper jaw, ...	6

The teeth in the lower jaw are the larger. In the upper jaw the two central teeth are largest, the next two smaller, and the two outer very small ; corner teeth about the size of those in the lower jaw.

DIMENSIONS.

	Ft.	In.
Length from snout to end of tail, ...	5	$10\frac{1}{2}$
,, ,, ,, centre of eye, ...		$4\frac{1}{4}$
,, ,, ,, back of gill-covers, ...		$7\frac{1}{4}$
,, ,, ,, pectoral fin, ...		8
,, ,, ,, anus, ...	2	$8\frac{1}{2}$
Depth of head, ...		$6\frac{1}{2}$
,, in front of pectoral fin, ...		9
,, 15 inches from snout, ...		$11\frac{1}{2}$
,, (greatest) 30 inches from snout, ...		$12\frac{3}{4}$
,, 48 ,, ,, ,, ...		$9\frac{1}{2}$
,, 54 ,, ,, ,, ...		$6\frac{1}{2}$
Thickness at snout, ...		$1\frac{1}{8}$
,, of head before eyes, ...		$1\frac{5}{8}$
,, over eye, ...		2
,, 12 inches from snout, ...		$2\frac{1}{4}$
,, at vent, ...		$1\frac{3}{8}$
,, at end of dorsal fin, ...		$\frac{1}{2}$
,, at caudal fin, ...		$\frac{1}{4}$
Length of dorsal fin rays :		
9 inches from snout, ...		$3\frac{1}{2}$
18 ,, ,, ,, ...		$4\frac{1}{2}$
24 ,, ,, ,, ...		$5\frac{1}{2}$
36 ,, ,, ,, ...		$5\frac{1}{2}$
48 ,, ,, ,, ...		$4\frac{1}{2}$
65 ,, ,, ,, ...		3
Length of longest (lowest) spine of caudal fin, ...		$7\frac{1}{2}$
Greatest breadth of caudal fin when extended, ...		$11\frac{1}{2}$

Space between spines of lateral line, ...	$\frac{5}{8}$
Eyes equal. Diameter of eye-ball, ...	$\frac{18}{10}$
,, of pupil, ...	$\frac{7}{8}$
Depth of lower jaw, ...	$\frac{7}{8}$
Mouth when open, ...	$1\frac{1}{2}$ by $1\frac{1}{8}$

The above description is accurate as far as this specimen goes; but some allowance must be made for a certain amount of mutilation. There was no trace of the elongated anterior spine of the dorsal fin, described by Yarrell, Günther, Nilsson, and others. The caudal fin presented only seven rays; and there was no trace of ventral fins. The wart observed at the root of the tail had some rough projections on it, which were probably broken spine rays of what may be considered the analogue of the anal fin. There was no trace of the black spots on the sides of the body, noticed by Yarrell, and others.

The fish is evidently different from the one described by Dr. Fleming; for, in his specimen, the vent was immediately under the pectoral fin, whereas in this it was behind the middle of the body. The pectoral fins, which consisted of five rays, measured $1\frac{1}{2}$ inches in length, but they all had the appearance of having been broken.

Though this specimen was comparatively perfect, it was extremely fragile; and in handling it with the greatest care it was impossible to avoid injuring some parts of the fins.

REPORT ON THE ORNITHOLOGY OF THE EAST OF SCOTLAND.

ADDITIONAL REMARKS BY THE WRITER.

Rock Dove No 181 "is confined to the Rocky Coasts."—Since the above was written, I have had the pleasure of a letter from Mr. William Wilson, junr, of Hillock, Terpersie, Alford, acquainting me that the Rock Dove (*Columba livia*) is permanently resident in Central Aberdeenshire, nesting on rocks along the sides of the rivulets on the Coreen hills, that they are very shy, and that he has always considered their appearance there as one of the most interesting features in the Ornithology of the district.—I can only express the hope that other members of the union will follow Mr. Wilson's example in forwarding any local information that may occur; this being the only way to gain a thorough knowledge of the distribution of the birds of the entire district.

Another correspondent directs attention in the report to the **Reed Warbler** obs. Forfar No. 24 The note on it, I find, as it stands at present, applies only to Perth—there should have been the addition, "noticed in Forfarshire" (fide Mr. Patrick Henderson.

Dundee). The same omission has been inadvertently made also in the note to the **Chiff-Chaff**, No. 21, to which record should be added "Forfar, fide Mr. Patrick Henderson."

I may also state (allusion having been made to it) that though such species as the **Reed Warbler**, and **Aquatic Warbler**, are enumerated in the body of the list, the numbers prefixed were merely intended as guides to the species mentioned and to the notes, and not to substantiate their claim to belong to the district. This is shown in the summary by their exclusion, along with all other doubtful species. The mention of No 25, **Aquatic Warbler** (a bird not yet recorded as British), was with the sole object of provoking investigation, owing to the resemblance of the eggs found on the banks of the Tay to those of that species.

As to the **Chiff-Chaff**, a third correspondent suggests the possibility of the willow-wren having been mistaken for it in the instances noted in the Report; to this I can only say, that having felt bound to mention all notices previously recorded, the identity of species must rest with the authority quoted. As regards myself, I have never had the good fortune to fall in with the chiff-chaff in Scotland. Though knowing the bird well in the South of Europe, and having been continually on the look out for it in this country, I have never seen it except in England.

H. M. Drummond Hay.

November, 1886.

A few errors have crept into the Report, which it is desirable to indicate for correction.

In the table on p. 358 the words "Perth" and "Forfar" have been transposed, hence for Nos. 23-34, inclusive, the records under "Perth" belong to Forfar, and those under "Forfar" belong to Perth.

In notes to Nos. 43, 44, 45, for *Pipet* read *Pipit*.

In note to 81 (Redshouldered Starling), line, 5, for 1885 read 1856.

In note to 157 (Ruddy Sheldrake), line, 2, for 1887 read 1881.

207 in table, on p. 373, should have *b* prefixed to call attention to the note on this species below. H. M. D. H.

PHYTOLOGY.

ON THE FLORA OF SHETLAND.

By W. H. BEEBY.

IN the following notes, the result of a visit of about eight days to the Shetland Islands at the latter end of July last, I have endeavoured to confine myself to the following points, viz.—to giving some account of the new and more interesting forms noted; new county records or confirmations; a few additional localities for some of the rarer species; and remarks on a few doubtful plants. In the last case I have mostly confined my remarks to such as have been recorded as common, as I had little opportunity for looking up doubtful plants, occurring in isolated localities, from want of time. I have not embodied the matter to be found in the papers of Mr. Ralph Tate (*Journ. Bot.*, 1866, pp. 2-15), Mr. A. Craig-Christie (*Trans. Bot. Soc., Edin.*, Vol. X., p. 165), &c.; as no attempt at a revision of the whole Flora could be made on so short an acquaintance with it. That the Flora of these islands is well worthy of further attention I am convinced; and the occurrence of such a plant as *Alsine hirta* in the same locality which has already produced *Arenaria norvegica* and *Cerastium arcticum* (*Edmondstonii*), as well as the occurrence of *Luzula maxima* var. *gracilis*, previously known only from the Faroes, is a strong indication that other interesting plants, both Scandinavian and Faroean, may yet be found in the islands.

After working down the plants collected (about 2,200, referable to 340 gatherings) to the best of my ability, I have largely availed myself of assistance with the more critical forms, for which I have in particular to thank Dr. Lange; whose wide knowledge of Arctic and Scandinavian Floras makes his determinations of peculiar value. For similar assistance I am also much indebted to Mr. Arthur Bennett (*Potamogeton*, &c.), Dr. Buchenau (*Juncaceæ*)

Messrs. H. & J. Groves (*Characeæ*), Prof. Hackel (*Gramina*), Herr Svante Murbeck (*Viola*), and Mr. H. N. Ridley (*Orchidaceæ*). Without their help I could not have hoped to present an account of the various forms such as could be of any value, more especially as I am acquainted rather with our southern forms than with those of the extreme north. My thanks are also due to Mr. A. Craig-Christie and Dr. F. Buchanan White for many useful hints and localities. A few *Hieracia* and other critical plants are still under examination; and on these I hope to report on some future occasion.

Four distinct districts were visited, the greater amount of time being spent in Unst, in which the tract north of Baltasound was alone worked; a walk of fifteen miles through Yell, and a few hours spent at Mid Yell Voe the following morning, represent the work done in that island; two days were spent about Ollaberry, in Northmavin, the northern peninsula of Mainland; and a few hours about Lerwick, in the southern peninsula. The following abbreviations are used:

U = Unst. Y = Yell.
N = Northmavin. L = Lerwick.
* = believed not to have been previously published as British.
‡ = not recorded in *Top. Bot., Ed. II.*, or in Bennett's "*Additional Records*," unless with some form of query.

Ranunculus Flammula L.—Most commonly as the var. *radicans* Nolte; sometimes, as by the shores of Littlesetter Loch, Yell, much like *R. reptans* L. The latter may occur; but Edmondston's record of it appears, from the localities visited, to refer to the var. of *Flammula*.

Caltha palustris L.—U. Loch of Cliff. Y. Littlesetter Loch. N. Ditches and streams about Ollaberry. * Var. *Zetlandica* mihi. U. South end of Loch of Cliff. Y. Peaty ditches by the Arisdale Burn, Hamna Voe; Littlesetter Loch. L. Stony margin of Clickhimmin Loch. The plant for which I propose the above name is too abundant and wide-spread to be passed by as a chance form of the type. It is characterised by its small size (about 5—8 inches), rooting stems, and small flowers, but the root-leaves resemble those of *palustris* rather than *C. radicans* Forst., the characteristic root leaves of which were sought in vain. I thought that it might be the *C. palustris* var. *radicans* of Fries, which has been said not to be the true plant of Forster; and Dr. Lange, to

whom I sent it together with root-leaves of *C. radicans* Forst. (from Mr. A. Bennett's garden) for comparison, replies that Fries' plant from Finmark appears to be the same as mine, which may possibly be a distinct species. I have the plant in cultivation, and hope to observe it further. I may add that we have a small prostrate form of *C. palustris* in Surrey which was at one time thought to be the var. *minor*, but although I have had it growing in moist peat for some years, and have pegged down the stems, I cannot induce it to root at the nodes.

Cakile maritima Scop. var. *integrifolia* Hornem.—Y. Sandy shore at Mid Yell Voe. Probably common in Scotland? I have it from Pettycur, Fife (by R. McKay), but have not seen it in the south.

Cardamine pratensis L. var. **dentata** Schult.—U. Near Baltasound and Haroldswick. N. Streams by the south side of Ronas Voe.

* **Cochlearia groenlandica** L.—N. Coast near Ollaberry. Under this plant Dr. Lange quotes (Fl. Groenl., p. 34 †) the *Eng. Bot.*, Plate No. 2403; but in *Eng. Bot.*, Ed. III., this plate represents our *C. alpina*, according to Syme not the true *C. groenlandica* L. Dr. Lange probably quotes this plate largely on account of the pods being represented quite veinless; but those of *C. officinalis* are also represented as veinless, and the veins may have been similarly omitted in the other plate. At all events it is satisfactory to be able to record this plant on the high authority of Dr. Lange. Another form occurs—U. Serpentine hills about Baltasound. N. Hills near Ollaberry. This plant has a strongly veined pod, and Dr. Lange reports—"seems a diminutive form of *C. officinalis*, or a distinct species." This seems to me our Scotch *C. alpina;* which differs much from a plant so labelled from Snowdon. There is evidently room for further work in this genus; it was rather too late for them in Shetland. *C. danica* L. was not seen.

Draba incana L.—The usual form in Unst is the var. *contorta* (Ehrh.). Some specimens have a slightly hairy pod, and represent the var. *confusa* (Ehrh.). A more distinct form is the var. *flexuosa* Lange, which has slender, flexuous stems, usually several from the same root. A few specimens of this, or a form very close to it, were gathered near the Wick of Hagdale, but the

†In the distribution given (l. c.) Dr. Lange does not include Great Britain.

specimen sent to Dr. Lange was scarcely sufficient to enable him to speak with certainty.

Viola palustris L.—Occasionally in bogs and stony margins of lakes. "Remarkable for its often apiculate, not very broad leaves." (Herr Murbeck.)

V. sylvatica Fr.—Here and there, chiefly near the sea level, including—*V. Riviniana* Reich. About Baltasound, Unst. ‡*V. silvestris* Reich. (*Reichenbachiana*). N. About Ollaberry; rocks about Eela Water. Herr Murbeck considers that a slight doubt attaches to the last, owing to late condition, &c.

V. canina Reich.—Here and there, and reaching much greater altitudes than the last two.

V. tricolor L.—Very large flowered forms in Unst. I did not note *arvensis*, but Edmondston's description shows that it occurs.

Drosera rotundifolia L.—The only species seen. Y. Sparingly between Ulsta and Mid Yell. N. Sparingly near Hillswick.

Polygala serpyllacea Weihe.—Common, and the only form seen.

Cerastium tetrandrum Curtis.—Common about the coast. I failed to find *C. semidecandrum*, the previous record of which is probably an error.

C. triviale Link.—Common and much more extended in its range than *C. glomeratum*, which does not seem to get far above sea level. Var. *alpestre* Hartm. U. A single plant on Burrafirth sands, doubtless sprung from seed fallen from the cliffs. N. Wet places near Ollaberry. The latter a taller and remarkably large-flowered form. Mr. Craig-Christie mentions a similar form at Baltasound, but I was unable to find it. Another form occurs sparingly scattered over the Serpentine hills about Baltasound, and is very noticeable on account of its short, strict habit, and bright green leaves; Dr. Lange reports on it—"in habit like var. *holosteoides* Fr., but it is hairy above."

* **C. longirostre** Wichura.—N. Grassy places among rocks by the coast at Ollaberry; seen nowhere else. Named by Dr. Lange, who remarks—"seems an extended form of *C. vulgatum*.' A remarkably large plant, with leaves 1½ inches and more in length; capsule nearly ¾ inch. It seems to differ from *C. triviale* in several characters, and I hope to grow it from seed. Placed as a sub-species by Nyman; occurs in Iceland, Faroes, Scandinavia &c.

C. arcticum Lange, var. **Edmondstonii**, mihi.—"Præter colorem atrorubentem omnino mihi videtur cum *C. arctico* Lge." Dr. Lange in litt.

One of my chief objects was to ascertain the true position of this plant, and as it was found in ripe fruit, Dr. Lange had no difficulty in giving a decisive opinion, which he was unable to do in the case of Mr. Hanbury's plant from near Ben-muic-dhui, owing to the absence of ripe seeds (see *Scot. Nat.*, 1886, p. 331). This plant has usually been placed as a variety of *C. latifolium* Smith, though retained under *C. latifolium* L. in the last edition of Babington's *Manual;* while Dr. Hooker (*Students' Flora*, ed. III.) goes to the other extreme, and places it as a variety of *C. alpinum* L. I think it has been pretty generally admitted for some time past that we have not the true *C. latifolium* L. in this country; but the var. *compactum* (*E. B.* III.) is precisely the same as the *latifolium* of Scandinavian authors, according to Syme. Now, as Dr. Lange quotes *C. latifolium* Hartm. as a synonym of his *C. arcticum*, it is probable that at least several of the stations given by Syme in *Eng. Bot.* III., especially those for the var. *compactum*, will be found to produce *arcticum*. The difference in the characters afforded by the seeds is perhaps not quite readily appreciated when those of only one plant are examined; but it is sufficiently obvious when the ripe seeds of *alpinum* and *arcticum* are compared. The var. *acutifolium* Edmondst. is a slight variation, observable chiefly in plants growing rather more inland.

Stellaria media With.—Common, a minute form on Crucii field Hill, Unst.—**S. uliginosa** everywhere in wet places; *S. graminea* sought in vain.

Honkenya Peploides Ehrh.—U. The usual form on Burrafirth sands.—*Var. *diffusa* Hornem. Y. Mid Yell Voe,—"but leaves broader and shorter in the Greenland plant."—Dr. Lange.

Alsine verna Bartl. *var. *hirta* Wormskj. "*forma condensata*." Dr. Lange. U. Very sparingly on the Serpentine hills near Baltasound. Very close to *A. rubella* Wahl., with which it must be placed if we maintain *verna* and *rubella* as distinct species, which is the course adopted by Nyman. In the arrangement used by Dr. Lange (*Fl. Groenl.*, p. 24), *hirta* and *rubella* are placed as varieties of *A. verna* Bart. (Cf. J. G. Baker in *Journ. Bot.*, 1870, p. 186.)†

† I doubt whether the Ben Lawers "*rubella*" differs from the Shetland form

Sagina procumbens L.—The form with five-parted flowers almost as common as the type.

* **S. Linnæi** Presl.—U. Occasionally on the Serpentine at Baltasound. N. Stony places near Eela Water.

S. subulata Presl.—Frequent. *Var. *glabrata* Koch. N. Near Ollaberry.

S. nodosa Meyer.—U. Sparingly on the Baltasound hills. I could not see *S. maritima*.

Spergula arvensis L.—The only plants gathered belonged to the var. *sativa* Boenn.

Montia rivularis Gmel.—Very common, and the only one seen, whether in streams or on the peat. This is the only form in Greenland.

Hypericum pulchrum L. *var. **procumbens** Rostrup. U. Abundant on the Serpentine hills about Baltasound. N. South side of Ronas Voe. Mr. Craig-Christie mentions (from Ronas Hill) a small form which is doubtless the same. A quite prostrate plant, with the stems hidden under the heather, above which only the apex appears, and usually bears but 1—3 flowers. The type was not seen.

Ulex europæus L.—Only seen with **Cytisus scoparius** in a field below Mrs. Hunter's house at Baltasound. Both planted?

Anthyllis vulneraria L. and var. **maritima** Koch.—The type frequent; the variety sparingly on Burrafirth cliffs; a beautiful plant, the leaves thickly covered and ciliated with silvery-silky hairs; flower-stems tall, robust, usually with more than one head of flowers.

Trifolium pratense L.—A form of this with narrow leaflets and somewhat stalked heads is probably the *T. medium* Edmondst. It inhabits exactly the localities described as those of the latter plant.

T. repens L.—A dwarf, large-flowered form near the sea at (N) Hillswick Voe.

Vicia sativa L.—A corn-field weed in Unst.

Lathyrus maritimus Bigel. var. **acutifolius** Bab.—This has been reported extinct, and I could find only a few barren shoots. Possibly more abundant in some seasons?

Epilobium palustre L.—Frequent, and I believe always as the *var. *fontanum* Hausskn. Mon? This is a very large-

flowered form—flowers $\frac{3}{8}$ inch long, and agreeing well in all other characters with Haussknecht's description, especially plants from streams south of Ronas Voe;—a widely distributed variety occurring in the Faroes.

Myriophyllum alterniflorum D.C.—The only one recorded. *M. spicatum* previously recorded in error.

Sedum Rhodiola D.C.—U. Burrafirth Cliffs.

Ligusticum scoticum L.—U. Rocks by the Wick of Hagdale, sparingly.

Heracleum Sphondylium L.—Seen only at Mid Yell Voe.

Daucus Carota L. **Chœrophyllum Anthriscus** L. The absence of the former was noted by Tate. Both are best excluded on present knowledge. ‡ **Ægopodium Podagraria** L. occurs as a garden weed at Ollaberry.

Galium palustre L. * var. **microphyllum** Lange in litt. "Fol. breviora et angustiora (linearia) quam in typo." U. Pastures south of the Loch of Cliff. L. By Clickhimmin Loch. *G. uliginosum* sought in vain.

Matricaria inodora L., * var. **phœocephala** Ruprecht. Broken fields between Baltasound and the Loch of Cliff; probably in other places. Dr. Lange (*Fl. Groenl*) gives the distribution—arctic America, arctic Russia, and Scandinavia, *Scotland*, Faroes, Iceland.

Chrysanthemum Leucanthemum L. Much sought, but without success.

Tanacetum vulgare is probably not truly wild.

Artemisia vulgaris L. Only once seen, near Ollaberry.

Achillea Millefolium L. Common * var. *alpestris* Koch. U. Burrafirth Cliffs.

Senecio Jacobæa L. sought in vain.

Solidago Virga-aurea L. Frequent, passing into the var. *cambrica* on rocks.

Jasione montana L. Type not common; a small form of it on the moors between Ronas Voe and Hillswick; *var. *major* Koch. Common on cliffs by the sea and inland. U. Cliffs about Burrafirth and the Loch of Cliff. N. Cliffs about Ollaberry. I have seen it from Brae Head, Co. Wicklow, Ireland (*leg.* Geo. Nicholson).

Vaccinium uliginosum L. Saxa Vord Hill.

V. Myrtillus L., f. *microphylla* Lge. A minute form on Saxa Vord Hill.; the stems buried in the earth, and the small leaves looking much like those of *Salix herbacea*, near which it grows.

Gentiana campestris L.—Common; forms with simple, one-flowered stems at Baltasound.

G. Amarella L., f. **multicaulis** Lge.—U. Abundant on the Burrafirth sands and adjacent banks below the cliffs. Differs in having the flowers brownish-red externally, and pale greenish yellow or cream-coloured internally; corolla-lobes apparently always erect, not spreading; stem usually very much branched below.

Mimulus luteus L.—Well naturalised by Clickhimmin Loch, Lerwick.

Rhinanthus minor Ehrh.—Common; small forms on the peat, large forms on the cliffs north of Saxa Vord Hill.

Thymus Serpyllum Fries, *var. **prostrata** Hornem.—N. rocks and moors about Ronas Voe. Probably it is the common form; and it may also be so in Scotland, whence I have no specimens.†

Myosotis cæspitosa Schultz.—Scarce. N. Wet places on the moors between Ronas Voe and Hillswick. L. Clickhimmin Loch.

M. repens Don.—Everywhere common in wet places; doubtless the *M. palustris* Edmondston, as stated by Tate.

M. arvensis Hoffm.—Common.—*M. collina* sought in vain.

‡ **M. versicolor** Reich.—Abundant in and about cultivated fields at the south-east corner of the Loch of Cliff, Unst.

Armeria maritima Willd. *var.—A small form is common generally, and appeared to me to agree well, excepting the slight pubescence, with *A. sibirica* Turcz., placed by Nyman as a variety. Dr. Lange reports: "*A. sibirica* (?) var. scapo pubescente."

Plantago lanceolata L.—Common, and very variable. The ordinary form about waysides, &c.; *var. *capitata* Presl.—U. common about Burrafirth sands and the Loch of Cliff. N. Cliffs near Ollaberry. This is the common form of rocks and sandy places.—*Var. *eriophylla* Dcne.—U. Burrafirth. N. Rocks

† Since writing the above, Mr. Bennett tells me it occurs on the Torridon range, W. Ross (leg. S. Grieve, 1886).

south of Ronas Voe.—A remarkable form occurs on the sloping sea-bank at Mid Yell Voe. It produces a long rhizome, which trails over the rocks, sometimes bare, sometimes buried, and bears tufts of leaves and flower-stems at intervals. Dr. Lange names it *var. *repens.*

P. maritima L.—Also very variable.—Var. *pygmæa* Lange. —Y. Alluvial grit, near the mouth of the Arisdale Burn, Hamna Voe.—Var. *hirsuta* Syme.—U. Abundant on the Serpentine hills at Baltasound. Doubtless the *P. setacea b. lanosa* Edmondston.—In grassy places on the Burrafirth cliffs is a form with leaves, long, erect, and pale green.

P. Coronopus L.—Common ; always as the form with leaves spread flat on the ground.—* Var. *pygmæa* Lange.—Y. With the similar form of *P. maritima* at Hamna Voe.

Chenopodiaceæ, Polygonaceæ.—These I was obliged to neglect, as they were, for the most part, in too early a state for determination. A dwarf form of *Rumex acetosa* (1-2 inches) occurs on the top of Saxa Vord Hill.

Salix cinerea L.—"Var. (?) folia rugosa et dense subtus pubescentia." Dr. Lange in litt.—U. Between the Loch of Cliff and Burrafirth in a boggy pasture.

S. aurita L.—U. Foot of cliffs, east side of the Loch of Cliff.

‡ **S. ambigua** Ehrh. U. With the last.

S. repens L.—U. Wick of Hagdale, near Baltasound, &c.

Sparganium.—The only forms seen belong clearly to the *affine* group, but being only in flower are not determinable.

Potamogeton natans L.—U. Abundant in the Loch of Cliff. N. Small loch between Ronas Voe and Hillswick.

P. polygonifolius Poun.—Common, chiefly as the var. *ericetorum* Syme. Deep-water forms occur in a burn (N) between Eela Water and Collafirth. A narrow-leaved state at Hilswick "approaches var. *angustifolius* Fr." A. Bennett in litt.

‡ **P. heterophyllus** Schreb.—L. Clickhimmin Loch.

‡ **P. nitens** Weber var. **curvifolius** Hartm.—U. North end of the Loch of Cliff. Mr. Bennett thinks this probably the *P. lanceolatus* Edmonst. *P. lucens* L. and *P. crispus* L.—Not seen.

P. perfoliatus L.—Loch of Cliff, as recorded by Tate, who thinks it the *P. lucens* Edmondst.

‡ **P. pusillus.**—A few immature examples were obtained in Clickhimmin Loch, Lerwick, but in the absence of fruit, Mr. Bennett cannot determine whether referable to the above, or to *P. Sturrockii*, which the plant somewhat resembles.

P. pectinatus L.—The only stations given by Edmonston are "brackish pools," and it is therefore probable that they all belong to *P. filiformis*. Still it may possibly occur, as it is recorded from Orkney on the authority of Dr. Boswell, and Mr. Bennett mentions it from Greenland.

Orchis latifolia L.—U. Near the Loch of Cliff. N. Banks near the sea, Queyfirth near Ollaberry. The only other orchids seen were **O. maculata** (common) and **Habenaria viridis** (Baltasound hills).

Luzula pilosa Willd.—N. Seen only sparingly by Eela Water.

L. maxima D.C.—Here and there. * Var. **gracilis**, Rostrup.—Confirmed by Dr. Lange. Dr. Buchenau remarks: "A very interesting form, new to me." This distinct variety is abundant on the upper slopes of Saxa Vord Hill, Unst, but flowers only on the small plateau which forms the summit. On the lower slopes of the hill neither form was seen, while the typical plant grows on the Burrafirth cliffs, some 700-800 feet below. The two forms, therefore, inhabit different stations, and they do not pass into each other. The var. *gracilis* is a much more slender and elegant plant, with short (1-3 inches) root leaves; stem only a foot high, slightly drooping; panicle simple, consisting of a single large terminal head of flowers, surrounded and overtopped by about 2-4 long, filiform, flexuous, or drooping peduncles, each bearing a single (smaller) head of flowers. I have a dwarf state of the type from Little Craigandal (*leg.* Rev. E. S. Marshall), but it does not approach the variety in any respect, excepting in its low stature. Known elsewhere only from the top of Hesto, Faroes. To me it is the most interesting plant met with.

L. campestris D.C.—Everywhere common.

‡ **L. multiflora** Lej.—Apparently scarce; occurs (N) near Ronas Voe.

Juncus conglomeratus L.—Scarce. N. Near Ollaberry. L. Clickhimmin Loch.

J. acutiflorus Ehrh.—I sought this carefully in all the districts visited, but without success.

J. lamprocarpus Ehrh.—Here and there, but not so common as **J. supinus.**

J. Gerardi Lois.—N. Marshes near the sea at Queyfirth; on the shore near Ollaberry. I was unable to detect *J. compressus.*

Schœnus nigricans L., var. **nana** Lange (in litt.). U. Abundant on the hills north of Baltasound, the locality mentioned by Edmonston, and uniformly, whether in wet or dry, low or high places, of a very small size—5-8 inches high. Whether it differs from the type in any more important characters I cannot say, as it was only in early flower.

‡ **Scirpus acicularis** L.—U. Queyhouse Loch, a branch of the Loch of Cliff.

‡ **S. uniglumis** Link.—U. about the Loch of Cliff, abundant at the south end. N. Salt marsh near Queyfirth.

‡ **S. pauciflorus** Lightf.—Rather common. U. Common in north Unst. N. Bogs near Hillswick; bogs and roadside ditches about Ollaberry.

Carex.—All the species accepted for Shetland in *Top. Bot.*, Ed. II., were noted, and most of them collected, with the exception of *C. incurva* and *C. capillaris*, the localities for which were not visited; and *C. præcox*, which must, I think, be excluded on present knowledge. It is recorded by no one except Edmonston, who speaks of it simply as "common," but I failed to find it. On the other hand, Edmondston does not mention *C. pilulifera* at all. This is recorded by Tate from Scarpoe, Unst, and is in reality general and rather common. I think, therefore, that the latter plant probably represents Edmondston's *C. præcox.*

C. pilulifera L. f. **reptans** Lge.—U. Grass slopes above Burrafirth cliffs; a form with slightly creeping and rooting stems, not at all cæspitose.

C. binervis Smith.—Rather frequent; a small form from (U.) Saxa Vord Hill; and (N.) wet rocks by Ronas Voe, is thus characterised by Dr. Lange: "f. gracilior! vix ultra ½′ longa, culmus gracilis, subflexuosus, spicæ femineæ breviores quam in forma typica." The Ronas Voe plant is a remarkably dwarf one, not unlike *C. præcox* in look; but as examples from the various districts show a gradual transition to fairly typical plants 18 inches high, I hesitate to give it a varietal name.

C. Hornschuchiana Hoppe (teste Lange).—N. Bogs near

Ollaberry; not seen elsewhere. Tate refers Edmonston's *C. speirostachya* to *C. distans;* the latter I saw nothing of.

‡ **C. flava** L.—Common as the var. **minor** Towns.

C. lepidocarpa Tausch (teste Lange).—N. Bogs near Ollaberry.—*C. Œderi* not seen.

C. juncella Fries.—Almost as common in wet places as the type **Goodenowii.**

Agrostis canina L.—Apparently scarce; seen only (U.) on the hills about Baltasound. A curious dwarf form occurs in the same district, and is considered by Professor Hackel to be a state infected with an *Ustilago,* analagous to the state of *A. vulgaris* called "pumila."

A. stolonifera L. (alba).—Common; var. *maritima* Meyer.—U. at Baltasound. N. Probably near Ollaberry. The form *coarctata* Reich (var.) at N. Ollaberry; and L. Clickhimmin Loch.

A. vulgaris L.—and the state *pumila*—both rather common.

Deschampsia cæspitosa Beaur.—Frequent; var. *pallida* Koch (sub *Aira*). Y. Borders of pastures at Hamna Voe. The flowers of this variety are as yellow as those of *Trisetum flavescens.*

D. flexuosa Trin.—Common; var. *montana* Trin.—U. Top of Saxa Vord Hill.

Aira præcox L.—Ubiquitous. I could not see *A. caryophyllea.*

Arrhenatherum avenaceum Beauv.—Apparently rare; Seen only (Y.) on the sea-bank at Mid Yell Voe.

Molinia cærulea Moendi.—Apparently always as the * var. *minima* Rabenhorst. This is no doubt the *M. depauperata* B. *bulbosa* Edmondst., the only form seen.

Glyceria fluitans R.Br.—N. Bogs near Hillswick Voe. Noted elsewhere; apparently always this species.

Poa pratensis L.—Usually as the var. *subcœrulea* (Sm.), while **P. trivialis,** on the other hand, attains larger proportions.

Dactylis glomerata L.—Said to be common, but I did not note it. Included in *Top. Bot.,* but on what authority does not appear.

Festuca ovina L.—Common, with viviparous forms; also the same form of the sub-var. *lævifolia* Hackel, on rocks by the Loch of Cliff, Unst.

F. rubra L.—Common, and all forms collected referred to the var. *genuina* Hackel, including sub vars. *typica, litoralis,* and

glaucescens; the latter, from Burrafirth, are very large examples, and may possibly represent the *F. elatior* Edmondst., which I could not see in his station.

Bromus mollis L.—Only seen sparingly at Hamna Voe, Yell.

Agropyron repens Beauv, and var. *Leersianum* Reich. (*T. repens barbatum*).—Y. Both on the sea-sands at Mid Yell Voe.

* **A. junceum** Beauv.—U. Sands of Burrafirth. Y. Sea-shore. Mid Yell Voe.

Pteris aquilina L.—U. I saw this only in a dwarf state between Burrafirth and the Loch of Cliff.

* **Nephrodium Filix-mas** Rich.—N. Among rocks on a moor between Queyfirth and Ollaberry. Certainly not common.

Polypodium vulgare L.—U. Rocks by the Loch of Cliff; *var. *brevis* Lange (in *Bot. Tidskr.* XIV., p. 217).—U. Rocks near the top of Saxa Vord Hill.

Lycopodium Selago L.—N. Moor between Queyfirth and Ollaberry.

Equisetum arvense L.—Common; var. *alpestre* Wahl. N. Rocks by the sea, Ollaberry.

E. palustre L. and **E. limosum** L., both common.

E. sylvaticum L.—U. Rocks by the Loch of Cliff. N. Banks near the sea at Queyfirth.

Chara fragilis Desv.—N. Eela Water near Ollaberry.

C. aspera Willd.—North end of the Loch of Cliff.

Nitella opaca Agardh.—North end of the Loch of Cliff. L. Clickhimmin Loch.

UNRECORDED DUMFRIESSHIRE PLANTS.

By ANSTRUTHER DAVIDSON, M.B., C.M., Sanquhar.

THE following list contains many of the more common plants of vice-County 72, which, though well enough known to local botanists, are still unrecorded in the 2nd Edition of *Topographical Botany*, or in the "*Additional Records*," published by Mr. A. Bennett in the *Scottish Naturalist*.

Nearly all the plants enumerated I have personally gathered; and those of a doubtful nature have been kindly examined by Mr. Arthur Bennett, F.L.S.

The sequence and nomenclature are those of the 8th Edition of the *London Catalogue*.

* Denotes introduced plants.

Ranunculus auricomus L. Common. R. Sardous Crantz. Ruthwell.

Nuphar intermedium. Black Loch, Sanquhar.

Cardamine flexuosa. With. Common.

Sisymbrium Thaliana Hook. Common,

Thlaspi arvense L. Carco.

Helianthemum Chamæcistus Mill. Locally common.

Stellaria palustris Ehrh. Lochmaben.

Arenaria serpyllifolia L. Common. A. peploides L. Common on the shore.

Hypericum quadrangulum L., common. H. humifusum L., common. H. hirsutum L., locally on the Nith.

Trifolium dubium Sibth. Common.

Vicia sylvatica L., Crawick and Kello Woods. V. angustifolia Roth. Not uncommon.

Geum intermedium Ehrh. Sanquhar.

Potentilla procumbens Sibth., fairly common. P. reptans L., Sanquhar.

Rubus Chamæmorus L. On the higher hills.

Rosa mollis Sm.; var. cœrulea Woods. Abundant at Sanquhar.

* Pyrus Aria Sm., planted. P. Aucuparia Gærtn., probably native.

Sedum Rhodiola D.C., Moffat hills. S. villosum L., common on the hills.

Myriophyllum spicatum L. Abundant.

Epilobium palustre L. Common.

Sanicula europæa L. Common.

Apium inundatum Reichb. Common in loch, Thornhill.

Asperula odorata L. General.

* Dipsacus sylvestris L. Thornhill.

Gnaphalium sylvaticum L. Common.

Anthemis Cotula L. Rare—Kirkconnel.

Matricaria Chamomilla L. Rare—Thornhill.

Carlina vulgaris L. Euchan.

Arctium minus Schh. Not common.

Crepis virens L. Common.

Hieracium vulgatum Fr., common; var. maculatum, Sanquhar. H. tridentatum Fr., Sanquhar. H. prenan-

thoides Vill., Carsrig. **H. crocatum** Fr., Sanquhar. **H. boreale** Fr., Sanquhar.

Leontodon hispidus L., common. **L. autumnalis**, var. **pratensis**, common at Sanquhar.

Taraxacum palustre D.C. Sanquhar hills.

Sonchus asper Hoffm. Thornhill.

Vaccinium Vitis-Idæa L. Not common.

Pyrola media Sw. Rare—Colvend. **P. minor** Sw. Locally common.

Lysimachia nemorum L. Common.

Symphytum tuberosum L. Thornhill.

Lycopsis arvensis L. Near Dumfries.

Myosotis strigulosa R. Thornhill. **M. cæspitosa** Schultz. Sanquhar.

Convolvulus arvensis L. Sanquhar.

Verbascum Thapsus L. Closeburn.

Veronica scutellata L. Not uncommon.

Lathræa squamaria L. Tynron.

Mentha hirsuta L., Starn Loch. **M. arvensis** L., common. **M. arvensis** var. **Nummularia**? Sanquhar. (The specimens of this, though numerous, are not quite typical.)

Lycopus europæus L. Lochmaben.

Calamintha Clinopodium Benth. Near Dumfries.

Stachys Betonica Benth., Euchan. **S. sylvatica** L., abundant.

Atriplex angustifolia Sm. Abundant.

Polygonum amphibium L. and var. **terrestre**. Thornhill.

Rumex sanguineus var. **viridis** Sibth., common in the woods. **R. obtusifolius** L., abundant.

* **Hippophae rhamnoides** L. Ruthwell.

Euphorbia Peplus L. Sanquhar.

Populus tremula var. **glabra** Syme. Sanquhar.

Salix fragilis L., Thornhill. **S. viminalis** L., Sanquhar. **S. cinerea** L. and **S. Caprea** L., very common. **S. repens** L., var. **argenteus** Sm., local, and var. **ascendens** Sm., Lochmaben.

Habenaria viridis R. Br. On heathy uplands. **H. bifolia** R. Br. Gatelaw Bridge.

Juncus supinus Moench., common; var. **fluitans** Fr., rare, Auchengraith. **J. acutiflorus** Ehrh., common.

Potamogeton natans L. Common.
Eleocharis palustris R. Br. Common.
Scirpus cæspitosus L., abundant. S. setaceus L., common.
Carex dioica L. and C. pulicaris L., common. C. paniculata L., Allanton. C. aquatilis var. Watsoni Syme, Sanquhar. C. Goodenowii J. Gay, abundant. C. præcox Jacq., common. C. pallescens L., common. C. lævigata Sm., Sanquhar. C. distans L., common on the shore. C. fulva var. Hornschuchiana, Sanquhar Moor; var. xanthocarpa Degl., near Monaive. C. extensa Good., near Dumfries; flava, minor Towns., Sanquhar Moor; hirta L., not uncommon; rostrata Stokes, abundant.
Anthoxanthum odoratum L. Abundant.
Milium effusum L. Crawick Glen.
Agrostis canina L. Common.
Aira præcox L. Common.
Trisetum flavescens Beauv. Sanquhar.
Sieglingia decumbens Bernh. Common.
Molinia cœrulea Mœnch. Abundant.
Festuca myurus L., Sanquhar. F. elatior L., Thornhill. Var. loliacea Huds, and var. pratensis Auct., common.
Bromus sterilis L. Dumfries.
Agropyron caninum Beauv. Common.
Aspidium dilatatum Presl. Abundant.
Asplenium Adiantum-nigrum L. Thornhill.
Ophioglossum vulgatum L. Sanquhar.
Equisetum pratense Ehrh. Crawick.

NEW BRITISH MOSSES.

By JAMES STIRTON, M.D., F.L.S.

This year I picked up, in localities widely apart, three mosses whose characteristics are not reconcilable with those of any mosses hitherto known to me, or with those described in works on the subject accessible to me.

The first is from Ben Lawers, where it was found in July, at an elevation of about 3,000 feet.

Didymodon turgescens; densely cæspitose or even pulvinate, very much resembling at first sight tufts of *Tortula fragilis*, but softer; stems simple or dichotomously divided, varying in length

from half an inch to two inches, radiculose, especially in lower half; leaves rather densely disposed, somewhat clasping, in a moist state, erect, and not undulated on margin, which is recurved in lower half, when dry, crisped, linear, and not expanded at base, acute or sub-acute at apex; nerve roundish and prominent on back, flat in front, not quite reaching apex; areolation in the lowest third pellucid, composed of oblong rectangular cells, which gradually merge, in a transverse direction, into the dense opaque papillose areolation of the upper two-thirds. This papillosity is shown on margin of leaf as well as on back of nerve.

This moss is closely allied to *D. cylindricus* in the minute structure of its leaves; but their length is only half as great, and their breadth near the base somewhat less than in those of *D. cylindricus*; while the breadth of the leaves of *D. Daldinianus* is double that in either moss. *D. cylindricus* is altogether a much smaller plant, and is certainly not tufted like the moss under discussion.

The second moss was found in August in Harris, in the Outer Hebrides. It is a *Grimmia*, and is almost the only representative of the genus found there.

Grimmia sublurida sp.n. is densely cæspitose, or rather pulvinate, and fastigiate; stems simple or sparingly dichotomously branched, about an inch in height in the centre; leaves broadly lanceolate, acute, with short, smooth hair-points, margin recurved in lower half on one side, plane, or only slightly reflexed on the other; areolation coloured throughout, not pellucid, long and narrowly sinuous near base, as well as in parallel rows more shortly so upwards, near apex dotlike, but having the cells very often constricted near the middle; nerve prominent on back, hollow in front. Some leaves are seen, under the microscope, to be bluntly papillose on margin near apex.

Barren; on rocks at or near sea-level.

This moss has perplexed me considerably. It has several of the characteristics of *Racomitrium sudeticum*; but its densely tufted condition, &c., decided me, in the absence of fructification, to separate it from this genus. The other species of the genus *Racomitrium* are largely, even profusely, represented in Harris; but the genus *Grimmia* scarcely occurs, if it occurs at all, so far as I can recall the facts.

The following is a somewhat more detailed description of a moss

detected twenty-one years ago near Bowling, on the Clyde, and again in August of this year. In 1871 I gave a brief sketch of the plant, and named it *Zygodon teichophilus.*

Densely cæspitose or pulvinate. Stems about half an inch long, simple, or dichotomously branched, radiculose. Leaves closely set, slightly contorted when dry, spreading when moistened, oblong-lanceolate or oblong, acute; nerve very prominent on the back, slightly hollow in front, reddish throughout, except in young leaves, excurrent into a strong longish mucro; pagina on each side of this mucro unequal in very many cases, *i.e.*, shorter on one side than the other, margin plane; leaves papillose on back, and on nerve near apex; areolation very dense and opaque, hexagonal and chlorophyllose above, larger and quadrangular close to base, but still chlorophyllose, and translucent only in the older leaves.

It might be as well to mention that a botanical friend has informed me that Professor Lindberg has lately published a description of a moss whose characteristics are similar to those of the moss under discussion, and that he has named it *Z. aristatus.* It is almost unnecessary to say that I have not seen a specimen of *Z. aristatus*, nor indeed his description.

While writing this I have received a letter from M. A. Le Jolis of Cherbourg, France, (to whom I sent a specimen of this moss) in which he states his belief that *Z. aristatus* is identical with *Z. teichophilus.*

A CURIOUS LICHEN FROM BEN LAWERS.

By JAMES STIRTON, M.D., F.L.S.

ON several occasions during the last ten years I have seen, at various altitudes on Ben Lawers and neighbouring mountains, a very curious lichen in a barren condition on peaty ground. The thallus appears as a dark brown minutely rugose, encephaloid, thickish crust having sprinkled over it white, or pale whitish, phyllocladia, resembling much those of some *Stereocaulon*, such as *St. paschale.* The brown crust contains numerous gonimia of a dirty cærulescent tint, and altogether this crust has much the appearance and constitution of some crustaceous *Collema*, or rather *Pyrenopsis*, such as that of P. fuscatula (Nyl.) in a much extended

and contiguous form. The white phyllocladia are always present, and contain the usual greenish-yellow gonidia. On this barren state I could found nothing definitely; although I could not withhold myself from framing various affinities to other lichens. Perhaps the idea that retained its hold most tenaciously was that the whole was a young undeveloped state of some *Stereocaulon*, as *St. condensatum*, with the brown cephalodia in excess.

This year, in the company of members of the Perthshire Natural History Society, under the leadership of Dr. Buchanan White, I was fortunate enough in detecting fruit, and in a form such as I could not have anticipated. Resting on the brown crust, and pretty thickly scattered over it, appeared prominent tubercles of a pale or pinkish-white colour, and resembling much the tubercles of some *Chiodecton*, although larger and rougher externally, or rather those of *Trypethelium*. Thickly scattered over these tubercles, whose breadth varied from a half to one millimetre, were seen minute prominent brownish-black points. A vertical section through a tubercle revealed perithecia (entire) in connection with these points, and varying in number from 8 to 50 in each tubercle. The walls of these sacs or perithecia were thin and of a brownish-black colour, and their contents those of a *Verrucaria*, viz., spores 8, very often uniseriate in the thecæ, at first colourless, then dark-brown, or ultimately nearly black, 1—septate, obovate, with one loculus small, bluntly triangular, the other much larger and ovoid, and their dimensions were .016—.025 × .008—.012 mm.; paraphyses rather sparse, long, distinct, but soft. The hymenial gelatine was only tinted a yellowish colour by means of Iodine, while the protoplasm of the thecæ became, with the same reagent, a fulvous colour.

The more developed of these tubercles, which, by the way, appeared white in section, and did not, so far as ascertained, contain gonidia, had some of the white phyllocladia attached around their bases, and occasionally a few higher up.

On the whole, the constitution of these tubercles is that of some *Trypethelium*, such as *Tr. Sprengelii;* but if we are to reckon the brown crust and the phyllocladia as parts of one and the same plant (and I do not see how we can evade this conclusion), we must take a widely different view of the matter. To be sure, the parasitism of a *Trypethelium* on the thallus of some alien lichen suggests itself, but against this is the fact that the thallus in ques-

tion has not been seen with other fruit of a more appropriate character—more appropriate, I mean, so far as our present knowledge of lichens would warrant us in anticipating. Besides, the genus *Trypethelium* has no representative in this country, nor, indeed, in Europe; and is essentially a tropical lichen.

Until I have further evidence I shall name this lichen *Lophothelium acervatum.*

REPORT FOR 1886 ON THE FUNGI OF THE EAST OF SCOTLAND.

By Prof. JAMES W. H. TRAIL, AM., M.D., F.LS.

(Prepared for the E. S. U. N. S., 1886.)

IN the Report on Fungi submitted in 1885 (*Scot. Nat.*, 1886, pp. 224-231), were included many species added during the six years that had intervened since the publication of *Mycologia Scotica* in 1879.

The Report this year deals naturally with a much smaller number of additions to the lists, being restricted to those added between December, 1885, and September 1st, 1886, to which date this Report is made up. By far the larger number are the result of personal investigations in the neighbourhood of Aberdeen, and, to a less extent, in the north of Forfarshire. There are also a few additions reported from *Grevillea*, on the authority of Dr. M. C. Cooke. These are marked below with the letter (G). But before proceeding to the list, it is desirable to call the attention of the members of the Union to the appearance of the two volumes of Mr. J. Stevenson's long-promised work, *British Fungi, Hymenomycetes.* The need of such a work was patent to all mycologists; and British mycologists are to be congratulated on the possession of a reliable manual, of recent date, upon this large and important family of Fungi, while Scotch botanists may fairly pride themselves on its being the work of one of their own number.

Specific names printed in Ionic letters in the subjoined list denote that the fungi have been determined as Scotch since December, 1885. † Denotes that they have, since December, been described in the *Scottish Naturalist.*

Province of Forth.

Leptostroma herbarum (Fr.) Link. On stems of herbs, Kinross (G).

PROVINCE OF TAY.

†**Phoma Strobi** (B. and Br.) Sacc. On *Pinus Strobus* leaves (G).
†**Stagonospora arenaria** Sacc., var. *minor*, Trail. On *Elymus arenarius*.
†**Septoria Cerastii** Rob. and Desm. On *Cerastium triviale* (G).
†**S. lamiicola** Sacc. On *Lamium* (G).
†**Leptostroma scirpinum** Fr. On *Carices* (G).
†**Discosia artocreas** (Tode), Fr. On *Beech* leaves, &c. (G).
†**Gloeosporium paradoxum** (De Not.), Fuck. On *Ivy* leaves (G).
†**Libertella betulina** Desm. In dry *Birch* bark (G).
Leptosphaeria amphibola Sacc. On stem of *Elymus arenarius*.
L. arundinacea Sow., var. **Godini**, Desm. On stem of *Phragmites communis*.
L. agnita Desm. On stems of *Eupatorium cannabinum*.

PROVINCE OF DEE.

Corticium lacteum Fr. On branches of Hazel.
Pistillaria culmigena Fr. On barley straw.
Spumaria alba Bull.
Leptostroma herbarum (Link.) Fr. On stems of *Teucrium*, &c.
Phyllosticta hedericola D. and M. On leaves of *Hedera Helix*.
Ph. Ulmariæ Thuem. On leaves of *Spiræa Ulmaria*.
†**Phoma macrocapsa** Trail. On *Mercurialis perennis*.
†**Cytospora carphosperma** Fr. In bark of *Pear* and *Mountain Ash*.
Darluca filum Cast. On *Puccinia* clusters on *Luzula maxima*.
Dilophospora graminis Desm. On *Poa pratensis*, in the spikelets.
Hendersonia Sambuci Müll. On *Sambucus nigra*.
†**Camarosporium Laburni** Sacc. and Roum. (a state of *Cucurbitaria Laburni*). On dead branches of *Cytisus Laburnum*.
†**C. metableticum** Trail. On *Ammophila arundinacea*.
Septoria Grossulariae (Lib.) West. On leaves of *Ribes alpinum* (not quite typical).
S. Rosae Desm. On leaves of *Rosa canina*.
S. Bromi Sacc., var. **Phalaridis**, Trail. On *Phalaris arundinacea*.
S. Virgaureae Desm. On leaves of *Solidago Virgaurea*.
†**S. Cerastii** R. and Desm. On leaves of Cerastium.
S. Ægopodina Sacc., var. ? (an sp. n. ?). On leaves of *Pimpinella Saxifraga*.
S. Hyperici Desm. On leaves of *Hypericum pulchrum*.
S. Lepidii Desm. On *Lepidium*, "New Pitsligo," Grevillea, 1886, p. 102.
S. Sedi West. On stems of *Sedum reflexum*.
Marsonia Potentillæ Desm., var. **Tormentillæ**, Trail. On leaves of *Potentilla Tormentilla*.
Gloesporium Ribis (Lib.), M. and D. (Leptothyrium Ribis, *Mycol. Scot.*, No. 1098). On leaves of *Ribes nigrum*.
G. Betulae Lib. On leaves of *Betula alba*.
Speira toruloides Corda. On dead stem of *Nettle*.
Coniothecium conglutinatum Corda. On Birch twig.

Puccinia Veronicarum D.C. On *Veronica alpina*, Glen Callater (Dr. Buchanan White).

P. Millefolii Fckl. On *Achillea Millefolium*, near Aberdeen (George Brebner). This is said by Winter to be the same species as *P. Tripolii* Wallr., from *Aster Tripolium*, but seems distinct enough.

P. Saniculae Grev. On leaves of *Sanicula Europaea.*

†P. caulincola Sch. On stems of *Thymus Serpyllum.*

P. Poarum Niel. On *Poa pratensis*, in the vicinity of *Æcidium Tussilaginis.*

P. Saxifragarum Schl. On *Saxifraga stellaris*, from Lochnagar (Geo. Brebner).

Uredo Empetri D.C. On *Empetrum nigrum*, Braemar (Dr. Buchanan White.)

Æcidium compositarum Mart, var. Bellidis. On *Daisy* leaves.

Milesia Polypodii B. and B. White. On *Polypodium vulgare.*

Entyloma Ficariæ F.v. Waldh. Occurs commonly in the lower leaves o *Ranunculus sceleratus*, near Old Aberdeen.

Tilletia striaeformis West. In leaves of *Triticum repens.*

Urocystis sorosporioides Körn. On *Thalictrum minus*, v. *maritimum.*

Protomyces Menyanthidis De Bary. In leaves of *M. trifoliata.*

Isariopsis albo-rosella (Desm.) Sacc. On *Cerastium triviale.*

I. carnea Oud. On leaves of *Lathyrus pratensis.*

Volutella Festucæ (Lib.) Sacc., var. **bacillaris**, Trail. On dead leaves of *Luzula* and *Carex.*

Tubercularia granulata Pers. On dead twigs of *Acer.*

Hadrotrichum microsporum Sacc. and Malb., var. **majus**, Trail. On leaves of *Agrostis vulgaris.*

Fusicladium depressum (Cladosporium depressum B. and Br., *Mycol. Scot.*, 1433). On *Angelica silvestris.*

Helminthosporium folliculatum Corda. On *potato* stems.

Chalara minuta sp. n. On rotting needles of *Abies excelsa.*

Rhipidocephalum Abietis g. and sp. n. On rotting needles of *Abies excelsa.*

Rhinotrichum repens Preuss. On rotten wood (? Ulex).

Ovularia carneola Sacc. On leaves of *Scrophularia nodosa.*

Ramularia Succisae Sacc. On leaves of *Scabiosa succisa.*

R. Lampsanæ (Desm.) Sacc. On leaves of *Lampsana communis.*

R. Taraxaci Karst. On leaves of *Taraxacum officinale.*

R. macrospora Fres. On leaves of *Campanula rotundifolia.*

R. plantaginea Sacc. and Berl. On leaves of *Plantago lanceolata.*

R. Plantaginis E. and M. On leaves of *Plantago major.*

R. agrestis Sacc. On leaves of *Viola tricolor.*

R. montana (Speg). On leaves of *Epilobium montanum.*

Septocylindrium Magnusianum Sacc. On leaves of *Trientalis Europaea.*

Mastigosporium album Riess. var. On leaves of *Alopecurus pratensis.*

Peronospora densa De Bary. On *Rhinanthus Crista-galli.*

P. Viciae Berk. On *Lathyrus macrorhizus.*

P. Urticae Lib. On *Urtica urens*, and occasionally on *U. dioica.*

P. obovata D. By. On *Spergula arvensis*, bearing conidia near Aberdeen, and oospores near Gamrie, in August.
P. Potentillæ De By. On leaves of *Geum rivale.*
Pilobolus crystallinus Tode. On Rabbit's dung.
Exoascus deformans (Berk.) Fuckel. On *Prunus Avium.*
Phacidium Calthæ Phil. On *Caltha palustris.*
Perisporium vulgare Corda. On old mat and cordage.
Hypomyces aurantius Tul. On decaying Polyporus.
Nectria Ribis Tode. On gooseberry twigs.
Lophiostoma caulium (Fr.) De Not. and C. On decayed stems of *Urtica dioica.*
Dothidea Junci Fr. On *Juncus communis.* (This is quite distinct from D. Junci Cooke *Exbk.*, 2417, and *Mycol. Scotica*, 1900, as the latter is a *Leptosphæria*, not a true *Dothidea.*)
Læstadia faginea C. and Pl. On Beech leaves.
Cryptosphæria myriocarpa (Nitzsch.) On *Ash* twigs (*Mycol. Scot.*, 2026).
Sphaerella lineolata (Desm.) De Not. and Ces. On *Ammophila.*
Podospora Brassicæ (Kl.) Winter. On rotten cabbage stumps.
Sporormia intermedia Auersw. On Rabbit's dung.
Melanomma Lenarsii (West.) Sacc. On stems of *Calluna vulgaris.*
Trematosphæria megalospora (De Not.) Sacc. On rotting wood.
Leptosphæria maculans Sow. On dead *Scirpus lacustris.*
L. sabuletorum B. and Br. (*M. Scot.* 2109.) On *Ammophila.*
L. culmifraga Fr. (*M. Scot.* 2111.) On *Aira caespitosa.*
L. culmicola (Fr.) Krst. On *Aira caespitosa*, Oats, &c.
Zignoella insculpta (Fr.) Sacc. On Holly twigs.
Pleospora vulgaris Niessl. On *Plantago lanceolata*, *Lupinus*, &c.
P. infectoria Fckl. On various *Grasses.*
Ophiobolus herpotrichus (Fr.) Sacc. (*M. Scot.* 2100.) On *Grasses.*
O. Urticæ (Rabh.) Sacc. On dead stems of *U. dioica.*

NOTES ON SCOTCH PLANTS.

Pinguicula vulgaris, Linn. Var. alpicola, Reich. In West Ross.—In 1879, when botanising in West Ross in order to form a catalogue of the plants of the county for a new edition of *Topographical Botany*, which Mr. H. C. Watson then had in contemplation, I gathered on the slopes of Scuir na Cairan, at about 2,000 feet elevation, and in close proximity to the tableland above the Falls of Glomak, a *Pinguicula*, which at first sight suggested *grandiflora*, Lamk. Mr. Baker, on being shown a specimen, said it looked something like *grandiflora.* I then forwarded it to Dr. Boswell, who remarked upon it as follows : "A very striking form of *P. vulgaris* ; I can see nothing in it of *grandiflora* in the dried state ; but Pinguiculæ should be examined alive. The leaves, calyx, spur, and general shape of the corolla

are those of *vulgaris*. I have never seen it with flowers so large and lip-segments so broad."

The plants were above six inches high; and the petals were much more contiguous than usual. It appears to agree fairly well with Reichenbach's *alpicola*, see *Icones*, f. 175. It is probably identical with *P. grandiflora* Bert., (non Lamk.); which is discribed as having "fiore circa il doppio piu larghi e sprone più longhi."

Equisetum maximum, Lamk. Var. serotinum, A. Braun. in Wigtonshire.—This form of *maximum*, which is recorded in *English Botany* only from the extreme south of England, I gathered in 1883 on the west coast of Wigtonshire, south of Port William, near Monreish. Its peculiarity rests in the fertile (æstival) stem resembling the barren (vernal) one. Dr. Boswell says it is not a variety, but a condition of growth, and is not always developed from the same plant. The Wigton plants varied from a foot to thirty inches high. According to Milde this form is the *E. eburneum* of Schreber.

Senecio Jacobæa L. Var. flosculosus, Jord., in Wigtonshire.—This rayless form of *Senecio Jacobæa* occurred by the sea shore, a little below Port William. It is apparently rare in Britain, being recorded in *English Botany* from Sutherland and Wexford only. Sherard long ago found it near Drogheda in Ireland, see *Ray*, 3rd. edit. "*Flore nudo copiosissime nascens in sabulosis prope littus; tribus vel quatuor milliaribus a Drogheda occurit.*"—G. CLARIDGE DRUCE.

SCOTTISH CRYPTOGAMIC SOCIETY.

This Society held its annual meeting in Aberdeen on the 30th Sept., and 1st and 2nd Oct., Prof. J. W. H. Trail being President. Among those present were two esteemed and old friends from England, Messrs. Phillips and Plowright, and members from all parts of Scotland, between the Borders and Forres. The usual programme was carried out, the days being devoted to excursions, and the evenings to meetings and friendly intercourse. It was resolved to publish the more important papers read before the Society; and it was remitted to a small committee to have this resolution carried into effect.

The general meeting was held on the 30th Sept., at 8 p.m., in the Aberdeen University buildings. The presidential address was devoted to the **Uses of Cryptogams to Man.** The papers read were as follows:—**On some Varieties of Ferns**, by Mrs. Farquharson; **On the Smut of Cereals**, by A. Stephen Wilson, C.E.; **Revision of the Scottish Peronosporeæ**,

and Revision of the Scottish Sphaeropsideæ, both by Prof. Trail.

The two last papers were exhaustive lists of the fungi of the groups indicated, with many new records for Scotland; the classification employed being in harmony with the views of Continental Mycologists. Mr. Wilson's paper as usual possessed the merits of originality and interest, and provoked considerable discussion.

On the 1st December the members dined in the Douglas Hotel, and spent a pleasant evening together.

The excursions were marred by rain, which brought that of the first day, to Monymusk, to a premature close; making it impossible to botanise with success in the drenching rain. Monymusk woods were thrown open to the Society, by the liberality of Sir Francis Grant, Bart., and the fine old house, and its many interesting contents were also most kindly shown by his orders. The latter privilege was the more highly appreciated because of the wet weather out of doors. Fungi proved very scarce though the woods appear admirably suitable for them. A few were detected; among which was *Agaricus porrigens*, new to "Dee."

Next day an excursion was made to the banks of the Dee at Drum and Park, to the grounds of Park House, and to the Loch of Park. The weather was much less unpleasant than on the preceding afternoon; and a number of interesting Fungi were picked up, among which were *Agaricus* (*Collybia*) *distortus* Fr., *Glœosporium Fagi* (D. and R.) and *Desmazierella acicola* Lev. all unrecorded for Scotland; and *Agaricus* (*Tricholoma*) *imbricatus* Fr., *A.* (*Mycena*) *galopus* Pers., *A.* (*M.*) *vulgaris* Pers., *A* (*Psaliota*) *echinatus* Roth., *A.* (*Hypholoma*) *capnoides* Fr., *A.* (*H.*) *epixanthus* Fr., *Cortinarius anomalus* Fr., *C. castaneus* Fr., *Russula adusta* Fr., *R. fellea* Fr., *Boletus bovinus* Fr., *B. variegatus* Sow., *Polyporus elegans* Fr. var. *nummularius* Fr., *Uredo Hypericorum* DC., *Peziza crucifera* Ph. and Pl., *Helotium virgultorum* Fr., and *Phomatospora Berkeleyi* Sacc., all unrecorded for the province of Dee; besides a good many other rare or local species, *e.g.*, *Peziza Persoonii*.

On Friday, 1st October, the Corbie Den and the grounds of Kingcausie were visited by the kind permission of Mr. Fortescue. The morning promised well when the party left Aberdeen; but by the time Milltimber station was reached the sky threatened rain; a threat fulfilled by rain commencing before noon, and continuing to fall during the excursion. Fortunately most of the time was

spent in the shelter of the woods around Kingcausie; and the fungi discovered during the day amply repaid the slight discomfort caused by the rain, several of the smaller species being hitherto unknown as Scotch. Among the material collected, some of which yet awaits careful examination, the following have been determined:—*Leptothyrium vulgare* (Fr.) Sacc.; *Diplodia Rhododendri* Bell., *Phyllosticta Ajugæ* S. and Sp., associated with *Ramularia Ajugæ* Niessl, on leaves of *Ajuga reptans*, in Kingcausie Woods; *Ovularia primulana* Karst., on leaves of *Primula vulgaris*; *Dermatea Houghtoni* Phill., on bark of *Prunus Laurocerasus*; *Hyponectria Buxi* (D.C.) Sacc., on dying leaves of Box; *Gnomonia Epilobii* (Fckl.) Awd., on dead stems of *Epilobium angustifolium*; *Sphaerella microspila* (B. and Bk.) Cke., on living leaves of *Epilobium montanum*; and *Lophiotrema vagabundum* Sacc., on dead stems of *Geum*. All the above are new to Scotch records; and the following are new to the province of *Dee*, though previously recorded from one or more districts of Scotland:—*Agaricus* (*Tricholoma*) *virgatus* Fr.; *A.* (*T.*) *inamœnus* Fr.; *A.* (*Inocybe*) *geophyllus* Sow., var *lateritius*; *Lactarius vellereus* Fr.; *Marasmius ramealis* Fr.; *Phyllosticta Teucrii* S. and Sp., on leaves of *Teucrium Scorodonia*; and *Puccinia Malvacearum* Mont., which last was very abundant on a number of plants of *Malva sylvestris*, along a garden wall near the high road. The plants had suffered much from the fungus, and groups of spores were very numerous on stems, leaves, sepals, and ovaries.

It will be seen from this report that the Cryptogamic Society is doing good service in extending the knowledge of Scottish Fungi; but there is a lack of workers in the other departments of Cryptogamic Botany. Let us hope that this will not long continue to be the case; and that the Society will be enabled to extend its usefulness by the addition to it of members who will devote special attention to those orders that are at present comparatively neglected. Those desirous of joining the Society will receive all information concerning it on applying to the Secretary,—Rev. John Stevenson, Glamis.

J. W. H. T.

REVIEW.

THE LONDON CATALOGUE OF BRITISH PLANTS.

Eighth Edition. London : G. Bell & Sons.

CONSIDERING the small area of the British Isles, the additions made to their Flora since the publication of the seventh edition of the London Catalogue are very numerous. Nyman's *Conspectus* of the European Flora did a great deal to direct attention to the possibility of many plants not yet on record being discovered in Britain, while credit is specially due to Mr. Arthur Bennett for his power in stimulating workers, and his critical skill in distinguishing species. A considerable number of these additions are, directly or indirectly, due to him. It was Dr. Boswell's wish that Mr. Bennett should compile the new edition ; and the present compiler, Mr. F. J. Hanbury, has obtained his assistance—the genera *Potamogeton*, *Juncus*, and *Carex* being arranged entirely by him. The *Rosæ* have been attended to by Mr. J. G. Baker ; the *Rubi* by Professor Babington ; and the *Characeæ* by the Messrs. Groves. With coadjutors like these, it was quite certain that Mr. Hanbury's list would represent British Botany in a far more direct degree than did the previous editions of the catalogue, and he deserves the grateful thanks of British botanists for the manner in which he has executed his task ; while his promise to keep up the types, so that future editions will appear after shorter intervals than has previously been the case, is highly to be commended.

As must necessarily be the case in such publications, there are a few typographical errors, among which may be noticed *Mathiola* for *Matthiola* ; *Opiz* for *Opitz* ; *Power*, on page 13, for *Pourr.* ; *Herm.*, on page 14, for *Herrm.* ; *diochroa*, on page 34, for *dichroa* ; *Haeck.*, on page 36, for *Hackel* ; etc.

The census number should be omitted after *Spiræa salicifolia*, and it should be inserted after *Agrimonia Eupatoria* and *A. odorata*. I, for Ireland, should be inserted after *Asplenium Clermontæ* (if specific rank indeed be given to it), and after *Equisetum Moorei*. The variety of *Isoetes* is *Morei*, not *Moorei*.

Aster salignus, *Astragalus hypoglottis*, *Myrrhis odorata*, *Calystegia sepium*, and *Carex grypus* do not take capital letters for the specific name.

An asterisk might well be prefixed to *Chelidonium laciniatum*, *Taxus fastigiata*, and *Fraxinus heterophylla*. *Linaria supina* should be in italics.

The changes in nomenclature are very numerous. There are few British botanists who would not be puzzled at first to identify their Herbarium specimens with, for instance, *Thalictrum saxatile* D.C., *Festuca dumetorum* Linn., or *F. fallax* Th., and the synonyms in such cases as these might well have been inserted, since the catalogue is used not only as an index list, but also as a medium for exchange purposes. In the names of genera, which follow Bentham and Hooker's *Genera Plantarum*, the synonyms are frequently given. Numerous as the changes in terminology are, (parenthetically, thanks are chiefly due for them to the unwearied efforts of the present editor of the *Journal of Botany*, Mr. J. Britten, to bring our plant names to a more correct standard), they are not quite exhaustive. *Medicago arabica*, All., should take precedence

of *M. maculata*, Sibth.; as *Lathyrus montanus*, Bernh., 1810, should of *L. macrorrhizus*, Wimm.; while *Calamintha Nepeta*, Clairv., and *Trisetum flavescens*, Beauv., must respectively give way to *Calamintha parviflora*, Lam., and *Trisetum pratense*, Pers.; *Alchemilla conjuncta*, Bab., was previously named *A. argentea* by Don. De Candolle, not Syme, should be the authority quoted after *Nymphæa alba*, var. *minor*; Persoon, not De Candolle, for *Corydalis claviculata*; Schübl., not Bab., for *Linum usitatissimum*, var. *crepitans*. Gussone, not Koch, is the authority for *Lythrum Salicaria*, var. *canescens*; De Candolle, not Linnæus, for *Trinia vulgaris*; Pollich, not Moench, for *Valerianella olitoria*; Gærtner, not R. Brown, for *Antennaria dioica*; Waldst. et Kit., not Linn., for *Plantago arenaria*; Reichardt, not Reichenbach, for *Ophrys arachnites*; Schultz, not Syme, for *Juncus Kochii*; Smith, not Linnæus, for *Scirpus carinatus*. Besser's *Viola alba* is a very different plant from our white-flowered *odorata*. Hudson, not Linnæus, is the authority for *Ranunculus parviflorus*, *Malva parviflora*, *Prunus institia*, and *Scutellaria minor*. *Cochlearia anglica* should have either Miller, or Hudson, and not Linnæus.

The census numbers have been pretty well brought up to date; but Edinburgh is not credited with *Helosciadium repens*, nor Perth E. with *Draba inflata*. Forfar has erroneously been put down for *Myosotis alpestris*, which, as Dr. Buchanan White has pointed out, is only an introduced plant in Canlochan. *Per contra*, after *Caltha radicans*? still remains instead of !; yet the Forfar record is beyond dispute. *Eriophorum alpinum* is credited with two counties; but its old locality in Forfar has long ceased to yield it, and Sutherland rests on very dubious authority, and might well be marked —? The census number should be affixed to *Trifolium stellatum* and *Orobanche amethystea*. *Euphrasia gracilis* is surely on record for more than three counties. *Scleranthus perennis* is quoted for one county too many, the Warwickshire record in *Top. Bot.* being due to an erroneous transcript for *Scleranthus biennis*, which was the plant found by Mr. Bromwich. In the Oxfordshire locality *Leucojum vernum* has long been extinct; and it was a very doubtful native there while it existed. *Carex Davalliana* has 1 put after it. Does it still exist in Britain? *Carex ligerica* might have at least one additional county record; and *Anthoxanthum Puelii* may be recorded Bucks !, Berks !, Oxon !, and Northants!. The arrangement of the Batrachian *Ranunculi* has been much changed, and somewhat improved. The writer must, however, confess his inability to distinguish specific differences between "14, *R. pseudo-fluitans*, Bab." and "No. 18, var. d. *R. penicillatus*, Hiern." !

The eighth edition enumerates 1858 species, and over 800 varieties, the seventh edition having 1680 species, and 560 varieties; but in the latter edition the "casuals, aliens, and waifs of cultivation," numbering 96 species, and "ambiguities, errors, impositions, extinctions," numbering 112 species, were put on separate pages. Of these "aliens, &c.," 66 are admitted into the body of the text. Among the rejected species are some that have apparently an equally good right to be included—*e.g.*, *Aster brumalis*, *Echinospermum Lappula*, *Amaranthus Blitum*, *Cannabis sativa*, and *Symphytum asperrimum*. From the list of "extinctions, &c.," in the seventh edition, *Glaucium phœniceum*, *Vicia hybrida* ?, and *V. lævigata*, *Epilobium rosmarinifolium*,

Ammi majus, *Echinophora spinosa*, *Malva borealis*, *Juncus tenuis*, *Lycopodium complanatum*, and *Botrychium rutaceum* (if the latter be the curious plant, 1810, B. lanceolatum Angström), are transferred in the eighth edition; so that, either by new discoveries, or by judicious splitting, the list of British plants has been increased by about 100 species; but this number includes several hybrids which would much better come under the respective species—*i.e.*, *Rumices hybridi*, *Primula hybrida*, *Cnici hybridi*, *Verbasca hybrida*.

When it comes to the question of what varieties should be included in our British lists, there must be great diversity of opinion. Probably Mr. Hanbury has fairly met the wants of British botanists. Still, if such forms as Mr. Melvill's, under *Silene rosea*, be admitted (and it is only fair to say that Mr. Melvill himself states that they were scarcely varieties), there must be a great many far more worthy of varietal rank rejected.

Scotch botanists will look in vain in the Catalogue for such a well-established plant as *Lupinus perennis*, frequent as it is near Beauly, and along the Dee, Tay, &c. Oxford botanists will see no trace of *Aster paniculatus* and *A. Novi Belgii*, which are as well naturalised there as is *A. salignus* in Cambridgeshire. **Senecio crassifolius* also should be included, and so might *Mimulus guttatus* D.C., naturalised in the Howe of Kintail, and *Mentha Requienii* in the west of Ireland. *Salix hippophaefolia*, Thuill., should be admitted, and *Luzula albida* D.C., var. *rubella* Hoppe has been found, quite naturalised, by Dr. Arnold Lees near Kidderminster. The variety *grandiflorum* of *Helianthemum Chamæcistus* no longer appears to exist; does not the Ben Bulben plant agree with Continental *grandiflorum*.

Besser's glandulose variety of *Sagina nodosa*, the radiate form of *Centaurea nigra*, the hirsute variety of *Hypopithys*, the unspotted variety (*lævigatum*) of *Lamium maculatum*, the ovate-leaved *Mercurialis perennis*, Dr. Buchanan White's pale-flowered *Melampyrum sylvaticum*, the writer's dark-orange variety (*hians*) of *M. pratense*, Roy's two-glumed *Juncus triglumis*, the maritime variety (*condensata*) of *Vicia sylvatica*, the alpine form (*alpestre* Wahl.) of *Equisetum arvense*, the naked-stalked form (*nudum*) of *E. palustre*. Smith's three-flowered form of *Bromus giganteus*, *Salix Pontéderana*, *Veronica Anagallis*, var. *anagalliformis*, Bor., *Euphorbia exigua*, var. *retusa*, D.C., *Viola mentita*, Jord., &c., might well have been represented.

The hybrids of *Epilobium* are unnoticed; as are also *Hypericum perforatum* + *quadratum*, *Cardamine amara* + *pratensis*, *Armeria plantaginea* + *maritima*, *Linaria repens* + *vulgaris* (other than *sepium* Allm.), *Cnicus lanceolatus* + *palustris*, all which might well find a place in the next edition; as should also the pale-flowered form of *Scrophularia umbrosa*, which Mr. Pryor happily connected with its discoverer, an old Oxford botanist, under the name of *S. umbrosa*, Dum. var. *Bobartii*; the mountain form of *Carex pilulifera*, described in a former number of this journal by Dr. Arnold Lees, is perhaps worthy of note; and the variety *pygmæa* of *Œthusa Cynapium*, described in Koch's Synopsis, seems entitled to a place.

G. Claridge Druce.

TO OUR READERS AND WELL-WISHERS

WE trust that many are both readers of this *Magazine* and well-wishers desirous to promote its success so far as in their power. This can be done by all in extending the circulation, and by bringing it under the notice of those to whom it has been previously unknown ; and such assistance is always most welcome. But our especial request is made to those who can assist with papers or notes on Scotch Natural History or Geology, or allied subjects. The preponderance of Botanical over other contributions is due solely to the fact that the Zoologists and Geologists of Scotland have (with a few exceptions) given less aid than the Botanists, and contributions in all departments will be welcomed.

Secretaries of Societies will oblige greatly by forwarding reports of meetings, and also by obtaining for us, for publication in our pages, the papers of most interest read before such Societies as do not publish transactions.

In conclusion we must offer our grateful thanks to all that have supported us in past years, even while we beg for a yet wider extension of contributors and of subscribers in the future.

OBITUARIES.

ROBERT GRAY.

We regret to have to record the death of this well known Ornithologist, which happened on the 18th February, in Edinburgh. He was a native of Dunbar, but spent most of his life in the employment of the City of Glasgow Bank, in which he rose to be Inspector of Branches. About twelve years ago he became Superintendent of Branches in the Bank of Scotland, and for some years was Cashier in the head office of that bank in Edinburgh. His journeys in the discharge of his duties afforded him opportunities of prosecuting his researches upon the Birds of Scotland; and the results of these researches were published in his excellent books,—"The Birds of Ayrshire and Wigtownshire" (1869), and "The Birds of the west of Scotland" (1871.) We understand that he intended to bring out a second edition of the latter, and also a work on the birds of the East of Scotland; but he has not lived to fulfil these intentions.

DR. WILLIAM TRAILL.

In Dr. William Traill of Woodwick and North Ronaldshay, Orkney, there has passed away a devoted lover of nature, and a man universally esteemed by those who had the pleasure of being acquainted with him. On his personal history and character this is not the suitable place to dwell; suffice it to say that his record in both is without reproach in the fullest sense.

Born in Kirkwall in 1818, he began the study of Medicine in the University of Edinburgh when sixteen years of age, under the supervision of his near relative, Dr. Thomas Stewart Traill, the then Professor of Medical Jurisprudence. Professor Traill was a distinguished naturalist; and his collection of reptiles, especially of snakes, was one of the most complete then in existence. The young student under his guidance developed a strong taste for

natural history. He graduated in Medicine in 1841, and very soon went to Madras, in the service of the East India Company. The wider field thus opened to him in his favourite pursuits was eagerly taken advantage of; but he turned his chief attention to the great division of the Mollusca; and this continued to be his favourite study throughout life. He made extensive collections in India, China, Singapore, Malacca, and other localities in the East, during nearly twenty years. A residence of two years at home (1854-56), enabled him to extend his knowledge of the nomenclature and structure of the Mollusca, as well as to become acquainted personally with kindred spirits. Nor were the voyages to and from the East unproductive of results, for he studied the pelagic Mollusca, and published his observations in the *Madras Journal* on his return to India in 1856.

He formed a collection of Oriental shells remarkable no less for the excellent representation of the species than for the number of species, and for the rarities contained in it. He also contributed largely to Professor Traill's collection of snakes. On his retirement from active service he returned to Scotland, and spent most of his time in St. Andrews, where he found congenial occupation in assisting to enlarge the collections in the University Museum, and in the meetings of the Literary and Philosophical Society, of which he was a vice-president at the time of his death. He passed the greater part of each summer on his island of North Ronaldshay, where he promoted the welfare of his tenants in every way in his power. He took a great interest in the botany, geology, and antiquities of the Orkney Islands; and manifested this by successful efforts to acclimatise the New Zealand Flax, several *Veronicas*, and other plants in North Ronaldshay, and by papers in various journals, such as the *Transactions of the Edinburgh Botanical Society*, the *Edinburgh Antiquarian Society*, the *St. Andrews Literary and Philosophical Society*, &c; and he was also an occasional contributor to the pages of the *Scottish Naturalist*. He was in bad health for nearly a year and a half before his death in December. He leaves a widow, and a family of two sons and five daughters.

PHYTOLOGY.

NOTES ON THE FORMS OF CALTHA PALUSTRIS.

By F. Buchanan White, M.D., F.L.S.

As the flowering season of *Caltha palustris* is now at hand, it is a suitable time to call the attention of Scottish botanists to the need of a thorough investigation of the forms of this plant which occur in this country, since these seem to be at present but imperfectly known. My own attention has been more particularly drawn to this subject by a paper in "Verhandlungen der k.k. zoologisch-botanischen Gesellschaft in Wien" (xxxvi. Band, p. 347), by Dr. Günther Beck. The following is a translation of the more important parts of this paper :—

Caltha palustris L.

A. Mature follicles gradually narrowed, towards the apex, into the beak, curved, and in the upper part somewhat hooked.

1. C. cornuta Schott, Nyman.

Follicles S-curved, patent, or more often deflexed, gradually narrowed into the short beak ; beak at most 2 mm. long.

Var. *typica*. *C. Guerangerii* Bor.

Leaves incise-serrate on the auricles, crenate or subentire in front ; stem-leaves* generally crenate, more rarely crenate-toothed, reniform triangular, mostly broader than long.

Central Europe, France.

Var. *C. latifolia* Schott, Nyman. *C. grosseserrata* Pntck.

Leaves coarsely, often incise-serrate-toothed all round ; stem-leaves incise-toothed, semi-orbicular.

Alpine and sub-alpine places : Transsylvania, &c.

Dr. Beck's expression is "folia fulcrantia," which means leaves that have a bud in the axils. As most of the cauline leaves of *Caltha*, except perhaps the very uppermost, are of this nature, I have used the more familiar expression "stem-leaves."

2. **C. longirostris** Beck.

Follicles narrowed into a very long (5 mm.) beak, which is curved downwards. Leaves coarsely dentate-serrate, crenate-toothed in front; stem-leaves coarsely incise-toothed.

Alpine places; Bosnia.

B. Mature follicles very shortly and often abruptly attenuate-contracted into the beak, sub-erect, straight, or curved on the back.

(*a*) *Follicles straight, or nearly so, on the back.*

3. **C. læta** Schott, Nyman.

Follicles erect, straight, or nearly straight, on the back, curved in front, semi-orbicular, or broadly semi-elliptical; beak short 1—1·5 or, at most, 2 mm. long. Sepals yoke-of-egg yellow.

Var. *typica*. *C. alpina* Schur.

Follicles 9-11 mm. long, shortly narrowed into the straight and erect beak. Leaves serrate-toothed all round.

Chiefly sub-alpine. Lower Austria.

Var. *C. truncata*.

Follicles 10 mm. long, sub-truncate above; beak short (1—1·5 mm.), thick sub-horizontally, patent. Leaves crenate-toothed, crenate in front; stem-leaves coarsely crenate.

Sub-alpine. Lower Austria.

Var. *C. alpestris* Schott, Nyman.

Follicles small, at most 8-9 mm. long, sub-truncate above, roundly narrowed into the very short curved beak. Leaves small, at most less than three inches wide, crenate-toothed on the auricles, and crenate in front.

Alpine. Lower Austria, &c.

4. **C. alba** Jacquem.

Sepals white, &c.

Himalaya.

(*b*) *Follicles curved on the back.*

5. **C palustris** L.

Follicles erect or patent, curved both on the back and front, and hence obliquely elliptical, contracted into the beak.

(*i*) *Sepals larger,* $\frac{1}{2}$-$\frac{3}{4}$ *of an inch long.*

Var. *typica*. *C. vulgaris* Schott, Nyman.

Leaves cordate-reniform, crenate or more rarely crenate-toothed. crenate or sub-entire in front. Sepals broadly oval.

Europe, Asia, N. America.

Var. *C. integerrima* Pursh.

Leaves all nearly quite entire; stem-leaves obsoletely crenulate towards the base. Sepals obovate or oval. Stem many-flowered.

Lower Austria, Siberia, N. America.

Var. *C. parnassifolia* Rafin.

Leaves cordate-reniform, strongly toothed or crenate. Sepals elliptical. Stem one or few-flowered, and few-leafed.

Siberia, N. America.

(*ii*) *Sepals smaller, and often narrower, at most not exceeding* $\frac{1}{2}$ *an inch in length.*

Var. *C. minor* Miller.

Leaves cordate-reniform, crenate. Sepals oval. Stem erect, many-flowered.

Here and there amongst the typical form.

Var. *C. asarifolia* DC.

Leaves cordate-reniform, crenate. Sepals oval. Stem sub-erect, one-flowered.

Siberia, N. America.

Var. *C. membranacea* Turcz. *C. ranunculoides* Schur.

Leaves small (about $1\frac{1}{4}$-$1\frac{1}{2}$ inches broad), cordate-reniform, crenate. Sepals elliptical, three times longer than broad. Scape one or few-flowered, erect.

Transsylvania, Siberia, Japan.

Var. *C. radicans* Forster.

Leaves cordate-triangular, sub-truncate at the base, crenate-toothed. Sepals elliptic-oblong. Stem creeping or ascending, rooting at the joints, few-flowered.

Scotland, E. Finmark, Silesia.

———

In his Conspectus Floræ Europææ, Nyman admits two species —*C. palustris* L. and *C. radicans* Forst.—but thinks that the latter is probably a sub-species only, or a variety. Under *C. palustris*, he mentions several varieties, and alludes to six Austrian forms which he at one time distinguished as species (*vide* Beck's paper

given above). Remarking that all these forms are not of equal rank, Nyman thinks that *C. cornuta* is probably a good species.

In British books, two species are described—*C. palustris* (with varieties *C. vulgaris* Schott, *C. Guerangerii* Bor., and *minor* Syme), and *C. radicans*, the latter, however, being queried as a form of *C. palustris*. To the varieties of *C. palustris* must now be added the var. *zetlandica* Beeby, recently described in this magazine.

In the herbarium specimens (from my own herbarium and that of the Perthshire Natural History Museum), which I have had an opportunity of examining, there are, unfortunately, no follicles that are quite ripe. Hence, it is not possible to be quite certain that they altogether agree with forms described by Dr. Beck. I think, however, that at least two forms may be distinguished amongst them. Of these, one is *C. cornuta*, var. *typica* (otherwise *C. Guerangerii*), which, though not exactly abundant, is by no means uncommon. In the absence of fruit, this can generally be recognised (or at least guessed at) by the serration and shape of the leaves, especially of the stem-leaves, as distinct from *C. palustris*; moreover, according to British books, the flowers are smaller, and the sepals do not touch each other when expanded, which seems to be the case in the specimens I have seen.

The other form is *C. palustris*, var. *typica* (*C. vulgaris* Schott), which is our common *Caltha*. Amongst our specimens of this are a few which have the leaves very nearly entire, but as I have not seen the var. *C. integerrima*, I do not know if they resemble that form.

I am not sure but that amongst the plants which we have called *C. cornuta*, there may be another form, since, though the follicles are not ripe, yet they are sufficiently advanced as to suggest that there may be a difference in the shape of the ripe fruit. This difference is, sometimes, at least, associated with a difference in the shape of the leaves. Possibly, these divergent forms may belong to *C. læta* or to *C. palustris*, var. *minor* Miller. At any-rate, they deserve further observation.

The var. *minor* Syme of *C. palustris* is not, it is almost unnecessary to point out, the same as the var. *C. minor* Miller of Beck's paper. Syme's variety has evidently much affinity, if it is not identical, with *C. palustris*, var. *C. membranacea* Turcz. (*C. ranunculoides* Schur.) In our specimens, however, the sepals are

not so narrow in proportion to their length as Beck describes, varying, in a series of examples collected in one place, from only a little longer than broad to about twice as long as broad. The leaves also vary, in some plants being almost entire, though slightly undulate, and in others being distinctly crenate. It is very desirable that our small alpine *Caltha* should be compared with authentic specimens of *C. membranacea.*

A special look-out should be kept for Calthas which root at the joints. *C. radicans* (re-discovered a few years ago by Mr. Graham in Forfarshire), is well marked by the shape of its leaves. It ought to occur elsewhere than near Rescobie. The Finmark plant, which has been supposed to be the same as the Scottish, seems to be distinct from *C. radicans* Forst., and to be the same as *C. palustris*, var. *zetlandica* Beeby (see *Scottish Naturalist* for January, 1887, p. 21). It would appear, therefore, that there is more than one *Caltha* with rooting stems.

In conclusion, I may say that, as it is evident that more attention must be given to the shape of the ripe follicles, and as, unfortunately, these are not always to be found, plants which seem to merit observation should be taken home and grown. Though they grow naturally in wet places, Calthas are very amenable to cultivation in dry ground, and hence no difficulty should be experienced in subjecting doubtful specimens to a thorough investigation.

ADDITIONAL RECORDS OF SCOTCH PLANTS FOR THE YEAR 1886.

By Arthur Bennett, F.L.S.

FOLLOWING up the records given in the *Scottish Naturalist*, in 1886, I here purpose to enumerate those that have been made during 1886.

They include an addition to our Flora—viz., *Triticum violaceum*, Horn., and two or three plants not hitherto certain for Scotland, *e.g.*, *Linum perenne*, *Euphorbia Paralias*, &c. Numerous varietal forms have been recorded for the first time as Scotch in papers by Dr. Buchanan White and by Mr. Beeby in the last volume of this

Journal. That I must miss some records, will be obvious enough to those who have tried to keep up with our scattered botanical literature. If those who glance over these records will communicate any information they may be possessed of either to the Editor or myself, we shall gradually make this record a representative one for Scottish local botany. I need hardly say that any help I can afford will be most cheerfully given to the best of my ability. As before, the sequence, &c., is that of the 2nd Ed. of *Topographical Botany.*

S.N. refers to *Scottish Naturalist*, *E.C.* to the *Botanical Exchange Club*, *R.C.* to the *Botanical Record Club*, and *J.B.* to *The Journal of Botany.*

Ranunculus confervoides, Fr. The Scotch specimens so named I cannot consider the same as Fries' plant. A careful comparison with authentic specimens of Fries' plant convinces me they cannot be named *confervoides*; but I cannot match the Scotch specimens with any Scandinavian form at present.

Ranunculus Drouetii, 109 Caithness, *Hanbury, sp.*

R. circinatus, 105 Ross E., *Davidson, S.N.*

R. Lenormandi, 102 Ebudes S., *Fingland, sp.*

R. hederaceus, 98 Argyle, *C. Bailey. E.C.*

R. Ficaria, 110 St. Kilda, *Barrington.*

R. auricomus, 72 Dumfries, *Dr. Davidson.*

R. bulbosus, 111 Orkney, *S.N.*

R. hirsutus, 72 Dumfries, *Dr. Davidson.*

R. sceleratus, 73 Kirkcud., *Trans. D. & K. Club.*

R. arvensis, 73 Kirkcud., *Trans. D. & K. Club.*

Fumaria confusa, 74 Wigton, *M'Andrew, sp.*; 102 Ebudes S., *Miller!*

Cakile maritima, 74 Wigton, *M'Andrew*; 106 Ross E., *Davidson, S.N.*

Cochlearia alpina, 110 St. Kilda, *Barrington!*

C. danica, 102 Ebudes S., *Miller, sp.*

C. groenlandica (f. Lange), 112 Shetland, *Beeby, S.N.*

NOTE.—In *The Journal of Botany* for 1867, Mr. J. Carrol, in a list of Norwegian and Lapland plants, mentions finding *C. arctica*, Schlecht., and says, "exactly the same plant that I found on Ben Lawers in 1864." Mr. Carrol was an excellent botanist; and from this, and Mr. Beeby's remarks in *S.N.*, it is evident that this genus requires attention.

Cardamine sylvatica, 72 Dumfries, *Dr. Davidson.*

Arabis Thaliana, 72 Dumfries, and 73 Kirkcud., *Trans. D. & K. Club.*

Arabis petræa, v. hispida, 92 Aberd. S., *Hanbury, sp.;* 106 Ross W., *Davidson, S.N. ?*

A. hirsuta, 72 Kirkcud., *Trans. D. & K. Club.*

Barbarea vulgaris, 108 Suth., W., *Hanbury.*

Nasturtium officinale, 105 Ross E., *Davidson, S.N.*

N. sylvestre, 72 Dumfries, *Dr. Davidson.*

Erysimum Alliaria, 72 Dumfr., *Trans. D. & K. Club.*

Raphanus Raphanistrum, 74 Wigton, *M'Andrew.*

Helianthemum vulgare, 72 Dumfries, *Dr. Davidson.*

Viola Reichenbachiana, 112 Shetland, *Beeby, sp.* "?"

V. canina, 112 Shetland, *Beeby, sp.*

V. lutea, 112 Shetland, *Beeby, sp.*

Drosera obovata, 110 Hebrides, *W. S. Duncan.*

Polygala vulgaris, seg., 102 Ebudes S., and 109 Caithness, both *Miller!*

P. depressa, 110 St. Kilda, *Barrington!*

Sagina maritima, 108 Suth. W., *Marshall, sp.*

S. saxatilis, 106 Ross E., *Davidson. S.N.*; 112 Shetland. *Beeby!*

S. subulata, v. glabrata, 112 Shetland, *Beeby!*

Honkeneja peploides, 72 Dumfries, *Dr. Davidson*; 112 Shetland, *Beeby*, v. diffusa!

Spergularia marina, 102 Ebudes S., *Miller!*; 108 Suth. W., *Hanbury!*

Arenaria serpyllifolia, 72 Dumfries, *Dr. Davidson.*

Arenaria rubella, 112 Shetland, *Beeby!* "hirta."

A. trinervia, 74 Wigton, *M'Andrew.*

A. norvegica, 108 Suth. W., *Gray, sp.*, at *Edin. Bot. Soc.*, sec Grieve.

Stellaria glauca, 72 Dumfries, *Dr. Davidson*; 86 Stirling, *Kidston, sp.*

Cerastium longirostre, Wichura, 112 Shetland *Beeby, sp., S.N.*

C. triviale, alpestre, 112 Shetland, *Beeby!*

C. tetrandrum, 74 Wigton, *J. M'Andrew, sp.*

C. alpinum, 106 Ross E., *Davidson, S.N.*

C. arcticum, Lange, v. Edmonstonii, *Beeby.* 112 Shet-

land, *Beeby. sp.* Decided by Dr. Lange to be his "*arcticum;*" it is the *C. latifolium*, v. *nigrescens*, of authors. *S.N.*, 1887.

Linum perenne, 72 Dumfries, *Dr. Davidson, sp.;* 73 Kirkcud., *Mr. Coles, sp.*

Hypericum quadrangulum, 72 Dumfries, *Dr. Davidson, sp.*

H. humifusum, 72 Dumfries, *Dr. Davidson.*

H. pulchrum, v. procumbens, 112 Shetland, *Beeby, sp.*

H. montanum, 106 Ross E. (*Dr. White*) *Davidson, S,N.*

H. elodes, 102 Ebudes S., *Fingland, sp.*

Geranium dissectum, 98 Argyle, *C. Bailey, E.C.*

G. columbinum, 102 Ebudes S., *Miller, cat.*

G. sanguineum, 74 Wigton, *J. M'Andrew.*

Anthyllis vulneraria, v. maritima, 112 (*Beeby, sp.!*) Shetland.

Medicago lupulina, 73 Kirkcud., *Trans. D. & K. Club.*

Trifolium arvense, 74 Wigton, *J. M'Andrew.*

T. minus, 72 Dumfries, *Dr. Davidson.*

Vicia Orobus, 108 Suth. W., *Mr. Roy, S.N.*

V. sylvatica, 72 Dumfries, *Trans. D. & K. Club.*

V. angustifolia, 72 Dumfries, *Dr. Davidson.*

Lathyrus pratensis, 96 Easterness, *Groves, E.C.*

Potentilla reptans, 72 Dumfries, *Dr. Davidson.*

Rubus Chamæmorus, 72 Dumfries, *Wat. Bot. Ex. Club:* 81 Berwick, *S.N.* 1884.

Rubus Leesii, 85 Fife, *Dr. Mactier, S.N.*

Rubus corylifolius (f. *Baker*), 109 Caithness, *Dr. Davidson, sp.*

R. horridus, Schultz. (f. *Baker*, 102 Ebudes S., *Miller, sp.*

R. canina v. lutetiana, 111 Orkney, *H. H. Johnston, sp.*

Poterium Sanguisorba, 73 Kirkcud., *Coles, sp.*

Alchemilla arvensis, 108 W. Suth., *Hanbury.*

Epilobium alsinifolium × anagallidifolium, 90 Forfar, *Gardiner,* fide Hausknecht in *Monograph.*

E. palustre, 72 Dumfries, *Dr. Davidson;* v. fontanum, Hausk., 112 Shetland, *Beeby, sp.*

Hausknecht, in his Monograph of *Epilobium*, refers the plates of *E. alpinum* and *anagallidifolium* of "Eng. Botany," t. 506, 507, to *anagallidifolium*, Lam.; and restricts the "true *alpinum*" (Linn., *Sp., Pl.*, 348 (No. 7), 1753) to Scandinavia, Iceland, Greenland, Labrador, &c., under the name of *E. lactiflorum.* Likely enough this occurs in Scotland.

Circæa lutetiana, 74 Wigton, *J. M'Andrew;* 106 Ross E., *Davidson, S.N.*

Hippuris vulgaris, 73 Kirkcud., *Trans. D. & K. Club.*

Myriophyllum spicatum, 72 Dumfries, *Dr. Davidson.*

Callitriche hamulata. Mr. Watson does not give the counties for this in detail; but as the plant is continually being misnamed, it will be well to record specimens seen: 73 Kirkcud., *J. M'Andrew, sp.;* 104 Ebudes N., *Revd. Norman!*

Peplis Portula, 73 Kirkcud., *Trans. D. & K. Club.*

Sedum Rhodiola, 72 Kirkcud., l.c.

S. villosum, 72 Dumfries, *Fingland* and *Davidson.*

Saxifraga oppositifolia, 110 St. Kilda, *Barrington!*

S. rivularis, 96 Easterness, *Rev. A. Ley, E.C.*

S. cæspitosa, 96 Easterness, *Evans!*

Sanicula europæa, 72 Dumfries, *Trans. D. & K. Club.*

Heliosciadium inundatum, 72 Dumfries, l.c.

