THE

Scottish Naturalist

A QUARTERLY MAGAZINE OF

NATURAL SCIENCE.

EDITED BY

J. W. H. TRAIL, A.M., M.D., F.L.S.
PROFESSOR OF BOTANY IN THE UNIVERSITY OF ABERDEEN.

VOLUME II.—NEW SERIES.

(VOLUME VIII. FROM THE BEGINNING.)

PERTH:
S. COWAN & CO., PRINTERS AND PUBLISHERS

1885-1886.

S. Cowan & Co., Strathmore Printing Works, Perth.

CONTENTS TO INDEX.

INDEX OF ARTICLES.

INDEX TO CONTRIBUTORS.

TO OUR READERS.

THE Editor wishes to take the occasion offered by the commencement of a new volume of the *Scottish Naturalist* to thank very sincerely the friends that have assisted him with contributions since he undertook the editorship; and he ventures to hope that equally kind assistance will be extended to him in the future.

It has been his wish to render the Magazine acceptable to the subscribers by the value of the original articles in their bearing on the progress of biology and other scientific studies in Scotland, and also to supply a *resumé* of such articles as have been published in other magazines in so far as they tend in this direction. The transactions and proceedings of Scottish scientific societies, both at their meetings and in their publications, have been reported when it was in his power to do so; and he has to thank the secretaries of several societies for their courtesy in sending reports of their meetings, while regretting that he has not been able to obtain the necessary information in regard to too many others. The secretaries of all Scottish scientific societies would greatly facilitate the carrying out of this programme by forwarding to the Editor regular brief reports of the subjects discussed in their meetings. It is hardly needful to point out how desirable it is that each society should be aware of what is being done in all the others; nor is it needful to dwell at length on the suitability of the *Scottish Naturalist* to supply such information. This Magazine occupies a position not filled by any other in Scotland, and the societies are requested to give it their support, and to render it, as far as can be done, a bond of union among them.

In the case of such societies as do not print their transactions, there are, doubtless, not seldom papers deserving of a wider circulation and more durable form than is secured to them by being read in the societies; and to such papers the pages of the *Scottish Naturalist* will be gladly opened.

Articles of a more popular nature, when bearing on the subjects admitted as within the scope of the Magazine will also be welcomed. If it meets the wishes of the supporters of the Magazine a space

will be given for notes and queries relating to any branch of Natural Science in Scotland; and information will be given, as far as possible, to those in quest of it.

The Editor would take this opportunity of stating that it is his desire to obtain information from all parts of Scotland concerning the occurrence of plant diseases, whatever the cause; and that he will therefore be much obliged for any records, especially if accompanied by specimens of the affected plants, and also for specimens alone if they bear a note of the locality and of the degree of prevalence of the form of disease. The importance of the inquiry into the conditions and causes of disease in plants is becoming sufficiently appreciated to induce him to hope that this help will be given him by those that find themselves able to do so.

THE SCIENTIFIC METHOD IN BIOLOGICAL CLASSIFICATION.

By Rev. WILLIAM L. DAVIDSON.

II. TERMINOLOGY.

NEXT in importance to the handling of the group-characters with a view to definition, comes the matter of Scientific Terminology. In its full extent, this subject raises many questions; but, as we are considering it here solely in connection with Classification, we need not do more than occupy ourselves with the three great rules that play the main part in Scientific Naming.

I. The first of these rules is this:—That there shall be a distinct name for every separate or distinct thing; in other words, that in every department of scientific knowledge the descriptive terminology shall have a copiousness adequate to the needs of that department.

Now, when we consider that the Natural History Sciences are growing sciences, that research in them is being constantly pushed forward and new discoveries are being steadily made, it is evident that biological terminology cannot remain in a fossilized state. It must change as our knowledge of facts changes, keeping pace with the new revelations that from year to year surprise us. And this much must be frankly admitted, that in the case of interesting and striking discoveries, more especially when such would prove a good diagnostic character, both the botanist and the zoologist are ever ready with a corresponding terminology. Thus, when the fertilization of plants became a subject of absorbing interest in botany, and so much fresh light was thrown upon it by the obser-

vations and experiments of Darwin and others—there was no lack of resource in finding technical names appropriate to the various fertilizing processes. Under this impulse, self-fertilization and cross-fertilization have become respectively "autogamy" and "allogamy;" flowers that owe their fertilization to the wind are "anemophilous," and those that are dependent upon insects are "entomophilous;" while that species of self-fertilization which appears in such plants as the Dog-violet, and which consists in small, usually uncoloured, self-fertilized flowers appearing on the same plant subsequently to those that are cross-fertilized, is known as "cleistogamy." As, moreover, it is a point of particular significance for fertilization whether the stamens and the pistil do or do not reach maturity at the same time, it becomes of much importance to note the peculiarities of plants in this respect. Hence the introduction of such words as "proterandrous" and "proterogynous," the one to indicate that the stamens come first to maturity, and the other that the pistil is the first to mature. Hence also the word "dichogamous," to signify that stamens and pistil attain maturity together.

So, research has shewn that plants which under a less exact system of naming passed as Parasites are, many of them, no such thing; while parasitism itself has forms and degrees. And so, the distinction has been introduced between parasites, epiphytes and saprophytes—thereby enriching the language and aiding clearness and exactness of views.

So, when botanists have come to see that pathology in the vegetable kingdom is something worthy of minute attention, that the study of monstrosities in plants is capable of advancing our knowledge of plant-processes and plant-structure to a wonderful degree—when, in short, they have awakened to the fact that monstrosities are to them very much what abnormal and diseased organs in animals are to the physiologist, or diseased nervous functions in the human being to the psychologist—the need has become felt for a distinctive name for this particular study, and the want seems to be supplied by Professor Asa Gray's word "teratology."

I need not dwell on the richness of botanical language as expressive of the various structures and organs of plants—as when we find the terms combined with *enchyma* applied to plant-tissue almost legion (parenchyma, inenchyma, prosenchyma, angienchyma, pleurenchyma, trachenchyma, &c.), or when we meet with such a list of distinctive words ending in *carp*, as to leave nothing

to be desired (pericarp, epicarp, exocarp, mesocarp, sarcocarp, eudocarp, cremocarp, mericarp, &c.). There certainly is no lack here, but rather superabundance or excess.

All this is true; and yet botanical terminology has its weak points. It fails often where minute and seemingly unimportant differences have to be reckoned with; and poverty of names is frequently conspicuous in the presentation of group-characters. Thus, counting one thing with another, there is a considerable number of stamen-appendages among flowers, and the variety of current names for such appendages is also considerable; but it would not be difficult to mention several of those structures that are not definitely represented by a name. Again, the generic word "nectary" is made to do duty in a variety of situations where specific words ought certainly to be employed. So, the terminology is inadequate when dealing with modes of carpel-union. But, perhaps, the most obtrusive deficiency is felt when colours and forms have to be described.

Begin with forms. Copious though the terminology may at first sight appear, it is found, when put to the test, to be by no means sufficient—as any one knows who has had to identify leaves (for instance) or perianths from the book-description. And the cause of the deficiency is not far to seek, when it is observed that two of the main sources of form-terminology are these—(1) resemblance to well-known common objects (the cross, the strap, the helmet, the lip, the salver; hence such words as cruciform, ligulate, galeate, labiate, hypocrateriform); (2) the typical form of a genus or an order (hence rosaceous, liliaceous, orchidaceous, &c.). The looseness of this is very manifest. For, in the case of analogical names, it is taken for granted that the name-giving object is always of one and the same shape; whereas the truth is that in the majority of instances the shapes are varied. For example, the cross, the strap, the salver, no one of these is of one form, and one only: there are many kinds of crosses, many different forms of straps, several sorts of salvers, and so forth. Then, as to the second source of names, it assumes that the generic or the ordinal form is uniform and constant; which, of course, is not the case.

Here, then, is one sphere where reform is called for in botanical naming. Nor ought reform to be insuperable when we remember what has been done in the direction of form-naming in Mineralogy, and what indeed has sometimes been accomplished by the unscientific under the pressure of necessity.

(*To be continued.*)

ZOOLOGY.

A DREDGING TRIP TO ARRAN.

By J. R. HENDERSON, M.B.

ON a clear evening in July last the writer, accompanied by some scientific friends, steamed out of a Glasgow shipbuilding yard on board the Scottish Marine Station's yacht "Medusa." Our destination was Lamlash Bay, and we went with the object in view of a few days dredging along the picturesque shores of Arran.

After an uneventful journey down the sewage-polluted Clyde Dumbarton was reached, and the night was spent under shelter of its castled rock. On the following morning a start was again made; but, owing to the "Medusa" running aground on a sandbank during the ebb, we were reluctantly forced to prolong our stay and wait the turn of the tide. However, in a short time, the yacht was again under way, and after a delightful sail past the beautiful Clyde watering-places, and round the south end of Bute, the blue peaks of Arran hove in sight. Late in the afternoon we rounded Holy Island, and anchored in Lamlash Bay opposite the village.

For a long time this has been a happy hunting ground of naturalists; and certain it is that there are few areas of similar extent in Britain, which the modern dredge "with its iron edge and mystical triangle," has more assiduously scraped. The admirable shelter offered by the Holy Island opposite probably has a marked influence on the extreme richness of animal life present. Many names could be cited, but we will be content with simply mentioning those of Landsborough, Norman, and Herdman, who have specially worked up the invertebrate fauna of the bay. Dr. Landsborough, in his interesting "Excursions to Arran," written at a time when the island was less visited and known than now, gives very full lists, especially of the *Mollusca* and of the marine

Algae. The Rev. A. M. Norman, in papers on the Clyde Mollusca in the *Zoologist* 1857-60, records many Arran species, and Prof. W. A. Herdman, in the *Proceedings of the Royal Physical Society* of Edinburgh, has made extensive additions to the records of invertebrate animals. Perhaps, the most complete list, however, is that of Dr. Miles, in Bryce's "Geology of Arran and Clydesdale" (fourth ed. 1872), and in this the work of previous observers is also taken into account.

The remainder of the afternoon was spent in reconnoitring the village, and preparing for the following day's work; but in the evening we steamed across the bay towards the middle of the Holy Isle, and had a haul of the dredge in about twenty fathoms of water. When the contents had been spread out, many interesting forms quite unknown in our east coast experience lay before us. Among the shelly debris were many writhing Ophiuroids, and a few specimens of the curious Crinoid—*Comatula rosacea.* Sea urchins were also present, as the large *Echinus esculentus*, and its smaller purple-tipped relative *E. miliaris;* while here and there were various star-fishes, despairingly throwing out their worm-like tube feet. Of this last class there were many examples of the pretty scarlet *Porania pulvillus*, a good deal of whose sleek and rounded outline, is due to the presence of water, as we found that gentle pressure forced it out in fine jets, leaving poor *Porania* in a depressed and dejected looking state. The *Crustacea* were also represented by straggling spider crabs, as *Inachus dorsettensis*, and *Stenorhynchus phalangium*, while ordinary crabs scuttled away in all directions; but there were also a few more unusual forms, especially the rough backed *Eurynome aspera*, which appears to be not unfrequent in the bay, as we dredged a good many specimens subsequently, and also two species of *Ebalia*,—*E. tuberosa*, and *E. tumefacta*—the latter bearing on its carapace a somewhat fanciful resemblance to a human face. The *Mollusca* were well represented, one of the most interesting being *Trochus millegranus*, which was afterwards found abundantly, along with *T. magus*, and *T. tumidus*, also *Pecten tigrinus*, and the *var. costata*, *Aporrhais pespelecani*, and *Scaphander lignarius.* We were reluctantly forced to cease work for the day, and by the time we had reached our anchorage, darkness was setting in, and the village was indicated only by a row of lights, while the rugged peaks of Goatfell were no longer visible. The sea lay before us smooth as glass, and the

stillness of the evening was alone broken by the weird curlew's cry along the shore.

Next morning at sunrise, the writer accompanied by a botanical friend, started for a walk along the rocky coast beyond Clachland Point. The tide was favourable, and a good many interesting *Algae*, and invertebrates, were found; in particular, we noticed colonies of the pretty anemone *Sagartia bellis*, in rock pools, living near high water mark, also many specimens of *Trochus umbilicatus*, which appeared to be the characteristic *Trochus* in this locality.

After our return to the yacht, a start was made about nine o'clock for the north end of the bay, between the Holy Isle and Clachland Point, and the dredge was put down in about ten fathoms of water. On its being emptied on deck, it was found to be almost full of the coral-like *alga* (*Melobesia calcarea*) which affords shelter to many marine animals, but more especially *Mollusca*. Single valves of *Lima hians* were very numerous, and not a few living specimens were obtained enclosed in their *Melobesia* "nest;" and one or two of a rarer and more delicate species (*Lima Loscombii*) were also got. Of other *Mollusca*, there were examples of *Cardium norvegicum*, *C. fasciatum*, *C. nodosum*, *Emarginula fissura*, *Puncturella noachina*, *Pecten maximus*, *P. striatus* and a single quite recent valve of the rare *P. testae*, also *Venus fasciata*, *V. ovata*, and single valves of *V. casina*. Of *Crustacea* there were many examples of the hermit crab *Pagurus Prideauxii*, which we subsequently found common all over the area, in all cases associated with the pretty spotted anemone *Adamsia palliata* living on the outside of its protecting shell. We again got *Comatula rosacea*, and in addition *Astropecten irregularis*, *Luidia Savignii*, and several large specimens of the prickly *Asterias glacialis*. After the search, which lasted no little time, had ended, our course lay along the outside of the Holy Isle, off the north end of which the trawl was put overboard in about twenty fathoms of water; and the yacht proceeded at a slow rate for about half an hour. When the contents were drawn on deck, very few fish were present, though many other interesting animals came up; as a fine living specimen of *Terebratula caput-serpentis*, also *Trophon barvicensis*, and one or two shells of *Isocardia cor*, perfect and fresh, but without the animal. Two starfishes were obtained, viz., several examples of *Palmipes placenta*, and one of *Cribella rosea;* and there were many

fine specimens of the large cup-shaped sponge *Isodictya infundibuliformis*. Of Zoophytes there were, among others, *Tubularia indivisa*, *T. coronata*, and *Cellepora ramulosa*. Our last haul for the day was taken several miles off Whiting Bay in sixty fathoms of water, the greatest depth we reached during our trip. The trawl came up nearly filled with mud and several large stones, and on these we found many interesting parasites, as the curious Brachiopod *Crania anomala*, of which there were many specimens, and also a few zoophytes, among which we recognised *Tubulipora serpens*, *Diastopora patina*, *Stomatopora granulata*, and *S. dilatans*. We also found examples of the urchin *Brissus lyrifer*, single valves of *Pecten septemradiatus*, and a well preserved valve of *P. islandicus*, an upper tertiary fossil. A few common soles, lemon soles, and flounders, flapped about, and many specimens of *Nephrops norvegicus* lay helpless in the mud. A slight storm now set in and forced us to cease operations for the day; and we returned to Lamlash with good appetites, and pleased with our day's work.

Next morning we confined ourselves to the area in the north end of the bay, which we had previously gone over, and were rewarded by finding a number of new things, especially *Mollusca*, of which the following may be enumerated—*Circe minima*, *Tellina donacina*, *Trichotropis borealis*, and *Eulima polita*. Only a single star-fish was got which we had not previously taken, viz., *Solaster endeca*. Of Zoophytes there were a few specimens of *Plumularia pinnata*, which appears to be one of the commonest in the bay; and we found a few little crabs (*Portunus pusillus*). A sample of the nullipore sand was kept for examination, and was afterwards found to be very rich in *Foraminifera* and minute shells, as *Risssoae*, *Odostomiae*, *Eulima distorta*, *E. bilineata*, *Caecum glabrum*, various species of *Utriculus* and *Philine*, etc. Of Algae we noticed numerous specimens of *Bonnemaisonia asparagoides*, in fine fruit, and a few small plants of *Polysiphonia parasitica*, adhering to old oyster shells.

As we had arranged to be in Rothesay on the same day, we left Lamlash Bay in the forenoon, and proceeded along the coast by way of Brodick Bay, where the dredge was put down for the last time in about twenty-three fathoms water, on a muddy bottom. Here again we were rewarded by some new finds, prominent among which was a large specimen of the fine Zoophyte—*Aglaophenia*

myriophyllum, crowded with its peculiar reproductive capsules, and a cluster of the rare *Campanularia gigantea*, growing on a dead shell of *Aporrhais pes-pelecani*, also the Molluscs *Astarte sulcata*, and *Solecurtus antiquatus*.

During our three days trip the surface fauna had not been neglected, as one of the party attended to the tow-nets, and also to one sunk a few fathoms down. He was chiefly on the outlook for fish ova; but though not very successful in his special search, many other interesting things were got in abundance, such as the disputed organism *Peridinium*, many Diatoms, *Pleurobrachiae*, Copepods, and other small Crustaceans, Medusoid gonophores, larvae of Echinoderms, and Molluscs, etc.

On the whole the *Mollusca* and *Echinodermata* appear to be the strong groups in the fauna of Lamlash Bay; what seemed to us a feature is the relative scarcity of Zoophytes (though the list of species is a pretty full one), compared with such a district as the Firth of Forth, where, on the oyster banks, many specimens are obtained in every haul of the dredge.

By the time we reached Rothesay late in the afternoon, the elements were raging fiercely overhead, and a smart thunder storm attended by a heavy downpour of rain set in; however as any port is proverbially acceptable in a storm, the writer found a very pleasant one in a friend's house at Innellan, where he turned up a few hours later. thoroughly drenched, sunburnt, and hardly recognisable, yet pleased withal with the result of the dredging trip to Lamlash Bay.

SCOTTISH MARINE STATION, GRANTON.