Ægopodium Podagraria (112 Shetland, *Beeby* †).

Sium angustifolium, 72 Dumfries, *Trans. D. & K. Club.*

Œnanthe fistulosa, 88 Perth mid., *Dr. B. White.*

Scandix Pecten-Veneris, 108 Suth. W., *Hanbury.*

Anthriscus sylvestris, 72 Dumfries, *Dr. Davidson.*

Sambucus Ebulus, 111 Orkney, *S.N.*

Galium uliginosum, 72 Dumfries, *Trans. D. & K. Club.*

Sherardia arvensis, 111 Orkney, *S.N.*

Asperula odorata, 111 Orkney, *S.N.*

Valeriana dioica, 73 Kirkcud., *Trans. D. & K. Club.*

Dipsacus sylvestris, 72 Dumfries, † *Dr. Davidson.*

Leontodon hirtus, 72 Dumfries, *Dr. Davidson;* 74 Wigton, *J. M'Andrew, sp.;* 102 Ebudes S., *Fingland, sp.*

L. hispidus, 72 Dumfries, 73 Kirkcud., both *Trans. D. & K. Club;* 102 Ebudes S., *Fingland, sp.*

Sonchus asper, 72 Dumfries, *Dr. Davidson.*

Crepis virens, 72 Dumfries, *Dr. Davidson.*

C. succisifolia, 88 Perth M., *Groves E.C.*

Hieracium murorum, 102 Ebudes S., *Miller, sp.*

H. vulgatum, seg., 72 Dumfries, *Davidson, sp.;* 102 Ebudes S., *Miller, sp.*

H. prenanthoides, 72 Dumfries, *Dr. Davidson, sp.;* 108 Suth. W., *Hanbury!*

H. tridentatum, 72 Dumfries, *Dr. Davidson!* 92 *Aberdeen S., Linton, Wat. Bot. Club.*

H. norvegicum, Fr., 108 Suth. W., *Marshall, sp.;* 111 Orkney, *Linton*, f. Hanbury.

Taraxacum palustre, 72 Dumfries, *Dr. Davidson;* 110 St. Kilda, *Barrington!*

Arctium minus, 72 Dumfries, *Dr. Davidson;* 108 Suth. W., *Hanbury!*

A. intermedium, 109 Caithness, *W. R. Linton, J.B.*

Carduus crispus, 72 Dumfries, *Trans. D. & K. Club.*

C. heterophyllus, 72 Dumfries, l.c.

Carlina vulgaris, 72 Dumfries, l.c.

Gnaphalium sylvaticum, 72 Dumfries, *Dr. Davidson.*

Inula dysenterica, 72 Dumfries and 73 Kirkcud., *Trans. D. & K. Club.*

Matricaria inodora v. phœocephala, 112 Shet., *Beeby!*

M. Chamomilla, 72 Dumfries, *Dr. Davidson.*

Anthemis arvensis, 111 Orkney, *S.N.*

A. Cotula, 72 Dumfries, *Dr. Davidson.*

Achillea Millefolium v. alpestre, 112 Shetland, *Beeby!*

Campanula glomerata, 88 Perth M. and 89 Perth E., *Dr. B. White.*

Jasione montana and v. major, 112 Shetland, *Beeby!*

Vaccinium Vitis-idæa, 72 Dumfries, *Trans. D. & K. Club.*

Pyrola media, 72 Dumfries, *Dr. Davidson*, "Colvend" (but this is in Kirkcudbright, *fide* Dr. B. White).

P. minor, 72 Dumfries, *Dr. Davidson.*

Convolvulus arvensis, 72 Dumfries, *Dr. Davidson.*

Solanum Dulcamara, 111 Orkney, *S.N.*

Verbascum Thapsus, 72 Dumfries, *Dr. Davidson.*

Veronica scutellata, 72 Dumfries, *Trans. D. & K. Club;* 102 Ebudes S., *Fingland, sp.*

V. hederifolia, 74 Wigton, *J. M'Andrew, sp.*

Rhinanthus Crista-galli, v. major, 111 Orkney, *S.N.*

Lycopus europæus, 72 Dumfries, *Trans. D. & K. Club.*

Mentha aquatica, 72 Dumfries, *Dr. Davidson.*

M. arvensis, 72 Dumfries, l.c.

Thymus Serpyllum, v. prostrata, 112 Shetland, *Beeby!* 105 Ross W., *Grieve!*

Calamintha Clinopodium, 72 Dumfries, *Trans. D. & K. Club.*

Ajuga reptans, 108 Suth. W., *Hanbury!*

Lamium incisum, 102 Ebudes S., *Miller!*

Betonica officinalis, 72 Dumfries, *Dr. Davidson.*

Stachys sylvatica, 72 Dumfries, l.c.

Scutellaria minor, 102 Ebudes S., *Miller!*

Myosotis repens, 109 Caithness, *Hanbury!*

M. cæspitosa, 72 Dumfries, *Dr. Davidson.*

Mertensia maritima, 72 Dumfries, *Trans. D. & K. Club.*

Lycopsis arvensis, 72 Dumfries, *Dr. Davidson.*

Pinguicula alpina, 108 Suth. W., *W. J. Ball*, in *J.B.*, 1885, p. 311. Needs confirmation as to being the true plant.

Lysimachia nemorum, 72 Dumfries, *Dr. Davidson.*

Plantago maritima, v. pygmæa, 110 St. Kilda, *Barrington, sp.*; 112 Shetland, *Beeby!*

P. lanceolata, v. eriophylla, and v. capitata, 112 Shetland, *Beeby!*

P. Coronopus, v. pygmæa, 112 Shetland, *Beeby*

Littorella lacustris, 98 Argyle, *C. Bailey, E.C.*

Chenopodium Bonus-Henricus, 73 Kirkcud., *Trans. D. & K. Club.*

Atriplex angustifolia, 72 Dumfries, *Dr. Davidson*; 108 Suth. W., *Hanbury!*

Beta maritima, 74 Wigton, *J. M'Andrew, sp.*

Polygonum amphibium, 72 Dumfries, *Dr. Davidson.*

P. lapathifolium, 72 Dumfries, l.c.

Rumex Hydrolapathum, 73 Kirkcud., *Trans. D. & K. Club.*

R. aquaticus, 72 Dumfries, *Trans. D. & K. Club.*

R. nemorosus, 72 Dumfries, *Dr. Davidson.*

R. conglomeratus, 110 St. Kilda, *Barrington!*

R. obtusifolius, 72 Dumfries, *Dr. Davidson.*

Hippophae rhamnoides, 72 Dumfries, l.c. +

Empetrum nigrum, 74 Wigton, *J. M'Andrew.*

Euphorbia Paralias, 74 Wigton, *J. M'Andrew, sp.*

E. exigua; 73 Kirkcud., *Trans. D. & K. Club.*

E. Peplus, 72 Dumfries, *Dr. Davidson.*

Parietaria officinalis, 73 Kirkcud., l.c.

Populus tremula, 72 Dumfries, *Dr. Davidson.*

Salix fragilis, 72 Dumfries, l.c.

S. viminalis, 72 Dumfries, l.c.

S. cinerea, 72 Dumfries, l.c.
S. Caprea, 72 Dumfries, l.c.
S. ambigua, 104 Ebudes N., *Grieve!* 112 Shetland, *Beeby!*
S. repens, 72 Dumfries, *Dr. Davidson, sp.*
Myrica Gale, 111 Orkney, *S.N.*
Juniperus communis, 74 Wigton, *J. M'Andrew.*
Neottia Nidus-avis, 72 Dumfries, *Edin. Herb.*
Listera cordata, 73 Kirkcud., *Trans. D. & K. Club.*
Epipactis atrorubens, 89 Perth E., *Ewing, sp.*
O. incarnata, 112 Shet., *Beeby.*
Habenaria eu-bifolia, 72 Dumfries, *Dr. Davidson;* 102 Ebudes S., *Fingland, sp.*
Habenaria viridis, 72 Dumfries, *Dr. Davidson.*
Allium ursinum, 108, Suth. W., *Hanbury!*
Paris quadrifolia, 72 Dumfries, *Trans. D. & K. Club.*
Butomus umbellatus, 89 Perth E., *Dr. B. White.*
Potamogeton pectinatus, 102 Ebudes S., *Fingland, sp.*
P. filiformis, 102 Ebudes S., *Fingland, sp.*
P. pusillus, f., 112 Shetland, *Beeby, sp.*
P. heterophyllus, 112 Shetland, *Beeby, sp.*
P. nitens, 109 Caithness, *Marshall, sp.;* 112 Shetland, *Beeby, sp.*
P. Zizii, 74 Wigton, *Druce;* 81 Berwick, *Renton;* 87 Perth W., *Kidston, sp.*
P. natans, true, 72 Dumfries, *Dr. Davidson;* 95 Elgin, *Rev. J. Keith's herb.!* 102 Ebudes S., *Miller, sp.*
Ruppia rostellata, 95 Elgin, *Rev. J. Keith's herb.!*
Arum maculatum, 73 Kirkcud., *Trans. D. & K. Club.*
Sparganium simplex, 74 Wigton, *J. M'Andrew, sp.*
Juncus effusus, 110 St. Kilda, *Barrington!*
J. acutiflorus, 72 Dumfries, *Dr. Davidson.*
J. supinus, 72 Dumfries, *Dr. Davidson.*
Luzula sylvatica, v. gracilis, 112 Shet., *Beeby, sp.*
L. congesta, 112 Shet., *Beeby, sp.*
Scirpus sylvaticus, 73 Kirkcud., *Trans. D. & K. Club.*
S. setaceus, 72 Dumfries, *Dr. Davidson.*
S. acicularis, 112 Shetland, *Beeby!* ? in *Top. Bot.*
S. palustris, 72 Dumfries, *Dr. Davidson.*
S. uniglumis, 112 Shetland, *Beeby!*
S. pauciflorus, 112 Shet., *Beeby!*

S. cæspitosus, 72 Dumfries, *Dr. Davidson.*

S. fluitans, 109 Caithness, *Marshall, sp.*

Carex dioica, 72 Dumfries, *Dr. Davidson.*

C. pulicaris, 72 Dumfries, *Dr. Davidson.*

C. pauciflora, 108 Suth., W., "200 feet," *Rev. W. R. Linton, J.B.*

C. incurva, 94 Banff, *S.N.*, 110 Hebrides. *Babington:* "A sp. of this or *stenophylla* occurred on the sands at Scaristra."—*Cyb. Brit.*

C. helvola, Blytt., 90 Forfar! Almost certain, but will need to be gathered again.

C. intermedia, 109 Caithness, *Dr. Davidson, sp.*

C. paniculata, 72 Dumfries, *Dr. Davidson.*

C. vulgaris, var., 72 Dumfries, *Dr. Davidson!* The Elgin plant is *aquatilis.*

C. acuta, 88 Perth M., *Dr. B. White.*

C. atrata, 69 Easterness. *Groves* in litt.

C. eu-flava, 112 Shetland, *Beeby!*

C. Œderi, 102 Ebudes S., *Fingland, sp.*

Carex extensa, 72 Dumfries, *Dr. Davidson*, 97 Westerness, *E. F. Linton, sp.*

C. (fulva) Hornschuchiana, 112 Shetland, *Beeby!*

C. distans, 72 Dumfries, *Dr. Davidson.*

C. lævigata, 105 Ross W., *S. Grieve!*

C. capillaris, 109 Caithness, *Marshall, sp.*

C. rariflora, 89 Perth E., *Dr. White* and *Ewing, sp.*

C. sylvatica, 73 Kirkcud., *Trans. D. and K. Club.*

C. pendula, 73 Kirkcud., *Trans. D. and K. Club.*

C. præcox, 72 Dumfries, *Dr. Davidson.*

C. pilulifera, 102 Ebudes S., *Fingland, sp.*

C. filiformis, 72 Dumfries, *Dr. Davidson*, June, 1886.

C. hirta, 72 Dumfries, *Dr. Davidson.*

C. ampullacea, 72 Dumfries l.c.

C. pulla, 92 Aberdeen, S. Mr. Ewing has sent me for examination a curious form of this species, quite wanting the male spike, and having somewhat the appearance of *C. alpina*, or of a full specimen of *C. nigra;* but I have several specimens like it from Sweden and Norway.

I see that Mr. Bentham in the 5th ed. of his Flora doubts the Scotch *Carex frigida* being the true plant, and would rather name it *C. vaginata f.*

Kobresia caricina, 98 Argyle, *Dr. B. White*, *S.N.*

Anthoxanthum odoratum, 72 Dumfries, *Dr. Davidson.*

Milium effusum, 72 Dumfries, l.c.

Agrostis canina, 72 Dumfries, l.c.

Phragmites communis, 108 Suth., W., *Hanbury.*

Aira cæspitosa v. **pallida**, 92 Aberdeen, *Marshall*, sp.; 112 Shetland, *Beeby*, sp.

A. præcox, 72 Dumfries, *Dr. Davidson.*

Triodia decumbens, 72 Dumfries, *Dr. Davidson.*

Avena flavescens, 111 Orkney, *S.N.*

Molinia cœrulea, 72 Dumfries, *Dr. Davidson;* v. **minima** Rabenh., 109 Caithness, *Marshall, sp.*; 112 Shetland, *Beeby*!

Glyceria aquatica, 73 Kirkcud., *Trans. D. and K. Club.*

Sclerochloa loliacea, 102 Ebudes S., *Miller, sp.*

Poa laxa. Prof. Hackel writes me: "Specimens of *Poa laxa* from Lochnagar gathered by Rev. A. Ley, and assented to by Prof. Babington, are only depauperated *C. alpina*; and he adds: "I have seen no specimens of true *P. laxa* and *P. stricta* from Scotland.

Poa glauca, 104 Ebudes N., *W. R. Linton.*

Festuca Myurus, 72 Dumfries, *Dr. Davidson.*

F. sylvatica, 73 Kirkcud., *Dr. Davidson.*

F. elatior, 72 Dumfries, *Dr. Davidson.*

Bromus sterilis, 72 Dumfries, *Dr. Davidson;* 111 Orkney, *S.N.*

B. erectus, 72 Dumfries and 73 Kirkcud., *Trans. D. and K. Club.*

Triticum caninum, 72 Dumfries, *Dr. Davidson;* 73 Kirkcud., *J. M'Andrew*, sp.; 111 Orkney, *S.N.*

T. repens, 108 Suth. W., *Hanbury.*

T. junceum, 112 Shetland, *Beeby, sp.*

T. violaceum Hornem., 88 Perth Mid., *Cosmo Melvill* (see *S.N.* and *J.B.* for particulars). An interesting addition, if the defining of Don's *alpinum* as **violaceum** can be so called.

Polypodium vulgare, v. **breve** Lange, 112 Shetland, *Beeby, sp.*

Polystichum Lonchitis, 111 Orkney, *S.N.*

Lastrea dilatata, 72 Dumfries, *Dr. Davidson.*

Asplenium Adiantum-nigrum, 72 Dumfries, *Dr. Davidson.*

Botrychium Lunaria, 74 Wigton, *J. M'Andrew;* 110 St. Kilda, *Barrington* !

Ophioglossum vulgare, 72 Dumfries, *Dr. Davidson*; 110 "N. Rona," *Barrington.*

O. ambiguum, 110 St. Kilda, *Barrington* !

Lycopodium innundatum, 108 Suth., *Roy*, *S.N.*; 111 Orkney, *S.N.*

Equisetum sylvaticum, 105, Ross W., *S. Grieve* !

The genera that will yet repay special attention (beyond the usual critical ones) are *Epilobium*, of which we have probably many hybrids, &c. *Betula*—Prof. Babington has called attention to the possible occurrence in Scotland of *B. humilis*, in the *Scot. Nat.;* and possibly *B. subalpina* Larss., or *B. alpestris* Fr. will be found (or one or the other does occur?) *Festucæ* much want gathering, *i.e.*, with *good roots*. *Cochlearia*—On this Mr. Beeby remarks in *Scot. Nat.* for January of this year. *Sparganium*—I cannot help thinking that we possess some of the Scandinavian forms; but ripe fruit is essential for their accurate determination.

ON THE INFLUENCE OF CRYPTOGAMS ON MANKIND.

By Prof. JAMES W. H. TRAIL, A.M., M.D., F.L.S.

IN passing under brief review the influence of Cryptogams on human welfare, it will be at once observed that the relative importance of the various Orders of Cryptogams is very different, and that the most important by far in its effects is the great division of the Fungi, using that term to include the somewhat heterogeneous asemblage usually placed in it by British and most continental botanists, but which in fact resemble one another in little but the nature of their food.

The highest Cryptogams—the Ferns and allied forms—are of little value to mankind either directly or indirectly. The very abundant Order *Filices*, or Ferns, is deservedly in high favour in gardens and in hothouses, because of the delicacy and beauty of their foliage, and of the ease with which most of them can be cultivated; while the care required in the successful cultivation of some of them is itself a powerful attraction to lovers of gardening. But the group yields very few products of economic value, the most important

being the well-known medicine for destroying intestinal worms that is prepared from the Male Fern (*L. Filix-mas*), and which is obtained also from a few other species. The rootstocks of certain ferns contain a good deal of starch; and a few of them have been used as food in absence of other articles of diet; but a bitter substance contained in these rootstocks renders the starch unpalatable. When New Zealand was discovered by Europeans, the Maories fed largely on the rootstocks of a plentiful fern, now regarded as a variety of the Common Bracken (*Pteris aquilina*); but since cereals were introduced into these islands, the fern has fallen into disuse as a food plant.

The Horsetails or *Equiseta* are not much employed as ornamental plants, though such species as *E. sylvaticum* deserve cultivation, nor are they more useful to man than the ferns. Almost the only use made of them is the employment of the dried stems in polishing metals or woodwork; the amount of Silica in the outer coating of the stems renders them hard and rough, and thus very suitable for smoothing rough surfaces. The Clubmosses or *Lycopods* are of great interest to botanists, because of the many points of structure in which they stand intermediate between the Flowering plants and the Cellular Cryptogams; but they afford hardly any useful products. Nor are they hurtful to mankind; for, although some species are said to be poisonous, they are not at all likely to be used as food, or to be a cause of accidents. The *Selaginellæ* are not less interesting scientifically than the true Clubmosses; while they are deserved favourites in greenhouses because of their elegance and beauty. The small genera *Isoetes*, *Salvinia*, and *Marsilea* require little comment; though *M. salvatrix* has a peculiar interest in its spores having been used as food by the early explorers of Australia when in danger of famine.

The highest group of the Cellular Cryptogams, the **Mosses** and **Liverworts**, is also of comparatively little economic value to mankind, though of great beauty, and of much interest to botanists. They are not often cultivated, though deserving more attention in this respect; and they are thus of only secondary importance to gardeners, who use them chiefly as packing materials. The power possessed by many of the *Sphagna* of sucking up water like a sponge, and supplying it gradually to plants surrounded with a layer of them, makes them of considerable use in the cultivation of many plants.

It is, however, among the Thallogens that we meet with the most numerous examples of Cryptogams useful or injurious to mankind. The **Algae**, including the seaweeds (so often brilliant red, purple, or green, though frequently also dull and sombre-browns, or olive-greens, or almost black in colour), are known to every resident by the sea-shore, in some or other of the many forms that these plants assume. They are almost the sole plants of the salt waters, in which they cover the rocks with almost as copious a vegetation as that of our terrestrial pastures; and the immense masses thrown in on many coasts after a storm must be familiar to everyone who has spent a winter on seaweed-fringed coasts. Seaweeds afford, directly or indirectly, the greater part of the food of fishes, and thus are of the greatest value to the fisheries so successfully prosecuted along our coasts. The masses cast up after storms are very largely employed in many seaboard parishes as manure for the fields, and they are found to be most valuable for this purpose, and to increase the produce very largely.

Another very important use of seaweeds is affording various mineral substances from the kelp, or mass of ashes, that remains after they have been burned. Some years ago the preparation of kelp was a source of considerable revenue to the inhabitants of the Scotch sea coasts, and especially of the Hebrides, and of the Orkney and Shetland Islands. Among the most familiar sights of these coasts in summer were the dense columns of smoke that used to arise along the coast from the numerous heaps of seaweeds while being burned, which required to be done slowly at a low heat. The importance and value of kelp has fallen greatly since the progress of chemical discoveries has disclosed more economical methods of preparing carbonate of soda, of which it was formerly the chief source. Nor is it now used, as it was formerly, in the preparation of crown glass. It is still, however, the chief source of the element iodine, the compounds of which are largely used by chemists, and in medicine. About 8 lbs. of iodine can usually be obtained from a ton of good kelp. Bromine, the compounds of which are also much used in medicine, is obtained mostly from kelp; but in smaller quantity than iodine.

Seaweeds in considerable variety are employed as food. In our own maritime districts, and indeed by European nations generally, they are used only to a limited extent. The Alga most commonly seen in our markets is the Dulse (*Rhodymenia palmata*); and of it

very large quantities must be consumed if one may judge from the basketfuls on the stalls in the markets or hawked about the streets. The Pepper-dulse (*Laurencia pinnatifida*), which takes its popular name from its hot peppery taste, is a smaller plant, and is not much esteemed. Another seaweed (*Alaria esculenta*) also is eaten raw in some parts of Scotland. The frond is often some feet in length, and has a thickened central rib, which, when its outer skin is stripped off, is the part made use of. It has a slightly sweetish, but rather insipid taste. *Ulva lactuca*, the broad green fronds of which are not unlike the leaves of lettuce, is sometimes eaten as a salad in the same manner as lettuce.

Several other seaweeds are made use of when cooked. *Porphyra laciniata* and *P. vulgaris* have thin purple or greenish fronds, which, after several hours' boiling, form a pleasantly flavoured food, when seasoned with pepper and vinegar, or lemon juice. The Sweet Tangle (*Laminaria saccharina*) takes its name from the abundance in all its parts of a peculiar form of sugar, called *Mannite.* This can be obtained from the alga, by laying the plant for a time in fresh water, and then drying it by the sun's heat. After a time the mannite appears, as a white powdery coat, on its surface. The Icelanders are said to boil this seaweed in milk, and to prepare in this way a kind of pottage. The Carrageen or Irish Moss (*Chondrus crispus*) is collected, dried, and employed when boiled, to make a jelly, to which other nutritive substances can be readily added if desired.

Many other seaweeds can be employed in the same way; in fact, none are known to be hurtful; and many, or even most, contain a large amount of gelatine, which they yield on being boiled. Far more extensive use of them is made by the Eastern Asiatics than by European nations; in fact, they form very important articles of diet among the Chinese and Japanese. Among others largely eaten by the latter is the *Enteromorpha compressa*, so common on our own coasts. In the Scotch islands the sheep, and even cattle, often feed largely on seaweeds (*e.g.*, the species of *Fucus*), in the fresh state; and dried seaweeds in some places are stored for winter fodder.

Seaweeds possess certain medicinal properties. Besides the compounds of iodine and of bromine already referred to as obtained from their ashes, several are made use of in virtue of worm-destroying properties of a well-marked nature.

Another use made of seaweeds is their employment for ornamental purposes, owing to the ease and success with which they can be laid out on paper and preserved by drying; and still other uses might be mentioned, such as the employment of the stems of large *Laminariæ* to make handles for knives.

The Algæ of the freshwater lochs and streams are even more numerous in species than the seaweeds; but they are, for the most part, so small individually that they are far less conspicuous, and might often be wholly overlooked by the nonobservant. Yet they swarm in every place where water can lodge, and at times force themselves upon the notice of civic authorities by appearing in the water supplies of towns. There have frequently been serious consequences from the excessive multiplication and subsequent putrefaction of certain Algæ in the reservoirs and pipes, more especially on the continent of Europe. But in moderate quantity the freshwater Algæ are useful in the sources of town supplies, as they aid efficiently in the removal of organic impurities, and in supplying oxygen to the water.

The most important of the Algæ, from an economic point of view, are the diatoms, so well-known to microscopists for their wonderful beauty and variety, and so much esteemed as tests of the excellence of the lenses of microscopes, on account of the extreme delicacy of their markings, which only the best and most powerful lenses can show clearly. The flinty covering of the diatoms is almost indestructible by the agencies to which they are exposed after death; hence they remain unchanged at the bottom of ponds and lakes. Despite the minuteness of these plants, of many kinds of which upwards of 1,000,000,000 could lie in one cubic inch, in course of time beds of many feet in thickness become deposited, and assume the form either of fine-grained rocks, or of gray friable deposits, often under peat—this latter form receiving the name of *Kiesel-guhr*. The rock is often used for making polishing-stones, and the powdery deposits are also used in this way; but the chief use of *Kiesel-guhr* is in the preparation of dynamite. A very valuable bed of it is worked in the vicinity of Loch Kinnord in Aberdeenshire.

The Lichens afford fewer plants of value to mankind than do the Algæ. In their common forms, on stones and on tree trunks, they are familiar to everyone; varying in colour, but usually being some shade of grey or brown, less often black, yellow, orange, or

scarlet. In form they vary much; from conspicuous tufts or branched leaf-like masses, or cups on soil, or crusts clinging closely to stones or bark, down to forms so minute as to be scarcely visible. The nature of these plants has been hotly contested for several years between those who regard them as distinct and true species, and the followers of Schwendener, who believe them to be each an association of a fungus with an Alga, each aiding and nourishing the other. But it would be out of place to discuss this vexed question here; and Lichens may still fairly enough be regarded as distinct from true Fungi and true Algæ, in aspect, in habitats, and also in mode of nutrition. One interesting peculiarity of the group is, that they are an excellent test of the purity of the air, and of its freedom from injurious gases, since they die out where the atmosphere becomes contaminated with such impurities.

In many Lichens starchy and gummy substances occur, in some along with small quantities of sugary matter. The sugar is usually mannite, already mentioned as obtained from certain seaweeds. The presence of these various substances renders some Lichens nutritious, and a few have been used as food by northern races. The best known of these are the Iceland Moss (*Cetraria Islandica*), a large species common on our higher hills and mountains; the "Tripe des Roches" (*Umbilicaria* sps.) of the Artic Regions, familiar, by name, at least, to all who have read the accounts of the heroic explorations of Franklin, and of so many others, in the frozen North; and the "Manna" (*Lecanora esculenta*), of the sterile plains of Central Asia. Many other Lichens might be used freely as food were it not for the trouble of removing an unpleasant bitter substance which they contain, and which for its removal requires plants to be steeped for a considerable time in water. No Lichen is known to be poisonous. "Reindeer Moss" (*Cladonia rangiferina*) forms the chief support in winter of the reindeer, so invaluable to the Laplanders. This Lichen is plentiful on our own hills, but is of no economic value to the domestic animals of Scotland.

In former times Lichens were held in considerable estimation on account of their supposed medicinal properties as tonics, purgatives, vermifuges, and astringents; and the very common "Dog Lichen" (*Peltigera canina*) was considered almost a certain cure for hydrophobia. Unfortunately closer investigation has not

warranted the position assigned to them on these grounds, and they have been superseded by other more trustworthy remedies.

In 1868 a process was elaborated by Prof. Stenberg of Stockholm for the preparation of alcohol from Lichens; and considerable quantities are obtained from this source in special distilleries in Scandinavia, Finland, and Russia.

But the most important use to which Lichens have been put is to afford dyes for cloth, or for use in chemical laboratories, where litmus paper, prepared from Orchil (*Rocella tinctoria*), is among the tests in most frequent use. The dyes prepared from Lichens are usually purple or red, less often some shade of yellow, but they vary a good deal according to the details of the method employed in extracting them. The best account of these dyes and of the Lichens that yield them, will be found in papers by Dr. Lauder Lindsay, published in the Report of the British Association for 1855; the Transactions of the Edinburgh Botanical Society for 1852-54; and the Edinburgh New Philos. Journal, 1854-5. The dyes are obtained by steeping the plant in a solution of ammonia, or spirits of hartshorn, in water. The colour is developed in this mixture, and indicates the value of the Lichen.

In the early part of this century the "Cudbear" (*Lecanora tartarea*) was largely gathered from the rocks and boulders on the Scotch mountains, and was sold at about 1d per lb. to the manufacturers of the dye in Glasgow and in Leith. In this way about 14s or 15s per week could be earned by a man, since the plant was very abundant. In addition to quantities exported, a good deal was used in the Scotch Highlands and Islands, in the domestic economy of the cottagers, by whom the wool was home-dyed as well as home-spun. The Lichen was steeped in putrid urine, to provide the ammonia, for some weeks, along with some salt or pieces of kelp; and when the desired colour had been obtained, the mass was made into a paste with lime or burnt shells. The paste was then rolled into balls and hung up to dry. For use the balls were powdered, and boiled in water with alum to prepare the solution for the thread. Dr. Lindsay found that the most valuable Lichens were crustaceous, friable, whitish species, growing on rocks; that showy leafy kinds seldom gave purple dyes; and that the colours yielded by the latter were not of much use, being too undecided.

The Lichens of most commercial value at the present time are the "Orchils" (*Rocella tinctoria* and allied species), which are brought

chiefly from the West Coasts of Africa and the Canary and Cape de Verde Islands. Besides these, however, a good many others are employed, brought from other regions, to be made use of as adulterations or as substitutes for the more valuable kinds. The manufacture of dyes from the Orchils is still a considerable industry, though curtailed of much of its importance by the introduction into commerce of the varied and beautiful aniline dyes.

The FUNGI now must claim attention. In their importance to mankind they far surpass all other Cryptogams; but to treat of them with even an approach to the same fulness as the other groups have received, would require far more space than can now be devoted to them. In structure the Fungi show very great diversity; but all agree in requiring for their nourishment organic food, in the form of the living bodies, or of the dead and decaying remains of plants or animals. Many Fungi seem to grow from the ground itself; but even these get their food from decaying organic matter in the soil, or from the roots of plants. In size Fungi vary from a foot or more in diameter to extreme minuteness.

Everyone is familiar with the fact that there are edible mushrooms, from which also ketchup can be prepared; but the popular idea seldom embraces more than the common field mushroom (*Agaricus campestris*). Perhaps it is well not to encourage a rash tendency to experiment on the edible properties of Fungi, in view of the very poisonous nature of so many of them, and of the great likeness of certain edible to poisonous species; but the prevalent neglect of these plants causes the loss of a good deal of wholesome and safe food. There are no rules which can be relied on with absolute certainty to distinguish edible from poisonous mushrooms; and where the consequences of ignorance may be so serious, over-caution is less to be blamed than rashness; yet a little care would enable any moderately observant person to recognise several excellent species without much risk of error. Mr. Worthington Smith's sheets of coloured figures of the edible and poisonous mushrooms are valuable aids to their discrimination. Chantarelles (*Cantharellus cibarius*), Fairy-ring Mushrooms (*Marasmius oreades*), *Hydnum repandum*, young Puffballs (*Lycoperdon* sps.), Morels (*Morchella esculenta*); and others might be mentioned which could scarcely be mistaken by anyone at all acquainted with them. Truffles (*Tuber cibarium*) are held in high repute; but need not be looked for as food products of Scotland.

From edible Fungi the transition is not great to medicinal species. One is included in the British Pharmacopeia, and is in frequent use on account of its power of stimulating the action of the muscles not under the control of the will, and of thus causing contraction of the small blood-vessels known as capillaries. This fungus is the "Ergot of Rye," which is very abundant in the spikelets of many grasses besides the rye. The black mass of the fungus, somewhat like a cock's spur, is very often to be seen in autumn, projecting about a quarter of an inch from the spikelets. It does not affect any of the cereals cultivated commonly in Scotland; fortunately, since in other countries where it is common in the rye crop, the use of rye meal mixed with ergot has been found to cause very serious or fatal diseases, due to its action on the blood-vessels. Sometimes the effects are shown in brain disease; in other cases the extremities cease to receive nourishment; and mortification or gangrene begins in the fingers and toes, and spreads up towards the body, causing mutilation of the limbs, and often ending in death. The use of the ergot in midwifery is well-known to all medical men. Ergot kept in a damp place all winter gives origin in spring to the rounded or club-shaped stalked reproductive bodies of Claviceps purpurea; but these bodies are not often seen unless the ergots have been cultivated in order to obtain them.

Various other Fungi have in former times been held in more or less repute, both in this country and elsewhere, as valuable medicines, but they have not retained their reputation.

From medicinal to poisonous Fungi is but a step; and the ergot, as already stated, may be included under both groups. But there are many other Fungi, chiefly mushrooms and toadstools, that are poisonous, varying in their virulence from simply causing more or less severe irritation of the intestines (shown by vomiting and purging), to very severe illness and death. Even some mushrooms that are usually quite wholesome as food may, under certain conditions, produce unpleasant or dangerous effects, especially if kept so long that decay has commenced before they are eaten.

But it is by giving rise to serious and even fatal diseases in man, and also in domesticated animals, and in cultivated plants, that Fungi exert their most baneful influence on mankind; of species hurtful in one or other of these ways the name is legion. Who has not heard of *Bacteria*? and how many associate with the word

any ideas but those of disease and death? and how great a place do the bacteria fill in the minds and in the investigations of modern physicians, especially of those concerned in tracing the nature of epidemic diseases, their origin, and the methods of their diffusion? Already it is widely admitted that bacterial origin is proved in anthrax or splenic fever, in consumption or tuberculosis, and in various other diseases; and the same is asserted in regard to smallpox, typhoid fever, recurrent and malarial fevers, cholera, pneumonia, and several other diseases of a virulent type. In regard to wounds, the antiseptic treatment, now so generally adopted by surgeons, in most cases with good results, is based upon the belief that the evil effects, formerly so frequent after operations, resulted from the introduction of bacteria from the surrounding atmosphere into the wounds. The aim of antiseptic treatment is to prevent the entrance of such living organisms; and, since the introduction of this method of treatment, operations are now frequently undertaken with success that were formerly considered unjustifiable.

The importance of a knowledge of the bacteria in their relations to disease explains the interest taken in them, and the number of books on them that appear in constant succession. Their excessive minuteness, and their modes of life, call for very careful investigations; and every new discovery is hailed eagerly by many whose interest in them is by no means purely scientific.

The dread evoked by the disease-producing bacteria must not be allowed to make us forget that many others are of infinite value to mankind, since they are the active agents in effecting decomposition of the dead bodies of animals and of plants, and in thereby reducing them to conditions suitable for the nourishment of larger plants. But for the bacteria dead bodies of all kinds would remain dried up, but otherwise unchanged, to all time; and much of the most fertilising constituents in them could not be returned to the soil, but must remain unavailable for the growth of new organisms. Analogous to this process of causing putrefaction is the power that certain bacteria possess of giving rise to modes of fermentation, while others give rise to the formation of saltpetre, where rotting animal matter is in contact with potassic carbonate. There seems good evidence to warrant the belief that various diseases in domestic animals, as well as in mankind, *e.g.*, glanders in horses, are due to peculiar bacteria; and the same holds good with certain

diseases that have attacked and ravaged the silkworm larvæ, so largely reared in Europe for the sake of their silk, which forms an important product in many districts of the continent.

If we seek to pass under review diseases of cultivated plants of which Fungi are the cause, they prove to be far too many for even an enumeration here; and fresh investigations are continually adding to the number of diseases known to be caused by them. Only a few of the most serious diseases so caused may be mentioned at present. Farm-crops in Scotland at times suffer greviously. Potatoes seldom escape wholly from the ravages of the potato-disease fungus (*Phytophthora infestans*), and they are also liable to injury from other less conspicuous Fungi. Turnips, in the East of Scotland, fall a prey to the finger-and-toe disease, caused by *Plasmodiophora Brassicæ*; and the cereals suffer from the "Rusts" (*Puccinia straminis* and allied species). Of the vegetables cultivated in our gardens, few are free from liability to such diseases. Turnips and cabbages show the effects of the *Plasmodiophora*, and they are also liable, along with the other cultivated crucifers, to the attacks of moulds (*Peronospora parasitica*, *Cystopus candidus*, &c.), which cripple and distort, or even kill the plants. Onions, carrots, parsnips, spinach, and peas, all suffer from the growth of moulds in or on them, which frequently seriously diminish the crops. Raspberry bushes have their peculiar parasites (*Phragmidium Rubi-Idaei*, &c). So too have currant bushes, (*Microsphaera Grossulariæ*, *Glœosporium Ribis*, &c.) Rose bushes are rendered most unsightly by mildew (*Sphærotheca pannosa*); and allied Fungi frequently prove very fatal to the hop-plant in England, and to the vineyards of France, rendering constant vigilance necessary to save these crops from total destruction.

Trees suffer greviously at times from Fungi. The larger kinds burrow in the trunks, inducing decay, and pushing out their fruiting masses from the sides of the trees in the form of toadstools and *Polypori* of various kinds. The diseased trunks when exposed to gales are liable to snap across at the parts occupied by the Fungi. The foliage is frequently attacked. Everyone must have observed the orange-spotted leaves of willows, poplars and birches, when overgrown with *Lecythea*, the young stage of species of *Melampsora*. Conifers are at times stripped of their leaves by the action of similar Fungi, known as "rusts" from their colour, belonging to the large group of *Uredineae*. The destruc-

tive action of Fungi on dead wood is too well known in the form of "dry-rot;" which often almost necessitates the dismantling of the woodwork of houses, and is most difficult to get rid of.

The only means by which we may hope to overcome the injuries inflicted by Fungi upon our own bodies, and upon our various possessions, is to investigate fully their life-histories, and to ascertain how to prevent their attacks, and to contend with them, so that we may be able to extirpate the Fungi without injury to the body in or on which they live. Such investigations are the chosen work of the mycologist; and progress in them is being made slowly but steadily, with the result that remedies for one disease after another are being discovered; but little more than a beginning has been made as yet; though what has been accomplished gives reason to hope for a rapid advance in the near future.

REVISION OF THE SCOTCH PERONOSPOREÆ

By Prof. JAMES W. H. TRAIL, A.M., M.D, F.L.S.

(*Read before the Scottish Cryptogamic Society, 1886.*)

Since the publication of Mr. Stevenson's *Mycologia Scotica*, indeed largely because of its publication, our knowledge of the fungi of Scotland has been extended very greatly; as is amply evidenced by the extensive *supplements* that have already appeared in this Journal; while numerous additions to the Scotch flora are awaiting inclusion in these supplements. But it is advisable not only to enumerate, and briefly to describe, such species as are added to our lists, but also to revise the lists occasionally, in order to incorporate the additions; and thus to ascertain clearly what progress has been made; and what still remains to be done. Aid is supplied towards new investigations also if notices are given of such species as have been found in other countries, under such conditions as to render their occurrence with us possible, or even probable. A revision of the whole field is, however, not advisable, even were it possible, at the present time; and the work can best be done when the attention is confined for the time to a section, a family, or even a genus.

The family selected for revision in the following paper is one of the most interesting, on account of the parasitic habits of the fungi and of the harm inflicted by several of the species on cultivated plants. It is moreover very well defined by the peculiarities of its sexual reproduction; and the genera met with in Britain differ sufficiently from one another to render their recognition not a difficult task. Moreover the classification followed in the *Mycologia Scotica* separates the genera of this family widely from one another, placing *Cystopus* with the family of *Uredineæ*, and *Peronospora* among the *Hyphomycetes*, groups with which neither is closely allied. Under *Peronosopora* also are included three species, different from it in their true nature; these will be pointed out below. In addition to these reasons for selecting the *Peronosporeæ* for revision, several species new to Scotland have been added within the past two years, and a number of those previously recorded have been discovered of late years on foodplants and in localities from which they were previously unknown in Scotland.

In giving the districts in which the fungi have been detected, I have for brevity, made use of numbers instead of the names employed in the *Mycologia* and its *supplements*; but the districts themselves are the same, except in the sub-division of "Moray" into two. The correspondence of the numbers and districts is as follows:—1 Tweed, 2 Solway, 3 Forth, 4 Clyde, 5 Tay, 6 Argyle, 7 Dee, 8 Moray south of the Caledonian Canal, 9 Moray north of the Canal, 10 West-Ross, 11 Sutherland, 12 Caithness, 13 Outer Hebrides, 14 Orkney, 15 Shetland.

In the subjoined notes, all records of districts and of foodplants not previously given in Mr. Stevenson's book, are printed in italics.

At the end of the list will be found, I, names of the species wrongly included in *Peronospora*; II, brief descriptions of those species not described in *Cooke's Handbook of British Fungi*, or in the works mentioned above; and III, a list of species of *Peronosporeæ*, several of which should occur in Scotland, with the names of their foodplants. It is hoped that this list will prove useful to students of Scottish fungi, and that it will assist in the extension of our knowledge of these parasites.

PYTHIUM Prings.

P. de Baryanum Hesse, 7, in dead *Equisetum limosum*, near Aberdeen, plentiful.

CYSTOPUS Lev.

C. candidus (Pers.) Lev., 1, 2, 3, 4, 5, 6, 8, 10, plentiful. Has been observed on

Barbarea vulgaris.
Cardamine hirsuta and *C. flexuosa.*
Sisymbrium officinale.
Brassica Rapa and B. Sinapistrum.
Cochlearia officinalis and C. Armoracia.
Capsella Bursa-pastoris.

C. Tragopogonis (Pers.) Schr. (*C. cubicus* Str., No. 1306 in Mycol. Scotica), 5, on Tragopogon pratensis.

C. spinulosus De Bary. 5, *7*, local, but plentiful where it occurs, on Cnicus lanceolatus, *C. palustris*, and *C arvensis.*

PHYTOPHTHORA De Bary.

P. infestans Mont. (=*Peronospora infestans* Mont, No. 1443, Mycol. Scotica.) 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, *12*, *14*; too plentiful on stems and leaves of Solanum tuberosum (Potato).

PERONOSPORA Corda.

Sect. I. **Plasmopara** Schrœter, Basidia with few branches, which are simple, or each bear two or three *straight*, simple branchlets, or are (rarely) once bifurcated before bearing these. Conidia bear a papilla at the tip; in germination the contents escape as a mass of protoplasm, or as zoospores; Oospores round, with thin, smooth wall.

1. **P. nivea** Unger. 1, 5, 7, 8. Abundant in many places. Has been found on—

Sanicula Europœa, Invermay, near Perth (Dr. F. B. White).
Conium maculatum, near Aberdeen, a very slightly branched and rather peculiar variety.
Ægopodium Podagraria, common.
Myrrhis odorata, near Aberdeen.
Anthriscus sylvestris, plentiful.
Meum Athamanticum, in Braemar.
Angelica sylvestris, common.

2. **P. pygmæa** Unger. *7*, *8*. Abundant in summer on *Anemone nemorosa.* Oospores occur plentifully in the leaves, as was first observed in Scotland by Mr. G. Brebner.

3. **P. densa** Rabh. *7.* Rather plentiful beside the Dee at Cults, in August, on *Rhinanthus Crista-galli*, not previously recorded as Scotch.

Sect. II. **Bremia** Regel. Basidia repeatedly bifurcated, bearing at the ends of the branches flattened disks, from which arise from 3 to 5 branchlets, each of which bears a conidium. The latter has a low papilla at the tip; and in germination a tube emerges from the papilla. Oospores round, small, with thin cell-wall.

4. **P. Lactucæ** Regel (=*P. gangliformis* Berk, No. 1445, in Mycol. Scotica), 5, 7, 8. Common, probably in many places, on

Senecio vulgaris and *S. Jacobœa.*
Cnicus lanceolatus and *C. arvensis.*
Taraxacum officinale.
Sonchus oleraceus and S. arvensis.

Sect. III. **Eu-Peronospora.** Basidia repeatedly bifurcated, ending in slender curved branchlets, bearing terminal conidia, which have not an apical papilla. In germination, a mycelium tube protrudes from the side of the conidium.

Sub-sect. *a.* **Calothecæ.** Oospores covered with warts or netted ridges.

5. **P. calotheca** De Bary. 5, *7*, *8*. Not uncommon on *Galium boreale*, beside the Dee near Cults in August.
G. Aparine, near Aberdeen.
Asperula odorata, Glamis (J. S.).

6. **P. Myosotidis** De Bary. *7.* (Scot. Nat., 1886, p. 228.)
Myosotis arvensis. In May, near Aberdeen, once.

7. **P. Viciæ** (Berk.) De Bary. 5, *7*, *8*. Common in autumn on *Vicia Cracca*, Speyside (Rev. Dr. Keith).
V. sepium, near Dunottar.
V. sativa, near Aberdeen.
Lathyrus macrorhizus, near Aberdeen.
" On leaves of pea," in Tay.

8. **P. Alsinearum** Caspary (Scot. Nat., 1883, p. 35). 7, 8. Will be found probably in most localities, if looked for; on *Cerastium triviale*, near Aberdeen.
Stellaria media. Common. In August, the oospores were found plentifully in all parts of deformed flowers near

old Aberdeen. There were no signs of conidia on the surface of the plants.

9. **P. Arenariæ** Berk. 5, 8. on
Arenaria trinervia and A. peploides.
Sub-sect. *b. Leiothecæ.* Oospores smooth, or with a few low ridges only.

10. **P. parasitica** (Pers.) Tul. 1, *2*, 3, 4, 5, 7, 8, 10. Abundant (often causing galled conditions of the flower-stalks and flowers) on
Cheiranthus Cheiri.
Sisymbrium officinale and *S. Alliaria.*
Brassica oleracea, B. Rapa, B. Sinapistrum.
Capsella Bursa-pastoris.
Raphanus Raphanistrum. This species is very often found on the same plants as, and often accompanying, *Cystopus candidus.*

11. **P. Ficariæ** Tul. 5, *7*, *8*. Common, and often associated with *Entyloma Ficariæ*, in
Ranunculus Ficaria and *R. repens.* In the latter host, this association with *Entyloma* has not been observed.

12. **P. arborescens** Berk. (Scot. Nat., 1883, p. 34). *5*, *7*, *8*. on
Papaver dubium. Only conidia observed.
P. Argemone. Oospores found at Lunan, near Montrose, in June, 1885.

13. **P. affinis** Rossm. (Scot. Nat., 1883, p. 85). *7*, *8*. Local, on
Fumaria officinalis, near Forres, and
F. densiflora, near Aberdeen.

14. **P. obovata** Bon. *7*, *8*. on
Spergula arvensis, with conidia only, near Aberdeen; and with oospores (in plants that mostly showed no conidia) at Gamrie, in Banffshire. Not previously recorded as British.

15. **P. Trifoliorum** De Bary. 5, *7*. In some places common. On
Medicago lupulina, at Lunan, near Montrose.
Trifolium pratense, near Aberdeen.
T. medium, Muchalls.
Lotus corniculatus, Glamis (J. S.)

16. **P. Potentillæ** De Bary (Scot. Nat., 1884, p. 276). Scarce on
Alchemilla vulgaris, *8*, Rothiemurchus.
Var. **Gei**, Trail, on *Geum rivale*, *7*, near Aberdeen.

17. **P. Chrysosplenii** Fuckel., *8.* local on *Chrysosplenium oppositifolium*, near Forres (Rev. Dr. Keith). Not previously recorded as British.

18. **P. leptosperma** De Bary (Scot. Nat., 1883, p. 35), 8. Local on *Matricaria inodora*, near Forres.

19. **P. grisea** Unger, 5, 7, 8. Common on *Veronica Beccabunga.*

20. **P. effusa** (Grev.) Rabh, 1, 3, 5, *8.* Locally common on Spinacia oleracea.
Chenopodium album.

21. **P. Urticae** (Lib.), 5, 7, *8*, on Urtica urens, common.
U. dioica, rare, once near Aberdeen, differing to some extent from the form on *U. urens.*

22. **P. candida** Fuck, 3, 5, 7, 8, 10.
"On leaves of Primulæ" (Mycol. Scot., No. 1456). I have never seen a specimen of this fungus from Scotland. It must be rare among us; and most of the Scotch records probably belong to *Ovularia primulana* Thuem., or to *Ramularia* or *Cercospora*, of all which I have found examples in the East of Scotland.

Sub-sect. III. Oospores unknown.

23. **P. sordida** Berk. 1, 5, *7, 8.* Occasionally on leaves of *Scrophularia nodosa.*

24. **P. Scleranthi** Rabh, *7.* At Muchalls, near Aberdeen, on *Scleranthus annuus* (Scot. Nat., 1883, p. 35, sub *P. Alsinearum*).

The following species, referred in Mycologia Scotica (p. 278) to *Peronospora*, belong, not to *Peronosporeæ*, but to *Mucedineæ*, viz.:—

No. 1457. **P. obliqua** Cooke is *Ovularia obliqua* (Cooke) Oud.
1458. **P. interstitialis** B. and Br. is probably an *Ovularia.*
1459. **P. rufibasis** B. and Br. is a *Ramularia*, sub-genus *Didymaria*, and *R. destructiva* Ph. and Pl. is the same species, on the twigs instead of the leaves.

APPENDIX I.

Appended are short descriptions of those species of *Peronosporeæ*, undescribed as British in Cooke's Handbook, and in the Mycologia Scotica and its supplements.

(All the measurements are in thousandths of a millimetre.)

Pythium Pringsheim. Mycelium delicate, growing in tissues of dead plants or animals, or less often, in living bodies, which it destroys. Organs of reproduction develop fully in water; they consist of zoosporangia at the tips of branches. Zoospores form in the protoplasm, after escape from the sporangium into the water. Oospores formed singly in oogonia in cells of mycelium, or in lateral branches.

P. De Baryanum Hesse (=*P. Equiseti* Sadebeck). Parasitic in living plants in damp places, destroying the plants and forming numerous zoospores in the surrounding moisture. Zoosporangia globular, or broadly elliptical, usually on thin-walled branches, emptied of their cell contents. Protoplasm of zoosporangium escapes through a long beak before the formation of zoospores. Oospores round, 10-11 (25-35, Schroeter) diam, rather thick-walled, yellowish.

In Scotland, this species has been observed only in *Equisetum limosum* near Aberdeen; but it has been recorded from England by Mr. W. G. Smith (sub nom. *Equiseti*) from Potato plants; and in Germany it is fatal to seedlings of many plants, *e.g.*, cresses and clover. *Pythium* (sp ?) has been observed near Aberdeen in dead stems of *Epilobium* and of *Plantago.*

Peronospora densa Rabh. Mycelium bears unbranched haustoria; *Conidiophores* crowded into compact clusters, at first a pure white, but becoming dirty yellowish-white, erect, 150-200 high, towards the apex bearing from 2 to 4 straight branches, the lower of which may bifurcate, but usually all bear only from 1 to 4 straight blunt branchlets. *Conidia* vary from ovate to nearly globular, usually about 15-16 by 12-13; apex bears a low papilla. Oospores (said to be globular, with a thin, yellowish cell-wall) not yet observed in Scotland. Specimens from Cults, near Aberdeen, have the lower branches bifurcated twice or thrice.

P. Myosotidis De Bary. *Conidiophores* crowded in white or gray clusters, erect, six to nine times bifurcated, ending in slender, slightly-recurved branchlets. Conidia spherical (14-16 diam) or ovate, 20 by 15-16, hyaline, contents

becoming dark in glycerine. Oospores (described by De Bary as yellow-brown, covered with a wide-meshed network of thick ridges) not observed in Scotland. The affected leaves bear the conidiophores only on the lower surface; on the upper surface they become yellowish-green and then brown.

P. obovata Bon., spreading uniformly along stems and leaves in a greyish coat of *conidiophores*, which are 200-220 long, are 5-6 times bifurcated, and end in short, rather rigid, spreading or slightly recurved branchlets; *conidia* obovate, 24 by 12-13 (Schroeter gives 24-38 by 15-18), violaceous. Oospores, (found in plants that did not show conidiophores), globular, 30-40 diam., brown, with an irregular network of ridges, much like oospore of *P. Alsinearum*.

P. Potentillae De Bary; var. **Gei** Trail (off *Geum rivale*, near Aberdeen). *Conidiophores* (covering patches on lower surface of leaves, rendering them grey), 220 long, rather slender, six times bifurcated, ending in short recurved branchlets. *Conidia* dark violet, ellipsoid, 12-13 by 10-12. Schroeter gives conidia of *P. Potentillæ* as 20-24 by 16-18, and says that oospore has clear brown smooth epispore.

P. Chrysosplenii Fuckel. *Conidiophores* rather wide apart, over lower surface of leaf, white; five to seven times bifurcated; *Conidia* ovate, 20-22 by 15-18. Oospores (globular, 28-30, clear brown, wall thick, often with an indistinct network of ridges) not observed in Scotland.

P. Scleranthi Rabh. The conidiophores and conidia are scarcely distinguishable from those of *P. Alsinearum*, of which this is probably a mere form.

APPENDIX II.

It is probable that some or other of the following *Peronosporeæ* will be found in Scotland if looked for carefully, since all occur in Germany, and some of them in England.

Phytophthora Cactorum L. and C. On various plants, Beech seedlings, &c.

Peronospora (Plasmopara) pusilla De Bary, on leaves of *Geranium pratense, G. phaeum*, and *G. sylvaticum*.

P. (P.) **Epilobii** Rabh., on leaves of *Epilobium palustre* and *E. parviflorum.*

P. (P.) **ribicola** Schroeter, on leaves of *Ribes rubrum.*

P. **Chloræ** De Bary, on *Erythræa Centaurium.*

P. **Dianthi** De Bary, on *Silene inflata, S. Armeria,* and *Lychnis Githago.*

P. **Violæ** De Bary, on *Viola tricolor,* sub-sp. *arvensis.*

P. **conglomerata** Fuckel, on *Geranium molle* and *Erodium cicutarium.*

P. **Valerianellæ** Fuckel, on *Valerianella olitoria.*

P. **violacea** Berk, on flowers of *Scabiosa arvensis.*

P. **Radii** De Bary, on capitula of *Matricaria* sps., and of *Chrysanthemum Leucanthemum.*

P. **Linariæ** Fuckel, on *Linaria vulgaris.*

P. **Lamii** A. Braun, on *Calamintha Acinos, Salvia pratensis,* and most species of *Lamium.*

P. **Schleideni** Unger, on *Allium Cepa,* on leaves and flower heads.

P. **Rubi** Rabh, on lower sides of leaves of *Rubus fruticosus* and of *R. caesius.*

P. **sparsa** Berk, on leaves of cultivated roses.

P. **Knautiæ** Fuckel, on leaves of *Scabiosa arvensis.*

P. **Hyoscyami** De Bary, on leaves of *Hyoscyamus niger*

P. **alta** Fuckel, on leaves of *Plantago major.*

P. **Schachtii** Fuckel, on young leaves and inflorescences of cultivated Beet.

P. **Rumicis** Corda, on leaves and inflorescences of *Rumex acetosa, R. acetosella, Polygonum aviculare* and *P. Convolvulus.*

In conclusion, the following is the state of our present information compared with the records in the *Mycologia Scotica.* In 1879, there were known as Scotch:—**Cystopus,** 3; **Peronospora,** including **Phytophthora** (but excluding the 3 *Ovulariæ* and *Ramularia*), 14, or 17 *Peronosporeæ* in all.

The district-records then were:—Tweed, 6; Solway, 2; Forth, 6; Clyde, 3; Tay, 17; Argyle, 1; Dee, 7; Moray (south) 6; Ross, 4; Sutherland, 1.

In the *Supplements,* in the *Scottish Naturalist,* 5 additional species of *Peronospora* were recorded. In the present paper there are:—**Pythium,** 1; **Cystopus,** 3; **Phytophthora,** 1; **Peronospora,** 24; or 29 in all.

The district-records are as follows:—Tweed, 7; Solway, 3; Forth, 6; Clyde, 3; Tay, 18; Argyle, 1; Dee, 24; Moray (south), 21; Moray (north), 1; Ross, 4; Sutherland, 1; Caithness, 1; Orkney, 1. The great increase has thus been made in Dee and Moray (south).

NEW SCOTCH MICROFUNGI.

By Prof. J. W. H. TRAIL, A.M., M.D., F.L.S.

(All measurements are in thousandths of a millimetre, unless otherwise specified.)

DURING the past year or two, in the course of work among the Fungi belonging to the sections *Sphæropsideæ*, *Melanconieæ*, and *Hyphomycetes*, I have met with several forms that differ from all described in Saccardo's great work, the *Sylloge Fungorum*, and in the other works on Fungi that I have been able to consult. I therefore venture to regard them as unrecorded, and to name and describe them as new. It is true that there are very strong reasons in favour of the belief that the "species" in the three groups are not true species, but are only stages in the development of other forms, of which the larger number, when mature, must be referred to the *Pyrenomycetes*. It is also more than probable that in many cases one or more "species" of *Hyphomycetes* may belong to the same cycles of development as certain "species" of *Melanconieæ* and of *Sphæropsideæ*, with which they are usually more or less closely associated; and there are probably similar relationships within the limits of the latter groups. Yet, while due weight is assigned to such considerations, and also to the disadvantage of burdening Mycology with synonyms, so very little is as yet known with accuracy regarding the mature forms to which these imperfect fungi belong, that any attempts at uniting them must at present be largely conjectural. Premature attempts to do so must do harm, if the nomenclature is to be fixed by them, since the result may be to perpetuate error. It seems a safer course to treat these imperfect forms as provisional species, when they present characteristics of a definite kind, bearing in mind that they must be

transferred to other groups as their cycles of development become known,—their names then representing only stages in the cycles. All the fungi to be described in this paper have been found by myself in the North-east of Scotland, almost wholly in the province Dee, along with a large number of other microscopic fungi, new or rare in Scotland. It is evident that much remains to be done ere we can boast of a thorough acquaintance with Scottish Mycology, and most of all among the very numerous forms included in the groups under consideration. I hope in a short time to publish in this Magazine a revision of the Scotch species in these groups.

SPHÆROPSIDEÆ.

Dendrophoma phyllogena *sp. n.*

In pale dead spots near tips of leaves of Holly (*Ilex aquifolium*) Pycnidia numerous, subdermal, black, ellipsoid, subpapillate, basidia fasciculate, about 30 to 35 long, by 2 thick at base, hyaline, bearing alternate short branches, each tipped with a hyaline cylindrical sporidium, 8-12 by 1·5-2.

Old Aberdeen, in May.

Ascochyta Lathyri *sp. n.*

On dead leaves of *Lathyrus sylvestris.* Spots ill-defined, tending to cover the entire leaf; pycnidia numerous, subglobose, depressed, diam. 50-100; sporidia hyaline, cylindrical, with obtuse ends, 8-10 by 2·5.

At St Cyrus, near Montrose, in October.

A. Viciæ *sp. n.*

On pods and leaves of *Vicia sepium.* Spots paler and withered, with a rufous border, irregularly rounded. Pycnidia scattered over the spots.

Sporidia subcylindrical, obtuse, often slightly curved, granular, yellowish, 13-16 by $2\frac{1}{2}$-3. Allied to *A. Pisi*, but differs in the sporidia too much to allow being referred to it as a variety.

Near Dunottar, in September.

A. microspora *sp. n.*

Epiphyllous, spots nearly circular, black or dark brown, thickly dotted with globular pycnidia, (diam. 70), which appear pale brown under the microscope; sporidia subcylindrical, with rounded ends, straight or curved, 5-7 by $1\frac{1}{2}$-2, hyaline.

On *Arctium Lappa*, at St Cyrus, in October. On *Petasites vul-*

garis there occur near Aberdeen, in autumn, spots on the leaves, in which I find an *Ascochyta* indistinguishable from this, except that the conidia are 6-8 by 1½-2.

A. Primulæ *sp. n.*

Epiphyllous; spots like those of *Phyllosticta primulicola* Desm.; pycnidia scattered over the spots, depressed-globose, pale brown, diam. 100-110, papillate; sporidia hyaline, cylindrical, obtuse, 5-6 by 2-2½.

On *Primula vulgaris*, near Dunottar, in August.

Ascochyta graminicola Sacc., 1, var. **Brachypodii,** *var. nov.*

Differs from the type and from Saccardo's varieties of the species in the slightly curved and stouter sporidia, which measure 15-17 by 5, and are slightly fusoid with blunt ends. The pycnidia are not crowded, though arranged in groups.

On dead leaves of *Brachypodium sylvaticum*, on the coast near Dunottar, in September.

2, var. **leptospora,** *var. nov.*

Agrees with var. *Holci* Sacc. in the form of the sporidia; but the latter are rather smaller (12-14 by 2½-3), and are hyaline, without guttæ.

On dying leaves of *Agropyrum repens*, near Old Aberdeen, in September, and of *Psamma arenaria* on sand dunes near Aberdeen, in August.

Stagonospora aquatica Sacc. var. **sex-septata** *var. nov.*

This may be a new species, but it agrees so well with *S. aquatica* in all respects except the slightly larger pycnidia (150 diam.), and in the sporidia, which are slightly more slender (measuring 32-35 by 5-6, instead of 26-28 by 5½), and have *six* septa instead of *three*, that it seems better meanwhile to regard it as a variety of Saccardo's species. The slightly inequilateral form of the sporidia is seen in this as well as in the type; and they live on the same host-plant.

In dead stems of *Scirpus lacustris*, in the Corbie Loch, a few miles from Aberdeen, in September.

Stagonospora equisetina *sp. n.*

Pycnidia innate, scattered, globose, diam. 80, brown; sporidia straight, fusoideo-cylindrical, 18-24 by 4-5, subacute, 6-8-guttulate, faintly 5-7-septate, hyaline.

On dead stems of *Equisetum palustre* in the Corbie Loch, in September.

Septoria Lychnidis Desm. var. **pusilla.**

Differs from type in the sporidia, which have only from 1 to 4 septat, and measure 35-50 by 1½-2, instead of being 5-7-septate, and measuring 50-70 by 2½-3.

On living leaves of *Lychnis diurna*, at Dunottar, and near Aberdeen, in August and September.

S. cercosporoides *sp. n.*

Spots irregular, ill-defined, black, most conspicuous on upper surface of leaves. Pycnidia in groups, ellipsoid, about 90 by 70, thin, rather pale brown; sporidia clavulate, with one end blunt, thus resembling sporidia of *Cercospora*, 50-60 by 2, nearly hyaline, 6-8-septate.

On *Chrysanthemum Leucanthemum*, near Montrose, in Oct. Seems quite distinct from *S. socia* Pass., and from *S. Leucanthemi* Sacc. and Speg.

S. Prunellæ *sp. n.*

Spots irregular, but bounded by larger veins of leaves; pycnidia numerous, innate; sporidia nearly hyaline, filiform, 45 by 1, multiseptate.

On living leaves of *Prunella vulgaris*, at Dinnet, near Ballater, in September.

MELANCONIEÆ.

Cylindrosporium Oxalidis *sp. n.*

Spots in leaflets, brown, dry, pale-margined, rounded, from 1 to 3 mm. across; pustules scattered, subdermal, with a wide pore for escape of the sporidia, which are filiform, slightly tapering to the ends, curved, 20-25 by 1, and hyaline.

On *Oxalis Acetosella*, at Portlethen, near Aberdeen, in Sept. Agrees, on the whole, best with genus *Cylindrosporium*.

Marsonia Melampyri *sp. n.*

Spots in leaves, undefined, dark, becoming nearly black; pustules scattered in the spots, or in patches, translucent; sporidia hyaline, oblong-ellipsoid, slightly curved, scarcely constricted at the septum, 12-20 by 3-3½; intermixed with chains of hyaline cells 3-4½ by ½.

On *Melampyrum pratense*, at Dinnet, near Ballater, in September.

M. Potentillæ (Desm.) Fisch. var. **Tormentillæ** *var. nov.*

Differs from the type chiefly in the sporidia, which measure 12-16 by 3-4 (instead of 20-25 by 7-9, as stated by Saccardo).

On *Pot. Tormentilla* near Aberdeen, in July. I have found two intermediate forms also in the East of Scotland, viz., on *Potentillæ Anserina*, with sporidia 14-20 by 4-5, near Montrose, and on *Pot. Comarum*, with sporidia 18-21 by 3-4, near Aberdeen. These may be distinguished as vars. *P. Anserinæ* and *P. Comari*.

Coryneum Comari *sp. n.*

Pustules (grouped in ill-defined, darker spots in leaves) circular, about 50-60 across, with conspicuous pore, sporidia honey-yellow, darkening to pale brown, straight, broadly fusiform, 25-30 by 4-5, triseptate.

On *Potentilla Comarum* in a marsh, a few miles north of Aberdeen, in August.

The following additions have been made in the above groups to the Scotch flora since August 1886:—

Phyllosticta Helianthemi Roum., on *Helianthemum vulgare*, near Dunottar and near Aberdeen; **P. Teucrii** S. and Sp., on *T. Scorodonia;* common; **P. Galeopsidis** Sacc., on *G. Tetrahit*, near Aberdeen; **P. Ajugæ** S. and Sp., on *A. reptans*, associated with **Ramularia Ajugæ**, at Kingcausie, near Aberdeen, in October; **Phoma melaena** (Fr.) Mont., on *Astragalus glycyphyllus*, at St Cyrus; **P. deusta** Fckl., and **P. complanata** (Tode) Desm., both on dead stems of *Rhinanthus Crista-galli*, near Aberdeen, in January; **P Callunæ** Karst., on *Calluna vulgaris*, near Aberdeen, in winter; **P. Berkeleyi** Sacc., on *Urtica dioica*, *Sambucus nigra*, &c., (it is a stage of *Phomatospora*) near Aberdeen, in winter; **P. saligna** Fr. (a stage of *Linocera Capreæ* Fckl.) on decayed leaves of *Salix cinerea* near Aberdeen in February; **P. neglecta** Desm., in culm of *Juncus effusus*, near Aberdeen, in January; *Cytospora leucosperma* (Pers.) Fr., on Rose twigs, near Aberdeen in winter; **Coniothyrium Hederæ** (Desm.) Sacc., on dead twigs of Ivy, near Aberdeen, in February; **Diplodia Rhododendri** Bell. on *Rhododendron*, near Aberdeen, in September; **Ascochyta malvicola** Sacc., on *Malva sylvestris*, near Aberdeen, in September; **A. Plantaginis** S. and Sp., on *Plantago*

major, near Aberdeen, in September; **Hendersonia sarmentorum** West., on twigs of Ivy, near Aberdeen, in February; **Septoria sinarum** Speg., on *Dianthus barbatus*, at Aberdeen, in July; **S. Junci** Desm., on *Juncus effusus*, and on *J. maritimus*, in October; **S. affinis** Sacc., on Oats and on Couch grass, near Aberdeen, in September; **S. Alismatis** Oud., on *Alisma Plantago* L., at Kingcausie, in October, (this fungus is an *Ascochyta*, rather than a *Septoria*); **S. lineolata** S. & Sp., var., (sporidia only 34-45 by ¾-1, on *C.arex arenaria*, near Aberdeen, in October; **Melanconium sphæroideum** Link, on bark of *Alnus glutinosa*, at Cults near Aberdeen, in July.

WEBERA CUCULLATA SCHWGR. IN ROSS.

By H. N. DIXON.

THIS continental moss, hitherto unrecorded from these islands, I found in the summer of 1883, near the summit of Ben Attow, Ross-shire (alt. 3500—4000 ft.). I was unable to determine it; but through the kindness of Mr. E. M. Holmes it was submitted to Mr. Mitten, who referred it to the above species. It was growing, in the barren state, in a crevice of the rock, in company with *Dicranum elongatum* Schwgr., with which it was so closely intermingled as to make it almost impossible to separate the one from the other.

As this species has not been described in any British work, it may be useful to subjoin the description given by Schimper (Synops, 2nd ed. p. 397.)

"Dense cæspitosa. Caulis e basi plerumque decumbente erectus, simplex vel parce ramosus. Folia inferiora et ramulorum subimbricata, ovata, concava, mutica, integra, superiora longiora, angustata, apice serrata et haud raro cucullato-incurva, omnia mollia, subopaca. Capsula pendula, crassiuscula, cum collo abbreviato-piriformis, sicca vacua, sub ore haud coarctata sed orificio angustata, mollis, badia, ætate atrobrunnea. Operculum minus, mamillare. Peristomii dentes angustiores, breviores, luteoli, interni tenerrimi pallidi processus perangusti ciliaque brevia fugacia." Bryol. Eur. Vol. IV. Tab. 343. . . . .

" Differt a *Webera nutante* var. *uliginosa* foliis latioribus mollibus vix nitentibus, capsula crassiore microstoma, peristomio minore, interno minus perfecto."

SCOTCH PLANTS

Carex rigida, Good. Var. inferalpina, Læstad., in South Aberdeen. I found this plant in 1880, on the south side of Tolmount, Forfar, and also on the Clova table-land, near Loch-na-gar in South Aberdeenshire ; but it remained unnamed, save as a form of C. rigida growing in wet ground, till recently Mr. Arther Bennett's notice of it recalled it to my attention. He has passed the specimens as correct.

On the west shore of Loch Callater, in South Aberdeenshire, occurred, in 1878, a very dwarf form of Veronica Beccabunga, L., with bright blue flowers. This appears to be identical with the Var. minor, Roth, see " Tent. Germ." p. ii. 1788.

In 1882, at the upper end of Glen Dole, I noticed a form of Vicia sepium, L. with narrower leaves. It is, Sir J. Hooker says, " the usual form of rocky banks," and is probably identical with the Var. angustifolia described in Koch's " Synopsis." G. Claridge Druce.

JUNCUS ALPINUS PROBABLY A SCOTCH PLANT.

Recently, while revising the allied forms in my herbarium in the endeavour to come to some conclusion respecting *J. nigritellus* Don, I was struck with a single stem so labelled, and gathered in the Clova mountains in 1870. This specimen had escaped notice of late, and now seemed to me referable to one of the forms of *J. alpinus* Vill. Dr. Buchenau reports on it :—" I am certainly very much disposed to consider it *J. alpinus ;* still, it might be one of the very rarely occurring intermediate forms between *alpinus* and *lamprocarpus*." Dr. Buchenau remarks that fuller material would enable him to decide at once, and it is to be hoped that some botanist will work this district and collect freely of any unusual-looking forms. According to Don (Eng. Bot. Supp. 2643), his *nigritellus* was referred by Laharpe to a form of *J. alpinus ;* concerning the latter I may say that there are forms with black, as well as others with pale chestnut, flowers and fruit. Dr. Boswell states (Eng. Bot. III. Vol. X, p. 32) that he only knows *J. nigritellus* from Don's description ; the plate, however, represents the plant as having a conspicuous rhizome, such as is, I believe, also characteristic of *alpinus ;* but which I have never met with in *lamprocarpus*, although the sand-hill forms of the latter, which have been distributed in recent years as *nigritellus* by our Botanic Exchange Club, have a more or less branching and diffuse rootstock. The plant alluded to above was collected in Glen Dole by Mr. John C. Hutcheson, in August, 1870.

W. H. Beeby.

Practical Observations on Agricultural Grasses, by Wm. Wilson, jun., Alford, is a pamphlet dealing with a very important subject from one who has devoted much attention to it in the field, and who is thus able to contribute the results of his own experience towards the solution of questions that have not in past years excited the interest they deserve. Mr Wilson extends the term *Agricultural Grasses*, for practical purposes, to include all plants suited to form the pasture and hay of a farm, and discusses the kinds that his observations have led him to believe most suitable for such a climate and such soils as exist in Aberdeenshire. We commend the subject to the consideration of farmers, to whom it is, indeed, of the utmost importance.

ARENARIA NORVEGICA IN SUTHERLANDSHIRE.

It may interest the readers of the *Scottish Naturalist* to learn that a very rare plant, *Arenaria norvegica*, was gathered by me on the 7th August last near Inchnadamph in Sutherlandshire. This plant has never before been detected on the Scottish mainland; and I am glad to add that I found it in some quantity. The habitat is about 12 miles inland, and not more than 200 feet above the level of the sea.

21st December, 1886. ARCHIBALD GRAY, Edinburgh.

(Mr. Gray's discovery of *A. norvegica* on the mainland of Scotland is of very great interest, and extends the known range of this plant very considerably in Britain. The only certain locality for it in our islands has previously been Balta Sound in Shetland, as the reported discovery in North Ronaldshay, Orkney, has never been confirmed. Mr. Gray's plant, if we may judge from a specimen kindly communicated by him, is entirely similar to the Shetland form.—ED. SCOT. NAT.)

PROCEEDINGS OF THE BERWICKSHIRE NATURALISTS' CLUB.

THESE well-known "Proceedings" show no sign of falling off in interest in the volume published in 1886; though they contain a rather larger share, than in former years, of devotion to antiquarian researches,—a change largely due to the veteran Secretary of the Club having of late years transferred his labour in great measure to these, from zoology. Long may he be spared to pursue his productive studies; but may we express the hope that he has not wholly given up his old love for the new. The short Anniversary Address, by Rev. T. Leishman, D.D., is followed by very full reports, by the Secretary, Mr. J. Hardy, of the excursions undertaken during 1885. These were from Jedburgh to Oxnam on May 27th; to Rothbury on June 24th; to Haughton Castle and neighbourhood on 30th July; to Westruther and Wedderlie on August 26th; to Aikengall from Cockburnspath on September 30th (list of plants given); to Kelso on October 14th. There are numerous remarks of interest in these reports, but our space will not permit of quotations from them.

The subsequent papers relate largely to matters of antiquarian or local interest; and we cannot discuss these here; but they will be found well worthy

perusal. Prof. Geikie contributes **Geological Notes** on Oxnam Parish; Dr. C. Stuart gives **Notes on damage to Trees caused by the Frosts of 1879-80** and following years in Berwickshire; and also on Shippath Dean, in Lammermoor, on **The Migration of Birds**, and on the **Weather of 1885**, and **Notes on Birds**. Other notes on birds are **Curious Nesting-place of the Great Tit** (in a letter box), by Miss C. H. Greet; **On the Occurrence and Migration of Birds in the Belford District for 1885**, by John Aitchison; **On the Habits of the Ox-eye when feeding its young**, by James Wood; **Natural History Observations in 1885**, by John Thomson; **Ornithological Notes**, by George Bolam; and **on the Occurrence of Birds in the East Lothian during 1885**, by George Pow. Mr James Hardy contributes a very full **History of Chareas graminis, the Grass or Antler Moth on the Borders**; in **Localities for Plants** A. H. Evans adds several Phanerogams to the list for the district; and in **Alnmouth Marine Algae** several interesting Algæ are noticed by Andrew Amory. **Obituary Notices** of the following members of the Club are also given in this volume :—**Rev. John F. Bigge, Henry Gregson, J.P., Prof J. H. Balfour, John Towlerton Leather, Rev. Wm. Darnell, Rev. Wm. Stobbs, Henry Richardson, M.D., and Sir George H. S. Douglas.**

Enough has been said to show our readers the value and importance of the volume under review.

REVIEW OF LONDON CATALOGUE OF PLANTS, Ed. 8.

My review of the London Catalogue which appeared in the last number of this Journal, stated that *Ranunculus parviflorus*, *Malva parviflora*, and *Prunus institia* were originally named by Hudson, not Linnæus. This was erroneous. The mistake arose from my attaching a wrong slip to the sheet when, in great haste, correcting the proofs. I wrote directly afterwards to the printers, but too late to stop its insertion. I may now state that these names do not appear in the first edition of the "Specimen Plantarum." The *Ranunculus* is described for the first time in the "Systema Naturæ" in 1759; the *Malva* in the "Amoenitates Academicae" in 1753 (the Hudsonian *parviflora* is supposed to be the *M. borealis*, Wallm. the *pusilla* of Withering), and the *Prunus institia* in the "Centuria" in 1755. *Myrrhis Odorata*, I stated, did not need a capital letter for the specific name. Subsequent research, however, reveals that by Rivini, it was called "*Odorata*" only, so it is more correct to write it with the capital. I also said that the Sibthorpian *Medicago maculata*, 1794, must give way to the name of *M. arabica*, All. in "Flor. Pedem.," 1785. This will probably have to be quoted *M. arabica*, Curtis, a beautiful figure and good description being given by Curtis in the "Flor. Lond.," I believe, prior to the publication of Allione's Flora. Capital letters are needed in the specific names of *Hippophae*, *Stratiotes*, and *Scabiosa Succisa*, as Tournefort called the first *Rhamnoides florifera*, Boerhaave described the second as *Aloides*, and Haller named the third *Succisa*.

G. Claridge Druce.

REVIEWS.

REPORTS OF OBSERVATIONS OF INJURIOUS INSECTS AND COMMON FARM PESTS, WITH METHODS OF PREVENTION AND REMEDY.

By E. A. ORMEROD.

We have before us two of the above Reports (viz., the Eighth, for 1884, and the Ninth, for 1885), subsequent to that last noticed in this Magazine. These two retain the eminently practical character of the previous Reports; and are indispensible to all who are interested in this, a department alike of Entomology, and of Economic Botany. Among the subjects discussed with especial fullness in both Reports, are, the true value of Sparrows in horticulture and in farming, and the ravages of the Warble Fly, so well known to farmers as living under the skin of cattle, and injuring the hides. Sparrows have been under observation for some time in America, as well as in Great Britain, and the verdict, in almost all cases, is that they eat very few insects, unless driven to do so by hunger, but prefer to feed on seeds of cultivated plants in gardens, or in fields. They are also hurtful by driving from the localities they frequent the true insectivorous birds, which have weaker bills, and are unsuited to fight, literally for existence, with the sparrows. In many districts measures are now being taken to diminish the number of sparrows, with the result that insects are found to be lessened in number, owing to increase in the number of swallows and other purely insectivorous birds. This gain is further increased by the fact that peas, corn, and other produce of a kind generally liable to severe injury from the sparrows, is not in any way injured by the birds that take their place when their numbers are reduced. In the United States and in Canada the sparrows have increased to such an extent since their introduction, about twenty years ago, that the American Ornithologists' Union reported formally on the matter in 1885, after having had under consideration a mass of evidence in the form of replies to a series of questions that were distributed widely to persons likely to give information of value. The conclusions arrived at were: 1. That sheltering or otherwise fostering sparrows by the public should be discouraged; and that their introduction artificially, into new localities, and their sale for such purposes should be forbidden by law. 2. That all existing laws protecting the sparrow should be repealed, and bounties offered for its destruction. The "Wild Birds Protection Act" does not prevent the destruction of sparrows by owners of land or of houses, or by any persons authorised by them, in any method thought best, since these birds are not named in the schedule of birds attached to the bill.

There are few statements in either of the Reports under Review from Scotch farmers or gardeners—fewer considerably than in former years; yet this can hardly be due to lessened injury from the ravages of insects, but rather must be attributed to a failure on the part of those most likely to benefit by the Reports to appreciate the very real practical value of observations, such as are recorded in them, in regard to both the life-histories of the insects, and the most effectual means of limiting their ravages.

The following pests are noticed in the Reports, the special Report being

denoted by the numeral (4or 5) in brackets. **Apple**—Winter Moth, *Cheimatobia brumata* Steph. (4); on **Beans**—Bean Aphis, *A. Rumicis* L. (5); Bean Seed Beetle, *Bruchus granarius* L. (5); Pea, Bean. and Clover Weevils, *Sitona*, sps. (4); Garden Swift Moth, *Hepialus lupulinus* L. (5); **Cabbage**—Cabbage Powdered-wing *Aleyrodes proletella* L. (5); **Carrot**—Carrot Aphis,? *A. Papaveris* Fab. (4); **Celery**—Turnip Moth, *Agrotis segetum* (4); **Corn and Grass**—Antler Moth, *Chareas graminis* Steph. (4 and 5, in latter years in Selkirkshire); Corn Aphis, *A. granaria* Kirby (5); Daddy Longlegs, *Tipula oleracea* (4 and 5); Garden chafers or "chovies," *Anisoplia horticola* Curtis (5); Haulm Fly, "Gout," or "Poddie," *Chlorops taeniopus* Curtis (5); Red Maggot or Wheat Midge, *Cecidomyia ? Tritici* Kirby (4 and 5); Corn Thrips, *T. cerealium* (4); Click Beetles and Wire Worms, *Elater lineatus* L., &c. (4 and 5); **Currants and Gooseberries**—G. & C. Sawfly, *Nematus Ribesii* Curtis (4); Magpie or Currant Moth, *Abraxas grossulariata* (5); Black Currant Gall-mite, *Phytoptus Ribis* Westw. (5); **Hop**—Hop-Aphis and Damson-Hop-Aphis, *A. (Phorodon) Humuli* Schr. and var, *Mahaleb* Fonsc. (4); and Aphis Harvest Mite (feeding on Aphides) (5); *Dilophus vulgaris* Meigen (larvæ in Hop-roots) (5); **Mangold**—Beet Carrion Beetle, *Silpha opaca* L. (4); Cockchafers, *Melolontha vulgaris* Steph. (4); Mangold and Beet Fly, *Anthomyia Betæ*, Curt. (4); Mangold Aphis, ? *A. Papaveris* Fab. (5); Millipedes (5). (Notes migrations to new feeding-grounds of *Julus terrestris*); Night-feeding Ground Beetle, *Steropus madidus* Fab. (5) (not previously known to injure plants); Night-feeding Weevils, *Otiorhynchus sulcatus* Fab., and *O. picipes* Fab. (5); **Mustard**—Mustard Beetle or "Black Jack," *Phædon Betulæ* L. (5); **Oak**—Buff-tip Moth, *Pygœra bucephala* Steph. (4): Oak-leaf Roller, *Tortrix viridana* Steph. (5); **Onions**—Onion Fly, *Anthomyia ceparum*, Curt. (4); **Parsley**—Parsley Blight, cause doubtful (4); **Pea**—Pea Aphis, *Siphonophora Pisi* Kalt. (5); **Pear**—Vapourer Moth, *Orgyia antiqua* Steph. (5); **Pine**—Pine Sawfly, *Lophyrus Pini* Curtis (4), from Scotland; **Poplar**—Puss Moth, *Dicranura vinula* Steph. (5), from Fife; **Potatoes**—Death's-head Hawk-moth, *Acherontia Atropos* (4); Millepedes (4); **Raspberry**—Red Maggots? *Lasioptera Rubi*, Heeg. (4): **Turnips**—"Surface Caterpillars" or Larvæ of *Agrotis segetum*, Westw. (4 and 5); *A. exclamationis* L. (4), and *Tryphœna pronuba* L. (4); Diamond-back Moth, *Plutella cruciferarum*, Doubleday (4); Turnip Fly, *Haltica (Phyllotreta) nemorum*, Curtis; **Wheat**—Earcockles," or "Purples," Galls of *Tylenchus Tritici*, Bastian (5); **Willows**—Willow Beetle, *Phratora vitellinæ* L. (4). The following are included on account of their connection with diseases in domestic animals—Marsh Snails, *Limnœus*, sps. (4), and Warble Fly or Ox Bot Fly, *Oestrus Bovis*, Clark (4 and 5).

East of Scotland Union of Naturalists' Societies,

INCLUDING THE

Aberdeen Natural History Society,
Aberdeen Philosophical Society,
Alford Field Club & Scientific Society,
Arbroath Horticultural and Natural History Association,
Dundee Naturalists' Society,
Kirkcaldy Naturalists' Society,
Largo Field Naturalists' Society,
Montrose Natural History and Antiquarian Society,
Montrose Scientific and Field Club,
Perthshire Society of Natural Science.

FOURTH ANNUAL MEETING.

TUESDAY, 12th JULY.

14 o'clock (2 P.M.)—Council Meeting in the Lecture Room of the Perthshire Natural History Museum.

20 o'clock (8 P.M.)—**Annual General Business Meeting** at the Perthshire Natural History Museum. Report of the Council, President's Address, Reports, Communications and Papers.

WEDNESDAY, 13th JULY.

9.20 o'clock.—Meet at General Station for Excursion. Single Tickets to Bridge of Earn (Train 9.35 A.M.; Fare 3½d). Route by "Old Bridge of Earn" (a picturesque ruin supposed to have been built by the Romans), Moncreiffe Pond, Moncreiffe Gardens, "Druidical" Circle, Moncreiffe Hill (the view from which is called by Pennant, "the glory of Scotland"), Moredun Top (with its Pictish Fort), and thence to Perth. Distance to be walked, less than five miles.

19 o'clock (7 P.M.)—Conversazione at the Museum.

THURSDAY, 14th JULY.

Excursion—to be continued for several days—to the Breadalbane Hills. Particulars of this Excursion may be learned by application to Dr. Buchanan White, Annat Lodge, Perth.

NOTICE.

The Library at the Perthshire Natural History Museum (South Tay Street, Perth), will be open for the reception of Members of the Union from 10 (A.M.) on TUESDAY, 12th July. The Museum is, as usual, open without charge for admission.

All Communications relating to the business of the Union to be addressed to the Secretary, Mr. W. D. SANG, C.E., Kirkcaldy.

GEOLOGY.

ORIGIN OF THE INTERBEDDED AND INTRUSIVE BASALTS OF KINNOULL HILL.

By Henry Coates.

THE basalts and other igneous rocks which enter into the structure of Kinnoull Hill are identical in chemical composition with the lava streams which issue from the craters of Vesuvius and Etna, and, not only so, but their occurrence, as rock masses, also points unmistakably to the same conclusion. Two kinds of igneous rock occur on Kinnoull Hill.

Apart altogether from distinctions of mineralogical composition and other lithological characters, all volcanic rocks, considered with regard to their origin, fall into two great divisions—First, those which have come to the surface of the earth's crust in a molten state, and have consolidated, either exposed to the air or under water; and second, those that have not come to the surface of the earth in a molten condition, but have forced their way into fissures and other channels, and there consolidated beneath the earth's surface.

It is obvious that volcanic rocks formed in the first way will be found resting on beds which were formed immediately prior to their being poured out, and that, lying on the top of them, will be found beds which were formed immediately after. They are, therefore, called "contemporaneous," or "interbedded" volcanic rocks. With regard to rocks formed in the second way, it is equally evident that the rocks in which they occur must have been formed before the volcanic mass

was forced into them, perhaps many ages before. They are, therefore, called "intrusive," or "subsequent" volcanic rocks.

The different modes in which the two classes of rocks have consolidated, give rise to important differences, both in minute structure, and in their occurrence as rock-masses. Thus, interbedded volcanic rocks are always more or less open in texture, particularly in the upper part of the sheets, which generally presents a slaggy appearance, precisely like that of the surface of a recent lava flow. The amygdaloidal structure is due to the expansion of the rock, while still plastic, by the contained steam. In the case of an intrusive rock, the pressure of the superincumbent mass was too great to admit of such expansion. The steam holes or "amygdules" generally became filled up with various mineral deposits, such as calcite, chalcedony, &c. The amygdaloidal structure is well marked in the interbedded volcanic rocks of Kinnoull Hill; and where the cavities had been filled with quartz they give rise to the familiar Kinnoull Hill pebbles or agates. The concentric lines, which add so much to the beauty of these, mark the successive layers of the deposit, and may therefore be called "lines of growth."

There are also certain structural peculiarities which mark intrusive rocks. They are always more fine-grained in their outer than in their central portions, in consequence of the former having been the first to cool and crystallise. They are frequently more or less prismatic. Both of these characters are well seen on examining the intrusive rocks of Kinnoull Hill.

One of the most important distinguishing features, however, is that while interbedded rocks always conform with the bedding of the rocks with which they are associated, intrusive rocks never do—at least in perfect degree. Then again, while the rocks in contact with an intrusive mass are frequently baked and hardened, and otherwise altered by the molten mass which had been forced against them, that is never the case with rocks containing interbedded sheets.

How are these two kinds of volcanic rocks represented in the structure of Kinnoull Hill? The great mass of the hill consists of beds of the interbedded or contemporaneous type, while at the back of the hill, cutting through the other rocks, is an extensive vertical dyke of intrusive, or subsequent, igneous rock. The interbedded sheets consist of extensive beds of porphyrite, which slope away towards the north-west. It therefore follows that the well-known face or cliff of Kinnoull Hill represents the broken edge, or "outcrop" as it is called, of these beds, which at one time must have extended across the whole of what is now the lower valley of the Tay, but which, in the course of many ages, have been worn away by the denuding action of weather and water. It is thus clear that the corresponding rocks on the opposite side of the valley, which form the main part of Mon-

crieffe Hill, must have been part of the same series. As the Moncreiffe Hill series also dip north-west, they must, of course, underlie the Kinnoull Hill series, and must also have been laid down immediately prior to them.

Kinnoull Hill, as it stands this day, is the result of three successive processes, extending over a great interval of time. First, there was the laying down of the sheets of lava, poured out in a molten state from volcanic vents, whose activity gradually died out many ages ago. These sheets were poured out over a level tract of country, part of which, at least, was under water. The periods of activity varied in duration and intensity.

Sometimes sheet after sheet would be poured one on the top of the other without intermission ; then a period of comparative quiescence would intervene, and sufficient time would elapse for tolerably thick deposits of sand and gravel to be laid quietly down on the bed of the lagoon or sea. Again, the subterranean forces gathered head ; and a vast shower of dust and stones was shot into the air by the bursting open again of the choked up volcano or volcanoes. This loose material was scattered all around, and fell on the beds of sand and gravel, the dust forming the beds of tuff, and the coarser material the beds of breccias that are now found underlying the Kinnoull Hill lavas. After the loose material had been blown out, streams of lava again poured forth, and obliterated the face of the land for miles ; and continued their discharge till the beds had been filled up which now form the cliffs of Kinnoull Hill. The total duration of volcanic activity formed the first of the three stages in the history of Kinnoull Hill. The geological date of the first stage could be determined with certainty, for the sheets are interbedded with sandstones and conglomerates of undoubted Old Red Sandstone age. The second stage in the history was represented by the gradual upheaval of the rocks from the horizontal position in which they were laid down to the gently sloping position in which they are now found. When the change took place, there are not any means of determining. The third and final stage was that of denudation—that is the stage represented by the carving out of the valley which now separates Kinnoull Hill from Moncrieffe Hill. When that process of denudation began, we are unable to say. It might have been, and probably was, in progress long before the advent of the Great Ice Age ; or it might have had its commencement in the grinding of the glaciers, which have scored and polished the surface of the hill in many places. One thing we do know, and that is that the process is going on still, and that Nature's carving tools, frost, wind, rain, and stream, are as busily at work to-day as ever they were. So much then for the history of Kinnoull Hill, which may be summarised in the three words—deposition, upheaval, and denudation.

But it may be asked :—If Kinnoull Hill is not an extinct volcano, whence did all the volcanic material come which was poured out over the surface of the land till it had accumulated to the enormous thickness of not less than fifteen hundred feet? The supposition proposed by Dr. Geikie seems highly probably—that the district was dotted over with a number of low volcanic hills, each of which contributed its quota of lava-streams and ashes. We must also bear in mind the immense antiquity, geologically speaking, of the Kinnoull Hill lavas, and the great changes that have taken place during the geological ages which have elapsed since their formation.

There appear to have been at least four great periods of activity. The first occurred in Silurian times, and attained its greatest development in Wales. The next was that of the Old Red Sandstone age; and is exemplified by the volcanic hills which extend over the greater part of central Scotland, embracing the Sidlaw and Ochill ranges, and with them, of course, Kinnoull and Moncrieffe Hills. The next great outburst occurred in Carboniferous times, when the coal fields were in course of formation. The last period of volcanic activity was the Miocene period. The volcanic product of that period is represented by an immense number of trap-dykes, occurring at various points along the west coast of Scotland. It is probably to that final period of activity that the dyke belongs that forms the most striking example presented by Kinnoull Hill of intrusive volcanic action.

These different periods show how very ancient, relatively, the Kinnoull lavas are; and we can now better appreciate the changes that have taken place since their formation. We may take it for granted that the older a volcanic district is, the more of the superstructure of the volcanic products must have been removed; so that, in a region of very ancient activity, the rocks which are now exposed at the surface are not only more or less altered in character, but represent only the foundation or substructure, as it were, of former volcanic hills; and it is this foundation that is exposed in Kinnoull Hill.

ZOOLOGY.

THE DESTRUCTION OF BEASTS AND BIRDS OF PREY.

BY MR. W. J. MAXWELL, OF TERREGLES.

Reprinted from the Transactions of the Dumfriesshire and Galloway Natural History and Antiquarian Society (issued 1887).

THE subject of which I am to write is not of scientific interest alone, and it is not as a scientific question that I intend to deal with it. I wish, rather, to draw attention to the practical or utilitarian view of the question, in the hope that something may be done before it is too late to check the indiscriminate destruction of the native beasts and birds of prey.

One of these predatory animals, the Fox (*Canis vulpes*), I may pass over. There is no fear of foxes being exterminated in the south-west of Scotland, for some time to come, either by fair or foul means.

The Badger (*Meles taxus*) and Polecat (*Mustela putorius*) may, I suppose, be considered extinct hereabouts, although I can recollect when the latter animal was quite common; and, indeed, I remember, when a boy, seeing a nest of young ones dug out of a hole in our own garden. The same fate which has befallen the Polecat seems likely soon to overtake the Stoat (*M. erminea*), a more useful animal, in my opinion, and one deserving of more consideration than it has usually met with hitherto. I look upon the Stoat as our best protector from the legions of Rats, which now threaten, not only to eat us out of house and home, but even to pull down the very houses in which we live. The country simply swarms with rats. Every ditch and burn is infested with them; and therefore, though there is an endless number of different ways of killing or of driving them away from houses, all those various expedients, however ingenious, are in vain, except as a means of obtaining temporary relief. As soon as one batch of rats is killed off or expelled, a fresh lot is ready to take up the quarters they have vacated. The only effectual check upon the Rat is the Stoat, who hunts him down with deadly pertinacity in his favourite haunt, the ditch or running stream. Although the Rat can swim like a fish, and can thus escape from a dog or a cat, he has a poor chance of saving his life when pursued by a family of stoats. As I have seen myself, in the days when stoats were plentiful, they hunt the Rat as a

pack of foxhounds hunt the Fox, and can boast of a much larger percentage of kills.

The Stoat is, undeniably, an enemy to game; and is, therefore, very naturally an object of hatred to the gamekeeper. It would be unreasonable, I think, to blame the keeper for waging war against an animal which he looks upon as a dangerous enemy to the game which it is his duty to protect. Admitting, however, that the Stoat is a poacher, and destructive to game, is there not good reason for believing that the Rat is as bad? Would not a few stoats be a less evil than legions of rats infesting every brook and every hedgerow, and doubtless robbing many a partridge or pheasant's nest? When we consider the large number of rats that two or three stoats would kill in the course of the year, it certainly seems as if it would pay best to leave the Stoat alone. Undoubtedly the Rat is capable of atrocities which the Stoat would never think of. For example, at a farm-steading not far from Terregles, I heard of their killing and devouring two young pigs; and this was not all. They afterwards killed a calf. At this rate it is not unlikely that before long they will kill a cow, and they may not stop there. They have frequently been known to attack men. If the stoat is to be saved from extermination there is no time to be lost, as he is already becoming a very scarce animal, and probably the next four or five years will see the last of him in the district around Terregles.

The Common Weasel (*Mustela vulgaris*) is still frequently to be seen, but I doubt if he is such a formidable enemy to the Rat as the Stoat. He is a very useful little animal, however, and should be protected by law.

The Hedgehog (*Erinaceus europæus*) is also sadly in want of some such protection. He is fast being exterminated, and will probably soon be extinct, although only a few years ago so common that one could scarcely take a walk in the fields on a summer evening without seeing several usefully employed hunting for slugs in the dewy grass. As slugs form the chief food of the Hedgehog, it is obvious that he must do an immense amount of good in that way, probably far more than we realise. Now that the black-headed gulls have become so scarce hereabouts, I do not know of any other check to the increase of slugs; and everyone who has anything to do with gardening knows what damage slugs can do. Why do not those who have walled gardens keep a few tame hedgehogs? I don't know whether slugs are more numerous now than they used to be, but certainly they are now a very serious pest, and will increase where there is no check upon them. Two years ago I saw a field of newly brairded oats so covered with small grey or white slugs that there must have been on an average at least thirty or forty to the square yard, and they very nearly destroyed the crop altogether. This state of things may not be

due to the destruction of Hedgehogs, but I am at a loss to imagine any more likely cause.