Boreus hyemalis L., *near Aberdeen*.—Of this curious insect I took two males and one female in the beginning of the month of November last on a mossy wall-top within a mile or two of Aberdeen. They agree in every respect with the description in M'Lachlan's *Monograph of British Neuroptera-Planipennia* (*Trans. Ent. Soc. Lond.*, 1868, p. 218-20), and males have the ventral valve as described on p. 219, not as in *B. Westwoodii* Hagen. I was able also to confirm the saltatorial habits and the mode of pairing mentioned in the above account. I am not aware of any previous record of this species from Scotland.

JAMES W. H. TRAIL.

ZOOLOGICAL NOTES FROM ABERDEEN.—A specimen of **Leach's Petrel**, *Thalassidroma Leachii* Audubon, was caught at Girdleness lighthouse on the night of August 19th. This is by no means a common species on the east coast of Scotland. In a letter from Mr. John A. Harvie Brown relative to this species of bird, he says that it was found "by Mr. Swinburne in North Rona in the summer of 1883, and breeding there abundantly. Previous to that St. Kilda was the only locality known." In the latter locality it was first discovered by Mr. Bullock in 1818. I am not aware of its previous occurrence in the neighbourhood of Aberdeen. Its stomach contained an oily matter.

The Bergylt, *Sebastes Norvegicus*, Cuv. Four examples of this fish were caught by a steam trawler on August 16th, 1884, three of which came into my hands. This is not a common species in this district; it has however occurred at various places along the east coast from Berwick to Lossiemouth. Although this species has been observed at various places around the British Isles little seems to be known of its habits, hence we find such statements as the following. Couch says "The young are produced in June. . . . It is even supposed on good evidence that they proceed from the mother alive." The statement is repeated by Day in his recently published work on British Fishes. From the examinations of the specimens now referred to, I am able to state that the young do *not* "proceed from the mother alive," two of my specimens having roe and the other milt, as in other oviparous fishes, and all about two-thirds developed. This would point to about the months of October or November as the period when the spawn is deposited.

The Thrasher. *Alopias vulpes.* Bonap. An example of this species was caught at Fraserburgh on August 30th 1884. It measured 14 feet 8 inches in length: this is the only occurrence of the species on the Aberdeenshire coast that I know of.

Crested Blenny, *Carelophus Ascanii*, Walbaum. On September 13th, 1884. I found a small specimen of this interesting little fish on board a steam trawl vessel. It is of very rare occurrence here. It is recorded by the late Dr. Dyce as having been taken at Muchalls, Kincardineshire, in 1862, and on his authority it appears in my printed list of the fishes of the district.

The Rainbow Wrasse, *Coris julis*, Günther. One of this species was caught at Fraserburgh on September 17th, 1884, and was sent to Dr. Nicholson, Professor of Natural History in Aberdeen University, in whose keeping the fish now is. Unfortunately the specimen had been disembowelled before being sent to him, thereby preventing its being ascertained what its food may have been. This is the first instance of its occurrence in Aberdeenshire waters. According to Day it ranges "From the south coast of England to the Azores and Canary Islands, likewise extending through the Mediterranean, where it is very common."

Angel Fish, *Rhina squatina.* A specimen was brought to land on November 16th, by one of our local trawlers. This is the second specimen I have seen in these parts. The stomach contained the remains of fish.

GEO. SIM, Aberdeen.

PHYTOLOGY.

ON THE NATURALIZATION OF PLANTS.

By Prof. C. C. BABINGTON, M.A., F.R.S.

A PERUSAL of the Editor's interesting paper, entitled "List of casuals and introduced plants" (page 243), has again turned my attention to the naturalization of so many plants included in our Flora. It seems to me that we usually make rather too much of it, and are inclined to include many plants having a real claim to be considered as natives, or at least thoroughly naturalized. We consider a man as a real Englishman or Scotchman if his ancestors have been for a few generations established here as their home. We are all in fact naturalized although we call ourselves natives. Similarly of the plants. There is probably not one of them which did not come at some early period from some other country: some at a very early date (far sooner than we did), and others at various later times. I consider all plants which hold their own, and increase by seed, to have a fair claim to be enumerated in our lists. They are truly naturalized—*e.g.*, *Veronica Buxbaumii* which was introduced as a new garden annual early in the present century, and is now universally distributed. Such a plant as *Anacharis Alsinastrum* presents much difficulty. It is also universally distributed, but it is not known ever to have produced seeds in Europe; or as I am informed in America to the east of the Alegany Mountains (Asa Gray). *Lycium barbarum* again presents some difficulty. As a rule it does not increase by seed (which is probably rarely perfected), but near Cromer in Norfolk it does seed abundantly, and is being sown about the country by the agency probably of birds. According to my rule, therefore, it is a naturalized plant there; although usually only a casual, or, as Hooker calls it, a "cottage ornament." I do not allow "spreading by stolons" as conferring any claim to admission as a natura-

lized plant. There is no doubt that plants introduced by farmers, gardeners, or manufacturers, do, as it is called, establish themselves; but then it is usually only for a time, and that often a short time: they are simply casuals, and have no right in our lists. There are many plants which are now only found upon cultivated ground (*i.e.*, ground from which the natural herbage has been removed), which may possibly, or even probably, have been introduced at some very distant period, but which now we cannot, and, as I think, ought not, to distinguish from those of so much earlier arrival in Britain, which we justly call natives. In deference to the ideas of the late Mr. Watson I have marked most of the Poppies as "possibly introduced." They are not usually observed off cultivated land, but they may sometimes be found on bare spots which have not been subjected to cultivation.

It is most interesting to trace, as far as we can, the time and manner of introduction. Where did the Poppies come from? They surely preceded cultivation somewhere. But that is a very distant time; for even in Britain cultivation of corn preceded the Christian Era.

THE BOTANICAL WORK OF GEORGE DON OF FORFAR.

By G. C. DRUCE, F.L.S.

(*Continued from page* 261.)

Fourthly—Plants which there is less probability of our again finding, but which still may be sought for with a chance of success. These are:—

Ranunculus alpestris.
Arabis ciliata.
Silene alpestris.
Arenaria fastigiata.
Stellaria scapigera.
Potentilla intermedia.
Saxifraga pedatifida.
Eriophorum capitatum.
Phleum Michelii.

There are others which, if correctly reported by him, probably from drainage or cultivation, have been extirpated. Such are:—

Crepis pulchra.
Eriophorum alpinum.
Calamagrostis stricta.

Fifthly—Some probable mistakes of identification. Such may be:—

Saxifraga muscoides.
Sanguisorba media.
Centaurea intybacea.
Salix hastata.

Hieracium amplexicaule, unless Don may have found the latter on old buildings, such as Clova Castle, which Arnott records it from. *Tussilago alpina*, is not absolutely impossible to have occurred; nor is *Hieracium cerinthoides*, although very great doubts exist as to their claims to be native.

Potentilla tridentata seems to be very unreliable, if its geographical distribution be looked at; but it must be remembered that our knowledge of the geographical distribution of plants is somewhat empirical; that the place has never probably been searched at the early date on which Don says he found it, and again that his statement is precise. Time would not be wasted if an especial search were made for this in the early spring.

One must also bear in mind that Don went in no beaten track, and was indefatigable in his exertions; and one must also remember how extremely local some of our native species are.

Here it will be well for me to state my belief that Don often gave a general rather than a particular locality for plants, because he was a florist, and sold these rare alpines, and some amount of professional jealousy was felt by him against other florists, some of whom had attempted to rob him of the credit of his discoveries.

In a day-book of his, now in the possession of Mr. Knox, frequent entries of alpines, such as *Veronica alpina*, *Lychnis alpina*, &c., are made.

We now have the pleasanter duty of enumerating the more important of Don's undisputed discoveries, which amply bear out the remarks of Sir James E. Smith in regard to his "scientific merits and ardent zeal."

Caltha radicans, Forst. (*Scot. Nat.*, 1884, p. 128).

Cochlearia Groenlandica, Sm., discovered in August, 1807, in Clova and on Lochnagar.

Lychnis alpina, L., found on rocks near the summit of Clova mountains in 1795.

Sagina saxatilis, Wimm. (*S. Linnaei, Presl.*), from various mountains in Perth and Forfarshires.

Oxytropis campestris, L., found on a rock in Glen Dole, in Clova, in 1812.

Rosa Doniana, Woods (variety of *R. involuta*, Sm.), distinguished by Don from its habit, before it was characterised by systematists.

Saxifraga platypetala, Sm. (*S. hypnoides*, L. var., *sponhemica*, Gmel.), in the Clova mountains.

Mulgedium alpinum, L. (*Lactuca alpina*, Benth.) Don must have the honour of adding to our flora this handsome species; for though he himself refers to an earlier record, the plant referred to in it was clearly an error, *Cichorium intybus* having been mistaken for this plant.

Myosotis repens, Don, was first discriminated as a British plant by Don; and

Lamium intermedium, Fries, was another of his discoveries.

Salix nigricans, Sm. var., **rupestris**, Sm., and **Salix lanata**, L., were both discovered by Don, though Drummond is generally credited with the latter.

Polygonatum verticillatum, All., is mentioned in the *Flora Scotica* as discovered by Mr. Bruce, but it was first found by Don, as he claims in a letter to Winch, and as is correctly stated by Withering.

Juncus balticus, Willd, is generally said to have been discovered by Drummond on the sands of Barrie, but in Don's herbarium are specimens gathered long before.

Luzula arcuata, D.C., was added by him to the British flora from the tops of the Cairngorm mountains.

Eriophorum alpinum, L. (Fasc., No. 26), found in 1791 near Forfar, by Don; was destroyed during his lifetime, by drainage.

Carex rariflora, Sm., is another of his discoveries (in 1807), from the Clova mountains; as was also

Carex vaginata, Tausch, in 1802.

Alopecurus alpinus, Sm., was discovered by him on the high tableland of Lochnagar.

Calamagrostis stricta, Nutt., (*Deyeuxia neglecta*, Kunth), discovered in 1807 in the White Mire, near Forfar, is said to have been destroyed by drainage; but it may yet be found about Restennet or Rescobie.

Aira lævigata, Sm. (*Deschampsia cæspitosa*, Beauv, subsp., *alpina*, R. & S.), was first found in Britain by Don, in 1808,

on the Clova mountains, and he pointed out to Sir J. E. Smith its differences from *cæspitosa*. (*Linn. Trans.* x. p. 330).

Avena alpina, Sm. (*A. pratensis* L. var., *alpina*, Sm.), was found by Don on the summits of the Clova mountains. He says that it produces a great quantity of foliage.

Equisetum variegatum, Sm., discovered by Don on the sands of Barrie, still exists there.

George Don was also among the earliest recorders of the following species as British plants, or as new to Scotland when discovered by him; or he added new localities to those previously known for them:—*Dianthus Armeria*, near Forfar; *Silene noctiflora*, Angus coast; *S. nutans; Lychnis viscaria*, var. alba, Airlie Castle; *Sagina apetala* and *S. maritima; Cerastium tetrandrum* and *C. latifolium*, Ben Lomond; *C. alpinum*, Ben Lawers; *Vicia Lathyroides; Ulex nanus* (*Gallii*), Pentland Hills; *Rosa Sabini*, Clova Mountains; *Rubus suberectus; Spiraea salicifolia; Circæa intermedia*, Forfar; *Saxifraga rivularis*, Clova Mountains; *Ribes petræum*, Airlie Castle; *Galium pusillum.* lower rocks of Clova; *G. Witheringii*, near Forfar; *Valeriana Pyrenaica; Erigeron alpinus; Anthemis tinctoria*, Forfar; *Senecio sylvaticus*, var. *lividus; Crepis succisæfolia*, near Forfar; *Hieracium dubium; H. aurantiacum*, Banff; *Campanula persicifolia*, near Cullen; *Erythræa littoralis*, Brodie; *Myosotis alpestris*, Ben Lawers; *Asperugo procumbens*, Auchmithie and Westland; *Lysimachia thyrsiflora*, near Rescobie; *Veronica alpina*, Perth, Angus, and Aberdeen; *V. saxatilis*, Ben Lawers; *Bartsia alpina*, Maol Ghyrdy; *Teucrium Chamædrys*, old walls at Balgavies and at the House of Kelly; *Polygonum minus*, near Forfar; *Rumex palustris*, marshes, near Forfar; *Salix nigricans*, var. *Andersoniana; S. Lapponum*, vars. *arenaria* and *glauca;* and *S. arbuscuta*, all found in Clova; *Goodyera repens; Allium carinatum*, banks of the Isla; *Juncus filiformis; J. biglumis*, Ben Lawers; *J. castaneus; J. obtusiflorus; J. acutiflorus; J. lamprocarpus; Luzula Forsteri;* near Forfar, in fir wood; *Potamogeton heterophyllus; Scirpus Tabermæmontani*, Angus coast; *Blysmus rufus*, sands of Barrie; *Carex divisa* (Fasc, No. 196), Montrose; *C. pauciflora; C. incurva*, Sands of Barrie; *C. capillaris; C. filiformis*, Moss of Restennet; *C. lævigata; C. pulla; Phleum alpinum*, Ben Lawers and Lochnagar; *P. arenarium*, Sands of Barrie; *Poa cæsia* and *P. glauca*, from Clova; *Glyceria distans* and *Festuca loliacea*, Huds., Angus coast; *F. gigantea*, var. *triflora; Bromus secalinus, B. racemosus*, and *B. tectorum; Lepturus filiformis*, Aberlady; *Hordeum maritimum*, Angus coast;

Woodsia hyperborea, Clova; *Lycopodium annotinum*, Clova; and *Isoetes lacustris*.

It seems needless to remind the reader in more than a few words that of these plants several are not indigenous, and some are not even naturalised.

Don also recorded numerous additions to the mosses of Scotland.

The foregoing list will show in a truer light Don's work and ability, which was recognised, if not rewarded, by his contemporaries, many of whom again and again testify to his love of science and his untiring labour, Sir J. Smith, Sir Joseph Banks, Mr. Knapp, in his *Grasses*, Dr. Neill, Sir W. Hooker, being notable examples. The Linnean Society created him an associate. Mr. Gardiner, in his Flora of Forfar, frequently pays tribute to his memory, and evidently places full confidence in his truthfulness, nor was his character attacked till Dr. Arnott, in his British Flora, began a series of charges of bad faith, of false recording, of gross mistakes, &c.

In looking through Hooker's *Flora Scotica*, it is rather amusing, after reading Arnott's tirades against Don, to see his own records for Scotland. Of these, I shall just quote a few, which may be compared with some of Don's work. Arnott gives no sign of the plant being other than natural to the locality.

Polemonium cœruleum, Arniston woods.
Actæa spicata, Cliesh.
Mecanopsis cambrica.
Hyoscyamus niger, Firth of Forth.
Linaria Cymbalaria.
Hieracium amplexicaule, Cliesh Castle.
Anchusa sempervirens, Craigmillar.
Sedum dasyphyllum, Colinton woods.
Euphorbia cyparissias, Clinton woods.

He also gives *Arabis Turrita* for Cliesh Castle, a plant having no more right to a place in our Flora than the Laburnum or Lilac.

Mr. Arnott is also responsible for recording *Stratiotes* as if a native of Forfar Loch, although he ought to have known that Don expressly states that he planted it there in 1792.

Compared with these records, Don's belief in the native origin of *Valeriana Pyrenaica* and *Carum Carui* may be pardoned. In looking over Don's fasciculi, one cannot help being assured of his

straightforwardness. Many of his records even of the reputed discoveries are very minute; to several plants, such as *Draba aizoides*, and *Senebiera didyma*, he states that, not being able to obtain *wild* specimens, he sends some from his garden.

Dr. Arnott, though in some respects an excellent botanist, was not well qualified for preparing an English Flora. He evidently considered plants could be diagnosed with all the precision of a chemical formula, and never mastered the elementary idea of the extreme variability of animate nature and its excessive proneness to change, so that split species or intermediate forms receive at his hands most cavalier treatment, or are summarily dismissed from notice as hybrids. He can see no specific difference between *Ranunculus tripartitus* and *R. aquatilis*, or between *R. hederaceus* and *R. Lenormandi*, except the larger flowers, which "may be caused by the heat of the condensed water which flows into the canal where it grows." Upon this arbitrary botanist Don exercised a most morbid influence, so that no suggestion of dishonesty or bad faith seemed strong enough to apply to him, for it is not only that he charged Don with making mistakes—mistakes that are most egregious blunders—but that he asserts that no credence can be given to his statements, because he intentionally misled, either by making false records, or sowing plants, or by distributing plants from his garden as if they had been gathered wild.

I will admit that Don had little knowledge of geographical distribution or histology; but he had fully developed a naturalist's keenness of eye, a scientific love of classification which showed itself, not by faggotting plants together in an arbitrary manner in order to conceal his want of knowledge of their extreme variability, but by noticing minute differences; and he often was enabled to differentiate varieties, which, unimportant as they may be to the arm chair botanist, may and often do prove of material service to the agriculturist or gardener. Above all, Don possessed that divine fire (often absent from the endowed professor) which kept him unwearied at labour; plodding, it may be, over the spongy morass, or breasting the high and solitary moorland; or anon climbing with all a fowler's zeal up the high rocky crags of that lovely district of Clova, itself not the least of his discoveries. Too independent in opinion to curry favour with the wealthy, and too fond of science—that hard mistress, in some respects, to the

poor—to make himself rich by application to business, Don, like Dick, is an instance—and there are many in the working classes —of a life devoted to one idea ; heroes, yet receiving no reward, except such reward as earnest work in itself gives. Yet despite the apparent failure of such lives, they stand out in marked contrast to the insipidities, the mediocrities, or the merely fashionable crowd. In such cases, with such lives, any errors, so long as they are only errors, should be tenderly dealt with. Some of us at least who have trodden over the same lovely district, and who have gathered in the identical localities many of the rich treasures Don has made known, can feel some gratitude for his labour and respect for his memory and life.

A short memoir of George Don appeared in vol. iii. of the *Botanical Gazette*, by Patrick Neill, LL.D., of Canonmills, treasurer of the fund raised for Don's widow, which gives some interesting information.

Don's early education was limited to the reading, writing, and arithmetic taught at the parish school. He had a natural turn for mechanics, and acquired a taste for reading and observation. Even from his boyish days he delighted in noticing the minute characters of such birds, insects, and plants as came within his reach. He was apprenticed to a clockmaker in the town of Dunblane, and here formed his first hortus siccus, consisting of all the phænogamous and cryptogamous plants which he could cull in the neighbourhood. When he became a journeyman he removed to Glasgow, and here he generally worked five days a week at his business, and in this space of time finished the making of a clock; the remainder of the week was spent in botanizing if the weather permitted. Occasionally he stole an additional day or two and penetrated into the Highlands as far as Ben Lomond, or even Ben Lawers, in search of alpine plants, adding several unexpected varieties to the lists known to Mr. Lightfoot or to his guide, the excellent Dr. Stuart of Luss.

Having himself saved a very small sum of money, and married a young woman (see Mr. Knox's paper), who had also saved a little money, he went to Forfar and procured a lease for 99 years of a small bit of ground from Charles Gray, Esq. of Carse, at a trifling rent, but on condition of his building a cottage of certain dimensions within a given period. There he spent four years necessarily in a very frugal and penurious style. The chief part

of the ground was occupied by a small garden, the vegetables being sold to such inhabitants of Forfar as chose to send for them. A portion which bordered on the loch of Forfar was laid out as a botanic garden of hardy herbaceous plants, arranged according to the Linnæan classes and orders; and to these, it is believed, he gave more of his time and attention than to the more vulgar but more profitable cultivated sorts.

"When," says Dr. Neill, "on a pedestrian excursion along the east coast of Scotland it occurred to me that Forfar ought to be visited for its remarkable botanic garden and its owner, whose fame was familiar to me, owing to my intimacy with his regular correspondent, Mr. John Mackay of the Leith Walk Nurseries. On reaching Forfar towards evening, I soon found Don's garden, and entering, inquired of a very rough-looking person with a spade in his hand, whom I took for a workman, whether Mr. Don was at home. The answer was, 'Why, sir, I am all that you will get for him.' Having apologized in the best manner I could, I stated that when I left home I did not anticipate a visit to Forfar else I could have brought a note of introduction from Mr. John Mackay. Don pointed to my botanical box and immediately said, 'That is introduction enough for me.' . . Next morning at six he conducted me to Restennet Moss, where I had the great satisfaction of procuring a living patch of *Eriophorum alpinum*, and a number of fine specimens for drying. The Moss was at this time partially drained, for the sake of a rich deposit of marl, but at one end there was still sufficient marsh for the growth of *Cladium Mariscus* and *Erioph. angustifolium*, and of course for the rare *E. alpinum*, which grew on the drier or firmer part of the Moss. Mr. Don remarked that in a few years the plant would disappear, which, I understand, has accordingly happened.

"The situation of curator at the Botanical Gardens, Edinburgh, having become vacant, Mr. Don was strongly recommended to Professor Rutherford by the late Mr. Brodie of Brodie, and his recommendations were backed by Sir J. E. Smith, who was well aware of his merits as a practical botanist, from having published in his English Botany several of Don's Scottish discoveries. He was accordingly appointed, and removed to Edinburgh with his family, leaving his garden in care of his father, who resided on the spot, and who was himself a great cultivator of flowers for amusement, and followed the trade of a currier, first in Dundee

(where George must have been born) and afterwards in Forfar.

"Mr. Don had not had experience in the cultivation of stove plants, and, it must be confessed, did not shine in that department. At the same time, there can be no doubt that as a botanist he greatly excelled the professor, who was an accomplished chemist but had little turn for botany. It thus happened that there soon arose a want of cordiality between the parties, and Mr. Don contemplated a return to his favourite spot of ground at Forfar.

"During his residence in Edinburgh he attended nearly all the medical classes, with the view of ultimately following that profession. On his return to Forfar he added a nursery to the botanic garden, but it was unprofitable, in consequence of the ground being bad and labour expensive. He formed an extensive collection of plants, principally hardy, as well as a considerable herbarium, chiefly of British plants, making numerous excursions to the mountains, at the same time following his profession of a country surgeon, which he had qualified himself for in Edinburgh. Had he thrown up botany he would have done well in his new profession, for he was very successful at first; but his business ultimately dwindled in consequence of his being continually out of the way when wanted, in search of new discoveries—a pursuit ill-adapted for a poor man with a large family."

MYCOLOGIA SCOTICA—Supplement.

By Rev. J. STEVENSON.

(*Continued from* S. N., 1884, *p.* 183.)

3005. Agaricus (Armillaria) bulbiger A. S. *Fr. Hym. Eur. p.* 40.

Pileus fleshy, convex, then expanded, obtuse, even margin, as well as the stuffed equal *marginato-bulbous* stem pallid fibrillose; ring oblique, fugacious; gills emarginate, pallid.

Very distinct from its bulb. Pileus pale reddish-yellow, rufescent, pallid, at first covered with fibrils, then naked, soft. Gills at length of the same colour as the pileus, distant.

	In pine wood.		Rare.		Sep.	
East.	—	—	—	—	Moray	—
West.	—	—	—	—		

Rothiemurchus. Rev. Dr. Keith.
England. Europe.

* A. (Clitocybe) **cerussatus** Fr. var. difformis Schum. *Fr. Hym. Eur. p.* 86.

Caespitose, often gigantic. Pileus undulato-lobed; stem curt, longitudinally wrinkled; gills at length pallid.

It varies with the pileus, at first sprinkled with flocci, 2-7 in. broad in the same cluster, and the stem of the larger specimens 1 in. thick and long.

Roxburgh. Rev. David Paul.

3006. A. (Clitocybe) **vermicularis.** *Fr. Hym. Eur. p.* 98.

Pileus slightly fleshy, umbilicate, then reflexed, infundibuliform, repand, even, smooth, moist, becoming pale; *stem hollow, soon compressed, smooth, shining*, and, as well as the decurrent very crowded *thin* gills, *white*.

Somewhat fragile; pileus of a beautiful red or flesh-colour, then tan (almost hygrophanous), most frequently undulato-lobed.

	In fir wood.				Sep.	
East.	—	—	—	—	Moray	—
West.	—	—	—	—		

Chapelton wood, Forres. Rev. Dr. Keith.
Europe.

* A. **fusipes** Bull. var. oedematopus Schaeff. *Fr. Hym. Eur. p.* 112.

Somewhat caespitose. Pileus conical, then become plane, date-brown-fuscous, and, as well as the stout *ventricose fibrillose stem, pulverulent;* gills pallid.

On decorticated beech, Glamis. J. S.

3007. A. (Pleurotus) **spongiosus** *Fr. Hym. Eur. p.* 167. *C. Hbk. No.* 111.

On dead wood. Oct.

East. Tweed — — — — —

West. — — — —

Roxburgh. Rev. David Paul.

England. Europe.

3008. A. (Pleurotus) **lignatilis** *Fr. Hym. Eur. p.* 169. *C. Hbk. No.* 116.

On beech trunk. Nov.

East. Tweed — — — — —

West. — — — —

Roxburgh. Rev. David Paul.

England. Europe.

3009. A. (Clitopilus) **undatus** *Fr. Hym. Eur. p.* 199. *C. Hbk. No.* 269.

On grassy banks. Aug.—Oct.

East. — — — — Moray —

West. — — — —

Rothiemurchus. Rev. Dr. Keith.

England. Europe.

3010. A. (Nolanea) **mammosus** Linn. *Fr. Hym. Eur. p.* 207.

Pileus somewhat membranaceous, conico-campanulate, *papillate*, *striate*, *smooth*, fuscous, silky-isabelline when dry; stem fistulose, rigid, *polished*, smooth, *white-mealy at the apex;* gills adfixed, separating, somewhat crowded, grey.

Odour peculiar. Stem elongated, shining, fragile, somewhat thickened at the apex. It varies with the gills rose-colour.

On grassy ground. Aug.

East. Tweed — — — Moray —

West. — — — —

Roxburgh. Rev. David Paul. Rothiemurchus. Rev. S. Keith.

England. Europe.

3011. A. (Pholiota) **aureus** Mattusch. *Fr. Hym. Eur. p.* 214.

Pileus fleshy, hemispherical then expanded, obtuse, *somewhat velvety*, pulverulent or obsoletely squamulose,

golden-tawny; stem stuffed, somewhat equal, *even*, and, as well as the adnexed ventricose gills, paler.

Very handsome, flesh comparatively thin, soft, white then becoming yellow. It sheds its spores very plentifully, hence the distant ring and the apex of the stem are pulverulent. It has occurred with the soil glued together by the mycelium in the form of a ball at the base. Ring varying wide, radiato-striate and veined.

On the ground. Sep.

East. — — — — — —
West. Solway — — —

Dumfries Fungus Show, Sep., 1883.
Europe.

The typical plant, which has not been found hitherto in Britain, is a much handsomer plant than A. Vahlii, richer in colour, and velvety on the pileus.

3012. A. (Pholiota) heteroclitus *Fr. Hym. Eur. p.* 220. *C. Hbk. No.* 295.

On trunk.

East. — — — — — —
West. — Clyde — —

Cadder Wilderness. Mr. T. King.
England. Europe.

3013. A. (Pholiota subluteus Fl. Dan. *Fr. Hym. Eur. p.* 224.

Pileus fleshy, thin, flattened, umbonate, squamulose, striate at the margin when moist; stem *stuffed*, *smooth*, *yellow*, thickened at the base, ring spreading; gills decurrent, crowded, cinnamon.

Somewhat caespitose, 3in., pileus yellow, with darker scales.

On grassy ground. Oct.

East. Tweed — — — —
West. — — — —

Faldon side. Rev. David Paul and William B. Boyd.
Europe.

3014. A. (Inocybe) hirsutus Lasch. *Fr. Hym. Eur. p.* 227. *Grevillea Vol.* VIII. *p.* 76.

In mixed wood. Sep.—Oct.

East. — — Tay — — —

West. — — — —

Glamis, Hunter's Hill. J. S.

England. Europe.

3015. A. (Inocybe) **asterosporus** Quel. *Bull. Soc. Bot. Fr. Vol.* XXVI. *p.* 50. *Bull. Soc. Rouen, Pl.* II. *f.* 6.

Stem stuffed, firm, bulbous, furnished with a separable cuticle, reddish, pubescent, with brown striae. Pileus convex, umbonate (m. 03—5), cracked, bistre; odour mouldy. Gills emarginate, ventricose, *thin*, whitish bistre, then cinnamon. Spores globose (mm. 012), stellate-spinulose, brown.

On grassy ground in woods. Aug.—Sep.

East. — — Tay — Moray —

West. — — — —

Glamis. J. S. Rothiemurchus. Rev. Dr. Keith.

England. Europe.

Very similar to *A. rimosus*, for a form of which it might be easily mistaken without examination of the spores, which are stellate.

3016. A. (Hebeloma) **glutinosus** Lindgr. *Fr. Hym. Eur. p.* 238.

Pileus fleshy, convex, then plane, obtuse, viscous with tenacious gluten, *sprinkled with superficial white squamules*, yellow-white, discoid; *stem* stuffed, *somewhat bulbous*, white-squamulose, and mealy at the apex, furnished with a cortina; gills sinuato-adnexed, crowded, light yellow, then clay-cinnamon.

Stem firm, at length ferruginous internally. Pileus slimy in wet weather, 3in. broad. Odour mild.

On the ground among leaves &c., Sep.—Nov.

East. Tweed — Tay — — —

West. — — — —

Glamis. J. S. Roxburgh. Rev. David Paul.

England. Europe.

3017. A. (Galera) **minutus** Quel. III. *p.* 10 *t.* 1 *f.* 5. *B. & Br. No.* 1656.*

Chamois-bistre, tender, quickly withered by a breath.

Stem somewhat capillary (1 cent.), smooth, tawny, shining, base webbed-spreading and white. Pileus campanulate (2-3 millim.), membranaceous, striate. Gills adnato-arcuate, as broad as long, moderately crowded, yellowish, then clay-coloured with the edge whitish, spores pruniform (mm. 006), ochrey.

	Among moss.					Sep.
East.	—	—	Tay	—	—	—
West.	—	—	—	—		

Glamis. J. S.

England. Europe.

* A. (Crepidotus) **alveolus** Larch. *Fr. Hym. Eur. p.* 275. *S. Mycol. Scot. No.* 358.

Roxburgh. Rev. David Paul.

3018. A. (Psalliota) **echinatus** Roth. *Fr. Hym. Eur. p.* 282. *Berk. Out. p.* 167.

	Among ferns.					Oct.
East.	Tweed	—	—	—	—	—
West.	—	—	—	—		

Faldonside, Melrose. William B. Boyd and Rev. David Paul.

England. Europe.

3019. A. (Hypholoma) **pyrotrichus** Holmsk. *Fr. Hym. Eur p.* 293.

Pileus somewhat fleshy, conical then hemispherical, obtuse, *densely clothed with somewhat adpressed tawny fibrils*, which are here and there squamulose-fasciculate, *fiery-tawny*, *flesh and cortina tawny;* stem hollow, fibrillose, becoming tawny; gills adnate, pallid, then becoming brown.

Very striking, caespitose. Stem fibrous-soft, often slightly squarrose-scaly.

	In mixed wood.					Sep.—Oct.
East.	—	—	Tay	—	—	—
West.	—	—	—	—		

Glamis. J. S.

England. Europe.

(*To be continued.*)

A NEW BRITISH CAREX FROM CAITHNESS.

We have just received from Mr. A. Bennett, information of the discovery of *Carex kalina*, *B. sattegatensis*, Fr. Mr. Bennett's article will appear in full in the next number of this Magazine, but the discovery is of such interest as to call for the earliest possible publication. The species was found by Mr. Grant, of Wick, on sand banks beside Wick river, and specimens were forwarded by him to Mr. Bennett under the name "*C. riparia* (?)" The type is known from northern Europe, the Faroe Islands, and Iceland, the form *kattegatensis* has been found in Norway and in the south of Sweden.

BOTANICAL NOTES.

Allium carinatum, L., *in Dumfries and Kirkcudbrightshires.*—Mr. F. R. Coles, Tongland, Kirkcudbright, has sent me specimens of this Allium from the coast of Kirkcudbright opposite St. Mary's Isle, when he describes it as growing "at the edge of the shingle among Rubus, Ulex,and Sarothamnus in broken roughish ground, with no trace of any planted shrubs near; there are cottages near, but inquiries of the cottars as to the plant elicited remarks tending to make one think they supposed it a slight evidence of insanity that they should grow so trivial a plant. Other inquiries from Lord Selkirk's head gardener failed to show the plant as known by him on St. Mary's Isle."

Mr. Watson sent me specimens also "From a sandy roadside at Closeburn, Dumfries, where it grew among whin." These localities seem to point to the plant being well established, but it increases so rapidly from a single head bulbil that much suspicion must always be thrown on the species as a possible native. In my garden it increases with at least ten times the rapidity of *A. oleraceum*.

Calamagrostis lanceolata, Roth., *in Kirkcudbrightshire.* — Mr. J. M'Andrew of New Galloway has sent me a specimen of this species gathered "at Kenmore, Holms, an extensive flat of alluvial land at the mouth of the River Ken, and at the north end of Loch Ken, used only for hay. This flat is flooded several times in the year. In this flat are several lagoons, generally bordered by bushes, and *Calamagrostis* was growing at the damp side of one of these lagoons among willow bushes." This description of its place of growth is just as it grows in Norfolk and Cambridgeshires, when I have seen it cut with the reed grasses for coarse hay. It has been reported from Pennycuik, Edinburgh; but Dr. Syme suggests its being "planted," in English Botany, 3rd ed. In "Topographical Botany," 2nd ed., it is admitted as a native as far north as Cheviotland—Cumberland and Edinburgh being suggested as errors, and confusion with *C. Epigejos* being suggested in some cases.

ARTHUR BENNETT.

On Scottish Carices.—On Cairn of Daimh in Glen Shee, East Perth, I gathered a sedge which seemed intermediate between *Carex panicea* and *C. vaginata*. Mr. Arthur Bennett says that it comes very near to *C. Pelia*. *Carex rupestris L.* I gathered in Glen Shiel, West Ross.

Oxford, *5th November*, 1884. G. C. DRUCE.

GEOLOGY.

THE CRYSTALLINE ROCKS OF THE SCOTTISH HIGHLANDS.

In the last volume of this Magazine we have had occasion (pp. 48 and 140) to report the publication of papers dealing with the important and most interesting problem of the age of the crystalline rocks of the Scottish Highlands. This problem is reawakening in the attention of geologists, but is only a new phase of a controversy that in past years was carried on between Sir Roderick Murchison on the one hand, and the late Professor Nicol of Aberdeen University on the other.