Among birds of prey the Owl is undoubtedly the most deserving of protection, and it is protected to a certain extent by law, that is to say, it is included in the schedule appended to the Wild Birds' Protection Act of 1880, and therefore any person killing owls between 1st March and 1st August is liable to a penalty of £1 per bird. This Act is not very strictly enforced, however; and probably it is a good deal more in favour of the Owl, that at well-regulated covert-shootings owls are not shot when they make their appearance, as they often do on such occasions. Although I don't think the Owl is getting much scarcer in this neighbourhood, it is far from being treated as such a useful bird deserves. Where pole-traps are allowed there must always be a large number of owls destroyed.

The Kestrel (*Falco Tinnunculus*), also a harmless bird, living chiefly on mice, cockchafers, &c., falls a victim to the same hateful invention. The only other hawks we know of in this district are the Sparrowhawk (*Accipiter Nisus*), the Buzzard (*Buteo vulgaris*), and the Merlin (*Falco Æsalon*). They are all looked upon as deadly enemies to game, and I am not prepared to say that they do not kill game. To say that game forms any considerable portion of their food, I think is nonsense. There is nothing in the fact of a bird being in the game-list to make it more attractive to the hawk; and game must form a very small item in his style of living. Admitting that these hawks are enemies to game, there is still something to be said in their favour in the interests of sport. Anyone who has read reports in the newspapers regarding the opening day of grouse-shooting, must have observed that the grouse are always not only extremely scarce, but extremely wild and difficult to approach. Why is this the case? It is because in most cases the only enemy that the grouse have to fear is man; and they find that the best way to baffle him is to rest on bare exposed places, where they can command a good view of the surrounding country, and can withdraw, chuckling at his discomfiture, long before he gets within shot. The grouse do not adopt these tactics where hawks abound. There they know no shelter except under the brown heather, where even the keen eye of the enemy overhead fails to detect their cowering forms. Some time ago I saw a letter in *The Field* from the owner of a grouse-moor in the Hebrides, stating that in consequence of his not allowing birds of prey to be killed on his moor, he was enabled to shoot over days the whole season, and thus to have good sport without resorting to the driving system. There is, therefore, something to be said for the Sparrowhawk, the Buzzard, the Peregrine Falcon, and the Merlin, from the sportman's standpoint; and as for the other animals to which I have referred, the balance of evidence is in favour of their preservation.

In these days of associations for all purposes under the sun, I think it is high time there was an association for the protection of wild animals useful to man. It will soon be too late.

ROOKS.

By A. Nicol Simpson.

WITHIN the grounds of the Abbey here, there is yearly a small Colony of those birds. This season there are *two* nests on one tree that call for special notice. It was early that *two couples* erected their wooden dwellings and duly deposited eggs.

A gentleman who lives within thirty yards of the birds' abode daily observed them at their work. While thus watching, he discovered that in place of *four* birds as formerly, there were now only *three*. This has been confirmed by several gentlemen. I personally visited the locality and remained for some time watching the birds. From inquiries I made, it seems one of the *cock* birds has left or been killed and the remaining *cock* attends in turns on the *two hens*.

When I visited the spot a gentleman who is almost daily in the grounds confirmed the truth of the above, and not only so, but likewise drew my attention to another in the vicinity, which he stated was similarly placed. Thus it seems there are *three* birds to *two* nests or *six* birds to *four* nests.

I conclude the absent ones have fallen victims to powder and lead. Yet it appears a remarkable freak in Rook life that a cock should act in such a friendly manner towards the hen when deprived of her mate.

(For cases of *three Rooks* occupying *one* nest the notice of Mr. T. Brown's *List of the Birds of Tynron Parish*. (p. 133 of this journal.)

Ed. *Scot. Nat.*)

Swift attacked on the wing by a Sparrow.—One morning, in the end of the month of May, I noticed two birds come tumbling to the ground in one of the quadrangles of Marischal College, in Aberdeen. They were struggling fiercely, with much screaming, the smaller of the two having evidently the better of the struggle. On my going towards them, the struggle continued till I was quite close, when the smaller bird flew away, and I then saw that it was a sparrow. The larger bird proved to be a swift. It fluttered, but was unable to rise from the level surface, so that it was easily captured. It appeared little the worse; and, on being thrown into the air, it flew away quite strongly. There is no doubt that the contest was begun while the birds were flying; and yet it seems strange that a sparrow should be able to overtake, and to assault on the wing, a bird of so powerful flight as a swift. That the sparrow should have gained the mastery in the struggle is not to be wondered at. The cause of quarrel was not noticed.

J. W. H. TRAIL.

PHYTOLOGY.

NOTES ON NUPHAR PUMILUM AND N. INTERMEDIUM.

BY ARTHUR BENNETT, F.L.S.

IN the "Scottish Naturalist" for 1886 I noted that Dr. Caspary of Konigsberg had my specimens of the plants for examination, and I promised then to give the results. This I now do, though I am sorry my material was so scanty, as it is evident that what is wanted is the collecting of *good* specimens of all our smaller Water-Lilies.

Nuphar pumilum Smith.

Ellesmere. Salop. Mr. Jones.

"Seems to be *N. pumilum* although the stigmatic disk below the rays seems to be even, &c."—Dr. Caspary.

This Salop plant I consider to represent Smith's plant exactly; and the following extract from a letter of Mr. H. C. Watson's, of Nov. 19, 1879, shows that he also so considered it:—"Thanks for the specimen of *N. pumilum* from Shropshire,—a desirable one for my herbarium, having myself raised a query as to the certainty about the species there. It is curious that these species of the Highland lakes should occur in Salop, but apparently not in any of the Welsh lakes. The uncertainty which yet attaches to the so-called '*pumilum*' of the Eastern Counties of England made me wish to make sure about that of Shropshire."

* The Botanical Exchange Club has this year distributed specimens from Merioneth, Wales, gathered by Rev. A. Ley, as N. *pumilum* Smith.

Nuphar ?

Loch, Dumfries, Sept. 1885, collected by Fingland.

"*Nuphar luteum* x *pumilum*, Caspary, *N. intermedium*, Ledeb.:—That this plant is a hybrid there is no doubt, stigmatic disk entirely even between the rays, axillary elevation present, anthers—2 to 4 times as long as broad, leaf hairless underneath," Dr. Caspary.

Nuphar ?

Sanquhar, Dumfries, Dr. Davidson, "*N. luteum* x *pumilum*." Caspary.

The same name Dr. Caspary gives to a specimen kindly lent me by Mr. Beeby, also from Dumfries.

Nuphar pumilum Sm.

Loch Kinnord, Aberdeenshire, 2. 8. 79, Eliz. A. Lomax, ex-Botanical Exchange Club.—"Recte," Dr. Caspary.

Nuphar pumilum Sm.

Loch in Aviemore, E. Inverness., 2nd. Aug., 1882, J. Groves.

"Pollen partly bad; leaves smooth on the underside; therefore probably a hybrid. But it is impossible to judge with certainty from so scanty material and a flower so unfavourably closed." Dr. Caspary.

Nuphar pumilum Sm.

Loch Winless, Caithness. August 1885, J. Grant.

"Seems to be *N. pumilum* Sm., but material wretched." Dr. Caspary.

This was all the material I possessed. I hope that Dr. B. White will have some notes on these smaller Nuphars in the forthcoming "Flora of Perthshire"; and I would urge all who have the opportunity to gather a good series; they will be of interest not only to British botanists but even to those of N. America, whence I have some very interesting notes and specimens from the Rev. T. Morong of Ashland, Mass. He describes one of their smaller species as growing "in a little lake just like some of the Scotch Highland Lakes." Whether the plant he names is the true *pumilum* of Smith is yet undecided; but he has placed in Dr. Caspary's hands a fine series for examination.

SCOTTISH GALLS.

BY PROF. J. W. H. TRAIL, A.M., M.D., F.L.S.

DURING the past year a few additions have been made to the galls recorded by me in the pages of the *Scottish Naturalist*; but the number is so small as to induce a belief that the more conspicuous forms have been nearly exhausted for Scotland, and that the species still undetected mostly belong to those inconspicuous forms produced by Midges, Mites, and Nematoid worms. Of these a good many may yet be expected to reward future investigations, but the evidence that we possess is sufficient to prove that the galls of Scotland are far fewer, and considerably less varied in appearance and structure, than are those of Germany, and of other countries of the European continent. Many of the commonest European galls, so far as known, do not occur with us, even though the host-plants are plentiful,—an indication, probably, that in some cases the plants reached our land before the gall-makers had developed their parasitic habits, and that in others the

plants were introduced in a condition (*e.g.*, as seeds, by birds) not suited for the introduction of the gall-making insects. It is, however, impossible now to discover the special cause of immunity in the case of each of such plants, and we must be content, in most cases, to record the bare facts, leaving the explanations of these facts unattempted.

To complete the account of the galls of Scotland, those caused by Fungi ought also to be ranked alongside of those of animal origin; and I hope to make the former galls the subject of a future paper. Meanwhile, I shall confine my remarks to the latter, in completion of my former papers in this Journal.

Galium uliginosum L.—I have recently found on this plant, near Aberdeen, galls of the same nature as those produced by mites (*Phytoptus*), on various other species of *Galium*, e.g., on *G. Aparine* (Sc. Nat. IV., p. 15, b.), on *G. saxatile* (l.c.), and on *G. palustre* (Sc. Nat., N. Ser., I., p. 210, b.) Like the latter galls, they are leaves convoluted or rolled from the tips so as to form shelters for the mites. In colour they hardly differ from the healthy leaves. On all the species of *Galium*, they are probably the work of the same species of mite.

Sonchus arvensis, L. On a few small plants of the Sow-thistle, at Gamrie, a few miles east of Banff, I found on 20th August, 1886, several galls of *Cecidomyia Sonchi* F. Loew (V. Bot. Zool. Ges. Wien, 1875, p. 18). They resemble blisters of the epiderms of the leaf, being raised a little in a very low cone above the general level, especially on the upper surface. Looked at from the surface, the gall is pale yellowish or reddish-green, surrounded by a dark purple-red ring, and is about 5mm. (⅕inch.) in diameter. On section it is found to have the lower wall very thin, and pierced by a minute opening; this wall is the lower epiderm of the leaf, separated from the middle tissues. The upper wall includes the latter tissues; and is therefore thicker. The chamber between the two is lenticular, and is occupied by a yellow larva which, when full-fed, becomes a pupa, in a small white cocoon in the gall. I was unfortunately unable to rear the Midges, but the galls agree completely with Dr. Löw's description, so as to leave no doubt that they are to be ascribed to *C. Sonchi*. Often a number of galls (over a dozen) are crowded on a leaf, especially on the leaves near the base of the stem.

Fraxinus excelsior, L. (Ash). I have already described (*a*) the galls on mid-ribs of the leaflet of the Ash, produced by *Diplosis botularia* Winn, (Scot. Nat. I, p. 158, and II, p. 252). (*b*) In August 1886, I found, near Banff, a number of leaf-galls in the leaves, which in nature and structure much resembled those just described from *Sonchus*, consisting of blister-like swellings of about the same size as the latter but they hardly differed in colour from the rest of the leaf, and only from one to three occurred on each leaflet. Most of them were empty; but in one or two I found a whitish or yellowish larva, appar-

ently belonging to a *Cecidomyia*. After a time the galls wither, and turn dry and brown ; and in this state they much resemble the spots caused by certain species of Fungi (*Septoria*, &c.), a resemblance increased by the fungi that grow on the surface of the gall after the escape of the larvæ. The latter leave the galls when full-fed ; and apparently become pupæ in the soil. (*c*) *Mite-galls of the inflorescences*, well-known in Germany under the name "Klunkern;" first described by Vallot (Mem de l'Acad. de Dijon, 1839, p. xxxiv), they have been redescribed by Drs. Thomas, F. Loew, Schlechtendal, and others ; and are excellently figured by Dr. F. Loew (V. Z. B. Ges. Wien, 1878, t. II, f. 2). They are apparently rare in Scotland ; and, though I have found shrivelled and broken examples in Aberdeenshire, I have not found them in the fresh state.

In the early summer of 1886, Dr. Buchanan White kindly sent me two or three examples found by himself in the neighbourhood of Perth. The mites (a species of *Phytoptus*), were not to be discovered on these examples ; but the galls so entirely agreed with Dr. Loew's description of the galls as to prove that their production is due to the same agency. They form very irregularly rounded growths, from the size of a pea to that of a walnut, at first brownish-green, afterwards dark brown. The peduncle of the inflorescence is a good deal distorted, and the flower-buds cease to be recognisable as such, and form mere projections on the surface of the mass. The surface is closely covered with very short erect hairs ; but these tend to fall off. On section the galls prove to be solid ; and soon become extremely hard, with no cavities in their centre. They are chiefly composed of modified cellular tissue. Dr. Loew found large numbers of a very small, transparent *Phytoptus* in the fresh galls ; the easiest method of obtaining them is to wash the galls in water, and to examine the sediment from the washings with the microscope.

Quercus Robur L. (*aa.*) Galls of *Aphilothrix corticis* Htg. have already been recorded by Mr. Cameron from the vicinity of Glasgow ; but last year I observed them for the first time near Aberdeen, in two or three places. They are sunk in groups in the bark of roots or of stems, especially in the thickened mass (callus) surrounding wounds. They are not visible while young, in which state the outer layer of the wall is continuous with the cortex; while the inner layer is harder than, but united with, the outer. The galls are oval, with their long diameter vertical to the surface. When dry the top falls off, showing the cavity, and the galls become conspicuous. They are formed in autumn, but are most noticeable in spring. (*bb.*) The spring form of gall of the above insect occurred on the same trees as the bark-galls just described. The generation that forms the spring galls is known by the name of *A. gemmatus* Adler. The gall formed by it grows in the young buds ; it is sessile, oval, only about 1 or 2 mm. long, but

not enclosed wholly in the bud scales, green, turning brown, the walls very thin, and not separable into distinct layers. Neither form of gall seems common near Aberdeen ; but they are not readily seen, and are probably much more widely distributed and more common than they appear to be.

REVISION OF SCOTCH SPHÆROPSIDEÆ AND MELANCONIEÆ.

(By Prof J. W. H. TRAIL, A.M., M.D., F.L.S.)

IN the following paper I shall endeavour to summarise what is known with regard to the Scotch fungi usually referred to the groups *Sphaeropsideæ* and *Melanconieæ*. These two groups are, without doubt, very unsatisfactory, inasmuch as they are, in all probability, mere stages in the development of higher forms, mostly belonging to the *Pyrenomycetes*. That this is their true nature may be held as proved with regard to several of the so-called species ; and, although a genetic connection with certain of the higher forms has too often been somewhat rashly assumed to exist where fuller knowledge has not supported the assumption there is good reason to believe that, one after the other, the "species" of the two groups will be referred to the perfect fungi to which they really belong. Our present knowledge is not sufficient to permit of this being done except with a few ; and it is advisable in the meantime to retain the names by which they are known, as if they were distinct and good species. Enough is known already, however, to warrant the conclusion that the "genera" employed in the two groups are not wholly natural assemblages, but include forms that belong to fungi of groups that differ widely in the mature condition.

In Mr. Stevenson's **Mycologia Scotica**, 104 "species" are enumerated under the groups *Sphaeropsideæ* and *Melanconieæ* ; but of these, three must be excluded, as referable to other groups ; and one as not a true fungus. The limits of the two groups in that work (founded on Cooke's **Handbook of British Fungi**) are not quite the same as those now admitted by Mycologists. The arrangement of "species" and "genera" has recently been simplified, and characters defined more clearly. It can, indeed, scarcely be said that the method of classification employed in Saccardo's great work, the **Sylloge Fungorum** (Vol. III.) is more *natural*

than that which it has superseded, yet it is more easy to employ for the detection of the forms already named; and it thus fulfils much the same purpose for Fungi that the equally artificial Linnean system did for Phanerogams. Each method has done much to open up to workers stores of information scarcely available formerly.

For this reason, Saccardo's work is felt by Mycologists to be a boon; and it has been accepted as a basis from which, it may be hoped, further advances may be made towards the goal of a truly natural system.

Dr. Cooke has recently given in **Grevillea** (Nos. 70-73, Dec., 1885-Sept., 1886) a list of the British "species" of the two groups, based on the **Sylloge Fungorum**. Though he has included Scotch fungi in his list, it is far from complete; there is ample room for a revision of the Scotch forms, which include a number not mentioned by him for Scotland, not a few of them, as enumerated in the April number of this magazine, being new to Britain or new to science.

The Scotch list still falls very far short of that for the whole of Britain; but it has been more than doubled during the past eight years, since the publication of the **Mycologia Scotica**. Besides the numerous additions recorded, I have a number of these fungi from the north-east of Scotland, about which I have not yet been able to satisfy myself. The "species" described in the **Sylloge** are so numerous, and the distinctions between many of them are so very slight, as to render it most difficult to know from descriptions in how far they are worthy of being regarded as distinct; and forms often occur intermediate between, or combining the characters of, two, or even more, "species;" hence it is often scarcely possible to come to a conclusion under which name to place a doubtful form. It seems better in such a case to defer publication than to risk propagating or perpetuating errors; and I have followed what appears to be the most prudent course.

In the subjoined list I have followed the **Sylloge Fungorum**, Vol. III., in the nomenclature and systematic arrangement. Purely artificial as the latter is, it has the merit of greatly reducing the labour of identifying the objects of our search. On the other hand, the disadvantages of the method are most evident, as it brings together plants not closely related to one another; while, if rigidly applied, it separates close allies, and occasionally

makes it very doubtful under what group a variable plant should be classed. If any attempt is made to keep together plants nearly allied, this leads to the purely artificial system being set aside now and again, with the result that plants may not unfrequently be found placed under groups from which they differ in the essential group-character; though this is not so often done among the *imperfect* fungi as among the *perfect Pyrenomycetes* (Sylloge, Vols. I. and II.), in which Saccardo sometimes departs far from a strict adherence to his system of classification, and thus render the results misleading in too many cases.

As no account of Saccardo's method of classification of the Fungi has yet been published, to my knowledge, in Scotland, it will be necessary to indicate it briefly, in so far as relates to the *Sphaeropsideæ* and *Melanconieæ*.

He distinguishes the groups thus :

I. Sphæropsideæ Lev. (emendatae).

Fungi possessed of a perithecium (but without asci), inside which are sporules, supported on more or less evident basidia.

Fam. 1. **Sphærioideæ** Sacc.

Perithecia membranaceous, carbonaceous, or subcoriaceous, dark (never bright-coloured nor fleshy), globose, conical, or lenticular, complete, immersed or superficial.

Fam. 2. **Nectrioideæ** Sacc.

Perithecia (and stroma when present), fleshy or waxy, bright-coloured (white, yellow, orange, or red), globose, or less often hysterioid (*i.e.*, opening by a slit instead of a round hole), or subcupulate. Sporules, in all yet known, hyaline.

Fam. 3. **Leptostromaceæ** Sacc.

Perithecia membranaceous or carbonaceous, dark, more or less evidently dimidiate, peltate, without an opening, or ostiolate, or hysteroid, erumpent or superficial.

Fam. 4. **Excipulaceæ** Sacc.

Perithecia membranous or carbonaceous, dark, cupuliform, or patelliform, or excipuliform, or hysteroid, at first subspheroid, but early opening wide, smooth, or pilose.

II. Melanconieæ Berk.

Fungi (without either perithecia or asci) composed of sub-

cutaneous clusters (pustules) of sporules, which at length are erumpent in part, usually rather soft, dull coloured, grey, or brightly coloured. Conidia supported on more or less obsolete basidia, arising from a more or less well-developed stratum.

Each of the families is divided into sections by the colour and degree of division of the spores. The largest number of sections is met with in the **Sphærioideæ**, in which Saccardo recognises :

1. **Hyalosporæ.**
   Sporules 1-celled, hyaline, globose, ovoid, or sub-oblong, straight, or sausage-shaped (allantoid).
2. **Phæosporæ.**
   Sporules 1-celled, olive to sooty-brown, globose, ovoid, or oblong.
3. **Phæodidymæ.**
   Sporules 2-celled (1 cross septum), fuscous, ellipsoid, ovoid, or oblong.
4. **Hyalodidymæ.**
   Sporules 2-celled (1 cross septum), hyaline, or yellowish, ellipsoid, ovoid, or oblong.
5. **Phragmosporæ.**
   Sporules 2-pluri-septate, oblong or fusoid.
   Sub-section A. *Phæophragmiae.*
   Sporules sooty or olive-brown.
   Sub-section B. *Hyalophragmiae.*
   Sporules hyaline.
6. **Dictyosporæ.**
   Sporules 2-pluri-septate, muriform, or radiately septate, sooty, or olivaceous brown. (None yet known with hyaline spores.)
7. **Scolecosporæ.**
   Sporules rod-like, filiform, or elongate-fusiform, 1-celled, or with cross septa, hyaline or yellowish.

In each of the other families similar sections are formed, based, as in *Sphærioideæ*, on the form, structure, and colour of the sporules; but in none of the others are the sections quite so numerous.

It is self-evident that the sections are not of equal value; and experience proves them very unequal in number of species.

But a greater difficulty meets us in the fact that in many of the fungi the sporules in the same perithecium may be so different as to permit of classing the plants under two, or even three, of the sections, *e.g.*, one frequently finds 1-celled and 2-celled sporules together. It is also very difficult to determine into which section many should be put; since the depth of colour and the presence and number of septa vary with age. There is also every reason to believe that the "species" referred to different "genera" are often really mere stages in the life-history of the same fungus.

But despite these defects there is no other method of classification so easy to use as Saccardo's; and it will probably be more and more widely used for some time to come. Hence it may be hoped that a revision of the Scotch **Sphæropsideæ** and **Melanconieæ** based on this system will prove useful to Scotch Mycologists.

The distribution of these fungi in Scotland is indicated by the districts recognised in **Mycologia Scotica**, these being: *Tweed, Solway, Forth, Clyde, Tay, Argyle, Dee, Moray* (*south* of the Caledonian Canal, denoted in this list by Moray), *Moray* (*north* of the Canal, from which we have no information), *Ross, Sutherland, Caithness, Outer Hebrides, Orkney, Shetland.* From several districts there is absolutely no information concerning these plants, and for most the records are very scanty. By far the fullest lists are those for Tay, Dee, and Moray south of the Canal.

I have attempted, so far as I could, to give the name of the discoverer and of the recorder of each fungus as Scotch, denoting these respectively by D. and R. M., followed by a number, denotes that the species is mentioned in the **Mycologia Scotica** published in 1879; and in regard to a good many species, my information rests on the records in that work. Where I knew the true date of record the year is inserted.

The chief discoverers and recorders of Scotch micro-fungi are named below in historical order:—Dr. Greville, whose works, "The Scottish Cryptogamic Flora," 1823-29, and the "Flora of Edinburgh," must always be a mine of information. Dr. Johnstone (Berwick) and Jerdon (Jedburgh) came next. Revs. J. Fergusson (New Pitsligo and Fern), M. Anderson (Menmuir), Dr. Keith (Forres and other Morayshire localities), and John Stevenson (Glamis and other localities in Forfarshire, Perthshire, and Ross), and Dr. Buchanan White (Perthshire, &c.), almost simultaneously

made great advances in our knowledge of these fungi. For the most part their discoveries, as well as the earlier ones of Johnstone and Jerdon, were recorded by Messrs. Berkeley and Broome, in their well-known series of papers in the Annals and Magazine of Natural History, extending over many years. Mr. Stevenson has summed up the result of these discoveries up to the year 1879, in his **Mycologia Scotica**. Additions have been continued in the numerous supplements to this work in the *Scottish Naturalist*. Reference must also be made to Dr. Buchanan White's "Preliminary List of the Fungi of Perthshire," in the *Scottish Naturalist*, Vols. V.-VI., 1879-81; and to Dr. Keith's "List of Fungi of Moray (*Scot. Nat.*, Vol. II., 1873-74), "Supplementary List of the Fungi of Moray" (l.c., Vols. IV.-V., 1878-79), and "Second Supplementary List of the Fungi of Moray" (l.c., New Series, Vol. I., 1884-85). A good many of Dr. Keith's discoveries (chiefly among the *Discomycetes*) have been recorded by Messrs. Phillips and Plowright in their papers, in *Grevillea*, on "New or Rare British Fungi."

Dr. M. C. Cooke has also discovered and recorded, in *Grevillea* chiefly, several fungi from the neighbourhood of Edinburgh.

My own work among micro-fungi is of recent date, and is supplementary to that accomplished by others. The results are recorded by myself (except some by Mr. Stevenson) in the supplements to **Mycologia Scotica**, and in other papers all in this Journal, and almost all in its second series. All the species and varieties to which I have given names were discovered and first recorded by myself. The districts from which I have collected fungi are—Tay (near Montrose and Rescobie), Dee (around Aberdeen, up Deeside and in other localities), and Moray (from Forres eastward). An asterisk marks species found by me in Scotland.

The numbers immediately following the names are those under which the fungi are placed in Saccardo's **Sylloge Fungorum**, Vol. III. Those preceded by *C* are the numbers in Cooke's list in **Grevillea**. Those preceded by *M* are the numbers the fungi bear in Stevenson's **Mycologia Scotica**; and those preceded by *S.M.* are the numbers they bear in the **Supplements** to the **Mycologia** published at intervals in the *Scottish Naturalist*; and species not previously described as Scotch, nor included in Cooke's **Handbook of British Fungi**, are briefly described below. These descriptions, where founded on

personal identification of species, were made from my own microscopic specimens. The descriptions of genera and of larger groups are from Saccardo's **Sylloge Fungorum**, Vol. III.

NOTE.—*Pycnidia*, employed below instead of *perithecia*, is preferred here, as the latter term is better restricted to the corresponding organ in the mature *Pyrenomycetes*. *Sporidia* is preferred to *sporules* as a term more familiar in British works. *The measurements given below are in thousandths of a millimetre, unless specified; mm.* denotes that they *are in millimetres, or in fractions of a millimetre.*

SPHÆROPSIDEÆ, Lev.

Fungi possessed of pycnidia (without asci), inside which are sporidia supported on more or less evident basidia (foot stalks).

Fam. 1. SPHÆRIOIDEÆ, Sacc.

Pycnidia membranaceous, carbonaceous, or subcoriaceous, dark (never fleshy or bright hued), globose, conical, or lenticular, entire, immersed or superficial.

§. 1. HYALOSPORÆ, Sacc.

Sporidia hyaline, globose, ovoid, or sub-oblong, straight or rather curved (sausage-shaped or allantoid), continuous (one-celled, *i.e.*, without septa). (*Note.*—Some forms referred to this section by Saccardo approach *Scolecosporæ* in the long, slender sporidia; others approach *Phæosporæ* in their depth of colour, and others have two-celled sporidia, like those of *Ascochyta*, sometimes associated in the same pycnidium with the ordinary one-celled form.)

Analytical key to the genera.

A. Pycnidia separate from one another.
B. Pycnidia bare, without bristles.
C. Causing discoloured spots on leaves and stems.
Pycnidia lenticular, opening by a pore. *1. Phyllosticta.*
C.C. Not causing discoloured spots.
D. Sporidia without appendages.
E. Subiculum absent.
F. Pycnidia subcutaneous, membranaceous or subcoriaceous, often papillate, basidia each bearing one sporidium, often very short. *2. Phoma.*
F.F. Pycnidia as in *Phoma*, basidia branched or toothed, each bearing several spores. *3. Dendrophoma.*
E.E. Subiculum present as radiating black fibrils, to which the pycnidia are affixed. *4. Asteroma.*

D.D. Sporidia bear three or four cilia at the apex. *5. Neottiospora.*

B.B. Pycnidia covered with long erect simple bristles, sporidia fusoid-falcate. *6. Vermicularia.*

A.A. Pycnidia caespitose, immersed in, or adnate to, the stroma.

H. Sporidia ovoid-oblong; stroma globoso-truncate, incompletely plurilocular. *7. Rabenhorstia.*

H.H. Sporidia allantoid, stroma valsoid or warty, rather soft, irregularly plurilocular. *8. Cytospora.*

H.H.H. Sporidia rod-like, usually straight, stroma conico-truncate, carbonaceous, typically plurilocular. *9. Ceuthospora.*

L. PHYLLOSTICTA, Pers.

Pycnidia usually subcutaneous, membranous, thin, pore frequently wide; sporidia small, ellipsoid or ovoid, hyaline or yellowish; basidia very short or absent. (*Note.*—The fungi referred to this genus often appear on spots previously overgrown by *Ramularia*, and allied genera, among *Hyphomycetes*, and are succeeded on some plants by such forms *Ascochyta* and *Septoria* among *Sphæropsideæ*. It is more than likely that these genera represent forms of reproduction of *Sphaerella* and allied genera among *Pyrenomycetes*.)

a. On Woody Dicotyledons.

* 1. **P. Loniceræ** West, 90, C. 377, M. 1156 (sub. *P. vulgaris* var. *Loniceræ*, Desm).

On leaves of *Lonicera Periclymenum* (Honeysuckle), Tay, Dee.

* 2. **P. Hederæ**, Sacc. and Roum, 101, (D. & R. *Trail*, 1887).

On leaves of *Hedera Helix* (Ivy), near Aberdeen. Dee.

Spots dry, circular, except where broken by the leaf-margin, pale in the middle, with a darker border; pycnidia numerous, lenticular; sporidia very small, 3-4 by 1-1¼. (In this Journal in January, p. 40, I recorded this as *P. hedericola* D. and M.; but the form found near Aberdeen proves to be *P. Hederæ* S. and R.)

France and Belgium.

* 3 **P. Tiliæ**, Sacc. and Speg., 141, C. 396 (D. & R. *Trail*, 1887).

On leaves of *Tilia europaea* in autumn, at Forres, and near Aberdeen.

Dee, Moray.

Spots variable in form and size, often many on a leaf, dry, pale, surrounded with a dark brown border; pycnidia scattered, lenticular, 100-130 diam., light-brown; sporidia oblong, 5-7 by 3, pale yellowish.

England, Italy.

* 4. **P. Ligustri**, Sacc. 107, C. 382 (D. & R. *Trail*, 1887).

On fading leaves of *Ligustrum vulgare* (Privet, around Aberdeen, in Spring.)

Dee.

Spots dry, pale rufous, or dirty white, with a red-brown border, form and size various; pycnidia on the upper surface, few, lenticular, 60-80 diam., brown; sporidia oblong, 5-7 by $2\frac{1}{2}$-3, biguttulate, on short basidia.

England, Southern Europe.

. *On Herbaceous Dicotyledons.*

5 **P. Violæ** Desm. 203, C. 404, S.M. 2178 (R., 1881, *Sc. Nat.* vi., 118).

On leaves of Violet.

Tay, Argyle.

* 6. **P. Helianthemi** Roum. 204, C. 405, (D. & R., *Trail, Sc. Nat.*, 1887, p. 96).

On leaves of *Helianthemum vulgare*, near Aberdeen, Autumn.

Dee.

Spots nearly circular, or confluent, small, pale, with a red-brown border, pycnidia on upper surface of spot, few, dark; sporidia very small, oblong, 3-4 by 1, sometimes biguttulate.

England, France.

* 7. **P. Ulmariæ** Thuem. 223, (D. & R., *Trail, Sc. Nat.*, 1887, p. 40).

On leaves of *Spiraea Ulmaria*, in summer and autumn.

Dee (Aberdeen).

Spots small, the very small centre being dry, pale, and rather irregular in form; the broad border is fuscous or purplish brown; pycnidia on the upper surface few or solitary in each spot, convex, approaching hemispherical, 180 diam., dark; sporidia numerous, oblong, or slightly dumbbell-shaped, 5-6 by 2 ($3\frac{1}{2}$-5 by 2-$2\frac{1}{2}$, *fide* Sacc.), hyaline.

Siberia.

* 8. **P. scrophularinea** Sacc. 254, (D. & R., *Trail*, no previous record).

On leaves of *Scrophularia nodosa* (Figwort), in autumn.
Tay (near Montrose), Dee (near Aberdeen).

Spots small, angular, dry and pale, with a broad purplish or red-brown border; pycnidia few, lenticular, about 100 diam.; sporidia oblong, straight or curved, 4 by 1-1½, hyaline.
Italy.

* 9. **P. Teucrii** Sacc. and Speg. 271, (D. & R., *Trail, Sc. Nat.* 1887, p. 90).

On leaves of *Teucrium Scorodonia*, in autumn, common around Aberdeen.
Dee.

Spots variable in form, brown, dry, becoming paler in the centre; pycnidia in groups, lenticular, 80 diam., brown; sporidia oblong-cylindrical, 4-5 by 1½, hyaline.
Italy.

*10. **P. Galeopsidis** Sacc. 275, (D. & R., *Trail, Sc. Nat.* 1887, p. 90).

In leaves of *Galeopsis Tetrahit*, in autumn, near Aberdeen.

Spots often very numerous on a leaf, rounded or irregular, dry, pale ochreous; pycnidia lenticular, 50-70 diam., sporidia oblong, 4-5 by 2½-3.

Said by Saccardo to be associated with *Sphaerella umbrosa* Sacc., in North Italy, but the *Sphaerella* has not yet been found in Scotland.

*11. **P. Ajugæ** Sacc. and Speg. 276, C. 425, (D. & R., *Trail, Sc. Nat.*, 1887, p. 90).

On leaves of *Ajuga reptans*, in autumn, near Aberdeen; succeeding *Ramularia Ajugæ* Niessl.
Dee.

Spots usually numerous on each leaf, roundish or irregular, dry and pale in the centre, surrounded by a brown border; pycnidia few, scattered, spherical, 80-100 diam.; sporidia oblong, 6-7 by 2½-3, straight, or slightly curved, hyaline.
England, Italy.

II. PHOMA, Fr.

Pycnidia at first subcutaneous, often becoming erumpent, membranaceous, subcoriaceous, or subcarbonaceous, subglobose or oblong, smooth, often papiliate, aperture small or none; sporidia between spherical and cylindrical in form, hyaline, usually showing two dots or guttulæ. Basidia filiform, often very short or absent.

(*Note.*—This is a very large and unsatisfactory genus, some species verging towards *Coniothyrium* in colour of the sporidia, others towards *Ascochyta* in the sporidia being often uniseptate, and others towards *Scolecosporae* in the long slender sporidia. The species are very hard to distinguish; and, probably, many of the named forms are not distinct from one another, save in name. The fungi referred to *Phoma* are in most cases early stages of *Pyrenomycetes* of various groups, *e.g.*, *Diaporthe*, *Pleospora*, *Phomatospora*, &c. The sporidia vary a good deal in size. Those species in which they exceed 15 in length have recently been placed by Berlese and Voglino in a separate genus, *Macrophoma*; but this differs from *Phoma* in no other character than size of sporidia, and does not deserve higher than sub-generic rank.

Subgenus—I. EU-PHOMA.

a. On Woody Stems of Dicotyledons.

*12. **P. Ryckholtii**, Sacc., 484, C. 8. (D. and R. *Trail*, no previous record.)

On twigs of *Symphoricarpus racemosus* (Snowberry) in winter. Dee.

This precedes or accompanies *Diaporthe Ryckholtii*, of which it is the spermogonium, near Aberdeen. Pycnidia subcutaneous, depressed; sporidia fusiform, obtuse, 7-9 by 2-3, hyaline, with 2 guttulæ; basidia rather long.

*13 **P. Xylostei**, Cooke and Harkness, 405, C. 9. (D. and R. *Trail*, no previous record.)

On twigs of *Lonicera Periclymenum* (Honeysuckle). Dee (near Aberdeen).

Pycnidia scattered, subcutaneous, prominent and dark; sporidia oblong, or nearly elliptical, 5-7 by $2\frac{1}{2}$-3, hyaline.

*14. **P. Callunæ**, Karst., 500. (D. and R. *Trail*, *Sc. Nat.*, 1887, p. 90.)

Common on dead stems of *Calluna vulgaris*, near Aberdeen. Dee.

Pycnidia scattered, about $\frac{1}{4}$ mm. across, subcutaneous, depressed-spherical, but prominent, dark; sporidia elliptical, obtuse, hyaline, 12-13 by 6.

*15. **P. pulla**, Sacc., 511, C. 47. (D. and R. *Trail*, no previous record.)

Common on dead twigs of *Hedera Helix* (Ivy), near Aber-

deen, along with *Diaporthe pulla*, of which it is the spergonium.

Pycnidia crowded under the darkened epiderm, sporidia oblong or elliptical, 7-8 by 3, hyaline, biguttulate, basidia curved, 12-15 by 1.

*16. **P. Berkeleyi**, Sacc., 796. (D. and R. *Trail, Sc. Nat.*, 1887, p. 90.)

In wood of dead branches and stems of *Sambucus nigra* (Elder), *Urtica dioica* (Nettle), and *Lychnis diurna* (Red Campion).

Common near Aberdeen, along with *Phomatospora Berkeleyi*, Sacc., of which it is the spermogonium. It is very inconspicuous.

Dee.

Pycnidia sub-gregarious, immersed, sub-globose, papillate, the papilla alone being visible; sporidia oblong or sub-cylindrical, 7-10 by 2, hyaline, biguttulate.

b. On Leaves of Woody Dicotyledons.

17. **P. geniculata**, B. and Br., 604, C. 88, M. 1105. (Sub *Sphæropsis geniculata*, M. 1105.) (D. *Anderson*, R. *Stevenson*, in M. Scot.)

On leaves of *Pinus Strobus*.

Tay (Menmuir).

18. **P. Sorbi** (Lasch.), Sacc., 634, C. 88, M. 1146. (Sub *Septoria Sorbi*.)

On leaves of *Pyrus* (*Sorbus*) *Aucuparia*.

Tay, Ross.

19. **P. Ralfsii** (B. and Br.), Sacc., 672, C. 94, M. 1104. (Sub *Sphaeropsis Ralfsii*.) (D. *Anderson*.)

On leaves of *Hedera Helix* (Ivy).

Tay (Menmuir).

c. On Herbaceous Dicotyledons.

20. **P. longissima** (Pers.), West., 746, C. 111, M. 1065. (D. and R. *Johnstone*.)

On stems of Umbelliferæ.

Tweed (Berwick).

*21. **P. complanata** (Tode) Desm., 751, C. 112. (D. and R. *Trail, Sc. Nat.*, 1887, p. 90.)

On dead stems of *Rhinanthus crista-galli*, in spring.
On the Links near Aberdeen.
Dee.

Pycnidia scattered, subcutaneous, but erumpent, ½ mm. across, flattened spheres in form, becoming umbilicate, papillate; dark, texture firm; sporidia oblong, straight or curved, 5-6 by 1½-2¼, hyaline, biguttulate. Pycnidia much like the perithecia of *Pleospora herbarum*, which is plentiful on the stems of the same plant. Is it possible that they are stages of development of the same fungus?

*22. **P. Asteriscus**, Berk., 753, C. 113, M. 1092. (D. *Jerdon.*)
On dead stems of *Heracleum Sphondylium.*
Tweed (Jedburgh), Dee (Aberdeen).

*23. **P. herbarum**, West., 793, C. 125. (D. and R. *Trail.*)
On dead stems of various plants, frequent.
Dee.

This is a very unsatisfactory plant, and probably includes the spermogonia of a good many *Pyrenomycetes*, but especially of *Pleospora herbarum.* On the other hand, it is scarcely possible to distinguish several other named kinds of *Phoma* from varieties of *P. herbarum.*

Pycnidia subgregarious, at first subcutaneous and globoso-depressed, then erumpent, and subumbilicate, papillate, dark, sporidia elliptical or oblong, hyaline, biguttulate, size from 5 by 3 to 10 by 4.

*24. **P. acuta**, Fuck., 794, C. 126. (D. and R. *Trail.*)
On dead stems of *Urtica dioica* (Common Nettle), along with *Leptosphaeria acuta*, of which it seems to be the *spermogonium.*
Dee.

Pycnidia scarcely different in appearance from the perithecia of *L. acuta*, papillate; sporidia oblong, about 5 by 1½, hyaline, biguttulate.

25. **P. nebulosa** (Pers.), Mont. 801, C. 130, M. 1094. (D. & R. *Greville.*)
On dead herbaceous stems.
Tweed (Berwick), Forth (Edinburgh).

*26. **P. melaena** (Fr.), M. and Dur. 804. (D. and R. *Trail, Sc. Nat.* 1887, p. 90.)
On dead stems of *Astragalus glycyphyllus.*

Tay (St. Cyrus, near Montrose).

Causing black patches on the stems, in which are grouped small black sub-globose pycnidia, under the blackened epiderm, aperture almost or altogether absent; sporidia oblong, straight, 3-5 by 1½-2, hyaline. Saccardo suggests that *P. melæna* is probably the spermogonium of *Sphærella melæna* (Pr.) Awd.; but I found no trace of the *Sphærella* on the stems.

*27. **P. superflua**, Sacc., 826, C. 139, S.M. 3033. (D. and R. *Trail, Sc. Nat.* 1885, p. 128.)

On dead stems of *Scabiosa succisa*, near Aberdeen.

Dee.

*28. **P. macrocapsa**, Trail, S.M. 3077. (D. and R. *Trail, Sc. Nat.*, 1886, p. 327.)

On dead stems of *Mercurialis perennis*, near Aberdeen.

Dee.

*29. **P. saligna**, Fr. (D. and R. *Trail, Sc. Nat.*, 1887, p. 90.)

On dead leaves of *Salix cinerea*, with *Linocera Caprææ* (of which it is the spermogonium), near Aberdeen.

Dee.

*30. **P. deusta**, Fuckel, 925. (D. and R. *Trail, Sc. Nat.*, 1887, p. 90.)

Causing dark patches on the stems and fruits of *Rhinanthus crista-galli* on the Links, near Aberdeen.

Dee.

Pycnidia beneath the dark epiderm, sub-gregarious, papillate, prominent; sporidia 8-10 by 1½-2, sub-cylindrical, straight, hyaline; basidia simple.

c. On Fruits and Flowers of Dicotyledons.

*31. **P. leguminum**, West., 870, C. 141. (D. and R. *Trail*, not previously recorded.)

On dead pods of *Cytisus Laburnum*, near Aberdeen.

Dee.

Pycnidia small, scattered in large groups, spherical, dark; sporidia oblong-ovoid, obtuse, 5-7 by 2½, hyaline, biguttulate; basidia very short. This fungus comes very close to, if it is not identical with *P. herbarum*.

*32. **P. samarorum**, Desm., 911, C. 144, M. 1093. (D. *Fergusson.*)

On dead fruits of *Fraxinus excelsior* (Ash).
Tay, Dee.

Like the last, very close to, if not identical with, *P. herbarum.*

d. On Monocotyledons.

*33. **P. typharum,** Sacc., 977, C. 154. (D. and R. *Trail,* no previous record for Scotland.)

On dead leaves of *Typha latifolia,* near Aberdeen, along with *Leptosphaeria typharum,* of which it is probably the spermogonium.
Dee.

Pycnidia scattered, minute, but rather prominent, sub-spherical, dark, opening through ostiola, which are nearly as long as the pycnidia; sporidia 3-4 by ½-1, sub-cylindrical, rather curved, hyaline.

*34. **P. neglecta,** Desm., 982. (D. and R. *Trail, Sc. Nat.,* 1887, p. 90.)

On dead stems of *Juncus effusus,* near Aberdeen.
Dee.

Pycnidia wide apart, subcutaneous, but rather prominent, shortly papillate, black; sporidia oblong, 4-5 by 1½-2, hyaline.

e. On Vascular Cryptogams.

35. **P. epitricha** (B. and Br.), Sacc., 1005, C. 155, M. 1106. (Sub *Sphaeropsis epitricha,* B. and Br.) (D. *Fergusson.*)

On dead stems of *Equisetum palustre.*
Dee (Glaslaw).

II. Macrophoma (Sacc.) B. & V.

(Sporidia 15 long and upwards, otherwise as in *Euphoma.*)

36. **P. (M.) malorum,** Berk., 908, S.M. 2175. Sub *Sphaeropsis malorum,* Berk.) (D. *Keith.*)

On stored apples, in Forres.
Moray.

37. **P. (M.) Strobi** (B. and Br.), 603, C. 82, S.M. 3067. (D. *Stevenson,* R. in *Grevillea,* xiv. 1885.)

On leaves and cones of *Pinus Strobus.*
Tay (Glamis).

38. **P. (M.) cylindrospora,** Desm., 761, C. 93, M. 1103.

(Sub-*Sphaeropsis cylindrospora*, Desm.) (D. and R. *Gardiner.*)

On leaves of *Hedera Helix* (Ivy), in spring.

Tay (Forfarshire).

III. Dendrophoma, Sacc.

Like *Phoma*, except in the branched or toothed basidia, each bearing several sporidia.

*39. **D. phyllogena**, Trail. (D. and R. *Trail, Sc. Nat.* 1887, p. 87.)

On dead spots on leaves of *Ilex Aquifolium* (Holly), at Aberdeen.

Dee.

IV. Asteroma, D.C.

Pycnidia very minute, sub-globose, sometimes confluent, on radiating fibrils. Sporidia one-celled, hyaline, ovoid, or shortly cylindrical.

*40. **A. Padi**, Grev., 1201, C. 441, M. 1166. (D. and R. *Greville.*)

On leaves of *Prunus Padus* (Bird Cherry).

Tay, Argyle, Dee, Moray.

*41. **A. Ulmi**, Klotsch, 1248, C. 448, M. 1164. (D. *Klotsch.*)

On leaves of *Ulmus campestris* and *U. montana* (Elm).

Dee, Moray.

*42. **A. Prunellæ**, Purt., 2257, C. 451, M. 1165. (D. *Fergusson.*)

On leaves of *Prunella vulgaris.*

Tay, Dee.

*43. **A. juncaginearum**, Rabenhorst, 1283. (D. and R. *Trail*, no previous record.)

On scapes and leaves of *Triglochin palustre*, in peat mosses near Aberdeen, in winter.

Dee.

Spots at first olive brown, then black and shining, smooth, often 12 mm., or more, in length, with dark-branched fibrils radiating outwards in bundles. Among these lie scattered minute dark pycnidia.

France, Belgium, Germany.

V. Neottiospora, Desm.

Pycnidia immersed, depressed-globose, with an orbicular or

irregular aperture, membranaceous. Sporidia oblong-fusoid, penicillate-setulose at the tip, hyaline.

44. **N. Caricum**, Desm., 1294, C. 165, S.M. 3068. (R. in *Grevillea*, 1885.)
In dead leaves of *Carices*.
Moray.

VI. Vermicularia, Fr.

Pycnidia usually erumpent, membranaceo-carbonaceous, globose conical, at length more conical, with the pore at the tip, or without a pore, *covered with rather long, rigid, septate, sooty-coloured hairs.* Sporidia in the type cylindrical-fusoid, often unequal-sided, hyaline; basidia various, usually simple, but in some bearing several sporidia.

*45. **V. trichella**, Fr., 1329, C. 179, M. 1120. (D. and R. *Greville.*)
On petioles and blades of leaves of *Hedera Helix* (Ivy).
Forth, Dee.

46. **V. dematium** (Pers.) Fr., 1336, C. 180, M. 1119. (D. *White*, R. in *Mycol. Scot.*)
On dead herbaceous stems.
Tay.

47. **V. atramentaria**, B. and Br., 1345, C. 182, M. 1121. (D. *Keith*, R. in *Mycol. Scot.*)
On decayed potato stems.
Moray.

VII. Rabenhorstia Fr.

Pycnidia sunk in substance of stroma, which is leathery-carbonaceous, splitting near the apex, the upper part falling off with the bark. Sporidia ovoid or oblong, hyaline, stalked.

48 **R. Tiliae**, Fr., 1427, C. 314, M. 1169. (D. and R. *Johnstone.*)
On dead branches of *Tilia* (Lime).
Tweed (Berwick).
This is regarded as the spermogonium of *Hercospora Tiliae.*

49. **R. rudis**, 1429, C. 315, M. 1168. (D. *Carmichael.*)
On dead branches of *C. Laburnum.*
Argyle (Appin).

VIII. Cytospora, Ehrenb.

Stromata subcutaneous or erumpent, conical or verrucose, internally showing unequal spaces (sometimes abortive), often arranged in a circle. Sporidia very abundant, oblong, sausage-shaped, sub-hyaline, expelled, when moistened, in tendrils of various forms; basidia various. The fungi referred to this genus are mostly spermogonia of *Valsa*, and of other genera of *Pyrenomycetes*, with sausage-shaped spores.

50. **C. chrysosperma** (Pers.) Fr. 1519, C. 332, S.M. 3069. (R. in *Grevillea*, xiv., 64.)

On decorticated branches of *Populus alba* (White Poplar). Clyde.

*51. **C. leucosperma**, Fr., 1561, C. 342. (D. and R. *Trail*, no previous record.)

On dead twigs of Wild Roses, near Aberdeen, in winter. Dee.

Mentioned in Cooke's Handbook as the spermogonium of *Valsa ambiens* (No. 2475); but Saccardo gives *C. ambiens*, Sacc. (not yet recorded from Scotland), as belonging to this Valsa.

*52. **C. carphosperma**, Fr., 1594, C. 331, S.M. 3069. (D. and R. *Trail*, *Sc. Nat.* 1886, p. 265.)

On dead twigs of *Pyrus communis* (Pear), and of *P. Aucuparia* (Rowan or Mountain Ash), near Aberdeen. Dee.

This also is mentioned in Cooke's Handbook as belonging to *Valsa ambiens*.

*53. **C. foliicola**, Lib., 1602, C. 337, S.M. 3032. (D. and R. *Trail*, *Sc. Nat.*, 1885, p. 128.)

On stems and dying or dead leaves of *Vinca minor* (Lesser Periwinkle), near Aberdeen, in winter and spring. Dee.

*54. **C. Laurocerasi**, Fuckel, 1603, C. 355. (D. and R. *Trail.*)

On dead leaves, and var. *ramulorum*, Sacc., on dead branches, of *Prunus Laurocerasus* (Cherry Laurel), near Aberdeen, from autumn to spring. Dee.

IX. Ceuthospora Greville.

Stroma subcutaneous, then erumpent, conico-truncate, subcori-

aceous, plurilocular, the loculi opening into a common outlet; sporidia subcylindrical, usually nearly straight, hyaline, escaping in a tendril. Very near *Cytispora*, differing in little save more regular loculi and straighter sporidia.

*55. **C. phacidioides**, Grev., 1618, C. 360, S.M., 3070 (D. and R. *Trail*, 1886).

On dead leaves of *Ilex Aquifolium*, along with *Phacidium Ilicis* Fr., to which it has been assigned as a stage.

Forth, Dee.

56. **C. Lauri**, Grev., 1628, C. 36, M. 1175 (D. and R. *Greville*).

On dead leaves of *Laurus nobilis* (True Laurel).

§ 2. PHÆOSPORÆ.

Sporidia, as in *Hyalosporae*, save in being olivaceous or sooty brown.

X. CONIOTHYRIUM Corda.

Pycnidia, small subcutaneous-erumpent, or almost superficial, globular or depressed, papillate, membranaceous, or (rarely) subcarbonaceous, dark. Sporidia globular or elliptic, minute; basidia short and slender, or wanting. (*Sphaeropsis* differs from this genus only in the larger and firmer pycnidia and the longer basidia, bearing larger sporidia usually.)

*57. **Hederæ** (Desm.) Sacc., 1728, C. 166 (D. and R. *Trail*, *Sc. Nat.* 1887, p. 90).

On leaves and dead twigs of *Hedera Helix* (Ivy).

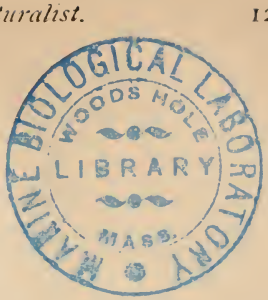
Dee (Aberdeen).

Phoma Hederae Desm. 1210, (in Cooke's Handbook). Pycnidia scattered, lenticular, covered with darkened epidermal cells; sporidia, sub-ovate or angular by pressure, 5-8 by 4-6, olivaceous or brown, with one or two paler guttulae.

*58. **C. conoideum** Sacc. 1789, S.M. 3071 (D. and R. *Trail*, *Sc. Nat.* 1886, p. 266).

On dead stems of *Angelica sylvestris*, along with *Leptosphaerias conoidea*, of which it is probably the spermogonium; common.

Dee.



THE BOTANICAL EXCHANGE CLUB OF THE BRITISH ISLES.

REPORT FOR 1886.

THERE is much in this Report to interest all British botanists; but we shall restrict our remarks to the records of Scotch plants, of which a number of varieties are here noticed; but shall not usually quote Mr. Beeby's collections from Shetland, already described in this Journal. "**Ranunculus acris L.**, var. **tomophyllus Jord.**, Balta Sound, Unst, Shetland, 17th August, 1886; a dwarf form, rarely exceeding four inches in height; W. R. Linton." "**Nuphar luteum Sm.**, var. **intermedium**, Lochan, near Tyndrum, Mid-Perth, 22nd July, 1885; J. Groves." "**Lupinus perennis L.** Thoroughly naturalised on the heath at Feavel, Sandwich, Orkney; H. H. Johnston." Mr. Johnston states in a note that the lupines had escaped from a cottage garden more than twenty years ago, and that they are exterminating the native plants of the moorland. "**Peucedanum Ostruthium** Koch, Loch Cannor, Aberdeen, Aug., 1879; Eliz. Lomax" (An escape, or planted? **Ed. Scot. Nat.**). "**Hieracium anglicum Fr.**, and **H. iricum Fr.**, Hoy, Orkneys, 10th August, 1886; W. R. Linton." "**Leontodon autumnalis L.**, var. **pratensis Koch**, Orkneys, 1886; W. R. Linton, S. Aberdeen, 1885, H. E. Fox." "**Primula Scotica Hook.**, hilly pasture, Sandwich, Orkney. Acaulescent plants produced scapes the first year under cultivation, and one plant in the wild state flowered twice in the same year, first with pedicals (var. *acaulis*), and second with a scape (*P. scotica*). It is therefore evident that the acaulescent character does not constitute a true variety, and the var. *acaulis* should be omitted from the next edition of the London Catalogue; H. H. Johnston." "**P. Scotica Hook.**, var. **acaulis**, Lond. Cat., Melvich, W. Sutherland, 11th July, 1886, F. J. Hanbury." "**Gentiana Amarella L.**, forma **multicaulis** Lange, Burrafirth Sands, Unst, Shetland, July, 1886. Differs notably from our chalk plant in the colour of the flowers, which is brownish-red externally, and cream or pale greenish-yellow internally. Corolla-lobes always erect, not spreading in this locality; W. H. Beeby."

Plantago maritima L., var. **hirsuta Syme.** "Serpentine Hills, Unst, 26th July, 1886; W. H. Beeby. Var. **minor Hook.** and **Arn.**, Hoy, Orkneys, 9th August, 1886; W. R. Linton. There is a difference between these two plants which I did not notice till rather too late. The Shetland plant has linear leaves, with a good deal of silk about their base. The silk is absent

from the Orkney plant, which has broader leaves and is very hirsute. Mr W. H. Beeby tells me that Dr. Lange has said on his plant: 'Probably var. *hirsuta* Syme, but I have seen no authentic specimens.' Mr. Charles Bailey, whose opinion I invited, writes: 'The Rev. W. R. Linton's *P. minor* is clearly the same as Dr. Boswell's *hirsuta* of E. B. Mr. Beeby's plant does not strike me as the same. My first impression was that it was *P. monosperma* Pourr., but it does not agree in the fruit. I have looked through all my *Plantagos*, and cannot match it. It does not agree with *P. alpina* L., nor *P. montana*, nor *P. subulata* L., nor *P. lanceolata*, var. *dubia* Ram., though it has somewhat the aspect of the latter.'"

Scirpus uniglumis Link. Salt marsh, near Ollaberry, Northmaven, 23rd July, 1886; W. H. Beeby. By the Wick River, Caithness, 7th July, 1886; F. J. Hanbury.

Carex curta Good., var. alpicola Wahl., Ben Lawers, 19th August, 1886; H. & J. Groves. Caenlochan, Forfar, July, 1885; H. E. Fox. "The plant so named in Britain; whether we have true *vitilis* Fr., I much doubt, and Dr. Boswell expressed the same opinion in one of our Reports some years ago. The two plants are certainly not like my *vitilis* Fr., from Sweden and Lapland."—Arthur Bennett. Deyeuxia strigosa Kunth, Loch Duran, Caithness, 6th July, 1886.—F. J. Hanbury. Equisetum sylvaticum L., var. capillare Hoffm. "Woods near Dunphail, Morayshire, 14th July, 1886. New to Great Britain."—F. J. Hanbury. "Judging from the one specimen sent, I see that the variety stands in the same sort of relation to the type as *E. fluviatile* to *E. limosum* L. The term *capillare* well describes the *hair-like* branches, which are all much attenuated, extending 3 in. and 4 in. from the whip-like stem. The internodes of the branches, too, are lengthened out, and average about a quarter of an inch. The specimen is a barren stem. The branchlets are generally ascending slightly, and comparatively few are recurved. Nyman (*Consp. Flor. Europ.*) does not separate it as a variety."—E. F. Linton. Chara fragilis Desv. var delicatula A. Br., "Loch of Harray, Orkney Isles, 7th August, 1886."—W. R. Linton.

The following records are additions to county-lists in *Top. Bot.*, Ed. II., and in the *Reports* of the club:—*Arctium nemorosum* Lej., in Caithness (W. R. Linton); *Hieracium tenellum* Backh., and *H. globosum* Backh., both in Easterness (James Groves); *Potamogeton nitens* Weber, and *Carex capillaris* L., both in Caithness (F. J. Hanbury); *C. rariflora* Sm., E. Perth (Ewing and Bennett); *C. Oederi* Ehrh., W. Sutherland (Marshall and Bennett).

PUBLICATIONS OF SCOTTISH SCIENTIFIC SOCIETIES.

THE TRANSACTIONS AND JOURNAL OF THE PROCEEDINGS OF THE DUMFRIESSHIRE AND GALLOWAY NATURAL HISTORY AND ANTIQUARIAN SOCIETY :—

Sessions 1883-84, 1884-85, 1885-86, (Published 1887).

WE are glad to see so good evidence as this publication affords of the well-being of the most southern of Scotch Natural History Societies. The range of subjects is wide and varied, including local antiquities, as well as the Natural Sciences ; and the contributors of papers are drawn from a wider circle than in a good many Societies of the same kind. A good feature in the meetings is the exhibition of specimens, especially of such as have been newly discovered in the district. We have had the opportunity, in former issues, of noticing the progress of the Society from newspaper reports ; but we are now enabled to estimate more clearly the work that it has done during the three years, and its prospects of continued prosperity.

The scientific papers read were as follows :—

In 1883 : **The Sociological Value of Entomology**, by D. Sharp. M.B ; **The Museums of Brussels**, by J. Gibson Starke ; and **Ornithological Notes** (pp 6-7), by W. Hastings. In the latter paper are noted the occurrence of a female Black-tailed Godwit (*Limosa ægocephala*), a Ring-ouzel (*Turdus torquatus*) with a white head and neck, a male Shoveller (*Spatula clypeata*), and a Red-breasted Merganser (*Mergus serrator*), as well as an unusual abundance of the Great Black-backed Gull (*Larus marinus*) and of the Short-eared Owl (*Asio accipitrinus*).

In 1884, in a paper on **First Blossoming of Wild Flowers in Tynron during the summer months of 1882 and 1883** (p. 8.), by James Shaw, the conclusion come to is that "Generally speaking, the vanguard of any given species came to the front a fortnight later in 1883" than in 1882. **Zymotic Diseases, their Cause and Cure** (pp. 12-14.), by J. Wilson, gives a resumé of the recent views in regard to the part filled by Bacteria in zymotic diseases, of the modes of propagation and distribution of these micro-organisms, and of the best methods for combatting them. **The Destruction of Beasts and Birds of Prey** (pp. 14-18.), by W. J. Maxwell, deals with a subject of so great practical value that we venture to print it in full in another part of this Journal (p. 102). A

Geological sketch of Annandale (p. 36.), by George Johnstone, is of local interest. **Notes on Local Ornithology** (pp. 45-46.), by W. Hastings, mentions a young Barn-owl (*Aluco flammeus*), found in December, still in the down, and not more than three weeks old, a white crow and a blue crow (species not stated), a domestic hen with spurs and plumage of a cock, a pure white partridge, and a grey plover (*Squatarola helvetica*). **Remarks on the recent Additions to the Flora of Dumfriesshire and Galloway** (pp. 47-50.), by F. R. Coles, includes additions to the lists in Mr. M'Andrew's "Flora" of these counties, which was compiled in 1882. These additions are of much interest ; but have already been included in the *Scottish Naturalist* in Mr. Bennett's "Additional Records," with the exception of certain varieties. **Notes on the Flora of Upper Nithsdale, and Additions to the Flora of Dumfriesshire** (pp. 50-56.), by A. Davidson M.B., are valuable contributions to the botany of the South-west of Scotland ; the more important additions have also been mentioned by Dr. Davidson in a paper in this Journal. **Dates of Blossoming of Plants in Tynron** (p. 56.), by J. Shaw, continues observations made during the previous year, and states that April 1884 was about a week in advance of April 1883, but in June the roses were a week behind 1883, and in the beginning of July the heather was about a fortnight behind ; but the flowers in the end of July were almost abreast of those of 1883.

The papers read in 1885 were as follows :—

Notes on some Trichoptera from the Stewartry (pp. 57-58), by J. J. King ; in this paper 47 species are enumerated and localities are given. **The Broads and Fens of East Anglia** (p. 72), by A. Bennett, F.L.S. **The Influence of Trees on Rainfall and Climate** (pp. 72-74), by P. Gray. **The Rocks of the Moffat District and their Fossil Remains** (pp. 75-82), by James Dairon, F.G.S., is an interesting sketch of this district, so well known for the curious fossils, Graptolites, that occur in its Silurian shales. **A Leaflet from the Book of Nature** (pp. 87-93), by F. R. Coles, is an excellent popular account of what is to be found in any good locality by the seeker for shells and mosses ; though the impossibility of giving popular names to minute objects, and the necessary use of numerous "lang-nebbit" scientific names, may, perhaps, rather frighten the tyros. **The Arctic Shell-beds of the Clyde** (pp. 93-94), by R. W. Macfadzean, describes the post-tertiary deposits at Garvel Park, Greenock, and mentions the species of fossils found in them. **Ancient Lake Dwellings of Scotland** (pp. 94-95), by G. F. Black, mentions eight Dumfriesshire localities where these dwellings have been discovered.

A List of Kircudbright Land and Freshwater Molluscs (pp. 103-108.), by F. R. Coles, V.P., enumerates all known to the

author as found in the county, with a historical sketch of the progress of Conchology in the district. The number of species is 44, out of 132 British. Mr. Coles appends to his list an interesting paper upon the habitats most in favour with these Molluscs, and the methods to be employed by the Conchologist.

A Day on Ben Lawers (pp. 108-109.), by J. M'Andrew, describes a visit to that paradise of botanists on 18th July 1885. **The Botany of the Sanquhar District**, (pp. 109-112.), by Dr. A. Davidson, adds considerably to the previous records for that district in both species and varieties. **A list of the Birds of Tynron Parish** (pp. 113 121.), by T. Brown, contains the names of 86 species, a large proportion for an inland parish with no lochs. There are valuable notes on many of the birds, the result of Mr. Brown's personal observations ; many of them are on the habits connected with nesting. The association of *three* Rooks in the same nest was noticed in two cases, in each of which the nests had to be guarded against the attacks of thievish neighbours. Two magpies were once found attacking a half-grown hare, and had seriously injured it. The dates of the Cuckoo's arrival are noted every year from 1876 to 1885 ; the earliest date was April 21st, 1883, the latest May 7th, 1884.

Mr. W. Hastings continues his **Notes on Local Ornithology** (pp. 121-123.) for 1885.

1886 :—**A Gossip about Lichens** (pp. 142-143.), by P. Gray. **Botanical Field Notes for 1885** (pp. 145-148.), by J. Fingland, is a contribution to the Botany of Nithsdale, enumerating a considerable number of plants ; several of them are markedly characteristic of the western side of the British Islands, being rare or unknown in the eastern half of the country. **Recent Additions to the British Flora** (pp. 148-153.), by Ar. Bennett, F.L.S., is a statement, with numerous notes, of recent additions or corrections to the British Flora. The Scotch species have already been noticed in Mr. Bennett's papers in the *Scottish Naturalist*.

Excursions of the Society during the summers of 1884, 1885, and 1886, were made to various places of interest in the counties. They were largely attended ; and were productive of good results, as proved by the reports at the end of the present volume. Lists of the plants, insects, &c., observed are given ; but space forbids our entering into a detailed notice of them.

TRANSACTIONS AND PROCEEDINGS OF THE EDINBURGH BOTANICAL SOCIETY—Vol. XVI., Part II., pp. 181-300, 1886.—The articles in this part are varied and interesting. Several deal with exotic Botany ; but we shall almost confine our notice of the papers to those that refer to the Botany of Scotland or to Scotch botanists.

The address of the Chairman (Mr. Boyd of Faldonside) is entitled, **Some Remarks on the Study of Mosses.** Then follow **Obituary Notices** of Professor John Hutton Balfour, M.D., Messrs. Isaac Anderson-Henry, Rev. George Macfarlane, and T. C. Archer, Director of the Museum of Science and Art in Edinburgh. The other papers may be grouped as follows :—**Report on Australian and New Zealand Plants grown on the East Coast of Arran,** by Rev. D. Landsborough ; **Report on Temperatures and Open-Air Vegetation at the Royal Botanic Gardens, Edinburgh, from July, 1884, to June, 1885,** by Robert Lindsay, Curator; **Report on Temperature and Vegetation in the Garden of the Royal Institution of Glasgow during 1884-1885,** by R. Bullen, Curator.

Note on Asplenium Germanicum, by John Lowe, M.D. ; (experimental cultivation of plants from the Maloja Pass produced every intermediate form between *A. germanicum* and *A. septentrionale*).

On Some New Cases of Epiphytism among Algæ, and **Preliminary Note on the Evolution of Oxygen by Seaweeds,** both by John Rattray, A.M., &c.

On the Occurrence of Carex salina Wahlnb., b. Kattegatensis, Fries, in Scotland, by A. W. Bennett, F.L.S.

The following should also be mentioned, though not relating to Scotch Botany specially :—**Notes on some of the Larger Palms in the Palm-stove of the Royal Botanic Gardens, Edinburgh,** by Robert Lindsay, Curator.

On the Development of Bifoliar Spurs into Ordinary Buds in Pinus sylvestris, by Prof. Dickson, M.D.

Haberlandt's Views on the Physiological Functions of Plant Tissues, by G. F. Scott Elliott, B.A.

Report of Excursion of Scottish Alpine Botanical Club to Teesdale and Kirkby Lonsdale, in 1884, by William Craig, M.D.

SCIENTIFIC JOURNALS.

SCIENCE GOSSIP.—1886 (*April-Dec.*)—Nothing relating to Scotland.

1887 (*February.*)—Axinus Croulinensis, dredged, by Mr. A. Somerville, in about thirty fathoms' depth in Gair Loch and Loch Broom.

ZOOLOGIST (*April*, 1886).—Notes and Observations on British Stalk-Eyed Crustacea, by Edward Lovett, enumerates and describes the recorded British species of Crangon; and mentions Scotch localities for most of them. Habits of the Arctic Skua (Lestris parasiticus) as observed in Caithness, by W. Reid. (*May.*) Sexual Characters in the Salmonidæ, by J. A. Harvie-Brown, records the capture of two salmon in a river in N. W. Ross-shire, both having the horny projection on the lower jaw, yet both females, containing well-developed ova. Review of "Rough Notes on the Birds observed during twenty years' shooting and collecting in the British Islands," by E. T. Booth (this work relates largely to observations made during residence in Scotland). (*June.*) Unrecorded Occurrence of the Bluethroat in East Lothian, by George Pow (shot in May or June, 1868, at Belhaven, Dunbar, and preserved there). (*July.*) Snow Bunting Breeding in Scotland, by J. A. Harvie-Brown (records the young being found in the nest, in the Highlands). (*August.*) Opah or Kingfish (Zeus luna) in Shetland (the specimen was exhibited in the Colonial and Indian Exhibition). (*September.*) Rooks nesting on chimney tops (in Thurso), by L. H. Irby. The Tree-Sparrow in Skye; Iceland Falcon in Skye; and Late Retention of Winter Plumage in the Guillemot, near Oban, on 25th June, all by Rev. H. A. Macpherson. Rare Starfish (Asteronyx Loveni) off Aberdeen, by George Sim (not George *Linn*, as printed in *Zoologist*). (*November.*) Report on Migration of Birds in Spring and Autumn of 1885. (*December.*) The Yellow-browed Warbler (Phylloscopus superciliosus) in Shetland (on 25th Sept., 1886), by J. A. Harvie-Brown. Black-headed Gull and Common Scoter in Skye, by Rev. H. A. Macpherson.

1887 (*January.*)—On the Breeding of Arctic Birds in Scotland, by Henry Seebohm, notes as breeding in Scotland the Snow Bunting, Ptarmigan, Red-necked Phalarope, Whimbrel, Greenshank, and various sea birds, and accounts for it, and points out that these birds breed in climates with a July isothermal a little below 60° F., which holds for Scotland, but not for the European continent till a far more northern latitude is reached. Snow Bunting on Ben Nevis in Summer, by E. C. Moor. Distribution of the White-bellied Brent-goose, by H. A. Macpherson, records one shot in Skye, in October, 1886. (*February.*) Waxwing in Aberdeenshire (near Lumphanan, in December), by George Brown. Curlew Sandpiper and Spotted Crake in Shetland, by J. T. Garriock. (*March.*) On the former existence of Ptarmigan in South-West Scot-

land, by Robert Service, shows evidence that Ptarmigan were natives of Dumfries and Kirkcudbrightshires till the end of the first quarter of the nineteenth century.

ENTOMOLOGISTS' MONTHLY MAGAZINE (*April*).—**Anchomenus Sahlbergi Chau, a Beetle new to Europe,** by Rev. W. W. Fowler; identified from a male and two females in Dr. Sharp's collection, taken by Mr. Henderson twenty years ago, on the Clyde below Glasgow; previously known only from Eastern Siberia; described with diagnosis from closely allied species. (*June.*) **Notes on British Tortrices,** by Charles G. Barrett, notes that in a series of *Sericoris alternana* from Scotland were several, agreeing exactly with types of *metallicana* Hübn.; showing that *alternana* is a variety of *metallicana*. **Heydenia auromaculata in Shetland, a species new to Britain,** by C. G. Barrett (distributed as *Œcophora flavimaculella*, by Mr. M'Arthur). (*July.*) **Cæcilius piceus Kolbe, and C. Burmeisteri Brauer in Scotland,** by J. J. King. **Scottish Hemiptera,** by J. W. Douglas. (*October.*) **List of British Tipulidæ, &c., with Notes,** by G. H. Verrall, runs on through the numbers for November and December also. (*December.*) **Notes on some Spring-frequenting Trichoptera,** by Kenneth J. Morton. **Cafius fucicola in Scotland,** by R. F. Logan. **Note on Scotch Coleoptera,** by A. Beaumont, enumerates a few species from East of Scotland.

1887 (*January.*)—**Supplement to Annotated List of British Anthomyidæ,** by R. H. Meade. **Scottish Coleoptera,** by R. F. Logan, corrects erroneous records of *Malachius viridis* and *Aphodius quadrimaculatus*, both recorded by Murray as on Mr. Logan's authority. (*February.*) **Hymenopterological Notes,** by P. Cameron, notes *Nematus pallipes* Fall. from Aviemore; **List of British Tipulidæ,** &c., by G. H. Verrall, mentions *Orimargi virgo Zett.* from Sutherlandshire, *Antocha opalizans* O. S., abundant in the valley of the Shin, *Molophilus appendiculatus*, Stæ, from Sutherland, *M. propinquus* Egger, from Loch Maree, *Rhypholophus similis* Stæg., near Inverness, *Erioptera flavescens* L., *E. tœnionota* Mg., *E. fuscipennis* Mg., and *E. trivialis* Mg., all as far north as Sutherland, and *Lipsothrix errans* Walk. at Inveran. (*March.*) **Capture of Bradycellus collaris** (on the Pentland Hills, between 700 and 1200 feet above sea-level), by R. F. Logan.

(*April*). **On the life-history of Depressaria ciniflonella Z.** by W. H. B. Fletcher;—a description of the eggs and larvæ, and of the habits of the latter, which fed on *Birch* leaves; the eggs were sent from Rannoch. *Homalota cavifrons* Sharp, (near Edinburgh), by R. F. Logan. **Notes on British Tipulidæ, &c.** ("**Daddy Long-legs**"), **with notes,** by G. H. Verrall, enumerates the following from Scotland:—*Idioptera trimaculata* at Aberdeen, *Ephelia miliaria* in Sutherlandshire, *E. apicata* in Rosshire, *E. submarmorata* sp. n. (described), at Loch Maree. (*May*). (*Notes on British Tipulidæ* contd.) *L. Meigenii* Verr, at Inchnadamph and in other localities in North Scotland, *L. lineolella* sp. n. (described), common.

ENTOMOLOGIST 1885 (p. 22).—**Cidaria flavicinctata double-brooded**, by Elizabeth Cross (moth emerged in November, reared from ova from Rannoch). (p. 75.) **On the Variation of Eupithecia nanata**, by J. Tutt, supports the view that *E. Curzoni* Gregson is a variety of *E. nanata*. (p. 76.) **Eupithecia Curzoni**, by J. B. Hodgkinson, regards it as a variety of *E. satyrata*. (pp. 81-87.) **On some probable causes of a tendency to melanic variation in Lepidoptera of high latitudes**, by Lord Walsingham, supports the theory that the darker colour is advantageous to insects by absorbing more heat, enabling them to benefit more fully by the small amount of available heat during the brief summers, and to fly sooner after emerging from the pupa, so that the sexes thus are more likely to pair early if dark coloured. (p. 122.) **Melanic Variation in Lepidoptera of High Latitudes**, by Herbert Goss, calls attention to certain insects becoming *paler*. (pp. 131-136.) **Nine days at Rannoch**, by Ar. J. Rose, and Oliver C. Goldthwaite. (pp. 229-231.) **Lepidoptera in Argyllshire** (at Kilmartin), by Howard Vaughan, enumerates a good many species, but "does not contain the names of any rarities." (p. 322.) **Melanism in Renfrewshire**, by J. B. Hodgkinson, records black *Thera variata*, *Hypsipetes impluviata*, *Oporabia dilutata*, and varieties, tending to melanism, of several other species.

1886 (pp. 54-57.) **The Lepidoptera of North Knapdale, Argyllshire**, by John Mackay. (pp. 64-65.) **Sphinx pinastri in Scotland**, by W. Edwards, records finding a larva on fir trunk, in Mull, in September, 1860 (from which a moth emerged in July, 1861), and a second larva in the same place in September, 1861. (pp. 217-223.) **In search of Zygæna exulans**, by W. H. Tugwell, is an account of experiences in Aberdeenshire and in Rannoch; but records no novelties for either district. (p. 249.) **Sphinx Convolvuli in Aberdeenshire**, by W. Reid. (p. 279.) **Acherontia Atropos in Shetland**, by Willoughby Gardner.

JOURNAL OF BOTANY, 1885 (*July*).—**Recent Additions to the British Lichen-Flora**, by Rev. J. M. Crombie, F.L.S., enumerates the following from Scottish localities, as added since 1882 (the new species described by Nylander, are recorded and described by Mr. Crombie in *Grevillea*):—

Ephebeia hispidula (Ach.), fertile on Ben Lawers; *Synalissa intricata* (Arn.), Nyl. in *Flora* 1883, p. 534, sperms goniiferous, from Black Craig in New Galloway.

Stereocaulon Delisei Bor., on boulders, Moor of Rannoch.

Thamnolia vermicularis, var. *taurica* (Ach.), on ground, near top of Cairngorm Mountains.

Peltigera scabrosa Fr., on walls, near Corrymulzie, Braemar.

Physcia melops (Duf.) Nyl., on limestone walls, Appin, Argyllshire.

Lecanora (*Placodium*) *elegans*, var. *tenuis* (Mhlnb.), Craig Guie, Braemar.

L. (*P.*) *miniatula* Nyl., on quartzose rocks, at 1950 ft., Morrone, Braemar.

L. (*P.*) *obliterascens* Nyl., on rocks, Craig Tulloch, Blair Athole. (This and the preceding may be only varieties of *L. tegularis* Ehrh.)

L. (*P.*) *scopularis* Nyl., on rocks at Portlethen, Kincardineshire.

L. irrubata, var. *Siebenhaariana* (Krb.), on schistose rocks, summits of Ben Lawers and Craig Cailliach.

L. galactina, var. *deminuta* (Stenh.), on limestone, Craig Guie, Braemar.

L. prosechoidiza Nyl., on maritime rocks, Portlethen, Kincardineshire.

L. subdepressa Nyl., on maritime and mountainous rocks, probably not uncommon in the Grampians, but usually confounded with *L. gibbosa.*

Pertusaria carneopallida Nyl., Glen Lochay, Perthshire.

Schoenus ferrugineus L. in Britain, by F. Buchanan White, M.D.

(*August.*)—**Carex elongata L. in Scotland,** and **Calamagrostis strigosa Hartm. in Britain,** both by A. Bennett, F.L.S.

(*October.*)—**Two New British Plants,** by H. N. Ridley, descriptions, with plates of *Schoenus ferrugineus* from Loch Tummel, and *Carex salina*, var. *kattegatensis* Fr., both previously recorded in the *Scottish Naturalist.* **Astragalus alpinus in Perthshire,** by James Brebner, on a grassy hillslope, on which also grew *Oxytropis Halleri;* in the same article is reported the discovery of *Carex ustulata* from near Loch Lyon. **Pinguicula alpina in Sutherlandshire,** by E. S. Marshall.

(*November.*)—**Botanical Notes of a Tour in Caithness and Sutherland, July, 1885,** by Rev. H. E. Fox, M.A., and Frederick J. Hanbury, F.L.S., is a valuable addition to previous records of the floras of the two counties. **Astragalus alpinus in Forfarshire,** by Arthur Bennett, records specimens gathered by Greville in 1837, and by Sadler "on Craig Maid" in 1872.

(*January*).—**Notes on the British Characeæ for 1885,** by Henry and James Groves, includes the following Scotch records:—*Chara fragilis* Desv. Sutherland, E., *C. aspera* Willd, Forfar (Rescobie Loch); *Tolypella glomerata* Leonh., Caithness (Wester Loch); *Nitella translucens* Ag., Sutherland E. (Lochinver.) **Caithness Botany,** by Anstruther Davidson, contains remarks upon the paper by Messrs. Hanbury and Fox, in the J. B., 1885, p. 333., and adds, *Carex Oederi*, *Scirpus pauciflorus*, *Drosera intermedia*, and *Carex fulva.*

(*March.*)—**Hieracia Notes,** by E. F. Linton. records *H. eximium* as "fairly plentiful at 2700—2800 feet in Corrie Etachan, Aberdeen, south:" *H. nitidum* "Clova, Forfar, 20th August, 1884"; *H. gothicum*, Skye; *H. strictum*, Glenshee, Perth, E.; *H. crocatum*, Uig, Skye. **Caithness Botany,** by Ar. Bennett, estimates the number of species and varieties for the county as not under 600; and gives several new records, which are included in Mr. Bennett's paper in the *Scottish Naturalist*, already published.

(*May*).—**The Distribution of Potamogeton in Britain,** by Mr. Bennett, sums up additions to records in *Top. Bot.* during the two past years; those relating to Scotland are included in Ar. Bennett's paper in the *Scot. Nat.* quoted above. **On Sparganium neglectum,** by W. H. Beeby, notes absence of *S. neglectum* from Scotland. **Botany of Caithness and Sutherland,** by F. J. Hanbury, records *Carex aquatilis* var. *cuspidata* Læst. from Wick River, *Hieracium norwegicum* Fr., *H. pallidum b. Schmidtii* Tausch, *H. murorum b. crassiusculum* Almq. and *c. basifolium*

Almq., *Polygala calcarea* F. Sch. from limestone hillocks at Durness. Mr. Hanbury also records *Carex rigida* var. *inferalpina* Læst. from Little Kilrannoch in Forfarshire, and a *Cerastium*, probably *C. arcticum* Lange from the Cairngorms. **Carex helvola Blytt in Britain**, by Ar. Bennett (see *Scot. Nat.*, April, 1886). *(July.)*—**Notes on the Flora of St. Kilda**, by R. M. Barrington, is an enumeration of all the Flowering Plants found by him in June, 1885. **Notes on British Rubi**, by Prof. C. C. Babington (notes some Scottish forms). *(August.)* -**Notes on British Rubi**, continued. *(September.)*—**The Mosses of Ross-shire**, by H. N. Dixon. *(October.)*—**Flora of Colonsay and Oransay**, by W. F. Miller (enumerates additions to earlier lists of Flowering Plants). *(November.)*—**Caithness and West Sutherland Plants**, by F. J. Hanbury (new records for both counties). *(December.)*—**The Distribution of Potamogeton in Britain**, by Ar. Bennett (gives a few new Scotch records). **New Records**, by Rev. W. R. Linton (enumerates a few plants not in earlier records for Caithness, West Sutherland, Orkney and Shetland.

1887 (*January.*)—**Carex atrata in Easterness** (in the Larig Pass), by H. & J. Groves.

(*February.*)—**Webera cucullata Schwægr. in Britain** (on Ben Attow, Ross-shire, at from 3,500 to 4,000 ft. above sea level), by H. N. Dixon. **Agropyrum violaceum Hornem. in Scotland** (on Ben Lawyers, about 1,000 ft. below the summit, on 30th July, 1878), by J. Cosmo Melvill.

(*May.*)—**Notes on British Characeæ for 1886**, by H. & J. Groves, records from Scotland :—*Chara fragilis* from Shetland, *C. contraria* from Caithness (Western Loch, J. Grant), *C. vulgaris*, Elgin, and var. *melanopyrena*, Caithness (Ben Dorrery, A. Davidson), *Nitella opaca* Ag. Dumfries Sutherland W., Shetland.

GREVILLEA (1885, *March*).—**British Sphæropsideæ**, by M. C. Cooke, records the following from Scotch localities not noted in "Mycologia Scotica." *Septoria Unedonis* Desm. on *Arbutus Unedo*, Glasgow ; *S. Cerastii* Desm. on *Cerastium*, Menmuir ; *S. Hydrocotyles* Desm., Aboyne ; *S. lamiicola* Sacc., on *Lamium*. Glamis ; *S. scabiosæcola* Desm., on *Scabiosa*, Glasgow ; *S. gracillima* Cooke, on *Carex*, near Edinburgh ; *S. Traillii* Cooke, on *Scirpus lacustris*, "Aberdeen (Prof. Traill)" (this seems to be only *S. dolichospora* Trail, renamed, without reason assigned) ; *Leptostroma scirpinum* Fr., on *Scirpus*, &c., Berwick ; *L. herbarum* Link, on herb stems, Kinross, Berwick *Discosia artocreas* (Tode) Sacc., on leaves of *Fagus*, &c., Perth. *(June.)*—**British Sphæropsideæ**, by M. C. Cooke, records from Scotland certain species not included in "Mycologia Scotica" or its supplements, viz. :—*Gloeosporium paradoxum* De Not., on Ivy leaves ; *Libertella betulina* Desm., on Birch bark, at Glamis ; *Didymosporium profusum* Grev., and *Stilbospora macrosperma* Pers., on Oak branches. **New British Fungi** enumerates and describes three from Forres, found by Rev. J. Keith, viz., *Ovularia Doronici* Sacc., *Ramularia Adoxæ* Fckl., and *Septoria Adoxæ* Fckl.

(*September.*)—**British Pyrenomycetes**, by G. Massee, is a revision of

this group, brought up to date, and gives localities. The following are new records for Scotland :—*Claviceps microcephala* Tul. on *Anthoxanthum* and *Holcus lanatus; Hypocrea fungicola* Karst., on *Polyporus*, Darnaway Forest. **British Sphæropsideæ**, *Phoma macrocapsa*, Trail (*Scot. Nat.*, 1886,) is wrongly quoted as *Phoma macrocarpa.* (*December.*)—**British Pyrenomycetes**, by G. Massee, enumerates from Scotland :—*Rhytisma Andromedæ* Fr. on living leaves of *Andromeda polifolia*, Dundee.

(1887, *March.*)—**British Pyrenomycetes**, by G. Massee (continued), notes, *Valsa Syringæ* Ntke. on branches of Syringa, from Bot. Gardens, Edinburgh ; *V. pauperata* C. & E., on *Cerasus Avium*, from Jedburgh, and *Diatrype undulata* B. & Br., from Glamis. **Index Lichenum Britannicorum** by Rev. J. M. Crombie, Part I., concluded.

(June.)—**British Sphæropsideæ**, additions, including the records of new British species contained in the April *Scot. Nat.*, and a few other Scotch records omitted from the previous lists by oversight. **New British Fungi**, by M. C. Cooke, notes (with description) ; *Panus patellaria* Fr., found by Dr. Keith on branches of cherry at Forres ; and quotes the descriptions of the new species from the April *Scot. Nat.* Some **New British Discomycetes**, by W. Philips, F.L.S., describes *Dermatea Fagi* sp. n., off Beech bark from Kingcausie, near Aberdeen, in October. **British Pyrenomycetes**, by G. Massee, continued, enumerates *Valsa* (*Chorostate*) *Carpini* Pers., on Walnut, Hornbeam, and Sycamore, from Scotland ; *V. olivaestroma* Cka. on *Cerasus Avium*, from Jedburgh ; *V. syngenesia*, Fr. on *Rhamnus Frangula*, from Forres : *Melanconis chrysostroma* Fr., on branches, from Jedburgh ; *M. Tiliae* Fr., on lime, Jedburgh : *Pseudovalsa convergens* Tode, on *Rubus*, from Berwick.

The second edition of Cooke's "Handbook of British Fungi," continues to appear by instalments with each number of *Grevillea* ; and has now reached No. 762 in the genus *Agaricus*.

REVIEWS.

LARVÆ OF BRITISH BUTTERFLIES AND MOTHS.

AMONG the works published by the Ray Society few, if any, surpass in excellence the volumes issued for 1885 and 1886. These are the first and second volumes of "Larvæ of British Butterflies and Moths," by (the late) William Buckler, edited by H. T. Stainton, F.R.S. The book is one which must take a foremost rank in the already extensive library devoted exclusively to Lepidoptera, though it deals with the insects only in the immature stages, from the egg to the pupa. The names of the author and of the editor are guarantees of the

trustworthiness of the plates and of the text; and to render the latter more complete, the Rev. J. Hellins, so well known among Entomologists for the value of his personal labours in rearing and observing the habits of larvæ,—labours carried on to a considerable extent in conjunction with Mr. Buckler, has written descriptions where omitted by the latter or has supplemented such as were incomplete.

In the preface, the editor explains the origin of this book. We learn that Mr. Buckler was a painter of miniatures, but found that photography destroyed his occupation. In 1857 the services of an artist were required to paint the larvæ of the *Tineina*, for Mr. Stainton's classical work on the "Natural History of the Tineina," and, in reply to an appeal by Mr. Stainton, Mr. Buckler undertook the work. He continued to carry it on for three years, but found his time so much occupied by it as to interfere with other engagements; and he had therefore to resign it. But he had been biassed towards the continuance of this line of study, and in 1858 he began to paint the larvæ of the larger Lepidoptera for his own amusement.

His collection of drawings became large, and he set himself to render it as complete as possible. In this he was much assisted by friends sending to him from all parts of Britain eggs laid by rare insects after capture, and larvæ when found on their foodplants. In this way a very large amount of material was accumulated by him. He painted the larvæ, and usually wrote descriptions of them; but he also left a number of drawings without descriptions. It is these deficiencies that Mr. Hellins has so well supplied in the two volumes before us.

One great difficulty which Mr. Buckler had to contend with was rearing the larvæ when uncertain of the foodplants or plants, and a good many larvæ were lost for lack of information, more especially when they were hatched from eggs laid in captivity.

A number of the descriptions of larvæ were published by Mr. Buckler in the *Entomologists' Monthly Magazine*, but his paintings remained unpublished during his life. Where necessary to complete his series of paintings, he procured from the Continent of Europe eggs and larvæ of such species as he was unable to obtain British examples of in their earlier stages.

At his death, in January, 1884, the Ray Society purchased his drawings, and MSS. from his executor, and undertook their publication; a step for which they deserve the thanks of all lepidopterists.

The plates in the two volumes issued bear evidence to the conscientious nature of the reproduction of Mr. Buckler's figures. Such larvæ and pupæ as are familiar to us in real life are so truly coloured that we cannot doubt the accuracy of those that are seen by few even among lepidopterists. They are drawn of the natural size, and in the natural attitudes; and such varieties are figured as the author could obtain. Many interesting additions to previous records are also made

in the descriptions ; and this work must be regarded as an important advance on what was previously known regarding the metamorphoses of British Lepidoptera. A feature of considerable interest is a list by Mr. G. C. Bignell, of the parasites bred from each species of the Lepidoptera included in each volume.

In Vol. I. are figured the larvæ and pupæ of the British Butterflies, so far as Mr. Buckler could procure them. Of the sixty-four species that may be regarded as native to Britain one, the Large Copper, *Chrysophanus dispar*, has become apparently extinct of late years, and of five other species, *Colias Hyale*, *Argynnis Lathonia*, *Polyommatus Acis*, *P. Arion*, and *Pamphila Comma*, Mr. Buckler did not succeed in procuring specimens, and of three others (*Pieris Daplidice*, *Vanessa Antiopa*, and *Steropes Paniscus*) he had to procure continental specimens. But all the others are figured from British examples,—an approach to completeness that is very noteworthy when we remember how seldom the larvæ of any save a few species are to be seen at all. The larvæ of *Aporia Crataegi*, *Melitæa Cinxia*, *Thecla Pruni*, and *T. W-album* are not described, though figured. It may be said, however, that the immature conditions of every Scotch butterfly are figured and described.

In Vol. II. are included the *Zygænidæ* (except *Nacha ancilla*), the *Sphingina* or Hawkmoths (except *Chærocampa Nerii*), the *Sesiidæ*, the *Ægeriidæ* or Clearwings (except *Trochilium vespiforme*, and *T. allantiforme*) and, among *Bombycina*, the families *Hepialidæ* or Swifts, *Zeuzeridæ* and *Notodontidæ* complete. In this volume, Mr. Hellins has written a large part of the letter press, the appendix by him forming nearly half the text, and notes by him being inserted elsewhere to supplement Mr. Buckler's descriptions where incomplete, with the initials J.H. to distinguish them. It is needless to repeat how much Mr. Hellin's assistance has increased the value of the book.

We grieve to say that Mr. Hellin's death this year, in the 58th year of his age, has brought to a close investigations in which he had made himself an adept, and which rendered his aid so valuable in the publication of Mr. Buckler's work. We trust that his MS. may be incorporated in the book in future as it has been in the volumes already published. We understand that Mr. W. H. B. Fletcher is to take up the work where Mr. Hellin's death interrupted it.

In conclusion, we commend the book to our readers as one that contains much information not elsewhere obtainable, and as including the larvæ of all the Scotch Lepidoptera of the groups yet treated of.

WORKS ON BRITISH FUNGI, HYMENOMYCETES.

Students of the British Mushrooms have no longer ground for complaints that the only English works on their favourite group are several years behind date. A little time ago there was good reason for such a complaint; for the latest work available was Cooke's "Handbook of British Fungi," published in 1871. This work gave a great stimulus to the study of British Fungi; and, thanks to the labours of Mr. Stevenson at Glamis, Dr. Keith at Forres, and other Scotch botanists, very great progress has been made in our knowledge of Scotch Fungi, and has been recorded in *Mycologia Scotica* and its supplements. In England the advance has been even more marked, owing to the more numerous labourers in the field. Moreover, much has been done in comparing more fully the British and Foreign species; and the result has been to render necessary new text books on Fungi to represent as fully as possible the present state of our knowledge. This can be done only by the concerted action of specialists in several groups; since no one man can be expected to know every group of Fungi in its details. We rejoice that such action is now being taken in respect of certain groups.

As regards the *Hymenomycetes*, Dr. M. C. Cooke has for some time been issuing a second edition of his Hand-book in the form of a supplement, separately paged, to each part of *Grevillea*. He has now reached No. 762 in the genus *Agaricus*. The descriptions are intended to accompany his "Illustrations," a very useful series of coloured plates of *Hymenomycetes*, which now numbers 766.

British Fungi, Hymenomycetes.

Of this much-hoped-for work, by the Rev. John Stevenson, Glamis, the concluding volume has recently been issued to subscribers. Its author has been known for years as an assiduous and energetic student of the group of which it treats; and he has been in close correspondence with other mycologists of similar tastes. He has studied with especial care the works of Elias Fries, the prince of mycologists; and the preface informs us that the work under review is founded on Fries' writings, though constant reference is made also to the works of Berkeley, Cooke, Karsten, Phillips, Plowright, W. G. Smith, and other leaders in Mycology.

In translating descriptions by Fries, from Latin, and other foreign languages, the author has received, and duly acknowledges, much aid from Dr. Keith, Canon Du Port, and several other mycologists; and doubtful points have been fully discussed before a decision was arrived at. Only species undoubtedly British have been included; hence a good many, recorded with doubt as regards their determination, or the circumstances under which they were found, are not mentioned. The synonymy is restricted to recent writings and illustrations. Undoubtedly the tendency in mycology towards needless and hurtful multiplication of species has been very marked, and many so-called species will be abolished as knowledge increases. Mr. Stevenson might usefully have indicated where he believes that pruning is desirable.

The first volume includes only three genera, viz., *Agaricus*, with 782 species; *Coprinus*, with 33; and *Bolbitius*, with 7. The numbers given in Cooke's "Hand-book" are 452, 28, and 5 respectively; so that the increase in the number of species in these genera, since the publication of that work, has been extremely rapid. The second volume completes the group of Hymenomycetes. The increase in the lists of British Fungi is almost as marked in this volume, viz., remaining *Agaricini* 361, *Polyporei* 201, *Hydnei* 77, *Thelephorei* 108, *Clavariei* 69, *Tremellinei* 33 (849 in vol. II.), against 214, 182, 44, 72, 55, and 28, excluding certain species as not true *Hymenomycetes*. Thus between 1871 and 1886 the number of known British *Hymenomycetes* has been raised from 1040 to 1673 (including 2 species described by Mr. Stevenson in an appendix to vol. I.).

In regard to the descriptions of the species, they have been modelled on those of Fries, and are excellent, as might indeed be anticipated. It is unlikely that botanists will quarrel with the method of including the diagnosis in the description, but distinguished by italics, despite the author's fear lest they should. The remarks that follow the descriptions, with special reference to the allied forms and their distinctive marks, will be of great use in the employment of the book in field work. Another feature of much value is the woodcut of each subgenus, by W. G. Smith.

In conclusion we have great pleasure in welcoming this work; which ought to give a very great stimulus to the progress of the study of British *Hymenomycetes*, and we hope for the speedy appearance of monographs of a similar kind for other groups.

PROCEEDINGS OF THE EAST OF SCOTLAND UNION OF NATURALISTS' SOCIETIES.

PERTH MEETINGS, 1887.

Abstract Minutes.