The great name of the former geologist procured a general acceptance of his views; so that for many years they held undisputed sway, though never yielded to by his opponent, who had personally examined the disputed area. But within the past year or two, interest has again centred itself on the north-west of Scotland, as containing the key to the problem of the age of the Highlands; and Drs. Lapworth and Callaway have done good service in recalling to the notice of British geologists that the generally accepted view rests on an insufficient basis. In 1883 a party from the Scottish Geological Survey was stationed in Sutherlandshire, with instructions to map the Durness district carefully. The results arrived at by them have led to a reversal of Murchison's conclusions, and we take this occasion of vindicating in some measure the reputation of one esteemed by all that studied under him, and to draw attention to the acceptance in the main of Professor Nicol's conclusions even by the Geological Survey, by reprinting from *Nature* (Nov. 13, 1884) the following article by A. Geikie, F. R. S., the Director of the Survey. The article is of so great value that our readers will be pleased to have it in a magazine, devoted, as this is, to recording advances in Natural Science in all branches in Scotland.—(Ed., *Scot. Nat.*)

The article is as follows:

"The Crystalline Rocks of the Scottish Highlands."—Ever since the discovery of Silurian fossils in the rocks of north-west Sutherland, it has been recognised that in that region lies the key to the structure of the Scottish Highlands. Accordingly, when in the progress of the Geological Survey, the mapping of the Highlands had to be undertaken, I determined that a detailed survey of the Sutherland ground on the scale of six inches to a mile should be made as a basis for the work. In the summer of last year, a surveying party under the charge of Mr. B. M. Peach, was stationed there with instructions to begin by mapping the Durness basin. This duty was satisfactorily accomplished before the end of the season. The Silurian series of Durness was ascertained to be about 2000 feet thick, and to consist of numerous successive zones, which were traced on the six-inch map, and discriminated in such a way as to be recognisable should they be found to occur in the more complicated region of the east. With this necessary ground-work well established, the Eriboll tract was attacked this summer by Messrs. Peach and Horne. I had never myself had an opportunity of studying the Eriboll section, which, from the days of Macculloch down to the present time, have been such fruitful subjects of discussion. It was a special instruction to the officers now intrusted with the detailed survey of the region to divest themselves of any prepossessions in favour of published views, and to map the actual facts in entire disregard of theory. By the close of this last season the structure of the Eriboll area had likewise been traced on the six-inch maps, and I then went north to inspect the work. From time to time during the summer, reports had been made to me of the progress of the survey, but though from the published descriptions of that tract, I was aware that its structure must be singularly complicated, and although apprised of the conclusions to which the surveyors, step by step, and almost against their will had been driven, I was hardly prepared for the extraordinary geological structure which the ground itself presented, or for the great change in the interpretation of the sections as given by Murchison.

No one cursorily visiting the ground, could form any notion of its extraordinary complication, which could be satisfactorily unravelled only by patient detailed mapping such as had never yet been bestowed upon it. With every desire to follow the interpre-

tation of my late chief, I criticised minutely each detail of the work upon the ground ; but I found the evidence altogether overwhelming against the upward succession which Murchison believed to exist in Eriboll, from the base of the Silurian strata into an upper comformable series of schists and gneisses. The nature of this evidence will be best understood from the subjoined report (which will be found in *Nature*) which at my request Messrs. Peach and Horne have prepared. As the question of the succession of the rocks in the north-west Highlands is still under discussion, I think it right to take the earliest opportunity of making this public declaration. It would require more space than can be given in these pages, to do justice to the views of those geologists, from Nicol downwards, by whom Murchison's sections have been criticised, and to show how far the conclusions to which the Geological Survey have been led have been anticipated. When the official memoirs are published, full reference will be given to the work of previous observers, to which, therefore, no further allusion is made at present.

The most remarkable features in the Eriboll area are the prodigious terrestrial displacements, to which there is certainly no parallel in Britain. Beginning with gentle foldings of the rocks, we trace these becoming increasingly steeper on their western fronts, until they are disrupted and the eastern limb is pushed westwards. By a system of reversed faults, a group of strata is made to cover a great breadth of ground and actually to overlie higher members of the same series. The most extraordinary dislocations, however, are those to which, for distinction, we have given the name of *Thrust-planes*, they are strictly reversed faults. but with so low a hade that the rocks on their up-throw side have been, as it were, pushed horizontally forward. The distance to which this horizontal displacement has reached is almost incredible. In Durness, for example, the overlying schists have certainly been thrust backwards across all the other rocks for at least ten miles. In fact, these thrust-planes, but for the clear evidence of such sections as those of Eriboll, could not be distinguished from ordinary stratification-planes, like which they have been plicated, faulted, and denuded. Here and there, as the result of denudation, a portion of one of them appears capping a hill-top. One almost refuses to believe that the little out-lier on the summit does not lie normally on the rocks below it, but on a nearly horizontal fault

by which it has been moved into its place. Masses of the Archæan gneiss have thus been thrust up through the younger rocks, and pushed far over their edges. When a geologist finds vertical beds of gneiss overlying gently inclined sheets of fossiliferous quartzite, shale, and limestone, he may be excused if he begins to wonder whether he himself is not really standing on his head.

The general trend of all these foldings and ruptures is from north-north-east to south-south-west, and the steep westward fronts of the folds show that the terrestrial movement came from east-south-east. Corroborative evidence that this was the direction of the movement is furnished by a series of remarkable internal rearrangements that have been superinduced upon the rocks. Throughout the whole region, in almost every mass of rock, altogether irrespective of its lithological characters and its structure, striated planes may be noticed which are approximately parallel with the thrust-planes, and are covered with a fine parallel lineation, running in a west-north-west and east-south-east direction. These surfaces have evidently been produced by shearing. Again, many of the rocks near the thrust-planes, and for a long way above them are marked by a peculiar streaked structure, which reminds one of the fluxion-lines of an eruptive rock. The coarse pegmatites in the gneiss, for example, as they come within the influence of the shearing, have had their flesh-coloured felspar and milky quartz crushed and drawn out into fine parallel laminae till they assume the aspect of a rhyolite in which fluxion-structure has been exceptionally well developed. The gneiss itself coming into the same powerful mill, has acquired a new schistosity parallel with the shearing-planes. Hornblende rock has been converted into hornblende schist. Moreover, new minerals have, like-wise made their appearance along the new divisional planes, and in many cases their longer axes are ranged in the same dominant direction from east-south-east to west-north-west.

Murchison believed that the Silurian quartzites and limestones of Eriboll pass up under, and are quite conformably overlain by this upper gneiss. It is quite true that they are so overlain; but the overlying rocks, instead of having been regularly deposited on them, have been pushed over them. What then, are these overlying rocks? Though they have undergone such intense alteration during the process by which they were moved into their present position that their original characters have been in great measure

effaced, lenticular bands occur in them which can certainly be recognised. Some of these bands are unquestionably parts of the Archæan gneiss ; others are Silurian quartzite, and in one case we can detect a large mass of the Upper Durness limestone. Traced eastwards, however, the crystalline characters become more and more pronounced until we cannot tell, at least from examination in the field, what the rocks may originally have been. They are now fine flaggy micaceous gneisses and mica-schists, which certainly could not have been developed out of any such Archæan gneiss as is now visible to the west. Whether they consist in part of higher members of the Silurian series in a metamorphic condition remains to be seen. The occurrence of a band of crystalline limestone and calcareous schist, which has been traced for many miles above the great thrust-plane, certainly suggests that it represents the upper part of the calcareous Durness series attenuated and altered by the intense shearing which all the rocks have undergone. This much at least is certain, that the schistose series above the thrust-plane is partly made up of Silurian strata, and has received its present dip and foliation since Silurian times.

Having satisfied myself that Murchison's explanation of the order of sequence could not be established in Eriboll, I was desirous to see again, in the new light now obtained, some of the Ross-shire sections for the description of which I am responsible. Had these sections been planned for the purpose of deception they could not have been more skilfully devised. The parallelism of dip and strike, between the Silurian strata and the overlying schists is so complete as to prove the most intimate relationship between them ; and no one coming first to this ground would suspect that what appears to be a normal stratigraphical sequence is not really so. But the clear coast-sections of Eriboll, where every dislocation is laid bare, have now taught me that I have been mistaken, for the parallelism in question is not due to conformable deposition. The same kind of evidence of upthrust and metamorphosis that these coast-sections reveal, can be traced southwards for a distance of more than ninety miles. The task of unravelling the geological structure of these southern regions will be much facilitated by the remarkable persistence of the Sutherland Silurian zones, some of which, with their characteristic features and fossils, are as well marked above Loch Carron as they are at Loch Eriboll.

In South-western Ross-shire, the platform on which the Silurian

rocks rest is a thick mass of Cambrian red sandstone. In the great upthrow, it is this sandstone platform which has there been pushed over the limestones and quartzites. On the west side of Loch Keeshorn, the red sandstones, in their normal unaltered form, rise up into the colossal pyramids of Applecross ; but on the east side, where, at a distance of little more than a mile, they overlie the limestones, they bear so indurated an aspect that they have naturally been classed with the quartzose members of the Silurian series. Traced eastwards they present increasing evidence of intense shearing ; fluxion-structure makes its appearance in them, with a development of mica along the divisional planes, until they pass into frilled micaceous schist, in which, however, the original clastic grains are still recognisable. They finally shade upwards into green schists and fine gneiss which merge into coarse gneiss with pegmatite. The short space within which ordinary red felspathic sandstone and arkose acquire the characters of true schists, is of some importance in regard to the change from the unaltered Silurian strata of the Southern Uplands into the metamorphic condition of the Highland phyllites, grits, &c.

Obviously the question of chief importance in connection with the structure now ascertained to characterise the north-west Highlands relates to metamorphism. That there is no longer any evidence of a regular conformable passage from fossiliferous Silurian quartzites, shales, and limestones, upwards into crystalline schists, which were supposed to be metamorphosed Silurian sediments, must be frankly admitted. But in exchange for this abandoned belief, we are presented with startling new evidence of regional metamorphism on a colossal scale, and are initiated some way into the processes whereby it has been produced.

From the remarkably constant relation between the dip of the Silurian strata and the inclination of their reversed faults, no matter into what various positions the two structures may have been thrown, it is tolerably clear that these dislocations took place before the strata had been seriously disturbed. The persistent parallelism of the faults and of the prevailing north-easterly strike of the rocks indicates that the faulting and tilting were parts of one continuous process. The same dominant north-easterly strike extends across the whole Highlands, and also over the Silurian tracts of Southern Scotland and of the North of England. There is reason to regard it in all these regions as probably due to one

great series of terrestrial movements. These must have occurred some time between an early part of the Silurian period and that portion of the Old Red Sandstone period represented by the breccias and conglomerates of the Highlands. In the Central and Eastern Highlands, the slates, phyllites, grits, quartzites, and limestones, which, along the southern border, are scarcely more altered than their probable equivalents among the Silurian Uplands, had been greatly plicated, and had assumed a more or less crystalline structure. But when these changes were brought about, there lay to the north-west a solid ridge of Archæan gneiss and Cambrian sandstone which offered strong resistance to the plication. The thrust from the eastward against this ridge must have been of the most gigantic kind, for huge slices, hundreds of feet in thickness, were shorn off from the quartzites, limestones, red sandstone, and gneiss, and were pushed for miles to the westward. During this process, all the rocks driven forward by it had their original structure more or less completely effaced. New planes, generally parallel with the surfaces of movement, were developed in them, and along these new planes a re-arrangement and re-crystallisation of mineral constituents took place, resulting in the production of crystalline schists. This metamorphism certainly occurred after early Silurian times, for Cambrian and Lower Silurian strata, as well as Archæan rocks, have been involved in it.

It is obvious that into the problems of Highland geology, always admittedly obscure, a fresh element of difficulty is introduced. At the same time the aid furnished by a minute study of the southern sections is so great that we may hope to attack these problems with more success than has hitherto seemed probable. The work, too, is not of a kind to be attempted in a few hasty scampers over the ground. It will require patient detailed mapping. But when the great base-lines have once been accurately traced, the difficulties will doubtless begin to diminish, and, like the pieces of a puzzle, the various segments of the Highlands will then be found to arrange themselves in their proper places.

ARCH. GEIKIE.

MEETINGS AND PROCEEDINGS OF SCOTTISH SCIENTIFIC SOCIETIES.

NOTE.—Accounts of meetings during the month preceding the date of issue of any number of this *Magazine* are too late for that number, but will appear in the next.

THE CRYPTOGAMIC SOCIETY OF SCOTLAND held its tenth annual conference at Kelso on the 3rd, 4th, and 5th of September last, under the presidency of William B. Boyd, Esq. of Faldonside.

It had been determined that there should not be a public show of fungi at this meeting; and, fortunately so, as the supply of the larger fungi was altogether insufficient to furnish an exhibition. With the exception of some districts in the west of Scotland, the year has been a barren one. Excursions were made on the three days, to Bowmont Forest, Stichill, and Springwood Park. The beauty of the scenery and unclouded sunshine helped to mitigate the disappointment which the absence of fungi created. The meeting was, on the whole, a most enjoyable one. If fungi were absent, old friends were present, and new interests were awakened, and at the close of the conference the members parted with another green spot for memory to recall.

In his annual address the President gave a clear and exhaustive account of the progress and results of botanical research in the Border counties of Scotland. He traced minutely the labours of Johnston and Jerdon, and gave ample evidence that since their time botanical study has been prosecuted with zeal and success by the members of the Berwickshire Naturalsts' Club. When Johnston's "Flora of Berwick-upon-Tweed" was published in 1829-31, little attention had been paid to Cryptogamic botany; but great advances were made by Jerdon, whose valuable lists of the fungi of the district are contained in the "Transactions of the Berwickshire Naturalists' Club." The study of ferns and mosses has hitherto attracted the chief notice of the Border Cryptogamists. The President referred specially to a list of mosses, drawn up by Mr. Hardy in 1868, which contains 267 species. The address, which was a valuable contribution to the history of local research, was listened to throughout with the greatest interest, and a hearty vote of thanks was awarded to the President.

Additions to *Mycologia Scotica* were laid upon the table. The following figures will serve to show that Scottish Mycologists have not been idle in recent years. In 1879 (when *Mycologia Scotica* was published) there were 2154 species recorded for Scotland. During the last five years 891 species have been added to the list, so that the species recorded for Scotland now amount to 3045. Between the publication of Cook's *Handbook* in 1871, and the publication of *Mycologia Scotica* in 1879, 192 species were recorded from Scotland as new to the British Flora. During the last five years 66 species have been added, so that species new to the British Flora reported from Scotland now number 258. Between the same dates—1871 and 1879—107 new species were recorded for Scotland. During the last five years 17 species have been added, so that species from Scotland new to the Cryptogamic Flora now number 124.

It has frequently been our experience that in seasons when the commoner fungi were less abundant, greater rarities were met with. This may possibly be owing to attention being more concentrated on the few; but during the excursions at Kelso, we were denied this consolation. The only fungus which is worthy of being specially recorded is *Agaricus areolatus*, Kl. It was found by the President at Faldonside on the day previous to the meeting, and was again met with at Springwood Park. It has not been gathered, so far as we are aware, since it was discovered by Klotsch, more than half a century ago, in the Botanic Garden in Glasgow.

Lichenology proved the more fruitful field, as the following species, identified by Dr. Stirton, will serve to show :—*Cladonia pungens* Flk. ; *C. digitata* L. and F. *brachytes* Ach. ; *C. macilenta* Ehrh.; *C. sylvatica* L. ; *Ramalina subfarinacea* Nyl. ; *Platysma saepincola* Ehrh. ; *P. glaucum* L. ; *Peltigera polydactyla* Hffm.; *Stictina scrobiculata* Scop.; *Parmelia physodes* L. ; *P. conspersa* Ehrh., and *P. isidiata* Anzi.; *P. incurva* Pess. ; *P. saxatilis* L., and var. *omphalodes* L.; *Physcia pulverulenta* Schreb. ; *P. aquila* Ach. ; *Squamaria crassa* Huds.; *Lecanora fuscata* Schrad.; *L. ferruginea* Huds.; *L. recedens* Tayt.; *Lecidea fumosa* Ach.; *L. uliginosa* Schrad.; *L. stellulata* Tayl.; *Opegrapha atra* Pers. ; *O. saxicola* Ach.; *Verrucaria Maura* Wh'nb. It is worthy of note that *Physcia aquila* was met with about twenty miles from the sea-shore, to which it is usually confined.

The following mosses are worthy of mention :—*Pterogonium gracile*, *Hypnum crista-castrensis*, and *Tortula papillosa*.

JOINT MEETING OF LITERARY AND SCIENTIFIC SOCIETIES AT NAIRN.—The annual meeting of Societies in the north of Scotland was held in 1884 in Nairn, by invitation of the Nairn Literary Institute, on Friday and Saturday, 24th and 25th July, and was attended by representatives of the following Associations :—Aberdeen Natural History Society, Alford Field Club, Caithness Field Club, Edinburgh Geological Society, Edinburgh Naturalists' Field Club, Elgin and Morayshire Literary and Scientific Association, Inverness Gaelic Society, Inverness Literary Society, Inverness Scientific Society and Field Club, Keith Field Club, Kirkcaldy Naturalists' Society, and Ross-shire Philosophical Society.

On Friday afternoon the guests were received in the Nairn Museum by the President and other members of the Nairn Literary Society, and Mr. George Bain called their attention to various objects of interest. Of these the chief were the Brodie cabinet of minerals and a fine collection of Old Red Sandstone fossil fishes from Lethenbar and the Clune, in Nairnshire, collected by Mr. Stables, and presented by the Earl of Cawdor to the Museum.

The Brodie cabinet had as its nucleus a collection of minerals made in the beginning of this century in Greenland by the well-known Danish mineralogist Giesecke. This collection was sent to Copenhagen in a Danish vessel which was captured by a British cruiser during the war between Britain and Denmark. The collection was sold in Edinburgh along with the rest of the cargo as a prize, and was bought by Colonel Imrie, by whom it was presented to Lord Gray. He presented it to the late Duchess of Gordon, who added largely to it, and bequeathed it to the late Brodie of Brodie, who made a gift of it to the Nairn Museum. Among other valuable minerals it contains two which were very rare when the collection was made in Greenland—viz., Cryolite and

Sodalite. Herr Giesecke applied for the restoration of his collection, but was unable to recover them. In compensation he was made Professor of Geology in the University of Dublin.

A meeting was held in the evening for the reading of papers. After a short address by Major Fraser, the President of the Nairn Literary Institute, the following papers were read :—

The Botany of Croy, by Rev. Mr. Fraser. The district of Croy lies chiefly in the basin of the Nairn river, between 100 and 300 feet above the sea-level, with the higher grounds to the north and to the south, the highest point in it being Ben Buidh-mor, 1797 feet in height. The area is about ten miles long, and from three to six miles wide. Its whole surface consists of boulder clay, gravel, and sand, with some peat, and rests on sandstone or gneiss. Three small lochs occur in the area, but are not known to present any aquatic plants of special interest. Mr. Fraser submitted a list of the Flowering Plants and Ferns of Croy (360 species), which is printed in full in a pamphlet report of the proceedings. It will doubtless yet be added to considerably in the more difficult groups, but forms a good commencement to the working out of the local flora. We note, as local or rare in the north-east of Scotland :— *Trollius Europaeus*, *Papaver Argemone*, *P. Rhoeas*, *Sisymbrium Sophia*, *Stellaria nemorum*, *Arenaria trinervia*, *Geranium lucidum*, *Potentilla reptans*, *Peplis Portula*, *Senecio viscosus*, *Hypochoeris glabra*, *Monotropa Hypopitys*, *Polygonum Bistorta*, *Rhynehospora alba*.

Cup-Marked Stones, by Dr. Grigor, Nairn, gave an account of the numerous markings in stones in Nairnshire, in which county they are specially common ; and the author mentioned the explanations for their origin that have been suggested, and the superstitions attached to them in Nairnshire. Rev. W. Grigor, Pitsligo, followed with a paper on **Children's Games** ; and Rev. Dr. Joass with one on **The Bronzes of Sutherland**, illustrated by the exhibition of specimens of various weapons, ornaments, and other articles from Sutherland and other parts of Scotland.

The next paper, entitled, **The Geology of Nairnshire**, was written by Mr. John Horne of H.M. Geological Survey, and was of much interest ; but a summary would fail to give any but a very imperfect idea of this paper.

Mr. William Docherty, Thurso, gave some notes on **Marine Zoology**, as the result of his personal experiences with an aquarium. Mr. Milne, King Edward, concluded the meeting with a paper on **Nitrate of Soda**.

The members immediately thereafter were entertained to supper by the Nairn Literary Institute, and passed a very enjoyable evening.

On Saturday an excursion occupied the day fully. About ninety gentlemen and a few ladies started, and all went well with the party, the weather (that most important factor in a day's enjoyment out of doors in Scotland) having been all that could be wished. The route chosen was full of interest, alike antiquarian and historical in connection with the downfall of the Stuart cause at Culloden, artistic from its natural beauty, and scientific. Among the places of most interest visited were Cawdor woods and burn, the old Kirk of Barivan, and the curious old castle of Cawdor, with its traditions of old times. Here they were hospitably received by Lord Cawdor. Beside the road to Clava was seen a conglomerate boulder, named Tomriach. This is one of the largest in Scotland

and measures 25 feet in height, 35 feet in length, 92 feet round, and is estimated to weigh 570 tons.

At Cantraybruich, about 500 feet above the sea-level, is a bed of blue clay containing numerous Arctic shells.

At Clava the cairns and stone circles were visited. There are many circles in the strath.

Luncheon was taken on Culloden Moor, and the various landmarks of the battle were pointed out and the incidents described by the Rev. Mr. Fraser of Croy.

During the return journey the beauty of the scenery was much admired, especially at Holme Bridge. A visit to Kilravock Castle concluded a most pleasant and successful excursion. On their return to Nairn the party broke up in time to allow the return of the strangers to their various destinations.

DOLLAR LITERARY AND SCIENTIFIC SOCIETY.—This Society was omitted in our lists of Scottish Scientific Societies; but we are glad to have the opportunity afforded us of correcting the omission and of reporting its proceedings. The Society meets monthly, and in the course of the present session two meetings have been held, at the first of which Mr. Carmichael lectured upon the theories of the beautiful, and made use of natural objects to illustrate his views. At the next meeting Professor Struthers, of Aberdeen University, lectured on **The Relation of Man to the Higher Animals** in the light thrown upon that relationship by the theory of evolution. The lecturer gave a *resumé* of the gounds on which evolutionists believe that a genetic relationship exists between the various species of animals, dwelling specially upon the existence of abnormal and of rudimentary structures in the human body, and on inferences to be drawn from these. Both lectures were much appreciated.

EDINBURGH GEOLOGICAL SOCIETY (Saturday, 14th June, 1884).—The Society visited, under the leadership of the Rev. E. Kennedy of Largo, the coast line from Cat's Craig to Largo. The party first proceeded to the mouth of the Cockle Burn, and examined some very interesting sections of sand and gravel, old sea-beaches and basaltic columns. Passing towards Largo a splendid upheaval of the edge of the Carboniferous strata was observed, and, together with a considerable mass of coal fossils, proved most interesting. After examining several boulders the party walked up the Keil's Den Burn to sections of shale and sandstone where some fossils were obtained. They afterwards visited the Blindwells Quarry, where is a mass of basalt intruded into the Carboniferous Limestones and shales, and thereafter returned to Edinburgh.

PERTHSHIRE SOCIETY OF NATURAL SCIENCE (November 13, 1884).—Numerous donations to the Museum in all branches of Natural History were announced, those to the Perthshire collections being of especial value. The President, Dr. F. Buchanan White, read a paper entitled **Museum Notes I. Perthshire Mammalia.** It is the wish of the Society to supplement the collections contained in their excellent Museum with a series of papers that will show the principles on which it has been arranged, and also the deficiencies in the collections that are in need of being supplemented. Dr. White's paper is the first of this series, the mammals having been selected alike because of the

more general interest in them, and because of deficiencies in the collections that require to be filled. We learn from the paper that there are 33 or 34 species of mammals indigenous to Perthshire. The article will appear in the next part of the Proceedings of the Society *in extenso*.

PROCEEDINGS OF THE BERWICKSHIRE NATURALISTS' CLUB —This old and well-known Society has recently published its volume for the year 1883-84 which, as usual, forms a good octavo volume, being Vol. X. pt. II., pp. 225-424, with 14 plates. As in past years the subjects embrace wide range, including several articles on archæological topics, on meteorology, &c., in addition to those that come more naturally under review in this magazine. We may at once state that the quality of the articles is not inferior to those in the earlier volumes of the series, and continue to merit for the Club the high estimation in which it is held.

We now pass to a brief notice of the contents.

Mr. Hardy gives the usual excellent report of the meetings, but to this we shall afterwards return.

The articles fall into several groups. Obituary notices are given of four members of the Club that have died within the year, these being—Rev. John Orr, of Berwick; Robert Crossman, of Cheswick and Holy Island; Rev. John W. Dunn, of Workworth; and Dr. James Robson Scott, of Ashtrees. Professor Duns contributes an obituary notice of William Stevenson (died at Paisley in 1882), for many years an earnest student of the meteorology and of the geology of the South of Scotland. Dr. H. S. Anderson follows with a brief sketch of the career of the renowned traveller, Mungo Park.

Mr. Hardy shows the same energy and research in archæology that have already made him so well-known in biology, and writes (1) on an **Urn near Luffness**, (with 1 plate); (2) **Ednam Hospital**; 3, **On a Spoon at Mousin and Notice of Mousin**; 4, **On the Cross at Crosshall**; 5, **On a Flint Scraper from Gullane Links**; and, 6, **Notes on Yarrow**; besides a paper, along with Miss S. Dand, on **Incised Rocks at Morwick** (with 4 plates of figures). The other articles on Archæology are **Black Dyke and British Camps**, by James Tait; **Flint Implements in Coquetdale** (2 plates), and **Dagger found at Rothbury**, by D. D. Dixon; **Names of the Farne Islands, &c.**, by Mr. R. Carr-Ellison; and **Notes on British and other Coins** (1 plate), by Miss Russell.

Meteorology may be said to be represented by **Hailstorm near Jedburgh**, by J. Scott-Dudgeon; **Injury to Firs by a Snowstorm**, by M. T. Culley; **Effects of Storm of 14th October, 1881, on Plantations**; and **Meteorological Notices.**

Lower Carboniferous Entomostraca (1 plate), by T. R. Jones, F.R.S., is the only strictly Geological paper. In it several new forms are described.

Zoology is represented by papers on Birds—viz., **Herons and Border Heronies**, and **Titlark Feeding Young Cuckoo**, by James Smail; **Cygnus Bewickii** (from Shaws), **with Notes on Anatomical Characteristics** 1 plate), by Dr. T. Anderson; and **Ornithological Notes**, by George Bolam, containing much that will interest ornithologists.

Botany figures with only three papers. These are **Carex divisa in Holy Island**, by the Rev. J. Farquharson; **Fungi from Roxburgh**, by Rev. D.

Paul, which enumerates several rarities among the larger fungi of "Tweed." They will be noticed in the supplement to *Mycologia Scotica*.

Notes on the Marine Algæ of Berwick-on-Tweed, by Edward A. L. Butters (4 plates) enumerates and describes 17 species of seaweeds not previously found in the district, several of the species being figured on the accompanying plates. The additions are—*Sphærozyga Carmichælii*, *Spirulina tenuissima*, *Oscillatoria littoralis*, *O. subuliformis*, *O. nigroviridis*, *O. insignis*. *Lyngbya ferruginea*, *Rivularia atra Roth.*, var. *confluens*, *Hormospora ramosa*, *Cladophora flavescens*, *Vaucheria velutina*, *Fucus vesiculosus*, var. B. *subcostatus*, *Dictyosiphon hippuroides*, *Sphacelaria cæspitula*, *Cruoria adhærens*, *Melobesia Lenormandi*, *M. corallinæ*. Of these species several are quite common in the district, though previously overlooked.

We shall now return to the excursions, the report of which occupies 45 pages, but which must be noticed very briefly here. Five excursions were made in 1883—viz., to Kelso and Eccles on 30th May, to Holy Island on 27th June, to Aberlady on 25th July, to St. Mary's Loch on 29th August, and one to Wooler and Cheviot in September. The first, second, and fourth of these were well attended, and were favoured with fine weather; the other two were made under unfavourable skies, and were consequently ill-attended. Several plants of interest were picked up on Holy Island, but we can hardly claim this as a Scotch locality. We note *Cakile rugosa*, found on the Castle Rock, reported as new to Britain; but it has often been found before as an escape. Some account of the ponds at Gosford, and of the waterfowl preserved on them, as also of the shrubberies, begins the report on the Aberlady excursion. *Trifolium fragiferum*, gathered on the coast west of the Peffer, and a great abundance of larvæ of *Euchelia Jacobææ* on the links at Gullane, were the most noteworthy finds.

PROCEEDINGS OF THE PERTHSHIRE SOCIETY OF NATURAL SCIENCE.—Vol. I. Part 4.—1883-84.—This recently published part well sustains the reputation already gained by the Society for the quality of the papers brought before it; but as we have had occasion during the past year to refer to most of the articles in our reports of the meetings of the Society, we shall here confine ourselves to the titles of the papers, and must leave those desirous of a fuller knowledge of their contents to obtain it from this source, or, still better, from the *Proceedings* themselves. The papers are—"On the Occurrence in Perthshire of Bones of the Red Deer in a Subfossil Condition," by Dr. F. Buchanan White; "Some Results of the Challenger Expedition (*Pelagic Hemiptera*), also by him; "Dimorphism in Oak Gall-Makers and in their Galls," by Professor J. W. H. Trail; "Account of the Conversazione on the Opening of the new Perth Museum on 20th, 21st, and 22nd December;" "Hedgehog's Nest" and "Seasonal Phenomena," and "Notes," by Dr. F. B. White; "The Life-History of a Garden Snail," by Henry Coates; on specimens of *Carex ustulata* and *Triticum alpinum* Don, from Don's Herbarium, labelled as from Ben Lawers; notes on varieties of *Helix nemoralis*, from Perthshire, by Henry Coates; "Evolution and some things said regarding it," by Rev. Dr. Milroy; the President's (Col. Drummond Hay) Address, dealing with the objects and needs of the Society's Museum; "How an Insect Flies," by S. T. Ellison, illustrated with diagrams; "Fruit Culture and some of the Hindrances to its more General Cultivation," by Dr. Robertson. During the

past summer the Society made several excursions, which were well attended, and were productive of a good deal of information in regard to the Perthshire fauna and flora. Space will not permit us to report these at length, but we cannot omit mention of some of the more important finds.

On May 10th, at Craighall, Solomon's Seal (*Polygonatum verticillatum*) and Toothwort (*Lathræa squamaria*) and *Helix lamellata* (not previously known from this part of Perthshire) were met with. On May 22nd, in Kincardine Glen, *Neottia nidus-avis*, *Caltha palustris*, var. *Guerangerii*, *Epilobium angustifolium* var. *brachycarpum*, *Anodus Donianus*, and other interesting plants were found. In the excursions to Aberfeldy, Castle Menzies, and Weem (May 31st), to Abercairny (June 14th), and to Ben Chonzie, near the head of Glen Turret (June 28th), though various local or rare plants and insects were found none need be specified here.

On August 9th, the Banks of the Tay near Meikleour were visited, and the excursion was very successful. Beside the Isla were found a curious variety of *Carex aquatilis*, *Nasturtium palustre*, and what seems to be *Rumex crispus* var. *trigranulatus;* and the river was *Spongilla fluviatilis*, not previously found in Perthshire. Beside the Tay *Lysimachia nummularia* was plentiful, and so also was *Carex vesicaria*, a very local plant in Scotland north of the Forth. *Rumex Hydrolapathum* and *Typha latifolia* were seen in a marsh near Tay farm. *Astragalus glycyphyllus* grows on the bank of the Tay; and in an old bed of the river near Delvine *Polygonum minus* reaches what is believed to be its most northerly station in Britain. In one of the backwaters of the Tay, near the same place, *Subularia aquatica* was discovered, and so also was *Peplis Portula*.

On September 20th the last excursion of the season, to Longforgan and Invergowrie, gave the opportunity of examining, among other places, quarries near Kingoodie. In these were found *Ranunculus confusus*, *Senecio viscosus*, *Rumex crispus*, var. *trigranulatus*, &c., among other noteworthy plants, and of molluscs *Helix aspersa* (local and rare in Perthshire), several forms of *H. nemoralis* and *H. hispida*.

In conclusion, we venture, though without special permission, to quote from the report of the excursion to Ben Chonzie verses written for the occasion by the Bard (Mr. John Young, C.E.) of the Perthshire Mountain Club, and read on the cairn at the summit. "Salix herbacea floreat" is the motto of the Club, which includes in its membership only those that have ascended a Perthshire mountain of at least 3000 feet in height, and that have therefore been in the regions where *Salix herbacea* is the representative, though the smallest, of British shrubs.

Once more at Flora's high behest
Our band has come from east and west,
To scale the mountain's rugged crest,
Salix herbacea floreat!

With rapture sparkles every eye;
The Ben towers upwards to the sky;
On yonder crags our pathways lie;
Salix herbacea floreat!

Dull are the blossoms here below,
Up there they shine with brighter glow,
Where blooms the Gentian of the snow.
Salix herbacea floreat!

The Alpine Speedwell's glorious blue,
The mossy Campion's rose-red hue,
Azalea and Mountain Meadow-Rue,
Salix herbacea floreat !

Adown the dark cliff's mossy side
The sea-green Rose-root's scattered wide ;
The Holly ferns in crannies hide,
Salix herbacea floreat !

" Upon the mountain ledges green,"
The Saxifrage's purple sheen
In many a splendid patch is seen,
Salix herbacea floreat !

And thou, blest Linne's own dear flower,
Dwelling now in some woodland bower,
Now where the Alpine summits tower,
Salix herbacea floreat !

Up, brothers, up, scale ye the height !
He who ascends is in the right !
Below 'tis dark, above 'tis light !
Salix herbacea floreat !

The master issues his command,
" Leave far below the Lotus land !
Around the cairn take your stand ! "
Salix herbacea floreat !

At last around the stones so gray,
From whence the master holds his sway,
The pilgrim band their footsteps stay,
Salix herbacea floreat !

" Fill up the quaigh with mountain-dew !
Hand to each brother old and new,
And bid him say in accents true,
' Salix herbacea floreat ! '"

The master calls upon his men
To fill the quaigh up once again,
" To all friends round Lawers' mighty Ben ! "
Salix herbacea floreat !

" Fill, quaighman, fill up as before !
We drink to those who are no more,
Who climbed the hills with us of yore !
Salix herbacea floreat ! "

SCIENTIFIC JOURNALS.

ENTOMOLOGISTS' MONTHLY MAGAZINE (1884, *July*).—**Notes on Tenthredinidæ**, by P. Cameron (*Nematus Fletcheri* sp. n. described, and male said to have been caught at Thornhill, near Dumfries) ; **Notes on**

British Tortrices, by Chas. G. Barrett (*contd.*); **Hydroptila femoralis Eaton in Scotland**, by J. J. King (near Port-Glasgow). (*August*) **Notes on British Tortrices**, C. G. B. (*September*) **Note on the British Species of Laccobius**, by D. Sharp, M.B., states as Scottish four species (*E. sinuatus* Motsch, *alutaceus* Th., *minutus* Auct,, and *bipunctatus* Th.,) and gives their distinguishing characters; **Eupithecia togata in Roxburghshire**, by A. Elliot; **Adicella filicornis Pict., an addition to British Trichoptera** (in Lanarkshire), by Kenneth J. Morton; **Trichoptera from Unst**, by R. M'Lachlan (*Limnophilus sparsus*, *Stenophylax latipennis*, *S. concentricus*, and *Plectrocnemia conspersa*, all small and dark; **The Nitidulidæ of Great Britain**, by the Rev. W. W. Fowler (with descriptions), mentions as from Scotland *Epuræa silacea* Er., *E. oblonga* Herbst.; (*October*) *E. deleta* Er. *E. parvula* Sturm., *E. immunda* Er., *E. variegata* Herbst., *E. obsoleta* Fab., *E. pusilla* Er., *Micrurula melanocephala* Er., besides certain species common throughout Britain; **On Parthenogenesis in the Tenthredinidæ**, by P. Cameron, records 13 species of sawflies in which the author had proved its occurrence. (*November*) **Notes on the Larva, &c., of Asynarchus cœnosus curt.**, by Kenneth J. Morton; **Notes on British Tortrices**, by C. G. Barrett, states that original specimens of reputed Scottish *Retinia duplana* are really small dark *R. turionella*; **Notes on the Tortrices of Rannoch**, by A. H. Jones; **Penthina Staintoniana a Scotch form of P. Sauciana.**, by A. H. Jones. (*December*) **The Nitidulidae of Great Britain**, by W. W. F., enumerates as Scotch *Omosita depressa* and *Thalyera sericea*, besides others generally distributed; **Revision of the British species of Sphecodes** Latr., by E. Saunders, F.L.S., mentions *S. subquadratus* from Dumfries; **On a Small Collection of Trichoptera from Unst, North Shetland**, by R. M'Lachlan, F.R.S. (includes *Phrygan a varia* F., *Limnophilus auricula* C., *L. griseus* L., *L. sparsus* C., *Stenophylax latipennis* C., *S. concentricus* Zett., *Mesophylax impunctatus* M'Lach. var. *Zetlandicus* (var. nov.) *Halesus radiatus* C., *Drusus annulatus* Steph., *Oecetis ochracea* C., *Plectrocnemia conspersa* C., *Polycentropus flavomaculatus* Pict. ? Small size and dark colour are dominant features of the Shetland Trichoptera, just as among the Lepidoptera.