21st May, 1887.—The Council met in Perth in the rooms of the Perthshire Society of Natural Science. Six members were present, Dr. Buchanan White being in the chair. The usual formal business was passed. Mr. Sang intimated that, owing to an increase of professional work, he must resign the posts of Secretary and Treasurer to the Union at the next annual meeting. Col. Drummond-Hay was nominated as President-elect for the ensuing year, but was obliged to decline owing to the state of his health. Mr. John Roy, Aberdeen, was thereafter appointed President-elect.

12th July.—A meeting of Council was held in the Museum of the P. S. N. S. Twelve members were present, Dr. Buchanan White being in the chair. The Treasurer submitted his financial statement for the year, and Messrs. Forrester and J. Martin White were appointed auditors. The assessment for the year was fixed at 4d. per member, as before. It was resolved that the Proceedings of the Union should be published in the *Scottish Naturalist* as before, it being left to the Treasurer and Editor to arrange as to details. Prof. Trail was reappointed Editor. Dr. Howden was appointed Delegate for the Union at the Manchester meeting of the British Association. On the motion of Mr. Russell, Largo, it was resolved that the Union shall meet in Largo in 1888.

The Secretary was empowered to have copies of the constitution of the Union printed, and to invite Working Men's Naturalist's Societies to join.

Mr. W. D. Sang having tendered his resignation as Secretary and Treasurer, Professor J. W. H. Trail was appointed to these offices, subject to his acceptance thereof,—Mr. Sang consenting to retain office until the next meeting of Council. A vote of thanks was accorded to Mr. Sang for his past services.

Dr. White having referred to the loss which the Union has sustained by the death of Dr. James S. Crichton, Arbroath, the following minute was unanimously agreed upon :—

"The Council desire to place on record their sense of the great loss that the Union has sustained by the death of Dr. James S. Crichton of Arbroath,—a loss felt not only by the Union, but also by the scientific world at large. In Dr. Crichton the Union has lost a valued member of Council, a zealous worker, and a true friend. The Council are confident that in recording their sincere sympathy with Mrs. Crichton in her bereavement, they are expressing the feeling of every member of the Union."

The ANNUAL GENERAL MEETING was held in the Museum of the P. S. N. S. in Tay Street, Perth, at 20 o'clock (8 P.M.), Dr. Buchanan White being in the chair.

The minutes of meetings since the last general meeting were read and approved; and the Secretary was instructed to forward to Mrs. Crichton a copy of the minute regarding the late Dr Crichton.

Dr. White introduced Mr. Roy, President-elect, who then took the chair, and gave his presidential address. Mr. James Durham read a paper on an Ancient Volcanic Glass found near Newport, Fife, and exhibited a specimen. Dr. White, on behalf of Prof. Trail, presented the annual report on Fungi of the East of Scotland; and on behalf of Mr. Wm. Wilson, jun., Alford, a paper on the Rock Dove of Central Aberdeenshire, and a note on a new form of the Lady Fern, from the Coreen Hills, in Aberdeenshire, for which Mr. Wilson proposed the name Athyrium Filix-fœmina, var. *acrocladon*. The paper was accompanied by a specimen. In the discussion that followed the paper, the President stated that the form had been familiar to him for years, and was not rare. Mr. Henry Coates, on behalf of Prof. Trail, submitted a paper on the Gall-making Diptera of Scotland. Mr. Young, on behalf of Mr. R. N. Kerr, read a paper on the habits of the Dipper. Mr. J. Martin White gave a verbal report on the British Association Meeting of 1886.

Votes of thanks were accorded to the authors and readers of the papers and reports; and a vote of thanks to the President closed the meeting.

In the afternoon the delegates and others were entertained to dinner in the Salutation Hotel by Mr. Robert Pullar, F.R.S.E. A large number of gentlemen were present, and the gathering was most enjoyable and harmonious. The toasts were eminently suitable to the occasion, no less in the manner in which they were proposed than in their nature.

On Wednesday, 13th July, the members of the Union made an excursion to Moncreiffe Hill. The party left Perth at 10 A.M. by train for Bridge of Earn, whence they proceeded to Moncreiffe pond and gardens, the Druidical circle, and the Pictish fort on Mordun Top; and returned to Perth in the afternoon.

In the evening the Perthshire Society of Natural Science entertained the members from other Societies at a Conversazioné in the hall in Tay Street. In the course of the evening two addresses were delivered, viz.:—by Mr. F. W. Young, Dundee, on "Dust and Mist;" and by Dr. Andrew Wilson, Edinburgh, on "Sea Serpents, Real and Imaginary."

REPORT ON THE EXCURSION OF EAST OF SCOTLAND UNION OF NATURALISTS' SOCIETIES TO KILLIN IN 1887.

By R. H. Meldrum.

This excursion occupied three days (Thursday, Friday, and Saturday, 14th, 15th, and 16th July). On Thursday the party proceeded from Perth by rail to Killin Pier; and thence ascended Cam Creag, a spur of Meall-nan-Tarmachan. Here *Kobresia caricina* was found, along with many other interesting alpine plants, including the rare *Gentiana nivalis*, *Sesleria cærulea*, *Carex atrata*, *Salix reticulata*, *Draba incana*, *Tofieldia palustris*, &c. From Cam Creag the party proceeded towards Craig-na-Caillich, gathering on the way *Juncus biglumis*, *Carex capillaris*, *Saussurea alpina*, *Saxifraga nivalis*, *Potentilla maculata*, *Aspidium Lonchitis*, *Lycopodium alpinum*, &c. Crossing Craig-na-Caillich the way was taken to Meall-dun-croisg. Here, in a marshy spot, *Carex limosa*, *Carex pulla*, and *Carex pauciflora* were gathered; and on the rocks *Arenaria verna* was seen in its only Perthshire station. The shortest road to Killin was now taken; and the best plant seen during the descent was *Kobresia*.

On Friday Ben Lawers was visited, the ascent being made from the west side. The rocky ledges near the top were blue, in many places, with the beautiful alpine forget-me-not, *Myosotis alpestris*, while dense cushions of *Arenaria sedoides* clothed the slopes, alternating with equally dense cushions of *Silene acaulis*, which however was past flowering. Here also were observed *Gentiana nivalis*, *Rhinanthus Cristagalli* var. *Drummond-Hayi*, *Arenaria rubella*, *Draba rupestris*, *Veronica saxatilis*, &c. Still nearer the top, *Saxifraga cernua* was seen in its only British station; one or two specimens were in flower. From the top the steep slope was descended towards Loch-na-Cat, and in marshy places near the base several fine speci-

mens of the rare *Juncus castaneus* were obtained. On the rocks at the head of Loch-na-cat, *Saussurea alpina* and *Erigeron alpinus* were gathered; and *Athyrium alpestre* was found among the boulders at the foot of the rocks.

The party now descended the Lawers Burn, gathering on the way *Cornus suecica* and *Vaccinium uliginosum.*

On Saturday the ground explored extended from Lochan-na-lairige to a point on the hills above Killin, whence a descent to the hotel was made. The chief plants seen during the day were *Woodsia hyperborea* and *Cystopteris montana. Kobresia caricina* was again seen, in two localities, and a Meadow Pipit's nest, containing four eggs, was found at an elevation of about 2500 feet.

During the three days spent at Killin the following mosses, besides other commoner ones, were gathered:—

Andreæa alpina, Cynodontium virens, Dicranella crispa, Dicranum fuscescens, Campylopus Schimperi, Distichium capillaceum, Barbula tortuosa, Encalypta ciliata, Grimmia torquata, G. funalis, Tetraplodon mnioides, Splachnum sphæricum, S. vasculosum, Meesia uliginosa, Conostomum boreale, Zieria julacea, Timmia norvegica, Neckera crispa, Habrodon Notarisii, Orthothecium rufescens.

One of the party took a number of photographs of interesting or beautiful scenes in and around Killin. The last detachment of the party, which at first had comprised members from Perth, Kirkcaldy, Forfar, Arbroath, and Montrose, left for Perth on Saturday night, having had a most enjoyable and interesting excursion, and having been favoured with excellent weather.

HISTORICAL SKETCH OF THE FRESH-WATER ALGÆ OF THE EAST OF SCOTLAND.

By John Roy.

(*Being the Presidential Address for 1887 to the E.S.U.N.S.*)

In trying to trace the progress of discovery in a particular district or portion of a country, one is constantly hampered by the carelessness of the older writers in the matter of localities. No doubt many of our plants were known to occur in the N.E. of Scotland at a very early date. But there is no getting hold of definite facts. Indeed, Robert Morrison, who flourished in the 17th century, and who

published descriptions and wonderfully good figures of a large number of plants, does not, so far as I can remember, give a single Scottish locality, notwithstanding that he was a native of Aberdeen, and Professor of Botany at Oxford.

The earliest name that I am able to cite as having done a little to localize a few of our plants is Dr. James Cargill, who died at Aberdeen, in 1614. He published nothing himself; but he was a correspondent of Gesner, Lobel, and Caspar Bauhin. The latter was Professor of Botany and Anatomy at Basil, which chairs were erected for him in 1589; and Cargill was one of his pupils. In his *Prodromus*, he mentions a few Algæ sent by Dr. Cargill prior to the year 1603. These are: *Alaria esculenta*, *Laminaria digitata*, *Rhodymenia palmata*, all of which are still abundant on our coasts; but he also sent, with description, what was at that time called *Fucus maritimus Gallopavonis*, a species which does not appear to have been found on our coasts since. It seems now to be confined to the S. and W. of England. This is the *Padina Pavonia* of modern writers. Lightfoot gives it without any note of doubt, while Hooker and Harvey think there must have been some mistake; though they cannot imagine what species could have been mistaken for it. Neither can I; and further, I am not disposed to think that any mistake was made. According to the testimony of his contemporaries Cargill was not the sort of man to make careless mistakes, such as this would have been. Lobel in his "*Adversaria*" (London Ed. of 1605, at p. 485), under *Lancastriensis Asphodelus luteus* (*i.e.*, *Narthecium ossifragum*) writes thus: "Aliquot mensibus elapsis Nortuegico luteo Asphodelo parem et similem ex Scotia huc Londinum ad me misit peretissimus vir Jacobus Cargillus, doct. medicus, philosophus, anatomicus et botanicus insignis." Other similar statements concerning him might be quoted. I infer that the plant, possibly never abundant on our coasts, has disappeared since his time. It would be easy to cite parallel instances of land plants having disappeared. I may be allowed to quote one example, viz., *Glaucium luteum*, which grew on the coast, a little south of Aberdeen, 120 years ago. It had disappeared 70 years since; and I don't think it is now to be found north of the Forth. As still better adapted to my purpose I shall mention the case of two marine plants. Harvey in *Phyc. Brit.*, vol. iii., figures and describes *Sphacelaria racemosa* Grev., which he states was found in the Firth of Forth, opposite Carolina Park, by Sir John Richardson, before he started on his first Arctic voyage. Only a solitary tuft was gathered and it has not been found there since. In the same work, under *Griffithsia equisetifolia* Ag., the following statement occurs: "First described

by Lightfoot in the year 1777, in his *Flora Scotica*, on the authority of a specimen communicated by Mr. Yalden from the Firth of Forth ; and it is not a little remarkable that, though the plant has been found on most parts of the English and Irish coasts since Lightfoot's time, yet no more recent instance of its occurrence in Scotland has been recorded, nor have I received it from any of my Scotch correspondents." These plants have disappeared from their original localities in comparatively recent times ; and I take it that the existence of the " Peacock's-tail Fucus," on our coasts nearly three hundred years ago, perhaps in much more recent times, is fairly well established. Cargill sent one other Alga to Bauhin, with description, this time a fresh-water one, *Alga bombycina*, which agrees very well with our *Conferva bombycina*, as far, at least, as a merely naked-eye description could be expected to agree ; and this is the first recorded fresh-water Alga from N.E. of Scotland of which I have been able to find any notice.

We then pass over a long interval without any note from the N.E. of Scotland. In 1777 Lightfoot's *Flora Scotica* appeared, but he only adds one to the small list given by Cargill, viz., *Laurencia pinnatifida*, Huds. But an earnest student had been hard at work there before Lightfoot wrote ; indeed he died, at the age of forty-two, the year before Lightfoot visited Scotland ; I refer to Dr. David Skene, who was a correspondent of Linnæus. He published nothing, though he had made extensive preparations. Fortunately, most of his MSS. are still in existence, and a small fragment of his Herbarium, comprising Cryptogams only. His MSS. contain careful descriptions in Latin of a large number of Phanerogams and Cryptogams, the localities being usually given. The whole of his papers and the small remnant of his plants came into the hands of the late Mr. Thomson of Banchory, who had the whole carefully bound in volumes. In a note at the beginning of the little vol. of specimens, Mr. Thomson states that in several cases the labels were lost, in others they had got mixed, in which case the names he had put down were not always to be relied on. I have gone carefully over the Algæ, numbering 43 specimens and embracing 25 species. They are all marine, except one (*Lemanea fluviatilis*). In his MSS. he notes, and in most cases describes, 40, of which four are freshwater species, viz., the *Lemanea*, a species of *Nostoc*, *Œdogonium capillare* and *Chara vulgaris*, which is scarcely a true Alga. Another long barren period follows, broken slightly by the publication of a small list of Marine Algæ, at Aberdeen, in 1814, by James Arbuthnot, jun., of Peterhead. From 1840, onwards, the study of Marine Algæ, always an attractive subject, went on apace ; and the results appeared in the publications of Mr. William

Gardiner, Dundee, Alex. Croall, Montrose, and Professer Dickie, Aberdeen. The publication of Hassall's *Fresh Water Algæ* in 1845, marks an epoch in the study of these obscure organisms, so far as English readers are concerned. This was followed, in 1848, by Kützing's *Species Algarum;* which was succeeded and illustrated by his nineteen volumes of plates. In his *Species Algarum*, he mentions a plant, *Hydrurus fœtidus*, as Scottish; but without citing authority or indicating locality. I have searched through all the books I can think of for information on this point. The plant is not uncommon in other countries, but I wanted the information in regard to our own. Strangely enough, two years ago Dr. Nordstedt, of the University of Lund, and I found it in a locality which is visited every year by numerous botanists, viz., the River Clunie, in the middle of the village of Braemar. Still, of course, that does not solve the difficulty as to Kützing's information. Since the publication of these works not a year has passed without additions of more or less importance being made to our stock of knowledge.

I shall now confine myself to Fresh Water Algæ, particularly to a few groups. I shall first make a remark or two on the *Protococcoids*, which embrace a number of so-called species. They are extremely simple in form, which is more or less spherical. Each plant consists of a single cell either floating freely by itself, or aggregated with others into a more or less mucous mass. And their life history appears to be equally simple with their form. They increase by cell-division; that is, the protoplasm in the cell separates into two divisions; the two halves are pushed apart, and each assumes the spherical form, and floats off free. This operation is repeated again and again. Now the question may be asked, and has been asked: Is this the whole life history of these minute objects, (only a few ten-thousands of an inch in diameter), or is this merely a stage in the history of some higher plant? On this subject Dr. Schaarschmidt, Lecturer in the Royal Hungarian University at Kolosvár, in a recent paper says: "What some years before many conjectured as possible, is by recent observers asserted as true not only for the *Cyanophyceous* but for the *Chlorophyllophyceous* Algæ, viz., that many, if not all, the unicellular species, and some of the composite species of the Cyanophyceous Algæ, and, perhaps, of the Chlorophyllophyceous, are merely stages in the life history of higher plants. These states being fixed, the different forms have been defined and distinguished as different species. It will, probably, be finally found that some of the so-called species of *Glœocapsa*, *Chroococcus*, &c., as also of *Cylindrocystis*, *Protococcus*, &c., have their

own peculiar species of the higher Algæ from which they spring, and into which alone they can develop. In the order of Cyanophyceous Algæ species of *Glœocapsa* are degraded by recent discoveries as subordinate forms of higher Cyanophyceous Algæ, as *Sirosiphon, Oscillaria*, &c. ; *Glœocapsa Itzigsohnii*, Bornet, for example, was proved to be a peculiar state or development of *Sirosiphon Bornettii*, Zopf.

"Whilst no proof whatever has, as yet, been furnished for the vast majority of the Cyanophyceæ, as regards the genus *Cylindrospermum* we will briefly characterize the interesting relation between a minute *Chroococcus* and *Glœothece* and a species of *Cylindrospermum*. The filaments of this plant are composed of cylindrical or more or less globular cells. The spores are much larger than the ordinary cells, from which, at first, they are not readily distinguishable ; but, when the frond has attained a certain age, the spore-cells begin to enlarge, and, finally, assume a form and size apparently fixed ; the matured spores are cylindrical, rounded at the ends, and surrounded with distinct yellowish coats. The relative position of spores and heterocysts is various. The contents of the heterocyst are paler, the colour of the cell-wall yellowish. The cell at first seems merely to elongate until it reaches nearly twice its original length ; then the division commences. A median constriction divides the cells into two daughter-cells, the filaments then assuming a moniliform aspect. The cells are closely connected, no nuclei being discernible, as in *Nostoc* cells. By this process the filament rapidly increases in length ; but at the ends the new joint become further separated until they are almost detached. The separated cells remain together, and form irregular masses, resembling *Synechococcus*. These changes were observed in dried material, but were traced from uninjured filaments, and remind us of the metamorphosis of *Polypothrix amphibia*, Zopf. Besides these filaments we have seen many of Conferva-like appearance, which are composed of cells three or four times as long as broad, filaments with swollen yellowish cell-walls, and filaments composed of thicker-coated cells. The cells of these filaments separate in a similar manner to that before described. The result of the fragmentation (at the ends of the filaments) is a *Chroococcus* or *Glœothece*-form. The *Glœothece*-form springs from the *Chroococcus*-form, that is, from the rounded cells by their repeated division."

The remarks of, and case cited by, Schaarschmidt, aid a little, a very little, in the development of this subject. It would have been more satisfactory had his observations been founded on fresh material. My own position in the matter is simply this : that, while heartily sympathizing with those who hold that these low forms of vegetable

life are stages in the life history of higher plants, and while quite prepared to accept this view, on sufficient evidence being adduced in its favour, still, in the course of my own investigations, extending over a good many years, I have met with nothing whatever to induce me to adopt this theory—nothing even pointing in that direction ; so that, while very willing to be convinced of its truth, my evidence, so far, is entirely negative.

The next group on which I would remark is the *Volvocineæ*. The point I wish to notice is this : that Kirchner and others claim this beautiful and most interesting group of organisms as belonging to the animal kingdom ! I have seen no evidence sufficiently strong to justify the proposed change. Indeed the evidence appears to me to point all the other way. A very good account of the development of *Volvox*, drawn up by Mr. Wills, Birmingham, will be found in Cooke's *Fresh Water Algæ ;* of *Stephanosphæra pluvialis*, by Mr. Archer, F.R.S., Dublin, in the *Proceedings of the Dublin Microscopical Club ;* and of *Sphærella nivalis* (the Red Snow plant of Arctic voyagers) by Dr. Wittrock of the University of Upsala, in Nordenskiold's account of his visit to Greenland. I think we have all the members of this group of plants in our division of Scotland, with one remarkable exception, viz., *Stephanosphæra pluvialis*, which, as far as I am aware, has never been found in these islands, except in one little rock-pool on Bray Head, near Dublin ; where I had the pleasure of gathering it last year in company with the discoverer, my valued friend Mr. Archer. The Red Snow plant, so abundant in many parts of the Arctic Regions, in West Greenland, for instance, where the snow for miles, was designated "The Crimson Cliffs," is exceedingly rare and local in this country. It has been found on Ben Muich Dhu, and was gathered two years ago on Ben Nevis, by Dr. Nordstedt. If there are any old enough snow-wreaths about the back of Ben Lawers they should be examined for it. *Volvox globator* occurs on Durdie Moor, near Perth. We have both it and *V. minor* in the north ; and also both species of *Gonium*, though one of them (*G. sociale*) has been found in one pool only.

Passing on to the *Conjugatæ*, an interesting question has been raised as to sexuality. Do certain filaments represent males, and certain others, females ? If so, are there any certain marks by which they may be distinguished ? These questions have often been raised, but are not easily answered. Mr. A. W. Bennett, in a recent paper, maintains the possibility of distinguishing the sexes in the *Zygnemeæ*. The points he relies on are these four :—1. The difference in the size of the cell ; in the *Zygnemeæ*, the supposed germ-cells being the

larger; while in the *Mesocarpeæ* the contrary is the case. 2. That the portion of the conjugating canal contributed by the germ-cell is shorter and wider than that contributed by the sperm-cell. 3. That the protoplasmic contents of the cells always travel in one direction, that is, that in scalariform conjugation the contents of the cells of one thread invariably pass over into the cells of the other thread with which it is conjugating; and 4. That in *Mesocarpus* the spore which is formed in the conjugating canal never occupies its centre, except in those cases where the spore is large enough to occupy the whole of that space. My valued friend, Mr. F. Bates, of Leicester, answered Mr. Bennett in a paper in "*The Journal of the Quckett Mic. Club*," in a manner so entirely in agreement with my own observations, that I have no hesitation in adopting the reply as expressing my own conclusions. He shows convincingly, as I think, that the points Mr. Bennett relies on to prove his case are untenable. The paper will be found in the part for March, 1885. Microscopists will learn with regret that Mr. Bates has been obliged to give up the use of the microscope.

Another exceedingly interesting group of the Fresh-Water Algæ is the *Œdogonieæ*. Since the investigation of these plants was put on a proper footing by Pringsheim, several years ago, they have been assiduously studied; and by no one more carefully than by Professor Wittrock, whose monograph is the standard work on the subject. Not much, I am sorry to say, towards the investigation of the species comprised in the two genera, *Œdogonium* and *Bulbochæte*, has been done in the district embraced by the Union; indeed, I do not know of any observations prior to my own; and mine are necessarily very fragmentary, and do not represent more than half the species found in Scandinavia, while, I feel sure, the numbers in the two countries should be nearly equal. Any one taking up the study of this beautiful family would enter upon a practically unoccupied field; and numerous interesting discoveries would reward his labours.

I return to the *Conjugatæ* for the purpose of making a few remarks on a remarkable division of that large and important order, one to which I have devoted a little attention, viz., the *Desmidieæ*. These elegant objects, I need hardly say, are very minute, the very largest of them being just barely visible to a sharp eye as a green point; and, therefore, fairly high magnifying powers are required for satisfactorily working them out. I may remind you that they are unicellular Algæ: *i.e.*, each individual consists of a single cell, usually more or less deeply constricted in the middle, and having its halves perfectly symmetrical. The surface is often highly ornate. It is usually

colourless; but is sometimes reddish brown, and is often variously ornamented with minute dots or puncta, shallow depressions, granules regularly arranged, or spines simple or compound. These markings are of specific importance, being practically uniform for the same species. The cell wall is composed of an outer and an inner membrane; and probably the markings are confined to the outer membrane; at least, in a curious species found by myself, which is reddish, and has the cell-wall punctate, the outer membrane slips off, and the inner is seen to be perfectly smooth and colourless. I have hitherto been unable to test this in any other case, but probably it will ultimately be found that what has been proved true in this case will hold good in all.

Desmids increase rapidly by division. At the constriction an outgrowth from each semi-cell is produced, which pushes them further apart as the growth goes on, until the new semi-cells thus formed are as large as the original ones, which they very soon come to resemble, both as to outline and ornamentation. Then the two Desmids, which till now remained attached, part company and float off, two perfect individuals, each composed of an old and a new half. We do not know how often this process may be repeated, or how many new *alter-egos* the original semi-cells may have had. In a few cases they remain attached after dividing, and form long ribbon-like filaments of great beauty. One of these, which I have frequently seen, from N. and S. America, India, and S.E. Asia, but which has not hitherto been found in Europe, *Micrasterias foliacea*, is a superb object. But while a few species form filaments in this manner, the great majority float freely as single individuals,—plants, without root, stem, branches, or leaves, but not always without fruit, though there are no flowers. Two individuals of the same species come near together in some mysterious fashion. A sort of light, transparent, often invisible, mucous veil is thrown around them, or rather exuded by themselves, —each opens slightly at the constriction,—the inner membrane pushes out, and forms a little tube closed outwards,—they soon meet and fuse together. There is now a direct opening from both, and a distinct union. The chlorophyll and protoplasm of each pour out, and the two streams meet in the middle of the joint tube, which rapidly swells, and forms a globular mass, with the now emptied and dead semi-cells attached to it. The cell-wall of this globular mass rapidly increases in thickness; and, though in many it remains smooth, in most species it emits spines, long or short, which are blunt, or acute, and frequently have their tips several times divided. The mass forms altogether a very beautiful, as well as interesting,

object. It is also of the greatest specific importance. For the zygospore, as it is called, presents uniformly the same characteristics for a given species. Hence, if two species of Desmids look so much alike that one might be disposed to consider them to be one and the same species, yet if we find them conjugated, and the zygospores of the two prove different, this shows that they are distinct. It will readily be admitted, therefore, that it is of no little consequence to the investigator to find species conjugated. Still, many species have never been found conjugated, though every year is reducing the number of these. In the vast majority of cases, however, there is little difficulty, with due care, in discriminating species, even when not conjugated. But, when perfected, what is the object of the zygospore, and what becomes of it? Wolle, the author of an important work on the Desmids of the United States (published three years ago), gives as his opinion that multiplication by cell-division tends to impoverish the species, and that the process of conjugation, and the consequent formation of a zygospore, is necessary for its regeneration. I am not prepared to controvert this idea; but I must remark on it that many species that I have never seen to conjugate show no signs of degeneration or impoverishment, by which, I suppose, he means a slight falling away from the type. There must be some reason why the two modes of increase are provided; but apparently it has still to be discovered. As to what becomes of the zygospore, Wolle very well summarizes the views of De Bary, as follows:—"The next step, so difficult to be traced, is the opening of the wall of the zygospore, setting free small spheres of sarcode; as they issue, they enlarge and acquire a gelatinous or thin membranous wall. The wall thickens and the sphere enlarges, the contents constrict, first in one direction, and then transversely to the plane of the first incision; these plants develop and set free two or four new plants, in size and form like the mother cell, except in the cytioderm or membrane; this is not granular, but smooth, and remains so until after the multiplication by division takes place. After the first division, the new semi-cells assume the characteristic granular surface; the result of this first division is two plants, each composed of one granulated and one smooth semi-cell. The second division will make two perfect cells, and two that retain the smooth semi-cell; the third division produces eight cells, all of which except the original two semi-cells will be of typical form."

These views of De Bary were published in his treatise on the Conjugatæ in 1858, and practically no advance has been made since. Notwithstanding the hundreds of zygospores observed by myself, I

have never seen anything like the processes described by De Bary; but I would be more inclined to hold, with Hofmeister, that the various transformations take place in the zygospore itself, and not that portions of the contents escape separately, division taking place afterwards.

A third supposed mode of increase is by means of zoospores. These were detected in one species, *Docidium Ehrenbergii*, by my valued friend, Mr. Archer of Dublin, and published by him in the *Natural History Review* for July, 1860. He describes them as being comparable in appearance and mode of formation to the Zoospores in *Cladophora*, where they undoubtedly propagate the plant, and form young colonies in abundance. He observed them in the month of September. The curious thing is that no one seems to have observed them since. Probably they are formed late in the season when these plants are seldom looked for, and they may therefore be more common than is generally supposed; at the same time, I am bound to state that, though I have collected Desmids at all seasons, I have never seen the zoospores.

The power of movement in Desmids is an interesting point in their history. Probably all their movements depend on the influence of light. It has long been known that if they are covered with mud, and exposed to the light, they will quickly make their way to the surface, which affords the opportunity of securing clean gatherings not otherwise easily made. A peculiarity of this process is a tendency to turn the longer axis towards the light, with the younger half of the cell next it. *Tetmemorus granulatus* often shows a forward movement, and some species of *Closterium*, resting themselves on their tips, sway backwards and forwards for a considerable time. The cause of these movements is not well understood, or rather is not understood at all. Another peculiar state of matters is equally obscure, that namely in which the cell contents become changed iuto a mass of granules moving with great rapidity. This state is best seen two or three days after they have been gathered. It is quite a different state from the movements of the granules seen near the extremities of *Closteria*, and of other genera, which are normal in these plants.

Desmids are to be found most abundantly, in comparatively small, shallow, permanent pools of clear water in open situations. They nestle among the leaves of such plants as *Myriophyllum*, *Utricularia*, *Chara*, *Sphagnum*, &c., or they attach themselves to submerged stems of grasses and other plants. Many interesting species occur in tufts of moss on wet rocks. Others occur abundantly in rapid streams, attached to tufts of *Fontinalis*, and other mosses. One species has

been found on *ice* only, on the glaciers of Greenland and Scandinavia; and a few are pretty much confined to snow, though not exclusively so. They have a very wide range of distribution. Many of our own species are identical with those of Greenland, Spitzbergen, and Novaia Zemlia, on the one hand, and with those of Brazil and India, on the other; and most of the species found in Japan are the same as the Scandinavian, that is, practically the same as our own.

Like the Diatoms, the study of the Desmids and the improvement of the microscope came together. I have been unable to ascertain that anything whatever was attempted in this way in our district, till the year 1840. Mr Ralfs began about that time to make preparations for his beautiful work on *British Desmidieæ*, which appeared in 1848. He had two able assistants in the north, to whom he very frequently refers, the late Professor Dickie, F.R.S., and Mr Peter Grant. The latter has been dead for many years, indeed I never met him. He was an indefatigable collector, and sent material to Ralfs from all parts of Aberdeenshire and Banffshire. Dr. Dickie examined for himself; but was in close communication with Ralfs, to whom he gave much assistance. From 1849 till 1860 he resided in Belfast, and before his return to Aberdeen in 1860 he had practically given up the study of Fresh Water Algæ, having found that of Marine Algæ much more congenial. In the latter department, I need hardly remind you, that for many years he had no superior. This statement satisfactorily accounts for the small list of *Desmidieæ* given in his "Botanist's Guide," amounting, I think, to only about 70. After Dickie and Grant, I am not aware of anyone having taken up this subject systematically, in this district till I began it myself, sixteen or seventeen years ago; and at that time the only other person I knew of who worked at Desmids was Mr. Archer of Dublin; we were mutually indebted to Dr. Dickie for bringing us into correspondence,—a correspondence which soon became close and valuable, especially to me. Since then, students of this subject have become more numerous, though still far too few.

Recently, with the object of perhaps publishing something on Scottish Desmids, and with a view to ascertaining their distribution through the country as accurately as possible, I have been searching for any lists that may have been printed for particular localities. In particular, I looked through the earlier volumes of the Transactions of the Botanical Society of Edinburgh, as likely repositories for such. There I found two lists, both for 1855; the first by Mr. Geo. Lawson, from West Lomond Hill, comprising 29 species, all common; the second from Breadalbane Mountains by Mr. Hugh C. Stewart, com-

prising 18 species, also all common. Then in the contents to Vol. V. I found the following: "List of Desmidieæ observed in the neighbourhood of Dundee," by W. M. Ogilvie, to which I turned eagerly, and to my disgust read the following, instead of the list: "This list embraced upwards of 50 species, many of them rare!" I gave up the quest.

The members of this Union could render great assistance in an investigation of this kind, either by working up the Desmids of their own neighbourhoods, or by sending the material to me. The study is rendered easier now, by the publication of Cooke's "British Desmids," a work which, though defective in many respects, and with figures too frequently not good, will be found of much assistance.

I might perhaps be expected to say something about Diatoms; but in the first place, these remarks have run to a greater length than I intended, and in the second place, anything I could say would be second-hand, for, except in a general way, I do not pretend to know Diatoms.

I now, therefore, bring these somewhat rambling remarks to a close, with the expression of the hope that this Union, young in years, will long continue a strength and a power for scientific impulse and progress in this district.

NOTES ON THE DIPPER, WATER OUZEL, OR WATER CROW.

(*Cinclus aquaticus.*)

By R. N. Kerr, Dundee.

MY object in writing these notes on the Dipper—one of our most interesting and singularly remarkable little birds, is to add a few more proofs against the statement made by several ornithologists that it feeds upon, and, therefore, destroys "vast quantities" of the salmon ova.

It would be presumptuous on the part of any one to say that the dipper *never* eats the ova; but I am of opinion, after fifteen years careful observation, that its doing so is the exception, not the rule.

The cruel hand of persecution has been put forth against this innocent bird; and the result is that in many parts of the country he is rarely seen, except in the loneliest cleuchs and glens.

Jardine in his *British Birds* (Vol. II., p. 7), says: "In the north of Scotland this little bird is persecuted for its supposed depredations; a reward of sixpence is put upon its head; and in one Highland district we have the factor's authenticated report of 548 having been

destroyed during three years." A Mr. Rennie states emphatically "that the dipper *consumes* a considerable quantity of fishes' spawn, and especially of the ova of the salmon."

I have watched this bird in all seasons, taken him even when issuing from the spawning bed at the head of the Coquet in Northumberland, opened him in the presence of his very foes, the watchers, and shown them the little beauty's stomach brimfull of water beetles and larvæ, mixed with minute particles of shells and small stones. Might it not be possible, as one shrewder than his fellows said, that all traces of the ova might have disappeared, being more easily digested. I leave this point for the Analyst and Physiologist. I have followed him and dissected him in localities where he was most likely to be found guilty; but always with the same result. In the stomachs of the young the same ingredients were found; but no traces of ova, and very little trace of small fish.

I have found the nest on the Tees and its tributaries, on the Wear and its rivulets, on the Tyne (Blythe Wansbeek, Coquet, Till), Tweed (Leader, Whiteadder, Blackadder, Garrow), Ettrick, Meggal, Manor Water, Annan, and Nith; among the Cumberland mountains; on the Jed, Gala, North and South Esks in Midlothian; among the streams of the Lammermoor Hills, the Pentland Hills, Moorfoot Hills, in Perthshire, Forfarshire, and Fifeshire. I have also had it sent me from various parts where the bird frequented, and ova were to be found; and have come to the conclusion, not hastily indeed, that the Dipper (cheery songster of some of our most sequestered nooks, known only to the angler and fern hunter) is quite innocent of the grave charges made against him; and that in future all keepers and watchers should be strictly enjoined to leave him alone.

I shall quote in defence of my observations the statements of two of our greatest ornithologists—I say greatest advisedly, because their works are entirely based on a lifetime of close observation.

Mr. Macgillivray says: "that the whole internal anatomical construction of the Dipper precludes the idea of his feeding entirely on soft food. The slightly extensile tongue, sagittate, narrow, and grooved, with its terminal bristle points; the extremely muscular strong-walled stomach, with its dense and tough inner-lining; the whole of the digestive apparatus, all point to harder and less easily digested fare as necessary. The digestive organs, he further adds, are entirely analogous to those of the thrushes and allied genera, but bear no resemblance to those of the Piscivorous birds, the æsophagus being narrow, and the stomach a true gizzard. After a fine defence of the bird, he concludes: "Although I have opened many, I have never

found in them remains of fish or roe; nor does the dung of the bird when left in a place frequented by it ever present an appearance similar to that of the king-fisher."

Again, Mr. John Hancock, Newcastle, in his *Birds of Northumberland and Durham* (1874), page 62, says:

"This harmless frequenter of our brooks has of late been accused of devouring salmon spawn, and in some quarters has been doomed to the fate of all 'vermin.' A few years ago, I examined specimens, that were killed because they were feeding on the spawning ground of the salmon in North Tyne, and found that their crops contained nothing but aquatic insects and their larvæ: no trace whatever of spawn could be detected. In fact, the insects upon which our poor doomed friend had been feeding were much more likely to destroy the fish spawn than it was."

Again, in examining some of the bird's stomachs in the Barras Museum, Newcastle, yesterday, 6th July, I found the following:

"The two birds (Dippers) from which these stomachs were taken, were shot *6th Jan. 1864*, on one of the best salmon spawning grounds in the district, in the neighbourhood of Reedsmouth. The specimens were sent by request, the object being to confute as far as possible an erroneous opinion which was gaining ground amongst fishers that this interesting little bird fed upon the spawn of fish. The stomachs before us show only the remains of insects, stones and shells, no appearance whatever of spawn."

(Signed) John Hancock.

The testimony of two such men is valuable.

Yarrell, in his *British Birds*, gives a very detailed account of the Dipper, but tells us that he *never saw a Dipper alive*, and that in his lifetime he dissected only one specimen which a friend sent to him from Wales. We may consider him therefore, as far as the Dipper is concerned, not a competent authority.

Bewick, in his *British Birds*, remarks in regard to the food of this bird, that it consists of small fishes and insects.

Bechstein says: "When wild it principally subsists on aquatic insects, though it eats also worms and small fish, for which it dives."

Morris says: "The food consists of various water-beetles, and the larvæ of these are its food."

There is another very interesting point still unsettled among naturalists. I refer to the bird's mode of progression under water.

I have watched frequently the deliberately cool way it takes the water. It always appeared to fly through the water, reached the bottom, seemed to struggle to keep itself steady on the stones and gravel, its wings moving rapidly all the time. It remained from fifteen to thirty seconds, then came bounding to the surface like a cork. Its feathers, like those of all aquatic birds, are impervious to water. I pursued a wounded one in the month of December, 1885, and after twenty minutes hard chase, captured him under a bed of thin ice. In the parts of the stream free from ice he dived and reappeared ten yards, sometimes twenty yards further down the water. His movement in the water was none other than flying. His wings are admirably adapted for aquatic flight.

Any one wishing to know for himself the true habits of this bird, must follow it into its native haunts. As a proof of the need of this listen to our authorities, and let him judge who will.

Morris, in his *British Birds*, says, that the Dipper has the power of walking at the bottom of the water is an established fact (?). The argument against its being able to do so is, that to the reasoning powers of some persons it does not seem possible. Its feet are admirably adapted for holding on to the stones over which it makes its way, and for stemming at the same time the force of the current. In its walks it keeps on the bottom as long as you can see it, and doubtless also after you have lost sight of it.

Words to the same effect are used by Lamaire in his "Natural History of the Birds of Europe."

Macgillivray, in his *British Birds*, says, that the assertion that the Dipper walks in the water on the bottom, which some persons have ventured to make, is not made good by observation, nor countenanced by the nature of things. The Dipper is by no means a walking bird; even on land I have never seen it move more than a few steps, which it accomplished by a kind of leaping motion. Its short legs and curved claws are very ill adapted for running, but admirably calculated for securing a steady footing on slippery stones.

Bewick, in his *British Birds*, states, that the most singular trait in the character of the Dipper is that of possessing the power of walking on the pebbly bottom of a river with the same ease as on dry land.

It is a weary waste of time getting up the Natural History of Birds from books. Certainly they have their good uses; but he who would wish to obtain accurate facts must, like Macgillivray, go forth to the woodlands, moors, and river glens, or mountain slopes, and observe for himself, being ever on guard against drawing rash conclusions.

ON COLUMBA LIVIA IN CENTRAL ABERDEENSHIRE.

By Wm. WILSON, Junior.

FROM the interest shown by ornithologists in my note to Colonel H. M. Drummond Hay, informing him of the presence of a dove known as rock dove in the locality where I live, it occurred to me that a short account of the bird might be of interest. It has nested beside the rivulets of the Coreen Hills as long as any one remembers. From two to four pairs reside on each rivulet. They are exceedingly shy, and are continually on the alert; and if disturbed at all while the nests are in course of formation, they generally forsake them. Sometimes, if twice, and almost invariably if four times disturbed, from time the eggs are dropped until they are hatched the birds will forsake their nests and eggs. I know no bird so apt to do so. While it is evident that the wood pigeon is in its element in localities where art has replaced nature, both as regards residence in artificial woods in society, and seeking food on cultivated lands, the form in question remains almost alone, and derives its chief food from natural pastures and moors. When feeding on cultivated fields, and in contact with a flock of wood pigeons, they do not always shun them, but act similarly to rooks and hooded crows, and when disturbed, each pair takes its own way; of course, it is similar when leaving a field when undisturbed.

They are permanently resident, and I have, at one time or other, seen nests at all seasons; if the weather is mild, even in mid-winter. The usual place for the nest is on the rocky or gravelly ledges by the rivulets, where sheltered by the overhanging surface, which, containing roots, &c., is more coherent, and overhangs the looser part of the side of the brae on the sides of most of our Highland rivulets; it being understood that I mean by side of the rivulet not edge of the water, but the edge of the top of the precipice worn out in geological time by the action of the rivulet or other natural causes. Sometimes the nest is made on a birch or willow bush by the side of the rivulet, say in about one case in six or thereby; and once I found a nest on an open hillside, situated like that of a grouse or moor-fowl. The young, when touched in the nest, show temper; when handled, at least before the feathers grow, they are extremely delicate, and sometimes die when held a short time in one's hand. They are very liable to dis-

aster; and a very small percentage are successfully reared by the old birds. These birds seem to be free from being molested by man, and I do not know a case of one being shot, which is most exceptional among our wild pigeons. These facts have been gathered from observations of a number of years.

I shall conclude by giving the result of this year's inquiry up to the time of writing. Examined two rivulets in April, found one nest in formation in the second week, and one nest in the third week, with two eggs. I was attracted by seeing feathers, and found that the bird must have had a narrow escape, as it had been attacked, and got off with the loss of several small and a few wing or tail feathers. I took home, and still have the eggs, which were not touched. In the last week of April I visited the nest first found, roused the bird, and found two eggs. On the other stream I found another nest with two eggs. In the beginning of the last week of May I again visited the first nest, and found young fully fledged. They flew out of the nest, and I captured one with a struggle. The day was extremely cold, and I returned the shivering bird to its nest, exhausted by wet and cold. In a week I visited another nest, found it empty, the eggs having been somehow destroyed. There was the appearance of another nest, in which a fortnight later there was one egg. On my return ten days later there was still only the one egg. The bird had been a few times disturbed, and had left the nest. I afterwards found another nest, this time on a birch shrub or small tree. The nest where a brood had been successfully reared had again been appropriated, and contained a young bird and an egg. The old bird whipped the egg out of the nest; it fell to the ground, and was destroyed. It contained what seemed to be a young one, which had partly formed, and then putrified. I returned in a week, and found nothing in the nest, some disaster having occurred. In the nest on the bush were two young ones. Thus, out of five attempts, only one terminated successfully, showing similar results to previous observations, although not carried out in the same regular way. I may mention that I had a communication from the late R. Gray, Esq., who saw the note about these pigeons in the *Scot. Nat.*, and wished a specimen for examination. I have arranged with G. Sim, A.L.S., Aberdeen, to examine a full-grown bird when one can be got, to ascertain with which of the recognised forms they agree. The birds, as far as I know, have never been examined; and in calling them "rock pigeon" (*Columba Livia*), I have used the local name, and not authenticated that they correspond with the sea-side form. Whatever their structure may be, they are unquestionably of scientific interest, and differ, at least in some respects, as regards

habits from any of the recognised forms of *Columbinae*. Any one wishing to see a nest could scarcely visit the locality at a wrong time during the season from spring to winter. During winter, as already mentioned, nesting goes on only in mild weather.

NOTE ON AN ANCIENT VOLCANIC GLASS NEAR NEWPORT, FIFE.

By JAMES DURHAM, F.G.S.

ANYONE that has concerned himself with volcanic phenomena is aware that lavas, when rapidly cooled, form more or less perfect glasses, *e.g.*, obsidian, pitchstone, or trachyte; just as, when slowly cooled, they form stony rocks, such as andesites and basalts (which are the ordinary road-metals of a great part of the district of the Union); or when extremely slowly cooled they form perfectly crystalline rocks, such as granite in the acid series, or gabbro in the basic.

The capability of cooling into a glass seems to depend to a very great extent upon the quality of the lava. Extremely acid lavas most readily formed the most perfect glasses, often of great extent and thickness; while basalts became glasses, for the most part, only along narrow lines of contact with other rocks, which rapidly deprived them of their heat by radiation and absorption.

Students of volcanic rocks of Palæozoic age have always been impressed with the apparently entire absence of glasses among the ejecta of these ancient volcanoes, even when the stony lava-streams seemed identical with those of recent eruptions.

This absence of glass, along with certain differences of mineralogical structure, induced one school of geologists to come to the conclusion that volcanic eruptions in Palæozoic times were entirely different in character from those of Tertiary and Recent ages.

On the other hand, other geologists continue to maintain that all through the ages volcanoes had behaved just as they do to-day; and explain the absence of glasses, and the other mineralogical differences, as being the result of changes arising in the rocks through chemical and physical actions, prolonged throughout the ages during which these rocks have been buried in the ground.

This rock, which I have the honour of exhibiting to you to-night, strikingly confirms the conclusions of the Uniformitarian School of geologists (mainly British), as in it we have a perfect glass of Palæo-

zoic age, readily recognisable as such by anyone who cares to examine it.

It occurs in this wise. A breccia, that is a confused mass of angular fragments of volcanic rocks, which probably formed part of the crater-cone of a volcano of the Old Red Sandstone age, near Tay Bridge, Newport, Fife, is mostly composed of masses of all sizes of quartz-andesite, one of the more acid members of this intermediate group of volcanic rocks.

In many of the large blocks of the quartz-andesite (or as petrologists call it, Dacite), are hollows of considerable capacity, relatively to the size of the block. It is in one of these hollows, in a huge block on the plain of the beech, that the glass occurs. It mainly fills the hollow; but is surrounded with a considerable quantity of a white powder, which is the glass in its last stage of decay.

That distinguished geologist, Prof. John W. Judd, F.R.S., of the Royal School of Mines, says of this glass :—"It is a unique instance, in the case of a rock of such great antiquity," that "some portions of the glassy base are seen to be quite as free from alteration as any Tertiary or Recent obsidian," and further adds that "most striking and beautiful is the pertitic structure of this remarkable rock. I know of no glass, ancient or modern, which exhibits this structure in greater perfection. This remarkable rock must be classed as a porphyritic and pertitic mica-dacite glass. It appears that this vitreous variety occurs in scattered nests in the midst of the ordinary stony form. I have seen in the lava streams of Lipari similar angular masses of glass, enclosed in the stony rhyotites; and the appearances in both the ancient and the recent rocks suggest that a brittle glassy rock had been broken up and entangled in a more stony cooling mass, that had assumed a stony character. Subsequently this lava itself appears to have been broken-up by a volcanic vent being opened below it; and its fragments thus became enclosed among the ejecta of the later volcano." To put it briefly, Professor Judd finds no essential difference between these modern glassy rocks, upon which he is so famous an authority, and this ancient glass, which has been discovered in the centre of the district of "The East of Scotland Union of Naturalists' Societies."

REPORT FOR 1887 ON THE FUNGI OF THE EAST OF SCOTLAND.

By Prof. JAMES W. H. TRAIL, A.M., M.D., F.L.S.

IN the present Report are included all additions to the Fungi of the district embraced in the Union made between 2nd September, 1886 and 15th August, 1887. Very little information has been contributed by members of the Union; and the localities that have afforded material for it are almost exclusively those worked by myself.

Yet despite the limited area, and the want of co-operation, the number of additions is very considerable, especially from "Dee."

The Scottish Cryptogamic Society held its meetings in Aberdeen from 28th September to 1st October 1886. The dry autumn had been so unfavourable to the larger Fungi that it was resolved not to attempt a show; but several of the larger species were forwarded from Haughton, on Donside, by the kindness of Mr. and Mrs. Farquharson. The excursions of the Society to Drum, Park, and Kingcausie, in the valley of the Dee, also added considerably to the list of Hymenomycetes, a group still very insufficiently wrought up in "Dee;" and Mr. Phillips both added species to the lists by his own investigations, and named for me various Discomycetes that I had laid aside unnamed.

During the year I have revised the groups *Peronosporeæ*, *Sphaeropsideæ*, and *Melanconieæ*, in our Scotch flora; and the results have been, or are being, published in the *Scottish Naturalist.*

In the subjoined lists of additions the families are placed in the same series as in former reports, to facilitate reference to the "Mycologia Scotica."

Additions to the Scotch lists are indicated in ionic letters. The names of species already recorded for the districts, but now mentioned from new food plants, are in italics. † or ‡ prefixed to a name denotes that it has been described since September 1886 in the *Scottish Naturalist.*

PROVINCE OF TAY.

Sphaeropsideae.

† **Phyllosticta scrophularinea** Sacc., on leaves of *Scrophularia nodosa*, St. Cyrus, in October.

† **Phoma melaena** (Fr.) M. and D., on dead stems of *Astragalus glycyphyllus*, St. Cyrus, in April; causes black patches.

† **Ascochyta Lathyri** Trail, on dead leaves of *Lathyrus sylvestris*, St Cyrus, in October.

† **A. microspora** Trail, in spots on living leaves of *Arctium Lappa*, St. Cyrus, in October.

Septoria Tanaceti Niessl, on leaves of *Tanacetum vulgare*, near Montrose, in October.

†**S. cercosporioides** Trail, on leaves of *Chrysanthemum Léucanthemum*, Dubton, in October.

Melanconieae.

†**Marsonia Potentillae** (Desm.) Fisch, var. **Anserinae** Trail, on leaves of *Potentilla Anserina*, Dubton, October.

Uredineae.

Phragmidium Rubi Pers. On leaves of *Rubus corylifolius*, St. Cyrus, October. This fungus is very much less common than *P. violaceum* Sch., the other parasite of this genus on Brambles.

Puccinia Asteris Duby (—*P. Tripolii* Wallr.) on leaves of *Aster Tripolium* shore of Montrose Basin, October.

P. Poarum Niels. On leaves of *Poa nemoralis*, Dubton, October.

Æcidium Asperifolii Pers., on *Anchusa arvensis* and **Puccinia straminis** Fckl. on *Secale cereale* (Rye), both occurred in the greatest profusion in a field by the road between Montrose and St. Cyrus, in October.

Hyphomycetes.

Ramularia calcea Desm., on leaves of *Nepeta Glechoma*, Dubton, October.

Ovularia primulana Thuem., on leaves of *Primula vulgaris*, St. Cyrus, October.

Periconia byssoides Pers., on dead stem of *Astragalus glycyphyllus*, St. Cyrus, April.

Discomycetes.

Rhytisma Andromedae Fr., on leaves of *Andromeda polifolia*, recorded from Dundee in "Grevillea," xv. p. 37.

Pyrenomycetes.

Physalospora Festucae (Lib.) Sacc., in dead leaves of *Festuca elatior*, St Cyrus, October.

Diatrype undulata B. and Br., recorded from Glamis in "Grevillea," xv. p. 69.

PROVINCE OF DEE.

Hymenomycetes.

Agaricus (Tricholoma) imbricatus Fr.		Park.
,,	,, virgatus Fr.	Kingcausie.
,,	,. inamœnus Fr.	,,
,,	(Collybia) distortus Fr.	Park.
.,	(Mycena) galopus Pers.	,,
,,	,, vulgaris Pers.	,,
,,	(Pleurotus) porrigens Pers.	Monymusk.
,,	(Pholiota) aureus Matt.	Haughton, near Alford.
,,	(Inocybe) geophyllus Sow. var. lateritius,	Kingcausie

Agaricus (Psaliota) echinatus Roth.	Park.
,, (Hypholoma) capnoides Fr.	,,
,, ,, epixanthus Fr.	,,
,, ,, appendiculatus Bull.	Haughton.
Cortinarius anomalus Fr.	Park.
,, castaneus Fr.	,,
Lactarius vellereus Fr.	Kingcausie.
Russula adusta Fr.	Park.
,, fellea Fr.	,,
Marasmius ramealis Fr.	Kingcausie.
Lentinus cochleatus Fr.	Haughton.
Boletus bovinus L.	Park.
,, variegatus Sow.	,,
Polyporus elegans Fr., var. nummularius Fr.	,,

Corticium amorphum Fr., on bark of *Abies pectinata*, near Aberdeen, February.

Cyphella ochroleuca B. and Br., on dead Bramble twig, Persley, near Aberdeen, February.

Pistillaria pusilla Berk., on dead *Equisetum palustre*, Corbie Loch, August.

Tremella tubercularia B. and Br., on rotting Beech Branches, near Aberdeen, February.

Myxomycetes.

Chondrioderma radiatum (L.) on dead stem of *Larix europaea*, near Aberdeen, February.

Sphaeropsideae.

†**Phyllosticta Hederae** S. and R., on dead spots in living leaves of *Hedera Helix* (Ivy), near Aberdeen.

†**P. Tiliae** S. and Sp., in spots on leaves of *Tilia europœa* (Lime), in autumn, near Aberdeen.

†**P. Ligustri** Sacc., in spots on leaves of *Ligustrum vulgare* (Privet), near Aberdeen, in winter and spring.

†**P. Helianthemi** Roum., in spots on leaves of *Helianthemum vulgare*, near Aberdeen; autumn.

†**P. Ulmariae** Thuem., in spots on leaves of *Spiræa Ulmaria*, near Aberdeen; summer and autumn.

†**P. Scrophularinea** Sacc., in spots on leaves of *Scrophularia nodosa;* near Aberdeen; autumn.

†**P. Teucrii** S. and Sp., in spots on leaves of *Teucrium Scorodonia*, near Aberdeen; autumn.

†**P. Galeopsidis** Sacc., in spots on leaves of *Galeopsis Tetrahit*; near Aberdeen; autumn.

†**P. Ajugae** S. and Sp., in spots on leaves of *Ajuga reptans*, at Kingcausie; autumn. Associated with *Ramularia Ajugæ* Niessl.

†**Phoma Ryckholtii** Sacc., on stems of *Symphoricarpus racemosus*; near Aberdeen; winter.

†**P. Xylostei** C. and H., on twigs of *Lonicera Periclymenum*; near Aberdeen winter.

†**P. Callunae** Karst., on dead *Calluna* stems, near Aberdeen; winter.

†**P. pulla** Sacc., on dead twigs of *Hedera Helix*, near Aberdeen; spring.

† P. Berkeleyi Sacc., on dead stems of *Urtica dioica*, *Lychnis diurna*, and *Sambucus nigra*, near Aberdeen; autumn.

† P. complanata (Tode) Desm., on dead stems of *Rhinanthus Crista-galli*, near Aberdeen; spring.

† P. herbarum West., on many dead stems, near Aberdeen.

† P. acuta Fckl., on dead stems of *Urtica dioica*, Aberdeen.

† P. deusta Fckl., on dead stems of *Rhin. Crista-galli*, Aberdeen; spring.

† P. saligna Fr. (a stage of *Linocera Caprœæ*), on dead leaves of *Salix cinerea*, near Aberdeen; spring.

† P. leguminum West., on pods of Laburnum, Aberdeen, spring.

† P. Typharum Sacc., in dead leaves of *Typha latifolia*, near Aberdeen; spring.

† P. neglecta Desm., on dead stems of *Juncus effusus*, near Aberdeen; autumn.

† Dendrophoma phyllogena Trail, in dead spots on leaves of *Ilex Aquifolium* (Holly), Aberdeen; spring.

‡ Asteroma Juncaginearum Rabh., forming black spots on stems of *Triglochin palustre*, near Aberdeen; winter.

† Cytospora leucosperma Fr., on twigs of wild roses, near Aberdeen; winter.

‡ C. Laurocerasi Fckl., on leaves, and var *ramulorum* Sacc., on branches, of *Prunus Laurocerasus*, near Aberdeen; winter.

Coniothyrium Hederae (Desm), Sacc., on leaves and dead twigs of *Hedera Helix* (Ivy), Aberdeen; winter.

Diplodia Rhododendri Bell., on leaves of *Rhododendron*, Aberdeen; spring.

‡ Ascochyta Viciae Trail, on leaves and pods of *Vicia sepium*, near Aberdeen; September.

A. malvicola Sacc., in spots on leaves of *Malva sylvestris*, near Aberdeen; September.

† A. microspora Trail, in spots on leaves of *Petasites vulgaris*, near Aberdeen; September.

† A. Plantaginis S. and Sp., in spots on leaves of *Plantago major*, Aberdeen; September.

† A. Primulae Trail, in spots on leaves of *Primula vulgaris*, near Dunottar; August.

A. Alismatis (Oud.), Trail, in spots on leaves of *Elisma Plantago*, Kingcausie; October.

† A. graminicola Sacc., var. Brachypodii Trail, on leaves of *Brachypodium sylvaticum*, near Dunottar. † Var. leptospora Trail. on leaves of *Agropyrum repens*, and of *Psamma arenaria*, near Aberdeen; all in autumn.

Hendersonia sarmentorum West., on twigs of Hedera *Helix* (Ivy), near Aberdeen; February.

† Stagonospora aquatica Sacc., var. sex-septata Trail, on dead stems of *Scirpus lacustris*, Corbie Loch; September.

† S. equisetina Trail, on dead stems of *Equisetum palustre*, Corbie Loch; September.

Septoria Sinarum Speg., in spots on leaves of *Dianthus barbatus*, Aberdeen; July.

† S. Lychnidis Desm., var. pusilla Trail, in spots on leaves of *Lychnis diurna*, near Aberdeen, and at Dunottar; autumn.

† S. Prunellae Trail, in spots on leaves of *Prunella vulgaris*, at Dinnet. near Ballater; September.

S. Junci Desm., in dead stems of *Juncus maritimus*, and of J. *effusus*, near Muchalls, and near Aberdeen ; autumn.

S. lineolata S. and Sp., var., on dead leaves of *Carex arenaria*, near Aberdeen ; October.

S. affinis Sacc., on leaves of *Avena sativa*, and of *Agropyrum repens*, near Aberdeen ; September.

Leptostroma scirpinum Fr., on dead stems of *Scirpus lacustris*, Corbie Loch ; September.

Leptothyrium vulgare Fr., Sacc., on dead stem of *Epilobium angustifolium;* Corbie Den ; October.

Melanconieæ.

Glaeosporium umbrinellum B. and Br., on oak leaves ; Dinnet ; September.

G. Fagi (D. and R.), West., on dying leaves of *Fagus sylvatica* (Beech), Drum, near Aberdeen ; September.

† **Cylindrosporium Oxalidis** Trail, in spots on leaves of *Oxalis Acetosella*, Portlethen, near Aberdeen ; September.

Melanconium sphaeroideum Link, on bark of *Alnus glutinosa*, Cults, near Aberdeen ; July.

† **Marsonia Potentillae** (Desm.) Fisch., var. **Tormentillae** Trail, in spots on leaves of *Potentilla Tormentilla*, † var. **Comari** Trail, in spots on leaves of *P. comarum*, both near Aberdeen ; July and August.

† **M. Melampyri** Trail, in dark spots on leaves of *Melampyrum pratense* ; Dinnet ; September.

† **Coryneum Comari** Trail, on leaves of *Potentilla Comarum*, a few miles north of Aberdeen ; August.

Uredineæ.

Puccinia Adoxae D.C., on *Adoxa Moschatellina*, at Banchory, in May.

P. Malvacearum Mont., on *Malva sylvestris*, near Kingcausie, in October.

P. perplexans Pl., on leaves of *Alopecurus pratensis*, found in July, at Aboyne, by Mr. G. Brebner.

Æcidium Ranunculi-acris, found in May by Mr. Brabner, in the same locality as *P. perplexans* occurred in afterwards.

Æ. Jacobææ Grev., was found this year on the Links or sandhills, north of the Don, near Aberdeen, in June, on *Senecio Jacobœa.* A search near the latter plant in July soon brought to light

Puccinia Schoeleriana Pl., on *Carex arenaria.* Neither fungus was found elsewhere on the links.

An Æcidium, apparently **Æ. Thalictri-flavi**, was plentiful on several plants of *Thalictrum minus* var. *maritimum* (near the last mentioned species) in June and July ; and in its immediate neighbourhood I found, in July, a **Puccinia** on *Festuca rubra*, which may be connected with it, as neither could be found beyond a limited area, where they grew side by side.

Uromyces Poæ Rab., plentiful near Aberdeen, in localities where *Æc. Ranunculacearum* had grown on *R. Ficaria.*

Uredo Hypericorum, D.C., on *Hypericum pulchrum*, at Park, in autumn.

Gymnosporangium juniperinum (L.), sparingly found, on *Juniperus communis* at Banchory Ternan, by Mr. Brebner.

HYPHOMYCETES.

Ramularia Adoxae Fckl., on *Adoxa Moschatellina;* Banchory; May.

R. inconspicua sp. n., on leaves of *Geranium sanguineum*, near Dunottar; September.

R. obducens Peck., on leaves of *Pedicularis palustris*, near Dunottar and Aberdeen; September.

R. pratensis Sacc., var. **leptospora** Trail, on leaves of *Rumex acetosa*, near Aberdeen and Dunottar; August and September.

R. Ajugæ Niessl., on *Ajuga reptans;* Kingcausie, October.

Monotospora megalospora B. and Br., on beech bark, Corbie Den, February.

M. sphaerocephala B. and Br., on beech wood, near Aberdeen; spring.

Hormiscium stilbosporum (Corda) Sacc., on Willows, near Aberdeen.

Acrothecium delicatulum B. and Br., on beech wood and bark; Persley; February.

Stachylidium extorre Sacc., on dead bramble, lime, &c.; Aberdeen; winter and spring.

Haplographium chlorocephalum Fres., on rotting *Carex distans;* Muchalls; October.

Brachysporium stemphylioides (Corda) Sacc., on dead stems of *Spiraea Ulmaria;* Muchalls; October.

B. (?) oosporum (Corda) Sacc., on beech bark, near Aberdeen; February.

Dendryphium laxum B. and Br., on dead potato stalks; Aberdeen; winter.

Cercospora Comari Peck., on leaves of Potentilla Comarum, near Dunottar September.

Polydesmus exitiosus Kuehn, in spots on leaves of *Sisymbrium officinale;* Banchory; August.

Zygodesmus (?) marginatus C. and H., on beech wood, near Aberdeen; winter.

Coremium niveum Corda, developed on decayed rhizome of *Primula sinensis;* Old Aberdeen.

Isaria eleutheratorum Nees, on a small beetle; Aberdeen; in winter.

Anthina flammea Fr., on rotten beech and oak leaves, near Aberdeen; March.

MUCORINI.

Sporodinia Aspergillus Schrk, on decaying *Boletus*; Dinnet; September.

SAPROLEGNIEÆ.

Leptomitus lacteus Ag., forming masses like Algæ in the Don, from Inverurie downwards; summer.

ASCOMYCETES.

Exoascus bullatus Fckl., on Hawthorn leaves; Aberdeen; summer.

E. Tormentillæ Farlow, on young shoots of *Potentilla Tormentilla*, near Aberdeen; July.

Taphrina Umbelliferarum Rostr., causing pale spots on leaves of *Heracleum Sphondylium*, near Aberdeen; summer.

Peziza subtilissima Cke., on bark of *Abies pectinata;* Dry Den, near Aberdeen; in winter.

P. acuum A. and S., on rotten needles of *A. pectinata;* Dry Den; winter.

P. crucifera Ph. and Pl., on twigs of *Myrica Gale;* Park; September.
P. albida Desm., on petioles of *Acer Pseudoplatanus*, near Aberdeen; November.
P. rubra Cke., on spent hops in frame; Old Aberdeen; April.
P. theleboloides A. and S., with the last.
P. Ulmariae Lasch., on dead stems of *Spiraea Ulmaria*, near Dunottar; April.
P. scutula Pers., on dead stems of *S. Ulmaria;* Persley; November.
P. (Mollisia) excelsior Karst., on dead stems of *Phragmites communis*, Corbie Loch; September.
P. (Calloria) leucostigma Fr., on dead beech wood; Kingcausie; in winter.
Helotium virgultorum Fr., on hazel-nuts; Drum; autumn.
H. pruinosum Jerd., on a *Valsa?* on wood; Kingcausie; winter.
Eustegia arundinacea Fr., on dead stems of *Phragmites communis;* Corbie Loch; September.
Desmazierella acicola Lev., on rotten needles of *Pinus sylvestris;* Park; September; found by Mr. Phillips.
Dermatea Houghtoni Phil., on rotten bark of *Prunus Laurocerasus;* Kingcausie; October; found by Mr. Phillips.
D. Fagi Phillips (Grevillea, xv., p. 114), on bark of *Fagus sylvatica* (Beech); Kingcausie; October; found by Mr. Phillips.
Tympanis amphibola (Mass.) Krst., on dead bark of *Abies pectinata;* Dry Den; in winter.
Phomatospora Berkeleyi Sacc. (—*Sphaeria phomatospora* Bk.), in stems of *Urtica dioica, Lychnis diurna, Sambucus nigra, and Scirpus lacustris;* near Aberdeen and at Park; autumn.
Sphaerulina intermixta B. and Br., on wild-rose twigs; Persley; March.
Gnomoniella vulgaris (C. and De. N.) Sacc., (—*Gnomonia gnomon* Tode), on dead leaves of *Corylus;* near Aberdeen; March.
Botryosphaeria Dothidea (M. and Fr.), C. and De Not. (—*Dothidea Rosae* Fr.), on living branches of *Rosa canina*, near Aberdeen.
Laestadia [? punctoidea (Cke.) Awd.], on oak leaves, near Aberdeen; April.
Sphaerella microspila (B. and Br.), Cke., in leaves of *Epilobium montanum*; Kingcausie; October.
S. Fragariæ (Tul.), Sacc., on dead strawberry leaves, near Aberdeen; autumn.
S. Cerastii Fckl., on *Cerastium triviale;* Kingcausie; October.
S. [? Gaultheriae C. and E.] on leaf of *Gaultheria Shallon;* Kingcausie; Oct.
S. Iridis Awd., on living leaves of *Iris pseudacorus;* near Aberdeen; autumn.
Gnomonia Epilobii (Fckl.), Awd., on dead stems of *Epilobium angustifolium;* Corbie Den; October.
Rosellinia mammiformis (Pers.), on beech bark, near Aberdeen.
Anthostoma Plowrightii Niessl., on dead *Ulex Europæus*, near Aberdeen; winter.
Quaternaria Persoonii Tul. (—*Valsa quaternaria* Pers.), in beech bark near Aberbeen; spring.
Philocopra minuta (Fckl.), on dung of field vole, near Aberdeen; spring.
Diaporthe pulla Nitsch., in Ivy twigs; Aberdeen; winter.
D. Ryckholtii Oud., on twigs of *Symphoricarpus racemosus;* Persley; winter.
Asterina Veronicae (Lib.), on *Veronica officinalis*, near Aberdeen; March.
Linospora Caprææ (D.C) on dead leaves of *Salix cinerea*, near Aberdeen; winter.
Leptosphaeria fuscella B. and Br., in twigs of wild roses; Persley; March.
L. dioica (Moug.), on Broom twigs; Persley; March.

April.

L. epicalamia (Riess.), C. and De Not., on leaves of *Luzula maxima ;* near Aberdeen ; March.

L. clara (Cke. and Awd.), Sacc., near Aberdeen, on *Sparganium ramosum*, in May.

L. juncina (Fr.), on *Juncus articulatus ;* Banchory ; May.

L. microscopica Krst., on *Agropyrum repens ;* Aberdeen ; winter.

L. Michotii (West.) Sacc., on *Scirpus lacustris ;* Corbie Loch ; September.

Clypeosphaeria Notarisii Fckl. (—*Sph. clypeata Nees*), on bramble twig ; Aberdeen ; winter.

Chaetosphaeria innumera (B. and Br.) Tul., in dead wood, near Aberdeen; winter.

Pleospora patella Fabre, in dead stems of *Linaria vulgaris*, near Aberdeen ; September.

Nectria inaurata B. and Br., on holly twigs ; Corbie Den ; in winter.

N. coccinea Fr., on holly bark ; Corbie Den ; in winter.

Xylaria corniformis Fr., on beech trunk, near Aberdeen ; winter.

Hypoderma commune (Fr.) Duby ; on dead stem of *Epilobium angustifolium ;* Corbie Den ; October.

Lophium mytilinum Fr., on bark of *Larix* ; near Aberdeen ; winter.

Lophodermium juniperinum (De Not.) ; on Juniper needles ; Banchory ; May.

L. melaleucum (Fr.), on leaves of *Vaccinium Vitis-Idaea ;* Banchory ; May.

Lophiostoma Hederæ Fckl., on Ivy twigs ; near Aberdeen ; March.

L. Arundinis De Not., ondead stem of *Phragmites ;* Muchalls ; October.

L. (Lophiotrema) **semiliberum** B. and Br.. with the last.

,, **sex-nucleatum** Cke., on dead stems of *Urtica dioica ;* Aberdeen ; in winter.

L. (Lophiotrema) angustilabrum B. and Br., on twigs of *Ulex europaeus*, near Aberdeen ; winter and spring.

Glonium lineare (Fr.), on dead wood (? Birch) ; Corbie Den ; in winter.

In conclusion, I may be permitted to call the attention of all interested in the Mycology of the East of Scotland to the wide gaps that exist in our information regarding the distribution of the Fungi within the district of the Union, despite the fact that the regions of Scotland investigated most thoroughly in this respect are Moray, *Tay*, and *Dee*. Even in these regions there are large areas still unwrought, or scarcely touched. Fife has been to a less extent examined, in the earlier half of this century, by Dr. Greville, and, in recent years, by the Rev. M. Anderson, around Menmuir ; but much remains to be done in that county. I shall be much obliged for information and specimens of microscopic Fungi (*Hymenomycets*, I do not undertake), and I will gladly assist any worker with such information as I possess.

OBITUARIES.

DR. JAMES S. CRICHTON.—It is with very deep regret that we record the death, on 28th June, of Dr. Crichton of Arbroath. He was the second son of the Rev. Dr. Crichton of Free Inverbrothick, and was born near Arbroath on the 2nd April, 1841. He was educated at the Educational Institution, Arbroath; and, on leaving school, served an apprenticeship as a chemist, in preparation for the study of medicine. He studied for his future profession in Edinburgh, where he graduated M.D. in 1864. He was for a year or two at Burnley as assistant; but returned to Arbroath, and commenced practice, first as assistant to Dr. Key, and afterwards on his own account. At the time of his death his practice was one of the largest in Arbroath; and he enjoyed the confidence and esteem of the whole community.

A never-failing promoter of all schemes that had for their aim the benefit of the community, he was for a time President of the Young Men's Christian Association. An active member of the School Board during three years, he devoted his attention to the improvement of the sanitary condition of the schools. He was one of the originators of the Arbroath Literary Club, and did much to extend its usefulness.

But it was another side of his character that we chiefly knew—viz., his deep and true love of, and appreciation for, scientific pursuits of every kind. He was one of the heartiest supporters both of the Arbroath Natural History Society, of which he occupied the presidential chair, and of the Arbroath Field Club. Of late he made strenuous efforts to secure that Arbroath should be included in the area of the proposed scheme of University Extension, and he urged the importance to the town of obtaining the best possible teaching in all departments. The value of a good local museum was fully recognised by him, and was prominently kept in view at all times.

He prepared a valuable hand-book on the "Flora of Arbroath and its Neighbourhood." His few leisure hours were largely spent among the sea-weeds of his native coast. With these he was well acquainted, and his collection of them was of much interest.

His death was the result of a severe injury received in the beginning of February, which, however, did not prevent him from attending to his patients, even till within three days of his death. He is survived by a widow and eight sons, of whom the eldest is twelve years of age.

His was one of those natures that teach by their example what a true life is, to a degree and in a way far surpassing pulpit oratory; nor did he find it hard, we believe, to reconcile a profound love of Nature with a firm belief in the truth of revealed religion.

Robert Francis Logan died at his house, Spylaw, near Edinburgh, on 28th July, at the age of sixty. In him has passed away one who began to publish his records so long ago that to the present generation of entomologists he appeared to belong wholly to the past, though of late years he had begun to resume the labours that for a time he had laid aside. He was a most reliable observer; but published less than might have been hoped for from so constant and successful a student. His earliest published record dates from 1845 (*Zoologist*, p. 1141), when, though then only eighteen, he speaks of having been investigating the entomology of Dudingston "for about seven years." His earlier notes related to Lepidoptera; and several appear in the *Zoologist* in successive years. He afterwards sent notes to the *Trans. Entom. Society of London*, to the *Proceedings of the Royal Physical Society of Edinburgh*, to the *Naturalist* (his chief article being "The Lepidopterous Insects of Mid-Lothian"), and to other periodicals.

After a time he devoted his attention to the Coleoptera, and assisted Mr. Andrew Murray with information in the preparation of the "Catalogue of the Coleoptera of Scotland," published in 1853. Mr. Logan's death is a serious loss to the little band of Scotch entomologists, at all times so few.

ZOOLOGY.

ON THE HYMENOPTERA (BUT CHIEFLY THE GENUS BOMBUS) OF THE PROVINCE OF MORAY.

By Rev. G. Gordon, LL.D.

IN a report of a recent meeting of the East of Scotland Naturalists at Perth, it was hinted that the attention of some of the members was to be given to the local *Hymēnoptera*. To such members the following notes may be of interest. They were drawn up years ago, in contemplation of continuing the papers on the Provincial Fauna: the last of which was given in *The Zoologist* on p. 3781, (February, 1853.)

The List, now submitted, follows the nomenclature adopted by the late Frederick Smith, Esq., of the British Museum, in his "Catalogue of British Hymenoptera in the British Museum, London, 1855." The List has also far higher value from the circumstance that a specimen of every insect contained in it was seen and named by Mr. Smith. (*Note.*—w. denotes worker, ♀ female, and ♂ male.)

Bombus muscorum, w. ♀ ♂

Smith's Catalogue, p. 212.

B. senilis, w. ♀

The only species met with on several visits to Shetland was *B. Smithianus*, which was abundant at Hillswick in 1878, although scarce in 1879. Not yet seen in Moray.

B. fragrans, w.

This large and beautiful bee is one of the rarer provincial species.

B. lapponicus, w. ♀

Occasionally met with in the garden; but small ponds, fringed with the *Menyanthes* in flower, are favourite localities for it, if it be a denizen in a district.

B. Derhamellus, w. ♀

Very abundant in June, 1885.

B. pratorum, w. ♀ ♂

B. Scrimshiranus, w. ♀

B. lucorum, w. ♀ ♂

By far the most abundant species. It is the first to appear in spring, and is capable of enduring degrees of cold which would benumb its congeners: *ex. gr.*, in the month of March, some years ago, while the thermometer stood in the shade at 34° F., with a sprinkling of snow on the ground, three of them were seen busy at work, extracting honey from the flowers of an *Arbutus* (*Andrachne ?*), which the previous mild weather had made fit for their use.

Although Mr. Smith (p. 225) says, of *B. terrestris*, "this species is found in all parts of the United Kingdom," I have never met with it in the Province of Moray. The common *B. lucorum* is apt to be mistaken for it. Yet not only the superior size of *terrestris* and its fulvous abdomen, but its flight and hum (as once seen and heard by me on Wimbledon Common) should readily distinguish it.

B. lapidarius, w. ♀ ♂
B. hortorum, w. ♀ ♂

The flowers of the Columbine have great attraction for this species. In the autumn the Garden Hyssop is frequented by the workers of several species.

Apathus rupestris, ♂
A. campestris, ♀ ♂
A. Barbutellus, ♀ ♂
A. vestalis, ♀ ♂

In these fourteen earth-bees the schoolboys of Moray saw only three species—the 'Garreck,' the 'Foggie,' and the 'Redend'; and, while like Burns' "plundering herds" they "assailed the bykes," the most daring enterprise was to attack and rob the last (probably *B. lapidarius*) of its sweet household store.

The following additional Provincial Hymenoptera, having been also named by Mr. Smith, may be here recorded, viz.:

Colletes succincta.
Halictus rubicundus.
H. cylindricus.
H. albipes.
Andrena Rosæ.
A. albicans.
A. Clarkella.
A. Gwynana.
A. bicolor.
A. Trimmerana.
A. clypeata.
A. albicrus.
A. coitana.
Megachile circumcincta.

Part II., Smith's Cat., p. 113.

Mellinus arvensis. *C. patellatus.*
Crabro cribrarius. *Odynerus parietum.*
O. trimarginatus.

Vespidæ, Smith, p. 211.

Vespa vulgaris. *V. sylvestris.*
V. rufa. *V. Norvegica.*

ZOOLOGICAL NOTES FROM FYVIE.

Leach's Petrel (Thalassidroma Leachii).—A fine specimen of this bird was found dead, near Rothie Norman, Fyvie, on the 3rd August.

Camberwell Beauty (*Vanessa Antiopa*).—A large specimen of this butterfly was seen at Gourdas, Fyvie, on the 18th August.—G. Sim, Gourdas, Fyvie, Sept. 5, 1887.

The Hessian Fly in Scotland.—The most noteworthy addition to our entomological records during 1887 is the unwelcome Hessian Fly (*Cecidomyia destructor*), which has been found very widely present, in the stems of barley, at least as far north as the Moray Firth. There is comfort for the farmers in the knowledge however, that its parasites also have been discovered in Scotland, by Mr. Tait and others. It has evidently been a resident for a considerable time with us, though previously overlooked. Any information regarding its occurrence in any part of Scotland will be welcome to the

Editor of the "Scottish Naturalist."

PHYTOLOGY.

ARABIS ALPINA L. IN SCOTLAND.

By Arthur Bennett, F.L.S.

IN the "Journal of Botany" for last August, Mr. H. C. Hart records the finding of the above plant in the Isle of Skye. In the "Scottish Naturalist" for 1886, p. 66, I wrote that "it seemed strange that it is not British," and I have always thought it ought to belong to our Flora, looking at its distribution, &c. Mr. Hart kindly sent me a specimen for examination; and writes with the specimen: "I found it in three distinct places in the northern part of the Cuchullin range. The altitude was about 2300 to 2800 ft. above sea level, and the situation was in very stony places, which have some permanent moisture in wet weather. It is a matter of climbing to reach any of the localities. I have compared my specimens with Greenland ones, and they differ only in the stem leaves of the latter, being less auriculed, and less deeply toothed. The plate in the Botanical Magazine represents my plant admirably. I only gathered very few specimens." The Cuchullin range in some parts of its peaks rises to 3260 ft. (Scuir Alister 3260 ft. by aneroid, *Mr. Hart in J. of Botany*); this is higher than generally given I think, the Rev. J. Wilson gives 3180, 3200, 3220 ft. as the height of the three highest summits. They are principally composed of syenitic and hypersthenic rocks (Wilson), and generally very bare. Mr. Hart mentions (in *J. of Botany*) the following species as observed: *Alchemilla alpina, Arabis petræa, Saussurea alpina, Oxyria reniformis, Saxifraga stellaris, Cerastium alpinum,* and *Azalea procumbens.*

I give a few references, and the distribution of the species:

Arabis alpina, Linn., *Sp. Pl.* 2, p. 664 (1753).
Wahlenberg *Fl. Lapponica* (1812), p. 181-2.
Blytt M. N., *Norges Flora*, p. 974.
Hartman, *Hanbok i Skan. Flora*, ed. 11, p. 191.
Koch., *Synopis Fl. Germ. et Helv.*, ed. 2, 1, p. 40.
Nyman, *Consp.Fl.Europ.*, p. 34.
H. C. Hart, *Brit. Polar Exped.*, *Journal of Botany*, 1880, p. 178.

Figures—Svensk Botany, t. 773.
Flora Danica, t. 62.
Hb. Exsic.—Fries Herb. Normale, f. 7, n. 16.
Billot, 914, 3317.
Rchb., 1072.
Distribution—Lapland, Finmark, Norway! Sweden! Spitzbergen! Nova Zemblia, Iceland! Faroes and all Europe (sec Nyman), except Turkey, Greece and Sicily; Canada, Alaska, Greenland! Labrador! Arctic Siberia, Kamtschatka!

It is very variable in size, and also in amount of pubescence; it differs from *petræa* by the auricled leaves which will at once mark it, if found, without the other specific characters.

The finding of this species in Skye should encourage a careful search of any peaks that have not been well examined, as I can scarcely think it can be confined to Skye in Scotland.

JUNCUS TENUIS, WILLD., IN SCOTLAND.

By Arthur Bennett, F.L.S.

In the beginning of September Mr. J. M'Andrew, of New Galloway, sent me a couple of Kirkcudbrightshire plants to name. Agreeably surprised was I to find that one was certainly the *Juncus tenuis* of Willdenow; which, after disappearing for many years as a reputed Scotch species, was now again restored to a place in the Flora. In the first edition of *English Botany* Smith described it as a new species (under the name *J. gracilis)*, as a native of Scotland. In his *English Flora*, vol. 2, p. 167, Smith renamed it *J. Gesneri*, considering that the plant of Don was not that of Willdenow. Since then the plant has been considered not a Scotch species, and has been relegated to the "reputed species."

Mr. M'Andrew tells me it grows on the roadside three-quarters of a mile west of New Galloway, near a house, along with *Juncus squarrosus*, *J. lamprocarpus*, grasses, &c.

There seems to be an element of suspicion in this; and it is regarded as an introduced plant in New Zealand by my friend Mr. Cheeseman, of the Auckland Museum. On the other hand, one cannot but agree with Mr. M'Andrew, who writes: "I cannot see how it could have come there," in answer to my query respecting its surroundings.

For details as to Don's plant, see *Scottish Naturalist*, 1883-84, p. 264, by Mr. Druce; and Mr. Ridley's article in *Journal of Botany*, 1885, pp. 1-3, with a plate.

As Dr. B. White of Perth observes in a letter, "it is not a species (looking at the distribution in Nyman) that I should have expected there." Still, its places of growth are scattered in a peculiar and erratic manner over Europe, so that too much must not perhaps be made of this.

JUNCUS ALPINUS AS A BRITISH PLANT

By F. BUCHANAN WHITE, M.D., F.L.S.

FOR the past two years *Juncus alpinus* has been a weight upon my mind. Rumours had reached me that one or two old examples of a rush in certain herbaria were probably referable to *Juncus alpinus;* at the same time there seemed to be no botanist bold enough to give a definite opinion upon the subject. Now as one of these dubious specimens came from Perthshire this was an eminently unsatisfactory state of matters; and it behoved Perthshire botanists to try to settle the question by discovering the plant.

Through the kindness of my friend Mr. Bennett, who furnished foreign examples from his herbarium, the aspect of the species was not altogether unfamiliar,—a point of considerable importance in looking for a rush of the "*articulatus*" group. Armed with this knowledge, every likely looking rush met with in our excursions has been examined, but without result till August of this year. On August 4th, Messrs. Barclay and Meldrum joined me in exploring a hill near Pitlochry; and there, amongst *Juncus lamprocarpos*, I found a rush which appeared to be more like *Juncus alpinus* than any previously examined. On comparing it, however, with the foreign specimens no definite decision could be arrived at, owing perhaps to the dwarfness and immaturity of the Pitlochry examples. So, having put a plant in the garden, the search was continued.

About ten days after this Mr. James Brebner sent me some rushes from near Killin, and amongst these were three panicles of what appeared, without doubt, to be *Juncus alpinus.* They were, however, in flower only; and, as it was desirable to see capsules, I asked my friend to try to find more specimens, which up to the present time he has not been successful in doing.

Finally on August 20th, Mr. Barclay and I botanized the neighbourhood of Blair-Athole, and found a small bed of the long-looked-for rush.

Such is, briefly, the history of the search for *Juncus alpinus.*

Juncus alpinus may be best described by comparing its character with those of the polymorphic, but more familiar, *Juncus lamprocarpos.* To that species it has a general resemblance; and without close examination might readily be passed over for it.

The stem is much more slender and terete, and has usually only two, though sometimes three, leaves. The leaf-sheaths are more acute on the back, but this is a character which seems variable, being more marked in the Killin specimens than in the others. The panicle branches appear to be more constantly erect than in *Juncus lamprocarpos*, in which, however, their direction is variable. The sepals are roundly obtuse, more rugose and more opaque; their margins thicker and more coloured, and often only slightly scarious; and the outer ones are mucronate below the tip. The latter is a character upon which great stress is laid by Koch and other authors, but in practice it is not always easily made out; and, moreover, the outer sepals in *Juncus lamprocarpos* have sometimes the appearance of being mucronate below the apex. Finally the capsule is of quite a different shape, being ovate-oblong instead of ovate-lanceolate. As in *Juncus lamprocarpos* the capsule is mucronate; but below the mucro it expands rather abruptly into a rounded shoulder; moreover it is rather smaller and somewhat less shining. The back of each valve is widely channelled towards the summit. From the shape of the sepals and of the capsule the fascicles of flowers in *Juncus alpinus* have a more truncate appearance than those of *Juncus lamprocarpos.*

Juncus alpinus grows in places similar to those frequented by *Juncus lamprocarpos*, *i.e.* in spots which are more or less permanently damp. It is not confined to high altitudes as the specific name would imply. Near Blair-Athole it occurs at about 500 feet above sea-level; near Pitlochry (the specimens from which, when grown to maturity, proved to be the same as those from Blair-Athole) it attains about 1800 feet; near Killin its altitude has not yet been observed. In size the plant varies according to the situation, our specimens ranging in height from 4 inches to over 1 foot. In colour the sepals and capsules of the Perthshire examples are very dark brown; but in some of the European varieties the colour is a pale brown.

For some of the following particulars regarding the synonymy and distribution I am indebted to Mr. Bennett—

Juncus alpinus, Villars (1787); *J. fusco-ater*, Schreber (1811); *J. ustulatus*, Hoppe; *J. nodulosus*, Wahl.; *J. geniculatus*, Schranck.; *J. alpestris*, Hartm.; *J. rariflorus*, Hartm.; *J. pelocarpus*, A. Gray.

Several varieties have also been described, from which fact, in addition to the synonymy, it may be gathered that *Juncus alpinus* has a considerable range of variation. Dr. Buchenau, to whom Mr. Bennett sent a fresh specimen, confirms my determination of the species and states that it belongs to his variety *genuinus*.

In Europe *Juncus alpinus* is widely distributed, occurring from Spain to Iceland, and from France and Germany to Russia. In Southern Europe it is alpine and subalpine. It has also been found in North-west Asia, in Greenland, and in North America.

It is worthy of note that, as far back as 1843, Professor Babington mentions it in his "Manual" as a species likely to occur in Britain. From its comparatively wide distribution in Perthshire it ought to be found in other parts of Scotland also.

I should add that the Watsonian vice-counties for the species are "88 Perth Mid," and "89 Perth East."

NEW BRITISH PLANT.—I have this year gathered *Carex cæspitosa* L. in Shetland. W. H. BEEBY.

REVISION OF SCOTCH SPHÆROPSIDEÆ AND MELANCONIEÆ.

BY PROF. J. W. H. TRAIL, A.M., M.D., F.L.S.

(*Continued from Page* 128.)

§ 3. PHÆODIDYMÆ.

Pycnidia as in **Hyalosporæ**; *sporidia* ellipsoid, oblong or ovoid, *2-celled* (one cross septum), *brown*.

Analyatical key to genera.

A. Pycnidia scattered, (smooth)
  B. Sporidia not enclosed in mucus. *Diplodia.*
  BB. Sporidia enclosed in mucus. *Macrodiplodia.*
AA. Pycnidia clustered into groups on a stroma. *Botryodiplodia.*

XI. Diplodia Fr.

Generic character as above.

59. **D. Æsculi** Lev. 1837, Cooke in *Grevillea* 1885, p. 36.
Sporidia ellipsoid, obtuse, constricted in middle, biguttulate, sooty brown, 22-24 by 8.
Tweed (Jerdon).
England, Europe.

60. **D. Padi Brun.** 1885.
Under the name **D. vulgaris** Lev. there stands in *Mycologia Scotica* (No. 1109) a fungus found "on twigs of *Prunus Padus*," by Rev. Dr. Keith, at Forres. *D. vulgaris* grows on stems of *herbs*; and it seems more probable that the fungus belongs to *D. Padi*. The latter is described in Saccardo's *Sylloge* as having pycnidia "scattered, minute, black, innato-erumpent, sporidia oblong, with the ends rounded, 1-septate, constricted, sooty brown, 22 by 8-10, upper cell thicker; basidia hyaline." Occurs in France.

61. **D. consors** B. and Br., 2019, C. 236, M. 1111 (D. and R. Stevenson).
On dead leaves of *Prunus Laurocerasus* (Cherry Laurel—not the true Laurel).
Tay (Glamis).

*62. **D. Rhododendri** Bell. 2027 (D. & R. *Trail, Sc. Nat.* 1887, p. 90).
On dead spots on leaves of Rhododendron, near Aberdeen, in autumn.
Dee.
Pycnidia on lower surface of spots, like scattered black dots, subdermal, nearly hemispherical, papillate, sporidia oblong or ovoid, 16-21 by 9-11, somewhat constricted in the middle, dark brown.
Belgium, France.

63. **D. arbuticola** (Fr.) Berk. 2028, C. 240, M. 112 (D. & R. *Cooke*).

On dead leaves of *Arctostaphylos Uva-ursi* (Bearberry), in Scotland.

c. On Herbaceous Dicotyledons.

*64. **D. obsoleta** Karst. 2045, C. 244, S.M. 3034 (D. & R. *Trail, Sc. Nat.* 1885, p. 128).

On dead stems of *Solanum tuberosum* (Potato).

Dee (near Aberdeen).

D. vulgaris Lév. 2065, C. 245, M. 1109.

See remarks under **D. Padi**.

65. **D. herbarum** Lev. 2066, C. 246, M. 1110 (D. *White*, R. *Stevenson*).

On stems of herbaceous plants.

Tay (Perth, Glamis).

XII. Macrodiplodia Sacc.

Pycnidia rather large; sporidia covered with mucus.

66. **M. Ulmi** Sacc. 2090, C. 250 (R. *Cooke*, in *Grevillea*, 1887.)

On branches of *Ulmus* (Elm).

Tweed (Jedburgh).

XIII. Botryodiplodia Sacc.

Pycnidia clustered on a stroma, erumpent, sub-carbonaceous.

67. **B. sphæroides** (Fr.) Sacc. 2120, C. 257, M. 1107 *sub Dothiora sphæroides* (D. *Jerdon*),

On dead branches of *Fraxinus excelsior* (Ash).

Tweed (Jedburgh).

§ 4. Hyalodidymæ Sacc.

Pycnidia as in **Hyalosporæ**; *sporidia* oblong or ovoid, *2-celled* (one cross septum), *hyaline* or *yellowish*.

Analytical key to genera.

A. Pycnidia usually in discoloured spots on leaves (lenticular, minute; sporidia not ciliated). *Ascochyta.*

AA. Pycnidia not in discoloured spots.

B. Pycnidia adnate to a radiating web-like subiculum on leaves. *Actinonema.*

BB. No subiculum.

C. Often parasitic on *Uredines;* sporidia tipped at each end with a hyaline appendage. *Darluca.*

CC. Growing on branches or stems; sporidia usually bear no appendages. *Diplodina*

XIV. Ascochyta.

Causing discoloured spots on leaves or branches; pycnidia innate, depressed, spherical or lenticular, opening by a pore, membranaceous; sporidia as stated for section.

Very similar to *Phyllosticta* and to *Septoria* in the spots they produce; possibly connected with these forms in the genetic cycle, and also with *Sphærella* and its allies among *Pyrenomycetes*, as the spermogonia.

a. On Leaves of Woody Dicotyledons

68. **A. metulæspora** B. and Br. 2134, C. 459, M. 1159 (D *Stevenson*, 1877, R. *B. & Br.*, No. 1730).
On *Fraxinus excelsior* (Ash).
Tay (Glamis).

b. On Herbaceous Dicotyledons.

69. **A. Pisi** Lib. 2197, C. 462, M. 1157 (D. & R. *Stevenson*).
On leaves of *Pisum sativum* (garden pea).
Tay, Dee, Moray.

*70. **A. Viciæ** Trail (D. & R. *Trail, Sc. Nat.* 1887, p. 87).
On pods and leaves of *Vicia sepium* near Stonehaven.
Dee.

*71. **A. Lathyri** Trail (D. & R. *Trail, Sc Nat.*, 1887, p. 87).
On dead leaves of *Lathyrus sylvestris* at St. Cyrus, near Montrose, in April.
Tay.

*72. **A. Dianthi** (A. & S.) Berk. 2203, C. 463, M. 1158 (D. *White*, R. *Stevenson* in *Mycol. Scot.*)
On leaves of *Dianthus, Lychnis Flos-Cuculi*, &c.
Tay, Dee, Moray.

*73. **A. malvicola** Sacc. 2210 (D. & R. *Trail, Sc. Nat.* 1887, p. 90)
On living leaves of *Malva sylvestris*, near Aberdeen, in autumn.
Dee.
Spots roundish or somewhat angular, black, becoming dry and pale in centre; pycnidia scattered, dark brown, lenticular; sporidia cylindrical, ends obtuse, 18-20 by $3\frac{1}{2}$-4.

*74. **A. microspora** Trail (D. & R. *Trail, Sc. Nat.* 1887, p. 87).

On living leaves of *Arctium Lappa*, at St. Cyrus, and of *Petasites vulgaris* near Aberdeen, in autumn.

Tay, Dee.

*75. **A. Primulæ** Trail (D. & R. *Trail, Sc. Nat.* 1877, p. 88).

On leaves of *Primula vulgaris* near Stonehaven.

Dee.

*76. **A. Plantaginis** 2234 (D. & R. *Trail, Sc. Nat.* 1877, p. 90.)

On leaves of *Plantago major*, near Aberdeen.

Dee.

Spots circular, brown, becoming pale in the middle; pycnidia lenticular, with a wide opening, dark brown; sporidia oblong, 6-8 by 2-2½, straight or curved, each cell guttulate, hyaline.

Italy.

b. On Leaves of Monocotyledons.

*77. **A. teretiuscula** Sacc. and Roum. 2243, C. 465, S.M. 3035 (D. & R. *Trail, Sc. Nat.*, 1885, p. 128).

On leaves of *Luzula maxima.*

Dee.

*78. **A. Alismatis** (Oudem), 3093 (sub *Septoria Alismatis* Oudem.) (D. & R. *Trail, Sc. Nat.*, 1887, p. 91).

On spots on leaves of *Elisma Plantago*, at Kingcausie, near Aberdeen, in October.

Dee.

Spots nearly black, approaching circular, becoming paler in the middle; pycnidia small, black, difficult to see, innate; sporidia rodlike, 18 by 2-2½, straight, uniseptate and constricted in middle, hyaline.

Belgium, North America.

(*Note.*—This species connects the genera *Ascochyta* and *Septoria*, but comes nearer the former.)

*79. **A. graminicola** Sacc. 2252 (D. & R. *Trail, Sc. Nat.* 1887, p. 88).

var. **Brachypodii** Trail, on *Brachypodium sylvaticum.*

var. **leptospora** Trail, on *Agropyrum repens* and *Psamma arenaria*; both near Aberdeen.

Dee.

XV. Actinonema Fries.

Pycnidia minute, almost superficial, mouthless, situated on a branched, radiating, web-like subiculum on leaves; sporidia stalked, oblong, two-celled (or 2-pluri-septate), hyaline.

*80. **A. Rosæ** (Lib.) Fr. 2257, C. 456, M. 1167 (sub *Asteroma Rosæ* D.C.).

On living leaves of Roses.

Tay, Argyle, Dee, Moray.

XVI. Darluca Cast.

Usually parasitic on *Uredineæ;* pycnidia globular, subpapillate, superficial, membranaceous ; sporidia oblong or fusoid, two-celled (1 cross septum), each end tipped with mucous appendage, hyaline.

*81. **D. filum** (Biv.) Cast. 2263, C. 458, M. 1118.

On various *Uredineæ.*

Tay, Dee, Moray.

XVII. Diplodina West.

Pycnidia subcutaneous, or erumpent, subglobose, papillate, dark, nearly smooth ; sporidia as in *Diplodia*, but hyaline.

*82. **D. Ammophilæ** Trail (D. & R. *Trail, Sc. Nat.* 1885, p. 76), S.M. 3036, C. 262.

On leaves of *Psamma arenaria*, near Aberdeen.

Dee.

(*Note.*—This fungus always has the sporidia tipped as in *Darluca.* It should be compared with *Ascochyta perforans* (Rob.) Sacc., which grows on the same host plant ; since the figures show the sporidia of the latter to be a good deal like those of *D. Ammophilæ*, there being a hyaline appendage at one end in some, though the description makes no mention of this character.)

5. Phæophragmiæ.

Pycnidia as in the other sections ; *sporidia* oblong or fusiform, *2-pluri-septate, sooty or olive-brown.*

XVII. Hendersonia Berk.

Pycnidia subcutaneous, erumpent, or nearly superficial, spherical, or depressed, often papillate, membranaceous or subcarbonaceous, dark ; sporidia as given above. This genus is scarcely separable from *Stagonospora*, as the species grade from the one to the other in tint of the sporidia, with no clear line of separation.

a. On Dicotyledons.

*83. **H. sarmentorum** West., 2293, C. 264 (Cooke's Handbook 1279, D. & R. *Trail*, 1887, p. 91).

On dead twigs of *Hedera Helix* (Ivy), near Aberdeen, in February.

Dee.

*84. **H. Sambuci** Muell. 2304 (D. & R. *Trail, Sc. Nat.* 1887, p. 40).

On dead branches of *Sambucus nigra* (Elder), at Elmhill, near Aberdeen, in November.

Dee.

Pycnidia in groups, small, subcutaneous, then erumpent; sporidia 10-14 by $2\frac{1}{2}$-$3\frac{1}{2}$, 3-septate, dark olive-brown.

85. **H. exigua** Cooke, 2330, C. 274, M. 1115 (D. & R. *Cooke*, in *Grevillea* III., p. 178).

"On smooth bark."

Forth (Edinburgh).

PROCEEDINGS AND TRANSACTIONS OF THE NATURAL HISTORY SOCIETY OF GLASGOW.

(Vol. I., New Series, Part III., 1885-86, with 3 Plates, 1887.)

THE newly-published part of the above publication keeps up the high character that it has earned in the past. The papers deal for the most part with the Fauna and Flora of Scotland, and must be indispensable to all interested in these subjects, as they contain much valuable information. We can only very briefly indicate their titles and nature.

Notes on the Land and Fresh-Water Mollusca of Greenock and surrounding District, by Thos. Scott (pp. 279-285). In this are enumerated all the species known to the author, special attention being drawn to certain species and varieties not included in the *Fauna and Flora of the West of Scotland*, published in 1876.

Notes on some Alpine Plants from Forfarshire and Aberdeenshire, by Peter Ewing (pp. 286-289).

Jottings from My Notebook, by David Robertson, F.L.S. (pp. 290-294). This paper relates to the companionship of the sexes of *Pagurus Prideauxii*, the source of the mucus thrown out by the sea-urchin *Amphidotus cordatus*, and the mode of life of *Scaphander lignarius*.

Biological Notes, by P. Cameron (pp. 295-304). The author mentions Mitegalls on *Pyrus Aria* from Glenlyon, on *Artemisia vulgaris* from Cambuslang, and on *Sedum Rhodiola* from Scuir of Eigg; galls of *Lasioptera juniperina* on *Juniperus nana* from Scuir of Eigg, of a *Cecidomyia* in swollen stems of *Rosa spinosissima* from the Ayrshire coast, and probably of *Aulax* (?) on *Lathyrus macrorrhizus* from near Kinghorn in Fife. Excessive abundance of the galls of species of *Neuroterus* in Clydesdale in autumn, 1884, is remarked. Fungoid galls are noted as found in the West of Scotland on *Rhododendron ferrugineum* (due to *Exobasidium*), on *Juncus squarrosus*, and *J. uliginosus* (due to *Entorrhiza cypericola*), and on *Ruppia rostellata* (due to *Tetramyxa parasitica*). Mr. Cameron notes a female *Acilius fasciatus* with smooth elytra, abundance of *Heliothrips Adonidum* in hot-houses, white *Gammarus Pulex* in Mull, and four new species of Scotch *Belyta*.

Meteorological Notes for 1885, and Remarks on the State of Vegetation in the Public Parks of Glasgow, by D. M'Lellan (pp. 305-311).

The Decapod and Schizopod Crustacea of the Firth of Clyde, by J. R. Henderson (pp. 315-354), is a valuable article, based on the work of previous investigators, supplemented by dredgings made in March, July, and August, 1885, in the Firth, in connection with the Granton Marine Station. It includes numerous new records, five being species new to Britain. A complete list of the species of the West of Scotland, and also of the other British coasts, to contrast with the former, follows the introductory remarks, and the paper is rendered more complete by notes of localities, &c., with regard to numerous individual species. Mr. J. F. X. King, in his **Notes on the Neuroptera of Rothiemurchus and Kingussie** (pp. 354-365), enumerates all the species taken by him in that district. These include about an eighth of the Dragon-flies, one-third of the May-flies, and one-half of the other British Neuroptera, collected during about fifteen weeks in summer. **On some Forms of Sphagna found in the Glenkens, Kirkcudbrightshire,** by James M'Andrew (pp. 366-368), relates to a very large number of the British species, found in a limited area. **Natural History Notes from Tarbert,** by James Scott (pp. 369-378), refers

to various marine organisms (Crustacea and Mollusca) in East Loch Tarbert and Loch Fyne. In **Ornithological Notes** (pp. 379-393), W. Craibe Angus writes on the occurrence, habits, &c., of the Shore Lark (*Alauda alpestris*), the Capercaillie (*Tetrao Urogallus*), the Pintail Duck (*Dafila acuta*), the Great Crested Grebe (*Podiceps cristatus*), and the Skua (*Lestris catarractes*).

In the "Proceedings" (pp. liii-lxxxviii.) there are numerous brief notes of much interest. The meetings extended over the period from 12th May, 1885, to 27th April, 1886. Among the more important notes are the following:—Reports of Excursions in 1885 to Barrhead on 9th May, to Kilsyth Glen on 23d May, to Dalry on 6th June, to Carluke on 20th June, to Thornliebank on 1st July, to Langbank on 8th August, to Largs on 22d August, and to Kilwinning on 5th Sept. There are also reports of the results of excursions by individual members to Killin, Ben Lawers, the Outer Hebrides, and other localities. Lists of Flowering Plants and of Cryptogams found in each excursion are included in the reports; and in several of them the insects and other objects of interest are also mentioned.

At the meetings during the winter 1885-86, besides the papers noticed above as published in full, there were numerous short notices and exhibitions of objects of interest from various parts of the world. Those of Scotch objects included *Camptothecium nitens* from Killin; *C. lutescens* Huds. in fruit from Ben Laoigh; *Drepanepteryx phalaenoides* L. from Cleghorn; Fungi from Tillicoultry; Mosses and Lichens, exhibited by Dr. Stirton, to illustrate his Presidential Address on the Glacial Period and its influences on the distribution of Cryptogamic plants; *Galathea strigosa* L., *Xantho florida* Mont., and *Pirimela denticulata* Mont., from Mull and Gareloch; numerous rare and curious varieties of Lepidoptera from the Clydesdale district, shown by Messrs. W. Watson and J. F. King; *Orobanche rubra* from Eigg; *Scutellaria minor* from Loch Aylort, and *Malaxis paludosa* from Loch Maree; several species of Algae from Kyles of Bute, Kildonan, and Helensburgh; *Leptaspidea brevipes* B. and W., dredged in the Clyde, near Greenock; Alpine Phanerogams from the counties of Aberdeen, Forfar, and Perth; Mosses in fruit from Perthshire and West Kilbride; *Anchomenus Sahlbergii* Chaud., from near Bowling; *Capnia nigra* Pict., from Loch Earn, and from Insh in Inverness; and various Mosses from the Calder Valley.

THE CRYPTOGAMIC SOCIETY OF SCOTLAND

HELD its thirteenth annual conference at Greenock on the 4th, 5th and 6th October last, under the presidency of the Rev. Hugh Macmillan, D.D., LL.D. The meeting was well attended, and proved a most enjoyable one throughout. The weather was fine for Greenock, and even the most enthusiastic Cryptogamists were compelled at times to pause in their search, and lift their eyes from earth to gaze upon the exquisite scenery of the islands, lochs and mountains of the far-famed West of Scotland. The hospitality of our Greenock friends needs no comment. At the annual dinner the members had a pleasant re-union.

At the public meeting of the Society the President delivered an admirable inaugural address on Cryptogamic Botany. We give it in our present issue, as it cannot fail to awaken interest and enthusiasm and reverence in the minds of many who were not privileged to listen to it.

The following papers were communicated :—1, **Heteroecism in the Uredines**; 2, **Revision of Scotch Perisporiaceæ**; 3, **Revision of Scotch Chytridiaceæ, Protomyceteæ, and Ustilagineæ**; 4, **Revision of Scotch Gymnoasceæ**, all by Professor J. W. H. Trail; and 5, **On a Curious Habitat of some Mosses**, by C. P. Hobkirk. The Society received considerable additions to its membership.

Excursions were made to Bute and Ardgowan, where the members were hospitably received by the Marquis of Bute, and by Sir Michael and Lady Octavia Shaw Stewart. Fungi were not very abundant, and we have no varieties to record. The only plant worthy of special notice is the rare lichen *Ricasolia amplissima*, which was found by Dr. Macmillan at Ardgowan. The season has been a peculiar one as regards the crop of fungi. In some localities, for short periods, immense crops of the commoner species sprung up, while in others they were altogether absent. This is to be accounted for by the presence or absence of autumn rain after protracted drought. It is worthy of note, however, that in all parts of the country, even during the continuance of drought, the common mushroom, *Agaricus campestris*, was exceptionally abundant.

A public exhibition of Cryptogamic plants was held, under the auspices of the Society, in the hall of the Watt Institute; and a sufficient supply of the larger fungi was forthcoming to cover the tables, which were adorned with potted ferns. Space was devoted to a scientific arrangement of fungi, and to collections of edible and poisonous species. Fine collections of mounted ferns by Mr. William Stewart, Glasgow; of Mosses by Dr. Stirton, Glasgow; and of seaweeds by Mr. James Cook, Paisley, were exhibited and much admired. A glass case containing beautiful specimens of *Agaricus campestris*, and its varieties, sent from the Mushroom beds in the old railway tunnel at Scotland Street, Edinburgh, attracted considerable attention.

The thanks of the Society are due to the Local Committee and especially to Dr. M. Calder, local Secretary, for their exertions in securing the success of the meeting, and to the many contributors who enriched the public exhibition. The Society will hold its next annual conference at Inverary.

J. S.

INAUGURAL ADDRESS.

AT THE THIRTEENTH ANNUAL CONFERENCE OF THE SCOTTISH CRYPTOGAMIC SOCIETY, HELD AT GREENOCK ON 4TH OCTOBER 1887.

By Rev. Hugh Macmillan, D.D., LL.D., F.R.S.E.

My first duty is to thank you heartily for the high honour you have conferred upon me in electing me to be your local president during the meetings of our society in Greenock. There are many members much more worthy of this honour than I am; but there are none who have the interest of the association more at heart, and who desire more earnestly to make this year's Congress in every respect a success. Your choice in the present instance is symptomatic of the fact that the antagonism between scientific men and ministers of religion has now, owing to more enlightened views on both sides, in a large measure ceased to exist; and that they are now capable of understanding and sympathising with each other's pursuits, and finding an interesting and instructive harmony between them. I feel that it is also a kind of acknowledgment, in my unworthy person as their representative, of the great debt which Cryptogamic science owes to members of my profession. Presbyterian and Church of England clergymen have been among the most enthusiastic students of this special department of Botany. At the end of last century there was a parish minister at Killin, at the head of Loch Tay in Perthshire, who enriched the Cryptogamic flora of Scotland by many interesting discoveries made among the Breadalbane mountains situated in his parish. This minister, whose name was the Rev. Mr. Stewart, father of the better known Dr. Stewart of Luss, was a remarkable example of the high culture of some of the Presbyterian clergy of Scotland at a time when science was little known. Besides faithfully performing his professional duties, and earning the respect and regard of all his people, he employed his leisure hours in translating the Bible into Gaelic, and in investigating the Cryptogamic flora of Loch Tay side. He was a correspondent of Lightfoot, the author of the "Flora Scotica," in which many of his discoveries appear, and of Linnæus, to whom he wrote long letters about his favourite

plants in elegant Latin. Another minister of the same kind was Dr. Burgess of Kirkmichael, in Dumfriesshire, who at the beginning of this century was a zealous correspondent of Professor Hope of Edinburgh, and did much to put the lichen flora of Scotland in a more satisfactory condition. In one of his letters, which I happen to possess, he says to Professor Hope that if some kind patron should appoint him to a parish in another part of the country, where he could have an opportunity of further pursuing his researches among flowerless plants, he would have nothing more to desire in this world. Nor must the name of Dr. Colin Smith of Inverary be omitted from the list of clerical pioneers of Scottish Cryptogamic Botany. This accomplished minister, who was at the head of the Celtic scholars of his day, and contributed extensively to Celtic literature, was an ardent and successful collector of mosses, and added many rare species to the list of these interesting plants in Scotland. We have still surviving at very advanced ages, showing the extreme healthiness of such pursuits, two clergymen of the Church of England, whose names occupy the foremost place in their respective departments. I have only to mention Mr. Berkeley and Mr. Leighton, veterans of science, who were famous when most of us were in long clothes, to call up before your imagination a long list of services rendered by these clergymen in the special branches of fungi and lichens, which cannot be overestimated. And in our own country we are proud to number among the members of our society three clergymen of the Church of Scotland who have given invaluable help in extending the knowledge of this subject. To the Rev. John Stevenson of Glamis, our honorary secretary, we are indebted for the most learned, accurate, and comprehensive work on Scottish fungi that has yet appeared; while his work on the Hymenomycetes is a perfect model of what such monographs should be. Clergymen therefore, whatever they may have been in other departments of science, have not been obstructive and obscurantist in regard to this particular department; and I feel highly honoured to be permitted to walk in the footsteps of such men.

Your election of me as your president is also significant of the fact that no class of men need so much the help of a scientific study that will bring them into contact with material and concrete things as those who are principally engaged amongst spiritual and abstract things. Theologians are now beginning to realise,

far more than their predecessors did, that the wisdom from above includes in addition to the things primarily necessary to salvation, all in the natural as well as all in the mental and spiritual worlds that can furnish the understanding and fill the soul with food convenient for its high capacities and boundless appetites. Balaam is strikingly said to be "the man whose eyes are open." The open eye to see clearly and appreciate truly the common things that God has placed around us in our daily path is a gift much rarer than it ought to be. Most people go through the world with their eyes half shut or wholly blinded, and so not only deprive themselves of endless sources of enjoyment and instruction, but remain culpably ignorant of much that would enlarge and elevate their ideas of God, and make their religion a grander and brighter experience.

There is fortunately no necessity now to apologise for the study of Botany; and no department of it has received such an impetus during the last twenty years as that which falls within the scope of this society. For a long time Cryptogamic plants were systematically neglected. When I began to study them thirty years ago, I found very few indeed to sympathise with me in my peculiar taste. In all Scotland there were not a dozen persons who knew anything about lichens—my special favourites. My friends, Dr. Greville and Dr. Lauder Lindsay, were the only names known in connection with the general subject. By professors of Botany, Cryptogamic plants were ignored in their lectures; and botanical books seldom condescended to notice them. Explorers in foreign lands gave an account sometimes of the new ferns and, perhaps, the mosses which they had discovered; but they hardly ever brought home a collection of lichens and fungi, or gave any idea of the lichen-flora or the mycology of the countries which they investigated. Here and there some lonely student pursued his researches among these plants unheeded. Flowers and ferns were to a certain extent popular, but not one in a thousand cared to descend lower into the arcana of the vegetable kingdom. What a remarkable revolution has now been effected! There are hundreds of students of Cryptogamic plants scattered over Scotland. We can muster among them a force sufficient to form a large and flourishing Cryptogamic Society—which is now in its thirteenth session—which includes among its members many of the most prominent scientific names in Scotland, and which by its

papers, excursions, and meetings, has done much not only to enlarge and elucidate, but also to popularise the subject. Being a peripatetic society, and holding its annual congresses in different localities, it has helped to diffuse all over the country from such centres a wonderful amount of interest in the objects of its study. In order to show the vast progress that has been made within the last twenty years, it is sufficient to say that the list of British mosses has been increased one-half more. The number of British lichens, when I began to study them, included in Hooker's Cryptogamic Flora, was about five hundred species; Leighton's monograph on British Lichens now describes more than two thousand species. And as for fungi, the number of native species has been trebled, and year by year is being added to by fresh discoveries. Well searched as our tight little island has been for a hundred years at least, not a season passes without many interesting additions being made to our Cryptogamic flora. And not only in the increase of species collected is this remarkable progress manifested, but also in a more profound and accurate knowledge of their structure, life-history, and relations. A vast deal has still to be done in the way of correcting former errors, discovering new species, and elucidating the structure and development of the more obscure plants; and, therefore, the labours of such a society as this are urgently needed. Of late years, the principal controversies of the scientific world have been connected with the lowest members of the Cryptogamia; and some of the profoundest problems of biology—the origin of life, whether by spontaneous generation or by germs, the nature and spread of disease, the process of fermentation, the methods of cure, including the antiseptic method, and Pasteur's prophylactic researches and experiments—involve for their comprehension and solution a considerable knowledge of the minutest forms of fungoid life. All this has drawn a large measure of attention to the plants in which we are interested, and has given to the aims and objects of this society an importance which should make its visit to any locality no ordinary event.

I shall not presume in this introductory address to convey any instruction upon the subject of Cryptogamic Botany to those who are more familiar with its details than I am, who, with all my love for the study, am obliged by the pressure of other work, to give it a subordinate place, and to keep it very much in the back-ground.

But there may be some present who are not familiar with the class of plants in which we are specially interested; and for their sakes I may be pardoned if I make a few remarks of a general character. The most cursory and superficial glance will recognise in every scene a class of plants whose singular appearances, habits, and modes of growth are so widely different from those of the trees and flowers around that they might seem hardly entitled to a place in the vegetable kingdom at all. On walls by the wayside, on rocks on the hills, and on trees in the woods, we see tiny green tufts and grey stains or parti-coloured rosettes spreading themselves, easily dried by the heat of the sun, and easily revived by the rain. In almost every stream, lake, ditch, or any collection of standing or moving water, we observe a green slimy matter forming a scum on the surface or floating in long filaments in the depths. On almost every fallen leaf and decayed branch, fleshy gelatinous bodies of different forms and sizes meet the eye. Sometimes these different objects appear growing on the same substance. If we examine a dead, partially-decayed stick, half buried in the earth in a wood, we may find it completely covered with various representatives of these vegetable growths; and nothing surely can give us more striking proof of the universal diffusion of life. All these different plants belong to the second great division of the vegetable kingdom, to which the name of Cryptogamia has been given on account of the supposed absence in all the members of those prominent organs which in the other great division are essential to the production of perfect seed. This Linnæan name is now, however, found to be a misnomer, for Cryptogamic plants are propagated by sexual elements as truly as flowering plants, and these elements have been distinctly discovered, even in the obscurest species. There is no actual gulf of separation between flowering and so-called flowerless plants in regard to their mode of propagation. They constitute links of a common chain, in which as we proceed from the most simple to the most complex, we trace the tendency of nature to specialise more and more the parts devoted to a particular function; just as in a civilised community the same operations are performed by the divided labour of many individuals which in an early state of society are executed by one. Cryptogamic plants are propagated by little embryo plants called spores or sporules, generally invisible to the naked eye, and differing from true seeds in germinating

from any part of their surface, instead of from two invariable points. Besides this grand distinguishing point, they possess several other peculiar qualities in common. They consist of cells only, and hence are often called cellular plants in contradistinction to those plants which are possessed of fibres and woody tissue. Their development is also superficial—growth taking place from the various terminal points—and hence they are called Acrogens and Thallogens to distinguish them from monocotyledonous and dicotyledonous plants. Popularly they are known as mosses, lichens, algæ, and fungi.

The plants in question open up a vast field of research. They constitute a microcosm—an *imperium in imperio*—a strange minute world underlying the great world of sight, which, though often unheeded by man, is yet ever in full and active operation around us. It is pleasant to turn aside for a while from the busy human world, with its ceaseless anxieties, sorrows, and labours, and contemplate the silent and wonderful economy of that other world of minute or invisible vegetation with which we are so closely related though we know it not. There is something exceedingly interesting in tracing Nature to her simplest forms. The mind of man has a natural craving for the infinite. It delights to speculate either on the vast or the minute; and we are not surprised at the paradoxical remark of Linnæus that Nature appeared to him greatest in her least productions.

There is a certain appropriateness in the visit to Greenock of a society which studies these remarkable objects. There is a good field along our shores, and on the moorland heights behind, for the collection of these plants. And were it not for the lateness of the season, and the withdrawal of the means of communication —for there is no town in the three kingdoms that has greater facilities for getting out of it than Greenock—the members of the society could be taken to haunts at the head of our sea lochs, where they could find a larger number of rare and interesting species of mosses and lichens than almost anywhere else in Scotland. But apart from that, our good town itself presents an interesting field of study to the cryptogamist, so that he who runs may read. There was a book published on the flora of the Colosseum at Rome containing a description of upwards of four hundred plants that grew on that great historical ruin. Similarly a book might be written on the mosses and lichens that grow on the walls and

houses and pavements of Greenock. Our friends at a distance, I daresay, have heard that we have the reputation for now and then having a few showers of rain—just enough to keep our waterworks, and sugar mills going; and these occasional showers leave behind them evidences of their presence and power in the green mural decorations which spring up so abundantly on walls and on the outsides of empty houses. We can almost tell whether a house is to let or not by these significant advertisements. Green means forsaken; and "the wearing of the green," by the houses in our town shows that there is no home-rule within; that the coercion law of the household fire has not been in operation for a considerable time. Indeed so bold are these cryptogams that they march up our steps in some parts of the town in spite of the assiduous washings of the servant, which cannot obliterate their tell-tale marks. And should the weather by any chance at any time become worse, we might almost expect them to ring the bell and act the postman and deliver to us cryptogams!

Cryptogamic plants once occupied the foremost place in the economy of nature. Like many decayed families whose founders were kings and mighty heroes, but whose descendants are paupers, they were once the aristocracy of the vegetable kingdom, though now reduced to the lowest ranks, and considered the canaille of vegetation. Geology reveals to us that one whole volume of the earth's story book is filled almost exclusively with their history. Life may have been ushered upon our globe through oceans of the lowest type of confervae, long previous to the deposit of the oldest palæozoic rocks as known to us; and for myriads of ages these extremely minute and simple plants may have represented the only idea of life on earth. But passing from conjecture to the domain of established truth, we know of a certainty that at least throughout the vast periods of the carboniferous era, ferns, and mosses occupied the throne of the vegetable kingdom; and by their countless numbers, their vast dimensions, and rank luxuriance, covered the earth with a closely woven mantle of dark green verdure. The relics of these immense primeval forests, reduced to a carbonaceous condition, are now buried deep in the bowels of the earth, and constitute the source of our domestic comfort, and of nearly all our commercial greatness. And as in early geological epochs they occupied so conspicuous a position, so now in geographical distribution they are entitled to a prominent place.

With the exception of the grasses they are the most abundant of all plants, possessing myriads of representatives in every part of the globe from which unfavourable conditions exclude all other vegetation. And thus they contribute far more than we are apt from a superficial observation to imagine to the picturesque appearance of scenery and to the formation of the richly woven robe of vegetation which conceals the skeleton of the earth. They are the first objects that clothe the naked rocks which rise above the surface of the ocean, and they are the last traces of vegetation that disappear under degrees of heat and cold fatal to all life. Their structure is so singularly varied and plastic that they are adapted to every possible situation. Although they occupy but a very subsidiary and unimportant position among the vegetation which surrounds us in our daily walks, and are concealed in isolated patches in the woods and fields by the luxuriance of higher and more conspicuous plants, yet they constitute the sole vegetation of very extensive regions of the earth's surface. Every part of the globe within a thousand feet of the line of perpetual snow on the mountains is redeemed from utter desolation by these plants alone. The sublimest parts of the earth are adorned with garlands of the humblest plants. Mosses and lichens form the tapestry, the highly-wrought carpeting, laid down in the vestibules of Nature's palaces. The northern portion of Lapland, the continent of Greenland, the large islands of Spitzbergen, Nova Zembla, and Iceland, the extensive territories of the Hudson's Bay Company, the enormous tracts of level land which border the Polar Ocean from the North Cape to Behring's Straits, across the north of Europe and Asia, and from Behring's Straits to Greenland, across the north of America—a stretch of many thousands of miles—all these immense areas of the earth's surface, where not a tree nor a shrub, nor a flower is seen, except the creeping Arctic willow and birch, and the stunted moss-like saxifrage and scurvy grass, are covered with fields of lichens and mosses far exceeding anything that can be compared in that respect amongst Phanerogamous plants. Thus, to the rugged magnificence of Alpine scenery, and the dreary isolation of the Arctic steppes, and the boundless wastes of brown desert and misty moorland, these humble plants form almost the sole embellishments.

So much for the distribution of these plants on the land; their range in the waters is still more extensive. Lichens and mosses

cover the waste surfaces of the earth ; diatoms and confervæ are everywhere miraculously abundant in the waters, in rivers and streams, in ditches and ponds, alike under the sunny skies of the south and in the frozen regions of the north ; on the surface of the sea in floating meadows, and in the dark and dismal recesses of the ocean only to be explored by the long line of the sounding lead. The ocean swarms with innumerable varieties, without their presence being indicated by any discolouration of the water. The Arctic and Antarctic Oceans—covering areas larger than the continents of Europe and Asia—are peopled by myriads of diatoms ; various inland seas and lakes are tinged of different hues by their predominance in the waters ; while it has been ascertained from the soundings obtained during the investigations connected with laying the telegraph cable between Ireland and Newfoundland that the floor of the Atlantic is paved many feet deep with their silicious shields, preserving in all their integrity their wonderful shapes, notwithstanding the enormous pressure of the vast body of water that rests above them, and the fact that they are as tender and easily injured as the most delicate snowflakes. Such is the wide space which these organisms occupy in the fields of nature—a prominence which is surely sufficient to redeem them from the charge of insignificance. They are inferior in majesty of form to palms and oaks ; but in their united influence it is not too extravagant to say that they are not less important than the great forests of the world.

It may be asked by a class of persons, unfortunately too numerous, what is the use of these humble plants? In the business language of the world things are called useful when they promote the profit, convenience, or comfort of everyday life, and useless when they do not promote, or when they hinder any of these desired ends. But even judged by this standard Cryptogamic plants are not found wanting. Peat, so useful in many places as fuel, is almost entirely composed of mosses ; while for packing purposes and the preservation of plants growing in pots, certain species of moss are very valuable. Lichens yield food to man and beast ; the Iceland moss constituting a large part of the diet of the people in the remoter parts of Iceland, and the reindeer moss forming the pasture fields of the reindeer in Lapland and Greenland. As dye-stuffs, lichens are still employed, producing under proper treatment some of the most delicate and beautiful

colours; while formerly they yielded the principal drugs of the pharmacopeia when the principle of *similia similibus curantur* reigned in medicine. Fungi—though too often the sources of plagues and epidemics affecting plants and animals, not excepting man himself, and fearfully destructive in their ravages—form the leaven so necessary in the baking of our bread and in the manufacture of fermented liquors. A few, like the ergot of rye, are endowed with valuable medical properties; and a very large number yield an abundant supply of palatable and nutritious food. No country perhaps is richer in edible fungi than Great Britain; but such is the extent of direful ignorance and silly prejudice regarding them, arising from their cold, moist, clammy nature and the disagreeable situations in which they often grow, that this savoury and important food is year after year allowed to perish ungathered in the woods and fields. In these days of commercial depression, when severe economy has to be practised, and many of our labouring population are reduced to sore straits, these esculent fungi might be gathered either for sale or for personal consumption, and would form a by no means insignificant item in the day's earnings or in the day's bill of fare. In America during the late civil war the edible fungi of the country were extensively used as food by the troops, and helped in the scarcity of other rations to keep up their vigour. It is in order to encourage this popular utilisation of fungi that the annual meetings of our Cryptogamic Society have been held in September or October, when these plants are most numerous and luxuriant; and it were wished that their efforts in diffusing such useful knowledge were aided and supplemented locally by the teachers of Board schools. There are at least sixty kinds of esculent fungi in Great Britain which may be safely used at table, and are as good if not better than the common mushroom which appears to be the only species whose merits are at all appreciated, although, strange to say, it is on the Continent rigidly excluded by the inspectors of markets on account of its unwholesome qualities. There is the chantarelle with its rich orange trumpet-shaped cap and veins; the blewitts, occurring abundantly in old pastures during the winter months and often growing frequently in large rings; the liver fungus growing on oak stools; the champignon, or Scotch bonnets, which form the bare circles in the grassy meadows called fairy-rings. "I have myself," says Dr. Badham in his work on the Esculent Fungi of

Britain, "witnessed whole hundredweights of rich wholesome food rotting under trees; woods teeming with food and not one hand to gather it; and this, perhaps, in the midst of potato-blight, poverty, and all manner of privations, and public prayers against imminent famine." On the Continent, fungi afford not merely a flavouring for a delicate dish or a pleasant sauce or pickle, but the staple food of thousands of the people. Indeed, for several months in the year, especially in Poland and Russia, they constitute not only the staple, but the sole food of the peasantry; and from this circumstance they are called by enthusiastic writers "the manna of the poor." To many who are not reduced by necessity to use them as food they form a valuable source of income when collected for the market.

But it is not for their uses in human economy that the various humble plants which fall under the cognisance of the Cryptogamic Society are chiefly valued. They have in themselves a deep source of interest—in the great variety of their forms, in the remarkable peculiarities of their structure, and in the physiological problems with which they are connected. The study of them is well calculated to exercise an important educational influence. While they try the patience, they exercise the faculties by forcing attention upon details. The beauty of very many of them is also a great attraction. What lovely effects they produce in nature; mosses and lichens imparting their varied hues, and their soft cushions, and round rosettes to the woodland nook, and the ivied ruin, and the crumbling wall, in picturesque beauty; and green confervæ floating in springs, in fleecy clouds in ponds, or in long graceful wreaths in streamlets, like the hair of the naiads bathing in the clear waters, seen by those who have the gift of imagination, and believe in the powers of fern-seed to make the invisible apparent. And often how lovely in themselves are these lowly objects! Nothing can be more beautiful than mosses as a tribe, with their intricate tracery and translucent foliage. How beautiful are the snow-white coral tufts of the Stereocaulons and the Cladonias; how graceful the scarlet-tipped goblets of the cup-mosses; how bright the primrose-coloured maps of the geographical lichen mottled with black on the alpine rocks; how gorgeous are the broad scarlet caps that crown the pure-white stems of the fly agaric in our birch woods when the sun is shining down upon them through the faded foliage! There is not

in nature a more picturesque object to the painter, or a more interesting subject to the botanist, than the old decaying stump of a tree in some lonely haunt of an ancestral wood, where the soil, enriched by the organic contributions of centuries, is bursting into life through every crevice. Such a stump, as Wordsworth says of the mountain, is familiar with forgotten years; and on every inch of it there are growing ferns and curious structures belonging to lichen, moss, fungus, and alga. It is peopled with all the fantastic tenantry of Shakespeare's fairyland.

Add to all these recommendations the important advantage that most Cryptogamic plants can he observed and collected without interruption throughout the whole year, and in situations where other vegetation is reduced to zero. They can be studied alike under the cloudy skies of December and when illumined by the sunshine of June. When the flowers and ferns have vanished, when the lights are fled and the garlands are dead, the deserted banquet-hall of Flora is still relieved by the presence of humbler retainers, whose fidelity is proof against every change of circumstance, and whose better qualities are displayed when the storm is wildest and the desolation most complete. They are no summer friends. As Ruskin has beautifully observed: "Unfading as motionless," the worm frets them not, and the autumn wastes not. Strong in lowliness, they neither blanch in heat nor pine in frost. To them, slow-fingered, constant-hearted, is entrusted the weaving of the eternal tapestries of the hills; to them, slow-pencilled, iris-dyed, the tender framing of their endless imagery. Sharing the stillness of the unimpassioned rock, they share also its endurance; and while the winds of departing spring scatter the white hawthorn blossom like drifted snow, and summer dims in the parched meadow the drooping of its cowslip gold, far above among the mountains, the silver lichen-spots rest, star-like on the stone, and the gathering orange stain upon the edge of yonder western peak reflects the sunsets of a thousand years."

May I be permitted to close these desultory remarks with one reflection, which the invisiblity of many of the plants comprehended within the scope of this society's researches suggests. If there is one half-truth more than another, whose fallacy science has shown in these days, it is the old proverb, "seeing is believing." The evidence of sight, which we are accustomed to regard as the surest of all evidence, goes but a little way in many of the

investigations of science. Science opens up whole worlds of unseen wonders in the midst of the common familiar objects of our daily life. It brings us into contact on every side with elements and forces that do not come within the sphere of our ordinary perception. By the aid of the telescope, it sounds the profound abysses of the sky, brings to view stars that lie far beyond the reach of the naked eye, and resolves seeming wisps of dim vapoury light that float on the face of the midnight heavens into firmaments of suns. By the help of the microscope, it reveals to us a universe of minute and most wonderful life in a wayside pool or a heap of fallen leaves—in a drop of water or a particle of dust. The great value of science is this—that it corrects the evidence of our senses; shows us that the true essence and meaning of all things is hidden from our natural, unaided sight; and bids us look, as we are commanded by the highiest and most solemn of all sanctions, not at the things which are seen, but at the things which are unseen. The correlation of forms as well as forces throughout the universe teaches us also the great lesson that we cannot isolate any department of knowledge from the great whole, however desirable it may be to do so for special and more accurate study. As every road led to Rome, and every stream leads to the sea, so every branch of study leads to the great ocean of truth. The smallest moss, or lichen, or fungus, is a key that opens the gate of the great temple of knowledge, and conducts us to its inmost shrine. We can say of it what Tennyson says of the flower:

> "Little flower, if I could understand
> What you are, root and all—and all in all—
> I should know what God and man is."

May I venture one other delicate hint in conclusion? Our Society reminds me somewhat of Schwendener's famous theory of the origin of a lichen. We all know that the erudite German does not grant an autonomous existence to a lichen any more than we are disposed to allow it to Ireland. It constitutes a vegetable Great Britain, composed of the union of a fungus and a green alga, the fungus parasitic upon the alga, and in a peculiar Irish way of its own, contrary to the practice of all other parasites, stimulating and developing the resources of its host, and causing it to grow and luxuriate instead of fading and perishing. It may

be said, to use this analogy, that our Society is composed principally of the union of those who specially study fungi, and those who specially study algæ, aerial or aquatic; the fungologists vastly predominating, and hiding their green brethren out of sight by their overwhelming numbers and the magnitude of their pursuits. Nothing can be said against this arrangement, for hitherto it has worked admirably; the parasite in this case at least having certainly contributed by its more popular interest and importance, to the prosperity of the Society, and helped it to grow and become what it is, to the *liking* of all. But, at the same time, it may be pleaded that a little more attention should be devoted to lichens and mosses; that they should have an opportunity to vindicate their own claims to being more generally studied. I am sure the fungologists among us will be only too glad to encourage the students of other departments to carry on their researches; and we shall gladly welcome to our membership a larger number of those who have been working in the more neglected fields of our science. By mutual and hearty co-operation, our ardent desire that our Society may flourish like a green moss, endure as long as a crustaceous lichen on a rock, and grow larger and more vigorous like a fungus, although other similar societies should decay, will be ful filled!

ADDITIONS TO SCOTCH PERONOSPORÆ.

In my Revision of these Fungi last year (*Scot. Nat.*, 1887, pp. 84-85), I enumerated several species that might be found in Scotland, and I have now to report the discovery of two of these.

19.* **P. Lamii** A.Br.

Usually hypophyllous, diffuse, or in dirty whitish spots; conidiophores 4-7 times bifurcated, terminal branchlets slender, recurved; conidia globular or elliptical, 16-24 by 15-21, pale violet; oospores said to be small and brown.

On leaves of *Lamium purpureum*, in September.

S. Moray (Forres, Rev. Dr. Keith).

25. **P. Rumicis** Corda.

On young shoots and leaves, diffuse, dirty white or pale violet; conidiophores 3-6 times bifurcated, terminal branchlets slender, nearly straight; conidia ovate or elliptical, 23-31 by 17-22, dull pale violet.

On *Polygonum aviculare*, in September and October.

Dee (a few miles north of Aberdeen, found by myself).

JAMES W. H. TRAIL.

ON THE FLORA OF SHETLAND.

By W. H. Beeby, A.L.S.

AT the end of last August, I found myself again in Shetland, expecting, the visit being made six weeks later than that of the previous year, that I might find the *Spargania*, &c., in good fruit. So far as regards the *Spargania*, I fared little better than in 1886, for the fitful Shetland summer is not advantageous to late-fruiting things of this sort; and the last three seasons have, I understand, been unusually bad. At this time of year the most striking feature in the Flora is the large size of the individual flower-heads of some of the Compositæ—particularly noticeable in *Senecio aquaticus*, which makes a brilliant display; in *Sonchus arvensis*, where it occurs; and, to some extent, in *Achillea Ptarmica*. The same characteristic is strongly marked in *Raphanus*, and, in a lesser degree, in several other plants.

On landing at Scalloway, I found a steamer excursion to the island of Foula announced for the next day but one. Some idea of the difficulty of reaching this island to those whose time and means are limited may be imagined, when it is mentioned that the only communication is afforded by a sailing smack which carries the mail once a fortnight; and that but one other steamer excursion has been made during the past fifteen years. I, therefore, gladly availed myself of the opportunity; but, unfortunately, the arrangements allowed of only two hours being spent on the island, which, however, yielded one new record for the county. As before, most of the time was spent in Unst; with one day about Scalloway, and a few hours about Lerwick.

I had hoped to report on some of the forms, such as *Cerastium longirostre*, mentioned in my previous paper (*Scott. Nat.* 1887, p. 20), respecting their behaviour when cultivated with the view of testing their claims to be considered distinct; but the seeds did not germinate. A few plants grown from the roots collected are noticed in their respective places. I have not referred again specially to such common plants as seem to have been recorded erroneously; but these were constantly kept in mind, and their apparent absence may be taken as emphasised, so far as regards

the districts visited. I have again had recourse to various authorities for assistance with the more critical plants; and to these gentlemen, I now tender my thanks for their valuable help. The following abbreviations are used:

U—Unst. S—Scalloway.
*—believed new to Britain.
‡—not recorded for the county in "Top. Bot." Ed. II., or in Bennett's "Additional Records," unless with some form of query.

Ranunculus Flammula L. var. **radicans** Nolte.—The extreme form of this plant from Littlesetter Loch, Yell, has, in cultivation, reverted at once to typical *Flammula* (Cf. 'Journ. Bot.' 1887, p. 370).

Caltha palustris L. var. **zetlandica** Beeby (*Scott. Nat.* 1887, p. 21).—This plant seems to pass gradually from forms in which the leaves are roundish and almost entire, into forms which can scarcely be separated from *C. radicans* Forst. On the other hand, I found this year, by the upper end of the Loch of Cliff, Unst, large erect forms of *C. palustris*, which did not root at the nodes of the flower-stems, but in which the leaves were exactly similar to those of *C. radicans* Forst; thus *palustris* and *radicans* both seem variable in their leaf-forms and in the size of the flowers, and I am disposed to think that the rooting stems afford the only reliable character for the separation of the two plants; hence, I believe that *zetlandica* should be considered a variety, or form, of *radicans* rather than of *palustris*. The tendency to root at the nodes is inherent in the plant, and is not a temporary state induced by local influences, as in the case of the *Ranunculus* cited above. I have grown the *zetlandica* near London, in a smallish pot, the diameter of which did not admit of the stems rooting into the soil; but, notwithstanding the hot, dry summer of last year, every flowering stem sent out rootlets at one or two of the nodes.

Cakile maritima Scop. var. **integrifolia** Hornem.—This also occurs at the Knabb, Lerwick; I have not met with the ordinary form.

‡ **Cochlearia danica** L. (t. Lange.)—Some very large plants at the Knabb. I have not yet seen *C. officinalis*, except as it may be represented in the *C. alpina*. The last named plant has

flowered and seeded freely in cultivation, and has not altered, unless perhaps it is slightly larger.

Stellaria media Cyr.—A large-leaved, fleshy, maritime form on the shingly beach at Gutcher, Yell; seeds larger than in the ordinary form of the islands—var. **major** Lange in litt.

Alsine hirta Hartm.—By the kindness of Dr. Buchanan White, I was able to send Dr. Lange some examples of the Ben Lawers '*rubella*.' Dr. Lange reported (Feb. 1887) as follows:—"the little *Alsine* you send me is, I think, a compact form of *A. verna* var. *hirta*." It is, therefore, a question whether we have the restricted *rubella* in this country. Fries uses the name in an aggregate sense, mentioning under it the two forms—the true *A. rubella* Wahl., and the *A. hirta* Hartm. The former appears to be an arctic form; and it may be noted that the name *Arenaria rubella* Hooker, was first given in Parry's "Second Voyage," probably to a Greenland plant and not to the Scotch; but I have not the book at hand. From Dr. Lange's report it would appear that the Ben Lawers plant is the same as that from Shetland, as I had at first supposed.

Sagina maritima Don.—U. Cliffs about Springfield. S. Coast about Scalloway.

S. subulata Presl. var. **glabrata** "Koch." (*Scot. Nat.*, 1887, p. 25). *Dele* "Koch"; *adde* "Lange in litt."

Spergula arvensis L. var. **sativa**.—Extends to the top of the Sneug, Foula (c. 1400 feet), where a few plants were seen.

‡ **Lepigonum salinum** Kindb.—S. Sea coast near Scalloway.

‡ **L. marinum** Fries—*Spergularia marginata* Syme. U. North shores of Balta Voe. A remarkable form, with a strong perennial root, but with the seeds apterous, or nearly so. Dr. Lange remarks "var seminibus auguste marginatis vel apteris. Ceterum convenit, et sensim in alias quoque speciebus variat." Mr. Arthur Bennett is inclined to think it the "*S. marina b. fasciculatis*" (*Lepigonum fasciculare* Lönnroth), which is characterised thus: "seminibus obovatis, exalatis, vel paucioribus margine augustissima alatis." Only the old aggregate "*Spergularia marina*," which includes the above two segregates, is recorded in *Top. Bot.*

Hypericum pulchrum L.—The typical form occurs (S.) in the deep and sheltered ravine of the Burn of Sundaybanks. The

var. *procumbens* Rostrup remains unaltered in cultivation; entirely maintaining its prostrate habit, and three-flowered cyme.

Anthyllis vulneraria L. *var. **ovata** Bab. in litt.—This name must replace the "var. *maritima* Koch," recorded in my last paper. Professor Babington corrected me on this point last March, remarking, "I have not seen anything like this. The broad ovate solitary or terminal leaflet and the remarkable pubescence are striking. But it is not the *A. maritima* Schweigg. . . . . neither have I anything like it in my Arctic collection." Dr. Lange reports on specimens collected last year—"var. *macrophylla* Lange ad int.; Robusta, sericea, foliolo terminali maximo, ovali; conferenda cum var. *maritima*, cujus forsan forma." I have adopted the first proposed varietal name; but the terminal leaflet varies from broadly ovate, through oval, to the commoner oblong-oval form.

‡ var. **Dillenii** (Schultz)—U. Sparingly on the serpentine near the sea at the Wick of Hagdale; thence, going inland, it passes through forms, (1) with flowers variegated cream-coloured and crimson; (2) flowers pale cream-coloured; and finally becomes the ordinary yellow-flowered form of larger growth. Edmondston mentions *Dillenii* as occurring.

Rubus saxatilis L.—U. Springfield, as recorded by Tate. Only barren plants were seen.

‡ **Geum rivale** L.—S. In small quantity, in grassy places among rocks, by the west side of Tingwall Loch. This is the only species of *Geum* on record alike for Shetland, Faroes, and Iceland.

Epilobium montanum L.—S. In the ravine of the Burn of Sundaybanks. Also recorded from Unst, by Edmondston.

* **Callitriche polymorpha** Lönnroth (in *Obs. crit. pl. suec.* 1854, p. 19; *Bot. Notiser*, 1867)—U. In the Mailand Burn, apparently abundant. For the determination of this plant, new to the British Flora, I am indebted to Dr. Hjalmar Nilsson, of the Botanical Museum, Lund. So far as I can see from the comparison of the dry fruits, by sections, &c., it comes between *stagnalis* and *hamulata*; the fruit is larger than that of the latter, and pale, but without the wing which characterises the former; and it differs from both in the remarkably long styles, which are twice the length of the fruit, and are persistent. The distribution of the species is unknown beyond Norway and Sweden, but it is

likely to have been passed over as one of the above. It probably occurs in Surrey, but the specimens examined did not afford conclusive evidence; and it will doubtless be found in other places.

C. hamulata Kütz.—U. Mailand Burn, abundant. In Northmavin, I gathered it near Ollabery and Eela Water in 1886. I have not gathered *C. stagnalis* in Shetland but it doubtless occurs there.

‡ **C. autumnalis** L.—U. Loch of Cliff; Loch of Watlee, abundant. S. Asta and Tingwall Lochs. This is no doubt the plant intended by Edmondston under above name, as he speaks of it as "abundant," and it certainly is so in some of the lochs. But the plant was so much confounded with *hamulata* in his time, that his record has not been accepted by Watson.

‡ **Cornus suecica** L.—Near the top of the Sneug (c. 1400 feet), on island of Foula. Sparingly, and only barren plants, seen.

Lonicera Periclymenum L.—S. Ravine of the Burn of Sundaybanks, as recorded by Edmondston, who mentions it from two other stations.

Galium Aparine L.—Shingly beach at Gutcher, Yell; not a common plant.

Senecio Jacobæa L.—After much looking, I found one plant of this in Mrs. Hunter's garden at Baltasound, doubtless introduced in cultivation. Edmondston says of this "a far too common weed in most parts of the country; rare in Unst." This exactly describes **S. aquaticus** which, about Scalloway, &c., is a most abundant weed of cornfields and waste ground, but which in Unst is less common, occurring in ditches, &c., but not so generally as a cornfield weed. I am therefore disposed to refer Edmondston's plant to *S. aquaticus*. This latter usually occurs as a dwarf plant 8 inches to a foot high; the general outline is an inverted pyramid; and the flat-topped inflorescence of large flowers makes the plant very showy.

Euphrasia officinalis—Mr. F. Townsend has examined the gatherings of this aggregate made in 1886, and they seem to comprise three forms:

E. Rostkoviana Hayne.—A very large flowered plant, abundant in boggy and rushy pastures about Ollaberry, Northmavin, is believed by Mr. Townsend to be a glabrous variety of this form.

E. nemorosa H. Mart.—U. Burrafirth; Saxa Vord Hill; about the Loch of Cliff. Northmavin, moors about Ollaberry. Mr. Townsend places these under his *Nemorosæ*, of which group *E. nemorosa* is the type. Probably this is the common form of the islands. A third form may be present, but the material was too scanty. Some of the plants differ from any Mr. Townsend has seen elsewhere in Britain, "and seem to approach a form from Greenland and Iceland."

Stachys ambigua Smith.—S. Near Scalloway. The late Rev. W. W. Newbould told me some years ago that the Scandinavian form of this plant differed from our ordinary form in more nearly resembling *sylvatica*. This is also the case with the Shetland plant; which, as Mr. Bennett observes, is the same as that from Orkney, whence I have specimens collected by the Rev. W. R. Linton. I did not observe *sylvatica*, and according to Dr. Boswell it is much rarer than *ambigua* in Orkney.

Armeria maritima.—Very small forms are plentiful on the sea-cliffs of Unst, but I looked in vain for anything with the glabrous scape which marks the true *A. sibirica* Turcz.

Plantago maritima L. var. **hirsuta** Syme.—Referring to the observations of Mr. Charles Bailey and the Rev. E. F. Linton on this plant ("*Bot. Ex. Club Report*," 1886; "*Scot. Nat.*," 1887, p. 129), it certainly does differ considerably, at first sight, from the Rev. W. R. Linton's Orkney specimens. The leaves in both are variable in breadth; and this is especially the case in the Shetland plant, in which they average narrower than in the Orkney one. The Shetland plant also produces, among the leaf-bases, an unusually copious supply of that white "wool" or "silk," which is present, in greater or lesser quantity, in every specimen of a Plantain that I have yet seen from either Orkney or Shetland. But it is not wanting in Mr. Linton's Orkney plant, though sparingly produced in it. When the wool is abundant, and the plant is hirsute, the hairs often carry up portions to the upper parts of the leaves during their growth, and it is this, chiefly, which gives the Shetland form its different appearance. The hirsute covering of the leaves themselves is identical in both plants, and consists of a thick growth of white, somewhat rigid, jointed hairs. I have not been able to find a type specimen of Syme's variety; but I should not feel disposed, at present, to separate the Orkney and Shetland plants, further than as forms of the same variety.

‡ var. **dentata** Koch.—The typical glabrous form, and **f. hirta**, among rocks by the west side of Tingwall Loch, Scalloway.

Suæda maritima Dum. var. **procumbens** Syme.—U. Abundant by the north shore of Balta Voe.

‡ **Atriplex patula** L.—U. A maritime form by Balta Voe. Var. **erecta**. S. Corn-field near Scalloway.

A. Babingtonii Woods.—U. Shores of Balta Voe. Yell, shore at Gutcher. S. Scalloway.

‡ var. **virescens** Lange. (t. Lange)—With the last in the two first-named localities, and apparently the more common form. Both are, doubtless, general along the coast line. It seems probable that the var. **virescens** is the "**A glabriuscula**" Edmondston. Watson includes *A. hastata*, and Edmondston states that *A. deltoidea* Bab. is abundant; but I did not meet with either, although my gatherings were somewhat numerous.

Rumex obtusifolius Auct.—U. At Baliasta, on waste ground. S. Somewhat frequent about roadsides at Scalloway. Not common, and always looking starved, and as though unsuited to the climate; thus in strong contrast to the three following species. The plant from Scalloway I had thought might be var. *silvestris* (Wallr.), and Dr. Lange writes "probably;" but the plant was not sufficiently mature to allow of certainty.

R. crispus L.—Generally distributed, and rather common.

R. domesticus Hartm.—This is the commonest Dock of the islands, and grows in luxuriance in all suitable spots, both by the sea and inland. (*R. aquaticus* Edm.)

‡ **R. conspersus** Hartm.—U. About Baltasound and Baliasta. S. Scalloway, about the coast, as well as inland in many places. So far as I have seen, as generally distributed as the last, and perhaps not much less common. This is probably *R. acutus* Edm. (at least in part). I did not see *R. acutus* L. (*pratensis*), but it may occur, as it is recorded from Orkney by Dr. Boswell. Some botanists have thought that *R. conspersus* is a hybrid between *domesticus* and *obtusifolius*; Dr. Lange considers it to be a hybrid of *R. domesticus* and *acutus*.

A curious form occurs at (U.) Baliasta growing with *R. obtusifolius*. This plant, Dr. Lange thinks, may be "*R. conspersus* **platyphyllus* Aresch. (?)" which "seems to be a hybrid between *domesticus* and *aquaticus*." The perianth is much like that of *conspersus*; but the leaves are very different, resembling closely

those of *obtusifolius*. *R. aquaticus* Auct. Suec. is not yet known as British, but from its distribution there is no reason why it should not occur. It is probably owing to the fact that this name has been, and still is, applied so variously, that Nyman credits England and Scotland with *R. Hippolapathum* Fries instead of with *R. domesticus* Hartm. Altogether, the Shetland Docks appeared to me very interesting; and I regretted that I had not the means to make a more extensive collection of the various forms.

Populus.—I did not see **P. nigra** at the Burn of Sundaybanks; but it was nearly dusk when I reached the spot. It is an extremely unlikely tree to have been planted here; and I have no doubt the tree found here will prove to be **P. tremula**, which occurs as a native of Orkney and Caithness.

Salix herbacea L.—Common on the hills of Foula, at 1000-1400 feet.

Sparganium affine Schniz.—This is, apparently, the common species of the islands. According to Dr. Neuman, who has for some time studied the Scandinavian species, there are three forms included under this name. All of these occur in Britain, but I am at present imperfectly acquainted with their distinguishing features. So far as can be seen from the specimens, none of which are in good fruit, the common form in Shetland is **S. affine, genuinum**; and it occurs copiously (U.) in the Loch of Cliff, Burn of Burrafirth, &c. Besides this, another form occurs, which Dr. Neuman regards as a distinct species or subspecies. Fortunately, I obtained a few examples of this plant in good fruit. I await the publication of my friend's expected paper on the genus, before giving a description of this plant.

‡ **S. minimum** Fries.?—A plant is abundant in the Mailand Burn, Unst, which Dr. Neuman believes to be this species. Owing to the depth of water all the flower-heads were submerged; and consequently the female heads were not fertilised, so that the fruit was very imperfect. The only other European species to which the plant could be referred is *S. hyperboreum* Læst.; but Dr. Neuman reports as indicated above, after examining the fruit in the fresh state.*

Potamogeton heterophyllus Schreb, and **P. nitens.** Web.

* (I should be grateful for examples of Scotch *Sparganiа* in ripe fruit, either on loan or in exchange.)

=S. Both at the upper end of Tingwall Loch. The latter plant, of which only the var. **curvifolius** was gathered in 1886, was possibly scarce, as only a single specimen was gathered; Mr. Bennett speaks confidently as to its name.

‡ **P. prælongus** Wulf.—U. Loch of Watlee. S. Tingwall Loch. Abundant in bot h.Can this be the *P. lucens* of Edmondston's Flora, which I have not yet been able to find? I did not, however, see **P. prælongus** in the Loch of Cliff, which is one of the stations given by him for *lucens*.

‡ **P. pectinatus** L.—S. Asta and Tingwall Lochs. Unfortunately I found only barren examples. Mr. Bennett reports—"I suppose will be right—no fruit."

‡ **Zannichellia polycarpa** Nolte (t. Ar. Bennett).—U. Loch of Watlee.

Zostera marina L.—The only form seen is the var. **angustifolia** Fries.

Luzula maxima D. C. var. **gracilis** Rostrup.—I remarked last year that this plant was barren on the upper slopes of Saxa Vord Hill, flowering only on the summit. On the Hill of Hermaness, opposite Saxa Vord, the plant occurs in profusion, but I could not find a single flower-stem; but then, Hermaness only reaches the altitude of 650 feet. I again found the variety flowering in the island of Foula, on the Hammerfeld (1000-1100 feet) and the Sneug (c. 1400 feet).

Juncus triglumis L—U. Hill of Colvadale, abundant in wet stony ground at the low elevation of 200-300 feet. The only other record is Ronas Hill (T. Edmondston). My last visit enabled me to see that **J. lamprocarpus** is much more common than I had supposed. I did not detect *J. alpinus*, which is likely to occur. On a dwarf form from stony ground by the east side of Tingwall Loch, Dr. Buchenau reports—"Planta pusilla, dubia. *J. alpinus* vel *J. lamprocarpus*."

Scirpus pauciflorus appears to be common and generally distributed.

* **Carex cæspitosa** L. (Fr.) U. West side of the Loch of Cliff. I did not visit this side of the Loch in 1886, when, however, I walked round the other side without seeing it. I don't suppose that it will prove to be common. Dr. Lange reports—"is, as I think, rightly named."

C fulva Good. (*C. Hornschuchiana*).—U. Hill of Colvadale.

Var. **sterilis** Syme. Sparingly in the same locality. This latter plant is the '*C. fulva* Koch' according to Syme E.B. III.; and it is evident that continental botanists apply the name *fulva* to some plant other than *Hornschuchiana.*

C. ampullacea Good. f. **androgyna.**—U. by the Mailand Burn there occurs abundantly a large luxuriant form, which has all the female spikes male at the apex; the male portion varying from ¼ to 1½ inches in length. I do not discard the well-known name for this plant until it is decided whether it should be called *C. obtusangula* Ehrh., or *C. rostrata* Stokes.

Agrostis canina L. var. **mutica** Gaud. (t. Hackel).—On the Sneug, island of Foula.

‡ **Deschampsia discolor** Röm. et Sch. (*Aira setacea* Huds).— S. Very sparingly by the east side of Tingwall Loch.

Of the Ferns, **Athyrium Filix-foemina, Blechnum boreale,** and **Lastrea dilatata** are the commonest and most generally distributed.

‡ **Isoetes lacustris** L.—U. Loch of Cliff; Loch of Watlee. S. Tingwall Loch; fairly common in all the stations.

DRAGONFLIES.—Mr. W. Harcourt Bath, Ladywood, Birmingham, desires to correspond with students of the Odonata in all parts of the globe, as he is specially making up this group of insects. Specimens for figuring in his forthcoming "Monograph of British Dragonflies" will be very acceptable. There is probably no class of insects so neglected as Dragonflies; and Mr. W. Harcourt Bath will be very pleased to assist everyone desirous of commencing their study.

REVISION OF SCOTCH SPHÆROPSIDEÆ AND MELANCONIEÆ

(By Prof J. W. H. TRAIL, A.M., M.D., F.L.S.)

(*Continued from Page* 190.)

(All measurements, except where specified, are in thousandths of a millimetre).

b. On Monocotyledons.

*86. **H. Sparganii** Niessl. 2377, C. 276, S.M. 3037 (D. & R. *Trail, Sc. Nat.* 1885, p. 126).

On dead stems of *Sparganium ramosum*, near Aberdeen, in March.

Dee.

H. arundinacea (Desm.) Sacc., M. 1116. See **Stagonospora vexata.**

H. elegans Berk. M. 1113.

"On dead Reed, spring-summer."

Under this name is given in the *Mycologia Scotica* a fungus which must be a *Stagonospora*, as Berkeley describes it (Ann. N.H. 208, t.XI.f.9) as having hyaline sporidia, broadly fusiform, long, 6-8-septate, each articulation showing a large globose nucleus, pedunculate. This seems to come nearest *Stagonospora dolosa* Sacc. and Roum.

*87. **H. culmiseda** Sacc. 2392, C. 278, S.M. 3038 (D. & R. *Trail, Sc. Nat.*, 1885, p. 129).

On dead stems of *Phragmites communis*, at Rescobie, in Forfarshire (not at Aberdeen, as quoted in Cooke's list).

Tay.

c. On Cryptogams.

*88. **H. Equiseti** Trail (D. & R. *Trail, Sc. Nat.*, 1885, p. 76), S.M. 3039, C. 279.
On dead stems of *Equisetum* (*? limosum*), near Aberdeen, in February.
Dee.

XVIII. PROSTHEMIUM Kunze.

Pycnidia subcutaneous, carbonaceous, depresso-globose, black; sporidia cylindrical, pleuro-septate, united into stellate groups, coloured; basidia obsolete or filiform.

89. **P. stellare** Riess, 2431, C. 284, M. 1163 (D. & R. *Keith*).
On Alder branches at Greeshop, near Forres.
Moray.

§ 6. HYALOPHRAGMIÆ.

Like Phaeophragmiæ, but spores hyaline, or only yellowish.

XIX. STAGONOSPORA Sacc.

Differs from *Hendersonia* only in colour of sporidia, which however, grade almost into pale brown tints. Though the sporidia are typically 2-pluri-septate and guttulate, in some the septa are indistinct or absent. *Stagonospora* tends, in form of sporidia, to pass into section *Scolecosporæ*.

a. On Dicotyledons.

None recorded from Scotland.

b. On Monocotyledons.

*90. **S. typhoidearum** (Desm.) Sacc. var. **Caricis** Fuckel. 2465, C. 291, S.M. 2176 (sub *Darluca typhoidearum* var. *Caricis*), (D. *Trail* R. *Keith, Sc. Nat.*, 1881, p. 17).
On dead *Carex arenaria*, near Aberdeen, in autumn.
Dee.

*91. **S. aquatica** Sacc. 2470, var. **sexseptata** Trail (D. & R. *Trail, Sc. Nat.*, 1887, p. 88).
On dead stems of *Scirpus lacustris* at Corbie Loch, a few miles from Aberdeen, in September.
Dee.

*92. **S. Caricis** Oud. 2471, C. 293, S.M. 3040 (D. & R. *Trail, Trail, Sc. Nat.*, 1885, p. 186).
On dead leaves of *Carex* (? *laevigata*) at Drumoak, in May.
Dee.

*93. **S. paludosa** (Sacc. and Speg.) Sacc. 2475, C. 295, S.M. 3040 (D. & R. *Trail*, 1885, p. 79).
On dead leaves of *Carex ampullacea*, near Aberdeen, in spring.
Dee.

*94. **S. Heleocharidis** Trail (D. & R. *Trail, Sc. Nat.*, 1885, p. 76), S.M. 3042, C. 296 (wrongly quoted as *S. elæocharidis* Trail).

*95. **S. arenaria** Sacc. 2476, var. **minor**, Trail (D. & R. *Trail, Sc. Nat.*, 1886, p. 266,), S.M. 3072.
On dead stems of *Elymus arenarius*, near Montrose, in June.
Tay.

*96. **S. elegans** (Berk.), C. 298. See remarks under *Hendersonia elegans*. Comes nearest *S. dolosa* Sacc. and Roum.
On dead Reed; spring-summer.
Tay.

*97. **S. vexata** Sacc. 2483. (D. *Keith.*)
To this species must be referred the fungus of the Reed, mentioned in *Mycologia Scotica* (No. 1116, under the name of *Hendersonia arundinacea* (Desm.), Sacc.), as found by Dr. Keith at Kinrara, in Morayshire. This (*l.c.*) agrees with *S. vexata* in having hyaline sporidia, each 60-70 by 7, and 10-12-septate; but the true *H. arundinacea* has olive-brown sporidia, only 28-30 by 3½, and 3-5-septate.
On dead *Arundo* stems.
Moray.

c. On Cryptogams.

*98. **S. equisetina** Trail (D. & R. *Trail, Sc. Nat.*, 1887, p. 88).
On dead stems of *Equisetum palustre* in the Corbie Loch, near Aberdeen, in September.
Dee.

§ 7. DICTYOSPORÆ Sacc.

Pycnidia as in the other sections; *sporidia* ovoid, oblong, or rounded, *2-pluriseptate-muriform*, or *septa radiating or crossed, sooty or olive brown.*

XX. Camarosporium Schulz.

Pycnidia subcutaneous, at last erumpent, separate from one another, spherical, often papillate, membranaceous, or subcoriaceous, dark, sporidia as above. Several of the "species" are spermogonia of *Cucurbitaria.*

*99. **C. Laburni** Sacc. and Roum., 2496 (D. & R. *Trail, Sc. Nat.*, 1886, p. 266), S.M. 3073.

On dead branches of *Cytisus Laburnum*, common.

Dee.

This is the spermogonium of *Cucurbitaria Laburni*, which it very closely resembles, save in not possessing asci.

*100. A similar but unnamed stage of *Cucurbitaria Spartii* is plentiful on twigs of *Cytisus scoparius* (Broom) around Aberdeen, and may be called in like manner, **Camarosporium Spartii.** It differs from the *Cucurbitaria* only in the absence of asci.

*101. **C. Oreades** (Dur. and Mont.) Sacc. 2526, C.309 (*Hendersonia* Oreades Dur. and Mont, M.1114). (D. *Fergusson*).

On Oak leaves. October.

Dee, Moray.

*102. **C. metableticum** Trail, *Sc. Nat.*, 1886, p. 267, S.M. 3074.

In dead leaves of *Ammophila arundinacea*, on Sandhills, near Aberdeen, in December.

Dee.

§ 8. Scolecosporæ.

Pycnidia as in *Hyalosporæ; sporidia slender, filiform, or elongate fusiform*, undivided, or septate, hyaline or yellowish. *Note.*—This section grades into *Hyalosporæ*, through certain species of the latter that have slender spores (in *Phoma* chiefly), and into *Hyalophragmiæ* it passes through certain species of *Stagonospora.*

Analytical key to genera.

A. Pycnidia separate, not immersed in a stroma.

Pycnidia complete, small, lenticular, ostiolate, not papillate, very often in discoloured spots on leaves; sporidia usually very slender. *Septoria.*

Pycnidia globose-lenticular, but incomplete, on the leaves, but scarcely causing spots; sporidia stouter. *Phleospora.*

Pycnidia, complete, globular or depressed, usually papillate, on stems and branches, scarcely ever causing spots. *Rhabdospora.*

Pycnidia globose-oblong, depressed, rather large, incomplete above, dehiscing as in *Hysterium;* on branches and stems. *Phlyctaena.*

AA. Pycnidia sunk in a stroma, sporidia free from one another, slender, with a few rigid spreading cilia at each end. *Dilophospora.*

XXI. Septoria Fr.

Pycnidia as above; sporidia usually filiform, with numerous septa or guttulæ, rarely without either, hyaline or yellowish; basidia small or absent. This "genus" resembles *Ascochyta* in the spots it produces on the leaves, &c., of plants; and several of the species in the two may perhaps be stages in life-histories of the same fungi, probably of *Sphærella* and allies among *Pyrenomycetes.*

103. **S. Clematidis** Rob. and Desm, 2841, C.508, M.1143 (D. & R. *Stevenson*).

On leaves of *Clematis Vitalba.*

Tay.

104. **S. Hippocastani** B. & Br., 2575, C.468 (sub *S. Æsculi* Lib.) M.1132.

On leaves of *Æsculus Hippocastanum* (Horse-chestnut).

Tay (Dun).

Cooke, in his list in *Grevillea*, identifies this with *Ascochyta Æsculi* Lib., and mentions it under the name *Septoria Æsculi* Lib. The sporidia of this fungus do not agree with the description in *Annals and Mag. of Nat. History*, 1850, No. 434, by Messrs. Berkeley & Broome, though the difference may be due to difference of age. But the name *S. Hippocastani* may stand in the meantime.

*105. **S. Rosæ** Desm. 2615 (D. & R. *Trail, Sc. Nat.* 1885, p. 40).

On living leaves of *Rosa canina*, at Banchory, in July.

Dee.

Spots brown, with a reddish border; pycnidia numerous, but free from one another, about 100 in diameter; sporidia effused as a white crust on leaf, filiform-clavate, curved,

45-75 by 2½-3, with 3 to 7 septa, or without septa, hyaline.

106. **S. Rosarum** West, 2617, C.472, S.1145.
"On living leaves of Roses.
Tay, Dee."

107. **S. Hederæ** Desm. 2644, C.475, M.1137.
On leaves of *Hedera Helix* (Ivy), in Summer.
Tweed, Solway, Clyde, Tay, Moray S., Ross.

*108. **S. Grossulariæ** (Lib.), West, 2647.
On living leaves of *Ribes alpinum* L., at Banchory, on Deeside, in August, not previously recorded as Scotch.
Dee.
Spots at first brown, then dry and whitish in the centre; pycnidia scattered on the upper surface of the spots, ostiole wide; sporidia filiform, curved 20-30 (-50) by 1 (-1½), hyaline, 4-5-septate.
I have some doubt in referring this fungus to *S. Grossulariæ* (Lib.), though the only important distinctive character is the greater average length of the sporidia. It seems distinct from the next.

*109. **S. Ribis** Desm. 2649, C.447, M.1151.
On leaves of *Ribes nigrum* (Black Currant).
Tay, Dee.

110. **S. Viburni** West, 2657, C.479, M.1139 (D. & R. *Stevenson*).
On leaves of *Viburnum*; Summer.
Tay.

111. **S. stemmatea** (Fr.), Berk., 2660, C.480, M.1135.
On leaves of *Vaccinium Vitis-idœa*; Autumn.
Tay, Ross.

112. **S. Unedonis** R. & D., 2661, C.481, M.1140 (D. & R. *Stevenson*).
On leaves of *Arbutus Unedo*; Summer.
Tay (Glamis).

113. **S. Fraxini** Desm., 2672, C.482, M.1147.
On leaves of *Fraxinus excelsior* (Ash); Summer.
Tay, Moray S.

114. **S. castanicola** Desm., 2723, C.486, M.1150.
On Chestnut leaves; Autumn.
Moray South (Forres).

b. On Herbaceous Dicotyledons.

*115. **S. Anemones** Desm., 2828, C.504, S.M.3075 (D. G. *Brebner*, R. *Trail*, *Scot. Nat.*, 1866, p. 267).

On leaves of *Anemone nemorosa*.

Dee (not rare).

*116. **S. Ficariæ** Desm., 2833, C.506, M.1142.

On leaves of *Ranunculus Ficaria* (Lesser Celandine).

Common in Summer.

Clyde, Tay, Dee, Moray S.

A form occurs on *R. Flammula*, near Aberdeen, with rather larger pycnidia (110-120 diam.) and sporidia (35-45 by 1¼-1½), but otherwise like the type (*Sc. Nat.* 1885, p. 187).

117. **S. Lepidii** Desm., 2817, C.502, M.1131 (D. & R. *Stevenson*).

On leaves of *Lepidium Smithii*. Autumn.

Tay (Montrose), Dee (New Pitsligo).

*118. **S. Violæ** West, 2811, C.501, S.M.3044 (D. & R. *Trail*, *Sc. Nat.* 1885, p. 187).

On dying leaves of *V. sylvatica*, on Sandhills near Aberdeen.

Dee.

*119. **S. Sinarum** Speg. 2802 (D. & R. *Trail*, *Sc. Nat.* 1887, p. 91).

On living leaves of *Dianthus barbatus*; Summer.

Dee (Aberdeen).

Spots pale, circular, ill-defined, large; pycnidia scattered abundantly over both surfaces, sub-spherical, 80 diam., ostiole small; sporidia slender, 25-28 by 2, curved, ends rounded, hyaline, septa 1 or 2 (seldom wanting).

*120. **S. Lychnidis** Desm., 2804, var. **pusilla** (*Trail*, *Sc. Nat.* 1887, p. 89).

On leaves of *Lychnis diurna*; Summer-Autumn.

Dee (Dunottar and Aberdeen).

In the type the spots are rounded or irregular in form, pale reddish brown or yellowish brown, dry; pycnidia scattered, subspherical, dark brown; pycnidia filiform, "50-70 by 2½-3," ends abruptly acute, or somewhat curved or straight, 5-7 septate, hyaline.

The variety differs from the type only in the sporidia being 35-50 by 1½-2, and only 1-4 septate.

*121. **S. Stellariæ** Rob. & Desm. 2806 (D. *Keith*, R. *Phillips & Plowright*, in Grevillea, 1884, p. 50).
On dying leaves of *Stellaria media*, and of *S. graminea;* Autumn.
Dee, Moray.

*122. **S. Cerastii** Rob. and Desm. 2808, C.499, S.M., 3080 (D. *Anderson*, R. *Cooke*, in *Grevillea*, 1886).
On dying leaves and stems of *Cerastium;* Autumn.
Tay (Menmuir), Dee (near Aberdeen).

*123. **S. Hyperici** Desm. 2791, C.496, M.1154 (*D.* & *R. Stevenson*).
On leaves of *Hypericum pulchrum*, *H. perforatum* and *H. hirsutum;* Summer-Autumn.
Tay, Dee, Ross.

*124. **S. Gei** Rob. & Desm. 2763, C.490, M.1149.
On leaves of *Geum urbanum*, *G. rivale*, and *G. intermedium.* Summer—Autumn.
Tay, Dee, Moray.

*125. **S. Tormentillæ** Desm, & Rob., 2767, C.491.
On leaves of *Potentilla Tormentilla*, near Aberdeen. September. Not previously recorded as Scotch.
Dee.
Spots irregular, usually rather narrow, pale, with a reddish border, or the border may be wanting; pycnidia 18-110 diam., dark brown; sporidia filiform, 40-50 by 1½-2, straight or curved, hyaline, faintly yellowish, septa not visible, or sporidia obscurely 7-8-septate.

*126. **S. Sedi** West., 2858, C.509 (D. & R. *Trail*, *Sc. Nat.* 1887, p. 40).
On dying stems of *Sedum reflexum* near Aberdeen.
Dee.
Spots circular or oblong, grey, or approaching brown; pycnidia scattered, brown; sporidia 20-22 by 2½, straight or slightly curved, rounded at ends, hyaline, 4-6 guttulate, escaping in white tendrils when moist.

*127. **S. Epilobii** West. 2781, C.493, M.1144 (D. *Fergusson*).
On leaves of various species of *Epilobium.* Summer-Autumn.
Tay, Dee, Moray.

*128. **S. Heraclei** Desm. 2864, C.510, M.1127.

On leaves of *Heracleum Sphondylium.* Summer.
Tay, Dee, Moray.

*129. **S. ægopodina** Sacc. 2871.

The description of this fungus in the "Sylloge" is:—Spots epiphyllous, very small, angular, brown, then becoming pale in drying, rufous margined; pycnidia scattered, punctiform, lenticular, 70 diam., pierced (by the ostiole); sporidia filiform, slender, 25 by 1¼, slightly curved, minutely pluriguttulate, hyaline.

On leaves of *Ægopodium Podagraria* (in Italy).

I have found a fungus, at Banchory-Ternan, near Aberdeen (in Dee), in August, on *Pimpinella Saxifraga* (*Sc. Nat.* 1887, p. 40) which may be a variety of *S. ægopodina.*

The following is its description:—

Spots indeterminate in form, purple, becoming fuscous in centre, small; pycnidia minute, 60-80 diam, innate, pale brown, ostiole pretty large; sporidia very slender, 20-25 by ⅘-1⅕, filiform, straight or curved, not septate, hyaline.

*130. **S. Podagrariæ** Lasch. 2872, C.511, M.1130 (sub *S. Ægopodii* Desm).

On leaves of *Ægopodium Podagraria* (Goutweed). Summer and Autumn.
Clyde, Tay, Dee, Moray.

*131. **S. Petroselini** Desm. 2876, C.512, S.M. 3046 (D. & R. *Stevenson* & *Trail*).

On fading leaves of *Petroselinum sativum* (Parsley). Summer-Autumn.
Tay (Glamis), Dee (Aberdeen).

*132. **S. Hydrocotyles** Desm., C.513, M.1141 (D. *White*).

On leaves of *Hydrocotyle vulgaris* (Sheeprot). Summer and Autumn.
Tay, Argyle, Dee, Moray.

133. **S. Adoxæ** Fuckel 2945, S.M.3079 (D. *Keith*, R. in *Grevillea* 1886, p. 132).

On fading leaves of *Adoxa Moschatellina.*
Moray (Forres).

*134. **S. Scabiosicola** Desm. 2999, C.534, M.1148 (sub *S. scabiosæcola*) (D. *Stevenson*).

On leaves of *Scabiosa Succisa.* Summer and Autumn.
Tay, Argyle, Dee.

*135. **S. Tanaceti** Niessl. 2958.

What may be a variety of this was found by me near Montrose in October, in living leaves of *Tanacetum vulgare*. The following is the description of the latter form :—Spots usually near the ends of the lobes, indeterminate in form, brown, becoming paler, not large; pycnidia 60 diam., subspherical, innate, brown; sporidia filiform-fusiform, 20-30 by 1½-2, pale yellow-brown, hyaline, usually 3-septate. I have found it in September, 1887, near Aberdeen also.

*136. **S. cercosporoides** Trail, *Sc. Nat.* 1887, p. 89.

On leaves of *Chrysanthemum Leucanthemum* (Ox-Eye Daisy), in October.

Tay (Dubton).

*137. **S. Virgaureæ** Desm. 2960, C.530, M.1153 (D. *Anderson*).

On leaves of *Solidago Virgaurea* (Golden-rod). Autumn.

Tay, Argyle, Dee.

*138. **S. Menyanthes** Desm. 2887, C.515, S.M.3045 (D. & R. *Trail, Sc. Nat.* 1885, p. 18).

In fading leaves of *Menyanthes trifoliata* (Bogbean). Summer and Autumn.

Dee.

*139. **S. Prunellæ** Trail, *Sc. Nat.* 1887, p. 89.

On fading leaves of *Prunella vulgaris* (Self-heal). September.

Dee (Dinnet).

Since the publication of this as a new species last April, the *Additamenta* to the *Sylloge Fungorum* has reached me; and in it I find under the name *Septoria Brunellæ* E. & H. (*Journal of Mycology*, Vol. I., 1885, p. 6), what is evidently very closely allied to my plant. The description in the *Journal of Mycology* is :—"Spots dark rusty brown, irregular and variable in size, border raised, narrow; perithecia black, slightly prominent, thickly scattered, epiphyllous, 100-130 in diameter; sporules hyaline, with a brownish tint, linear, clavate, multiseptate, nearly straight, 40-75 by 1½-2. On leaves of *Brunella vulgaris*, Iowa," U.S.A. The chief differences between the two seem to be the absence of the

raised border and the smaller, narrower sporidia. In the meantime the names may stand as they are.

*140. **S. Stachydis** Rob. and Desm. 2925, C.527, M.1155 (D. *Stevenson*).

On living leaves of *Stachys sylvatica*. Common in Autumn.
Tay, Argyle, Dee, Moray.

141. **S. lamiicola** Sacc. 2916, C.524, S.M. 3081 (D. *Stevenson*, R. in *Grevillea*, 1886).

On leaves of *Lamium album*. Summer.
Tay (Glamis).

(In November, 1887, I found plentifully, near Aberdeen, a *Septoria* on leaves of *Lamium purpureum*. It agrees well in most respects with *S. lamiicola;* but some of the specimens afforded a complete transition to *S. Lamii* Passerini, the spots being limited by the leaf veins, and the sporidia measuring 38-40, by 1, and showing no septa. Perhaps those were less fully developed examples only; but my specimens lead me to doubt whether *S. Lamii* is distinct from *S. lamiicola*).

142. **S. heterochroa** Desm. 2917, C.525, M.1134 (D. *Fergusson*).

On leaves of *Malva*, *Plantago*, &c. Summer.
Tay (Findhaven).

*143. **S. Lysimachiæ** West. 2890, C.517, S.M.2265 (D. *Trail* and *White*, *Sc. Nat.* 1883, p. 32).

On living leaves of *Lysimachia nemorum*. Summer.
Argyle, Dee.

144. **S. Polygonorum** Desm. 3009, C.535, M.1133.

On leaves of *Polygonum*. Summer.
Tay, Moray.

*145. **S. Urticæ** Desm. and Rob., 3018, C.537, M.1152.

On living leaves of *Urtica dioica* (Nettle). Autumn.
Clyde, Tay, Dee, Ross.

*146. **S. Myricæ** sp.n.

On fading leaves of *Myrica Gale* (Bog Myrtle), at Park, near Aberdeen, in September.
Dee.

Spots ill defined, becoming tinged with brown; pycnidia few, innate, towards upper surface of leaf, hard to distinguish,

about 50 or 60 diameter, brown; sporidia filiform, 15-20 by 15-2, obtuse, 4-6-septate, hyaline.

c. On Monocotyledons.

*147. **S. Junci** Desm. 3087, C.547 (D. & R. *Trail, Sc. Nat.* 1887, p. 91).

On dying leaves and culms of *Juncus maritimus*, at Muchalls, and of *J. effusus*, there and near Aberdeen, in October.

Dee.

Spots greyish, indeterminate; pycnidia immersed, very numerous, about 150 diam., brown, subspherical, ostiole slightly prominent; sporidia 50-60 by 2½-3, filiform, ends acute or rounded, straight, or slightly curved, 12-14-septate, yellowish. (Saccardo gives the sporidia as 50-80 by 3, and as 12-20-nucleate, the nuclei being opaque).

* **S. Alismatis** Oud. 3093 (D. & R. *Trail, Sc. Nat.* 1887, p. 87). See *Ascochyta Alismatis.* (No. 78 of this list).

*148. **S. dolichospora** Trail, S.M.3047.

On dead stems of *Scirpus lacustris*, at Loch of Park.

Dee.

(Cooke's list in *Grevillea* enumerates under No. 546, with the name "*S. Traillii* sp.n." what can be only *S. dolichospora* renamed, without reason assigned, though the sporidia are described as 120-130 by 3, and 5-8 septate instead of as 120-130 by 2-2½, and with 9-12 very faint septa).

149. **S. gracillima** Cooke, 3072, C. 545, S.M. 3082 (D. & R. *Cooke*).

On leaves of *Carex*, near Edinburgh.

Forth.

*150. **S. lineolata** Sacc. & Speg 3076 (D. & R. *Trail, Sc. Nat.* 1887, p. 91.)

In dead leaves of *Carex arenaria*, on sandhills near Aberdeen, in October.

Dee.

No spots; Pycnidia in rows, innate, subspherical, 50-80 diam., dark brown, sporidia filiform, clavulate, only 35-45 by ¾-1 (instead of 60-70 by 1¾-2, as in type from North Italy), hyaline, without septa.

151. **S. Bromi** Sacc. 3051.

(On leaves and glumes of *Bromus mollis*, and of *Phalaris arundinacea* in North Italy. Saccardo's description is as follows:—Spots obsolete, turning pale, elongated; pycnidia numerous, globoso-lenticular; pierced (by the ostiole); sporidia filiform-clavulate, at one end acute, at the other obtuse, 50-60 by 2, slightly curved, pluriguttulate, hyaline.)

*Var. **Phalaridis** Trail, *Sc. Nat.* 1887, p. 40.

On dead leaves of *Phalaris arundinacea*, near Aberdeen, in September, sporidia 53-65 by 3½-4, septa 8-15.

*Var. **Alopecuri** Karst. (D. & R. *Trail, Sc. Nat.* 1887, p. 40).

On dead culm of *Alopecurus geniculatus*, near Aberdeen, in July; sporidia 45-75 by 2½, septa numerous, indefinite.

*152. **S. affinis** Sacc. 3054 (D. & R. *Trail, Sc. Nat.* 1887, p. 91.)

On leaves of Avena sativa (Oats), and *Agropyrum repens* (Couch-grass), near Aberdeen, in September.

Dee.

Spots withering, becoming pale, with a red-brown or purple-brown border, narrow or oval; pycnidia scattered, innate, about 150-200 diam., dark brown, ostiole wide; sporidia filiform, clavulate, 25-33 by 2½, rather curved, 3-4-septate, hyaline, faintly yellowish.

153. **S. graminum** Desm. 3068, C. 544, M. 1136 (D. *Keith*).

On leaves of grass, near Forres.

Moray.

a. *On Cryptogams.*

*154. **S. Equiseti** Desm. 3119.

On stems of *Equisetum arvense* in Autumn, near Montrose and near Aberdeen, new to Scotland.

Tay and Dee.

Spots small, ferruginous, scattered; no true pycnidia distinguishable; sporidia subcutaneous, in clusters, escaping through a hole in the epiderm, filiform, about 30-45 by 3½-4, obtuse, curved, pluriguttulate, or faintly septate hyaline.

(*Note.*—This is not a true *Septoria* in its structure.)

155. **S. thecicola** B. & Br. 3133, C. 550, M. 1138 (D. *Dickie*, R. *Berkeley* & *Broome.*)

On capsules of *Polytrichum piliferum*, near Aberdeen.
Dee.

XXII. Phleospora Wallr.

Pycnidia imperfectly developed, ostiole wide, subcutaneous, for the most part formed of the modified tissues of the host-plant; sporidia fusoid-filiform, thickish, 2-pluri-septate. Approaches near *Septoglaea* among the *Melanconieæ*, but differs in possessing pycnidia, though these are sometimes not completely formed.

156. **P. Aceris** (Lib.) Sacc. 3135, C. 551, M. 1129 (sub *Septoria Aceris*) (D. *Stevenson.*)
On leaves of *Acer pseudoplatanus.* Summer.
Tay (Glamis).

*157. **P. Ulmi** (Fr.) Wallr. 3138, C. 553, M. 1126 (sub *Septoria Ulmi* Kze.)
On elm leaves.
Tweed, Solway, Forth, Clyde, Tay, Dee, Moray.

158. **P. Oxyacanthæ** (K. & S.) Wallr. 3139, C. 554, M. 1128, (sub *Septoria Oxyacanthæ* Kunze). (D. *Stevenson*).
On leaves of *Crataegus Oxyacantha* (Hawthorn).
Tay (Glamis).

XXIII. Rhabdospora Mont.

Pycnidia subcutaneous, then erumpent, globular or depressed, papillate, of firm texture, black or dark brown; sporidia filiform, pluriguttulate or pluriseptate, hyaline. Growing usually on the stems, and not producing discoloured spots.

*159. **R. pleosporoides** Sacc. var, *rubescens* Karst., 3199, S.M. 3048 (D. & R. *Trail, Sc. Nat.* 1885, p. 189).
On dead stems of *Angelica sylvestris*, May.
Dee (near Aberdeen).

*160, **R. cirsii** Karst. 3118, S.M. 3049 (D. & R. *Trail, Sc. Nat.* 1885, p. 189).
On dead stems of *Carduus palustris*, near Aberdeen.
Dee.

XXIV. Phlyctæna, M. & D.

Pycnidia subcutaneous, sometimes erumpent, spherical-oblong, subhysterioid-dehiscent, scarcely complete; sporidia filiform or fusoid-elongate, unicellular, hyaline; basidia various in nature. On stems and branches.

161. **P. Johnstonii** B. & Br. 3236.
On dead stem of *Senecio Jacobæa*.
Tweed (Berwick).

XXV. Dilophospora Desm.

Stroma dark, crustaceous, enveloping the globular ostiolate pycnidia; conidia rodlike, one-celled, hyaline, with a tuft of hairs at each end.

* 162. **D. graminis** Desm., 3261, C. 175, M. 1117, (D. *Keith.*)
On leaves and glumes of *Holcus*, *Poa pratensis*, and other grasses in summer.
Dee (Aberdeen, &c.), Moray.

Fam. 2. Nectrioideæ Sacc.

For characters see p. 112.
None have yet been recorded as Scotch.

Fam. 3, Leptostromaceæ Sacc.

Pycnidia membranaceous or carbonaceous, more or less evidently dimidiate, peltate, dark, without an opening, or ostiolate or hysterioid (*i.e.* opening by a slit), erumpent or superficial.

Analytical key to Genera.

§ 1. Hyalosporæ, Sacc.

Sporidia globose or ellipsoid, or oblong, unicellular, hyaline.
A. Pycnidia not hysterioid, (*i.e.* not opening by a *slit*).
B. Pycnidia easily falling from the surface of the host plant, depresso-clypeate, basidia wanting. *Leptothyrium.*
B.B. Pycnidia not falling off, irregular, depressed.
Pycnidia often stellately arranged, basidia columnar. *Piggotia.*
Pycnidia immersed in a stroma on leaves, basidia obsolete. *Melasmia.*
A.A. Pycnidia evidently subhysterioid, opening by a slit; lanceolate or elongate, subcarbonaceous, often falling readily from the host plant. *Leptostroma.*

§. Phragmosporæ. Sacc.

Sporidia oblong, 2-pluriseptate, hyaline.
Sporidia fusoid, with a cilium at each end. *Discosia.*

§. Scolecosporæ Sacc.

Sporidia filiform or rodlike, one-celled or septate, hyaline.
Pycnidia clypeate, margin fringed with radiating cells, no ostiole. *Actinothyrium.*
Pycnidia elongate, longitudinally slit, hysterioid. *Leptostromella.*

XXVI. Leptothyrium Kze. & Schm.

Pycnidia as above, membranaceo-carbonaceous, with ostiole absent or variously formed, dark, composed of radiately arranged cells, and readily falling off after a time; in some, no true pycnidium is formed, but its place is taken by the dark altered epiderm, (thus forming a transition to *Melanconieæ*); sporidia ovoid-oblong or fusoid, one-celled, hyaline.

163. **L. Periclymeni** (Desm). Sacc 3330, C. 557, M. 1099 (sub *L. pictum.* B. and Br.) (D. *Stevenson, R. Berkeley & Broome,* 1875.)
On leaves of *Lonicera.* July-Nov.
Tay (Glamis, Fascally).

*164. **L. alneum** (Lev.) Sacc. 3333, C. 558, S. M. 2177 (sub *Melasmia alnea* Lev.)
On living leaves of *Alnus glutinosa* (Alder), summer and autumn.
Forth, Tay, Dee. Moray.
(Figured by *Greville* in Fl. Crypt. Scot. t. 146, f. 2).

*165. **L. acerinum** (Kunze) Corda, 3351, C. 563, M. 1123 (sub *Pilidium acerinum* Kze) (D. *Jerdon*).
On dead leaves of *Acer Pseudoplatanus.*
Tweed (Jedburgh), Dee (near Aberdeen).
I have found, near Aberdeen, on dead Oak leaves (Quercus Robur), lying beside affected leaves of Acer, fungi not in any way distinguishable from this species.

*166. **L. vulgare** (Fr.) Sacc., 3370, C. 565.
On dead stems of Epilobium angustifolium (Willowherb) at Kingcausie, near Aberdeen. October. New to Scotland. Dee.
Pycnidia in groups, oval or nearly circular, 250-400 diam., readily falling; sporidia fusoid, straight, or curved, obtuse, 7-8 by $1\frac{1}{2}$-2, hyaline.
England, Europe, Siberia.

167. **L. litigiosum** (Desm.) Sacc. 3385, C. 566, M. 1088 (sub *Leptostroma litigiosum* Desm).
On *Pteris Aquilina*; Autumn.
Forth, Tay, Dee.

L. Glechomatis B. & Br. (M. 1090). See under *Leptostroma*).

XXVII. Piggotia B. & Br.

Pycnidia flattened, irregular, thin, membranaceous, at first concealed under a very thin cuticle, which is often thrown off in stellate fashion; sporidia oblong or subcylindrical, one-celled, hyaline or yellowish; basidia terete.

168. **P. astroidea** B. & Br. 3387, C. 567, M. 1125.
On living leaves of *Ulmus* (Elm).
Tweed, Forth, Tay.

XXVIII. Melasmia Lev.

Pycnidia immersed in an effused black stroma, on leaves or stems, dimidiate, depressed, remaining closed, or opening by a slit; sporidia fusoid, one-celled, subhyaline; basidia various. *Melasmia* is chiefly made up of spermogonia of species of *Rhytisma*, and resembles them in aspect.

*169. **M. acerina** Lev. 3390, C. 568., and *forma* punctata S. & R. 3391, C. 569.
On leaves of *Acer Pseudo-platanus* and of *A. campestre*, in Summer and Autumn.
Tweed, Solway, Forth, Clyde, Tay, Argyle, Dee, Moray, Ross.

The two forms are spermogonia of *Rhytisma acerinum*, Fr., and of its var. *punctatum* Fr., respectively. Both are abundant on the leaves in autumn and winter; the asci form in spring; and the *Rhytisma* is developed in May.

*170. **Rhytisma Empetri** B. White, usually occurs in the spermogonium stage in Autumn, and is then to be placed under *Melasmia*. So far as one can decide from plant a description it may be the same as *M. Empetri* Magn. (Bericht. Deutsch. bot. Gesellsch. 1886 p. 104), Syll. Fung. Add. 4569); but, in absence of complete acquaintance with the latter, I do not venture to employ this name for the Scotch plant.
Tay, Dee, Moray.

XXIX. LEPTOSTROMA Fr.

Pycnidia superficial, or at first beneath a very delicate cuticle, dimidiate, flattened, elongated, black, often shining, marked with a more or less evident longitudinal furrow or keel; sporidia ovoid, oblong, or sausage-shaped, unicellular, nearly or quite hyaline. Many of the forms are the spermogonia of *Hysteriaceæ* among *Pyrenomycetes.*

*171 L. **virgultorum** Sacc. 3399, C. 570, not previously recorded as Scotch.

On dead twigs of *Rubus fruticosus* (Bramble).

Dee (Aberdeen, &c).

Pycnidia oblong, clypeate, flattened, shining black, with a longitudinal furrow; sporidia cylindrical, ends rounded, 4-5 by 1, hyaline, on clustered slender basidia 20-25 by 1. This is the spermogonium of *Hypoderma virgultorum*, (M. 1800 sub *Hysterium virgultorum*).

*172. L. **herbarum** (Fr.) Link. 3436, C. 575, Sc. Nat., 1887, p. 40.

On dead stems of *Teucrium Scorodonia*, and of various other herbs.

Tweed (Berwick), Forth, (Kinross), Dee (near Aberdeen). Winter.

Pycnidia gregarious, occasionally confluent, at first covered with a thin epiderm, lanceolate, with a median furrow, dark shining brown; sporidia subfusoid, curved, 4-7 by $1\frac{3}{4}$ hyaline.

Europe, Siberia.

*173 L. **Spireæ** Fr., 3440, C. 576, M. 1089.

On dead stems of *Spiræa Ulmaria* (Meadow-sweet) in Winter and Spring.

Tweed, Tay, Argyle, Dee.

173*a*. L. **Glechomatis** B. & Br., M. 1090, Sacc. Syll. Fung. III. 3443, (sub. *L. Glechomæ* B. & Br.). An examination of the type-specimens (from Glamis), now in Kew Herbarium, showed me that this is not a fungus, but the work of a larva of a small fly, (probably a species of *Phytomyza*), which burrows between the epiderms, and thus produces the characteristic spots on the leaves.

SOUTH OF SCOTLAND ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.

THE annual Exhibition Meeting of the Members of this Society, was held in their Meeting Place, Bridge Street, Galashields, on Saturday, November 5th. This Meeting is held for the purpose of exhibiting those insects and other Natural History objects, captured, or otherwise acquired, during the past season. There was a good attendance of members; and the season having been good, many insects were exhibited. Of the Diurni, all the genus *Pieris* have been most plentiful; *Artaxerxes*, *Alexis*, *Phleas*, *Davus*, *Pamphilus*, *Janira*, and *Hyperanthus* in their usual numbers; *Blandina* and *Atalanta* have been most abundant, while *Urticae* and *Cardui*, usually common here, have scarcely been seen. Of the Nocturni, *Populi* has been very plentiful, and the rare *Acherontia Atropos* and *Sphinx Convolvuli* have both been taken in the district. Among the Bombyces *Plantiginis*, *fuliginosa*, *Caja*, *Rubi*, *Quercus*, and *Vinula*, were all fairly abundant; but *Carpini* has been unusually scarce. Of the Noctuidae *triangulum*, *brunnea*, *baja*, *gothica*, *Janthina*, *Orbona*, *Fimbria*, *Pronuba*, *exoleta*, *Oxyacanthæ*, *nigra*, *ferruginea*, *litura*, *stabilis*, *instabilis*, *rurea*, *polyodon*, *strigilis*, *impura*, *and Psi* were taken about in the usual numbers," and *Satellitia* and the lovely *Aprilina* were positively swarming; while many single captures of other species were effected. *Geometers* were also somewhat numerous, and several species were added to the list of those already captured in the district. Mr. Clapperton exhibited a fine case of Diurni from North America, including *Danais Plexippus* and *Chrysitis*, several fine varieties of *Argynnis*, and a number of the American type of *V. Cardui*, which is rather larger than the English form. Mr. Wilson had some very large foreign Coleoptera; and a number of very fine cases of exotic insects in splendid condition, were exhibited by T. D. Gibson Carmichael, Esq., Chiefswood, including lovely specimens of *Morpho Cypris* and *M. Adonis*, from New Granada and Brazil, several fine *Papilios* from the Himalayan district, and a magnificent series of *Ornithoptera Brookeana* from Borneo. A fine case of the large silk-producing Bombyces was also among this lot, containing *Capraria* and *Isis* from South Africa, *Mylitta* from India, and *Polyphemus* from North America. This has undoubtedly been the most successful show ever held by the Society; as, apart from the local collection, the cases of Mr. Carmichael contained some of the finest insects ever seen by any of the Members.