NEW WORKS ON BRITISH CRYPTOGAMIC BOTANY.

Since our last notice (in July) several additions have been made to the literature of this branch, in continuation of works already in progress, and in re-issue of works already known favourably to specialists. Though none deals with the Cryptogams of Scotland peculiarly, yet all contain too much of interest to Scotch botanists to allow of their being passed in silence.

Braithwaite's **British Moss-Flora** has reached its eighth part (Tortulaceæ); the new part fully sustains the reputation of the others.

Hobkirk's **Synopsis of British Mosses** has just appeared in a second edition. The book has been favourabiy known to bryologists since its first appearance several years ago, as the most convenient recent small work on these plants; and the appreciation in which it is held has been proved by the fact that for some time it has been quite out of print. Space will not permit us to say more in this place than that this edition has been thoroughly revised b the author, and has been brought up to date in the information required in

a handbook such as it is designed to be. The arrangement and classification have been entirely revised, and have been altered so as to bring them into accordance with the arrangement proposed by Jæger in his *Adumbratio Muscorum*, as seeming the most natural and convenient, besides which, with a few alterations, it nearly coincides that of the "London Catalogue of British Mosses, second edition." For many of the rarer species Scottish localities are given.

Dr. M. C. Cooke has completed his **British Fresh-Water Algæ**; parts IX. and X. have appeared, including *Scytonemeæ*, *Calotricheæ*, *Rhodophyceæ*, and the index. Wherever possible, coloured illustrations have been supplied Desmids and Diatoms have not been included; but, even excluding these, th work is a large and handsome one. and must prove essential to all that occupy themselves with British Fresh-Water Algæ.

Cooke's **Illustrations of British Fungi (Hymenomycetes)** has reached its 26th part; and in *Grevillea* the re-issue ot descriptions of the species figured in the *Illustrations*, is being continued.

A Synopsis of the Bacteria and Yeast Fungi, by W. B. Grove, B.A., is a re-issue, with additions, of a series of papers that appeared in *Science Gossip*, and is founded in part on *Die Pilze*, by Winter in the new edition of Rabenhorst's *Kryptogamenflora*. The book treats well of a group of minute organisms now believed to be of the utmost importance because of their influence on human economy, but that are even yet but little accessible to study by any but specialists, on account both of their extremely minute size, and of the literature upon them being scattered and not readily accessible to English readers. The latter difficulty is in a very great measure removed by this work, which ought to give a great stimulus to the investigation of these minute or ganisms among us. The various forms are illustrated by woodcuts.

Diseases of Field and Garden Crops (chiefly such as are caused by Fungi), by Worthington G. Smith, F.L.S., is the title of a small manual by a well-known mycologist on a most important subject. We shall give a longer notice of it in this Magazine.

FORTHCOMING WORKS ON BRITISH FUNGI.

In no branch of Botany has the advance been more remarkable of late years than in the study of Fungi, nor has the interest been confined to a few workers only in any one country; for in all European lands, and in North America, ardent students of this group of plants have arisen. Nor is this wide-spread interest to be wondered at when we bethink ourselves of the value of investigations into these plants alike to the student of pure science, seeking to discover the laws of vegetable life under their simplest conditions that he may the more clearly comprehend these laws in their application to the higher types, or desirous of ascertaining the grounds on which classification should be based to be natural; to the physician in his efforts to lessen the sum of human diseases; the economist who looks to the injury done by fungi to human welfare by

damage inflicted to our possessions animate and inanimate; and lastly, of the interest to every one in the effort to penetrate in some degree into the mysteries of nature, mysteries that even yet meet the inquirer on every side in this line of research.

But be the ground of investigation what it may, the result is that of late years very rapid progress has been made in adding to what was formerly known concerning Fungi. This information is very widely scattered in works and journals in many languages; and the labour of keeping abreast of the advance is too great to be accomplished by any one worker for the whole domain of Mycology. Hence it is more and more felt to be necessary for specialists to devote their attention to comparatively limited groups, so far as a critical knowledge of species is concerned, while retaining a sufficient acquaintance with the science in general to guard against falling into the errors to which too limited a view renders the student liable. In future, therefore, we need not again look for such a textbook on Fungi as Cooke's *Handbook of British Fungi*, unless, indeed, taken up by several specialists in common, each of whom would be responsible for his own special part. But we have no English textbook on Fungi that can be regarded as at all abreast of the present state of our knowledge, or as rendering accessible to the British student of Mycology the vast stores of information accumulated by botanists of all lands since the publication of Cooke's *Handbook*.

It is, therefore, with very great pleasure that we are able to announce the probable appearance in no long time of several monographs or groups of British Fungi. Each monograph will be the work of a specialist, than whom there is none in the country more fit to do the work successfully. We trust that they may receive the encouragement they deserve, alike in the numbers of subscribers, and in assistance from all that may be able to aid them with information.

These monographs are to be on the following groups of fungi :—

Flora of British (Hymenomycetes) Fungi, by Rev. John Stevenson. Mr. Stevenson has made himself well known by his labours in this group, labours that have added not a few species to the British Flora, and still more to the Flora of Scotland. The work will be published (if the number of subscribers will allow) by Messrs. Wm. Blackwood & Sons. The subscription list will shortly be closed; subscriptions may be intimated either to the publishers or to the author (Glamis).

Mr. William Phillips is engaged on a **Monograph of the British Discomycetes**. He is admittedly the first authority on these Fungi in Great Britain. Intending subscribers should communicate with the author (Canonbury, Shrewsbury).

Mr. Plowright is, we understand, at work on the *Uredineæ* with a view to publication. The results to which he has been led from his own experiments are doubtless known to all interested in this very curious and perplexing group of plants; and the work will certainly be of much value.

INSECTA SCOTICA.

THE TRICHOPTERA OF SCOTLAND.

By JAMES J. KING and KENNETH J. MORTON.

MYSTACIDES.

NIGRA L. Common. Rivers and lakes.
DISTRIBUTION—EAST. o Forth Tay Dee o o o o
WEST. o Clyde o o o

AZUREA L. Common. Rivers and lakes.
DISTRIBUTION—EAST. o o Tay o Moray Sutherland o o
WEST. o Clyde Argyle o o

LONGICORNIS L. Common. Lakes.
DISTRIBUTION—EAST. o Forth o o Moray o o o
WEST. o Clyde o o o

TRIAENODES.

BICOLOR Curt. Common. Weedy ponds, and lakes.
DISTRIBUTION—EAST. o o o o Moray Sutherland o o
WEST. o Clyde Argyle o o

ADICELLA.

REDUCTA M'Lach. Not common. Rock springs.
DISTRIBUTION—EAST. o o o o o Sutherland o o
WEST. o o o o o

FILICORNIS Pact. Not common. About springs in warm glens.
DISTRIBUTION—EAST. o o o o o o o o o
WEST. o Clyde o o o

ŒCETIS.

OCHRACEA Curt. Very common. Lakes.
DISTRIBUTION—EAST. o Forth o Dee Moray o Sutherland
o Zetland
WEST. o Clyde o o o

LACUSTRIS Pict. Common. Weedy lakes and canals.
DISTRIBUTION—EAST. o o o Moray o o o
WEST. o Clyde Argyle o o

TESTACEA Curt. Scarce. Streams.
DISTRIBUTION—EAST. o o o o Moray o o o
WEST. Solway o o o o

HYDROPSYCHIDÆ.

HYDROPSYCHE.

PELLUCIDULA Curt. Common. Streams.
DISTRIBUTION—EAST. o o o o Moray Sutherland o o
WEST. Solway Clyde Argyle o o

FULVIPES Curt. Scarce. Large rivers.
DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o o o o o

INSTABILIS Curt. Common. Streams.
DISTRIBUTION—EAST. o Forth Tay Dee Moray o o o
WEST. Solway Clyde Argyle o o

ANGUSTIPENNIS Curt. Not common. Streams.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o Clyde o o o

GUTTATA Pict. Common. Large Rivers.
DISTRIBUTION—EAST. o Forth o o Moray o o o
WEST. o Clyde o o o

LEPIDA Pict. Not very common. Large rivers.
DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o Clyde o o o

DIPLECTRONA.

FELIX M'Lach. Not uncommon about small streams running through well-wooded glens.
DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o Clyde Argyle o o

PHILOPOTAMUS.

MONTANUS Donov. Common. Rapid streams.
DISTRIBUTION—EAST. o o Tay Dee Moray Sutherland o o
WEST. Solway Clyde Argyle o o

WORMALDIA.

OCCIPITALIS Pict. Not uncommon. Springs and waterfalls.
DISTRIBUTION—EAST. o Forth Tay o o o o o
WEST. o Clyde Argyle o o

MEDIANA M'Lach. Rare. Rapid streams.
DISTRIBUTION—EAST. o o Tay o Moray o o o
WEST. o o o o o

UBNIGRA M'Lach. Common. Rapid Steams.
DISTRIBUTION—EAST. o o Tay o Moray o o o
WEST. o Clyde o o o

PLECTROCNEMIA.

CONSPERSA Curt. Very common. Streams.

DISTRIBUTION—EAST. o Forth Tay o Moray Sutherland o Zetland.
WEST. Solway Clyde o o Hebrides.

GENICULATA M'Lach. Not common. Streams.
DISTRIBUTION—EAST. o o o Dee o o o o
WEST. o Clyde o o o

POLYCENTROPUS.

FLAVO-MACULATUS Pict. Very common. Streams.
DISTRIBUTION—EAST. o Forth Tay Dee Moray Sutherland o o
WEST. Solway Clyde Argyle o o

MULTIGUTTATUS Curt. Not common Streams.
DISTRIBUTION—EAST o o o o Moray Sutherland o o
WEST. o Clyde Argyle o o

KINGI M'Lach. Locally common. Streams.
DISTRIBUTION—EAST. o o o o Moray o o o
WEST. o o o o o

HOLOCENTROPUS.

DUBIUS Ramb. Not common. Ponds.
DISTRIBUTION—EAST. o o o o Moray o o o
WEST. o Clyde Argyle o o

PICICORNIS Steph. Common. Ponds filled with water-weeds.
DISTRIBUTION—EAST. o o o o o o o o
WEST. o Clyde Argyle o o

CYRNUS.

TRIMACULATUS Curt. Very abundant. Rivers and lakes.
DISTRIBUTION—EAST. o Forth Tay Dee Moray Sutherland o o
WEST. o Clyde Argyle o o

FLAVIDUS M'Lach. Common. Weedy ponds.
DISTRIBUTION—EAST o o o Dee Moray Sutherland o o
WEST. o Clyde Argyle o o

The Scottish specimens of this insect vary considerably from the English ones.

TINODES.

WÆNERI L. Common. Streams and lakes.
DISTRIBUTION—EAST. o Forth Tay Dee Moray Sutherland o o
WEST. Solway Clyde Argyle o Hebrides.

AUREOLA Zett. Locally common. About rapids and rock springs.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o Clyde Argyle o o

LYPE.

PHÆOPA Steph. Not uncommon. Slowly running streams.
DISTRIBUTION—EAST. o o o o o o o o
WEST. o Clyde Argyle o o

PSYCHOMYIA.

PUSILLA F. Common, Large rivers.
DISTRIBUTION—EAST. o Forth Tay Dee Moray o o o
WEST. o Clyde o o o

RHYACOPHILIDÆ.

CHIMARRHA.

MARGINATA L. Common. Rapid streams and waterfalls.
DISTRIBUTION—EAST. o o o o Moray o o o
WEST. Solway o o o o

RHYACOPHILA.

DORSALIS Curt. Very common. Streams.
DISTRIBUTION—EAST. o Forth Tay Dee Moray Sutherland o o
WEST. Solway Clyde Argyle o o
SEPTEMTRIONIS M'Lach. Common. Usually by streams with rocky beds.
DISTRIBUTION—EAST. o Forth o o o o o o
WEST. o Clyde o o o
OBLITERATA M'Lach. Common. Streams.
DISTRIBUTION—EAST. o o Tay o o o o o
WEST. o Clyde o o o
This insect appears in the autumnal months.

GLOSSOSOMA.

BOLTONI Curt. Not very common. Rivers.
DISTRIBUTION—EAST. o Forth Tay Dee Moray o o o
WEST. Solway o o o o
VERNALE Pict. Common. Rivers.
DISTRIBUTION—EAST. o o Tay Dee Moray Sutherland o o
WEST. Solway Clyde Argyle o o

AGAPETUS.

FUSCIPES Curt. Common. Small streams.
DISTRIBUTION—EAST. o Forth Tay o Moray Sutherland o o
WEST. o Clyde Argyle o o
COMATUS Pict. Common. Rivers.
DISTRIBUTION—EAST. o Forth Tay Dee Moray Sutherland o o
WEST. Solway Clyde Argyle o o

OBITUARY.

Rev. CHARLES CLOUSTON, LL.D.

DR. CLOUSTON was an excellent example of a class of men to whom we owe much of the progress that Scotland has made in times past—we refer to the parish ministers that devote their leisure hours to the scientific study of their surroundings. Though Scotland cannot boast any name so widely honoured as that of Gilbert White of Selborne, yet we could name not a few worthy followers in his footsteps; and, among the number, the subject of this notice must hold no mean rank.

His attention was directed not to any one branch of science alone. In several directions the investigations carried on by him bore good fruit, and aided much in extending the knowledge of Orcadian Meteorology, Botany, and Archæology.

As a meteorologist few men can claim to have carried out more extended or more careful observations, as he may be said to have continued these, almost without intermission of any kind, in the western part of the Mainland of Orkney during the long period from 1822 to 1884. From 1862 till his death he took charge of one of the official sets of meteorological instruments; and his records were regularly published in the official report. He also wrote an essay entitled, "An Explanation of the Popular Weather Prognostics of Scotland on Scientific Principles." This essay gained a prize offered by the Marquis of Tweeddale in 1867. He also wrote a "Guide to the Orkney Islands," which first appeared as a part of Anderson's Guide to the Highlands, but was afterwards reprinted in separate form. In this work are numerous interesting notes on the various departments of science in which its author occupied himself. Among other subjects we find information of

value in regard to the flora of the islands, to our knowledge of which he added considerably.

The Orkney Islands are rich in monuments of the past; and in the exploration of these Dr. Clouston took an active part. During his long life he had frequent opportunities of engaging in this congenial work, as several of the most important of these ancient memorials were discovered or explored during the latter part of this century. Dr. Clouston's father was minister of the parish and town of Stromness in the Mainland of Orkney, and was himself descended from an old Orcadian family of Norse descent. Dr. Clouston was born in the year 1800. Wishing originally to enter the medical profession he studied with that intention in Edinburgh University; and he became L.R.C.S.E. in 1819. But thereafter he entered on the study of Theology; and in 1826 he became assistant and successor to his father, who had charge of the combined parishes of Sandwick and Stromness. We are informed that the duration of the united ministries of his father and of himself reached the extraordinary length of 120 years. For many years he made a good use of his knowledge, giving advice and medicines (gratis) to the people of Sandwick, where no medical officer was resident. The University of St. Andrews conferred on him the well-merited degree of LL.D. He leaves a widow, two sons, and two daughters.

THE AIMS OF A NATURALISTS' FIELD CLUB.

By Dr. HOWDEN.

[The following paper was delivered to the Montrose Scientific and Field Club on 27th January, 1885. Though of special interest and value to the Members of that Society, we believe it to deserve a more permanent record and a wider diffusion than it could obtain in the minutes of the club; and we commend it to the careful perusal of all interested in the question of the fitting work of local Natural History Societies and Field Clubs. Ed. *Scot. Nat.*]

The second clause of the constitution of the Montrose Scientific and Field Club states that its "objects shall be to promote scientific studies and research, and to cultivate friendly intercourse

among its members." In the following remarks, I shall endeavour to explain what seem to me to be the best means and directions in which those objects can be carried out.

The Society has not yet reached that stage when its membership can be attained only by distinguished services to science, or by competitive examinations, yet it may not be amiss to point out to actual or intending members that a halo of awe and mystery is created in the minds of many people by the use of the terms science, scientific and scientist. While not denying the convenience of these words, it should be remembered that science simply means knowledge, and that a scientist is one who devotes much of his time to the acquisition of, or it may be to the teaching of, knowledge. It follows conversely that all knowledge is science, and that all the "logies" are within its domain. A sub-division has, however, come to be made by the use of the somewhat unmeaning term natural science. This term, if I understand it properly, is intended to mean the science or knowledge of the nature and properties of matter. It is to this department of knowledge then I imagine we mean to confine ourselves, and by doing so to exclude metaphysics, religion, and politics. You constantly hear people say, "So-and-so is a scientific man," or "He is not a scientific man; he is a practical man." What is meant of course is, that he is not theoretical, but practical—though I am bound to admit that your practical man is often justly qualified by his ignorance to be exempted from the appellation of scientific. Again, you often hear a person say, "I am not a scientific man!" He means, of course, by this, that he is comparatively ignorant of some branches of knowledge; but to say that he is not scientific, in the strict sense of the term, implies that he is an utter idiot. Every infant so soon as it can use its senses, begins its science training; and all through life we are striving to acquire knowledge which has for its end the promotion of our happiness and the prolongation of our lives. How much the scientific training and expansion of the human race have been impeded by interested ignorance and superstition, is a matter of history; and we have only to look back over sixty or seventy years to see what a more correct and extended knowledge of the properties of matter has done to promote human wellbeing.

It is to this knowledge that we owe the advance that has been made in augmenting the comforts of life, increasing the facilities of

human intercourse, and in the promotion of human happiness all round. We can hardly realise what would be the state of society if all the discoveries and applications of knowledge made during the last sixty years were blotted out; and we may well wonder what our great-grandfathers would think if they could know that we can travel to London in 12 hours, or to America in 6 days; that we can send a message to Hong Kong in a few minutes; can converse in human voice with a friend in Edinburgh; and light our streets, houses, public buildings, carriages, and sea-boats, with what we call electricity, but which, so far as we know, is nothing at all. And yet we seem to be only beginning to know or to apply the knowledge of the conditions and properties of nature to our own purposes. We are only beginning, *e.g.*, to know something of the laws of the weather; and it is not too much to predict that ere long we shall understand these laws, so that we may guard against the catastrophes they produce with absolute certainty. So with health and disease, we are only beginning to understand that disease is the result of conditions which, in nine cases out of ten, perhaps ninety-nine out of a hundred, are of our own creation, or can be easily avoided; and that the physician's highest function is gradually but surely becoming that of a preventer, rather than a curer of disease.

Taking it for granted, then, that we are at one on these points, I have now to consider how we should regulate our studies and researches. The first thing, it seems to me, that each member should do is to make up his or her mind what particular department of knowledge he or she is to adopt for special study. Is it to be chemistry, physics, geology, astronomy, meteorology, biology, or what? You may have an intelligent smattering of all these, but you cannot *study* them all; therefore, you *must* make a selection.

Now, when you begin to study one department of science it seems to you that by application and perseverance you will soon gain a full knowledge of it. But the longer you study, and the more you study, the more you find you have to learn. "Hills peep o'er hills, and alps on alps arise;" undreamt of fields of research open out, and if you are faint-hearted you may think that life is too short to explore them. If, however, you have acquired the true spirit of science and thirst for knowledge, you will take your hammer, or your spade, or your microscope, or your telescope, as the case may be, and you will apply yourselves with

renewed energy, but in a more limited area than you had first contemplated.

After you have acquired, for example, an elementary knowledge of geology, you will find you must limit your area of investigation, if you are to be thorough and original, to—say the old red sandstone or the coal formation. In biology, the necessity for subdivision is still more paramount; entomology for instance, or even a small department of it, such as the coleoptera, lepidoptera, or hymenoptera, have each furnished life-work for many an earnest student.

Your researches, whatever they are, must be inspired by a strict devotion to truth. What knowledge you acquire may bring you no immediate or even prospective gain beyond the acquisition of it; but this to the true student is his highest reward. The pursuit of knowledge and truth has always had foes to contend with. You have not now to dread the persecution of the Church, whatever your investigations are; but you will find opposing your progress the all-powerful priests of Mammon. These counsellors will tell you you should not waste your time gathering beetles, or strain your eyes peering through a brass tube at dirty water. "*Cui bono?*"—what is the use of it? or, "What will it lead to?" "You should mind your business, and leave these things to scientific people." Far be it from me to wish any man or woman to neglect their social or domestic duties, but if there are any in this Society who are to be influenced by such arguments, I would advise them to leave it. The man who is prepared to sacrifice his intellectual, and even his physical life, for the sake of money-making, can never be a true student; he should not pretend to be one; let him stick to his last.

It may, however, not be amiss to tell the Mammonites that scientific studies are not incompatible with the most active social life. Dr. George Johnstone, of Berwick-on-Tweed, carried on a large practice as a physician; he took an active part in municipal and all social matters; he was for a time Mayor of Berwick-on-Tweed; and yet he was an earnest biological student up to the day of his death, and left as the result of his labours his "Flora of Berwick-on-Tweed," "Manual of British Zoophytes," "Manual of British Sponges," and altogether about five-and-thirty books or memoirs of great scientific importance and value.

Sir John Lubbock, more generally known as a statesman, as a

banker, and especially by bank clerks as their holiday friend, is one of the most hard-working naturalists of the present day, and is the author of many classical works on entomology and other branches of science.

Young of Kelly, though he was an old man and a millionaire, was as keen a student of chemistry to the end as he was when he discovered the shale oil; and from what I have heard him say, I am sure it would have been easier for him to have parted with all his wealth than with his love for science.

The late Dr. John Fleming, first Professor of Natural History in the Free Church College, one of the foremost naturalists of his day and the author of many valuable works, was a parish minister in Fife, but was none the less faithful to his duties, though his enthusiasm for natural history was so great that on one occasion, while walking from the manse to the church robed in gown and bands, he gave full chase to a rare butterfly which came across his path.

Nearly forty years ago, I knew a lad in a country bank, who spent his leisure in collecting British birds, and studying their habits. He now holds one of the most trusted offices in one of our largest Scotch banks; but he is also one of our foremost ornithologists, and it is not long since I had the pleasure of attending a meeting of the Royal Society, under the chairmanship of my old friend. To come nearer home, do you suppose the late John Simpson of Marykirk, who was a perfect encyclopedia of knowledge, neglected his patients or did his work as a surgeon less efficiently, because his pockets were generally crammed with mosses, shells, beetles, or some other *vermin* which he had picked up in the course of his wanderings? or, that the respected Free Church minister of the parish of Craig, is less earnest in his ecclesiastic duties, because he is one of the highest authorities on the fishes of the old red sandstone? or that John Robertson, though he is an astronomer, is less attentive to his duties as a railway porter, especially in calling out, "Coupar Angus, change here for Blairgowrie?"

No station in life is too exalted, and none too humble, to bar the student from drinking from the fountain of knowledge. A Prince Consort may draw from it as freely as, but not more so than, Hugh Miller the mason, Thomas Edwards the shoemaker, or our own Alexander Croall the joiner, who, fifty years ago, took

to Natural History as a recreation when in feeble health, and who still works in a green old age at his favourite study, to which, he has told me, he owed improved health, if not life itself, and who is now a high authority in botanical science, and the joint author of the beautiful work on British Algæ, published by Bradbury and Evans.

Having selected your subject, you must, of course, read; but above all observe for yourselves. Take as model observers such men as White of Selborne, Kirby and Spence, Lyall and Geekie, in geology; and, above all, Darwin, the most faithful observer and recorder of facts, perhaps, that has lived in any age.

In the early life of our Society, we are under great obligations to those members who so kindly read papers on general subjects —such as heat, light, electricity, &c. In the preparation of these papers, the authors do themselves good, and afford us pleasure and information. It should, however, be kept in view that the true work of such a Society as ours is original observation and research; and that we will look by-and-bye for the outcome of this work, especially from our younger members. Here let me say that, though possibly some of the members may consider themselves too old to begin new studies, I am quite sure none of you are too young. The love of nature and of acquiring knowledge about all the wonderful things and phenomena that surround us is born with every child; and though we may smother this love, or divert it into other channels by a false education, it will, if allowed, or, still more, if nourished, assert itself.

Forty years ago a few schoolboys in Musselburgh, bit by curiosity, excited at the wonder of a chemist's shop, formed themselves into a little Society, under the ambitious title of the Musselburgh Philosophical Society. I, one of these boys, shall never forget the pure pleasure our meetings afforded us, though I am bound to confess they were often disastrous to our clothes, and were not unfrequently followed by parental chastisement, which indelibly imprinted on our memories the chemical reaction of sulphuric or nitric acid on tweed trousers! Our Society, to which I had the honour of acting as secretary and treasurer, met in a loft. Its membership did not, to the best of my recollection, exceed half-a-dozen, and its existence was of brief duration; but we were in earnest, and did real work. We taught ourselves practical chemistry—there were no science classes in schools in those days,

and, indeed, English was hardly taught, our time-table being mainly monopolised by Latin. We collected birds, plants, shells, insects, and minerals. We got a small dredge made, which I still possess; and we explored the Firth of Forth; and it may not be uninteresting to you to know that out of our six boy members, two afterwards became professors of science, the one being Foster Heddle, Professor of Chemistry at St. Andrews, the other Wyville Thomson, late Professor of Natural History in the University of Edinburgh; better known as Sir Wyville Thomson, the Director of the Challenger Expedition. In our correspondence we avoided familiarities, and maintained a style of language at once decorous and official.

For good work done by field clubs, I might refer you to the Transactions of the Berwickshire Naturalist Field Club, or the Tyneside Club, and many other active local Societies in Scotland and England.

I know no place which affords better scope for a field club than Montrose. You have much to interest you in civil and natural history; you have the Grampians not far off, whence flow numerous streams, which display in their beds most instructive sections of rocks; you have forests, meadows, hills, and plains; you have the basin of the South Esk, which itself is a mine of wealth; and you have not only the sea-shore, but you have the deep sea brought as it were to your very door by the steam trawlers.

It may not be amiss to point out what has been done, and what has yet to be done, in the way of local natural history. Mr. Alexander Croall, now of the Smith Institute, Stirling, worked up the botany, and especially the Marine Algæ of the district, in a very exhaustive manner, and has shown what may be done by a hard-working and far from robust man, in his unbusiness—I cannot call them leisure—hours. The fossils of the old red sandstone again have gained laurels for the Rev. Dr. Mitchell and Mr. Powrie of Reswallie. With these exceptions, I am not aware of any systematic investigations; and it must be remembered that even in these departments much may yet be done. Strange it is that with such opportunities as Montrose presents, we have no collection worth mentioning of the fishes found in our seas; the birds, mammals, and reptiles have not been systematically studied; while insects, marine invertebrates, and a host of the lower forms of animal and vegetable life, are almost unexplored.

Again, we have around us changes going on of the highest interest, whether we regard them from a zoological or geological point of view. The clays of Dryleys, Pugiston, and Redfield are little removed from the human period, and the shells, star fishes, and other animal-remains found in them are of species living now in the Greenland Seas; while the estuary clays, which surround the South Esk Basin, and form the "clay half" of the town, as well as the old sea margins of the sand hills, and on Rossie Island, contain shell deposits of species still living on our shores. The Links and the Bents teach us how, without any convulsion or upheaval, the land has gained gradually, and is now gaining from the sea; just as the rent rocks and sea-worn caves to the north and south tell us, on the other hand, how the sea has gained from the land.

The zoology and botany of the estuary of the South Esk Basin have an interest all their own. We there find species surviving that are apparently tending to become extinct. Zostera marina still lingers, as do also the mollusca Scrobicularia piperata and Conovulus ridenta; while several species of Rissoa, and the curious crustacean, Corophium longicorne abound in millions in the mud, to the delectation of the Red-shank and other wading birds, which are attracted thither by the dainty fare. Just beyond the tide mark in the South Esk we meet with the Unio or pearl mussel, while in its tributary, the Pow, we find instead the Anodonta or swan Anodon, the largest British fresh-water bivalve.

The investigation of the entomology of the the sea-shore within a walkable distance of Montrose would, I am certain, yield valuable results; while the area within the tide mark abounds with rare and interesting marine animals, whose structure and habits are well worth studying either in their native haunts or in the aquarium. We should also seek to enlist the interest of the fishermen and steam-trawlers in our researches; a bucket or old tub can be used as a receptacle for the rejected rubbish or "vermin" as the fishermen term everything but edible fish, and which, though to them useless, are treasures from the deep for the naturalists.

Then we have pre-historic man to look after in his caves, kjökken-möddings, standing-stones, and burial-mounds. We have to gather up his stone implements and pottery, and try to dovetail him, on the one hand with the post-glacial period, and on the other hand with the early historic time. We have to discover the how and the wherefore of these wonderful vitrified forts, such as that at

Finhaven, of the great early British fort at Catterthun, and of the sculptured stones of Craig and Dunnichen. Nor would it be inconsistent with our constitution should any of us be disposed to follow in the footsteps of Jervise in the domain of civil history.

Apart from all other reasons for the existence of a Society such as ours, relaxation from our daily toil is one of no mean importance. Mental rest cannot be gained by vacuity, but by an intelligent occupation in a new direction. It is the constant unvarying strain in one direction that wears out the elasticity of the mind, and though Pope tells you that "a little knowledge is a dangerous thing," depend upon it that it is the littleness and not the knowledge wherein the danger lies, and that a little knowledge, if it is accurate, is much less dangerous than none. In conclusion, I would remind you that besides having material to work on, and willing heads and hands to work with, you need a workshop. You want a meeting room, a library, and, above all, a museum, at once educational and illustrative of the civil and natural history of the district. The affiliation of this Society, with the Natural History and Antiquarian Society, seems the natural and simplest mode of attaining this desirable object; and I would earnestly urge on you to appeal for the wherewithal to provide these desiderata in connection with the Museum buildings to those townsmen, neighbours, and friends who have alike the means and the intelligence to discern the benefit that it is in their power to confer on the youth of Montrose in all time coming.

THE SCIENTIFIC METHOD IN BIOLOGICAL CLASSIFICATION.

By Rev. WILLIAM L. DAVIDSON.

TERMINOLOGY—(*continued.*)

IT is different when we turn to Zoology. All the completeness that botany can claim in the matter of scientific naming finds its counterpart here, whilst there is little corresponding to the defects that I have just alluded to.

In Zoology, there is no lack of names for different (though allied) things, either when these things are obvious or striking, or when they are minute or inconspicuous. Thus, take the words

expressive of *genesis*, and surely there is ample sufficiency for the purpose, biogenesis, abiogenesis, epigenesis, parthenogenesis, pangenesis, gamogenesis, agamogenesis, &c. Or take such a word as "Zoöid." It is the generic term for the "individuals of compound organisms," whether these individuals be produced by gemmation or by fission, and whether they remain attached to each other or become free. But when the separate Zooid is an *Actinozoön*, it goes by the name of a "polype;" when it is a *Polyzoön*, it is called a "polypide;" and when it is a *Hydrozoön*, it is known as a "polypite." Or take the words expressive of the *cup* and the *bell* forms. The cup that contains the polypite of an *Actinozoön*, and the cup that contains the polypite of the *Sertularida*, are not designated (as probably enough they would have been in botany) by the same name, but the one is a "calice" and the other a "hydrotheca;" while "calyx" is the name reserved for certain of the *Infusoria* and of the *Echinodermata*, and "nectocalyx" denotes the swimming-bell of certain of the *Hydrozoa*. Indeed, almost every separate class in Zoology has its distinctive technical names, and there is no hesitation in introducing new words when new facts are discovered. This is, certainly, as it ought to be: for if it is necessary in science to observe minutely and to mark specific differences, it is equally necessary to embody the differentia in an appropriate term.

II. But the converse of the foregoing rule holds, and, if it is proper that every separate thing should have a separate name, it is proper also that every separate name should have its own distinctive meaning.

This rule may be infringed in two ways: (1) when a technical term is employed both in a general and a special signification; (2) when the same technical word is applied to various different things.

A good example of the first infringement is the word "adnate." This, in botany, is used in a general sense as a synonym for *adherent*; and it matters not whether the adherence be that of calyx and corolla, or of corolla and pistil, or of any other parts; and it has also a narrower and special use as applied to anthers. Again, the word "cell" has, in botany, a general and two special significations. It should in strictness be confined to the anatomical plant-unit; but it has also two specialised uses, as referring to the anthers and to the ovary, which might easily enough be avoided if the term were replaced by such words as "sac,"

"cavity," or, better still, "loculus," whose companion-word, "locellus," is found extremely useful.

So with Zoology. "Auricle," for example, is sometimes restricted to the auricular part of the heart in *mammals*; more commonly, it is extended so as to include other than mammalian hearts. "Cell," in the animal organism, is properly the name for the well-known microscopic unit, but it has also the wider signification of "small cavity" in general, as when we speak of a bee's cell, &c.

The second kind of infringement we see in such a technical botanical word as "superior," with its correlative "inferior." One part of a flower is said to be superior to another when it is above it; this is mere position. A calyx is superior when its tube clasps or encloses the ovary (wholly or in part); this is container and contained. An embryo is superior when its radicle points towards the apex of the fruit; this is mere direction. Here, then, we have three distinct significations (above-below, without-within, up-down; or, position, enclosure, and direction); and the word, which might serve a good purpose if restricted to one special use, becomes worse than useless—it is misleading and confusing—when thus extended. There is also a fourth signification, when applied to the relation of parts of a flower to the axis. It is now distance that is denoted: nearer to the axis is superior, further from the axis is inferior.

The same thing occurs in Zoology. Thus, the "operculum" in fishes is one thing; in univalve molluscs it is another. Again, the word "nucleolus" stands both for the minute solid matter found inside the nuclei of some cells, and the minute solid matter found outside the so-called nucleus of certain of the *Infusoria*. And "nucleus" itself has a two-fold application—first to the solid germinal body that many cells contain, next to the solid band-shaped body found inside certain of the *Protozoa*; just as "nucleus," in botany, is applied both to the nucleus of a cell and to the inner mass of the ovule and seed—two entirely different things.

III. The third rule lays down: Avoid exuberance of technical names, and beware of multiplying synonymous terms.

In some instances, the existence of synonyms in science has an archæological value: synonyms are historical landmarks. But, in that case, they are synonyms only in name; the seemingly equivalent terms have really different associations and raise different ideas in the mind. Thus, the synonyms of the two primary divisions of plants, Phanerogams, and Cryptogams, are respectively Cotyledoneæ or

Vasculares and Acotyledoneæ or Cellulares. But on neither side are the synonyms identical; and the words Vasculares and Cellulares, because of their historical connections, convey special meanings to the instructed botanist. So, the words Exogens, Endogens, and Acrogens are not really synonymous with Dicotyledons, Monocotyledons, and Cryptogams. Besides the radical defect that, like Vasculares and Cellulares, they fail to express the truth, they are laden with adventitious meaning, and are retained mainly on account of this.