OLD KIRKPATRICK NATURALIST AND ANTIQUARIAN SOCIETY.—The inaugural address at the formation of this new Society was delivered by the President, the Rev. James Lamb, U.P. Church, Old Kirkpatrick, on the 24th Oct. The meeting was public and the President took the opportunity of explaining the nature and objects of the Society, and the peculiar richness of the district in material for study. The first regular meeting of the Society was held on the 28th Nov. when a very interesting paper was read by John

Bruce, Esq. of Bowling, the subject being "Notes and Observations on the History of Dalnottar." At the December meeting a paper is promised by the Rev. J. Harvey, M.A., F.C., Duntocher, upon certain Cup and Ring marks which he has discovered near Edinbarnet. At the January meeting Mr. John M'Intosh, Forester to Lord Blantyre, has agreed to give some notes of the trees of the district. The Society already numbers twenty members, some of whom are good naturalists and archæologists. Mr. D. Andrew of Gavinburn School is Secretary, and a number of local gentlemen have agreed to become Honorary Presidents.

SCIENTIFIC JOURNALS.

ZOOLOGIST, 1887 (*May*).—**Reported Occurrence of Emberiza melanocephala in Scotland**, by H. A. Macpherson. A male in winter plumage, exhibited at the Crystal Palace Bird Show on February 17th, "was caught near Dunfermline, on or about the 5th November last, while flying in company with some Snow Buntings." **The Ptarmigan in South-west Scotland**, by H. A. Macpherson, mentions two specimens in summer plumage and one in winter plumage, all now in Carlisle Museum, as having been presented by Mr. J. D. Murray of Murraythwaite, Dumfries, and as thus presumably local birds.

(*June.*)—**Nesting of the Stock-Dove in East Lothian**, by G. Pow, records a pair as breeding in rabbit burrows on Traprain Law.

(*September*).—**Report of the Grouse Disease**, by the well-known pathologist, Dr. E. Klein. The livers were found to contain "large numbers of corpuscles which are foreign to the liver tissue, and which in all respects correspond to some form of Low Fungi, most probably to Plasmodia." No Bacteria could be found. **On the Nesting of the Tufted Duck in Kirkcudbrightshire**, by Robert Service. **Pied Puffin and Razor-bill at St. Kilda**, by H. A. Macpherson.

(*October*).—**On the Bank Vole, Arvicola glareolus** (Schreber), by J. E. Harting, figures the species, and notes Scotch localities. **The Nightingale in Scotland** gives an account (from the *Scotsman* of 19th September) of an unsuccessful attempt, in 1795, by Lord Buchan, to naturalise this songster among us.

(*November*).—**On the present condition of the existing herds of British Wild White Cattle**, being the Report read before the British Association at Manchester. **Breeding of the Tufted Duck in Aberdeenshire** (Loch of Skene), by William Borrer. **Knot on the West Coast of Scotland**, by Arthur H. Macpherson, notes the occurrence of several hundreds on the shores of Loch Gilp ever since the middle of Sept.

(*December*).—**The Mole** (*Talpa europæa*), by J. E. Harting, gives an excellent life history and plate of this curious quadruped, with full details of its distribution in Britain. **Wild White Cattle in South-Western Scotland,** by Robert Service, notes herds that formerly existed at Ardrossan, Drumlanrig, and Cally. **Breeding of the Tufted Duck in Aberdeenshire,** by William Evans, records a nest found at Loch of Park in June; and in an editorial note Mr. Harting adds: "I could name many localities in Scotland where it is now quite common."

JOURNAL OF CONCHOLOGY, 1886 (*July*).—**Some Preliminary Notes on the Land and Fresh-Water Mollusca about Tarbert, Loch Fyne,** by Thomas Scott, includes list of all the species and varieties observed in the course of a year. At the meeting of the Conchological Society on 1st April, specimens of *Limax lævis*, *Pupa ringens*, and two or three others of the rarer mollusca were exhibited from Tarbert.

1887 (*January*).—At the meeting of 2nd September were exhibited *Helix nemoralis* var. *carnea* from Foyers, Loch Ness, *Amalia gagates* from Leven Hall, in Midlothian, *Helix fusca* and *H. sericea* from Skelmorlie in Ayrshire, and *Zua lubrica* var. *viridula* from Dunoon. At the meeting on 4th November, *Planorbis nautileus* from Lanarkshire was exhibited.

(*April*).—**Some Conchological Notes of a Visit to Fifeshire, N.B.,** by Thomas Scott. Lindores Loch was found productive of several species, of which a list is given, among them *Limnæa peregra* var. *lacustris*. **Notes on the Limnæidæ, L. peregra** var. **Burnetti,** by William Nelson (from Loch Skene, Dumfriesshire). **Colonizing Land and Fresh-water Shells in East Sutherland,** by William Baillie. Near Brora the writer has introduced *Helix virgata* and *Bulimus acutus* from Llanddudno, *Clausilia parvula* from Normandy, *Helix pisana*, *H. cantiana*, *H. rufescens*, *Clausilia laminata*, and *Cyclostoma elegans*. The first three are doing best as colonists. *Limnæa stagnalis* seems to have failed as such.

October.—(published 12th Nov.) **Conchological Notes.** from the neighbourhood of Greenock, by Thomas Scott, includes notes on the "nests" of *Helix aspersa*, *H. nemoralis*, *Arion ater*, *Limax agrestis*, and *L. flavus*; and on Shell-growth in *Helix arbustorum*.

ENTOMOLOGIST'S MONTHLY MAGAZINE, 1887 (July.)—**Variation in Scoparia ingratella; and remarks on S. ambigualis and S. atomalis,** by J. W. Tutt, notes that *S. ambigualis* had been received by the writer from Shetland (under the name *S. atomaliz*), and that he has specimens also from Glasgow and Paisley. (*August.*) **On certain species of Coleoptera new to Britain, or reinstated,** by Rev. W. W. Fowler, describes several species,—among them *Bythinus validus* Aubé from several scotch localities, and *Menophthalma* (*Corticaria*) *similata Gyll.*, from Braemar, the large dark variety. **Lobesia permixtana or reliquana; its synonymy and habits,** by H. T. Stainton. Both names were given by Hübner to the same insect. Mr. Stainton records it from Larbert in Srirling, and from Pitlochry.

(*October.*) **List of British Tipulidae (Daddy-longlegs), with Notes,** by G. H. Verrall, enumerates as Scotch:—*Limnophila aperta* n. sp. (described), extending from South Coast to Sutherland, *L. ferruginea* Mg. (diagnosed), in Sutherland, *L. ochracea* Mg., at Inveran, *L. bicolor* Mg., rare in Sutherland, *L. punctum* Mg., once at Rannoch, *L. discicollis* Mg., at Inchnadamph, *L. filata* Wlk., at Loch Maree, *Amalopis littoralis* Mg., at Inveran, &c.; **White Butterflies** (very plentiful in Roxburghshire), by A. Elliott. (*November.*) **New locality for Lycaena Artaxerxes** (about eight miles north of the English Border, at Cessford Castle), by A. Elliott; **Phytometra aenea, and Emmelesia albulata in Roxburghshire, and Sphinx Convolvuli in Roxburghshire,** by A. Elliott. In the South London Ent. and Nat. Hist. Society, on 22nd Sept., was shown *Melanthia bicolorata* Hufn. var *plumbata* Curtis, from Rannoch. In the Entomological Society of London, on 5th Oct., were shown a dark specimen of *Crambus perlellus* from the Hebrides, and *Gonepteryx Cleopatra*, said to have been taken in the North of Scotland. **Notes on the species of Heinemann's family *Chauliodidæ* that occur in England,** by W. Warren, is a valuable account of a genus of small moths not well known n Britain; each British species is described, and its life history is indicated; *Heydenia auromaculata* Frey was detected in Shetland in 1883, by Mr. M'Arthur, and is the only species yet known from Scotland, though seven others are found in England.

(*December.*) In the Entomological Society of London, on Nov. 2nd, Dr. D. Sharp exhibited as new to Britain *Tropiphorus obtusus*, taken by himself in Dumfriesshire.

NEW WORK ON BRITISH FUNGI.

We are delighted to welcome the appearance, last month, of the eagerly expected work on British Discomycetes by William Phillips, F.L.S., nor does the volume disappoint the sanguine expectations of mycologists. In our next issue will appear a fuller notice of this valuable contribution to British Mycology. Meanwhile we may mention that it forms the new volume of the International Science series.

OBITUARY.

THE year 1887 has been most fatal to the ranks of Botanists; and many of the best known, whose names have been even as "household words" to us of the younger generation, have passed away during the year. Even confining the roll to the best known names it is a heavy one: In January Dr. C.M. Van der Sande Lacoste, the bryologist, and Thomas Moore, for many years the well-known Superintendent of the Chelsea Gardens; in March Prof. Eichler of Berlin, one of the leading morphologists of the past two decades, aged 47, Prof. D.F. Didrichsen of Copenhagen, aged 73, and Prof. J.J.Kickx, the author of a valuable Cryptogamic Flora of Belgium; in May Prof. Areschoug, one of the leaders in algology, aged 75, the renowned J.B. Boussingault, the agricultural chemist, aged 85, and Ritter Wawra von Fernsee, the Austrian botanist and traveller, aged 57; in July Dr. H. W. Ravenel, one of the pioneers of the study of the Fungi of the U. S.A.; in August Dr. George Winter, the author of exceedingly valuable works on the Fungi, chiefly of Central Europe, after a tedious and painful illness, aged 41; in September Prof. R. Caspary, the author of valuable works on systematic botany of Phanerogams; and Prof. H. Lojka, the lichenologist; in October Prof. L. Cienkowsky, well-known for his researches among the lower forms of animal and vegetable organisms, and Dr. G. Inzenga, author of works on the Cryptogamic Botany of Italy; and in December Prof. Asa Gray of Harvard University, Boston, U.S. A., and Prof. Alexander Dickson of the University of Edinburgh.

To this long list have been added, since the beginning of the present year the names of Prof. Anton De Bary of Strassburg

University, Dr. John Thomas Boswell, better known as Dr. Boswell Syme, and John Smith, for many years Curator of the Royal Botanic Gardens, Kew, with the progress of which to their present excellence he was very intimately associated.

Professor Alexander Dickson, whose very sudden death at the early age of 51 has left a wide circle of mourning friends, was born in Edinburgh, on 21st Feb. 1836. His father was a lawyer in Edinburgh; and also was the proprietor of valuable estates in Lanark and Peeblesshires, to which Prof. Dickson succeeded, by the death of an elder brother. He received his education as a boy at home, and as a student at the University of Edinburgh, where he graduated M.D. in 1860, and gained a gold medal for his thesis, upon the structure of the seed-vessel in the *Caryophyllaceæ*. His tastes lay very strongly in the direction of morphological Botany; and it was with great reluctance that he found it necessary to commence practice in Edinburgh, and with great pleasure that he soon was enabled to give up medicine, in order to devote himself wholly to his favourite pursuits. His first experience in teaching Botany was in the University of Aberdeen, where he acted as "locum tenens" in the summer of 1862 for Prof. Dickie, who was then in bad health. In 1866 Dr. Dickson was appointed to the Professorship of Botany in the University of Dublin, vacant by the death of Prof. Harvey, the famous algologist; and in 1868 he obtained the same chair in the University of Glasgow, on the death of Prof. Walker Arnott.

On the resignation by Prof. J. H. Balfour, in 1879, of the chair of Botany in Edinburgh, Dr. Dickson was appointed his successor; and this appointment he continued to hold till his death on 30th Dec. 1887. While in Edinburgh he was also Regius Keeper of the Botanic Gardens.

Professor Dickson in his tendencies belonged to the older school of morphological botanists; and he did much good work in the field that he selected for his labours. The speculations that have been so plentifully advanced of late years in the arena of botanical discussion had little attraction for him; and he acted on the principle that what was true would bear to wait till tried by time, rather than sought to be abreast of the fluctuating wave of theories that might in a brief period prove false and misleading. But his acquaintance with the science was wide and deep; and

he was always unwearied in his efforts to render his instructions effective and trustworthy expositions of the subject that it fell to him to teach. In the class-room, in the laboratory and in the field he won the attention of the students, and communicated to them his extensive stores of information ungrudgingly; and he possessed a great power of illustrating the points under discussion by examples, and by his ability as a draughtsman.

He contributed numerous papers to the pages of the publications of the Edinburgh Botanical and Royal Societies, to the Edinburgh New Philosophical Journal, and to the Journal of Botany. Among the more important of his numerous investigations were those upon the morphology of the reproductive organs of the Coniferæ, on the embryology of Tropæolum, Pinguicula, Zostera, Phoenix, &c., on Pitcher-plants, and on Hepaticæ.

His personal qualities were such as to win the cordial friendship and esteem of all with whom he came into contact; and he will continue to be most regretted by those to whom he was most intimately known. He was an excellent landlord; and took a warm interest in all that related to the welfare of his tenantry. He was an accomplished musician, and was especially fond of Gaelic airs, many of which he noted down in his visits to the Highlands on Botanical excursions. He was never married.

His death was very sudden. Though not a man of robust health, he was not in any respect an invalid; and two days before Christmas he left Edinburgh in his usual health, to spend a week or two at his Lanarkshire residence, Hartree House. For several days he spent much of his time in his favourite amusement of curling. On Friday, 30th December, he was engaged in a curling match in which he was much interested; and he had just made an entry with a pencil of some results, being "skip" of his side, when he was seen to fall backwards, and was caught by a friend, but died almost immediately.

He has been succeeded in his professorship by Prof. I. Bayley Balfour, the son of his predecessor, Prof. J.H. Balfour.

We record with regret the death, on 31st January, 1888, of Dr. John Thomas Irvine Boswell Boswell of Balmuto, Fifeshire, perhaps better known as Dr. J. T. Boswell Syme. He was the

son of the late Mr. Patrick Syme of Edinburgh and Dollar, who married Miss Boswell, a daughter of Lord Balmuto—a Lord of Session—and for many years Sheriff of Fife.

Dr. Boswell was born in Edinburgh in 1822, and educated at Dollar Academy and Edinburgh University. He qualified as a Civil Engineer; and, while engaged in surveys on the west coast of Scotland, he occupied his leisure time in dredging and botanising. After a few years he gave up the profession of C.E., and turned his attention entirely to the study of Natural History, a science for which he had shown a remarkable aptitude from childhood. In 1849 he visited his brother-in-law in Orkney, where he made a collection of birds, and studied the plants, beetles, and moths of the district, besides devoting much of his time to dredging; and he continued during the rest of his life to take an enthusiastic interest in the flora and entomology of the Orkney Islands (especially the *Hieracia* and *Naiadaceæ*), where he found one or two plants new to Britain and several varieties differing from the typical forms. From 1851 to 1868, Dr. Boswell (then Mr. Syme) lived in London, where he held the positions of Curator to the Botanical Society of London, and Lecturer on Botany to the Charing Cross and Middlesex Schools of Medicine. He also lectured on Natural Science at the New College, Edinburgh, for a year previous to the appointment of Dr. Duns. On 28th April, 1856, he married Miss Hardwick, daughter of the late Mr. Hardwick, solicitor, London. In April, 1868, Dr. Boswell left London and came to reside at Balmuto, in Fife, where he spent the remainder of his life. In 1875, he succeeded to this property, and assumed the name of Boswell under the will of his uncle, Mr. Boswell of Balmuto and Kingcausie. Dr. Boswell was a keen lepidopterist and coleopterist; but his interest was chiefly centred in the botany of the North Temperate Zone. The chief work of his life was editing the third edition of "Sowerby's English Botany." He entirely re-wrote the scientific portion of this standard work on British Plants, which extends to twelve volumes, describing the plants from his own observations; and it is in these descriptions that his genius is most apparent. In all his work he was ably assisted by his wife, who acted as his amanuensis. In recognition of his great scientific attainments the University of St. Andrews conferred upon him the degree of LL.D. He was, besides, a Fellow of the Linnean Society and of the Royal

Botanical Society of Edinburgh, and a member of the Ray Society. Dr. Boswell was the most eminent authority of the day on critical and doubtful British plants, and such plants, together with new discoveries, were constantly submitted to him for classification. He formed a most valuable herbarium of British and European species, and also made a valuable entomological collection. In the garden of Balmuto he had a fine collection of bulbs, irises, and hellebores, besides a number of other interesting British and foreign plants.

For the last few years of his life he was debarred by failing health from active work, but up to the last his interest in scientific matters never flagged. He was naturally of an unassuming disposition; and only those who knew him personally understood the extent of his researches, the soundness of his conclusions, and the value of his opinions on almost every subject. It may be mentioned that he had a thorough knowledge of the theory and science of music, and was well acquainted with the science of Medicine. The loss to the scientific world, as well as to his personal friends, can hardly be over-estimated. He leaves a widow, a daughter, and two sons, the elder of whom is now the representative of the old family of Boswells of Balmuto, and is preparing for the Scottish Bar.

Mr. John Smith, A.L.S., ex-curator of the Royal Botanic Gardens, Kew, was born in Fifeshire in 1798, and had almost reached the great age of 90 at the time of his death last February. He had to make his own way in life, and overcame very great obstacles by his talents and perseverance. He rose from the grade of gardener's labourer to his honourable position at Kew, in which he did so much for the welfare of the Gardens, and which he held for a number of years, till the failure of his sight compelled his resignation of it. For some years, while a lad, he worked in private gardens in Fifeshire and elsewhere in Scotland; and for a year or two he was employed in the Edinburgh Botanic Garden, then the best in Britain. But for the greater part of his life he was connected with Kew Gardens, rising through the various grades to the Curatorship.

While he was at Kew the Gardens passed through a critical

period of their history, when for a time it appeared as if they were to be abandoned by the Government as a useless expense. Mr. Smith did much to develop them while under his care; and the progress begun under Sir William Hooker as Director and Mr. Smith as Curator has been continued, so that they are now unsurpassed. Mr. Smith was an ardent student, and succeeded, even while a lad getting very scanty wages, in procuring books of a kind that might have been despaired of by any but the most self-denying and resolute. He made good use of his knowledge, and was the author of a number of works of value upon Ferns, Economic Plants, Bible Plants, &c. Several of these were prepared after he had lost his sight, being dictated by him to an amanuensis and the proof revised by botanical friends. Garden Ferns were his favourite study, and his knowledge of them was equalled by few, if any, botanists. His scientific merits were recognised by his election as an Associate of the Linnean Society on 18th April, 1837, and he was also a member of Continental Scientific Societies.

ADDITIONAL RECORDS OF SCOTTISH PLANTS FOR THE YEAR 1887.

By Arthur Bennett, F.L.S.

THE following list is a continuation of those which appeared in the *Scottish Naturalist* for 1886 and 1887, consisting of the new county records which have come under my notice by the kind help of friends and correspondents during 1887.

The results are probably richer than in any former year, not only in the large number of comital records, but in the new species added to the Scottish Flora. These consist of at least six, viz.:—

Arabis alpina L., Skye.
Callitriche polymorpha, Lönnroth.
Juncus alpinus Vill.
Juncus tenuis Willd.
Rhynchospora fusca R. et S.
Carex cæspitosa Linn. (Fr.).

To save space, I will here indicate to whom we are chiefly indebted for the additional records in this paper, commencing with the northern counties, as this will avoid many repetition of names. Other helpers are mentioned after the county records.

112. Shetland—Mr. W. H. Beeby.
110. Hebrides—Mr. Somerville.
109. Caithness—Messrs. Grant, Hanbury, Reeves, & Dr. Ward.
108. W. Sutherland and
107. E. Sutherland } Rev. E. Marshall.
105. W. Ross—Mr. G. C. Druce.
104. N. Ebudes—Mr. Symington Grieve.
103. Mid Ebudes and
101. Cantire } Mr. P. Ewing.
99. Dumbarton—Messrs. Watt, M'Kay, Henderson, and Somerville.

98. Argyle—Mr. T. King.
97. Westerness—Mr. P. Ewing.
96. Easterness
95. Elgin } Mr. G. C. Druce.
94. Banff
89.
88. } Perthshire—Dr. Buchanan White.
87.
86. Stirling
77. Lanark } Mr. M'Kay.
76. Renfrew
75. Ayr—Mr. J. Smith.
74. Wigton—Mr. J. M'Andrew & *Botanical Record Club Report.*
73. Kirkcudbright—Mr. J. M'Andrew and Prof. D. Oliver.
72. Dumfries—Mr. J. Fingland.

As many of the commoner species are now recorded from all the counties, it is hoped that these lists may be much shortened in the future, leaving more space for notes, which the number of the records for 1887 will not allow to any extent.

The following corrections require to be made in the list for 1886 :—

Delete "*Viola lutea*, *Orchis incarnata*, and *Carex eu-flava*" from "*112*," as errors caused by my use of an early note of my own regarding Mr. Beeby's finds before his plants were properly determined.

Under *Linum perenne*, delete "*72* Dumfries," as the localities are all in Kirkcudbright.

Under *Anthyllis vulneraria*, for "var. *maritima*," substitute "var. *ovata* Bab."

On page 64, line 5 from bottom of page, instead of "*full*," which has no meaning, read "*pale.*"

The names, sequence, &c., as before, are those of *Topographical Botany*, Ed. II.

The following contractions are used below :—

S.N. refers to *Scottish Naturalist;* E.C. to Botanical Exchange Club Report; R.C. to Botanical Record Club Report; and J.B. to *Journal of Botany.*

Thalictrum minus ag. 104.
.T. maritimum 103 ! 110 !
Anemone nemorosa 97 !
Ranunculus Lenormandi 99.
R. hederaceus 104.
R. Lingua 86.
R. hirsutus (†Ar.B.) 104.

R. Ficaria 98. 101.
Caltha palustris 98.
Berberis vulgaris 86 †.
Nymphæa alba 97. 98.
Papaver dubium 99.
Corydalis claviculata 74.
Fumaria confusa 103 († ?) !
F. densiflora 74.
Cakile maritima 72 !
Lepidium Smithii 105.
Cochlearia danica 112 !
Draba verna 105.
Cardamine pratensis 97 !
C. eu-hirsuta 97 ! 98.
C. sylvatica 75. 86. 94. 96. 98.
Arabis petræa 97 ! 103 ! 105.
A. alpina L. 104 ! New to the British Flora. See *S. N.*, 1887, p. 180.
Nasturtium officinale 98.
N. palustre 86 !
N. amphibium 75.
Sisymbrium officinale 74.
Raphanus Raphanistrum 86 †. 97. R.C. 99.
Viola palustris 99.
V. eu-tricolor 97 ! 103 ! 105.
V. Curtisii 103.
V. lutea 74.
Drosera rotundifolia 103 !
D. anglica 99 !
D. obovata 89 ! 96 ! 105 ! 108 !
Polygala eu-vulgaris 77.
P. depressa 94. 95. 96. 99. 103 ! 108 !
Silene inflata 99. 104.
Lychnis vespertina 74. 95. 96. 99 †.
L. Githago 105.
Sagina apetala seg. 74 ! 99. 109! 110 !
S. nodosa 74 ! 108 !
Honkeneja peploides 105.
Spergularia neglecta 97 ! 98 !
S. marginata 98 ! 112 var.!

Arenaria serpyllifolia 74. 98. 99. 109 !
A. trinervia 75.
Cerastium glomeratum 98.
C. arcticum Lange 108 Herb. Kew !
Stellaria Holostea 98.
S. graminea 97 ! 98.
S. uliginosa 98. 101.
Hypericum Androsæmum 73 !
H. perforatum 101.
H. dubium 98. 109.
H. humifusum 99. 104.
H. elodes 110 !
Erodium cicutarium 72 ! 74 ! 104.
Geranium sylvaticum 75. 99.
G. pusillum 100.
G. Robertianum 99.
Rhamnus Frangula 86 †. ! 89.
Ulex europæus 103 †. !
U. nanus 73 !
Sarothamnus scoparius 74.
Ononis arvensis 74.
Anthyllis Vulneraria 75. 97. 98.
A. Dillenii 109 ! 112 !
Trifolium medium 75. 97! 98.
T. arvense 104.
T. fragiferum 89.
T. procumbens 97 ! 99. 109. Dr. Davidson.
T. agrarium 95 †. 96 †.
T. minus 105.
Astragalus glycyphyllus 74 !
Vicia sylvatica 104.
V. sepium 74. 75. 98.
V. augustifolia 75.

A beautiful form of *V. Cracca* occurs in Caithness; it comes between the type and var. *macrophylla* Regel.

Lathyrus pratensis 74.
Orobus tuberosus 75. 86.
Prunus spinosa 75. 98.
P. insititia 75 †.
P. avium 74. 99.

P. Padus 98. 99. 101. 105.
Agrimonia Eupatoria 98. 99.
A. odorata 73 !
Geum intermedium 75, 99.
G. rivale 101. 112 !
Potentilla alpestris 104.
P. procumbens 74. 86 ! 99.
P. reptans 76, 99.
Rubus Leesii 72. Christie, J. B., 1887, p. 314.
R. suberectus 96.
R. fissus 73 !
R. affinis 77 ! 95. 103 !
R. rhamnifolius 95.
R. macrophyllus 72 !
R. Koehleri 72 ! 73 !
R. hirtus 73 !
R. saxatilis 74.
R. Idæus 86.

(The Rubi have been determined by Mr. J. G. Baker.)

Rosa spinosissima 98 R.C.
R. involuta 96, 108 ! Hanbury & Marshall.
R. hibernica 95. „ „
R. mollis 77 ! 95. 96. 105.
R. tomentosa 95. 96.
R. micrantha 95.
R. „ var. hystrix 72 ! "Yes. J. G. Baker.
R. canina 73 R.C.
Pyrus Aucuparia 98.
P. Malus 96.
Poterium Sanguisorba 99.
Epilobium augustifolium 99 +.
E. hirsutum 98. 99.
E. parviflorum 98 R.C.
E. tetragonum 98.
E. obscurum 103. 108 !
E. palustre 94. 74 R.C. 103 !
Circæa lutetiana 98.
Hippuris vulgaris 99.
Myriophyllum spicatum 86. 98.

M. alterniflorum 86. 95. 98. 99.
Callitriche stagnalis 75. 103 !
C. autumnalis 72 ! 96. 112 !
C. polymorpha Lönnroth 112 ! New to the British Flora. See *S.N.*, 1888, p. 212.
Scleranthus annuus 105.
Peplis Portula 98. 110 !
Ribes alpinum 72 † ! 75 †.
Sedum Telephium 86 †.
S. acre 104. 105.
Saxifraga Sponhemica 96.
Chrysosplenium oppositifolium 74. 98.
Parnassia palustris 99.
Cornus suecica 112 !
Hydrocotyle vulgaris 98.
Sanicula europæa 98. 101. 103 !
Ægopodium Podagraria 97.
Carum verticillatum 88. 97 !
Bunium flexuosum 97. 98. 101.
Pimpinella Saxifraga 99. 109 !
Œnanthe fistulosa 89.
Œ. Crocata 103 !
Æthusa Cynapium 99.
Ligusticum scoticum 74.
Peucedanum Ostruthium 109 †.
Heracleum Sphondylium 74. 98.
Daucus Carota 99.
Torilis Anthriscus 97.
Chærophyllum temulum 74.
Myrrhis odorata 74. 103 † ? !
Scandix Pecten-Veneris 99.
Adoxa Moschatellina 98.
Sambucus nigra 97 † ! 98 †. 99 †.
Viburnum Opulus 108 !
Lonicera Periclymenum 74. 98.
Galium Cruciata 101.
G. verum 98. 105
G. Mollugo 92. P. Ewing.
Asperula odorata 98.
Sherardia arvensis 105.

Valerianella olitoria 98.
Hypochæris radicata 98. 103 !
Lactuca muralis 98 .
Sonchus asper 74. 98.
S. arvensis 98.
Crepis virens 97 !
C. paludosa 74. 103 !
Hieracium Pilosella 98.
H. melanocephalum 94 ! 96 !
H. holosericeum 94 ! 96 !
H. tenellum 96 ! 105 !
H. globosum (Groves, E. C. 86) 96 !
H. nigrescens 105 !
H. lingulatum 94 ! 105 !
H. senescens 96.
H. anglicum 94 ! 96 ! 98 R.C.
H. argenteum 109 !
H. aggregatum 96 !
H. cæsium 104 R.C.
H. murorum 96 !
H. vulgatum seg. 74. 93. 95. 96. 98. 108. 110.
H. gothicum 109!
H. umbellatum 95 ! 96 !
H. var. filifolium 95 !
H. crocatum 95 !
H. rigidum 96 !
H. corymbosum 95 ! 97 !
H. Dewari 88 ! 97 !
Lapsana communis 103 !
Cichorium Intybus 109.
Arctium minus 95. 96.
A. intermedium 72 ! 105.
A. nemorosum 109. Rev. R. Linton.
Saussurea alpina 96. 103 !
Carduus crispus 75. 98.
C. setosus 109.
Centaurea nigra 74. 99.
C. Cyanus 105.
Gnaphalium uliginosum 98.
G. dioicum 74.

Filago minima 72 !
F. germanica 74.
Petasites vulgaris 97 ! 98.
Taraxacum officinale 74.
Solidago Virgaurea. 74.
Aster Tripolium 105.
Chrysanthemum segetum 98.
Anthemis nobilis 75 †.
Achillea Ptarmica 74. 100.
Campanula Rapunculus 95 †.
Vaccinium Oxycoccos 98. 99.

Vaccinium intermedium of Ruthe has been found in Staffordshire; it should be looked for in Scotland, where *V. Myrtillus* and *V. Vitis-Idaea* grow together, as it is supposed to be a hybrid between these species.

Arctostaphylos alpina 105 ! Confirmed.
Calluna vulgaris 103 !
Pyrola rotundifolia 88 ! P. Ewing.
„ secunda 97 !
Ilex Aquïfolium 98. 99.†
Fraxinus excelsior 104. 109.
Gentiana campestris 105.
Erythræa littoralis 73 ! 95. 96 J. B., 1872, p. 166.
Menyanthes trifoliata 97 ! 99.
Convolvulus arvensis 98. 99.
C. sepium 98 † ?
Solanum Dulcamara 99.
Veronica arvensis 97 !
V. serpyllifolia 103 !
V. scutellata 99.
V. Beccabunga 98.
V. montana 75. 98.
V. agrestis 105.
V. Buxbaumii 98 †, 103 † !
V. humifusa 94.
Melampyrum pratense 98. 103 montanum !
M. pratense var. hians 95 !
Euphrasia officinalis 103 † !
Scrophularia nodosa 72 Coles. 74.
Lycopus europæus 74.
Mentha piperata 72 !

M. hirsuta 99. 110!
Thymus Serpyllum 109!
T. Chamædrys 96 ! 109 !
Calamintha Clinopodium 99.
Nepeta Glechoma 99.
Lamium amplexicaule 98.
L. intermedium 96. 105.
L. incisum 98.
Galeopsis Ladanum 99.
Stachys palustris 108.
S. ambigua 73 !
S. sylvatica 97 !
S. arvensis 73 ! 99.
Scutellaria minor 104 !
Ajuga reptans 98.
Myosotis cæspitosa 95 ! 96 !
M. palustris 98. R.C.
M. strigulosa 99.
M. repens 99.
M. sylvatica 104.
M. arvensis 97 !
M. collina 109.
M. versicolor 97 ! 98. 99.
Symphytum officinale 99 †.
S. tuberosum 86. 98.
Utricularia vulgaris 98 R.C.
U. minor 98 R.C.
U. intermedia 72 ! 95. 96.
Lysimmachia thyrsiflora 76.
L. vulgaris 74.
L. nemorum 103 !
Anagallis arvensis 74. 98. 103 † ?
A. tenella 74. 104.
Littorella lacustris 76. 86. 103!
Chenopodium rubrum 99 †.
Atriplex angustifolia 74. 95. 96.
A. erecta 112 !
Rumex conglomeratus 75. 109.
R. nemorosus 103 !
R. maritimus († A.B.) 104.

R. conspersus 112 !
R. crispus 98.
R. maximus 88 !

The name *Rumex aquaticus*, as applied to our British *domesticus*, should be given up and the name *R. domesticus* used instead, as this latter is definite, and the former indefinite.

R. aquaticus Auct. Succ.—R. hippolapathum Fries. ex p. is probably a Perthshire species ; but the material in hand is insufficient to establish it as a British species as yet.

Oxyria reniformis 107. 109 !
Polygonum Convolvulus 98. 105.
P. Raii 98.
P. lapathifolium 99.
P. Bistorta 86 †.
Euphorbia Helioscopia 98. 105.
E. Peplus 105 !
Mercurialis perennis 109.
Parietaria diffusa 99 !
Alnus glutinosa 109.
Betula verrucosa 74. 95. 96.
Quercus sessiliflora 95.
Q. pedunculata 95. 96.
Salix pentandra 74. 86 ! 88. 99.
S. fragilis 97 † !
S. rubra 95 †.
S. viminalis 74.
S. ferruginea 74.
S. cinerea 98 †.
S. aurita 98. 99 †.
S. Caprea 98 †. 108.
S. repens 105.
S. nigricans 104.
S. Myrsinites 108 confirmed !
S. Grahami 88 J. B., Vol. 9, p. 300.
S. herbacea 107.
Pinus sylvestris 94.
Juniperus communis 104.
J. nana 94. 96. 97.
Taxus baccata 86 †.
Listera cordata 99.

Epipactis latifolia 99.
Orchis incarnata 96.
Habenaria bifolia seg. 86. 95. 96. 99.
H. chlorantha 75. 101.
H. viridis 74.
Malaxis paludosa 72!
Allium vineale (compactum) 72!
A. ursinum 98. 99. 109!
Scilla verna 110!
Hyacinthus non-scriptus 86. 98. 103!
Convallaria majalis 75 +.
Triglochin palustre 86. 103!
Potamogeton pectinatus 112!
P. filiformis 110. Dr. J. Stirton, *S. N.*, 1886, p. 182.
P. perfoliatus 99.
P. prælongus 74. 112!
P. polygonifolius 95.
P. natans (true) 86. 97! 104. 110!
Zannichellia polycarpa 112!
Typha latifolia 74. 106.
Sparganium ramosum 97. 98.
S. affine 73! 105. 109 Dr. Davidson! 110!
S. minimum 96.
Lemna gibba 75. 84!
L. polyrhiza 84! } "Introduced by Canal." P. Ewing.
Zostera nana 73!
Luzula pilosa 98.
L. campestris 98. 103!
L. multiflora 75. 94. 95. 103!
Juncus conglomeratus 99.
J. glaucus 76. 77.
J. acutiflorus 73! 103!
J. supinus 103!
J. Gerardi 73! 103! 105.
J. tenuis Willd. 73! New to Scottish Flora, excluding Don's reported discovery.
J. alpinus Vill. 88! 89! 108! New to Scottish Flora. See *S. N.*, 1887, p. 182.
Rynchospora fusca R. et S. 73! New to Scottish Flora.
Blysmus rufus 72. 74! 75.

B. compressus 72 !

Scirpus acicularis 101.

S. palustris 73.

S. uniglumis 88 ! Determined by Mr. C. B. Clarke.

S. multicaulis 77.

S. pauciflorus 110 !

S. fluitans 103 !

S. Savii 103 !

S. setaceus 86. 99. 105 !

S. Taberæmontani 110 !

S. maritimus 110 !

S. sylvaticus 86 ! 99.

Eriophorum latifolium 74.

Carex curta 98 R.C.

C. alpicola 96 ! 108 !

C. remota 86.

C. intermedia 99.

C. vulpina 73 !

C. paniculata 101 !

C. vulgaris 98.

C. rigida 103 ! 109 !

C. aquatilis var. elatior, Babington 76 ! 96 ! 108 !

The var. *Watsoni* of Dr. Boswell is substantially the same as Babington's plant, published in the first edition of the *Manual* 1843.

C. acuta 98.

C. flava var. minor 94 ! 95 !

C. Œderi 72 ! 108 !

C. extensa 74 !

C. pallescens 76. 101 !

C. fulva 74.

C. distans 97 !

C. punctata 74 !

C. frigida.

I noted in 1887 that Mr. Bentham, in the 5th edition of his *British Flora*, considered the Scottish *C. frigida* as a form of *vaginata*. By the kindness of Dr. Macfarlane, I have been allowed a sight of the original specimens gathered by the late Mr. Sadler; and both Mr. C. B. Clarke and Mr. N. E. Brown, of Kew Herbarium, consider them *C. frigida* Allioni. Along with the sheet Dr. Macfarlane sent another with two undoubted specimens of *C. frigida* from "Clova, herb. Wight, ex herb. (W. H.) Campbell." On a small label glued

on there is this remark: "If *C. binervis*, it is a very strange form; I doubt it.—R. G." This, I suppose, would be either Dr. Greville's or Prof. Graham's remark. There is no further locality than "Clova Mountains, Com. Wright, 1834." This would probably mean Forfarshire, though at that time the Aberdeenshire side of the watershed might have been included.

C. lævigata 73 ! C. sylvatica 101.
C. vaginata 94 ! C. glauca 75 Druce.
C. capillaris 97.
C. limosa seg. 96 ! 97 ! 102 ! 75 Dr. A. Boyd !
C. præcox 99.
C. pilulifera 74. 94.
C. lagopina 90. P. Ewing, "Canlochan Glen, at 2700 feet, with *C. vaginata*" 96 !
C. hirta 98.
C. paludosa 73 ! 74 ! 86 !
C. riparia 73 ! 99.
C. vesicaria 95 "Herb. Oxon." *fide* Druce.
C. cæspitosa L. (Fr.) 112 ! New to British Flora, common in Sweden, where it is called "Stavgrass."
C. pelia F. O. Lang 108 !
Anthoxanthum Puellii 73 † !
A. Puellii var. nana Lloyd. 92 *fide* Townsend in J.B., 1875, p. 4.
Phalaris arundinacea 103 !
Phleum alpinum 94 ! 96 ! confirmed.
P. pratense 74. 98.
Alopecurus alpinus 94 !
A. agrestis 72 ! 109.
Milium effusum 75. 99.
Agrostis canina 96. 104.
A. nigra 88 ! Rev. E. S. Marshall.
Calamagrostis strigosa. Found in a second Caithness station by Messrs. Grant & Hanbury, in 1887 !
Phragmites communis 98.
Aira uliginosa 112!
A. flexuosa 107.
A. alpina 103.
A. caryophyllea 98.
A. præcox 99.

Avena flavescens 99.
A. pubescens 110 !
Arrhenatherum avenaceum 103 !
Triodia decumbens 86 ! 101 !
Kœleria cristata 110 !
Molinia cærulea 99.
Melica nutans 75. 105 R.C.
M. uniflora 99.
Catabrosa aquatica 75.
Glyceria aquatica, 99. 101.
Sclerochloa maritima 103 ! 108 ! Hanbury.
S. distans 108 ! Hanbury & Marshall !
Poa alpina 94 !
P. glauca 89 P. Ewing !
P. nemoralis 75. 96. 101.
Festuca sciuroides 105.
F. rubra 98 R.C. 103 ! 105.
Bromus asper 99.
Brachypodium sylvaticum 99.
Triticum junceum 72 ! 107 !
Asplenium viride P. Ewing 85.
Polypodium Phegopteris 99.
P. Dryopteris 99.
Polystichum Lonchitis 105.
P. lobatum 99.
Lastrea Oreopteris 97 !
L. spinulosa 73. 104.
L. dilatata 73 ! 74.
Pseudathyrium alpestre 107 !
Scolopendrium vulgare 74. 99.
Osmunda regalis 101.
Botrychium Lunaria 99. 110!
Cystopteris fragilis 99.
Lycopodium clavatum 99.
L. inundatum 75.
L. "complanatum" 94. 96. 105.
L. Selago 99.
Isoetes lacustris 112 !
I. echinospora 87 ?
Pilularia globulifera 74.

Equisetum maximum 98.
E. arvense 74.
E. sylvaticum 98. 101. 103 !
E. palustre 97 !
E. arenarium 104. 108 !

Scirpus Tabernæmontani Gmel. in Aberdeenshire.—In the summer of 1887 examples of this plant were sent to me by Dr. T. Jamieson, which had been found by himself beside the River Ythan, at no great distance below Ellon. The species has not previously been recorded from any locality between Forfar and Easterness ; the new locality is in North Aberdeenshire.

James W. H. Trail.

NEW WORKS ON BRITISH BOTANY.

Two important monographs, dealing with difficult and critical groups of British plants, will soon be published ; and intending subscribers are requested to send their names to the respective authors.

The British Hieracia will be described and illustrated very fully by Mr. F. J. Hanbury, F.L.S. (69 The Common, Upper Clapton), to whose visits to the North of Scotland in recent years we owe many new county records. Mr. Hanbury has made a most careful study of this very difficult genus ; and the monograph will have peculiar value for Scotch Botany, as the *Hieracia* are so numerous in our Alpine and Northern flora. It is to be published in parts in five years, and will cost about £5.

The British Uredineæ & Ustilagineæ will form the subject of a volume (price 7s. 6d.), by Mr. C. B. Plowright, F.L.S. (King's Lynn, Norfolk), whose name is a guarantee of the value of the work, on which he has been engaged for a considerable time. The life-histories of these fungi are so interesting, and their parasitism on many cultivated plants is frequently so injurious, that it is unnecessary to dwell upon the great importance of a full knowledge of them. We are certain that the monograph now announced will place us abreast of the most recent discoveries in regard to both groups of fungi ; and that it will be indispensable to Mycologists.

REVISION OF SCOTCH SPHÆROPSIDEÆ AND MELANCONIEÆ.

(By Prof J. W. H. TRAIL, A.M., M.D., F.L.S.)

(*Continued from Page* 236.)

*174. **L. Juncacearum** Sacc. 3429 (D. & R. *Trail, Scot. Nat.*, 1886, p. 226).

On dead leaves of *Luzula maxima* (Woodrush), near Aberdeen. Summer and Autumn.

Dee.

Pycnidia clypeate, oblong, with a longitudinal furrow, 450 long, shining black; sporidia small, 4-6 by $\frac{1}{2}$-$\frac{3}{4}$, indistinctly 2-guttulate, on basidia about twice as long as the sporidia.

France, Finland.

175. **L. Caricinum** Fr., 3431, C.572, M.1087.

"On leaves of *Carices, Luzula,* &c." September.

Forth, Tay, Moray.

*176. **L. scirpinum** Fr., 3427, C.571, *Scot. Nat.*, 1887, p. 40.

On stalks and leaves of *Scirpus lacustris,* in Autumn.

Tweed (Berwick, *fide* Cooke), Tay (Rescobie), Dee (near Aberdeen).

*177. **L. donacinum** Sacc., 3417, var. *majus* Trail, S.M., 1886, p. 267.

On dead stem of a grass, in December; near Aberdeen.

Dee.

178. **L. filicinum** Fr., 3434, C.574.

On dead petioles of *Pteris Aquilina* L.

Tweed (Berwick), Forth (Edinburgh), Clyde (Glasgow), Argyle (Appin), all *fide* M.C. Cooke, in *Grevillea* (XIV., p. 106).

XXX. Discosia Lib.

Pycnidia discoid, dimidiate, almost superficial, easily falling off, black, membranaceous; sporidia oblong, sausage-shaped

2-pluriseptate, ends with 1 cilium on each, yellowish or hyaline; basidia rod-like.

179. **D. Artocreas** (Tode), 3485, C.578 (R. *Cooke* in *Grevillea*, 1886, p. 107.

On leaves of *Fagus* (Beech), &c.

Tay (Perth).

Pycnidia gregarious, innate, orbicular, black, shining, at first convex, smooth; then, after a time, collapsed and wrinkled-plicate; sporidia fusoid, ends rounded, 3-septate, 14-22 by 2-3½, terminal cilia 10-15 long.

180. **D. alnea** (Pers.) Berk., 3486, C.579, M.1122.

On leaves of *Alnus glutinosa* (Alder).

Forth, Tay, Moray.

XXXI. Actinothyrium Kunze.

Pycnidia dimidiate, clypeate, readily falling off, not opening or scarcely so, membranaceous, margin with a radiating fringe of cells, dark; sporidia filiform, hooked, hyaline.

*181. **A. graminis** Kunze, 3507, C.580, M.1100.

On dead grass stems and leaves. Autumn to spring.

Tweed, Forth, Tay, Dee.

XXXII. Leptostromella Sacc.

Pycnidia subcutaneous, then almost superficial, elongate, depresso-convex, subcarbonaceous, dark, marked with a longitudinal furrow; sporidia rod-like or filiform, unicellular or indistinctly septate, hyaline; basidia rod-like.

*182. **L. hysterioides** (Fr.), Sacc., 3513; no previous record as Scotch.

On dead stalks of *Ligusticum Scoticum*, in September, on rocks at Portlethen, near Aberdeen.

Dee.

Oblong, convex, black; sporidia cylindrical, 18-20 by 2, rather curved, hyaline, often showing guttules.

Fam. 4. Excipulaceæ Sacc.

Pycnidia shaped like a cup or saucer, or as in *Excipula*, or hysterioid, at first nearly closed, but soon opening widely, membranaceous or carbonaceous, dark, erumpent or superficial.

§ Hyalosporæ Sacc.

Sporidia globose, ellipsoid, or oblong, 1-celled, sub-hyaline.

A. Pycnidia nearly smooth.
Pycnidia somewhat cup-shaped, discoid, often imperfect, subcutaneous. *Discula.*
Pycnidia bursting by valves. *Sporonema.*
A.A. Pycnidia pilose or setose.
Sporidia without appendages. *Amerosporium.*
Sporidia with a bristle at each end. *Dinemasporium.*

§ Hyalodidymæ Sacc.

Sporidia oblong or ovate, 2-celled, hyaline. *Discella.*

Phragmosporæ Sacc.

Sporidia oblong or elongate, 2-pluriseptate. *Pilidium.*

XXXIII. Discula Sacc.

Pycnidia disciform-saucer-shaped, often imperfect, as if formed from the altered matrix, covered with the epiderm, which is at length torn into shreds; sporidia ellipsoid, oblong, or cylindrical, one-celled, hyaline.

183. **D. microsperma** (B. & Br.) Sacc., 3571, C.585, M.1171 (sub *Discella microsperma*) (D. *Jerdon*).
On dead twigs of Willow.
Tweed (Jedburgh).

XXXIV. Sporonema Desm.

Pycnidia subcutaneous, then erumpent, at first closed, then splitting from the centre outwards into several divisions; central mass discoid, rather soft, often of a different colour from the rest; sporidia ovoid or cylindrical, 1-celled, hyaline, basidia filiform, often branched.

184. **S. obturatum** (Fr.) Sacc. 3588, C.588, M.1108 (sub *Clinterium obturatum* Fr.), (D. Carmichæl).
On leaves of *Calluna vulgaris* (Ling), at Appin.
Argyle.

XXXV. Amerosporium Speg.

Pycnidia subcupulate, setulose; sporidia cylindraceo-elliptical.

185. **A. macrotrichum** (B. & Br.) Sacc., 3602, C.593, S.M., 2179 (sub *Excipula macrotricha* Br. & Br.) (D. *Keith*, in *Scot. Nat.*, 1881, p. 118).
On broom-sticks (and Whins in England) in March.
Moray (Forres).

XXXVI. Dinemasporium.

Pycnidia cup-shaped, superficial, covered with dark brown rigid bristles; sporidia oblong or sausage-shaped, 1-celled, bearing a cilium near each end, hyaline basidia rod like, rarely branched.

*186. **D. graminum** Lev., 3610, C.595, M.1161.
On dead leaves of grasses.
Tay, Dee, Moray.

187. **D. strigosum** (Fr.), Sacc., 3611, C.596, M.1160 (sub *Excipula strigosa* Fr.).
On culms and leaves of grasses.
Tay, Argyle, Moray.

188. **D. hispidulum** (Schrad.) Sacc., 3619, C.597, M.1162 (D. *Carmichael*).
On dead wood.
Argyle.

* var. **herbarum** Cooke, C.598 (species), (D. & R. *Trail*).
On dead stems of *Urtica dioica* (Nettle), *Linaria vulgaris* (Toadflax), &c., near Aberdeen, in spring.
Dee.

XXXVII. Discella B. & Br.

Pycnidia as in *Discula*, but sporidia 2-celled.

189. **D. carbonacea** (Fr.) B. & Br., 3631, C.600, M.1170.
On dead twigs of Willows (*Salix*).
Tweed, Forth, Tay, Dee.

XXXVIII. Pilidium Kunze.

Pycnidia erumpent, discoid-scutellate, irregular, membranaceous, at last torn into shreds along the margin, sooty black, disk paler; sporidia oblong or fusoid-falcate, 2-pluriseptate, hyaline.

190. **P. fuliginosum** (Fr.), Auersw. 3639, C.603, M.1124 (sub *P. carbonaceum* Lib.), (D. *Keith*).
On Willow branches at Sanquhar.
Moray.

Melanconieæ.

Fungi having neither pycnidia nor asci, consisting of subcutaneous masses (pustules), sometimes at length erumpent, usually rather soft, dull coloured, grey, or bright

coloured ; sporidia growing on basidia of various forms (which are sometimes obsolete), supported on a more or less developed proligerous stratum.

Analytical key to genera.

§ Hyalosporæ Sacc.

Sporidia globose, ovoid or oblong, or shortly cylindrical, one-celled, hyaline, or rarely a little coloured.

Pustules long subcutaneous, grey or pale, on leaves or stems ; sporidia solitary. *Glœosporium.*

§ Scoleco-Allantosporæ Sacc.

Sporidia cylindrical, filiform or sausage-shaped, one-celled, hyaline or nearly so.

Pustules subcutaneous, effused, on living leaves, white or pale ; sporidia filiform, often flexuous. *Cylindrosporium.*

Pustules variable in form, often brightly coloured ; sporidia filiform-falcate. *Libertella.*

§ Phæosporæ Sacc.

Sporidia globose, oblong or elongate, one-celled, sooty or olive-brown.

Sporidia growing singly on tips of basidia, globose or oblong. *Melanconium.*

§ Didymosporæ Sacc.

Sporidia ovoid, subfusiform, or oblong, 1-septate.

Sporidia fuscous ; on decaying matters. *Didymosporium.*

Sporidia sub-hyaline ; on living leaves. *Marsonia.*

§ Phæophragmiæ Sacc.

Sporidia 2-or-more septate, sooty brown.

A. Sporidia oblong.

Pustules subcutaneous ; sporidia escaping in tendrils. *Stilbospora.*

Pustules erumpent ; sporidia never escaping in tendrils. *Coryneum.*

AA. Sporidia stellate-lobed, pluri-septate. *Asterosporium.*

§ Dictyosporæ Sacc.

Sporidia oblong, pyriform or rhomboid, pluri-septate, muriform, fuscous.

Sporidia produced singly on the tips of the basidia, sooty or olive-brown. *Steganosporium.*

XXXIX. Glœosporium Desm. & Mont.

191. **G. concentricum** (Grev.), B. & Br., 3665, C.909, M.1183 (D. & R. *Greville.*)
On cabbage leaves.
Forth (Edinburgh).

192. **G. Violæ** B. & Br., 3668, C 610, M.1185 (D. *Stevenson*, R. *Berkeley* & *Broome*, No. 1703, 1878).
On leaves of *Viola odorata*, in June.
Forth (Fifeshire).

193. **G. Cytisi** B. & Br., 3686, C.612, M.S. 2180. (D. *Stevenson*, R. *Berkeley* & *Broome*, No. 1703, 1878.)
On leaves of *Cytisus Laburnum*, in August.
Tay (Killiecrankie).

*194. **G. Gei** Trail, *Scot. Nat.*, 1885, p. 189, S.M., 3050.
On dead stems of *Geum urbanum*, near Aberdeen.
Dee.

195. **G. Fragariæ** (Lib.), Sacc., 3690, C.613, M.1697 (sub *Leptothyrium Fragariæ* Lib.)
On *Potentilla Fragariastrum*, from spring to autumn.
Forth, Clyde, Tay, Argyle, Ross.

196. **G. fructigenum** Berk., 3751, C.623, M.1184 (D. *White*).
On apples, at Perth.
Tay.

*197. **G. Ribis** (Lib.), Mont. & Desm., 3694, C.614, M.1908 (sub *Leptothyrium Ribis* Lib.).
On leaves of *Ribes rubrum*, and of *R. nigrum.*
Clyde, Tay, Dee, Moray, Ross.

*198. **G. paradoxum** (De Not) Fuckel, 3697, C.615.
On dead leaves of *Hedera Helix* (Ivy), usually along with its ascigerous state, *Trochila craterium.*
Tay (Den of Airlie), Dee (near Aberdeen).

*199. **G. Fagi** (Desm. & Rob.) West, 3728, C.620; no earlier Scotch record than this.
On dead leaf of *Fagus sylvatica* (Beech), at Park.
Dee.

Spots nearly circular, brownish on upper surface of leaves, greenish below, pustules paler, rather prominent; spo-

ridia oblong or ovoid, 11-15 by 4-5 (Saccardo gives them as 15-20 by 7-8, minutely 2-3-guttulate; basidia about half as long.

*200. **G. umbrinellum** B. & Br., 3731, C.621 (Cooke's Handbook, No. 1412); no earlier record as Scotch.

On fallen leaves of *Quercus Robur* (Oak), in Autumn.

Dee (Aberdeen).

*201. **G. Betulæ** (Lib.), Mont., 2733 (D. & R. *Trail, Sc. Nat.*, 1887, p. 40).

On dying leaves of *Betula alba* (Birch), common in autumn near Aberdeen.

Dee.

Spots often nearly circular, turning brownish or dark brown; pustules on the upper surface of the leaves, dark brown, numerous, at last erumpent, tearing the epiderm; sporidia cylindrical-clavulate, obtuse, 6-12 by 2 (Saccardo gives 13-16 by 2), hyaline.

XL. Cylindrosporium Unger.

Pustules subcutaneous, discoid or ill-defined; sporidia filiform, often flexuous.

This "genus" chiefly consists of the conidial stage of species of *Entyloma*, a genus of *Ustilagineæ*.

*202. **C. Ficariæ** Berk., 3848, C.631, M.1186 (belongs to *Entyloma Ranunculi* Bon.).

Common on living leaves of *Ranunculus Ficaria*.

Tay, Dee, Moray.

(I cannot distinguish *C. Ranunculi* Bon. from this, and believe that the two belong to the same species, though enumerated by Saccardo and by Cooke as distinct. Sacc. 3850, C.633).

*203. **C. niveum** B. & Br., 3849, C.639, M.1189 (D. *Fergusson*, R. *Berkeley* and *Broome*, 1875).

On living leaves of *Caltha palustris*.

Dee (local but common).

*204. **C. Oxalidis** Trail, *Sc. Nat.*, 1887, p. 89.

On living leaves of *Oxalis Acetosella*, in September.

Dee (near Aberdeen).

*205. **C. rhabdosporum** B. & Br., 3860, C.635, M.1188 (D. *Stevenson*, R. *Berkeley* & *Broome*, 1875).

On living leaves of *Plantago lanceolata*.

Tay (Glamis), Dee (near Aberdeen).

The following, which are placed under *Cylindrosporium* in "Mycologia Scotica," do not belong to *Melanconieæ*, but to *Hyphomycetes*, and should bear names as below :

C. longipes Preuss. (M.1187) is *Chalara longipes* (Preuss).

C. Senecionis B. & Br. (M.1190), is *Ramularia Senecionis* (B. & Br.), Sacc.

***C. Valerianæ** Speg. recorded in Cooke's list (634), from Aberdeen (from specimens supplied by me), is *Ramularia Valerianæ* (Speg.), Sacc.

XLI. Libertella, Desm.

Pustules on stems and branches, irregular in form, long subcutaneous ; sporidia often at last erumpent in tendrils of various bright colours, long, filiform, falcate ; basidia various in form.

206. **L. faginea** Desm., 3892, C.640, M.1181 (sub *Nemaspora crocea* Pers.), (D. & R. *Cooke*).

On bark of branches of *Fagus sylvatica* (Beech).

Tay (Dupplin).

207. **L. Rosæ** Desm., 3894, C.641, M.1182 (sub *Nemaspora Rosæ*).

On twigs of *Rosa*.

Tweed, Forth, Tay.

208. **L. betulina** Desm., 3897, C.642 (R. in *Grevillea*, 1886, p. 126).

On bark of *Betula alba* (Birch).

Tay (Glamis).

XLII. Melanconium Link.

Pustules subcutaneous, conoid or discoid, dark ; sporidia produced singly on tips of the basidia, between globose and oblong, one-celled, sooty brown, at last erumpent in dark tendrils or clusters, and staining the surface of the food plant.

The fungi in this group are mostly spermogonia of *Melanconis*, a genus of *Pyrenomycetes*.

209. **M. magnum** (Grev.) Berk., 3946, C.647, M.1175 (D. & R. *Greville*).

"On dead branches of Hornbeam, Sycamore, &c."

Forth, Moray.

210. **M. bicolor** Nees., 3963, C.650, M.1174.
On dead branches of *Betula alba* (Birch).
Tweed, Tay, Argyle.

XLIII. Didymosporium Nees.

Pustules subcutaneous, soon erumpent; sporidia oblong or fusoid, fuscous or sooty, said by Saccardo to be 1-septate, by Cooke to be unicellular.

211. **D. profusum** Grev., 4009, C.656 (D. & R. *Greville*).
On bark of *Acer Pseudo-platanus*, near Edinburgh.
Forth.

XLIV. Marsonia Fisch.

Pustules subcutaneous, subdiscoid, pale; sporidia ovoid, oblong or subfalcate, uniseptate, hyaline.

*212. **M. Potentillæ** (Desm.) Fisch., 4037, C.646, *Sc. Nat.* 1887, p. 89-90.
var. **Tormentillæ** Trail, on *Potentilla Tormentilla*.
„ **Anserinæ** Trail, on *P. Anserina*.
„ **Comari** Trail, on *P. Comarum*.
Dee (near Aberdeen).

*213. **M. Melampyri** Trail, *Sc. Nat.*, 1887, p. 89.
On leaves of *Melampyrum pratense*, at Dinnet.
Dee.

214. **M. Juglandis** (Lib.) Sacc., 4028, C.645, M.1096 (sub *Leptothyrium Juglandis*), (D. *Stevenson*).
On leaves of *Juglans regia* (Walnut).
Tay (Glamis).

XLV. Stilbospora Pers.

Pustules subcutaneous, conoid or discoid, dark; sporidia oblong or fusoid, 2-pluri-septate, sooty brown, at last extruded, and staining the bark dark.

215. **S. macrosperma** Pers., 4046, C.659 (D. *Carmichael*).
In bark on branches of *Quercus Robus* (Oak).
Argyle (Appin).

XLVI. Coryneum Nees.

Pustules discoid or pulvinate, subcutaneo-erumpent, dark; sporidia oblong or fusoid, 2-pluriseptate, sooty brown, never escaping in tendrils; basidia rodlike, variable in length.

*216. **C. Comari** Trail, *Sc. Nat.*, 1887, p. 90.
On leaves of *Potentilla Comarum*, in August, near Aberdeen.
Dee.

*217. **C. microstictum** B. & Br., 4059, C.660, M.1180.
On twigs of *Rosa canina*, &c.
Tay, Dee.

218. **C. disciforme** Kunze & Schm., 4075, C.667, M.1179 (D. *Jerdon*).
On dead branches of *Betula alba* (Birch).
Tweed (Jedburgh).

XLVII. Asterosporium Kunze.

Pustules pulvinate, erumpent, dark; sporidia stellate, dark brown, rays tapering, pluriseptate; basidia rodlike.

*219. **A. Hoffmannii** Kunze, 4095, C.670, M.1178.
On bark of *Fagus sylvatica* (Beech).
Tweed (Jedburgh), Dee (Aberdeen).

XLVIII. Steganosporium Corda.

Pustules subcutaneous, afterwards erumpent, pulvinate, dark, compact; sporidia produced singly on the basidia, ovoid or pyriform, 2-pluriseptate, muriform; basidia rod-like, often mixed with paraphyses.

220. **S piriforme** (Hoffm.) Corda, 4195, C.674, M.1177 (sub-*Stilbospora ovata* Pers.).
On dead twigs of *Fagus*, *Acer*, &c.
Tweed, Forth.

221. **S. cellulosum** Corda, 4200, C.675, M.1176 (sub *Stegonosporium cellulosum* Corda), (D. *Keith*).
On dead branches (of *Tilia*), at Sanquhar.
Moray.

APPENDIX.

I have to record two additions to the genus *Phyllosticta* found by myself in the neighbourhood of Aberdeen in the autumn of 1887. Both are new to Scotch records.

*1*a*. **P. Cytisi** Desm., 40, C.369.
On leaves of *Cytisus Laburnum*. October.
Dee.

Spots sub-circular, becoming brown and dry; pycnidia scattered in the paler centre ; sporidia oval or oblong, 5-8 by 3-4, hyaline or nearly so.

2a.* **P. Sambuci Desm., 95, C.378.

On leaves of *Sambucus nigra*. October.

Dee.

Spots sub-circular, becoming dark brown, then pale ; pycnidia scattered, few ; diameter 80 ; sporidia slender, oblong, 5-7 by $1\frac{1}{2}$-$2\frac{1}{2}$, hyaline, biguttulate.

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The list now concluded shows a considerable advance within the last decade in our knowledge with regard to the Scotch example of the two groups of "Imperfect Fungi" treated of in it. It is scarcely possible to compare in detail the numbers in the groups as given in the *Mycologia Scotica*, and as understood above ; but comparing the final results we have 223 in this list, to 100 (excluding four not belonging to either group) in the *Mycologia*. Looking to the districts, the advance in the number of records is found to be almost confined to the north-east of Scotland and Argyle. "Dee," formerly fifth, now heads the list.

In the *Mycologia*, in 1879, the numbers were :—

Tweed, 20 ; Forth, 16 ; Tay, 66 ; Dee, 15 ; Moray, 24.
Solway, 1 ; Clyde, 9 ; Argyle, 6 ; W. Ross, 7.

In the present list (1887) they stand :—

Tweed, 24 ; Forth, 20 ; Tay, 69 ; Dee, 149 ; Moray, 43.
Solway, 4 ; Clyde, 9 ; Argyle, 18 ; W. Ross, 8.

But our records are still very incomplete ; and there are many "species" of both groups still undetected in our flora. I hope to be in a position to add considerably to the above list from material in my possession that awaits a fuller examination than I have yet been able to give it.

NATURAL HISTORY SOCIETIES.

Aberdeen Natural History Society, *Session 1886-87—(Nov. 16).* Annual Business meeting for the election of office bearers, council, and committees, and to receive reports from the Secretary and Treasurer.

(*Dec. 21*).—The President (Prof. Trail) exhibited and remarked upon the additions made by him to the fungus Flora of the N. E. of Scotland during 1886. The Secretary of the Society (Mr. Roy) gave in a report on the excursions of the Society during the past year.

1887. (*Jan. 18*).—Prof. Trail read notes upon plants found by Mr. Beeby in the Shetland Islands during the summer of 1886; and exhibited specimens for which he was indebted to Mr. Beeby's kindness, and which included several interesting critical forms.

Mr. Roy read notes on the earliest ascertained recorders of plants in the N. E. of Scotland, with especial reference to Dr. James Cargill, Dr. David Skene, and Rev. John Lightfoot; and he intimated that he is engaged in collecting information with a view to the preparation of a complete bibliography of the botany of the district.

Mr. R. Gray read a paper on the habits of the Right Whale, in which he maintained, from observations made by himself and by others, in the arctic regions, that it sleeps under water.

(*Feb. 15*).—This meeting took the form of a conversazione, with an exhibition of interesting specimens, chiefly local, of apparatus, &c., shown by members to the Society and to friends.

(*March, 15*).—Mr. Adam read a paper on Hydroid Zoophytes, with special reference to their structure and life-history; and he also communicated notes on botanists of Aberdeen or its neighbourhood, and showed a number of books published by them.

The Council submitted a report recommending five summer excursions.

(*April 19*).—Mr. James Taylor read notes on the Diatoms of the district around Aberdeen, and also notes on some of the former botanists of the N. E. of Scotland.

The Secretary read an additional note on Dr. James Cargill, who died in 1614, and on Dr. David Skene, a correspondent of Linnæus, who died at Aberdeen in 1771. Among Dr. Skene's discoveries was **Carex incurva** Lightf.

The scheme of excursions for the ensuing summer was agreed to; and the Council further recommended strongly to the Society to investigate the natural history of the extensive Links that fringe the coast to the north of Aberdeen.

Session 1887-88. (*Dec. 20*).—Annual Meeting (deferred from November, owing to illness of the Secretary). Office-bearers for the year were elected; and the reports of the Secretary and Treasurer for the past year were read. Prof. Trail thereafter exhibited the local collection of Algae, selected and mounted from the herbarium of the late Prof. Dickie, which was purchased after his death for the Herbarium of the University of Aberdeen.

(*Jan. 17, 1888*).—Notes on the excursions of the Society during the summer of 1887 were communicated by several members.

The Secretary then read two communications from Mr. W. Wilson, Terpersie, of personal observations, the first relating to the situations in which he had found **Linnæa borealis** growing in Aberdeenshire, and stating that he had once found a ripe fruit upon the plant in that county; the other commenting upon the statement made in some manuals of British plants that **Cochlearia officinalis** is an annual. Some discussion followed both papers.

(*Feb. 21*).—This evening was devoted to the discussion of the natural history of the Links. Prof. Trail, after a short descriptive notice of the physical features of the tract in question, submitted lists of the flowering plants and Vascular Cryptogams, and of the more interesting and uncommon of the fungi that had been gathered there by himself; and he also submitted lists of the larger Lepidoptera and of the Spiders found by him on the Old Aberdeen and Murcar Links. These lists meanwhile are to be regarded only as preliminary to a thorough investigation of the area, with a view to its comparison with the similar coasts that border so great an extent of the continental shores of the German Ocean.

Mr. A. Murray read a paper upon the Lichen-flora of the Links, which he found to be monotonous, though rich in curious forms of the few species that are met with there. The absence of rocks and trees, and the very uniform nature of the soil are sufficient to account for the great uniformity of the lichens.

Montrose Natural History and Antiquarian Society.—At a special meeting held on 27th February, the subject of increased accommodation for the museum of the Society was under consideration; and plans were submitted of an extension of the present building, which was opened in 1842, and has not been enlarged since that time. The proposed extension would provide not only the desired accommodation for the valuable collections now requiring it, but also a lecture room, where science classes and technical education could be held, a small library, a reading-room, cloak-rooms, &c. The total estimated cost is £1800, of which sum the Directors have already in hand £887. A special appeal is to be made to the public of Montrose, both at home and abroad, to aid in carrying the scheme into execution. That it shall be successful is, we feel certain, the wish of all interested in the welfare of natural science in Scotland.

South of Scotland Entomological and Natural History Society (*3rd December, 1887*).—The usual monthly meeting of the members of this Society was held in the Committee-Room of the Good Templar Hall, Galashiels, on the above date. The Secretary read an extract from the *Entomologist* on a series of experiments by Mr. Poulton of London, proving that the colour of the silk spun by larvae can be controlled by altering the colour of their surroundings when spinning. An animated discussion followed, in which several of the members stated they had had similar experi-

ence. Cases of local insects were exhibited by the Secretary and Mr. Roseburgh, and Mr. Carmichael of Chiefswood showed six splendid cases of exotic butterflies, including a fine series of both *Morpho Menelaus*, and *M. Achilles;* also some rare Papilios, including *Dolicaon*, *Cloanthus*, *Rhetenor*, *Astorion*, *Protenor*, *Merope*, and *Nereus*. Mr. Tait exhibited some fine Himalayan insects. Donations to the Society's collection were made by the Secretary and Mr. Roseburgh, and a splendid series of *Urania fuliginis* was given by Mr. Carmichael.

(*7th January, 1888*, Mr. Litster presiding).—A long letter was read by the Secretary, from Mr. Smart of Sydney, New South Wales, on Entomological life in Australia, containing, among other matter, a description of larvae and cocoons of several Australian lepidoptera, which had been very abundant in the vicinity of Sydney during the past season, and also a most interesting account of *Benacus Haldemannii* (a fish-killing beetle) and its ravages among the fish in the ponds and fountains of the Governor's grounds. A general conversation followed, after which the Secretary exhibited a case of insects, including several from the south of England and some specimens of *Papilio* from India. Mr. Thomson exhibited a series of *Mania Maura*. A donation was made by the Secretary to the Society's collection of a series of *turca* and *iota;* and T. D. Gibson Carmichael, Esq. of Chiefswood, presented the Society with a very fine microscope, a number of slides, and books on British Beetles and Spiders. The thanks of the meeting were cordially voted to Mr. Carmichael.

(*4th February, 1888*).—The members held their eighth annual meeting on the above date. The Secretary read an extract from the *Entomologist* on the larvæ of Australian insects used as food by the aborigines, and exhibited a series of *Bombyx Quercus*, and several varieties of the same insect, also a number of Noctuæ. Mr. Tait exhibited several specimens of *P. pilosaria* which had emerged during January, and a photographic group of the members of the Society, which was much admired for its design and finish. The President (Mr. Litster) congratulated the Society on the progress made during the year. They had now a very fair collection, in good condition; and he hoped that during the next season an effort would be made to fill up many of the blanks in it. The librarian stated that several standard works had been added to the library during the year; and an abstract of the Treasurer's accounts showed a substantial balance in favour of the Society. The following office-bearers were elected:—President and Curator, Mr. Angus Litster; Vice-President, Mr. Wm. Pringle; Secretary, Mr. John Spiers; Treasurer, Mr. William Thomson; Librarian, Mr. John Clapperton; Auditors, Messrs. Roseburgh and Wilson. It was agreed to arrange entomological excursions during the coming year.

REVIEWS.

A VERTEBRATE FAUNA OF SUTHERLAND, CAITHNESS, AND WEST ROSS. By J. A. Harvie Brown, F.R.S.E., F.Z.S.; and T. E. Buckley, B.A., F.Z.S.

A most important addition has been made within the past winter to the Zoology of Scotland in the book the name of which stands at the head of this

review; and we welcome it gladly as a worthy companion to such books as Gray's "Birds of the West of Scotland" and Saxby's "Birds of Shetland." Like these, it is a valuable record of facts relating to the natural history of Scotland, in a district of great interest to the ornithologist; but it includes all the Vertebrates of the district, instead of being confined to the Birds.

The authors preface their fauna with chapters that treat of the physical aspects of the country, their sources of information with regard to the vertebrate fauna of the district, both published and manuscript, a memoir of Henry Osborne (a promising ornithologist who prepared a Bird-fauna of Caithness during several years of illness before his early death), and the faunal position of Sutherland and Caithness. The authors have "for the most part followed the list of Messrs. Clarke and Roebuck's *Vertebrate Fauna of Yorkshire*." It is perhaps rather to be regretted that they have inserted the *entire* list from that work, as it is a little confusing to be troubled with the names of the numerous species that do not occur in the North of Scotland. The mammals include the Pipistrelle Bat (rare), Mole, Common Shrew, Water Shrew, Wild-cat, [Wolf], Fox, Marten, Weasel, Stoat, Polecat, Otter, Badger, Common Seal, Harp Seal (once), Grey Seal, Rorqual (once), Sperm Whale (once), White Whale, Pilot Whale, [Wild Boar], [Reindeer], Red Deer, Roe Deer, Squirrel (formerly native, then extinct, re-entered Sutherland in 1859), [Beaver], Long-tailed Mouse, House Mouse, Black Rat (once), Brown Rat, Water Vole, Field Vole, Red Field Vole, Common Hare, Mountain Hare (decreasing), Rabbit; (names of extinct species are in square brackets).

Over 200 species of Birds are recorded as found in the district, though a good many of them have occurred only once or twice. The Great Auk and the Capercailzie are extinct, and several others are noted as rapidly verging towards extinction. The Reptiles are limited to the Adder, Common Lizard, and Slowworm; and the Amphibia to the Frog, Toad, and three Newts (*Triton cristatus, T. taeniatus, and T. palmipes*). The marine fishes of the whole of the Moray Firth have been included, along with those of the Pentland Firth and of the Atlantic coast. Thus about two-thirds of the British Fishes have been recorded from within the limits included; but not a few of these are very rare or have been taken only on the south shore of the Moray Firth.

The remarks attached to many of the Vertebrates are of very great interest and value, and well repay careful perusal. The illustrations and the get-up of the book are admirable. All interested in Scotch Zoology will find much to commend, and little to take exception to, in it, and will look forward with high anticipations to the appearance of the work that we understand is now occupying Mr. Harvie Brown's attention, upon the Zoology of the Outer Hebrides or Long Island.

We have pleasure in calling the attention of our readers to two books issued since the beginning of the present year by Messrs. Roper & Drowley, London.

THE SHELL-COLLECTOR'S HANDBOOK FOR THE FIELD, by Dr. J. W. Williams, is a manual of the Land and Fresh-Water Mollusca of the British Islands, and is the most successful effort that we are acquainted with to provide reliable descriptions of the species and varieties of these animals and their shells, in a form convenient for the pocket. It is, of course, well up to

date. The descriptions are short, but clear; and there are several good wood-cuts scattered through the book. Its usefulness to the practical conchologist is increased by the fact that it is interleaved to receive notes, despite its small size. It ought to prove very useful in encouraging the study of conchology in all parts of our country.

My Telescope, by "A Quekett Club Man," fulfils successfully its aim, stated on the title-page to be "a simple introduction to the glories of the heavens." In brief form it gives such an account of the most attractive of the heavenly bodies as should not only instruct, but also stimulate the desire to learn among those amateurs possessed of even moderately good telescopes. Numerous illustrations add to the attractions of this little book.

The Flora of West Yorkshire. By F. Arnold Lees, M.R.C.S., Eng. (Vol. II. of the Botanical Series of the Transactions of the Yorkshire Naturalists' Union).

Though we cannot claim Yorkshire as a part of Scotland, nay, though the relations of Yorkshiremen and Scotchmen in the days of the long struggle of our forefathers for independence were often openly hostile and seldom friendly, yet these relations have long been changed, and there is much to induce us to interest ourselves in the great shire that in so many of its features might be a part of the "land of brown heath and shaggy wood." But in few ways can our sympathies be more heartily given to the men of Yorkshire than in the wish that they may attain to the fullest success in their investigations of the natural history of their native county, since their success throws light upon our own borders, and aids us in similar labours in Scotland.

From this point of view we must congratulate ourselves, scarcely less heartily than we congratulate the Yorkshire Naturalists' Union, upon "**The Flora of West Yorkshire**," by the well-known botanist, F. Arnold Lees, which has just been published under the auspices of the Union. In the preface the author tells us that the work "has (truly) been to him a many years labour of love," and the result is such as to prove that the loving work of years must have been freely given. It is modelled on Mr. Baker's admirable book, "North Yorkshire;" but the quarter of a century that has elapsed since the appearance of that Flora has enabled Mr. Lees to advance upon his model so far that in extent and completeness this Flora is, we believe, unequalled; though we hope to see it rivalled in the near future, in thoroughness, if not in number of species, by Dr. Buchanan White's Flora of Perthshire, and other Scotch Floras in the preparation of which so much work has been done of late years.

Mr. Lees has commenced his Flora with chapters on the **Climatology** of the Riding, (under which are also included a discussion of Mr. Watson's Zones of Vegetation, tables of the altitudinal limitations in West Yorkshire for 420 selected plants, of 80 selected lowland plants, of 83 montane and 43 submontane species, and an inquiry into the "Genesis of the Flora"); on the **Lithology** in its influence on the distribution of the plants of West Yorkshire; and on the **Bibliography**, from the earliest mention of West Yorkshire plants by any botanist (Wm. Turner in his Herbal, doubtfully in 1548, certainly in 1568), arranged chronologically down to 1887.

Turning now to the *Flora*, in the stricter sense of the word, it will give some idea how complete this is when we state that under each native species or long-established colonist, as far as the end of the *Hepaticæ*, the following items are given: the local name or names, the designations under which each was noted from Yorkshire by ante-Linnean writers, the vice-comital distribution, with an indication of whether any species has been introduced into or become extinct in any such area, lithological or altitudinal distribution in the Riding, whether native, colonist, denizen, or casual, in the Watsonian sense, habitat, frequency of occurrence, season when in best condition for identification and preservation in herbaria, name of first recorder and date of record, localities arranged under the natural river-basins, with the names of recorders and usual marks of certainty, doubt, &c. Those species regarded as natives, colonists, or well-established denizens, are numbered consecutively; but "casuals" are not numbered, and are placed between square brackets.

The Thallophytes have been more briefly treated, and for most of them the information is confined to the localities and habitats; and under the parasitic and saprophytic fungi the "hosts" are named, so far as observed in West Yorkshire. The extent of the Flora may be realised on an enumeration of the *numbered* plants in it as follows:—Dicotyledons, 757; Coniferae, 3; Monocotyledons, 237; Vascular Cryptogams, 47; Characeæ, 12; Mosses, 348; Hepaticæ, 108; Lichens, 258; Fungi, 1009; and Fresh-water Algæ, 382.

In the three last groups there is evidently a field for the labours of the members of the Yorkshire Naturalists' Union, alike to render the records more complete and to bring the arrangement of the Fungi and the Algæ into harmony with the knowledge of these plants that has been gained during recent years. Nor can we doubt that this will be done, and that this defect in an otherwise admirable Flora will be soon remedied. It should not be forgotten that this fault is shared by every local British Flora yet published, and that few attain the degree of completeness (even as regards the Thallogens) of the one under review. It ought to stimulate us, who live north of the border, to emulate what has been achieved in West Yorkshire.

The Characeæ of America, by Dr. T. F. Allen (Pt. I., Introduction, Morphology, Classification, 1888, price $1). Our American cousins are proving more fully, year by year, that the Cryptogamic Flora of Europe cannot be thoroughly studied and understood if we leave out of view the work done and the monographs published west of the Atlantic Ocean. American botanists have necessarily had to refer largely to the writings of European authors; but we find it less easy to realise their claims to our attention in return. Dr. Allen's work on *Characeae* nominally deals only with the American species; but, in fact, it is indispensable to all students of the order. The part now issued is of far more than local interest. A brief introduction treats of the methods of collecting and examining Characeæ. This is followed by a historical sketch and an exhaustive account of the germination, development of each member, vegetative and reproductive, and of the phenomenon of cyclosis. The last twenty-seven pages are occupied with a synopsis of the species prepared by Prof. Nordstedt to include his recent discoveries down to 1887, and translated and slightly extended (to include new American species)

by Dr. Allen. Fifty-five excellent woodcuts add to the value of this very useful monograph.

A Manual of the British Discomycetes, By William Phillips, F.L.S., (published by Kegan Paul, Trench & Co., as Vol. LX., in the International Science Series, 1887).

For several years no group of Fungi has been in a condition less satisfactory to British mycologists than the Discomycetes. This group has remained unmonographed since the publication of Dr. Cooke's "Handbook of British Fungi" in 1871, since which time there has been no attempt to focus the information regarding them that had accumulated in the interval. Nor has the family fared much better during this period on the Continent; for, with the exception of monographs of one or two of the orders, Karsten's revisions of the species of this group in Finland, and one or two proposed schemes of classification, there are few recent sources of information respecting these Fungi. The need of a work embodying the results of the later investigations, both in the British Islands and on the Continent, had made itself so strongly felt that it gave great pleasure to British mycologists to learn a few years ago that Mr. Phillips was engaged upon the preparation of a monograph of the British Discomycetes; for it was felt that by no other could the work be so thoroughly done. Mr. Phillips' work has been eagerly looked for; and the expectations so confidently entertained of its value have been well justified, for it must be indispensable to students of mycology abroad as well as within Great Britain. It is, therefore, a ground for satisfaction of an unmixed kind that, despite the excellence of the typography and plates scarcely less than of its subject matter, the book is published at a price that places it within the reach of every person desirous to prosecute the study of these Fungi. Indeed we do not remember any other instance of an English book of such value upon any scientific subject supplied at so low a price.

The first impression of any mycologist, familiar with the earlier English works on the Discomycetes, on opening this volume will probably be surprise at the large number of additions that have been made to the British Flora in recent years; and it is evident that the novelties are still far from exhausted, if we may judge from the number of new species described in the book itself. On a more careful inspection he will be struck with the care displayed in the author's treatment of his subject, and with the valuable analytical keys to the genera, the subgenera, and the species, which add greatly to the value of the book. But he will probably feel a good deal bewildered by the number of "genera" the names of which are unfamiliar to him, and which he finds to be formed of parts of such old friends as *Peziza*, *Geoglossum*, &c.; and he may be inclined to question the value of "genera," some of which are separated from one another by characters that can hardly be put into words. Yet it must be recognised that the trained eye and intellect can frequently seize differences that elude the power of words to express in a way to which exception cannot be taken; and the result of experience alone can justify criticism of any real value in such questions. We believe that Mr. Phillips' book will stand the test of time; though probably open to rearrangement here and there in its details; *e.g.*, is *Stamnaria Persoonii* quite in its proper place in

the order *Bulgariæ?* As regards the multiplication of names, the number of species now included under the "genera" of Fries has made it a necessity to break up the latter either into named genera, or into sub-genera, for the convenience of manipulation. It is more a question of words than of facts; and while we would deprecate the excessive tendency among many mycologists to form new genera upon very unsatisfactory characters, we recognise that "genera," like the other grades in the classification of the biological kingdoms, do not represent groups of invariable value, but rather afford a means of grouping species in a manageable way, and may be of very different value in different orders.

We are glad to see that the micro-millimetre is the unit in all the numerous measurements of sporidia and asci; and would suggest that in the next edition of the book the millimetre should be substituted for the inch and line in the measurement of the cups or receptacles. The use of the uncial along with the metrical system has a rather confusing effect upon the mind; and the metrical system is scarcely less familiar to those for whose use the book is intended. In a second edition we hope also to see Scotch localities figure more largely than they do in this. But such points as can be remedied in a second edition are very minor blemishes upon a book that will serve as a powerful stimulus to renewed investigations on the part of all students of the large and interesting order of *Discomycetes*, and for which the author deserves the very hearty thanks of all British mycologists.

THE SUNNYSIDE CHRONICLE is a journal set on foot in the asylum presided over by Dr. Howden, to whom we are indebted for sending it to us. As was to be expected from Dr. Howden's connection with it, natural history is not neglected in the competition with other matters, and there are a good many notes on the habits of birds and on other topics of more than mere passing interest. Among these may be mentioned the departure of the Jackdaws from Sunnyside in a body about the last week of July; "Our Open-air Museum," being a short account of some boulders dredged from the sea-bottom about 30 miles S.S.E. of Montrose, and in the Moray Firth; "The Gopher;" "Rare Birds" notes the occurrence of Wild Swans, a Whimbrel, and two specimens of the Black-tailed Godwit, all on the "Back-sands" of the South Esk; and "The Hoodie Crow" is a brief note on that bird's habits.

THE WESLEY NATURALIST OR MONTHLY JOURNAL OF THE WESLEY SCIENTIFIC SOCIETY has now begun the second year of its existence, with every prospect of success in its aims; which are to afford a basis of union to Christian students of science, and to show the fallacy of the assertion that there is any necessary antagonism between religion and science. The names of the Editors are a sufficient guarantee of the scientific teaching that it contains; for the first name is that of the Rev. W. H. Dallinger, the greatest authority of the present day upon the microscopic investigation of the most minute and obscure forms of living organisms, concerning which the wars regarding the origin of life most rage.

THE GALL-MAKING DIPTERA OF SCOTLAND.

BY PROF. J. W. H. TRAIL, A.M., M.D., F.L.S.

(Read before the E.S. Union of Naturalists' Societies, in June, 1887.)

IN a paper read before the Perthshire Society of N.S. two years ago, I gave an account of some of our Scottish galls and gall-makers, restricting myself to the Cynipidæ of the Oak. This group of galls is perhaps the most interesting of all, because of the strange relations that exist in the life-cycle of certain of the species between successive generations of the insects and their galls, constituting the phenomenon known as dimorphism. In this two forms of gall-insects, formerly supposed to be entirely distinct, are now known to be only stages in the life history of one and the same species; in which each generation produces a form of gall peculiar to itself, the one being restricted to early summer, and the other to autumn. Dimorphism has not been proved to exist in any other group of gall-makers than the Cynipidæ. I now propose to lay before the East of Scotland Union a short account of another and larger section of gall-makers, belonging to the *Diptera* or two-winged flies, and of their galls. My personal information has been, for by far the most part, gathered in the counties of Aberdeen, Kincardine, Forfar and Perth; and I may thus hope to be able to throw some light in this paper upon the fauna and flora of the East of Scotland. Gall-making *Diptera* belong to only a few families; and even these families include very many species that are not *gall-makers;* though they may live as guests (*inquilines*) in the galls made by other species, or may feed in some part (often in the flower) of a plant without deforming it in any way. Many also live, as larvæ, in decaying substances or in mushrooms, &c. By far the larger number of true gall-makers among the *Diptera* fall under the head of **Gall-midges** or **Cecidomyidæ**, though a few of the Scotch gall-makers belong to the **Trypetidæ**, and a few others belong to other families, differing in habits from their nearest allies. The life-history of most of these isolated forms is not yet fully or reliably known. The families of gall-making Diptera differ so much from

one another that it is desirable to discuss them separately; but before doing so a little time may be devoted to a brief notice of the more important articles that deal with these insects and their galls in Scotland. They are as follows: Mr. James Hardy writes **On the Effects produced by some Insects, &c., upon Plants,** in the *Annals and Magazine of Natural History*, 1850, VI., pp. 182-188, and in the *Transactions of the Botanical Society of Edinburgh*, IV., p. 79. Mr. Hardy also published a paper in 1854, in the *Scottish Gardener*; but I have not been able to get a sight of this volume, so cannot speak with certainty of what the paper contains. However, all Mr. Hardy's papers include gall-midges among the gall-makers commented on.

Mr. Albert Mueller published an article on **British Gall-insects,** in the *Entomologist's Annual* for 1872, in which he enumerated several galls from Scotland, sent to him by me from near Aberdeen. One of these he had already recorded, (*Proc. Ent. Soc. Lond.*, 1871, p. 8), viz. that formed by the midge named by him (provisionally from the gall) *C. Campanulæ*, from the bluebell. Prof. J. W. H. Trail, in 1870, began to study the galls of the counties near Aberdeen; and (in absence of any comprehensive records of the galls of Scotland) in 1871 to publish a series of articles entitled **Scottish Galls,** a series which, with a good many breaks, has run through the volumes of the "Scottish Naturalist" since vol. I. These articles are to be found at the following pages: vol. I. (1871-72), 123-25, 156-59, 195-96, 234-35; vol. II. (1873-74), 30-32, 78-80, 172-73, 252-54, 301-4; vol. IV. (1877-78), 14-15, 168-70; vol. V. (1879-80), 213-16; vol. VI. (1881-82), 15-20, 255-57; N. Series, vol. I. (1883-84), 206-216, 276-80; vol. II. (1886), pp. 250, 302; vol. III. (1887), pp. 107-110.

Mr. Francis Binnie published a paper **On Dipterous Gall-makers and their Galls** in the *Transactions of the Glasgow Field Naturalists' Society*, 1876, part IV. pp. 154-64; and other papers in the *Proceedings of the Nat. History Society of Glasgow*, 1877, IV. part, **On the Asphondyliæ of the Glasgow District,** pp. 111-114; **Notes on Cecidomyia Trifolii F. Löw, and its Gall,** p. 114; and **Further Notes on the Cecidomyidæ, with Descriptions of three New Species,** pp. 178-185. In all his papers Mr. Binnie records the Gall-midges of the district around Glasgow.

Prof. J. W. H. Trail, in the *Transactions of the Natural History Society of Aberdeen*, published two articles, the first entitled **Galls and their Makers in Dee**, 1878, pp. 55-83, and the second, **Scottish Galls**, 1885, pp. 35-55. They contain the same information as the articles in the "Scottish Naturalist," the second paper being, in fact, a reprint of those in vol. I. of the *New Series* with a considerable appendix. Both articles relate especially to galls and gall-makers in the north-east of Scotland; indeed, that of 1878 is restricted to the province **Dee**, including almost all Aberdeenshire, and part of Kincardineshire.

In what I have now to communicate, I propose to bring together, in readily accessible form, what is known in regard to Dipterous Gall-makers and their Galls in Scotland; and, necessarily, my paper will rest very largely upon the information contained in the articles just mentioned.

I must now pass to a brief general review of the great groups under which the gall-making Diptera of Scotland naturally fall, and also of the general characteristics of their galls; and I shall follow this with a descriptive list of the galls of Diptera yet known from Scotland; adopting the systematic order of the plants as more convenient than that of the insects, inasmuch as there are yet many galls, the makers of which have not been reared, and are, therefore, still uncertain. The groups of Diptera among which Scotch gall-makers exist are, (1) **Muscidæ**, under which come two species said to be gall-makers, viz., *Lauxania aenea*, taken in "Dee" by Dr. Vice; and a species of *Anthomyia?*. *Lauxania aenea* Meig. is said by Winnertz to gall the ovaries of *Viola tricolor* and of its sub-species *Viola arvensis*; but I am not aware that this has been confirmed in Britain, though the fly is not scarce here. It is about $\frac{1}{6}$ to $\frac{1}{5}$ inch long, dark, metallic green, with reddish-yellow legs and antennæ; in form it is not very slender. The *Anthomyia* is uncertain, being known only in the larva state; it lives in a kind of gall, formed on fronds of the Lady Fern and the Shield Ferns by rolling in the apical half of the frond into a loose ball. The larva feeds on the inner portions, which become black and decayed; and when full fed it burrows into the ground. The larvæ in the galls on these ferns are like those of *Anthomyia* (a genus a good deal like the house fly); but in the meantime their identification remains uncertain.

II. The **Trypetidæ**, which form the next group, are closely

related to the *Muscidae;* under which they are sometimes ranked, and which they resemble greatly in form ; though they are usually of rather smaller average size. Many of the species have brilliant golden-green eyes, and dark spots or bands on the wings ; and the females have a more or less prominent ovipositor, to serve for depositing their eggs in a suitable place in the tissues of the plants on which the larvae feed. Some of the latter mine in the leaves, forming large pale blotches, *e.g.*, *Tephritis Onopordinis* in the parsnip and celery. Others live in fruits of various plants, *e.g*, in rosehips, barberries, &c. A large number are almost, if not altogether, restricted to the natural order Compositæ ; most of these feed in the receptacles, at the base of the head of flowers, and often they do great damage to the ovaries and seeds. A good many of the insects in this family are very common in the larval condition, though the flies are not often seen unless specially looked for or reared. But besides those that live in the almost unaltered parts of plants there are several gall-makers among the **Trypetidæ**; and though I have been unable to identify more than one species from Scotland, I have found galls that would indicate others also as existing here. The Scotch galls referable to this group are all modified ovaries of Compositæ ; I have specimens from *Centaurea nigra* (the work of *Trypeta solstitialis*), *Hypochœris radicata*, and *Hieracium corymbosum*. In all of these the ovaries have become hard and woody, and a good deal enlarged ; and there is a small opening at the upper end of each. In some parts of England the stems of thistles (*Carduus lanceolatus*, &c.), frequently bear a woody swelling an inch or more in length, and nearly an inch in breadth, the work of another fly of this group named *Urophora Cardui* L.

III. We now come to the gall-making Diptera *par excellence;* I refer to the **Cecidomyidae** or Gall-midges. These insects form a very large proportion of the galls of, at least, European countries ; and they are known to occur in most parts of the world. Probably no group of gall-makers equals them in number (except perhaps the mite-galls, if we include every kind of deformity caused by the genus *Phytoptus*). From many galls the makers have not yet been reared ; but it is so easy to recognise with certainty the group to which the larvæ belong that there need be no doubt in referring a gall to the group of *Cecidomyidae* if the larvæ are in it, and show the well-known features of that group.

The larvæ are small and rather slender, ringed, soft, fleshy, worm-like creatures, with no distinct head. They are white, or intermediate in colour between white and deep orange-red. Many of them live in decaying fungi, or wood, or in any other decaying matters; others live, as guests, in galls formed by gall-making *Cecidomyidæ*, or by Gall-mites, or, less often, by insects of other groups; but a large proportion form galls for themselves, and live singly, or several together, in the central cavity, or among the abortive leaves, stems, or other parts of which the gall is made up. Others feed upon plants without producing conspicuous distortions in them, *e.g.*, the "Hessian Fly" (*Cecidomyia destructor*) in Barley and Wheat, and the many species which live in fruits (*e.g.*, *C. Pisi* in pea-pods), or among the flower-beds of the *Compositæ*. Several of the more important field and garden crops suffer greatly from the ravages of *Cecidomyidæ;* but the gall-makers are far less hurtful to cultivated plants than are those *Cecidomyidæ* that feed in them without producing galls.

As there will be no opportunity of again referring to the latter, I shall here enumerate those that have been observed to be peculiarly hurtful to farm and garden produce in Europe, and which may therefore be expected to occur in Scotland, or have actually been observed here. They are:—On *wheat and other cereals*, in the flowers or at the joints of the stems,—the "Red Maggot" or "Wheat Midge" (*Cecidomyia Tritici* Kirby), the "Orange Midge" (*Diplosis aurantiaca* Wagn.), the notorious "Hessian Fly" (*C. destructor* Say), and a fly without a popular name, known as *Diomyza obfuscata* Mg., which was recorded by the late Andrew Murray from the south of England. Another species, *Diplosis equestris* Wagn, lives in saddle-shaped swellings on the stalks below the slightly discoloured leaf-sheaths. The larvæ of another, named *C. cerealis* Sauter, have been observed to live in multitudes between the leaf-sheaths and the stalk, and do considerable injury. Peas, both in field and in garden, are liable to injury from larvæ of *Diplosis Pisi* Winn., the "Pea Midge," which feed on the young seeds. Cabbages and Turnips have the seeds destroyed in the same way by larvæ of *C. Brassicae* Winn., and of *Diplosis cchracea* Winn. Pear trees lose many of their young fruits from the attacks of larvæ of *C. nigra* Mg., and *C. pyricola* Nordl.; and their leaves are injured by the inrolling and distortion of the margins by *C. Pyri* Bouche. This list might be extended still farther: but the above will suffice to

show that the number of hurtful species of Cecidomyidæ is considerable; and the *gall makers* injurious to cultivated plants will be noticed below. Let us now return to the larvæ for a little. The life-histories of the various species differ according to whether they form (or live as guests in) galls, or feed in undistorted tissues of plants, or in fungi, or in decaying substances. Many of them are easily reared; but this is by no means the case with others; and many, especially among the gall makers, as already mentioned, have not yet been obtained in the perfect condition. The larvæ, when full-fed, generally spin thin white cocoons for their protection in the next or pupal state. The cocoons are very small, seldom exceeding $\frac{1}{10}$ inch in length. Frequently the cocoons are formed in the habitats of the larvæ, but often the latter creep into the soil before spinning up; and when this is their habit, they are more difficult to rear.

Before quitting this part of the subject, it should be mentioned that Professor Wagner discovered, in 1861, larvæ, evidently of a midge of this family, living gregariously below bark. In these, offspring were produced inside the bodies of the older larvæ. The young ones thus formed grow for a time inside the body of the parent larva at the expense of the latter, which ultimately is reduced to little more than the skin. This peculiar development has been amply confirmed by Leuckart and by other zoologists. In this way the usual course of development has been curtailed very greatly; and the stages of egg, pupa, and imago, are dispensed with.

In the usual course of development in the *Cecidomyidæ*, as a group, the pupa casts off the larval skin (instead of being enclosed in it as in the diptera belonging to the *Muscidae*), and shows traces of the future form of the insect. When the perfect insect is ready to come out, it splits the pupa skin on the front half of the back, making a slit, running lengthwise alone, or lengthwise, with one across its front in the shape of a T; and through the slit it crawls out.

The *Cecidomydae* belong to a division of Diptera, called *Nematocera*, characterised by having at least six joints in the antennæ; which are therefore thread-like, or frequently resemble a row of small, hairy beads. The Gall-midges are all of small size, usually under $\frac{1}{12}$ in. in length, but the sub-genus *Asphondylia* includes species from $\frac{1}{10}$ to $\frac{1}{5}$ in. long. They are slender-bodied, pale, or dark brown, or orange-red; and the legs are long and slender. The wings have no alulae (*i.e.*, small, nearly free lobes at the hinder angles, as in

the house-fly), and they have only a few longitudinal veins (never exceeding five, and seldom more than three, of which the hinder one is the most slender), and one cross-vein near the base of the wings, so that there is no *discoidal cell* in the wings. The surfaces of the wings are hairy; and there is a fringe of hairs along the margins, especially along the hind margin. The antennæ are long, and often differ in number of joints in the sexes. The males are smaller than the females, which may be known also by having a slender awl-shaped ovipositor. They shrivel and change colour so much after death that it is often scarcely possible to recognise the species in the dry state; unless they have been reared so as to afford a clue to their habits and food-plants.

The number of *Cecidomyidae* recorded and named is very great; and it has been found necessary to break up the family into genera, closely allied, yet sufficiently well characterised. Even when this is done, certain of the genera include a very large number of species. The gall-makers fall under the following genera, of which I subjoin *only* the characters distinctive of each, following chiefly a useful tabular sketch in Taschenberg's *Praktische Insekten-kunde.*

1. First and second longitudinal vein (counting from the costa or front margin) lie so close as to be scarcely distinguishable; the second vein is scarcely half as long as the wing. — **Lasioptera** Meigen.
   First and second veins well separated; second vein nearly or quite as long as the wing. — 2.
2. Second vein ends *a little in front of tip* of wing; hind or last vein is usually distinctly forked: Antennæ moniliform, differing in the sexes, each joint bears a circle of hairs. — **Cecidomyia** H. Löw.
   Second vein ends *at or behind tip* of wing. — 3.
3. Wings usually dull; thorax humped in front. — **Hormomyia** H. Löw.
   Wings iridescent and shining; thorax not humped. — 4.
4. Antennæ filiform, with hairs of uniform length, alike in the sexes; species larger than the other *Cecidomyidae.* — **Asphondylia** H. Löw.
   Antennæ moniliform, with a ring of longer hairs on each joint, in males 26-jointed, in females 13 or 14-jointed; second vein arises from first a little way from base of wing. — **Diplosis** H. Löw.

The galls made by the Gall-midges differ much from those made by Gall-flies (*Cynipidae*), and by Sawflies (*Tenthredinidae*), inasmuch as the former galls do not begin to appear until the larvæ have emerged from the eggs; and are due to some effect produced by the larvæ, while the latter are often fully formed while the eggs are still unhatched in their interior, and must therefore be entirely independent of any action of the larvæ in their formation and growth.

The galls of *Cecidomyidae* show a considerable diversity as regards the parts of plants attacked, and in the effects produced by them on the plants, as well as in the internal structure of the galls.

We find among them every transition from the scarcely altered tissues in the flowers of grasses tenanted by midge larvæ, through slightly deformed and thickened leaf-margins, or slightly swollen flowers, to galls of a much specialised kind, such as those of *Lasioptera Rubi* on Raspberry, or of *Cecidomyia Galii* on Lady's Bedstraw. In one respect, however, even the most specialised Midge-gall falls short of the galls of the *Cynipidae*, viz., in complexity of structure. In none of the Midge-galls can we recognise clearly the different layers of tissue so characteristic of the true Gall-flies' work. Yet they differ among themselves very greatly in respect of complexity of structure. Most of them belong to the class of *open* galls, in which a small opening communicates between the cavity of the galls and the outer air. Some of the galls of this kind are sunk in the tissues of the plants; but most are entirely external, and consist of certain parts of the plants rendered fleshy, and rolled round to form a cavity for the protection of the larvæ. In the most perfect galls of this family of Diptera, the larval chamber is entirely closed.

THE ORNITHOLOGY OF ARBROATH.

By A. Nicol Simpson.

THE following list has been compiled by me from personal observation and research. Of late years I have been encouraged and guided in my studies by Col. H. M. Drummond Hay of Seggieden, the eminent ornithologist, to whom I am under many obligations.

Taking Arbroath as a centre, the district covered by my present investigations extends to a radius of about seven miles.

1. **Missel Thrush.**—Resident, but not over-abundant. In winter its numbers are increased, apparently from the Highlands.
2. **Song Thrush.**—A very common resident; breeds in most of the gardens outside the town, and often within the municipal boundary.
3. **Redwing.**—Comes to coast annually in autumn. The advent of winter drives it from the higher inland parts to the sea-shore. Numbers are trapped every winter by the bird-catchers. I have one in my collection which killed itself by striking the Bellrock light.
4. **Fieldfare.**—Like the Redwing, this bird annually visits the locality in winter; but it frequents fields and open places much more than the former.
5. **Blackbird.**—One of our sweetest songsters, and the first to break the chill spring mornings with his carol. He breeds in almost every garden where accommodation can be found for his domicile.
6. **Ring Ouzel.**—Breeds on the extreme boundary of my limit. I have heard of it within my parish; but no authentic information can be gathered to prove that the bird actually breeds within the seven-miles radius. A pair

lingered some days this year in April at Mayfield. Generally it is to be observed far on in the year on its way south.

7. **Dipper.**—Resident; breeding on the margins of most of the streams. It is locally known as the "Water Craw."

8. **Common Wheat-ear.**—A migratory species, coming before the swallow; very common along the sea-walls. From its note it is (erroneously) termed "stone chat" or "chatterer."

9. **Desert Wheat-ear.**—One was shot here on 27th December, 1887, and forwarded by me to Col. H. M. Drummond Hay, who kindly communicated a note of its occurrence to the "Ibis." Col. Hay informs me that this is the second specimen found in Scotland, the other having been got at Alloa, near Stirling.

10. **Whinchat.**—Breeds in the district annually, but cannot be said to be abundant. One or two live out the winter on the sea-margin every year.

11. **Stonechat.**—Sometimes a couple dwell by the shore if the winter be not too severe. I have found it breeding at Redhead, and also some miles inland, but that only occasionally. It is far from plentiful.

12. **Common Redstart.**—Arrives generally in April and goes inland to breed.

13. **Robin Redbreast.**—Widely distributed; often met with in shady places such as ditch sides and under overhanging banks.

14. **Whitethroat.**—Not very abundant except in spring and autumn near the shore, where they rest for some days in coming and going in their migrations. In harvest time especially they are to be noticed about the gardens by the sea-beach.

15. **Blackcap.**—A summer visitant. I have found it breeding on this side of Friockheim.

16. **Garden Warbler.**—Comes in May and leaves in the latter part of August.

17. **Golden-crested Wren.**—Although breeding here, the numbers seem to be augmented in the fall of the year by others from a distance.

18. **Chiffchaff.**—Occasionally met with, but considered a rarity

19. **Willow Wren.**—Rather common over the whole landward portion of my parish.
20. **Reed Warbler.**—Supposed to breed near Guthrie; although I have never found a nest, still I have observed the bird.
21. **Aquatic Warbler.**—A schoolmate who lived some miles from town told me he found this bird's nest among some bulrushes.
22. **Sedge Warbler.**—Local in its habits. I have got the eggs beyond Guthrie.
23. **Hedge Sparrow.**—Plentifully distributed. This bird leaves my place for some weeks after breeding, but returns again before severe weather.
24. **Bearded Tit.**—Only one instance do I know of this bird being found here, viz., at Letham Grange.
25. **Long-tailed Titmouse.**—Although breeding here, is rather local in distribution.
26. **Great Titmouse.**—Widely distributed.
27. **British Coal Titmouse.**—A resident, but not plentiful. A few may be met in winter now and again.
28. **Marsh Titmouse.**—Is of rather doubtful occurrence.
29. **Blue Titmouse.**—Very plentiful in some localities.
30. **Crested Titmouse.**—Although I have been told of its appearing here, yet it has not been sufficiently identified by any example of bird, nest, or eggs; so that I regard it as doubtful meantime.
31. **Nuthatch.**—The only one I have seen was a stuffed specimen, and its owner informed me that it was shot in the neighbourhood.
32. **Creeper.**—Very common where the landscape is beautified by trees.
33. **Wren.**—Plentiful by all the ditch-sides and hedges.
34. **White Wagtail.**—In the avenue leading to my house I discovered this bird. By the aid of a field-glass I distinctly made it out to be the White Wagtail.
35. **Pied Wagtail.**—Resident; often remains the winter here.
36. **Grey Wagtail.**—This is of doubtful occurrence here, being confounded, I fear, with the Yellow Wagtail. I have not myself been able to secure a specimen in the locality, so as to arrive at a decision.

37. **Yellow Wagtail.**—Plentiful on the Brothock and other streams. In summer often seen in town on the banks of the former stream.

38. **Meadow Pipit.**—Resident, but not widely distributed.

39. **Tree Pipit.**—Far from common, although breeding in the locality.

40. **Rock Pipit.**—Breeds on cliffs to the east of the town; but is sparingly distributed.

41. **Great Grey Shrike.**—On November 30th, 1887, one was shot north of Carnoustie.

42. **Waxwing.**—Occasionally found here in winter. One was shot some years ago on the road leading to Auchmithie, and since then I have observed one personally.

43. **Spotted Flycatcher.**—Breeds, but is far from plentiful.

44. **Pied Flycatcher.**—Rather rare, and of local distribution.

45. **Swallow.**—Arrives usually at the end of April; but often May is well advanced before the first arrivals take place; goes south in September. I consider that the swallows are late when October is reached before their departure, although once I observed fully a dozen flying seawards at midday on 7th October; that year the general body had left in the third week of September. In 1885 one hunted the hill facing the sea here as late as 5th Nov.

46. **Martin.**—Leaves earlier than the swallow. Large colonies may be seen on the sea-cliffs.

47. **Sand-Martin.**—Is compelled to be local in its habits. The march of commerce has robbed it of many a site. Where a suitable sandbank exists, there the Sand-Martin labours.

48. **Goldfinch.**—Although I understand that this bird was formerly abundant in our shire, to-day none breed here. The decline in the cultivation of flax may partly account for its present rarity. I caught one at Kelly Den; and on 15th December, 1886, I observed one on the coast.

49. **Siskin.**—Sometimes caught in winter. Said to breed within a mile of the cliffs. One autumn some years ago, fully a dozen entered my study, where I had a caged siskin. They had gained an entrance at the window which I had drawn down before leaving the room.

50. **Greenfinch.**—Resident and plentiful. In autumn almost

every field contains a flock. Although it is a very poor songster, it is a very amusing pet, if properly attended to.

51. **Hawfinch.**—*Rara avis.*

52. **House Sparrow.**—Extremely abundant. Ever present in spring, summer, autumn, and winter. This year (1888) one that is breeding in an outhouse at my place has a white tail. Often mottled varieties may be seen on the public streets and in the rural parts. There is a white specimen in the Arbroath Museum got in this neighbourhood. It is a young bird of this season. In December, 1886, I had one of uniform brownish-black colour.

53. **Tree Sparrow.**—I have found it breeding at Arbirlot; and a friend mentions that he suspects it nests even nearer Arbroath.

54. **Chaffinch.**—Met with on all our roadways. Breeds in hedges and trees, and is very fond of bushes in gardens, whereon to erect its marvellous nest.

55. **Brambling.**—A winter migrant and rather scarce.

56. **Linnet.**—Generally distributed. It used to breed extensively in the whins upon the moors and roadsides; but the advancement of agriculture has to a great extent cleared the country of the yellow blossoms, and the linnet may now be found nesting in the gardens in close proximity to the sparrow and the chaffinch. A linnet chorus in autumn is one of the pleasures of the year.

57. **Mealy Redpole.**—I have seen these caught at farmsteadings in winter.

58. **Lesser Redpole.**—Flocks of linnets contain a few examples of this bird sometimes.

59. **Twite.**—Breeds in the locality. Nests on the clifts east of the town. It is valued as a cage-bird.

60. **Bullfinch.**—One of our prettiest birds. I have heard of a gardener within my frontier who boasted of poisoning eight dozen of those birds in one week!

61. **Common Crossbill.**—Said to have been found here.

62. **Black-Headed Bunting.**—A local resident, but very restricted in its distribution. On 13th April, 1888, one was shot at Mayfield and another was observed.

63. **Corn Bunting.**—Widely distributed, especially along the coast.

64. **Yellow Bunting.**—Very numerous; building in very odd places sometimes.

65. **Cirl Bunting.**—The information I have is quite insufficient to identify this as a bird of my parish.

66. **Snow Bunting.**—Large flocks arrive here in some winters. It is quite a sight to see them on the wing.

67. **Skylark.**—This bird is very common in all our corn and grass lands. In spring they may often be heard singing on the ground.

68. **Woodlark.**—It is doubtful if this bird can be recorded from this locality.

69. **Shorelark.**—I am inclined to think this bird has been got here, and probably might be again procured.

70. **Common Starling.**—Of late years this has much increased in numbers. Starlings seem to accommodate themselves to new localities, which may account for their rapid increase.

71. **Jay.**—Not nearly so plentiful as formerly. The last one I saw was taken from the nest and hand-reared.

72. **Magpie.**—My parish appears to be a favourite locality with these birds. Although shot down wherever observed by professional and amateur gunners, yet on almost every road a couple may be seen.

73. **Jackdaw.**—Very common in town and country.

74. **Carrion Crow.**—A few haunt the sea-border daily, and breed inland.

75. **Hooded Crow.**—This bird is a regular visitor to the shore at low tide, and breeds within half a mile of the sea-cliffs.

76. **Rook.**—Large rookeries exist in my district, where the rooks are on the increase. A white specimen was got at the Guynd two years ago, and sandy-coloured birds are occasionally shot in the district.

77. **Raven.**—Formerly nested at Redhead. A friend informs me that he shot one there. Another was killed by a dog about two miles to the east of the town. To-day they are known by name alone in this locality.

78. **Common Swift.**—Arrives rather later than the swallow

and martin, and generally leaves earlier. It breeds largely in the town and about the churches in the rural parts.

79. **Nightjar.**—Has been observed within the town. One in my collection was shot about two miles north of Arbroath. In 1886, as late in the year as the 31st October, one flew nightly at Mayfield.

80. **Great Spotted Woodpecker.**—A few examples have been reported to me. The only trustworthy instances I can record are: one shot on the outskirts of the town, which was seen by myself, and another killed at St. Vigeans, on 12th November, 1886, and now in my possession.

81. **Green Woodpecker.**—One or two have been got in this locality.

82. **Wryneck.**—I can vouch for only one specimen having been found here; it was set up by a local artist.

83. **Kingfisher.**—Resident, but rare. I have seen it on the Lunan stream, and one in my collection was caught by a cat in Friockheim. It has been observed several times nearer town also. When at school I remember a boy getting the nest and eggs near Inverkeillor.

84. **Hoopoe.**—The only instance of this bird having occurred here is one from Douglas Muir, where a farmer's son shot it.

85. **Cuckoo.**—Summer migrant, reaching this locality about the first days of May. It breeds in several districts—Ethie Woods being a favourite locality.

86. **Barn Owl.**—By no means a common species of the family with us. Its nest may, however, be got at times.

87. **Long-eared Owl.**—A regular breeder, and fairly common where found.

88. **Short-eared Owl.**—Like the last; about equal numbers of the two species reach the hands of the local taxidermist.

89. **Tawny Owl.**—The commonest of all the owls within my parish.

90. **Snowy Owl.**—An old friend, who has been a lover of the gun since childhood, I may say, gives me wonderful sketches anent this bird having frequented the Cliffs

in years past; but so far as my knowledge goes, no Snowy Owl now builds upon that sea-wall.

91. **Marsh Harrier.**—This bird is said to have been got; but personally I have no authentic knowledge of it.

92. **Montague's Harrier.**—On 10th May, 1885, a fine male bird was shot near Mayfield; and on 30th November following a female was procured at Seaton Den. Both these birds are in my collection.

93. **Hen Harrier.**—A casual visitor, so far as I can learn.

94. **Common Buzzard.**—One was trapped a few years ago at Seaton House; but it is a rare bird in this neighbourhood.

95. **Rough-legged Buzzard.**—Said to be occasionally found of late years, but from my investigations this appears doubtful.

96. **Golden Eagle.**—Shot occasionally to the north. One at present in the Arbroath Museum I saw repeatedly while alive, it having been confined for some years in a cage.

97. **Goshawk.**—I learn that ten or fifteen years ago every winter yielded a couple or two to the naturalist's gun; now it is conspicuous by its absence.

98. **Sparrow Hawk.**—Fairly abundant, and breeds in certain localities within my radius.

99. **Kite.**—Has been several times handed in for preservation to the local taxidermist.

100. **Honey Buzzard.**—My information with regard to its occurrence near Arbroath is not worthy of being recorded. Personally I have not met it.

101. **Peregrine Falcon.**—A pair breed annually on that precipitous promontory, the Redhead. On 16th July, 1886, I saw one of the young birds shot. Every year I observe the parent birds hovering around their eyrie.

102. **Hobby.**—A very rare bird here. One or two have been set up here, but whence they came no one can now say.

103. **Merlin.**—Fairly distributed; it breeds on the Coast Cliffs, as well as inland. A female in my possession was caught in the intricacies of a salmon-net which had been hung up to dry. It had chased a small bird; but the latter escaped and the would-be slayer was caught.

104. **Common Kestrel.**—This is the most plentiful of the *Falconidæ* within my limited area.

(*To be continued.*)

ORNITHOLOGICAL NOTES.

A FRIEND of mine who notes the passing events in the Ornithological world informs me he has for some years past resided from early summer to the verge of winter in Kirriemuir.

Every summer he speaks of the skylarks singing merrily while seated on the walls or palings. He indicates that they perch upon these places and sing; and this the more when the sun is hid or the weather dull or cloudy; but he tells me that they will be found so engaged almost any day, and not one only, but many at a time. Now I often see and hear larks singing on the ground, especially in spring, but in my neighbourhood I never yet discovered a lark singing while sitting on a wall or a paling. Of course, I speak only of what I have seen in my own neighbourhood; and as my friend is confident that his observations are correct, I am inclined to believe that larks may behave differently in different localities.

Last week he rehearsed this story. While strolling in a wood outside Kirriemuir, he came suddenly upon a Song Thrush seated on a nest, and was within three yards of the bird before it made any attempt to leave its post of duty. On approaching the nest he looked into the cavity, and was astonished to find, not the eggs of a mavis, but those of a blackbird. This seemed somewhat remarkable to him, and he investigated further, noting particularly the composition of the edifice. Both nest and eggs were those of the Blackbird. Of this he was certain, while he was equally confident that the bird sitting on the nest was a Song Thrush.

Is this not rather singular? Perhaps some of your correspondents may have observed such an occurrence, in which case I trust they will record the fact in your next. Personally the facts are new to me.

Arbroath, 22d May, 1888. A. NICOL SIMPSON.

[May not this have been a case of a blackbird and a thrush mating together? Such an occurrence has been observed and recorded on various occasions. —ED., *Scot. Nat.*]

Pallas' Sand Grouse (*Syrrhaptes paradoxus*).—These strange visitors were seen lately in the parish of Fyvie, and were at first supposed to be some variety of plover. They were dispersed in groups from single individuals up to large flocks; their identity was proved on the 26th May, when two males and four females were shot out of a flock of about 50 on the Waggle Hill, Monquhitter. The males measured 16½ inches in length and weighed 10½ oz. The females were 14 inches in length and weighed 10 oz. In the ovaries the eggs were well developed and seemed within a few days of maturity. Some had their feathers slightly worn, but others were splendid specimens. They were in good condition, as the contents of their stomachs showed; as one contained 370 seeds of barley and thousands of seeds of clover. The others had upwards of 300 seeds of barley, oats, clover, and festuca in their stomachs. Their flight was rapid, not unlike the golden plover; and they uttered some harsh, disagreeable notes when surprised.

Gourdas, Fyvie, *June 4.* GEORGE SIM.

[During the month of May there occurred an immigration into the British Isles of Pallas Sand Grouse on a very extensive scale. They have been recorded from numerous localities along the east coast of England, the earliest date at which they were observed being 14th May. We have seen records of their occurrence in Scotland from Cruden, in Aberdeenshire (where one was killed by a boy with a stone from a flock on May 17th), from the vicinity of Nairn, Peterhead, Fort George, Tyrie, Fyvie, and Monquhitter (see Mr. Sim's note); but doubtless they have been met with in many parts of Scotland. Information of any kind with regard to this migration, which must have included thousands of individuals, will be welcome. It is probable that some of the birds may nest in suitable localities, and that they may succeed in rearing their young. The absence of fear of man shown by them in some of the places where they they came under observation was said to be very remarkable.

ED., *Scot. Nat.*]

THE LEPIDOPTERA OF THE OUTER HEBRIDES, ORKNEY, AND SHETLAND.

OUR readers will have observed that for several years the Zoology and the Botany of the Scottish Islands has been attracting attention, with the result that very great progress has been made in extending the bounds of our knowledge of their indigenous fauna and flora. In this journal we have always made it a special aim to present to our readers a statement of the more important papers upon all branches of the fauna and flora of the natural history of Scotland that appear in other journals or in the publications of scientific societies. In pursuance of this aim, we now submit the following list of the Lepidoptera of the Western and Northern Islands, prepared from two lists by Mr. Richard South, which appeared in the numbers of the *Entomologist* for February and April of this year. Mr. South's lists are compiled from the "Lepidoptera of Scotland," edited by Dr. White in the volumes of the first series of the *Scottish Naturalist*, from a paper published in 1882 by Dr. White on "The Lepidoptera of Orkney, Shetland, and the Outer Hebrides," in the same journal, and from information supplied by several entomologists, whose assistance is acknowledged by Mr. South.

The list of the islands is here given in full, as likely to be of more value to Scotch entomologists in this form than if it were restricted to an enumeration of the additions to Dr. White's paper exclusively. It does not enter much into the variations met with among the Lepidoptera in the three groups of islands; but this gap is to some extent filled by Herr Hoffmann's paper on the "Lepidoptera of the Shetland Islands," of which a translation appeared in our pages in October, 1885, and January, 1886.

In the list H. denotes the Outer Hebrides, O. denotes Orkney, and S. Shetland.

Rhopalocera.

Pieris Brassicæ.	H. O.
„ Rapæ.	O. S.

Vanessa Atalanta.	O. S.
„ Cardui.	O.
(*fide* Dr. Boswell Syme).	
„ Urticæ.	O.
Epinephele Janira.	H.
Cænonympha Pamphilus.	H.
„ Typhon.	H. O. S.
Lycæna Icarus.	H. O.

Heterocera.

Acherontia Atropos.	O. S.
Sphinx Convolvuli.	O. S.
Macroglossa stellatarum.	O.
Nemeophila Plantaginis.	H. O. S.
Arctia Caja.	O.
Spilosoma fuliginosa.	H. O.
Hepialus Humuli.	H. O. S.
„ Velleda.	H. O. S.
„ lupulinus.	O.
„ Hectus.	H.
Bombyx Rubi.	H.
„ Quercus.	H. O.
Saturnia Pavonia.	H. O.
Dicranura Vinula.	H.
Cymatophora Or.	H.
Leucania impura.	H.
Tapinostola fulva.	H.
Nonagria lutosa.	S.
Hydræcia micacea.	H. O. S.
nictitans.	H. O.
Xylophasia rurea.	H. O.
„ monoglypha.	H. O. S.
Chareas graminis.	H. O. S.
Mamestra furva.	H. O. S.
„ abjecta.	S.
„ Brassicæ.	O. S.
Apamea basilinea.	H. O. S.
„ gemina.	H. O.
„ unanimis.	O.
„ leucostigma.	H.
„ didyma.	O. S.

Miana fasciuncula.			S.
„ bicoloria.		O.	
Celæna Haworthii.	H.	O.	S.
Stilbia anomala.		O.	
Caradrina quadripunctata.	H.	O.	S.
Rusina tenebrosa.	H.		
Agrotis vestigialis.	H.		
„ saucia.			S.
„ suffusa.	H.	O.	S.
„ cursoria.	H.		S.
„ Tritici.	H.		
„ aquilina.	H.	O.	
„ agathina.	H.	O.	
„ strigula.	H.	O.	S.
„ simulans.		O.	
„ lucernea.		H.	S.
Noctua glareosa.	H.	O.	S.
„ augur.		O.	
„ c-nigrum.	H.	O.	S.
„ brunnea.	H.	O.	
„ festiva.		O.	
„ festiva v. conflua.	H.	O.	S.
„ Dahlii.		O.	
„ baia.	H.		
„ castanea.	H.	O.	
„ xanthographa.	H.	O.	S.
Triphæna comes.	H.	O.	
„ orbona.			S.
„ pronuba.	H.	O.	S.
Pachnobia hyperborea.			S.
„ rubricosa.		O.	
Tæniocampa gothica.		O.	
Xanthia citrago.	H.		
„ circellaris.		O.	S.
Dianthœcia capsincola.		O.	
„ nana.	H.		S.
Dasypolia templi.			S.
Epunda lutulenta v. luneburgensis.	O.		
Cleoceris viminalis.	H.	O.	
Euplexia lucipara.		O.	

Phlogophora meticulosa.		O.	S.
Aplecta occulta.	H.	O.	S.
Crymodes exulis.			S.
Hadena adusta.	H.	O.	S.
„ glauca.	H.	O.	
„ dentina.	H.	O.	S.
„ oleracea.		O.	S.
„ Pisi.		O.	
„ thalassina.	H.	O.	
Calocampa vetusta.		O.	S.
„ exoleta.		O.	
Gonoptera Libatrix.			S.
Habrostola tripartita.		O.	
Plusia gamma.		O.	S.
„ iota.		O.	
„ pulchrina.		O.	
Anarta melanopa,	H.		S.
„ Myrtilli.	H.	O.	
Rumia luteolata.	H.		
Odontoptera bidentata.	H.		
Boarmia repandata.	H.		
Dasydia obfuscata.	H.		
Cabera pusaria.	H.		
Scodiona belgiaria.	H.	O.	
Ematurga atomaria.	H.	O.	
Abraxas grossulariata.	H.		
Ligdia adustata.	H.		
Oporabia filigrammaria.	H.	O.	
Cheimatobia brumata.		O.	S.
Larentia didymata.	H.	O.	S.
„ cæsiata.	H.	O.	S.
„ flavicinctata.	H.		
„ salicata.		O.	
„ viridaria.	H.	O.	
Emmelesia alchemillata.	H.		
„ albulata.	H.	O.	S.
„ minorata.		O.	
„ adæquata.	H.	O.	
Eupithecia venosata.	H.	O.	S.
„ satyrata.	H.	O.	

,, castigata.	H.
,, nanata.	H. O. S.
,, vulgata.	H.
,, minutata.	O.
,, lariciata.	H.
,, sobrinata.	O.
,, pumilata.	H. O.
Thera simulata.	H. O.
,, variata.	H.
,, firmata.	H.
Hypsipetes ruberata.	O.
,, trifasciata.	H.
,, sordidata.	H. O.
Melanthia ocellata.	H. O.
Melanippe hastata.	H.
,, sociata.	H. O.
v. obscurata South.	H.
,, montanata.	H. O. S.
,, fluctuata.	H. O. S.
Coremia munitata.	H. O. S.
,, designata.	O.
,, ferrugata.	H.
Camptogramma bilineata.	H. O. S.
Cidaria miata.	O.
,, truncata.	H. O.
,, immanata.	H. O. S.
,, suffumata.	H.
,, prunata.	O.
,, testata.	H. O. S.
,, populata.	H. O.
,, fulvata.	O.
Carsia paludata.	O. S.
Anaitis plagiata.	H. O.
Scoparia ambigualis.	H. S.
,, atomalis.	H. O. S.
,, murana.	H.
,, angustea.	H. O. S.
,, alpina.	O. S.
,, pallida.	O. S.
Nomophila noctuella.	O. S.

Herbula cespitalis.	O. S.
Scopula lutealis.	O.
„ prunalis.	O.
Crambus pratellus.	H. O. S.
„ pascuellus.	S.
„ ericellus.	H. O.
„ margaritellus.	H.
„ perlellus.	H. S.
„ culmellus.	H. O. S.
„ hortuellus.	S.
Phycis fusca.	H.
Platyptilia gonodactyla.	O.
Mimæseoptilus pterodactylus	O.
Tortrix rosana.	H.
„ palleana.	H.
Peronea ferrugana.	H.
„ variegana.	O.
„ hastiana.	O.
„ caledoniana.	O.
Rhacodia caudana.	H. O.
Teras contaminana.	O.
Dictyopteryx Loeflingiana.	O.
Penthina marginana.	H. O.
Pardia tripunctana.	H. O.
Sericoris littoralis.	H. O. S.
„ urticana.	H.
„ lacunana.	H. S.
Mixodia Schulziana.	H. O. S.
Orthotænia antiquana.	O. S.
Cnephasia musculana.	H. O. S.
Sciaphila penzina.	H.
Clepsis rusticana.	H. O. S.
Bactra lanceolana.	H. O. S.
Phoxopteryx unguicana.	H. O. S.
„ biarcuana.	H.
„ myrtillana.	O.
Grapholitha subocellana.	H. O.
„ penkleriana.	O.
Phlaeodes tetraquetrana.	H. O.
Hypermecia cruciana.	H. O.
Paedisca corticana.	H.

„ semifuscana.	S.
„ Solandriana.	H. O.
„ sordidana.	O.
Ephippiphora Pflugiana.	O.
Coccyx taedella.	H. O.
Pamplusia mercuriana.	O. S.
Dicrorhampha plumbana.	H.
„ Tanaceti.	O. S.
Catoptria ulicitana.	H. O. S.
„ fulvana.	H. O.
Symaethis oxyacanthella.	H. O. S.
Eupæcilia angustana.	H. O.
„ ciliella.	O. S.
„ thuliana.	S.
Argyrolepia Hartmanniana.	H. O.
„ cnicana.	O. S.
Aphelia osseana.	O. S.
Blabophanes rusticella.	H. O. S.
Plutella cruciferarum.	H. O. S.
„ annulatella.	H. S.
„ Dalella.	S.
Incurvaria Oehlmanniella.	O.
Swammerdamia caesiella v. griseocapitella.	O
Depressaria costosa.	O.
„ applana.	O.
Gelechia ericetella.	O. S.
„ (Lita) instabilella.	O.
Endrosis fenestrella.	S.
Œcophora pseudospretella	H. O. S.
Teleia proximella.	O.
Pleurota bicostella.	O.
Monochroa tenebrella.	H.
Glyphipteryx cladiella.	S.
„ thrasonella.	H.
„ Fischeriella.	O.
Argyresthia pygmæella.	O.
Gracilaria tringipennella.	H. S.
„ syringella.	S.
Coleophora anatipennella.	O.
„ caespitella.	H.

CONTRIBUTIONS TOWARDS A FLORA OF CAITHNESS.

By J. F. Grant and Arthur Bennett, F.L.S.

SO far as we know, there is no published list of Caithness plants in existence, except that of the records in "Typographical Botany." The following list is offered as a contribution towards a Flora of the county, which it is hoped may some day appear.

We have endeavoured to bring together all the information of which we are aware; for any additional information, no matter how small or seemingly trivial, we shall be grateful.

Caithness, the most northern county of the mainland of Scotland, consists chiefly of boulder clay and old red sandstone. About 70,000 acres of land are arable; but the rest of the county, some 325,000 acres in extent, is nearly all bleak, barren moorland. There are two river-valleys of some extent, those of the Wick and Thurso rivers, the former lying north-east and south-west, and the latter north and south. The best ground for the botanist is in the river-valleys or straths, particularly near the sea, the sea-cliffs, and the sandy dunes on the coast.

Caithness cannot boast of any high mountains like the adjoining county of Sutherland, otherwise its flora would be richer in species. The principal elevations are Morven (2331 ft.), Maidenpaps (1929 ft.), Scarry Hills (1876 ft.), Ord of Caithness (1250 ft.), Bencheilt Hill (940 feet), and Bencah Hill (780 ft.).

Though the knowledge of the Floras of Caithness and of Sutherland is progressing every year, we are hardly yet in a position to make any remarks on the relation of its botanical features to those of other lands, especially of the North Isles, Iceland, and the Faroes.*

* But I hope at some future time to make some notes on the county in relation to the admirable essays of Dr. Warming of Copenhagen, entitled, "Om Groenlunds Vegetation" and "Tabellarisk Oversigt over Groenlunds, Islands, og Fâroernes Flora," 1887-88.—A.B.

The number of species and varieties that are admitted for the county of Caithness is over 600, a fair number considering the physical features of the county. Caithness has about 80 species that have not yet been found in Sutherland, and about the same number not yet found in the Orkneys.

Our information is drawn from the following sources:—

Anderson's Guide.
The Northern Flora, by Dr. A. Murray, 1836.
Collectanea for the Flora of Moray (by Rev. George Gordon, LL.D.), 1839.
New Botanist's Guide, H. C. Watson, 1835-37.
Dr. Balfour, *ex* H. C. Watson.
Dr. R. Brown (Campster), *ex* H. C. Watson.
Dr. A. Davidson.
Mr. R. Dick of Thurso. (Herbarium, &c.).
Mr. Galloway of Thurso.
Mr. Nicolson of Wick.
Mr. Gray, *fide* Mr. Groves.
Mr. Hanbury, many specimens and notes.
Mr. G. Horn (Record Club Reports).
Mr. H. H. Johnstone, specimens.
Rev. W. R. Linton.
Rev. E. S. Marshall, specimens and notes.
Rev. H. Fox.
Mr. C. W. Peach, *ex* H. C. Watson's MSS. at Kew.
Mr. H. C. Watson's Catalogue in Kew Herbarium, &c.
Mr. Reeves and Dr. Ward.
Herr Strömfelt in introduction to "Additions to Icelandic Flora."

References:—

Robert Dick, *Transactions of Edin. Bot. Soc.*, July, 1854.
Dr. Robert Brown (Campster), *loc. cit.*
Arthur Bennett, *Journal of Botany*, 1882, pp. 114-117; 1884, pp. 50 and 253; 1886, p. 85.
Ar. Bennett, *Scottish Naturalist*, 1885-6, pp. 26, 68, 180, 268, 279 to 288, 309 to 319; *Id.*, 1887, pp. 56-66.
W. Docherty, *Meeting of Northern Scientific Societies at Banff*, 1883.
H. & J. Groves, *Journal of Botany*, 1883, pp. 20-22; 1884, pp. 1-2; 1886, p. 3; 1887, p. 146; all for *Characeæ*.

J. Grant, *Brit. Asso. Report*, 1885, in *Abstract*. Full report issued by the author.
Rev. H. E. Fox and F. Hanbury, *Journal of Botany*, 1885, pp. 333-338.
Dr. A. Davidson, *Journal of Botany*, 1886, pp. 23-24.
F. J. Hanbury, *l.c.*, 1886, pp. 148-149; 1886, pp. 343-344.
Rev. W. R. Linton, *l.c.*, 1886, p. 377.
Hanbury and Marshall, *l.c.*, 1887.

(*To be continued.*)

LICHENS.

By Dr. J. STIRTON, F.L.S.

WHILE overhauling some of my older collections of lichens in search of duplicates, I came across a bundle picked up in September, 1882, on the shores of Loch Rannoch. Amongst these was one I had previously overlooked in my hurried search for specimens. I was anxious to investigate this *lichen*, inasmuch as its *habitat* was peculiar, viz., on huge boulders partly submerged in the waters of the loch. Another peculiarity arrested my attention, viz., each fruit (apothecium) was snugly nestled in a small smooth cavity of the stone, whose dimensions were very little greater than those of the apothecium. Each apothecium was attached to the bottom of the cavity by a central point, leaving the rest of the under surface free. There was no appearance of a thallus; but an investigation of the margin and free black lower surface of the apothecium revealed, under the microscope, traces of a thalline structure, containing, *inter alia*, bluish gonimia, moderate in size and globular or elliptical in outline, and either slightly aggregate or scattered. No gonidia have been detected. As I cannot recall any lichen whose external characteristics, as well as internal organization, tally with this, I propose, meanwhile at least, to elevate it to generic distinction under the name **Cathisinia concinna.**

Apart from the gonimia, this lichen might be classified amongst the polysporous *Lecanoræ*, and probably near one of the many

forms of *Lecanora glaucocarpa;* but in accordance with the more modern systems of classification, this would be quite anomalous. On the other hand, the genus *Endocarpiscum*, now incorporated with *Heppia*, can scarcely, without severe straining, be extended to embrace the plant.

The following is its diagnosis :—

Thallus nullus visibilis nisi aspectum apotheciorum inferiorem obtegens, et gonimia mediocria phæroidea vel ellipsoidea includens. Apothecia in eadem foveola saxi solitaria vel interdum 2-3-aggregata, nigra, plana, vel humefacta leviter convexa, lecanorina, margine tenui leviter prominulo rugosulo cincta, umbilicato-adfixa vel etiam interdum substipitata, subtus nigra (latit: 1—2.5 mm :); sporæ in thecis numerosæ (100-200), incolores, oblongo-cylindraceæ, sæpissime medio quasi constrictæ, simplices, ·005—·006 mm. long., circiter ·0015 mm. lat.; paraphyses distinctae crassiusculæ (crassit. circ. ·0025 mm.) apicibus conglut. fuscescentibus vel rufo-fuscescentibus. Iodo gel. hym. intensive cær. Hypothecium rufo-fuscescens.

The hypothecium rests on a thick white stratum, or rather tumulus, of a striated texture, which is covered by the thalline structure.

The following is a continuation of my paper on the Cladoniæ :

Cladonia furcata

*** Cl. dispansa.**

Similis var. *corymbosæ* (Ach.), sed apothecius magnis (latit. 1—2.5 mm.).

Prope New Galloway Scotiæ a J. M'Andrew lecta.

Cladonia retipora (Flk.).

*** Cl. arcuata.**

Podetia albida vel pallida vel (præsertim subtus) fulvescentia, rigida, conferta, erecta vel procumbentia (alt. circ. 30 mm.), cylindrica, arcuato-vel sinuoso-divisa et-ramosa, reticulato-terebrata (Kfl. Cfl. vel intensius tincta).

In Victoria Australiæ (Falck). The habit is peculiar and altogether different from *retipora*. The divisions of the stems, primary and secondary, are all arcuate, almost semi-circular, and very rigid and brittle, the whole constituting an almost coralloid tuft.

Cladonia ciliata.

Similis *Cl. sylvaticæ* var. *sylvestri* (K—, C—), sed fibrillis nume-

rosis, quasi rhizinoideis, albidis, fasciculatim dispositis præsertim apices versus ramulorum obsita.

Prope New Galloway Scotiæ, a J. M'Andrew lecta.

Cladonia confertula.

Similis *Cl. squamosæ* var. *frondosæ* (Del.), sed phyllocladiis subtus K—, C. virescenti-cærulescentibus, serius et ultimo flavescentibus.

Phyllocladia basalia ampla auguste sinuoso-linearia (longit. circ. 4 mm.) erecta, conferta, subtus alba vel albida; podetia corticata, brevia (alt. 5-12 mm.) ascypha, simplicia vel apices versus parce ramosa, e laciniis oriunda, sparsim squamulosa praesertim supra; apothecia fusca, juniora planiuscula et pallide marginata, demum convexula et leviter marginata et tunc fusco-nigra, plerumque aggregata vel etiam conglomerata.

Supra terram ad pedem Montis Lawers Scotiæ.

The reactions as stated above are constant, and as I find identical reactions on several foreign and very different *Cladoniæ*, I cannot overlook their significance. This lichen has the general habit of a form of *Cl. cervicornis*.

THE GALL-MAKING DIPTERA OF SCOTLAND

BY PROF. J. W. H. TRAIL, A.M., M.D., F.L.S.

(Read before the E.S. Union of Naturalists' Societies, in June, 1887.)

(*Continued from page* 288.)

IN the subjoined descriptive list are given references to previous notices of the occurrence of the galls in Scotland. For brevity the following contractions are employed :—

B.I., Mr. F. Binnie in *Trans. Glasgow Field Nat. Society*, 1876.

B.II., Mr. Binnie in *Proc. Nat. Hist. Soc., Glasgow*, 1870.

Hdy.B., Mr. Hardy in *Trans. Berwickshire Club.*

Hdy.A.N.H., Hardy in *Ann. Mag. Nat. Hist.*, 1850.

Hdy.S.N., Hardy in the *Scottish Naturalist*, III., pp. 315-16, extracted from *Proc. Berwickshire Naturalists' Club*, 1875.

M.E.A., Müller's paper on British Gall insects in *Entomologists' Annual* for 1872.

M.E.S., Müller in *Trans. Entomol. Soc.*, London.

T.S.N., "Scottish Galls" in the *Scottish Naturalist*, by myself.

T.A., papers by myself in the *Transactions of the Aberdeen Nat. Hist. Soc.*, published in 1878 (I.), in 1885 (II.).

Any person commencing the study of our native galls will also find it necessary to refer constantly to the publications of Continental scientists. The most useful for the study of the Dipterous gall-makers are :—

Bremi's **Beitræge zu einer Monographie der Gallmucken**, 1847; Hermann Loew's **Die Gallmucken**, 1850; Winnertz's **Beitræge zu einer Monographie der Gallmucken**; Schiner's **Fauna Austriaca, Die Fliegen**, vol. II., 1864; Kaltenbach's **Die Pflanzenfeinde aus der Klasse der Insekten**, 1874; and, perhaps most of all, Dr. Franz Loew's papers on **Gallmidges and their Galls** in the **Verhandlungen Zool. Bot. Gesellschaft, Wien**, in 1873, 1874, 1875, 1878, 1880, and 1886. A complete list of articles referring to Gall-making Diptera would occupy many pages. On the *Trypetidae* the most useful work of reference is a large work by H. Loew, with photographs of the wings of the species. I have not attempted to state the distribution of most of the species outside of Scotland, as it would occupy too much space, and will be found summarised (up to 1876) in Bergenstamm and P. Loew's **Synopsis Cecidomyidarum.**

[*Note.*—Since the above was written, I have received from the Abbe Kieffer, of Bitsch in Lorraine, a paper (presented by him before the *Z. B. Ges. Wien* on 7th December, 1887, and published in the *Verhandlungen*, 1888, pp. 95-114), entitled, "*Uebür Gallmücken und Mückengallen.*" In this the author describes several new species of Midges reared by him, several of them from galls of kinds described in my present paper. These are noticed under the various galls.]

We must now pass on to the enumeration of the galls upon the various plants in Scotland. The descriptions will be as brief as I can make them, retaining sufficient clearness to enable a beginner to recognise the galls from them. The nomenclature of the plants is that of Hooker's "Students' Flora."

Thalictrum minus, var. **montanum** (Meadow Rue). Ovaries twice or thrice the natural size, hollow, often nearly

globular, becoming brown ; each is tenanted by one or two larvae of *Cecidomyia* (? *Thalictri* H. Lw.), which pupate in the soil ; at Kinloch-Rannoch in September. *T.S.N.*, New Ser., I., 206.

T. majus, var. **flexuosum**, ? Similar galls found by Dr. Power in Fife. (*Ent. Monthly Mag.*, XVIII., p. 116).

Ranunculus repens (Buttercup). Sometimes one finds the margins of the lobes of the lower leaves rolled inwards, and somewhat thickened, fleshy, and firm, but without marked change of colour. In fact, the change is scarcely such as to entitle the bodies to be included among galls. I have not found larvæ or living pupæ in these structures, though I have seen cocoons in them near Aberdeen. They are probably the work of *Cecidomyia Ranunculi* Bremi, a species recorded by Mr. E. A. Fitch from Essex.

I have this summer (1887), in July, found the flowers of *R. repens* deformed and dwarfed in one or two localities near Aberdeen. They bore traces of insect agency; but before I found them the larvæ had gone. So far as could be judged, they appeared to be the work of gall-midges. The flowers remained closed or only half-open.

Cardamine pratensis. (Lady's smock or Cuckoo-flower), the galls are much swollen flower-buds, all parts of which become thick and fleshy, and cease to serve their usual functions. The larvæ of *Cec. Cardaminis* Winn. live between the thickened organs in considerable numbers. They pupate in the soil. Usually from two to six lower buds of each inflorescence are galled. These galls are not uncommon, though local, near Aberdeen, in May (T.S.N., New Ser., I. 207); and Dr. White reports them from Perthshire.

Several midge-galls have been found elsewhere, galling flowers of other crucifers; and some of these will probably yet be found in Scotland ; *e.g.*, on *Barbarea vulgaris.*

Helianthemum vulgare (Rock Rose). The galls assume the form of enlarged terminal buds, the leaves in which overlap one another, instead of spreading, and shelter the larvæ. Common in many places along the Dee, at

Muchalls, at Lintrathen, in Forfar, and at Dunkeld, in Perthshire. Hdy.,A.N.H., 1850, p. 189 ; T.S.N., II., 31 ; and T.A., I., 56.

Viola canina (Dog Violet).

***V. sylvatica Reichenbachiana.**

On both these plants, and especially on the latter, the hinder lobes of the leaves are often rolled upwards, and become very fleshy, much thickened, and purple in colour. Often many galls occur in a rosette-like arrangement on a plant, rendering it stunted. Common on the Links near Aberdeen, and also in Strathdon (T.S.N., I., 134, and T.A., I., 57), and near Glasgow (B.I., 159). I have also found it at Rannoch.

In 1886, the Abbe Kieffer reared female midges from galls on *V. sylvatica* (sub nom. *V. sylvestris* Lnk.), evidently of the same kind as those described above, and found that they belonged to a species not previously known, which he named *Cecidomyia affinis*. He describes the female thus :—" Head pale yellow, with a yellow tuft of hairs in the middle of the pale-coloured face. Hinder part of the head brownish ; eyes black ; proboscis and palpi pale yellow. Antennæ as long as the head and thorax together, brown, joints 2 and 13 ; the latter joints cylindrical, unstalked, each with two small rings of hairs, of which the anterior runs obliquely round the middle, and the hinder, the hairs of which are shorter, is near the base, and almost adpressed. Thorax slate-gray, yellow below ; scutellum yellowish. Wings clouded ; the first longitudinal vein not very distinct, as it is close to the front margin and passes gradually into the latter beyond its middle ; the second longitudinal vein bends a little downwards in its apical half and reaches the margin in front of the tip ; the third longitudinal vein bifurcates in the middle of the wing ; its anterior branch reaches the hind margin as far behind the tip of the wing as the second vein does in front, and the posterior branch runs vertically to the hind margin ; there is no distinct cross-vein. Halteres yellow. Legs pale, with a brownish shimmer. Abdomen orange, with broad cross-belts above, composed of dark scale-hairs ; the other hairs on

the abdomen yellow; two black longitudinal stripes on the last ring of the abdomen. Ovipositor as long as the abdomen; its first joint dark, the second paler. Length of body of female 2 mm." Dr. F. Loew (V. Z. B. Ges. Wien, 1885, p. 510) records this gall from Thuringia and Upper and Lower Austria, and Abbe Kieffer found it in Lorraine. Dr. F. Loew has described a similar, but hairy gall on *V. tricolor*, as made by *Cec. Violæ* F.Lw., but I do not know of midge-galls on this latter Violet from Scotland.

V. tricolor (Heart's-ease or Wild Pansy) and its sub-species *V. arvensis*, are said by Winnertz to have the ovaries galled and swollen by *Lauxania aenea* Meig., a small fly belonging to the family *Muscidæ*. The fly is about $\frac{1}{6}$ inch long; and is shining, very dark green, with reddish-yellow limbs and wing-veins. The fly has been taken by Dr. Vice near Aberdeen; but I have no record of galled ovaries on this plant from Scotland.

Lychnis diurna (Red Campion) has been found by Mr. Binnie (B.I. 159, B.II., 184-85), near Glasgow, with the base of the calyx inflated, and the flowers remaining like buds. Several larvæ live in the calyx, between it and the petals. I have no other record of it from Scotland. It is perhaps the work of *C. Lychnidis* Heyd.

Cerastium glomeratum (Mouse-ear Chickweed), often has the terminal bud swollen, with the leaves pressed face to face, and their bases fleshy and concave, enclosing a space, or spaces, tenanted by several orange larvæ. These spin up in the galls, to emerge as midges next spring, or occasionally in the autumn in which the galls were formed. They are the work of *C. Cerastii* Binnie (B.II., 181-82). The galls are common near Aberdeen, also at Muchalls (T.S.N.II., 31, T.A., 1, 57), at Perth, and at Possil, near Glasgow (B.I., 159, under *Cerastium viscosum*). (Abbe Keiffer, *l.c.* pp. 13-15, has described under the name *Cec. Lotharingiae* n.sp. a midge reared by him from galls found on *C. glomeratum*, *C. triviale*, and *C. arvense*, near Bitsch, which agree entirely with the Scotch galls, but the midges differ from Binnie's description of his *C. Cerastii* in having the body yellow or yellow-

brown, with dark stripes, and the joints of the antennae 2 and 14, while *C. Cerastii* is said by Binnie to be dark brown and to have the joints of the antennae 2 and 13.)

Hypericum pulchrum (St. John's Wort) bears galls very much like those on the *Cerastium* in structure. They were found by Dr. Buchanan White at Dunkeld, and in Braemar (T.S.N., II., 31, 172; T.A., I. 57; and T.A., II., 54). It was referred by me (with a query) to *C. serotina* Winn; but seems rather, as Dr. F. Loew has suggested to me, to be the work of *C. Hyperici* Bremi.

Tilia vulgaris Hayne (Lime-tree) bears two forms of midge-galls in Scotland.

1. The first are round or oval swellings, $\frac{1}{6}$ to $\frac{1}{4}$ inch long, on the bract, where the peduncle separates from it, or in the flower-bud, which becomes much swollen and distorted. The galls are fleshy and smooth, and enclose an irregular cavity tenanted by several larvæ, which seem to be those of *C. floricola* Rudow. I have galls sent me by Dr. F. B. White in 1881, from Perthshire (T.S.N., VI., p. 255). They seem to belong to the same species as twig-galls found by Mr. Hardy (S.N., III., 315-6), in Berwickshire, and doubtfully referred by him to *C. Tiliæ* Schr.
2. The second form is quite like a gall recorded in Reaumur's *Mem.* III. (p. 421, t.34, f.7). It is a tubular inrolling of margins of young leaves; the inrolled parts become reddish, fleshy, and somewhat thickened; and are tenanted by reddish orange larvæ of a *Cecidomyia*, which go to earth when full fed. The galls were common on one or two trees in Old Aberdeen, chiefly on shoots from the root. The midge has not yet been reared from the larvæ, hence the species is uncertain. Macquart calls it, from its habits, *C. limbivolvens* (T.S.N., V., p. 214 b.; and T.A., 1885, p. 50).

Ulex Europæus (Whin, Furze, or Gorse) bears inflated flower-buds, which differ from ordinary flower-buds, externally, only in size; they are hollow, and are tenanted by one larva of *Asphondylia Ulicis* Trail (T.S.N., II., 172, and Verrall in *Ent. Monthly Mag.* xi., 225). Common near Aberdeen (T.S.N., II., 172; T.A., I., 58), also near Glasgow (B.L., p. 159, and B. II., p. 113).

Cytisus scoparius (Broom) is galled very commonly in Scotland by *Asphondylia Sarothamni* H.Lw.

1 and 2. The galls may be either swollen and distorted flower-buds, usually two or three upon each branch; or they may be swellings of an entire pod, if the pod is small, or of a part of it if it is pretty large, as is usually the case. In each of the flower-bud-galls only one or two larvæ live; in the pod-galls from two to ten may be present. (T.S.N., I. 295, II., 32 a, b); T.A., I., 58). From both forms I have reared *Asphondylia Sarothamni* (B.II., p. 112, 1 and 3). Both forms occur near Aberdeen, at Muchalls, at Lintrathen, at Dunkeld, and near Glasgow.

3. A third form of gall occurs in the same localities as the others, and may possibly belong to this species; but the gall is so different from the forms already described that the question must remain uncertain till the insect is reared. The gall is a bud, tubular, rather over $\frac{1}{4}$ by $\frac{1}{12}$ inch, green, slightly flattened at the sides, and smooth or ribbed. It is two-lipped above, with an opening, from which runs a passage, filled with interlocking white hairs, down to a smooth-walled cell at the base, in which lies an orange larva. The larva pupates in the earth, and probably the midge emerges in spring, a point of difference compared with the forms from Broom described above. Usually this gall occurs in some numbers in the axils of the leaves near the tips of the twigs. It is common towards the end of summer, and during autumn in many places (T.S.N., II., 172, c.; T. A., I., 58; B., I., 159, and B., II., 112). (Abbe Keiffer, in a paper presented on 12th December, 1887, to the *Z. B. Ges. Wien*, has figured the galls of this form as belonging to an undescribed midge named by him *Cecidomyia tubicola*).

Trifolium repens (white clover) has one or more of the leaflets folded, inflated, and fleshy; each is tenanted by one larva (rarely more) of *C. Trifolii* Fr. Lw. The larvæ generally spin up and pupate in the galls. I have found the latter often near Aberdeen (T.S.N., I.195, IV., 14; T.A., L., 58). Mr. Binnie records them from the Glasgow district (B.I., 159; B.H., 114-15).

Anthyllis Vulneraria (Woundwort) has the flower-buds

swollen, hard, and fleshy, with the sexual organs useless and distorted; and between the latter live several larvæ. I have reared *Diplosis Loti* De Geer from these galls, which are not rare on sandhills on the Aberdeenshire coast. (T.A.I., 58).

Lotus major (Greater Bird's-foot Trefoil) bears galls of the same structure as (but more swollen and reddened, and therefore more conspicuous than) those on *A. Vulneraria;* they also are the work of *Diplosis Loti.* (T.Sc.N., IV., 168; T.A.I., 59). I have found them near Aberdeen in August.

L. corniculatus (Bird's-foot Trefoil) also has the flower-buds galled, as in the last plant, by *Diplosis Loti.* The galls are plentiful near Aberdeen on the Links; and I have found them at Muchalls and elsewhere in the north-east of Scotland (T.S.N.I., 124, T.A.I., 59); and it is recorded from near Glasgow (B.I., 159).

On young branches the terminal bud is galled frequently, and the leaflets and other parts become slightly fleshy and swollen, but remain green. This gall also seems to be the work of *D. Loti;* but the insect has not yet been reared from it (T.A.I., 59).

Astragalus hypoglottis (Purple Milk Vetch), on the Kincardineshire and Forfarshire coast, often has the leaflets folded, hard, fleshy, somewhat inflated, and pale green. Usually so many are galled that they form masses one half to one inch or more across. Each leaflet is occupied by one or more larvæ of a *Cecidomyia* (?Onobrychidis Bremi). (T.S.N., II., 78; T.A.I., 59).

Vicia Cracca (Tufted Vetch) and **sepium** (Bush Vetch) bear galls very like those on *A. hypoglottis,* except in being rather larger. They are formed by a *Cecidomyia.* On *V. Cracca* they have been plentifully found by myself in Aberdeenshire, Kincardineshire, Forfarshire, and Perthshire (T.S.N.,II., 78, T.A.,I., 59); and they occur near Glasgow (B.I., 159). On *V. sepium* I have seen them in Aberdeenshire and in Perthshire (T.S.N.I., 124, T.A., I., 59). (Abbe Keiffer, in *V. Z. B. Ges. Wien, 1888, pp. 11-12,* has described as new a midge under the name *C. Viciæ* which he reared from galls of *V. sepium*

found in Lorraine, and they appear to be identical with the above galls found in Scotland; there can be no doubt that the galls on *V. Cracca* are the work of the same insect as those on *V. sepium.*)

Vicia sylvatica (Wood Vetch) also has the leaflets folded, and slightly thickened and inflated; but they are reddish-brown, and are scattered here and there among healthy leaflets, never being crowded, as in the other *Viciæ* (T.S.N.,II., 78; T.A.,I., 59). I have found the galls in Kincardineshire.

Lathyrus pratensis (Meadow Vetch) bears galls in certain respects similar to those on *Viciæ*, but usually they are larger and reddish-brown, and in groups of three in the leaf axils near the tips of the stems; in each live two or three orange larvæ (T.S.N.,II., 78; T. A., 1878, p. 60). Common in autumn near Aberdeen, and at Muchalls, in Kincardineshire, and Mr. Binnie reported them to me from Glasgow.

Prunus spinosa (Sloe or Blackthorn) has the leaves sometimes galled, a large swelling projecting downwards, and opening above by a cleft along the midrib. The walls are thin. The gall may reach the size of $\frac{1}{3}$ by $\frac{1}{6}$ inch. In the large ones the leaf is reduced to a mere fringe on each side of the slit. The surface of the gall is green. The midge has not been reared, but bears the provisional name of *C. pruni* Kalt. Mr. Binnie found the galls common at Mugdock, near Glasgow, in September (B.II., 182-83; T.S.N., IV., 14).

Spiræa Ulmaria (Meadow Sweet or Queen of the Meadow) very frequently has the leaves studded with hard pear-shaped galls about $\frac{1}{10}$ inch in diameter. The broad end projects a little way from the upper surface of the leaf, and is yellowish-green or red; the narrowed end projects below, and is white and downy like the leaf. Each is tenanted by an orange larva of *C. Ulmariæ* Bremi. Usually many galls are found on each leaf, especially near the margins. They are everywhere abundant (T.S.N., I., 124, 196; T.A., 1878, p. 60; B.I., 159-60).

Rubus Idæus (Raspberry) occasionally has the stems and the leaf-stalks enlarged into rounded or oblong swellings,

from $\frac{1}{4}$ to $\frac{3}{4}$ inch across. In each live several reddish-orange larvæ of *Lasioptera Rubi* Heeg. I have found this gall in September at Dunkeld, but have no other record of it from Scotland. (T.S.N., II., 78.)

R. fructicosus (Bramble). The leaflets are frequently folded and slightly thickened along the midribs; and enclose spaces, in which live the orange larvæ of *C. plicatrix* H. Lw. I have found these pseudo-galls at Dunkeld and near Aberdeen, in autumn. (T.A., I., 60.)

Rosa spinosissima L. Mr. P. Cameron (*Trans. N. H. Soc., Glasgow*, New Ser., I. p. 297), describes stems of this rose, from the Ayrshire coast, as "distorted and enlarged by what is no doubt a species of *Cecidomyia*. The swellings vary in length and thickness; some being nearly two inches long; others not more than one quarter of an inch; while in thickness they vary from two to five lines, being as a rule thicker at the ends than in the middle, when their length is over half an inch. When the galls are of some length, they cause the twigs to become bent, and it is very seldom that the swellings themselves are not twisted to a greater or less extent. Internally they are woody, but not very firm in texure; and the larvæ do not live in clearly defined cells. The larvæ are orange, and of the usual *Cecidomyia* form. I have unfortunately not been able to rear them to the imago state." These galls are "usually in near proximity to the galls of *Rhodites spinosissimæ*."

Rosa canina (Dog Rose), and **R. villosa** have the leaflets very often galled; they remain folded, and become fleshy, hard, inflated, and red-brown; and in each lives one white larva (or more) of *C. Rosarum* Hardy (A.N.H., 1850, p. 186), (*C. Rosa* Bremi). These have been recorded by Mr. Hardy from Berwickshire, and have been found by myself throughout Aberdeenshire and Kincardine; and also in Forfarshire, and at Dunkeld (T.S.N., I., 124, II., 79 b.; T. A., I., 60); and Mr. Binnie has met with them near Glasgow. (B.I., 160.)

Cratægus Oxyacantha (Hawthorn), *C. Crataegi* Winn., often galls the terminal buds of the upper twigs, producing a rosette of sessile deformed leaves, often covered with

prickly hairs. The rosette may be 1½ inch across. Between the leaves live several of the larvæ. The galls are common in Perthshire, but I have not seen them farther north (T.S.N., II., 79). Mr. Binnie says that they are common enough everywhere near Glasgow (B.I., 160).

Pimpinella Saxifraga (Burnet Saxifrage) frequently bears fruits much enlarged, about ⅛ inch diam., smooth, green, and thin. They are tenanted by one or more larvæ of *Asphondylia Pimpinellæ* F. Lw.; usually three or four galls, or more, exist on each umbel. They are frequent in August and September along the Dee and also at Braes of Gight; and I have them from Perth; and Mr. Binnie reports them from the vicinity of Glasgow. (T.S.N., I., 125, IV., 15; T.A.I. 62; B. II., 113).

Angelica sylvestris (Wild Angelica) is recorded by Mr. Binnie as having the flowers galled. The carpels are swollen, as are also the other parts of the flowers; but the larvæ occupy only the cups of the flowers. The galls were found near Glasgow. I know of no other record for them. Mr. Binnie suggests that they are probably the work of *A. Pimpinellæ* F. Lw. (B.II., 113 and 185).

Heracleum sphondylium (Cow Parsnip) frequently has the young leaves near the root, and at the tips of the stems, folded along the chief veins and slightly distorted, but not otherwise altered; in the spaces thus formed live several white larvæ of *C. corrugans* F.Lw. (*C. Heraclei* Kalt). I have found these pseudo-galls common during summer at Aberdeen, Muchalls, and Perth (T.S.N., IV., 15; T.A.I., 62, and T.A., II., 55).

The genus **Galium** (the "Bedstraws") includes a number of species that are galled by midges. Several of them are attacked by *Cec. Galii* Winn.; and the galls are, of course, much alike, differing only in minor points; hence one general description may almost serve for all. The galls of *C. Galii* in most cases form rather fleshy swellings on the stem, just above a node, or at the tip; often reddish or dull purple on the side most exposed to light; the thickness and fleshiness of the wall varies with the species of *Galium*. Often the galls are single; but sometimes they are united more or less closely into

masses; and occasionally flower-buds are galled. The larvæ are orange. When full grown, they escape from the gall usually by a cleft in its wall and pupate in the soil. The galls of this midge are very common in Scotland.

G. verum (Lady's Bedstraw).

1. Galls of *C. Galii* on this plant vary a good deal. They commonly form groups of three or more, near the nodes, each gall being an outgrowth about $\frac{1}{4}$ inch across. This form of gall is yellowish-green or pink, and smooth and shining, as if oiled; and the wall is rather thick and soft. (T.S.N.,I., 156; I., 62 a). Another frequent form is smaller than the last, with a dull green or reddish surface, more firm walls, and larger cavity. It is axillary; or forms a mass near the tip of the stems, in which the separate galls cannot be made out. (T.S.N., II., 80, T.A., I., 62-63). Occasionally the flower-buds are galled and somewhat swollen and inflated.
2. From the sides of the stem, a little way above a node, an outgrowth or two opposite project about $\frac{1}{8}$ inch. Each of the outgrowths is flattened laterally, and is obliquely conical, with the beak turned downwards, or occasionally upwards. It is green, naked and slightly wrinkled, and encloses a relatively large cavity, in which lives a whitish larva of a *Cecidomyia*. The outer wall is very thin. (T.S.N., II., 80; T.A., 63 c.)
3. The stem terminates in a spirally twisted tuft of leaves, the outer of which remain green and fresh, while the inner wither. Among the latter live several larvæ of a *Cecidomyia;* which pupate in the soil. (T.S.N., I., 151, and II., 80; T.A., I., 63 d.) For all the above see also B.I., 160).

The galls of *C. Galii* seem to be abundant throughout Scotland. Gall 2 also is common in Orkney, Sutherland, Moray, Aberdeen, Kincardine, Forfar, Perth, and Glasgow. Gall 3 has been found by me near Aberdeen and in Kincardine, and by Mr. Binnie near Glasgow; but is less frequent.

G. palustre (Marsh Bedstraw). *C. Galii* forms terminal of

axillary galls on this plant, with the leaves imbricated over them; the wall is relatively thin and the cavity large. (T.A.,I., 63 b; B.II., 182). Found by me in Aberdeen and Kincardine, and sent me by Dr. Buchanan White from Perthshire, and found by Mr. Binnie near Glasgow.

2. Terminal rosettes of leaves $\frac{1}{10}$ to $\frac{1}{6}$ inch across and slightly fleshy and purplish, are the work of *Cec. galiicola* F. Löw, the larvæ of which live between the leaves (T.S.N., I., 156; T.A., I., 63 a; T.A., II., 55), common at Banchory, on Deeside, in September.

G. boreale.

1. Galls of *C. Galii* on this plant form swellings just above the nodes, irregularly ovate, broader below; the wall is thin and the cavity large. I have found a few examples at Banchory beside the Dee (T.A., I., p. 63, b).

2. Terminal or axillary leaf-buds, reaching a size of $\frac{1}{6}$ by $\frac{1}{8}$ inch; the leaves are imbricated and green. Each gall is tenanted by one orange larva of a *Cecidomyia*. Usually several galls occur on a stem. They are common in autumn in the valley of the Dee, and Dr. Buchanan White has sent them to me from Perthshire. (T.S.N., I., 156; T.A., I., 63 a).

G. Aparine (Goose Grass or Cleavers). The galls of *C. Galii* on this plant form masses at the nodes, or at the tips of the stems. At the nodes they include stems and branches in a mass about $\frac{1}{4}$ to $\frac{1}{2}$ inch across; at the tips they form masses as much as $1\frac{1}{2}$ inch long by 1 inch across, composed of deformed branches, leaves, and flowers. They are always green. Each contains numerous cavities, each tenanted by a larva. I have found this gall locally plentiful near Aberdeen and at Banchory. (T.S.N., IV., 15; T.A., I., 63, 64.)

G. saxatile (Stone Bedstraw). The flower-buds are swollen considerably, and are occupied by one or more orange larvæ of *Cecidomyia* (*Galii* ?) which lie among the fleshy inner parts of the flowers. Sparingly found on the links near Aberdeen. (T.S.N., IV., 169; T.A., I., 64.)

Valeriana officinalis (Valerian). The midribs of the leaves and the chief veins of the lobes are twisted and thickened;

the lobes remain crowded together, with the margins at the base slightly involute and fleshy; and between them live several white larvæ of *Cecidomyia*. These can spring a distance of two or three inches. The galled leaves are yellowish-green. I have found them at the end of June near Aberdeen and near Stonehaven. (T.A., I., 64.)

Scabiosa succisa (Devil's-bit Scabious), Mr. Binnie (B.I., 161) states that Mr. Cameron informed him that he had found on this plant at Cadder, near Glasgow, an axillary gall much like that found on *Achillea Millefolium*, presumably the gall of a species of *Cecidomyia*.

Centaurea nigra (Black Knapweed) has the ovaries galled by *Trypeta solstitialis* L. The galls are irregularly ovate, about $\frac{7}{16}$ by $\frac{3}{16}$ inch, woody and hard, brownish, but covered with short pale hairs. A small opening above gives entrance to a cavity occupied by the larva. The galled flower-heads are unchanged externally, though each contains one, two, or more galls often united into a mass. They are most easily detected by squeezing the heads between the finger and thumb. They occur at Banchory on Deeside; and Dr. White has sent them to me from Dunkeld. Though local, they are abundant where they occur. The flies are easily reared from the galls. (T S.N., IV., 15-16; T.A., I., 64.)

Achillea Ptarmica (Sneezewort). 1. Galls of *Hormomyia Ptarmicæ* Vall. (*H. floricola* Winn.) are common in autumn in Aberdeenshire and Kincardineshire, and Mr. Binnie records them as common near Glasgow. They form a rounded mass of abortive flowers, $\frac{1}{4}$ to $\frac{3}{4}$ inch across, reddish-grey and woolly, and surrounded with a circle of leaves. They are formed of soft tissue, among which are small cavities, each occupied by one range larva.

2. Another form of gall on this plant may also belong to *H. Ptarmica*. It seems to be an abortive leaf-bud or leaf. Usually several occur in the axils of the leaves near the tip of the stem. They are ovate, acute, about $\frac{1}{8}$ inch long, sessile, reddish-brown or greenish. Each contains

one larva. These galls occur along with the former (T.S.N., I., 157; T.A., I., 64-65; B.I., 161).

A. Millefolium (Yarrow or Milfoil). 1. Galls of *Hormomyia Ptarmicæ* Vall., similar to those on *A. Ptarmica*, but usually smaller, and wanting the reddish tinge. I have found these galls near Aberdeen. (T.S.N., I., 157; T.A., I., 65.)

2. Galls of *Hormomyia Millefolii* H.Lw., occur singly in the axils of the leaves, or in the lower part of the stems, at or below the ground, in groups of two or three. They are ovate or somewhat triangular, about $\frac{1}{5}$ by $\frac{1}{6}$ inch, smooth, naked, green, or purplish-brown, blunt, splitting open at the top, to set free the larva; the walls are thick and fleshy, and enclose a small cavity. I have found this gall in autumn near Aberdeen, and elsewhere on Deeside, and also in Perthshire; and Mr. Binnie states that it occurs near Glasgow. (T.S.N., I., 157 T.A., I., 65; B.I., 161.)

Artemisia Abrotanum (Southern Wood). On this plant I found galls in a garden in Old Aberdeen, in October, 1884, upon the younger leaves of the twigs. Numerous galls occur on each leaf. They are nearly cylindrical, attached to the surface of the leaf by one side, free and conical at the end next the tip of the leaf, about $1\frac{1}{2}$ by $\frac{5}{8}$ mm. ($\frac{1}{16}$ by $\frac{1}{40}$ inch), slightly yellowish or dull reddish-green, but otherwise the surface is like that of the leaf. The free wall is very thin. Each gall was filled by one orange-red larva of a midge. Several of the flies, both male and female, emerged in spring from galls kept all winter in a box. They proved to belong to a previously unnamed species of *Hormomyia*. I have named them *H. Abrotani*. (The insect is described in the *Scottish Naturalist*, n.s., vol. II., p. 250.)

Senecio Jacobæa (Ragwort) and *S. aquaticus* frequently have the flower-heads swollen to twice their natural size: and they remain green, or only show the tips of the corolla. A cavity is formed above the receptacle, in which lie several reddish-orange larvæ of *Cecidomyia*. I attributed these galls, from which I have not succeeded in rearing the makers, to *C. Jacobeæ* H.Lw. (T.S.N., VI., 15; T.A.

I., 65). Dr. F. Loew has pointed out to me that this midge is said not to distort the head; and suggested that the distortion is perhaps due to mites. Of the latter, however, I have seen no trace in the galls, and I cannot but regard the midge-larvæ as the gall-makers. The galls occur in Orkney, Sutherland, Caithness, Moray, Aberdeen, Kincardine, Forfar, and Perth.

Sonchus arvensis (Field Sowthistle). On this species I found leaf-galls in August, 1886, near Gamrie, in Banffshire, and, in 1887, at Muchalls. Usually from six to twelve or more occur on each leaf. They are low cones or blistergalls, the cavity being formed by a separation of the lower epiderm from the cellular tissues of the middle of the leaf. Looked at from the surface the galls are round, pale yellow-green or purplish, surrounded by a broad red purple ring. Each gall is tenanted by one larva of *Cecidomyia Sonchi* F.Loew, which pupates in the gall. I believe that these galls have not yet been recorded from any other localities in Britain, though they are not rare in France and Germany.

Hypochaeris radicata (Cat's Ear) is galled by a *Trypeta*. The gall is an ovary, which becomes globular, 3 mm. diam., brown, longitudinally ridged, with thin woody walls. I have occasionally found the gall on Old Aberdeen Links. (T.S.N., IV., 16; T.A., I., 65.)

Hieracium corymbosum. I have but seldom found an ovary swollen and woody (as in *Centaurea nigra*), in a flower-head unaltered externally. The gall is oval and bears four blunt longitudinal ridges, with lower ones between; it is about 4 by 3 mm. ($\frac{1}{6}$ by $\frac{1}{8}$ inch); the surface is hairy. Each gall is occupied by a larva of *Trypeta*. Near Banchory. (T.S.N., IV., 16; T.A., I., 66).

H. Pilosella has the margins of the leaves involutely rolled, with the inner surface of the tube lined with pale hairs, about $1\frac{1}{2}$ mm. ($\frac{1}{16}$ inch) long. Mr. Binnie has found this gall near Glasgow; and reared a male midge which he named, as new, *C. Pilosellæ*, and described (B.II., 179). The gall is very much like a mitegall found near Aberdeen

Campanula rotundifolia (Hairbell or Bluebell) very frequently, in Moray, Aberdeen, Kincardine, Forfar, and Perthshire, and near Glasgow, bears galls in the form of globular or ovatebeaked bodies in the axils of the leaves, or of terminal irregularly rounded masses, 6 to 8 mm. ($\frac{1}{4}$ to $\frac{1}{3}$ inch) across, consisting of several galls fused together. In all cases the outer surface of the galls is smooth, hairless, and green or dull brownish-green. The walls are compact but thin. Often several galls occur on each stem. They are either flower-buds or leaf-buds distorted. Each is tenanted by one larva of *C. Campanulæ* Muell. (M.E.S., 1871, p. 8; T.S.N., I., 157; T.A., II., 66, B.I., 161.) Dr. F. Loew has recently described and figured galls on *Phyteuma orbiculare*, and *P. spicatum* much like some of those on the *Campanula* (Verh. Z. B. Ges., 1886. I., 487).

Vaccinium Vitis Idæa (Cowberry or False Cranberry). In Braemar I have more than once found terminal pseudo galls on this plant, consisting of involute, imbricate, red fleshy leaves of the terminal bud. Between them live a few yellow larvæ of a *Cecidomyia*. (T.S.N., I., 158; and New Ser., I., 214; T.A., I., 66.)

Gentiana campestris (Field Gentian). In August, 1882, I found, in Braemar, flower-buds infested by larvæ of a *Cecidomyia*, by which they were rendered slightly fleshy and swollen; the sexual organs were ill-developed. (T.S.N., New Ser., I., 214.)

Fraxinus excelsior (Ash).

1. Very frequently the midribs of the leaflets are thickened for about 5 or 6 mm. ($\frac{1}{5}$ or $\frac{1}{4}$ inch), or more if two or more galls are fused together. The swellings are most noticeable below, and open by a slit along the midrib above; this slit remains closed in the fresh leaflets, but gapes in the fallen or dying leaves in autumn. The gall is hard, but fleshy; and is smooth when fresh. Each contains one or more larvæ of *Diplosis botularia* Winn. I have found the gall in Moray, Aberdeen, Kincardine, Forfar, and Perth. (T.S.N., I., 158, II., 352; T.A.I., 66.)

2. Near Banff and near Aberdeen, I found, in August, 1886,

blister-galls rather frequent in the leaflets of the Ash (*Fraxinus excelsior*); often three or four occurred on each leaflet. They were lenticular in form, being circular in outline when seen from either surface, and like a very low cone on the upper, but nearly flat on the lower surface. At first pale green, and about 4 or 5 mm across, they, after a short time, dried up, became brown, and seemed to increase in size, since the surrounding tissue also dried up. In the cell, formed by separation of the tissues, lived one whitish larva (apparently of a *Cecidomyia*); but most of the galls were empty, the larvæ evidently pupating in the ground; and I did not succeed in rearing insects.

Veronica Chamædrys (Germander Speedwell). Very commonly, in all localities from which I have records, has the terminal buds much swollen with imbricated leaves, covered with reddish-grey woolly hairs. The galls appear to be the work of mites; but between the leaves live several yellow larvæ of *Cec. Veronicæ* Bremi (T.S.N., 158, T.A., I., 67, B.I., 161).

V. serpyllifolia (Thyme-leaved Speedwell) and **V. officinalis** (Officinal S.), both often have the flower-buds rendered fleshy, and swollen to twice or thrice the natural size; they do not open, but are quite green, or a little paler than natural. The inner organs of the flowers are useless to the plants for reproduction. In each flower live one or more yellow or orange larvæ of *Cecidomyia*. I have these galls only from near Aberdeen (T.S.N., IV., 170, New Ser., I., 216; T.A., I., 67.)

V. scutellata (Marsh Veronica). On this plant, in a reedy swamp in the margin of the Corbie Loch, a few miles north of Aberdeen, in the end of August, I found flower-buds enlarged and distorted as in the two last-mentioned species of Veronica, and doubtless the work of the same species of *Cecidomyia*. The terminal buds of a few of the shoots were also galled, so as to look much like those described above on *Hypericum pulchrum*. No doubt they also were the work of the same insect.

Rhinanthus Crista-Galli (Yellow Rattle) is apt to become stunted, and to have the leaves twisted and crowded;

but the plants otherwise look much as they do in good health. Among the leaves are several larvæ of *Cecidomyia*. These pseudo-galls are common on a moor near Aberdeen, in June, but I have no other record of their occurrence. (T.S.N., II., 252; T.A., I., 67.)

Thymus Serpyllum (Wild Thyme).

1. The tips of the branches are very commonly galled by mites, and form rounded masses, which are rendered conspicuous by a thick coat of pale woolly hairs. They are often tenanted also by a few orange larvæ of *Cecidomyia* ? peregrina Winn (T.S.N., I., 158, II., 252; T.A., I., 67). Abbe Kieffer (*l.c.*, pp. 8-11) describes a midge, under the name *C. thymicola* n.sp., reared by him from terminal or axillary bud-galls, the leaves in which were imbricated, swollen, and covered with hairs above. These galls were found in Lorraine.

2. The galls are flower-buds, swollen to twice the natural size, but otherwise are little altered externally. The inner parts of the flower are changed and form an ovate, blunt body, green, pink-tipped at the narrowed upper end, and thin-walled. In each lives one orange larva of *Cecidomyia*. The galls are not rare on Aberdeen Links in July. (T.S.N., II., 252; T.A., I., 67.) Abbe Kieffer (*l.c.*, pp. 6-8) describes as new, under the name *C. Thymi*, a midge reared by him from galls, found by him in Lorraine, on *Thymus Serpyllum* and on *T. Chamaedrys*, either as affected flower-buds, or as terminal leaf-buds, with the two or four leaves smaller than normally, and yellowish green or reddish. I have not seen the latter form in Scotland, and the flower-bud galls, though much like those described by me above, do not wholly agree in structure.

Nepeta Glechoma (Ground Ivy) has the upper surface of the leaves studded with conico-cylindrical galls seldom exceeding 3 by 1½ mm. ($\frac{1}{8}$ by $\frac{1}{16}$ inch), green, but thickly covered with short greyish hairs, thin-walled, and each occupied by a larva of *Cecidomyia bursaria* Bremi. When the larvæ are full-fed, the galls fall off, leaving holes where they were. I have found these galls pretty common in autumn near Dunkeld (T.S.N., II., 253); and Mr. Binnie reports them from the Glasgow district (B., I., 161.)

Polygonum viviparum, P. amphibium, var. **terrestre, P. Persicaria,** all have the margins of the leaves rolled back, and fleshy, and reddish-brown, yellow, or bright-red, and very conspicuous. The margins may be altered for only a small part of their length ; or, if several galls are more or less united, the galls may extend from base to tip of the leaf. These galls are the work of *Cecidomyia Persicariæ* L. They are local, but often abundant where they occur. Dr. Buchanan White gave me specimens on *P. viviparum* from Braemar (T.S.N., II., 253, T.A., I., 67, 68), and on *P. Persicariæ* from Dunkeld, (T.S.N., II., 253). I have them on *P. amphibium* var. *terrestre* from near Aberdeen, from Arbroath, from Dunkeld, and from Perth (T.S.N., II., 253). On *P. Persicariæ* Mr. Hardy records them (*Scot. Nat.*, III., 315), from E. Lothian, and Mr. Binnie (B. I., 162), from Glasgow.

Rumex Acetosella (Sheep's Sorrel) has the flower-buds very often galled, in the vicinity of Aberdeen, by *C. Rumicis* H. Lw.; but, being very inconspicuous, the galls are very readily overlooked. The buds become swollen, but do not open, and the sexual organs abort. Usually many flowers are attacked on each plant. The midges are very easily reared from them. (T.S.N., New Ser., I., 216.)

Urtica dioica (Common Nettle) bears galls of *C. Urticæ* Perris abundantly, from Orkney southwards, in summer and autumn. The galls grow on the stems or on the leaves at the tips of the stems, usually one on each side of the base of the midrib, or on the leaf-stalks, or on the flower-stalks ; and sometimes there is a mass of them united in the terminal bud. They are irregularly globular, each being about 6 mm. ($\frac{1}{4}$ inch) diameter, brownish-green above, paler below, hairy, with a fleshy wall enclosing a cavity inhabited by several white larvæ. (T.S.N., I., 159; T.A., I., 68 ; B.I., 162.)

(*To be continued.*)

TWO VARIETIES OF ROSES NEW TO SCOTLAND.

BY N. J. SCHEUTZ.

IN the *March* number of the *Journal of Botany* for 1888 (pp. 67-68) is a paper, in Latin, by N. J. Scheutz, entitled "De duabus Rosis Britannicis. As these were both gathered in Scotland by the Rev. E. F. Linton, we extract from the paper the descriptions and notes, translating the latter.

"R. **mollis** Sm. var. **glabrata** Fries (*Novitiae Fl. Suecicæ*, Ed. 2, p. 151), *Foliolis utrinque glabris vel glabrescentibus, subtus glanduloso-punctatis vel rarius fere eglandulosis.*

Hab. Strome Ferry, Ross.

"The Scotch specimens agree with the Swedish. At first, indeed, one might believe that the form gathered in Scotland belonged to *R. tomentosa;* but the short, erecto-patent branches, the form and serrature of the leaflets, the hispid early ripe fruits, and ascending, persistent sepals are quite like those of *R. mollis*, of which it is most certainly the form *glabrata*. A similar form gathered in Northern England, and sent to Crepin under the name, *R. tomentosa*, is mentioned by him in his *Prim. Monogr. Rosarum*, fasc. vj., p. 108.

"R. **coriifolia Fr.** var. **Lintoni** Scheutz; *foliolis pubescentibus, subtus plus minusve glandulosis, duplicato-serratis dentibus cum 1-3 denticulis glandulosis; pedunculis brevibus nudis; receptaculis fructiferis subglobosis eglandulosis; sepalis post anthesin erecto-patentibus persistentibus, dorso eglandulosis.*

Hab. Ad. flumen prope Braemar, Aberdeen.

"A remarkable form by the leaflets, glandular beneath, tending to *tomentella*, to which I would have referred it had the sepals been reflexed and deciduous. If one follows the arrangement given by J. G. Baker in his '*Monograph of British Roses*,' this variety may be referred to the series *Subrubiginosæ*, and placed under *R. canina*, between the varieties *Borreri* (Woods) and *Bakeri* (Desegl.). It seems to come nearest var. *Bakeri*, which Crepin, in '*Primitiae Monogr. Rosarum*,' fasc. vj, p. 58, considers a variety of *R. coriifolia*. Among the Scandinavian roses is a form which is related to the var. *Lintoni*, but different in form and in some of its characters; this has been called *R. gothica* Winslow (*Bot. Notis.*, 1879, *Hb. Ros. Scand.* 29).

"I believe it not irrelevant to warn most of my readers that the

name *R. coriifolia* Fr. has been extended by several recent writers upon roses more widely, and so as to include more forms than are comprehended in it by Fries in '*Novit. Fl. Suecicæ*,' where Fries expressly states that *R. coriifolia* has the *leaflets eglandular beneath*, subsequently serrated, with the *serrations simple and eglandular*. Recently not a few forms and varieties of *R. coriifolia* have been gathered in Scandinavia, which differ more or less widely from the description given by Fries. For this rose in Sweden varies greatly, and in different localities assumes different forms, which, along with the typical form of *R. coriifolia*, stand in the same relation to *R. dumetorum* Thuill. as *R. Reuteri* (God.= *R. glauca* Vill.) and its forms hold in relation to *R. canina* L. in the strict sense.

"While examining *R. Lintoni*, it occurred to me that the forms of *R. coriifolia*, with leaflets *glandular* beneath (vars. *gothica*, *Bakeri*, *Lintoni*, &c.), may perhaps be related to the other forms that have the leaflets *eglandular* beneath in the same way as *R. tomentella* Lam. and its forms are related to *R. dumetorum* Thuill. and its forms. I believe that *R. tomentella* stands nearer to *R. dumetorum* than to the section *Subrubiginosæ*. These forms of *R. coriifolia*, which show leaflets glandular beneath, may be united into a series called *Subtomentellae*, which differ from the true *Tomentellae* chiefly by the erect persistent sepals."

Some Additions to the Scotch Flora.

Epilobium collinum, Gmel. *Fl. Bad.*

Prof. Haussknecht so names a plant I collected near Loch Tay, Mid Perth, on my first botanical visit to Scotland.

Carex ædocarpa, And.

This plant, which Nyman places under *C. Œderi*, has been seen by Dr. Lange. It occurred in Glen More, Easterness 96.

Agrostis alba, L. var. *coarctata*, Hoffm.

Professor Hackel so names plants collected near Loch Torridon and Kinlochewe, West Ross, 105.

Agrostis canina, L. f. *grandiflora*, teste Hackel.

This large coarse moorland form of *A. canina* occurred in West Ross 105, Elgin 95, and Easterness 96.

G. Claridge Druce.

Fungi Found near Roxburgh in 1886.—In the *Proc. Berwickshire Nat. Club* (pp. 530-31), the Rev. David Paul enumerates a good many *Hymenomycetes* found by himself, mostly at Sunlaws or Rutherford in 1886, and which he believes are new to the district. They are as follows :—

Agaricus (Armillaria) bulbiger A. and S., rare; **A. (Tricholoma) albobrunneus** Pers.; **A. (T.) arcuatus** Bull.; **A. (Clitocybe) fumosus** Pers.; **A. (C.) brumalis** Fr.; **A. (C.) ditopus** Fr.; **A. (Collybia) rancidus** Fr.; **A. (Entoloma) jubatus** Fr.; **A. (E.) sericeus** Bull.; **A. (Pholiota) unicolor** Flor. Dan.; **A. (Flammula) sapineus** Fr.; **Bolbitius Boltoni** Fr.; **Cortinarius triumphans** Fr.; **Paxillus panuoides** Fr.; **Polyporus amorphus** Fr.; **Scleroderma verrucosum** Pers. Mr. Paul also confirms the record (by Jerdon) of *A. phalloides* from Tweed, and corrects the record previously made of *A. spongiosus*, the fungus so named proving to be **A. corticatus** Fr.

[Of the above fungi we believe that *A. ditopus*, *A. rancidus*, and *A. unicolor* have not previously been recorded from Scotland. *A. fumosus* (in an abnormal form), *Paxillus panuoides*, and *Polyporus amorphus* have all been previously recorded from Tweed.—Ed., *Scot. Nat.*]

NATURAL HISTORY JOURNALS.

ENTOMOLOGIST, 1886 *(Dec.)*.—**Psyche opacella at Rannoch**, by E. Cross, notes also *Stilbia anomala* from Rannoch.

1887 *(April)*.—**Notes on the genus Lycæna**, by Richard South, treats of varieties in *L. Icarus* Rott. (=*L. Alexis* Hübner), mentions, among others, females from Pitcaple, Aberdeenshire, which have the wings suffused with violet, and a row of large bright orange crescents near the margin of each wing. Certain other Scotch forms are described, including the form *Icarinus* Scrib.

(*June*).—**Cecidomyia destructor**, by E. A. Fitch, notes first appearance of Hessian Fly, in the middle of May, at Errol, Perthshire.

(*July*).—**The Hessian Fly in Great Britain**, by P. Inchbald, with descriptions of female and of male by R. H. Meade.

(*Oct.*).—**The Hessian Fly** by Miss Eleanor A. Ormerod, reports the presence of the insect from Urquhart, in Morayshire, continuously along the E. coast of Scotland and England.

(*Nov.*).—**Diurni in Argyleshire**, by F. A. Walker, D.D., mentions several species and varieties, including *Vanessa polychloros*.

(*Dec.*).—**Parasites of the Hessian Fly**, by E. A. Ormerod. From pupæ found at Daleally, Errol, there were reared *Semiotellus nigripes* Lind., *Tetrastichus Rileyi* Lind., *Merisus intermedius* Lind., var. *micropterus*, *Platygaster minutus* Lind. All of these are also found in Russia, indicating Russian wheat as the means by which this pest has entered Britain. One specimen of what seemed to be *Merisus destructor* Say, an American species, also occurred among the insects. **Sphinx Convolvuli**, two recorded from near Galashiels by W. Pringle.

1888 (*Jan.*)—**Post-glacial Insects**, by Alfred Bell, enumerates all the known British Post-glacial fossil insects, including as Scotch *Dytiscus* sp., from Glasgow; *Geotrupes* sp., in peat from East Scotland; and *Dicaera* (allied to *Tipula*), in Wigtonshire.

(*Feb.*)—**Lepidoptera of the Outer Hebrides**, by Richard South, enumerates many additions to the records in the earlier volumes of the *Scottish Naturalist*; and remarks upon the more interesting varieties found in the islands.

Distribution of Lepidoptera in the Outer Hebrides, Orkney, and Shetland, by Richard South.

Contributions towards a List of the Varieties of Noctuæ occurring in British Islands, by J. W. Tutt; the Scotch forms mentioned in this article are :—*Cymatophora Or F.*, var. *flavistigmata* Tutt, var. *Scotica* Tutt, *C. duplaris* L., var. *obscura* Tutt, *Asphalia flavicornis* L., var. *Scotica* Staudinger.

(*March*).—In a continuation of the above paper are mentioned the following varieties from Scotland :—*Acronycta Rumicis* L., var. *Salicis* Stainton, *A. Menyanthidis* Vw., v. *Salicis* Curtis and v. *Scotica* Tutt. **Coleoptera taken in 1887**, by Alfred Beaumont, is a list of captures of Water-beetles, of which there were taken in Scotland *Coelambus noremlineatus* (near Alloa), *Deronectes assimilis* (Dollar), *Hydroporus Davisi* (Colinton, Midlothian), *H. rivalis* (Dollar), *H. melanarius* (Culross), *H. nigrita*, *H. obscurus* (Dollar), *H. discretus* (Pentlands), *H. literatus* (Culross), *H. Morio* (Culross), *H. tristis* (Culross), *H. umbrosus* (Culross), *H. vittula* (Dollar), *H. incognitus* (Alloa), *H. rufifrons* (Dollar), *H. longulus* (Pentlands), *H. obsoletus* (Pentlands), *H. ferrugineus* (Newhaven), *Agabus affinis* (Dollar), *A. unguicularis* (Alloa), *A. femoralis* (Culross), *A. arcticus* (Culross).

(*April*).—**Distribution of Lepidoptera in the Outer Hebrides, Orkney, and Shetland**, by Richard South, gives thirty additions to the list of species in the February *Entomologist*, and adds considerably to the numbers for the several districts.

JOURNAL OF BOTANY, 1887 (*June*).—**Notes on some Plants of Northern Scotland observed in July, 1886** (pp. 165-69), by E. J. Hanbury, F.L.S., and Rev. E. S. Marshall, M.A., F.L.S., is a valuable contribution to the county records for Caithness, West Sutherland, and South Aberdeen, along with one or two records for Elgin. The results are summed by Mr. Bennet in our pages.

(*July*).—**Notes on Isoetes** (pp. 206-7) by Arthur Bennett, F.L.S., gives the conclusions of Dr. Caspary on a collection of British specimens, among which were *Isoetes lacustris* f. *vulgaris*, "*stricta*, *elatior*, *et longifolio*, from Loch Brandy, Forfar, and *J. echinospora* from Loch of Park, S. Aberdeen.

(*August*).—**Arabis alpina in Skye** (p. 247), by H. C. Hart.

(*September*).—**Rubus Leesii in Scotland** (p. 314), by A. Craig-Christie, records the occurrence of the plant at Moffat.

(*October*).—**Supplement to Notes on Rubi, No. 2** (pp. 327-33), by Prof. Babington, is a review, with comments, on a valuable paper by Prof. Areschong, entitled, **Some Observations on the Genus Rubus, Part 1, Comparative Examination of the Rubi in the Scan-**

dinavian Peninsula, which was published in the *Lunds. Univ. Arsskr.*, vol. xxi. Prof. Babington recommends the paper strongly to the attention of the botanists of Great Britain.

(*Nov.*).—**Rubus Leesii in Scotland** (p. 349), by Dr. Buchanan White, points out that this form was recorded by Dr. Mactier, from near St. Andrews in 1882, in the *Gard. Chron.*, and in 1883 in the *Scot. Nat.;* and also states that a small thicket of it has been known for many years near Perth.

(*Dec.*).—**On Ranunculus Flammula** (pp. 370-72), by W. H. Beeby, F.L.S., records the change, in cultivation, of rooting plants (var. *radicans* Nott., *fide* Lange) into the typical form in a year; and suggests that the specific value of *R. reptans* should be tested by cultivation. **Rhynchospora fusca R. & S. in Scotland** (p. 373), by Ar. Bennett, records the plant from a moor in Kirkcudbright, where it was gathered in 1882 by Mr. J. M'Andrew. **Juncus tenuis, in Kirkcudbrightshire** (p. 374), by J. M'Andrew, found near New Galloway.

1888 (*Jan.*).—**Notes on the Flora of Easterness, Elgin, and West Ross** (pp. 17-26), by G. Claridge Druce, adds largely to the county records in *Topographical Botany*, Ed. II.

(*Feb.*)—In this number begins a **Biographical Index of British and Irish Botanists**, by James Britten, F.L.S., and G. S. Boulger, F.L.S. Such an index is much required. With regard to each name are given dates of birth and death, chief titles, degrees, dates of election to Linnean and Royal Societies, sources of information, genera dedicated to the person noticed, and record of books or papers published, or of other scientific work done by him. Information with regard to Scotch botanists is of course included, and assistance in rendering the list complete is desired by the authors.

(*March*).—**De duabus Rosis Britannicis** (pp. 67-68), by N. J. Scheutz, relates to two roses gathered in Scotland by Rev. E. F. Linton, viz., **R. mollis** Sm. var. **glabrata** Fr. at Strome Ferry, and **R. coriifolia** Fr., var. **Lintoni** Scheutz in Braemar. **On Potentilla reptans and its Allies** (pp. 78-79), by W. H. Beeby, A.L.S., gives the results arrived at by Herr S. Murbeck of Lund from the examination of a series of specimens from Britain. Among them was **P. suberecta** Zimm. from Kirkcudbright. **The Late Dr. Boswell** (pp. 82-84) is an obituary notice by J. G. Baker.

(*April*).—Obituary notice of **The late John Smith, A.L.S.** (pp. 102-3), by J. B. Baker. **Notes on the Flora of Easterness, Banff, Elgin, and West Ross** (p. 116), by G. C. Druce, adds a few plants to those recorded in the January number of the *J.B.*

(*May*).—**Notes on Highland Plants** (pp. 149-56) by Rev. E. S. Marshall, M.A., F.L.S., add considerably to the county records, as the result of a month (Aug. 19—Sep. 19, 1887), spent in the Highlands. They relate to Lawers, in Mid Perth, Loch Awe, Argyle, Fort William, Westerness, Altnaharra, Durness, and Inchnadamph, West Sutherland, Ben Klibreck, E. Sutherland, and Blair Athole, M. & E., Perth. A new hybrid *Epilobium, E. Marshallianum* Hausskn. (between *E. anagallidifolium* and *E. obscurum*) was found at 1600 feet above the sea near Inchnadamph, and is described on p. 151. *Betula glutinosa* Fr. var *parvifolia* Wimm. Herb. (*fide Lange*), at Cashil Dhu, new record for Britain.

ENTOMOLOGISTS' MONTHLY MAGAZINE, 1888 (*April*). —**Nepticula serella** sp.n. (p. 260), by H. T. Stainton, described from specimens reared from larvæ found mining leaves of *Potentilla Tormentilla* on Birnam Hill, near Dunkeld, in September (1859), and in Westmoreland. The description is as follows:—"*Exp. al .2 lines. Head dull, dark, ferruginous, with a still darker central spot. Ant. wings with the basal portion uniform, glossy golden-brown; beyond the middle is a nearly straight, moderately broad, pale golden fascia, apical portion of wing very dark purple, almost black, with the cilia (which have no dividing line) slightly paler.*

The continental *N. Tormentillella* . . . . has narrower anterior wings, with the basal portion bronzy green, and a purple band before the metallic fascia, which is rather silvery than pale golden, the apical portion of the wing purple, but not nearly so dark as in *N. serella;* head black."

(*June*).—**List of British Tipulidæ, &c.** (pp. 20, continued from vol. xxiv., p. 112), by G. H. Verrall, enumerates from Scotland—*Dolichopeza sylvicola* Curtis (as far north as Tongue), and *Tipula rufina* Mg. (Inchnadamph). Dichotomous tables are given for the recognition of the British species of *Pachyrrhina* and *Tipula*.

JOURNAL OF CONCHOLOGY, 1888 (*April*).—**Trophon truncatus** (Strom.), **var. scalaris** Jeffr. on the West of Scotland (pp. 319-20), by A. Somerville, B.Sc., F.L.S. This variety had not formerly been found south of Shetland.

SCIENTIFIC SOCIETIES.

PROCEEDINGS OF THE BERWICKSHIRE NATURALISTS' CLUB.—Since our last notice of these valuable Proceedings two parts have been issued of the volume for 1885-86, including pp. 321-586 and j.—xlv., and plates I.-IV.**

For some time the attention of the Club has been much devoted to the archæology and legendary lore of the Eastern Borders; and most of the pages of the newly issued parts are occupied with these subjects. They contain much that is of interest in this regard; but we must pass on to notice those papers that relate strictly to the Natural Sciences, of which there are several.

Notices of Fungi found mostly in the neighbourhood of Roxburgh in 1886, and hitherto unrecorded from the district of the Club (pp. 530-31), by Rev. David Paul. (We give a notice of this paper more at length elsewhere.—Ed., *Scot. Nat.*)

Eyemouth Harbour Works.—Geological Notes (p. 531), by the Resident Engineer. **Localities for Neottia Nidus-avis** (p. 533), by James Hardy; **Obituary Notice of Francis Douglas, M.D.** (pp. 538-41).

Ornithological Notes (pp. 542-43), by Wm. Evans, refer to the *Great Snipe and Great Crested Grebe*. **Notes on the Rarer Birds observed in the Dunbar District** (pp. 544-46), by George Pow.

Notes on the Birds of Stobo and Neighbourhood (pp. 546-58), by John Thomson.

Both the last-mentioned papers contain various notes of interest.

Additions to the Lepidopterous Fauna of the District, with notes of the capture of some of the rarer species (pp. 559-61), by George Bolam. The captures recorded in this were chiefly from the English side of the Border.

Notes on the Season of 1886—The Migration of Birds, Meteorology, and Natural History (pp. 562-75), and **A Summer Ramble in the Woods round Chirnside**, with Notices of **Our Summer Migrants, &c.** (pp. 576-79), both by Dr. C. Stuart, well deserve perusal because of the record of observations on the habits of mammals and birds made by the writer. An excellent index to the volume completes the last part of it.

Transaction of the Perthshire Society of Natural Science.—The Perthshire Society has altered the form of its publications as well as the name, the Transactions, of which "Part I." has recently been published, forming a neat octavo, in place of the small quarto of the "Proceedings" of the former series. But, though altered in form and in name, there is no alteration in the nature of the contents, which are, as in former years, of much interest and value. Col. Drummond-Hay contributes a paper (pp. 1-15) of **Notes on some Rare Perthshire Birds lately placed in the Museum.** These include details of the occurrence of the species in Perthshire, and observations upon their habits in foreign countries, as well as in Scotland. The birds discussed are the *Hawfinch*, *Rose-coloured Pastor*, *Ruddy Sheldrake*, *and Great-crested Grebe*. **Mnium riparium Mitt. in Scotland**, by R. H. Meldrum, records the discovery of this moss in Milton Den, Aberdalgie. Mr. Meldrum calls attention to the need of some competent bryologist publishing a reliable list of Scottish mosses in the *Scottish Naturalist* or elsewhere. Our pages will be very willingly opened for this purpose. **Some Localities for Perthshire Plants**, by R. H. Meldrum (pp. 18-24), enumerates a considerable number of new localities, not a few of them from the immediate neighbourhood of Perth, despite the assiduity with which that region had been already worked. **Origin of the Interbedded and Intrusive Volcanic Rocks of Kinnoull Hill**, by H. Coates (pp. 24-30). **The Flora of the Woody Island**, by Wm. Barclay (pp. 30-44), is a list of 315 Phanerogams and 5 Vascular Cryptogams, found wild or naturalised on an area not exceeding eight acres in extent, situated in the Tay a little way above Perth. The list is preceded by notes on several of the species.

The "Proceedings," which conclude this part, relate to the session 1886-87. The address of the President (Dr. Buchanan White) reports the successful results of several days spent among the hills around Killin, during which many rare alpine plants were gathered. At the various meetings numerous donations to the Society's Museum were intimated, and the following papers were read, in addition to those whose titles are quoted above:—**The Fossil Spores of the Coal Formation**, by R. Kidston; **The Anatomy of a Bird**, by James Stewart; **Remarks on Perthshire Willows**, by

Dr. Buchanan White; **Notes on the Native Races of Perthshire,** by Dr. De Bruce Trotter. The President, in the annual address, summarised the experience of the Society during the previous year, and pointed out the objects most requiring to be kept in view.

REVIEW.

AN ILLUSTRATED MANUAL OF BRITISH BIRDS, by Howard Saunders, F.L.S., F.Z.S., &c. (Gurney & Jackson, London), appearing in monthly parts at 1s., to be completed in about 20.

The number of standard works on British Ornithology is already considerable; and it might be thought that there is scarcely room for another; but the constant progress of scientific investigation calls for new books or for new editions of the old favourites, often so greatly changed as to be practically new works.

We have, therefore, great pleasure in calling the attention of our readers to the book whose title heads this review, and of which we have had the opportunity of examining the 1st and 2d parts, published in April and May of this year. The author of the book has devoted much attention to ornithology, and edited Vols. III. and IV. of the last (fourth) edition of Yarrell's classical "History of British Birds." With a view to supply a handy book on our Birds, embodying the results of the most recent investigations, he has commenced this "Manual," which is designed to give for each species a characteristic woodcut, an accurate description of the male, female, and young birds in the plumage of each season, a record of the distribution within Great Britain, mentioning the localities in which the rarer species have been detected, and the distribution and breeding-places outside British limits. Two pages are devoted to each, so that all are not treated with quite proportionate fulness, but we have not observed any important omissions under any species. The classification to be followed is, Mr. Saunders tells us, almost the same as that in Dresser's great work, the "Birds of Europe." In accordance with this the *Passeres* stand at the head of the series, and will be the first group discussed.

If we may judge of what is to come from what we have seen, the book is deserving of success and will be of service in promoting the study of British birds. It should do much to break down the insularity that too often hedges in British scientists.

ORNITHOLOGY OF ARBROATH.

By A. Nicol Simpson.

(*Continued.*)

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107. Cormorant.—Breeds annually at Redhead. Now and again one falls to the gun on this side of Lunan Bay.

108. Shag.—I have seen only one specimen from this locality; but it is supposed to frequent the rocks to the east of Auchmithie village.

109. Gannet.—Does not breed here; but is often shot on the coast between the Harbour and the Bellrock lighthouse; large numbers are occasionally caught in stake nets.

110. Common Heron.—Its breeding haunts are outside my locality, but its visits here are by no means uncommon. I have seen several by the shores of the Ighty and the Lunan streams, also on the coast and to the east of the town. In the gloomy depths of the Guynd woods the tall bird has got up under my feet as I penetrated the dense shrubbery.

111. White Stork.—Col. H. M. Drummond Hay mentions this bird as occurring at Ethie near Arbroath about 1836 (Col. Hay's Report to E. S. Union of Naturalists' Societies.)

112. Egyptian Goose.—It is doubtful whether specimens got here were wild birds or semi-domesticated. It is impossible to decide the question.

113. Grey-lag Goose.—Can find a place in my list only on the ground that it passes over this district late in the year.

114. Bean Goose.—I have never found this bird; but some authorities assert that it has been seen here.

115. **Pink-footed Goose.**—Not over-abundant, but in fair numbers; in the fall and winter many are shot in the district.

116. **White-fronted Goose.**—Doubtful but *said* to have been shot in this locality in severe winters.

117. **Brent Goose.**—Occasionally killed on this coast in winter.

118. **Canadian Goose.**—Doubtful.

119. **Whooper Swan.**—This and the other Swans cannot be said properly to belong to my special locality, although at times one or two are observed. Some months ago (June) three wild swans were discovered on a loch in the immediate neighbourhood. One was caught alive; but escaped before being fully identified.

120. **Common Shieldrake.**—Although outside my radius as a resident, yet at times it strays within it. It breeds somewhat west of my extreme boundary.

121. **Ruddy Shieldrake.**—As with the former I cannot claim this as a resident; but as found on Barry Links, and preserved in Arbroath, I add the bird to my list.

122. **Wild Duck.**—Locally distributed and fairly abundant. About the latter end of autumn large flocks come to the seashore, and to the lochs in the vicinity of the town.

123. **Gadwall.**—Very doubtful, even as a winter visitor.

124. **Shoveller.**—Only a winter visitor, occurring almost annually in fair numbers.

125. **Common Teal.**—A local bird, breeding regularly in marshy districts; Leysmill and such like localities being specially its habitat.

126. **Garganey Teal,** known to have been got outside my limited area.

127. **Pintail.**—Winter visitor, but occurring only at rare intervals.

128. **Wigeon.**—I remember a collector having one sent him which was got in our Harbour and since then I have seen several; it is a winter visitor.

129. **Pochard.**—Not known to breed here, though at times shot near town. One was got near Kelly Castle in January, 1885.

130. **Scaup.**—Sometimes met with, from late autumn to early spring.

131. **Tufted Duck.**—Considered a rarity here.

132. **Golden Eye.**—Now and again one is sent for preservation to the local taxidermist. The last one that I saw was sent in January, 1885.

133. **Harlequin Duck.**—Mentioned to me by a bird-catcher, as being got in the vicinity in winter, but I am doubtful if he actually knew the bird.

134. **Long-tailed Duck.**—One that I saw was shot by a gamekeeper on Panmure Estate in February, 1884.

135. **Eider Duck.**—Breeds to the west of Arbroath, and is occasionally shot here.

136. **King Duck.**—A few have been got here, one of which was taken alive. All that I have known of have been winter visitors.

137. **Velvet Scoter.**—Said to breed in our county; but I think this is a mistake. Stray examples now and again are seen; but the evidence of its nesting here is doubtful to my mind.

138. **Common Scoter.**—A few specimens are often got from the autumn flocks; otherwise it is far from abundant.

139. **Goosander.**—Winter visitor, and by no means uncommon.

140. **Redbreasted Merganser.**—Rara Avis.

141. **Smew.**—Has been got only outside my limits.

142. **Wood Pigeon.**—Resident, breeding in all our woods, and very abundant. Large flocks are seen in the autumn, generally supposed to arrive from Northern Europe.

143. **Rock Pigeon.**—Breeds upon the cliffs, where large colonies are established. Various caves between Arbroath and Lunan Bay are known by the name of "Doo Cave."

144. **Stock Dove.**—This bird I found breeding at Dumbarrow some miles from Arbroath.

145. **Turtle Dove.**—An accidental visitor. One that was caught by a fisherman some miles at sea, in the summer of 1886, I kept alive for many months. This is the only one that I ever saw in Forfarshire.

146. **Pallas' Sand Grouse.**—Under the direction of Col. H. M Drummond Hay, I made the strictest inquiries in my neighbourhood as to the appearance of the Sand Grouse

here during the memorable irruption in the summer of 1863. I was unable to gather any authentic information anent that special visit. Now, however, I am pleased to be able to say that one specimen has been discovered by Mr. Harry Seaton on the 5th June of the present year. The bird was described to me, and I had no hesitation in deciding it to be Pallas' Sand Grouse. Mr. Seaton discovered the bird lying on the foot-path known as Hay's Well Road about 9.30 A.M. The carcass was quite warm when found, and the finder conjectured it had struck the Telegraph wire in its flight; when it was found the wind was blowing N. E.

147. **Pheasant.**—Very abundant where preserved for sporting purposes, and may be said to be semi-domesticated.

148. **Partridge.**—Almost every field harbours a covey. It is widely distributed over the whole county.

149. **Common Quail.**—Although not procured in the immediate neighbourhood is occasionally shot by sportsmen to the north of Arbroath. I have the date when one of them was shot, viz., 18th Oct., 1884.

150. **Ptarmigan.**—In the northern parts of our county they are regular breeders.

151. **Red Grouse.**—Breeds annually in Montreithmont Moor beyond Friockheim.

152. **Black Grouse.**—Resident, also breeding on Montreithmont Moor.

153. **Capercaillie.**—Likewise breeds on Montreithmont Moor. The eggs are to be seen in our local Museum that were collected in that district some years ago.

154. **Water Rail.**—Being seldom seen this is considered a rare bird, but this is not so. I have found them year after year.

155. **Landrail.**—Summer migrant. Common in our fields. This year, however, they have been very scarce on the eastern boundary of Arbroath.

156. **Moorhen.**—Common on all our waters, both streams and lochs. It is known as the "Water-hen," without doubt a more appropriate name for the bird.

157. **Coot.**—Breeds some miles inland; and is plentiful where found.

158. **Golden Plover.**—Resident, nesting on the waste grounds northwards. Many remain on the coast all winter.

159. **Grey Plover.**—Occasionally found to the east along the coast in autumn; but I have not learned of their breeding in the district.

160. **Ringed Plover.**—Breeds regularly on, or near, the seashore, every season; they seem to be reinforced in autumn with numbers journeying southwards.

161. **Dotterel.**—I have seen only one, which was shot on the coast west of Arbroath a few summers ago; I am not certain if it breeds here.

162. **Lapwing.**—Not so plentiful as formerly. They seem to move about much in severe weather; on the bents and by the sea-margin there are always a few birds all the year round—locally termed Peewet or Toughet.

163. **Turnstone.**—I am very doubtful if Turnstones breed here; although I have met them in their summer plumage. One in my possession was procured near East Haven.

164. **Oystercatcher.**—Known locally as the "Seapie." It is found along our streams; and often frequents the coast in autumn.

165. **Grey Phalarope.**—I have seen only one specimen from this district.

166. **Woodcock.**—Resident, but very local in its distribution. It breeds within three miles of the town. A belt of wood half-way between Arbroath and Auchmithie used to be a favourite breeding-site. Thirty years ago the bird was plentiful; now it is very far from being so.

167. **Common Snipe.**—Breeds in the district, but only in the marshy spots, and is seldom seen unless in severe weather or by the sportsman or naturalist. I have seen specimens that had been killed by striking the beacon on Bell Rock.

168. **Jack Snipe.**—Occasionally observed near the coast in winter; it breeds northwards regularly.

169. **Dunlin.**—Breeds to the west, and is often a victim to powder and lead, much to the grief of all bird-lovers.

170. **Knot.**—Simply known as a spring and autumn migrant.

171. **Ruff.**—Considered a visitor, but not periodical, so far as I have been able to discover.

172. **Sanderling.**—Some years ago I shot one near East Haven. It is considered a rare bird, of uncertain appearance.

173. **Common Sandpiper.**—Frequents all the broader streams; and is often met with on the seashore.

174. **Spotted Sandpiper.**—Very doubtful, although mentioned as being found at Montrose and Aberdeen. (Col. Hay's *Ornith. of E. of Scotland.*) Stray birds may now and again appear, though not identified.

175. **Green Sandpiper.**—I remember of meeting a sportsman on the cliffs east of Arbroath, who submitted for my inspection a bird that he had killed. It was a Green Sandpiper, the first and the last I have seen in the parish.

176. **Common Redshank.**—Breeds beyond my boundary; but comes to the coast in winter in fair numbers.

177. **Greenshank.**—Occurs at intervals in the autumn months, while going south from its breeding haunts.

178. **Bartailed Godwit.**—Mr. Gray (*Birds of W. Scot.*) mentions this as being found in Forfarshire.

179. **Whimbrel.**—Periodical visitor, and not uncommon in spring and autumn; but I have not known of its nesting here.

180. **Common Curlew.**—Very common on the seashore all the year, but more especially so in autumn and winter. It breeds within a dozen miles of the town, on the higher grounds to the north. Occasionally the nest is got nearer.

181. **Arctic Tern,**
182. **Common Tern,**
183. **Little Tern,**
184. **Sandwich Tern,**
185. **Black Tern,**

Some of these Terns breed, and others occasionally appear, outside my parish. At times they are got within my boundary.

186. **Ivory Gull.**—I give this bird a place on the authority of a gentleman who informs me he captured one near the town.

187. **Blackheaded Gull.**—Seen in large numbers upon the coast fishing, but does not breed here.

188. **Common Gull.**—Abundant, especially in spring and winter.

189. **Herring Gull.**—Breeds at Redhead in large numbers. I have kept it in confinement more than once.

190. **Lesser Black-backed Gull.**—Does not breed here; but is seen at times upon the coast.

191. **Greater Black-backed Gull.**—Rather rare as a mature bird, although I have seen them preserved here occasionally.

192. **Glaucous Gull.**—A rare visitor.

193. **Iceland Gull.**—Mr. Marshall, taxidermist here, speaks of killing one on the coast, which he "set up."

194. **Kittiwake.**—Large colonies may be seen at Redhead, breeding very numerously all along the sea-margin. It is resident the whole year.

195. **Common Skua.**—Merely a visitor. One that I have was procured near the Bell Rock Lighthouse.

196. **Pomatorhine Skua,**
197. **Richardson's Skua,** } Both rare birds.

198. **Buffon's Skua.**—Found beyond my boundary. (Col. Hay's *Ornith. of E. Scot.*)

199. **Stormy Petrel.**—Generally a few are got in severe weather. I know of one flying direct into a window in the centre of the town. One that I preserved killed itself on the telegraph wire outside the town.

200. **Manx Shearwater.**—This bird has been got on each side of Arbroath; but no authentic information is forthcoming as to its being noticed in the immediate vicinity

201. **Fulmar.**—Observed only at very rare intervals.

202. **Razorbill.**—Resident; breeding beyond Auchmithie. Numbers are yearly caught in the salmon nets, and, along with hundreds of Guillemots and Puffins, it is often seen dead on the coast.

203. **Common Guillemot.**—A resident, often observed inland. Breeds in fair numbers near Redhead.

204. **Black Guillemot.**—I have not found it breeding here, but have seen a specimen preserved by our local taxidermist.

205. **Little Auk.**—Not by any means uncommon in severe winters. One in my collection was found washed ashore in January 1885.

206. **Puffin.**—Several pairs nest regularly on the cliffs to the

east. Often one or two may be found on the beach, killed by some means unknown.

207. **Great Northern Diver.**—Must be written down an uncommon visitor to our shores. Occasionally a specimen of this noble bird reaches the taxidermists. This year one was caught in the salmon net at Elliot, two miles west of Arbroath. The fishermen kept it alive in their bothy for some time, but ultimately gave it its liberty.

208. **Black-throated Diver.**—Unknown here otherwise than as a visitor.

209. **Red-throated Diver.**—Got at times along the coast. I have one in my possession that was caught in a herring net at sea by the crew of an Auchmithie boat.

210. **Great Crested Grebe.**—Known to be a casual visitor to the west and east; but my district cannot claim it on certain evidences.

211. **Eared Grebe.**—Occasionally met with westwards.

212. **Little Grebe.**—A rather rare bird. The only one that I have secured for my private collection was kindly presented to me by a friend in Friockheim, near whose house it was procured.

Ring-ouzel (*Turdus turquatus L.*) **in Orkney.**—In the valuable "Manual of British Birds," by Mr. Howard Saunders, which Messrs. Gurney & Jackson are at present publishing in parts, it is stated (on p. 15) with regard to the Ring-ouzel that "its breeding-places are in the wild and hilly districts of Cornwall, Devon, Somersetshire, the Pennine backbone of England and its spurs; Wales; and the greater part of Scotland, including most of those islands which present suitable features, except the Orkneys and Shetlands, to which it is comparatively a rare visitor." In former years I was well acquainted with the birds of Orkney; more especially so with those of the parish of Harray on the Mainland, (or Pomona as it is called by geographers, but *not* by Orcadians). This parish is separated from the sea by hills almost all round. The Ring-ouzel, though not often seen in the more level portions of the parish, was not rare in the glens or "dales" among the hills; and in one of the glens I once found a nest with four eggs, one of which I took and still have in my possession as a proof that the bird does breed in Orkney.

JAMES W. H. TRAIL.

ADDITIONAL NOTES ON THE REPORT OF THE ORNITHOLOGY OF THE EAST OF SCOTLAND FROM FIFE TO ABERDEENSHIRE, INCLUSIVE, (1885).

By Colonel H. M. Drummond Hay, C.M.Z.S., M.B.O.U.

[Note.—The numbers given correspond with those in the Original Report, to admit of entry in the interleaved copies under their several heads. The prefixture of an asterisk denotes the repetition of the number, in the case of new species not previously mentioned.]

2 **Song Thrush**—With regard to the "migration of this bird in Perthshire, except in very mild winters," there are sometimes exceptions in solitary individuals remaining, at least in the Carse of Gowrie district, in cold winters—probably wounded birds. An instance occurred in the present year, 1888, one having been noticed on the 4th of January after very severe frost on the marshy banks of the Tay at Elcho, and other instances have also occurred; but, as a rule, as already stated, the bird is absent in winter, returning in early spring. Perhaps it does not move to any very great distance, it may be only to the sea coast; and this appears more probable, as during one spring, recently, soon after their arrival in considerable numbers, on very severe weather setting in, with a heavy fall of snow, all suddenly disappeared, for a time, till the return of milder weather.

8. **Wheatear**—A curious variety (of a uniform pale colour) of this species, a female, was shot in Rannoch in the month of August, 1886, and is now in the Perthshire Museum. It was one of a pair in similar plumage, which were seen during the whole summer; though the nest was not found, they in all probability bred there. As the specimen differs somewhat from the ordinary type, not only in colour but in size, it seems to deserve description, which is as follows: Total length $5\frac{1}{2}$ inches; from carpel joint to tip of wing $3\frac{5}{8}$; length of tarsus $1\frac{1}{4}$; bill rather slender, and shorter than in the type; legs same length as in type, but seem longer in proportion to the bird; both bill and legs of a uniform light wood or hazel brown; head and neck light sand-colour; auriculars, and space between the eye and bill yellowish-brown, with a whitish streak over the eye; throat

and vent whitish sand-colour; breast and lower parts a shade darker; shoulders and wing coverts darkish sand-colour, the latter edged with cinnamon-brown; quill-feathers pale yellowish-brown, inner webs very pale, with the tips darker yellowish-brown; rump and upper half of outer tail-feathers pure white; central tail-feathers and band across the tail dark yellowish-brown, edged and tipped with lightish cinnamon-brown. The bird from which this description is taken, was in its old plumage, not having commenced the autumn moult, as was shown by the feathers being a good deal worn.

* 8 **Desert Chat—Saxicola deserti**—A bird of this species was shot about half a mile east of Arbroath by Mr. Alex. Marshall, birdstuffer in that place, as it was flying inland across the road, leading along the top of the cliffs, on the 28th of December, 1887, at about 2-30 p.m., there being a fresh gale from the south at the time. There had been severe frost previously. This specimen was exhibited before the Perthshire Society of Natural Science on the 9th of February, and early in March 1888 before the Zoological Society in London by P. Lutley Sclater, Esq., Secretary of the Society. This is the second appearance of this bird in Scotland, one having been shot in the previous year in the Forth District at Alloa. There is no instance as yet, of its having been noticed in any other part of Britain.

47 **Great Grey Shrike**—Specimens of this bird were obtained in the autumn of last year, 1887, both in Perthshire and Forfarshire, at Aberfeldy and Arbroath, communicated by Mr. P. D. Malloch, Perth, and A. Nicol Simpson, Esq., Arbroath.

50. **Spotted Flycatcher.**—A pale variety of this species, of a uniform creamy white, an adult male, was shot in the middle of August 1887, at Rannoch Lodge by the gardener, Mr. Clark, and was forwarded to the Perthshire Museum. It may be here mentioned that probably the non-report of the Spotted Flycatcher from the upper parts of Aberdeen, as stated in the Ornithological Report of 1885, is merely an omission, the bird having been noticed by myself in

July of last year, 1887, on the north shores of the Moray Frith, near Fortrose, as not unfrequent.

66. **Mountain Linnet**, is now ascertained to breed in Forfarshire, as Mr. Nicol Simpson (*in litt.* 8th August 1887), informs me that under the name of the "Rock Lintie" it breeds regularly about Arbroath, nesting under tufts on the cliffs, and that it is so-called, in opposition to the common Brown Linnet, there designated as the "Heather Lintie," from its habit of breeding on the moors and more open grounds.

81. **Red-shouldered Starling.**—From a letter received from his Grace the Duke of Argyle it would appear that the bird shot in Rannoch, was, in all probability, one out of several of this species, males and females, liberated by his Grace at Inverary Castle, about three weeks previous to the date of its capture; it cannot therefore be considered as properly belonging to the District.

93. **Great Spotted Woodpecker.**—Mr. James Henderson of Dundee (*in litt.* 14th May, 1888) informs me that specimens of this bird have recently been obtained both in Perthshire and Forfarshire, at Lundie and at Alyth.

97. **Kingfisher.**—Dr. Howden, Montrose, mentions that this bird is frequently seen on the North and South Esks, (communicated December 1887.)

* 122. **Greenland Gyr-Falcon.** (*Falco candicans*)—a very fine female specimen was seen to haunt the vicinity of Rannoch Lodge, Perthshire, for several days in the spring of the present year 1888, but, being found very destructive to the game, it was shot, on the 7th of May, by Mr. John M'Donald, keeper to Sir Robert Menzies, by whom it was presented to the Museum of the Perthshire Society of Natural Science at Perth where it has now been placed. Mr. Seebohm in his "British Birds and Eggs," mentions Mr. Gray as instancing an immature male got in Perthshire in the spring of 1862, "locality not stated." These two are the only records of this very rare species being obtained in the Eastern counties (within the Union) that I am aware of.

128 **Osprey.**—A pair of these birds bred last summer, 1887, at Loch Ordie, Dunkeld. The nest, which was of bulky con-

struction composed of lichen-covered larch sticks, many of them an inch in diameter, was placed on the summit of a lofty spruce (near the Loch) the top of which had formerly been broken off at about 60 feet from the ground, and the side branches arched over so as to form a sort of canopy to the nest, out of which were taken two eggs. On one occasion the male bird being fired at, dropt from his talons a large trout just captured. The hen was eventually killed, after which the male bird left the district. The nest is now in the possession of the Perthshire Society. On taking it down a part of a third egg was discovered which unfortunately had probably been destroyed by a Hooded crow.

134. **Great White Heron.**—A specimen is stated to have been shot in Perthshire in the spring of last year, 1887, somewhere in the same vicinity as the Little Egret was obtained, in 1881, on Loch Katrine in the Forth district; but particulars have not been forthcoming.

154. **Whooper or Wild Swan.**—A flock of twenty-two of these birds were seen in the Montrose basin, during the winter of 1886-1887; but none were killed, (communicated by Dr. Howden, Sunnyside, Montrose, Dec., 1887.)

177. **Goosander.**—This bird is now ascertained to nest annually in Perthshire. A very perfect nest of this species, containing eleven eggs, and copiously lined with grey down, now in the Perthshire Society's Museum, was obtained in Rannoch in May, 1887.

188. **Pallas' Sand-Grouse**—After an interval of 25 years another extensive invasion of these birds has taken place. Again spreading themselves from their haunts in eastern Tartary over Continental Europe they have reached these islands in considerable numbers, as they did in 1863. It cannot be said that they have never appeared in Britain since the latter year, for fresh arrivals were noticed in 1872 both in Northumberland and in Ayrshire; but they were few in number, and none were recorded from other places. A few years later a pair were killed in Ireland; but there was no further visit in force until the present year 1888, when about the end of the first fortnight in May, many flocks reached England, and, almost immediately after-

wards, notice was received of their arrival in Scotland, extending from Berwick to Shetland. They showed themselves in covies of twenty or thirty birds, or in smaller numbers, in every county within the Union. The first notice I had from Perthshire, was of a small troop of three birds seen near the head of Loch Rannoch on the 29th of May; one of these, a fine male in beautiful plumage, was shot, and was sent by Sir Robert Menzies to the Perthshire Society's Museum, in which it has now been placed. Another was shot shortly afterwards in Strathtay near Castle Menzies, and about the same time, a female was picked up dead in Strathearn on the railway near Abercairny, killed by the telegraph wires, a fate which it is to be lamented has happened in a very great number of instances throughout the whole country. By the beginning of June large parties had visited Fife; and it is satisfactory to know, as I learn from the proprietors on Tents Muir, that numbers have settled down there, and are nesting, and are being strictly watched. It is to be hoped that young broods may be reared, though from observations made in other parts of the country it is to be feared lest owing to the unsettled weather and heavy rains, the eggs may be addled, or the young birds, if hatched, may be drowned.† This bird being allied to the Pigeon, and associated with the "Columbæ," in the classification adopted by recent authors,

† NOTE.—Since the above was written, it is with much pleasure I have to state, from information received from Mr. Alex. Speedie, yr. of Kinshaldy, on Tents-muir, that from the number of birds on the ground at present, there is every reason to believe that the breeding has been successful; in confirmation of which, I may mention that in cutting a field of rye on the above-mentioned property, about the 18th of last month (August, 1888), five young birds were captured. These were strong, well-grown, and full-plumaged birds, with the exception of the pointed tail feathers not yet matured. A pair were sent alive to the Zoological Gardens in London, which they reached in safety; the remainder were kept for some time in captivity, but were found to be so impatient of confinement that they were again restored to liberty. Much interest now arises as to whether these birds will become sedentary, and remain with us during the winter or not. Reports to this effect from the various breeding districts in the eastern counties will be anxiously looked for next spring.

H. M. D. H.

it is unfortunate that a more appropriate name had not been found for it than "Sand Grouse," which to say the least of it is a misleading one; for in many of its habits, and especially from its tame and unsuspecting disposition, it reminds one more forcibly of the Ground Dove of the West Indies, than of any of the Grouse species. The feathered feet probably suggested the name by which it is now known.

224. **Ruff.**—A fine adult male, but without the ruff, being in autumnal plumage, was shot on the banks of the Tay, opposite Mugdrum Island, Perthshire, by Rodger Davidson, Esq, Kinfauns Manse, in October 1887. It is now placed in the Perthshire Museum.

234. **Black-tailed Godwit.**—Two specimens of this very rare bird were shot on the Back Sands at Montrose, in September of last year, 1887, and are now in the Montrose Museum. (Communicated by Dr. Howden, Sunnyside, Montrose, Decr. 1887.)

235. **Whimbrel.**—One was shot on the Back Sands, Montrose, in Sept. 1887, and has been placed in the Montrose Museum. (Communicated by Dr. Howden, Sunnyside, Montrose.)

259. **Leach's** or **Fork-tailed Petrel.**—It may be interesting to add to the note on this bird in the original report 1885 that two, if not more, of these birds, were picked up dead in Perthshire on the 22 Nov. 1880, one at Blair-Athole, and one in Strathearn, in a field near Strathallan Castle, driven off the Atlantic during the terrific westerly gale of that morning and the previous night.

Rediscovery of Deyeuxia neglecta Kunth in Scotland.—On my recent visit to Perthshire I was delighted to find in a small marsh by Loch Tay a limited quantity of the above grass, which, as *Calamagrostis stricta*, Nutt, was known to have occurred in Forfarshire, where it was originally found by George Don. The drainage of the Forfar marsh, however, destroyed it in its only known Scotch locality. The Perthshire plant, Mr. Arthur Bennett says, is not quite typical, having some of the characters of *borealis*; but further details will be given on a future occasion.

G. Claridge Druce.

NOTES ON THE BOTANY OF THE DISTRICT AROUND ALFORD.

By Wm. Wilson, junr.

(Read before the E.S. Union of Naturalists' Society, in August, 1888).

FROM the fact that nearly half-a-century ago a few gentlemen resident in Alford devoted their leisure time to the Botany of the district, an occasion is afforded for botanists to compare its present condition botanically with past records, and this I intend to do in the following notes.

Ranunculus auricomus and R. sceleratus (Wood Crowfoot, and Celery-leaved Crowfoot), have recently been found by Rev. T. Bell and by myself; while *R. bulbosus*, the rarest of the earlier noticed species, is still found here. *Trollius europæus* (Mountain Globe-flower), found by Rev. John Minto, seems now extinct. No traces of *Lepidium Smithii* (Mithridate Pepper-wort) are now to be found, nor of *Drosera anglica* (Great English Sundew), once found in Clatt. *Silene inflata* (Bladder Campion) is also extinct in the parish. *Arenaria verna* (Vernal Sandwort) is still found; but *A. serpyllifolia* (Thyme-leaved Sandwort) has not of late been met with. *Hypericum quadrangulum*, rare, *H. humifusum*, frequent, *H. hirsutum*, rare, and *H. pulchrum*, common, are all still similarly found; and *H. perforatum* has been found in Kildrummy. *Geranium pratense* (Blue Meadow Crane's Bill) is still found near Rhynie. *Trifolium ochroleucum* has been found in Monymusk, by Rev. T. Bell and by myself. *Lotus major* (Large Bird's foot Trefoil) has become extinct; while *Geum urbanum* and *G. rivale* (Common Avens and Water Avens) are still found, as formerly recorded. *Potentilla Fragariastrum* (Strawberry-leaved Cinquefoil) has been added to our lists by myself. *Epilobium angustifolium* and *E. alpinum* (Rosebay and Alpine Willow Herbs) are still found. *Hippuris vulgaris* (Common Mare's Tail), and *Peplis Portula* (Common Water Purslane),

have become extinct. *Chrysosplenium alternifolium* (Alternate-leaved Golden Saxifrage) is still found in the woods of Knockespock in Clatt. *Sanicula europæa* (Wood Sanicle) is still here. *Hydrocotyle vulgaris* (Marsh Penny-Wort) remains somewhat abnormal; Rev. John Minto found such a plant, while recently I found another. *Pimpinella Saxifraga* (Common Burnet Saxifrage) has kept its ground. *Oenanthe Crocata* (Hemlock Water Dropwort) is still found as recorded. *Anthriscus vulgaris* (Common Beaked Parsley) has been added by myself, as I found it growing at the Old Castle of Kildrummy. *Adoxa Moschatellina* (Moschatel) was formerly recorded, but had only existed in small quantities, and has left no traces. *Hedera Helix* (Common Ivy) has been found by me growing at a height of upwards of 1000 feet above the sea. *Lonicera periclymenum* (Honeysuckle) is still found in our woods; and additional patches or habitats of *Linnæa borealis* have been found; it occurs on the open moors among heather. I found a full-grown berry on it one season. *Valeriana officinalis* (Great Wild Valerian) has also been added to our flora. *Fedia olitoria* (Common Corn Salad), found by the late Dr. Farquarson, is not now to be found. *Knautia arvensis* (Field Knautia), once found by the Rev. John Minto, is not now found. *Mulgedium alpinum* (Blue Sow Thistle) has once been found under 1000 feet above the sea, by Wm. Wilson, senr., in full flower and growing healthily. *Hieracium anglicum* was found by myself on the Coreen Hills. *Cnicus palustris* (Marsh Plume Thistle) has a great tendency to variation in colour of flowers. New habitats of *Cnicus heterophyllus* (Melancholy Thistle) have been found here. Neither *Filago minima* nor *F. germanica* (Least and Common Filago) have of late been seen. *Solidago Virgaurea* (Golden-Rod) has evidently increased in number as well as *Chrysanthemum Leucanthemum* (Great Ox-Eye). *Campanula latifolia* (Giant Bell Flower), doubtful if the true type is still found. *Vaccinium Oxycoccus* (Cranberry) has been added to the list by myself. *Pyrola secunda* (Serrated Winter Green) is still found where formerly recorded. *Menyanthes trifoliata* (Buck bean) has grown better during the succession of cold seasons than during the warm seasons that preceded them. *Lithospermum arvense* (Corn Gromwell) has not been seen of late. *Veronica scutellata* (Marsh Speedwell) is rare here. *Melampyrum pratense* (Yellow Cow-wheat) is frequent in woods and on moors, as well as *Scrophularia nodosa* (Knotted Fig-

wort). *Ballota nigra* (Black Horhound) was once found but has left no traces.

Utricularia vulgaris (Common Bladderwort) supposed to be extinct, was rediscovered by Mr. John Roy in Alford, 1887. *Primula veris* (Cowslip) is rare. *Trientalis europœa* (European Chickweed Winter Green) is very abundant. *Plantago maritima* (Sea Plantain) occurs far inland. *Polygonum viviparum* (Viviparous Bistort) is frequent. *Juniperus communis* (Common Juniper), though frequent, is by no means abundant here. *Listera ovata* (Common Twayblade) has been added to the flora of the district by myself. *L. cordata* (Heart-leaved Twayblade) is very abundant; I found once a variegated-leaved plant. *Orchis latifolia* (Marsh Orchis) is on the increase. *Gymnadenia conopsea* (Fragrant Gymnadenia) is common on moors. *Habenaria viridis* (Green Habenaria) has become very rare. *H. albida* (White H.) and *H. bifolia* (Lesser H.) are both rare. *Iris Pseudacorus* (Yellow Water Iris) still grows in the district as formerly recorded. *C. limosa* and *C. præcox* are, as far as we can make out, extinct. Living in an intermediate district and having made a special study of grasses, I find that here one great feature is the intermediate nature of many of the forms. I have to acknowledge my indebtedness to the Botanical Department of the British Museum for kindly examining them. With their method of giving old names instead of constituting new forms where the plants examined are not quite normal I quite agree; but the occurrence of intermediate forms in such species as Agrostis, in my judgment, tends to support the belief in evolution in plants, the forms appearing to differ only as a result of difference of situation.

I have added to our lists *Alopecurus agrestis* and *A. fulvus* and a variety of *A. pratensis* with bulbous roots, *Phleum pratense* var. *nodosum*, *Agrostis alba*, one plant with blue flowers, *Agrostis stolonifera* (Fiorin Grass), and *Aira flexuosa* (Wavy Hair Grass) in a monstrous form. *Catabrosa aquatica* (Whorl Grass), recorded as found by Rev. John Minto, is extinct as far as I can make out. A distinct form of *Dactylis glomerata* (Cocksfoot Grass), a white form of *Cynosurus cristatus* (Crested Dog's-tail Grass), and *Festuca sciuroides* (Barren Fescue) are still found as recorded; also *F. gigantea* (Tall-bearded F.). *Bromus asper* and *B. secalinus* are new records for district. *Avena pratensis* and *A. flavesceus* both grow in the district. *A. fatua* and *A. strigosa* in fields. *Triticum*

repens shows great variation; and *Lolium perenne* (Rye-grass) occurs in several forms from first year to stunted form on waysides, partially naturalised.

Polypodium Phegopteris (Pale Mountain Polypody) was added to our list of Ferns some twenty years ago, by Wm. Wilson, senr., on one side of Alford, in the Coreen Hills, and by the Rev. A. Milne, shortly afterwards, from the opposite side of Alford. It has continued to spread since it was discovered. It could scarcely have existed here half-a-century ago, as careful investigation was then going on. I have found one plant of *Polystichum lobatum* (close-leaved Prickly Shield Fern) in the district. *Lastrea Oreopteris* (Mountain or Lemon-scented Shield Fern) is abundant. *Lastrea spinulosa* has been found by Mrs. Farquharson. *Cystopteris fragilis* (Brittle Shield Fern) is still found, as well as *Asplenium Ruta-muraria* (Wall Rue Spleenwort). While *A. Trichomanes* (Common Wall Spleenwort) has disappeared from Knockespock Wood it is still found on south side of Towanrieffe on Serpentine rock; and Mrs. Farquharson has added it to the plants of Alford proper by finding it near Terpersie. *A. viride* (Green Spleenwort) is found in Auchindoir; but although not recorded by Dr. Dickie I am almost confident that it had existed there when he published his flora. *A. Adiantum-nigrum* (Black-stalked Spleenwort) occurs with var. *Serpentini* and an intermediate form. Several forms of *Athyrium Filix-fœmina* (Common Lady Fern) grow hereabouts, the most interesting being var. *acrocladon*, (Wilson), found by me some years ago, which in some points is different from any of the other forms, and which this season has assumed a peculiar aspect. While *Cryptogramme crispa* (Rock, Brake, or Parsley Fern) is extinct in one place, I have found it in another in this district. Forked fronds of *Blechnum boreale* (Hard Fern) are met with. I found a double-leaved and double-spiked plant of *Botrychium Lunaria* (Common Moonwort). Our rarest Lycopod is *Selaginella selaginoides* (Less Alpine Clubmoss).

REPORT FOR 1888 ON THE FUNGI OF THE EAST OF SCOTLAND.

By Prof. James W. H. Trail.

DURING the past year I have again been able to add a good many records to the lists of the Fungi of the East of Scotland. As in former lists, most of these are from the province of "Dee," the others (four in number) being from the neighbourhood of Montrose.

A large proportion of the species recorded in the present list are new to Scotland, indicated by the names being printed in ionic characters, some being new to Britain or to science. The most conspicuous addition to the British flora is *Peziza ancilis* Pers., which measures as much as $2\frac{1}{2}$ inches across the cups, and is conspicuous alike from its size and from the cups growing gregariously.

I have to thank Mr. Phillips for his kindness in naming for me the *Discomycetes* in this list. Besides the Fungi of which I have been able to ascertain the names, I have during the past year gathered a number of others, a considerable proportion of which are probably new to Scotland, though lack of time during the summer has prevented their identification.

Dr. Buchanan White has kindly favoured me with a large bundle of specimens from Perthshire, on which I hope to report on a future occasion.

Province of Tay.

Cyphella capula Fr., on dead stems of *Calluna vulgaris*, in the Trossachs, in autumn.

Epicoccum purpurascens Ehr., on dead stems of *Galium erectum*, in July, 1888, at Dubton, near Montrose.

Peronospora alta Fckl., on *Plantago major*, near Callander, in autumn.

Lachnella crucifera Ph. & Pb., on dead twigs of *Myrica gale*, in the Trossachs, in autumn.

Anthostomella ammophila (Ph. & Pl.), on dead leaves of *Psamma arenaria*, in July, 1888, on Links of St. Cyrus, near Montrose.

Ophiobolus fruticum (R. & D.) Sacc., on dead stems of *Ononis arvensis*, on Links of St. Cyrus, in July.

Taphrina Umbelliferarum Rostr., on *Heracleum Sphondylium*, at St. Cyrus, in July.

PROVINCE OF DEE.

Agaricus (Mycena) pterigenus Fr., on dead ferns., Murtle, in October.

Cyphella capula Fr., on dead twigs of *Calluna vulgaris* in several places in Aberdeenshire, in April and May.

Cyathus striatus Hoffm., in a flower-pot at Broomend, Inverurie, sent me by Mr. Tait, in July.

Puccinia Andersoni B. & Br., on *Carduus heterophyllus*, in autumn, Murtle, on Deeside.

P. Trailii Plowr., on *Phragmites communis*, with its Æcidium on *Rumex Acetosa*, in June.

P. Virgaureæ (D.C.), on *Solidago Virgaurea*, near Old Aberdeen, in autumn.

Cæoma Laricis (Westd.), on leaves of *Larix europaea*, in early summer.

Phyllosticta Sambuci Desm., in spots on living leaves of *Sambucus nigra* (*Scot. Nat.*, VIII., p. 272), near Aberdeen, in October.

Ph. Cytisi Desm., in spots on living leaves of *Cytisus Laburnum* (*S. N.*, VIII., p. 277), near Aberdeen, in October.

Ph. Acetosæ Sacc., on leaves of *Rumex Acetosa*, near Aberdeen, in November.

Phoma stictica B. & Br., on twigs of *Buxus sempervirens*, in April, at Banchory.

P. phacidioides Sacc., on leaves of *Buxus sempervirens*, in April, at Banchory.

Septoria lamiicola Sacc., on leaves of *Lamium purpureum*, near Aberdeen, in November. (*S.N.*, VIII., p. 229.)

Rhabdospora salicella (B. & Br.) Sacc., on twig of *Salix*, in April, near Aberdeen.

Sphaeronæmella Mougeotii (Fr.) Sacc., on twigs of *Hedera Helix*, in April, at Goval, near Aberdeen.

Leptostroma botryoides Sacc., on dead leaf of *Fagus sylvatica*, near Bennachie, in April.

Discella carbonacea (Fr.) B. & Br., on twig of Salix, at Scotston, near Aberdeen, in April.

Thyrsidium hedericolum (De Not) D. & M. (= *Cheirospora botryoides* Fr.), on dead twigs of *Hedera Helix*, in April, at Goval.

Peronospora alta, on leaves of *Plantago major*, in autumn, near Aberdeen.

P. Lamii A. Braun, on leaves of *Lamium maculatum*, in autumn, at Midmar.

P. Violæ De Bury, on leaves of *Viola tricolor*, var. *arvensis*, in autumn, near Ellon.

Peziza ancilis Pers., on ground on Tyrebagger Hill, near Aberdeen, in April, new to Britain.

P. Crouani Cooke, on ground near Aberdeen, in April.

Hymenoscypha rhodoleuca (Fr.), on dead stems of *Equisetum ? arvense*, in May, at Portlethen, near Aberdeen.

H. Urticæ (Pers.), on dead stems of *Urtica dioica*, near Aberdeen, in April.

H. loliicola Phil. (sp.n.), on dead stems of *Lolium perenne*, on Tyrebagger Hill, near Aberdeen, in April.

M. (Pseudopeziza) Alismatis Phil. & Trail (*Grevillea*, XVI., p. 93), on leaves of *Alisma Plantago*, at Cults and near new Bridge of Don, in autumn.

Lachnella luzulina Phil., on dead leaves of *Luzula maxima*, at Seaton, near Aberdeen, in July.

L. aspidiicola (B. & Br.), on dead petioles, &c., of *Aspidium Filix-mas*, and of *A. dilatatum*, near Aberdeen, at Monymusk, &c., in April.

L. diminuta (Rob.), on dead leaves of *Aira cæspitosa*, near Aberdeen, in spring; common.

L. callimorpha (Karst.), on dead leaves of *Eriophorum angustifolium* in April and May, in various places near Aberdeen.

Tapesia fusca (Pers.), on dead stems of *Calluna vulgaris*, in April and May, plentiful near Aberdeen.

Ryparobius Cookei (Crouan), on dog's dung, near Aberdeen, in April.

Ombrophila helotioides Phil., on dead *Equisetum*, at Loch of Park, on Deeside, in autumn (C. B. Plowright). (*Grevillea*, XVI., p. 94).

Anthostomella ammophila (Ph. & Pl.), on dead leaves of *Psamma arenaria*, in summer, on Links near Aberdeen.

Philocopra Hansenii Oud., on hare's dung, on Bennachie, in April,

Sphaerella Vaccinii Cooke, on dead leaves of *Vaccinium Myrtillus*, on Bennachie, in April.

S. Duchartrei Crié, on dead leaves of *Vinca minor*, in the Corbie Den, near Aberdeen, in May.

S. melanoplaca Desm., on branches of *Geum urbanum*, at Murtle, near Aberdeen, in March.

S. Pteridis (Fr.), on fronds of *Pteris aquilina*, at Inverurie, in August.

Sporormia Notarisii Ces., on grouse dung on Bennachie, in April.

Ophiobolus Tanaceti (Fckl.) Sacc., on dead lobes of leaf of *Achillea Millefolium*, near Aberdeen, in autumn.

CONTRIBUTIONS TOWARDS A FLORA OF CAITHNESS.

By J. F. Grant and Arthur Bennett, F.L.S.

(Continued from page 307.)

Signification of signs used.

Wherever no authority follows a locality the latter rests on that of Mr. Grant, or on one of his *confrères* named below.

The sign † is used to express a more or less strong suspicion of non-nativity.

The sign ! is used to show that a specimen from the locality named has been seen by the second of the authors of this paper.

The authorities for the plant names are omitted as being well-known; except in the case of varieties, &c., that are not to be found in our manuals.

For additional local information on the Caithness Flora we are indebted to the following gentlemen (whose names should have

appeared in the first part of this paper):—Messrs. D. Bain, J. Dunnet, T. Henderson, R. Lindsay, W. Robertson, and P. Rosie.

As it is probable that during the time this paper is being printed, other material will accumulate, the authors hope to publish a Supplement, hence any additional matter sent to either will be most acceptable; and at that time advantage may be taken to make some critical notes, &c. on the forms.

Caithness. Co. 109 Top. Botany.

Thalictrum (minus) maritimum.

Sandy links by the sea. Between Sandside and Reay. *H. C. Watson.* Reay Links. *F. J. Hanbury.*! Freswick and Dunnet Sands. Ackergill Links. A very tall form grows on the sandhills, and is marked "*T. majus Jacq.*" in the Dick Herbarium.

T. flavum.

Top. Bot. ed. 1.

T. alpinum.

Brubster, 3/7/88. *T. Henderson.*! "Boggy ground on hills."

Ranunculus trichophyllus.

Frequent in old disused quarries.

R. Drouetii.

Dunnet Links. *F. J. Hanbury.*! Reay. *Rev. E. Marshall.*!

R. heterophyllus.

Castletown, Sibster. Reay Links, and Pond on road between Wick and Castletown. *F. J. Hanbury.*!

R. Baudotii.

Watery places by the sea. Reay and Castletown.

R. hederaceus.

Shallow pools and ditches, abundant. Thurso, *Strömfelt;* Hill of Dunnet, *H. H. Johnstone.*!

R. Flammula.

Wet places by rivers and lochs. About Reay. *H. C. Watson.* Wick River.!

R. acris.

Reay Links. *Dr. A. Davidson.*! Wick. *Rev. E. Marshall.*! Abundant.

R. bulbosus.

Rather rare and local. Most commonly found, in a dwarf state, on links by the sea.

R. repens.
Common in meadows and by waysides.

† **R. arvensis.**
Cornfields, introduced with seed from countries further south.

R. Ficaria.
Common in shady places, and frequently by the sea.

R. sceleratus.
Wick River. *C. W. Peach.*

Caltha palustris.
Reay. *H. C. Watson.* Abundant.

Trollius europæus.
Abundant in meadows near Thurso, and frequent in the county. *F. J. Hanbury.* Local, Wick and Thurso Rivers, and Reisgill Burn.

Aquilegia vulgaris. "Side of Thurso River, outcast." *Dick herb.*

† **Berberis vulgaris.**
Roadsides. Conisby, Brough, Dunnet, and hedgerows throughout the county; "near Thurso." *Dick herb.*

Nuphar pumilum.
Loch Winless. *Dr. A. Davidson.* !

Nymphæa alba.
Loch Winless, "*Mr. D. Bain*," and in the Reay district. Formerly reported from Loch Brickigoe, Thrumster, but now extinct. In ponds at Watten, Stirkoke, and near Thurso, introduced.

† **Papaver Rhœas.**
Cultivated ground, Wick, Thurso, Dunbeath, John o' Groats.

† **P. dubium.**
Oat field at Westerseat once plentiful. In turnip fields in several parishes, more common than P. Rhœas.

† **Chelidonium majus.**

Fumaria officinalis.
Reay. *H. C. Watson.* Common.

Nasturtium officinale.
Watercourses. Lybster, Wick, Thurso, Halkirk, &c., but rather local.

Barbarea vulgaris.
River banks. Sibster. Bleachfield on Thurso River, not common.

Arabis sagittata.
Dorrery, rare. Cliffs at Dirlot. *Dick herb.*

† **Cheiranthus Cheiri.** *R. Dick* in *Watson's* MS.S.

Cardamine pratensis,
Abundant; double flowers not infrequent.

C. hirsuta.
Yarrows Hills! Near Thurso. *Strömfelt*; Dunbeath, Wick.

C. flexuosa.
Shady and elevated places. Yarrows Hills. !

Draba incana.
Yarrows Hills! Yarehouse, Forss Water. Latheronwheel! Dunbeath. Berriedale, rocky ledges amongst hills or by the sea.

Erophila vulgaris.
Local, often near houses.

Cochlearia officinalis.
Common. Cliffs south of Wick. *Revd. E. Marshall*! Lybster. !

C. alpina.
Sea cliffs at Lybster, and muddy banks of Wick River near mouth. !
Caithness, *R. Dick.*

Sisymbrium Thaliana, Rocks; Lybster.
Hedge sides, very rare and local. Abundant near Thurso. *Dick herb.*

S. officinale. Hedge sides near the cemetery, Thurso.

† **S. Sophia.** On ballast, Thurso sea shore, 1855. *Dick herb.*

Capsella Bursa-pastoris. Plentiful everywhere.

† **Camelina sativa.** *R. Dick* in *Watson's* MS.S.

Senebiera Coronopus.
Waste ground, not common. On ballast, Thurso. *Dick herb.*

Thlaspi arvense.
Rather local, the parish of Dunnet being the only district where it is at all common.

Cakile maritima.
Murkle Bay. *F. J. Hanbury.* Sandy seashores, Keiss, Dunnet, and Freswick. Wester Links, Wick!

Sinapis arvensis.
Abundant.

Raphanus Raphanistrum.
Abundant.

† **Reseda luteola.**
Thurso. *F. J. Hanbury!*
Railway cutting near Georgemas; introduced in railway ballast.

Viola palustris.
Bogs in mountainous districts.

V. Riviniana.
Scouthal. Wick river. Castletown!

V. canina.
Ditch banks, common. Gilloch.

V. tricolor.
Near cultivated ground abundant; flowers much larger than in southern forms. Near Wick. *Rev. E. Marshall.* Westerseat!

V. arvensis.
Common. The Glebe. Wick!

V. Curtisii.
Sandy Links. Ackergill! Wester, Keiss, Murkle, & Reay; Dunnet Links *Rev. E. Marshall!*

V. lutea.
Reay Links.
var. **amœna.**
Shores of Loch Wester! Near Ackergill Tower!

Polygala vulgaris (seg).
Banks of Thurso River. *F. J. Hanbury.!*
Dry pastures and moors.

P. serpyllacea.
Heaths, common.

Drosera rotundifolia.
Moors, common.

D. anglica.
"Macnab spec." *H. C. Watson.* Bilbster. *Rev. E. Marshall.!* Morven. *F. J. Hanbury.*! Moors, common.

D. intermedia.
Near Loch Winless. Dr. Davidson. Specimens in Dick's herbarium are marked "???" Rare.

Silene Cucubalus.
Rather local; Wick and Thurso Rivers.

S. maritima.
Mouth of the Forss Water. *F. J. Hanbury.*
Common on sea-cliffs.

Lychnis alba.

Banks of rivers and small streams ; also sometimes on sandhills, as at Dunnet, Reay and Sandside.

L. diurna.

River banks and grassy cliffs by the sea. Thurso River. !

L. Flos-cuculi.

Damp ground, common.

L. Githago.

Cornfields.

Cerastium tetrandrum.

Sandy ground near the sea, common. Sinclair Bay. ! Walls of Girniegoe Castle. ! Murkle Bay, *F. J. Hanbury*. !

C. glomeratum.

Fieldsides, frequent.

C. triviale.

The commonest species. Dunnet Sands. !

var. **pentandrum.**

Sandy seashores. Keiss Links. ! Dr. Lange would refer these specimens to **C. pumilum** Curtis, but to me they seem to belong to this var. of *triviale*. Ar. B.

Stellaria media.

Everywhere.

var. **neglecta.** Cultivated ground. Oldwick, &c. ! Shorelands.

Stellaria Holostea.

River banks, common.

S. graminea.

Dry banks, frequent.

S. uliginosa.

River sides, common. Wick River. !

Arenaria trinervia.

Mois woods. Dunbeath. !

A. serpyllifolia.

Near houses, on dykes, local.

A. peploides.

Sea-beaches, common.

Sagina maritima.

On Keiss Links ! and similar situations ; a small form occurs, intermediate between type and var. *densa*, on Holborn Head. !

S. procumbens.
Waste ground. Keiss Links. ! Gersa, Watten. !

S. nodosa.
Damp places, especially by the shores of lochs.

S. apetala, dry ground near the sea.

Spergula arvensis (sativa).
Common in corn fields. Bilbster, *Rev. E. Marshall.* !

Spergularia neglecta.
Shaltigoe, Wick !

Montia fontana.
Watery places abundant ; Shores of Yarrow Loch. !

Hypericum perforatum.
Banks of streams.

H. dubium.
Ditch banks, and sides of streams.

H. humifusum.
Heaths and dry banks.

H. pulchrum.
Heaths and banks ; the commonest species.

Radiola millegrana. Westfield. *T. Henderson.*

† **Linum usitatissimum.** Cultivated ground near Thurso. *Dick herb.*

L. catharticum.
Pasture ground and dry moors, common. Gillock ! Wick !

Geranium sanguineum.
Rocky ledges on Reisgill Burn near the mouth. !

G. sylvaticum.
Slopes of burns, and river-banks ; Forss Water, Thurso River, Reisgill Burn ! Dunbeath Water.

G. molle.
Plentiful.

Geranium dissectum.
Waste places, frequent.

G. Robertianum.
Woods at Dunbeath, Watten ; and rocky ledges on hills ; sometimes on the rubbish-heaps beside old tumuli.

Erodium cicutarium.
Mostly by the sea on sandy downs ; Reay Links, *Rev. W. R. Linton* !

Oxalis acetosella.
Shady places, common, Scouthal Wood, Watten !

Malva moschata.
Top. Bot. ed. 1. A garden escape ?

† **Euonymus europæus.**
Top. Bot. ed. 1. Certainly introduced.

Ulex europæus.
Heaths and banks ; near Thurso ; *Strömfelt.*

Cytisus scoparius.
Banks, rather local.

Medicago lupulina.
Very common. !

Trifolium pratense.
In fields. Keiss !

† **T. hybridum.**
Westerseat !

T. repens.
Abundant.

T. procumbens.
Near Fields. *Dr. Davidson spec. !*

T. dubium.
Dry banks ; Thurso River !

† **T. agrarium.**
Westerseat ; field near Watten, *Dr. Ward !*

Anthyllis Vulneraria.
Banks, common.

var. **Dillenii.**
By the sea ; Freswick, Cliffs near Thurso, Brough, &c.; Thurso. *W. W. Reeves !* Between Thurso and Forss Water. *F. J. Hanbury !* Spear Head. *Dr. Ward !*

(**Melilotus officinalis**). Old quarry heaps at Hillhead.

Lotus corniculatus.
Ditches, and banks, common ; Near top of Morven !

L. pilosus.
Sibster. Ormlie and Thurso, *Dick herb.*

Oxytropis uralensis.
Seacliffs, Downreay. From Downreay along the coast to the mouth of the Borgie, *F. J. Hanbury !*

Vicia hirsuta.
Ditches and hedge-banks.

V. Cracca.

Ditches and Seacliffs abundant, Freswick Head! 1 mile west of Reay, *Hanbury* and *Marshall*, and gathered by *Mr. W. W. Reeves* coming between the type and var. *macrophylla* Regel, a beautiful plant. !

V. sylvatica.

Rare and local. Thrumster, Reisgill Burn, Dunbeath; grassy banks opposite Cemetery at Thurso. *F. J. Hanbury!*

V. sepium.

Dry banks of rivers and burns, and occasionally by roadsides.

† V. sativa.

Cultivated ground.

Lathyrus pratensis.

Ditches, and fields, abundant. Reay Links!

L. montanus.

Banks of streams.

Prunus spinosa.

Rare. Acharole, Watten. !

P. Avium.

Top. Bot. ed. 1. Dirlot, near the ruins of an old castle.

P. Padus.

Reisgill, Dirlot, Berriedale, Dunbeath, always on the banks of streams.

Spiraea Ulmaria.

Wet places, abundant. Reay Links, *F. J. Hanbury.*

S. Filipendula.

Rare. Hempriggs!

Rubus Idæus.

Hedge-sides and on mountain ledges, Morven, at 2,300 ft!

R. corylifolius.

Thurso River, near Cemetery! and above the station; also on Reay Burn. Scouthal Wood, *Dr. Davidson!*

R. cæsius.

Ben Dorrery? Dirlot? (? not above Perthshire, *Watson.*)

R. saxatilis.

Altnabreac, Thurso River. Reisgill Burn!

R. Chamæmorus.

Upland districts of the county. Corriechoich. Altnabreac. Knockfin Heights! Morven.

Geum urbanum.

Shady places, Thurso River opposite Bleachfield, Forss Water, Dunbeath Woods. Scouthal Wood, Wick River, Dirlot, *Dick herb.*

G. rivale.

Damp places, frequent.

Fragaria vesca.

Rocky river-ledges. Reisgill Burn. Lybster !

Potentilla Fragariastrum.

Dry banks, Yarrows ; bank of stream above Wick. *F. J. Hanbury !*

P. Tormentilla.

Heaths, dry banks ; common.

P. anserina.

Waste ground, common.

P. Comarum.

Watery places, frequent. Loch Durran. *F. J. Hanbury* ; ditches near Loch Winless. *F. J. Hanbury !*

Alchemilla arvensis.

Fields, rather rare.

A. vulgaris.

Wet meadows, common ; North part of Caithness, *H. C. Watson.*

A. alpina.

Morven, at 2,000 ft. !

Agrimonia Eupatoria.

Shady places, rare, Thurso River, opposite the Cemetery, and near the Cruives.

Rosa spinosissima.

The commonest species, frequent by the seaside on cliffs ; Watten Burn ! Sandy coast near Reay. *H. C. Watson.*

R. involuta var. **Sabini.**

Rocky ledges on Hills, Dorrery and Reay. *Robert Dick*, spec. ! *Dr. Davidson.*

R. mollis.

Dunbeath Strath ! Watten ! Acharole Burn, and Thurso River.

R. mollis var. **cœrulea.**

Scouthal, Watten, Dunbeath !

R. tomentosa.
Dunbeath Strath ! Thurso River !

var. **subglobosa.**
Houstry Burn ! Dunbeath !

† **R. rubiginosa.**
Hedgesides near Scouthal, at Achingale and Sibster.

R. micrantha.
Dick's herbarium.

R. canina.
var. **lutetiana.**
Dunbeath Strath ! Thurso River.
var. **dumalis.**
Dunbeath Strath !
var. **urbica.** Dunbeath ! Thurso ; and form **platyphylla,** Dunbeath !
var. **arvatica.**
Dunbeath and Thurso !
var. **subcristata.**
Watten, Dunbeath and Houstry Waters !

Dryas octopetala.
Caithness, *Anderson's Guide ;* Dr. Robert Brown doubted this in his Catalogue to Mr. H. C. Watson.

Pyrus Aucuparia.
Copses and sides of streams ; Scouthal, Dunbeath, Strathmore, Reay, *F. J. Hanbury*, Watten.

† **Cratægus Oxyacantha.**
Hedge-rows and sides of stream ; Sibster, Watten, Scouthal, Dunbeath.

Saxifraga tridactylites.
Dry places, Dunnet, *Dick Herbarium.*

S. hypnoides.
Bilbster ! Sibster.

S. stellaris.
Morven, *F. J. Hanbury ! Dick herb.*

S. oppositifolia.

Chrysosplenium oppositifolium.
Moist places, Dunbeath Strath, and Strathmore, near Thurso, *Strömfelt.*

Parnassia palustris.
Damp ground, moors, cliffs, and links by the sea ; Murkle Bay, *F. J. Hanbury !* Keiss Links, *Rev. E. Marshall !*

Ribes petræum.
Dunbeath Strath !

† **Ribes rubrum.**
Thurso, East Wood, *Dick herb.*

Sedum Rhodiola.
Seacliffs, Wick, John o' Groats, especially abundant east of Thurso, Duncansby Head !

S. anglicum.

S. acre. Near houses, and on sandy ground by the sea, Reay and Keiss.

Hippuris vulgaris.
Rather local, in old quarries with *Lemna.* Thurso, Stirkoke. Bower, Ditches by Loch Winless, *F. J. Hanbury.*

Myriophyllum spicatum.
Rivers and ponds, local.

M. alterniflorum.
Lochs, and streams, common ; Thurso river and stream out of Loch Winless. *F. J. Hanbury !* Pulteney Town water-course !

Callitriche stagnalis.
Muddy places. Gilloch, Castletown, Reay, Sibster !

C. hamulata.
Ditches, frequents. Halkirk ; *Dr. Davidson !*

C. autumnalis.
Deep lochs ; Calder, Watten, Wick water-course ! Yarrows Loch !

Peplis Portula.
Watery places, rare, Dunnet, near Thurso. *Dick Herb.*

Epilobium angustifolium.
Banks and rocky ledges. Hempriggs, Dunbeath, Yarrows hills, Dorrery, Braemore, Thurso River, Reay, Forss Water.

E. parviflorum.
Watercourse, Dunnet Links !

E. montanum.
Common. Dunbeath Strath, *F. J. Hanbury !*

E. obscurum.
Wet places, shores of lochs, &c., *F. J. Hanbury !*

E. palustre.
Watery places, common ; Loch Winless, *F. J. Hanbury !*

E. hirsutum.

Circæa lutetiana.
Copses, Dunbeath and Berriedale, rare ; between Navidale and Ord of Caithness, *Moray Coll.*

Hydrocotyle vulgaris.
Marshes and bogs, common.

Sanicula europæa.
Yarehouse, Dunbeath, Forss Water, Berriedale.

Conium maculatum.
Waste ground near houses.

Apium inundatum.
Boggy ground, Georgemas, Gilloch, Winless, Stream out of Loch Winless, *F. J. Hanbury.*

† **Carum Carui.**
Generally near the sea ; Duncansbay ; roadside east of Thurso, *F. J. Hanbury.*

Ægopodium Podagraria.
Thrumster, Staxigoe, Lybster, Thurso, &c., near houses.

Pimpinella Saxifraga.
Fields between John O'Groat's and Duncansbay Head.

Conopodium denudatum.
Fields, frequent.

† **Myrrhis odorata.**
Near houses, evidently a garden escape.

Scandix Pecten-Veneris.
Cornfields, often introduced with seed.

Anthriscus vulgaris.
Roadsides and fields.

A. sylvestris.
Hedgebanks, local.

Ligusticum scoticum.
Sea-cliffs and sandhills abundant ; Berriedale, *G. Gordon ;* near Wick (*Mr. M'Leay*), Withering. Near Reay and rocky cliffs at the mouth of the Forss water, *F. J. Hanbury !*

Angelica sylvestris.
Wet places, frequent.

† **Peucedanum Ostruthium.**
West side of Thurso river below the railway, *F. J. Hanbury*

Heracleum Sphondylium.
Waste ground, common.

Daucus Carota.
Dry banks.

Caucalis Anthriscus.
Hedgesides, Sibster and near Thurso.

† **Sambucus nigra.**
Roadsides. The only tree that grows luxuriantly in Caithness. Wick, Thurso, &c., Reay, *F. J. Hanbury.*

S. Ebulus. *Dick herb.*

Viburnum Opulus.
Rocky sides of streams, Lybster! Strath Watten!

Hedera Helix, Wick River, Thurso River, Dunbeath, &c.

Lonicera Periclymenum, Rocky ledges of Wick River below Sibster; Strath, Watten; Dunbeath; Isauld Burn, &c.

Galium boreale.
Rocks, Acharole, Dunbeath, Thurso River, Reisgill Burn, near Wick, *W. W. Reeves!*

G. verum.
Ditches and banks, common, Caithness! *H. C. Watson.*

G. saxatile.
Common.

G. palustre.
Marshes, common.

G. uliginosum.
With *G. palustre*, common.

G. Aparine.
Waste ground and hedgesides.

Asperula odorata.
Woods and subalpine rocks.

Sherardia arvensis.
Fields, common.

Valeriana officinalis.
Marshes, and wet places, frequent.

Valerianella olitoria, cornfields, (introduced?)

Scabiosa succisa.

Dry pastures, common.

Solidago Virgaurea.

Rocky banks, common; and by the sea. Freswick Head. !

Bellis perennis.

Abundant. The average specimens growing on boulder-clay pastures are much larger and finer than any that I have seen in other parts of Scotland. *J. Grant.*

Aster Tripolium.

Muddy and marshy ground by the sea, plentiful. Near Wick. *C. W. Peach.*

Antennaria dioica.

Heathy pastures, local.

Gnaphalium uliginosum.

Damp fields and roadsides.

G. sylvaticum.

Pasture ground.

Achillea Millefolium.

Abundant.

A. Ptarmica.

Waste places.

Anthemis arvensis.

Cultivated ground. The Glebe. Wick. !

Chrysanthemum segetum.

Fields, abundant. Bed of Thurso River. *F. J. Hanbury.* !

C. Leucanthemum.

Thurso River !, Sibster, and occasionally by roadsides. Rather local in the eastern parts of the county.

†C. Parthenium.

Near houses.

Matricaria inodora.

A common weed everywhere.

var. **salina.**

Sea cliffs and beaches; sandhills at Keiss; cliffs west of Reay. *F. J. Hanbury.* ! Mr. Beeby remarks on a specimen from the sandhills at Dunnet, "*salina* and *phæocephala* pass into each other, and the Caithness form is probably intermediate." *Journal of Botany.*

Artemisia vulgaris.

Ditch banks, and edges of fields.

Artemisia Absinthium. *R. Dick* in *Watson's MS.*

Tussilago Farfara.

Common.

Petasites vulgaris.

Lybster. *Dick herb.* Thurso, Canisbay, Bilbster ! Wick. The specimens on the banks of the Thurso River, near the railway, are probably *albus. J. F. Grant.*

Senecio vulgaris.

A common weed.

S. sylvaticus.

Walls and roofs of houses, not so frequent as *S. vulgaris.*

S. Jacobæa.

Thurso, Berriedale, Reay, John o' Groat's. Very local, and usually found on sandhills by the sea.

S. aquaticus.

Very common. *G. Nicholson.* Especially on a poor soil.

Arctium nemorosum.

Sandhills. Reay. *Rev. W. R. Linton. !*

A. minus.

The commonest form, especially by the sea.

A. intermedium.

"*Rev. W. R. Linton.*"

Cnicus lanceolatus.

Abundant.

C. palustris, wet fields and ditches, common.

C. heterophyllus.

In subalpine situations. Thurso River, Reisgill Burn, Scorriclett.

C. arvensis.

Abundant.

var. **setosus**—Railway cutting at Georgemas.

Saussurea alpina.

Sea cliffs 2 miles east of Thurso. *G. Horn. !*

Centaurea nigra.

Common.

† **C. Cyanus.**

Corn fields probably introduced.

† **Cichorium Intybus.**

Corn fields introduced.

(To be continued.)

THE GALL-MAKING DIPTERA OF SCOTLAND.

BY PROF. J. W. H. TRAIL, A.M., M.D., F.L.S.

(Read before the E.S. Union of Naturalists' Societies, in June, 1887.)

(*Continued from page* 328.)

Populus Tremula (Aspen) has the leaf-stalks galled by *Diplosis Tremulæ* Winn. The galls seldom encroach on the twigs, but often do so on the base of the leaf-blade. Each is rounded, about 6 mm. across, tapering a little above and below, smooth, reddish or yellowish green, with a thick hard wall, and small cavity, occupied by one larva. When the larva is full fed, the gall splits at one side, dries up, and becomes brown and harder. These galls are not uncommon in various places along Deeside (T.S.N., II., 253; T.A., I., 68).

Salix. In this large genus galls have been found in Scotland of at least five species of *Cecidomyidæ*, viz.:

1. *C. Salicis* Schrk. (*C. gallarum-salicis* Hardy, Trans. Bot. Soc., Edin., IV., 78-79), which causes fusiform swellings of the twigs, which may be from two to five times the natural thickness. In these swellings the woody tissue is not increased; but the pith is much enlarged, and contains several cavities, each occupied by a larva; the surface hardly differs from that of an ordinary twig.
2. *C. rosaria* H.Lw. (*C. cinerearum* Hardy, Trans. Bot. Soc., Edin., IV., 78, Scot. Gard., III., 84), causes rosette-galls at the tips of the twigs of the *Caprea* group of *Salix*. The leaves remain small, crowded, and sessile; and surround a small central space, almost filled with hairs, occupied by larvæ.
3. *C. heterobia* H.Loew (*C. saligna* Hardy, Trans. Bot. Soc., Edin., IV, 78), either produces rosette-galls on tips of twigs of various willows, or galls the male catkins, which become swollen, hairy, and deformed. Both forms have been sent me from *Salix triandra* near Perth by Dr. Buchanan White; and Mr. Hardy records it (as *C. saligna*) from rosette-galls on *S. cinerea* in Berwickshire.

4. *C. marginemtorquens* Bremi, curls back the edges of the leaves of *S. viminalis*, for an inch or more along each side; and renders them thick, fleshy, hard, and yellow. The separate galls measure about 6 by $1\frac{1}{2}$ mm.
5. *Hormomyia Capreæ* Winn. forms pear-shaped bodies, scattered over the leaves, often in considerable numbers, with the broad part projecting above the leaf, and the narrow end below; each is about $1\frac{1}{2}$-2 mm. long and broad; the walls are hard and woody.

Another form of gall, perhaps the work of the same insect, is much like the last in texture, but is rather larger and deeper green; the galls are usually coherent in masses along the mid-ribs and chief veins. They are often common. They open below by an orifice for each gall to allow the larva to escape.

S. triandra L. From Woody Island, in the Tay near Perth, Dr. White has sent me galls of *Cec. heterobia* H.Lw. on this willow, both as swollen catkins and as leafy rosette-galls. The former seem to prevail in spring, the latter in summer and in autumn.

Salix Caprea.

1. Galls of *C. Salicis* Schranck.
2. Galls of *C. rosaria* H.Lw.
3. Galls of *C. Capreæ* Winn. in typical condition, and also the form described above resembling the latter.

All occur in Aberdeenshire, the three last mentioned abundantly; I have these three from Sutherland, Moray, Kincardine, Forfar, and Perth, (T.S.N., II., 301-2; T.A., I., 69), and Mr. Binnie (B.I., 162) describes them from Glasgow.

S. cinerea. The same remarks apply to this as to *S. Caprea*; only on it I have never seen the galls I attribute to *C. Salicis* forming any save slender enlargements of the twigs (references as above, except T.A., 1878, p. 70). Mr. Hardy (*l.c.*, p. 78) records his *C. saligna* from leaf-rosettes of this plant.

S. aurita. I have no record of galls of *C. Salicis* from this willow (though doubtless it sometimes bears them), but I have the forms 2 and 5, from Sutherland and Aber-

deenshire to Perth. Mr. Binnie does not mention them. (References as for *S. cinerea*).

S. viminalis (Osier). Galls of *C. marginemtorquens* Bremi are common on one or two low trees near Old Aberdeen (T.S.N., I., 193; T.A., I., 70). Mr. Binnie records them from near Glasgow (B.I., 162).

S. purpurea (Purple Osier) bears galls of *C. Salicis*, reaching a length occasionally of two inches, and a thickness four or five times that of the twig. From galls gathered near Banchory, in Kincardine, in the beginning of May, I reared the insects in the end of May (T.S.N., II.. 393; T.A., I., 7).

Quercus Robur L.

1. Very frequently (so far as my experience holds, wherever the tree is found) the lobes or portions of the leaf-margins are folded back so as to protect a space underneath, and the folded portion is thickened, slightly fleshy, and yellowish. In the space live one or more larvæ of *Diplosis dryobia* F.Lw. (C. pustularis Bremi) (T.A., I, 74; B.II., 183).
2. Mr. Binnie (B.II., 179-81) records and describes as new, under the name *Cecidomyia Quercus* sp.n., a midge reared by him from among the leaves of slightly arrested and twisted terminal shoots of oaks. The pseudo-gall is not conspicuous till it withers, after the larva has left it, to pupate in the earth. The midges appeared in September. The galls are common near Glasgow. Mr. Cameron has also found the acorn cups distorted by larvæ of a midge.

Fagus sylvatica (Beech). The leaves of this tree very often bear small erect galls, like rifle-bullets in form, about 3 by 1 mm., at first green, but becoming brown. They are arranged usually along each side of the midrib; and sometimes two are joined at the base. On the lower surface of the leaf is a raised piece, like a scale, opposite each gall. The walls are thin. When the larvæ are full-fed, the galls break off and fall to the ground. There are two forms, probably the work of the same insect; one having the surface covered with erect brown

hairs, and the apex of the gall more rounded ; the other nearly smooth (but in fact bearing a fine coat of *adpressed* hairs), and with a more acute apex. The former is certainly the work of *Hormomyia piligera* H.Lw. ; the latter also is probably the work of this insect, but the galls have been attributed by Bremi to *C. tornatella*, which he named from the gall, though he did not rear the insects. I have both galls from Scotland ; those of *tornatella* from Aberdeen, Kincardine, Forfar, and Perthshires ; those of *H. piligera* from Forres in Moray, and from Glamis in Forfarshire. Mr. Binnie also mentions it from near Glasgow (B.I., 162 ; T.S.N., I., 235, VI., 256-7 ; T.A., I., 74-75).

Betula alba (Birch).

1. Mr. Binnie (B.II., 182) records finding swollen catkins near Glasgow, tenanted by larvæ of *C. Betulæ* Kalt. probably ; and I have found the same pseudo-galls recently near Aberdeen.
2. Fusiform hollow swellings of the midribs, sometimes 12 mm. long, by $1\frac{1}{2}$-$1\frac{3}{4}$, tenanted by one whitish larva of *Cecidomyia ;* found in autumn by me in Strathnaver in Sutherland, in Aberdeenshire, and at Dunkeld, and reported by Mr. Binnie, from Glasgow.
3. Round blister-galls in the leaf-blades, two, three, or more in each, reaching sometimes 4 mm. across by $2\frac{1}{2}$ mm. thick ; often two or three are joined by the edges. The wall is very thin ; the surface is like that of the leaf, but each gall is surrounded by a purple ring above. Each contains one larva, which, when full fed, bores through the lower surface, falls to the ground, and pupates there. The galls are common in July, in Aberdeenshire, on low bushy plants, and I have found them also in Sutherland, Kincardine, and Perth ; and Mr. Binnie reports them from near Glasgow.
4. The buds at the tips of the twigs are swollen and occupied by larvæ of *Cecidomyia.* Occurred on the same bushes as No. 3 (references for 2, 3, and 4 are T.S.N., II., 304 ; T.A., I., 75).

Juniperus communis (Common Juniper) in upland districts

very commonly bears galls of *Hormomyia juniperina* L., in the form of terminal ovate triangular cones on the slender twigs, each composed of three flattened leaves, which meet along their edges, and enclose three smaller leaves, between which is a cavity occupied by the larva. The galls look much like young fruit externally. They are at first green, but become brown as they dry. I have found them in Aberdeenshire, and Mr. Binnie has reported them to me from near Glasgow. (T.S.N., I., 194; T.A., I., 77.)

J. nana. (Dwarf Juniper). Galls of *H. juniperina*, entirely like those on *J. communis*, are recorded by Mr. P. Cameron, from Scuir of Eigg. (*Trans. N. H., Glasgow;* N.S., I., pt. 3, pp. 295-97).

Pteris aquilina (Bracken Fern). The pinnules have the margins revolute, fleshy, at first yellowish-red, later deep black. Each is tenanted by one orange larva of *Cecidomyia Pteridis* Mueller. The galls are very plentiful wherever I have looked for them, and Mr. Binnie reports them from Glasgow. (T.S.N., II., 304; T.A., I., 77-78, B.I., 163).

Nephrodium dilatatum and **N. Filix-mas** frequently bear pseudo-galls, which consist of unexpanded fronds, the pinnæ of which remained rolled up into a ball, from 10 to 50 mm. in diameter. The outer pinnæ are green, but those in the centre are black and decayed; and amongst them live one or more larvæ, which, from their structure, must belong to a species of *Anthomyia*. I have not succeeded in rearing the flies. I have found these structures near Aberdeen, from June to October, also in Kincardine, and in Forfar and Perthshire, and near Glasgow. (T.S.N., II., 305; T.A., I., 78.)

In conclusion, I subjoin a list of the gall-making Diptera of Scotland, so far as they have yet been identified. Several have been named from the galls alone, from which the insects never have been reared or obtained. Such names are placed between brackets. Some, the identifications of which are doubtful, are marked with ?

MUSCIDÆ.

Lauxania ænea Meig., said to live in galled ovaries of *Viola tricolor*; but the galls are not known from Scotland.

Anthomyia sp., on *Nephrodium dilatatum*, and on *N. Filix-mas*

TRYPETIDÆ.

Trypeta solstitialis L., in galled ovaries of *Centaurea nigra*. *Trypetæ* also gall the ovaries of *Hypochæris radicata* and of *Hieracium corymbosum*, in Scotland.

CECIDOMYIA Mg.

Thalictri H.Lw., in galled ovaries of *Thalictrum minus*, var. *montanum* and ? on *T. flexuosum*.

? **Ranunculi** Bremi., in rolled lobes of lower leaves of *Ranunculus repens*.

Cardaminis Winn., in galled flower-buds of *Cardamine pratensis*.

affinis Kieffer, in galled leaf-margins of terminal leaf rosettes of *Viola sylvatica* and *V. canina*.

? **Lychnidis** Heyd., in galled calyces of *Lychnis dioica*.

Cerastii Binnie, in galled terminal buds of *Cerastium glomeratum* and *C. triviale*.

Hyperici Bremi, in similar galls on *Hypericum pulchrum*.

floricola Rudow, in swellings of bracts and flower-buds of *Tilia vulgaris*.

(**limbivolvens** Macq.), in rolled leaf-margins of *Tilia vulgaris*.

Trifolii F.Lw., in folded leaflets of *Trifolium repens*.

? **Onobrychidis** Bremi, in galled leaflets of *Astragalus hypoglottis*.

Viciæ Kieffer in galled leaflets of *Vicia Cracca* and *V. sepium*.

(**Pruni** Kalt.), in galls on leaves of *Prunus spinosa*.

Ulmariæ Bremi., in small galls in leaves of *Spiræa Ulmaria*.

plicatrix H.Lw., in folded, twisted leaflets of *Rubus fruticosus*.

Rosarum Hardy, in folded, inflated leaflets of *Rosa canina* and *R. villosa*.

Crataegi Winn., in leaf-rosettes at the tips of branches of *Cratægus Oxycantha*.

corrugans F.Lw., in folded, twisted young leaves of *Heracleum Sphondylium*.

Galii Winn., in stem-galls or flower-buds of *Galium verum*, *G. palustre*, *G. boreale*, *G. Aparine*, and ? *G. saxatile*.

? **Galiicola** F.Lw., in leaf-rosettes on branches of *Galium verum*.

? **hygrophila** Mik, in bud-galls of *G. palustre*.

(? **Jacobeæ** H.Lw.), in swollen flower-heads of *Senecio Jacobæa* and *S. aquaticus*.

Sonchi F.Lw., in blister-galls in leaves of *Sonchus arvensis*.

Pilosellæ Binnie, on rolled leaf-margins of *Hieracium Pilosella*.

(**Campanulæ** Muell.), in galled buds of *Campanula rotundifolia*.

Veronicæ Bremi, in mite-galls on tips of shoots of *Veronica Chamædrys*.

similis F.Lw. in swollen leaf-buds or flower-buds of *Veronica scutellata*.

bursaria Bremi, small outgrowths on upper surface of leaves of *Nepeta Glechoma*.

Persicariæ L., in rolled leaf-margins of *Polygonum viviparum*, *P. amphibium* var. *terrestre*, and *P. Persicaria*.

Rumicis H.Lw., in galled flower-buds of *Rumex Acetosella*.

Urticæ Perris, in galls on leaves of *Urtica dioica*.

Salicis Schrk., in swellings in twigs of *Salix Caprea*, *S. cinerea*, and *S. purpurea*.

rosaria H.Lw., in leaf-rosettes on tips of branches of *Salix Caprea*, *S. cinerea*, and *S. aurita*.

marginem-torquens Bremi, in rolled leaf-margins of *Salix viminalis*.

heterobia H.Lw. in leaf-rosettes of *S. cinerea* and of *S. triandra*, and in swollen catkins of *S. triandra*.

Quercus Binnie, among leaves on deformed twigs of *Quercus Robur*.

(**tornatella** Bremi), in galls on leaves of *Fagus sylvatica* (perhaps a variety of *H. piligera*).

? **Betulæ** Kalt., in catkins of *Betula alba*.

(**Pteridis** Muell.), in galled leaflets of *Pteris aquilina*.

Species of *Cecidomyia*, not yet identified, cause galls on *Cytisus scoparius*, *Vicia sylvatica*, *Lathyrus pratensis*, *Rosa spinosissima*, *Galium verum*, *G. boreale*, *Valeriana officinalis*, ? *Scabiosa succisa*, *Achillea Ptarmica*, *Senecio vulgaris*, *Vaccinium Vitis-Idaea*, *Gentiana campestris*, *Fraxinus excelsior*, *Veronica serpyllifolia*, *V. officinalis*, *Rhinanthus Crista-galli*, *Thymus Serpyllum*, *Betula alba*.

DIPLOSIS H.Lw.

Helianthemi Hardy, in swollen terminal buds of *Helianthemum vulgare.*

Loti De Geer, in galled flower-buds of *Lotus major*, *L. corniculatus*, and *Anthyllis Vulneraria.*

botularia Winn., in swellings of midribs of leaves of *Fraxinus excelsior.*

Tremulæ Winn., in woody galls on leaf-stalks of *Populus Tremula.*

dryobia F.Lw., under thickened folded lobes of leaves of *Quercus Robur.*

ASPHONDYLIA H.Lw.

Ulicis Trail, in galled flower-buds of *Ulex Europaeus.*

Sarothamni H.Lw., in galled flower-buds and pods of *Cytisus Scoparius.*

Pimpinellæ F.Lw., in galled fruits of *Pimpinella Saxifraga*, and ? in galled flower-buds of *Angelica sylvestris.*

HORMOMYIA H.Lw.

Ptarmicæ Vall., in galled flower-heads of *Achillea Ptarmica* and of *A. millefolium.*

Millefolii H.Lw., in bud-galls on stem near ground, or in leaf-axils of *A. millefolium.*

Abrotani Trail, in leaf-galls on *Artemisia Abrotanum.*

Capreæ Winn., in small galls in leaves of *Salix Caprea*, *S. cinerea*, and *S. aurita.*

piligera H.Lw., in hairy, small, erect galls on leaves of *Fagus sylvatica.*

juniperina L., in terminal galls on twigs of *Juniperus communis*, and of *J. nana.*

LASIOPTERA Maig.

Rubi Schrk., in swellings of stems and leaf-stalks of *Rubus Idaeus.*

Appendix 1. **Senecio vulgaris** L. Since the earlier part of this paper was published, I have met in August, 1888, with a gall in the vicinity of Finstown in Orkney upon this plant. The flower-heads were considerably enlarged, especially at the base, where they assumed a red colour and a fleshy texture. On section the swollen part was

found to contain a cavity tenanted by several whitish or yellowish larvæ of a midge (? *Cecidomyia*). It was, unfortunately, out of my power to rear the insects. What is evidently the same gall is recorded from Bolchen in Lorraine by Herr Robert Liebel (*Zeitsch. für Naturwiss.* LIX., 1888, pp. 569-70).

App. 2. In the volume for 1888 of the *Verhandl. Zool. Bot. Gesellsch. Wien*, pp. 231-46, is a paper by Dr. Franz Löw, entitled *Mittheilungen über neue und bekannte Cecidomyiden*, in which are some notes that bear upon the subject of my present paper as given in detail below.

Galium verum, *Gall 3*, is believed by Dr. Löw to be the work of his *C. galiicola*, reared by him from artichoke-shaped galls on *G. Mollugo* (*V.Z.B. Ges. Wien*, 1880, pp. 33-34).

G. palustre, *Gall 2*, he is disposed to consider as belonging to *Cec. hygrophila* Mik (*Wien. Entom. Zeitung*, II., 1883, pp. 209-16, t. III.), a species with which I am not acquainted.

Veronica scutellata. Dr. Löw describes, under the name *Cec. similis* sp.n. (*l.c.*, pp. 232-33) a midge reared from galls on this plant sent him from Lorraine by Abbe Kieffer, and which entirely agree with those found by me beside the Corbie Loch. The midges are described as follows :—

Male.—Forehead and face yellowish, with pale grey hairs ; parts of mouth pale yellowish ; hindhead dark grey-brown ; eyes black, touching on apex, kidney-shaped, encircling bases of antennæ, margined behind with yellowish-grey hairs. *Antennæ* with joints 2+13, the two basal joints reddish, the other joints dark grey, stalked, equalling the stalks, each with a ring of pale grey hairs, stalks reddish. *Thorax* on the back dull, in front blackish-grey, behind reddish, with two shining longitudinal stripes diverging in front, sides and lower surface reddish, scutellum reddish, almost bare. *Wings* hyaline, with black veins, thickly covered and fringed with dark grey hairs ; front margin black ; first longitudinal vein close behind it and uniting with it just within the third of the wing-length ; second vein almost straight, reaching the front margin much in front of the tip, hinder branch of third vein almost straight, and passing obliquely to the hind margin. Fold of wing distinct. *Halteres* large, with grey-yellow stalk and dark-brown

head. *Legs* grey-yellow, femora, tibiæ, and tarsi on outer sides dark brown or black. *Abdomen* reddish-yellow, with a grey-brown cross-stripe above on each segment but the last, and yellowish-grey hairs on the hind margins of the segments, claspers small, brownish. *Length of body* 1 mm., of wings 1·4 mm.

Female.—*Antennæ* with joints 2+12, the two basal joints yellow-grey, the others dark grey, unstalked, each with a ring of pale grey hairs, last joint acorn-shaped, rather larger than the one next it. *Thorax* on sides and below yellowish. *Halteres* yellowish, with reddish-brown head. *Abdomen* flesh-red, with slight brownish cross-bands on the upper surface of the segments. *Ovipositor* can be much exserted, its first segment reddish-yellow, the rest yellowish. All else as in the male. *Length of body* 1·25 mm., of wings 1·5 mm.

CRYPTOGAMIC SOCIETY OF SCOTLAND.

THE fourteenth Annual Conference of this Society was held on the 12th and 13th ult. at Inverary, under the presidency of the Duke of Argyll. There was a good muster of members, and the meeting proved a most successful one.

Our old friend, Mr. William Phillips, whose recent work on "British Discomycetes" has brought him well-merited fame, was again with us, and the members had the pleasure of welcoming for the first time Dr. Carlyle from Carlisle.

As we propose publishing in due course detailed results of the Conference, which will ultimately be in the hands of members in the form of Transactions, our present notice may be limited to a brief account of the meeting. The writer will prepare a report on the Fungi of Inverary, in which he will have the assistance of Mr. Phillips, who made collections in his special department, and of Professor J. W. H. Trail, whose work among the Micro-fungi has already yielded most valuable results. From collections made by both the latter at Inverary good results may be anticipated.

The meetings of the Society were held in the Castle Pavilion, a spacious building originally erected for the home-coming of the Marquis and (Princess Louise) Marchioness of Lorne. A large collection of *Hymenomycetes* made by direction of the Duke, under the superintendence of Mr. Wyllie (Chamberlain), was laid out for examination, and for public inspection. Dr. Macmillan of

Greenock, Vice-President, contributed a fine collection of the Lichens of the district. Contributions of the larger fungi were also received from Col. Harrington Stuart of Torrance; Mr. Heron of Mount; Mr. Thorburn of Castle Semple; and Mr. J. Proctor of Glenfinnart, Ardentinny.

The forenoon of the 12th Sept. was spent in examining and naming the specimens on the tables. After entertaining the members at luncheon, the Duke conducted them to his Museum, where some time was spent in examining the various geological and archæological specimens that enrich it. A short excursion was then made in the surrounding woods.

In the evening, after the usual business of the Society had been transacted, the noble President delivered his annual address to the members, along with a large assemblage of the public. Speaking on the Cryptogamic Flora he delighted the uninitiated by the simple and lucid way in which he communicated information, and the initiated by valuable suggestions on the work of the Society. At the close of the address a very hearty vote of thanks was accorded to his Grace for the honour which he had conferred upon the Society by accepting the office of President, and for the address with which he had closed his term of office.

Various papers of interest were then submitted. Col. Harrington Stuart gave a popular address on "**Edible Fungi.**" Dr. Macmillan contributed a paper on the "**Lichens of Inverary,**" from which it appears that the foliaceous species abound, and grow with great luxuriance, and that the Lichen-flora is of a peculiarly western type.

(It may be noted here that, during a ramble after the close of the Conference, Mr. Phillips gathered on a single ash tree, within eight feet from the ground, 15 distinct species of Lichens). Professor Trail followed with papers on the **Discomycetes of Scotland**, and on the **Peronosporeæ of Orkney**, which were held as read, and gave the audience some interesting information on the influence which the microscopic fungi exert as parasites on flowering plants; and dwelt on the importance of a knowledge of the diseases which they produce with a view to checking the ravages which they often cause among our field crops. "**Some Notes on the Cryptogamic Flora of North-West Ayrshire**" were communicated by Mr. D. A. Boyd, Glasgow.

A more extended excursion was made on the 13th; and the annual dinner brought the Conference to a close.

The scenery of Inverary almost baffles description. Approached from Loch Fyne, the situation of the little town, and of the princely mansion, is seen to the best advantage. The site of the castle has been chosen by an artistic eye. It stands on a plateau, reached by a gentle green slope from the shores of the loch, of which it commands a full view. Divided by the picturesque hill of Duniquoich, crowned by its solitary watch tower, are the wooded glens of Aray and Shira, from which rivers of the same name issue to join their waters in the loch, while beyond, the sterner mountains rear their rugged peaks into the sky. Against the dark background of these loftier mountains the varied outline of the richly wooded knolls in the vicinity of the castle delights the eye. Sleeping, as we gazed on them, under brilliant sunshine and in perfect calm, with the whole scene reflected in the bosom of the loch, they spoke to the heart of peace and rest.

In the castle park there are many trees. These measurements of trunks will give some idea of their age and beauty.

Scotch fir—at 2 feet from the ground, 15 feet, and at 4 feet from the ground, 13 feet 8 inches in circumference. Silver Fir—at $2\frac{1}{2}$ feet from the ground, 15 feet in circumference. Spanish Chestnut—at 3 feet from the ground, 20 feet 6 inches, and at 5 feet, 19 feet 8 inches in circumference; the height of the trunk to the first branches being 15 feet. In the garden, to which the members were kindly conducted by Mr. George Taylor, there is a specimen of Arbor Vitae, which covers an area of 225 feet in circumference. The date when planted is not recorded; but it must be among the first specimens introduced into this country.

The exquisite scenery, the lovely weather, the pleasant fellowships, and last, but not least, the great kindness with which the Duke of Argyll received the Society, will make this Conference a green spot in the memory of its members.

The next annual Conference will be held at Crieff, Perthshire.

J. S.

Lachnella Rhytismæ Phill. near Stornoway.—On the last day of July this year I was in Lady Matheson's grounds at Stornoway, where I noticed a leaf of sycamore *(Acer Pseudoplatanus)* covered with Rhytisma, on which was growing a large quantity of *Lachnella Rhytismæ* Phill. This fungus has, I believe, been found before only in one locality, at Forres. The smooth knobs at the ends of the hairs of the cup are very clear and distinctive.

W. B. Grove, B.A.