So with the old names *Infusoria* and *Zoophytes* in Zoology; or with Cuvier's *Mollusca* and his *Articulata*; or, indeed, with the Cuvierian terminology in general, which, when retained in modern systems, has either an historical interest only, or has the application entirely altered.

It is wholly different, however, with the words that are intended to be strict equivalents. In high-flown composition, aiming simply at literary effect, it is often an advantage to have at command fine-sounding words of Greek or Latin, or other foreign origin, a plain Saxon term may fail to suit the purpose: but, as exactness is the object of science, there is no need for studying effect here, and a multiplication of foreign or hybrid words for the same thing when it can be avoided, is certainly an evil. What, then, shall we say to the following doubles in botany:—"loculi," and "thecae," applied indifferently to the cavities of anthers; "syngenesious," and "synantherous," signifying the same thing when used of stamens; "apocarpous," and "dialycarpous," absolute synonyms in reference to pistils; "foramen," and "micropyle," equivalents also in their application to the seed? Or what shall we say to the following in zoology:—"cutis," "corium," and "derma," three words for the true skin, as opposed to "cuticle," and "epidermis," for the scarf skin; "omphalos," and "umbilicus," for the navel; "spiracula," or "spiracles," and "stigmata," for certain tracheal openings in insects? Obviously, these and all similar synonyms are in the highest degree objectionable. Two or more names for the exact same thing (especially if each happen to be "sesquipedalian") are a burden to the learner, and they serve no good purpose to any one. Least of all does the *systematic* naturalist require them; for, dealing so much in the hard and technical, as he must of necessity do, it should be his endeavour not to make the uninviting still less attractive.

(*To be continued.*)

ZOOLOGY.

STRAY NOTES ON THE PEARL MUSSEL.

By WILLIAM JAPP, F.S.A.

I HAVE sometimes wondered why the black pearl mussel (*Unio margaritiferus* Turton), (*Alasmodonta margaritiferus* Gray), is not to be found in the bed of the Isla from its rise in the Forest of Caenlochan, at the head of Glenisla, Forfarshire, down to the confluence of the Isla with the Dean, a distance of about 18 miles. The reason may be found in the fact that the bed of the river for this distance is stony; the river is usually rapid, and there is an absence of smooth and slow-moving water, which, with a gravelly bottom, forms the best habitat for the pearl mussel. The watershed of the Isla, from Caenlochan Forest to the confluence with the Dean, represents a mountainous country with many streams running down from glens, which all help on a sudden rainfall to fill the main bed in great volume; and it is to be feared that an experiment lately tried by me, (October, 1881), may not be suited to the nature of the river bed. The experiment was that of introducing the mussel into the Isla at a point well up the river where the channel is full and comparatively deep.

There is a romance about the early history of the pearl mussel, which gives a charm to everything connected with it. Pearls have been allied with the name of Britain from the very earliest times; and one Roman historian has attributed Cæsar's expedition to Britain to his desire to search for and to own pearls. Pliny confirms this statement by affirming that Julius Cæsar presented a breastplate covered with British pearls to Venus Genitrix, and hung it in her temple at Rome. There are several other references which add to the charm, and strengthen the inference that the de

sire for ornamentation found with the Roman matron a gratification in the Scotch pearl.

By such associations I was induced to make an attempt at planting a mussel bed in the river Isla. I was encouraged also to make this effort because it is generally believed that where mussels exist the trout fishing of a river is improved, and, further, by the thought that the romantic character of the Isla might be increased by the possibility of one day picking up a mussel enclosing a pearl. I therefore put myself in communication with John Farquharson, pearl fisher, Coupar-Angus, who dubs himself pearl fisher to the Prince of Wales, and who certainly has been lucky in finding valuable pearls, and in selling them to the high born. My bargain with him was to procure and lay down on my property 3000 live and sound mussels, to be transported with all rapidity from the Balquhidder river in Rob Roy's country, to a place called Nyds in the parish of Glenisla. This was effected on 15th October 1881, on which day 3000 mussels were in the early dawn placed on the railway, and arrived at Alyth at 10.30 A.M., whence a dogcart rapidly conveyed the fisher and his boxes to Glenisla. The shells were packed in moss, moistened now and again during transit. What I am now to say on the scientific side is drawn chiefly from Mr. Farquharson's experiences. The deposit of mussels in the Balquhidder is limitless. Mr. Farquharson had liberty from the proprietor to fish for pearls and to make use of the shells themselves, in any way calculated to augment his income or the ends of science. The mussels were fished for in a sluggish piece of water at Balquhidder of considerable extent, the average depth of which is about 7 feet. He has constructed for himself a small wherry the size of which is about 3 feet 3 inches each way. He seats himself in his little boat and having provided himself with a long pole or wand, with a small split at the lower end, he eyes the mussels with correct aim ; and when the bottom of the river is free from disturbance, and the water peaceful and in its ordinary state, he can bring up about 6 mussels in a minute. He seizes the mussel with the split of the wand ; and pushes it down until the swelling of the shell is passed, and with a gentle pull he renders the mussel a captive, and lands it in the wherry, or on the side of the stream. If the shell is standing on its end a little open at the top, this position is a sign of life and energy. This fishing is rendered

much more easy, by the use of goggles. By means of these thousands of mussels are rendered visible, standing on end as if with eyes, and ears, and mouths, all attent. It is not certain that they hear; but they are very sensitive to the effects of sight and touch; but by the latter expression I do not mean direct contact, but the result say of impact, caused by a stone falling in the bottom, or by a stick suddenly striking the bed of the stream. According to Mr. Farquharson they are exceedingly acute in sight; and when his little wherry has passed over at a scarcely perceptible pace, these molluscs have by thousands at once shut their shells, so as in an instant to give evidence that they not only saw, but eared an enemy.

(*To be continued.*)

Boreus hyemalis L. in Berwickshire.—In reference to this insect, I may remark that, although not very common in this part of Berwickshire, I have found it in former years during the winter and early spring crawling on wall-tops or among rocks, or shaken from moss or grass. The only record I have made of it is in the report of the Edinburgh meeting (1850) of the British Association in the *Report of Periodical Phenomena for 1849, kept at Penmanshiel, Cockburnspath, Berwickshire*, pp. 348-49, where will be found, "March 12, Boreus hyemalis appeared; and again, Dec. 31st, reappeared." Among the Cheviots I have seen it among mosses on the porphyry rocks behind Wooler, but I do not notice that it has been put on record from this locality. I have also seen it in spring among moss or rocks in Old Cambusdean.

JAMES HARDY, Old Cambus.

Boreus hyemalis, L. near Killin.—On the 23rd October last, while searching a moss-covered wall in Glen Lochay, I took five specimens of an insect which at the time I could not identify. They were laid aside in a test tube until the other day, when it occurred to me that I should again examine them, but through having been neglected for such a length of time, they were in a very mouldy condition; The specimens turned out to be 3 ♂ and 2 ♀ of the above species, agreeing perfectly with M'Lachlan's description in his Monograph of the British Neuroptera-Planipennia.

I noticed that some of the specimen jumped upwards of an inch. My friend Mr. W. R. Baxter, who was searching for spiders along the same wall, also called my attention to the saltatorial habits of the species.

JAMES J. KING.

207 Sauchiehall Street, Glasgow.

PHYTOLOGY.

PLANTS OF ICELAND AND OF THE FAROE ISLANDS NOT KNOWN AS BRITISH.

By ARTHUR BENNETT, F.L.S.

IN the preface to the third edition of the *Student's Flora*, Sir J. D. Hooker remarks that he had been "urged by very competent botanists to include the Faroe Islands as really more British, geographically, than are the Channel Isles; but, if I did so, Iceland should also be included, and on the whole I have thought it best to retain the old limits of the British Flora." The plants of these islands might have been given as an appendix, but as this was not done, I have thought a list of their ex-British plants might be acceptable to readers of the *Scottish Naturalist*, especially as it is to Scottish botanists that we must look for the addition of any of these species to our Flora. At first it would seem an easy task to write down these species that are not to be found in our Floras; and this would be so if only one authority were taken, but on collating the various publications on the Floras, it was found to be a work of some difficulty to make them agree, the proportion of doubtful plants (especially Icelandic) being very large. I have, however, relied principally on Groenlund's *Islands Flora* and Babington's *Revision of the Flora of Iceland* for Iceland, and Rostrup's *Færœrnes Flora* for the Faroes. Yet to show the difference even here, while Groenlund has only 357 species, Babington has 467; but this difference is more apparent than real, as Babington numbers most of the doubtful plants, while Groenlund is excessively cautious in regard to what he admits and numbers.

Icelandic plants not known as British are the following:—

Ranunculus glacialis, L.; **R. hyperboreus**, L.; **R. pygmæus**, Wahlenb.; **R. nivalis**, L.

Cochlearia officinalis, L., v. arctica, Fr.
Draba incana, L., v. contorta, Lindbl.; D. alpina, L.; D. oblongata, Br. (Nyman); D. hirta, L. (Nyman).
Arabis alpina, L. Looking at the European distribution of this species it seems strange that it is not British (Sicily, Greece, and Turkey being the only other countries in which it does not occur).
Arabis petræa, Lam., f. hispida.
Erysimum hieracifolium, L.
Cardamine bellidifolia, L.; C. hirsuta L., v. intermedia, Horn.
Cakile maritima, L., v. integrifolia.
Viola canina, L., v. montana, L. fl. succ.
Arenaria propinqua, Richardson.
Alsine biflora, Wahl.
Cerastium alpinum L., v. glabratum; C. arcticum, Lange.
Stellaria crassifolia, Ehrh.; S. humifusa, Rottb. This, queried by Nyman, doubted by Babington, and not given by Grœnlund, was described and figured by Rottbœll from Icelandic specimens (Trimen, J. of Botany, 1870, p. 278); S. longipes, Gold. (Nyman); S. borealis, Big. (Babington).
Hippuris vulgaris, L., v. maritimus.
Epilobium latifolium, L.; E. montanum, L., v. collinum, Koch.
Sedum annuum, L.
Bulliardia aquatica, D.C.
Saxifraga Cotyledon, L.; S. nivalis, L., v. tenuis, Hartm.
Archangelica officinalis, Hoffm.; probably as A. norvegica, Rup., a sub.-sp.
Hieracium floribundum, Wimm., v. islandica Lange; H. alpinum, L., v. leucotricha, Lange; H. auricula, L. (Babington).
Antennaria alpina, Gaertn.
Achillea Millefolium, L., v. lanata.
Matricaria inodora, L., v. phæocephala, Rup.
Campanula rotundifolia, L., v. arctica, Lange! the W. Iceland plant being different from the British.
Gentiana detonsa, Rottb. (1770); senata, Gunn (1772); G. aurea, L.; and v. uniflora, Lange.
Pleurogyne rotata, Griseb.
Cassiope hypnoides, Don.

Ledum palustre, L. (**dilatum**, Ait. sub.-sp., Nyman).
Vaccinium uliginosum, L., v. **pubescens**, Wormskj. (sp.)
Rhododendron lapponicum, Wg. (Nyman), Babington accepts it on Baring-Gould's authority, hardly sufficient? not in Groenlund's *Islands Flora.*
Primula stricta, Hom.
Armeria maritima, L., v. **sibirica**, Turcz.
Pedicularis flammea, L.
Diapensia Lapponica, L.
Myosotis stricta, Link (likely British).
Plantago borealis, Lange; **P. maritima**, L., v. **pygmæa**, Lange.
Atriplex Babingtonii, Wood, v. **virescens**, Lange! (Caithness! J. Grant.)
Koeniga Islandica, L.
Callitriche verna, Kütz. (sic), v. **cæpitosa**, Schultz.
Salix glauca, L.; and v. **ovalifolia**; **S. herbacea**, L., v. **fruticosa**, Fr.; **S. sarmentacea**, Fr., and v. **rotundifolia**, Ands.; **S. ovata**, Lev.; **S. arctica**, Pall. (Carrol).
Betula alpestris, Fr.; **B. intermedia**, Thom. (something near this in Perth?); **B. odorata**, Bech. (alba, L. p.p.), v. **tortuosa**, Regel, and v. **parvifolia**, Regel.
Luzula confusa, Lindb.; **L. hyperborea**, Br. Groenlund makes these synonymous.
Juncus arcticus, Willd.; near **J. Balticus**. All specimens of this should be carefully examined; they are not easily discriminated.
Juncus alpinus, Willd. One of the sub-sp. or vars. of this is likely to be British.
Sparganium augustifolium, Michx.
Eriophorum Scheuchzeri, Hoppe.
Carex capitata, L.; **C. microglochin**, Wahlenb., might well be passed over as pauciflorus; **C. chordorhiza**, Ehrh.; **C. norvegica**, Wahlenb; **C. festiva**, Drej.; **C. rigida**, Good, v. **infuscata**, Drej., and v. **pudica**, Drej.; **C. hyperborea**, Drej., much the aspect of the extreme states of rigida, i.e. v. inferalpina, Lœst.; **C. turfosa**, Fr.; **C. cryptocarpa**, C. A. Mey; **C. salina** *, Wahlenb.;

* Curiously enough, since the above was written, Carex salina has proved to be a Scottish species (Caithness), and this in some measure from this paper having been compiled; this should be an inducement to further efforts being made to add others to our Flora.—A. B. (*Scot. Nat.*, 1885, p. 26).

C. anguillata, Drej.; C. capillipes, Drej.; C. pedata, L.

Calamagrostis stricta, v. borealis, Læst.

Agrostis rubra, Wahlenb; A. alba, L., v. maritima, Mey. British! though not in our Floras. I have, from Kent, Anglesea and Norfolk, specimens which agree well with Friesian specimens sent by Dr. Buchenau.

Trisetum subspicatum, Beauv.

Aira cæspitosa, L., v. pallida, Rich.

Poa cæsia, Smith.

Lycopodium annotinum, L., v. alpestre, Hartm.

Equisetum arvense, L., v. riparia.

Blechnum Spicant, Roth., v. fallax, Lange.

At one time the Habenaria viridis of Iceland was thought to be a different species, and was named Peristylus islandicus by Lindley.

CAREX SALINA WHLNB., VAR. KATTEGATENSIS FRIES IN SCOTLAND.

By ARTHUR BENNETT, F.L.S.

[Note.—By a printer's error on p. 26 of *Scot. Nat.* for January, 1885, the name is given as *Carex kalina*, Fr., var. *sattegatensis*.—Ed., *Scot. Nat.*]

In August, 1883, Mr. Grant of Wick, Caithness, sent me a Carex named "*C. riparia?*" This being at a time of the year when one is botanically busy, I only glanced at it, and wrote "*C. paludosa* v. *Kochiana*," from the aristate glumes. Having occasion last December to carefully examine all my specimens of Carex, this one, when dissected, I saw at once had nothing to do with *paludosa*; and it seemed, after comparison with continental specimens, to be some form of *salina* (a species that, I may say, contains several sub-species and varieties, all difficult of determination). When at Kew I compared it with the herbarium specimens; but as neither Professor Oliver nor Mr. Baker seemed quite to think with me, I felt afraid of a mistake, and sent the specimen to Dr. Almquist (the author of the *distigmaticon* section of Carex in Hartmann's *Scandinavian Flora*, 2d edition). This answer was—

"The Carex you sent in your last letter is *Carex salina* B. *kattegatensis*, Fr.

I subjoin a description of the species :—

Stems (in Caithness specimens), 18 inches high, with broad membranous sheaths to the lower part of the leaves, leaves $\frac{3}{8}$ in. broad, with the central nerve whitish and very prominent. Female spikes, 2 or 3, 2 inches long ; the lower glumes, with long aristate tips usually 3-nerved (but exceedingly variable), much longer than the fruit ; male spikes 2 to 4, the lowest usually with female flowers at the base, glumes narrow, half truncate at the apex or obtusely rounded ; perigynia short, $1\frac{1}{2}$ lines long, nearly without nerves but variable (not mature and nut shrivelled).

Habit of slender forms of *paludosa* ; characters near form of *aquatilis*, but the young spikes are richly coloured with purplish brown, with the central part of the glumes pale yellowish-brown.

Distribution of the species :—

Iceland !—Faroe Isles—Spitzbergen—N. Zembla.

Arctic Russia—Lapland !—Norway !—Sweden !

Greenland !—British North America—United States !

Distribution of var. kattegatensis :—

Norway ! Provinces of Bohuslän ! and Halland in Sweden.

Placed by Nyman (*Conspectus Florœ Europœœ*) as a sub-species under *C. hœmatolepis* of Drejer.

LIST OF RECENT ADDITIONS TO THE FLORA OF DUMFRIES-SHIRE AND GALLOWAY.

Compiled by F. R. COLES.

In the following list the numerals refer to the numbers in the London catalogue of British flowering plants. The following abbreviations are employed :—*Dumf.* for Dumfriess-shire, *Kirk.* for Kirkcudbrightshire, F.R.C. for the writer, J. F. for Rev. J. Fraser, F. W. G. for F. W. Grierson, M'A. for J. M'Andrew, R. W. for Robert Watson, and J. W. for J. Wilson.

14 **Ranunculus peltatus** Fr. var. **truncatus** *Kirk.* (F. R. C.) ; var. **floribundus** *Kirk.* (F. R. C.), and *Dumf.* (J. W.) ; var. **fissifolius**, *Kirk.* (F. R. C.)

15 **R. diversifolius** var. **Godronii**, *Kirk.* (F. R. C.)
16 **R. Drouetii** Schultz, *Kirk.* (F. R. C.)
17 **R. trichophyllus** Chaix, *Dumf.* (J. W.)
115 **Cochlearia officinalis** L. var. **littoralis**, *Kirk.* (F. R. C)
116 **C. danica** L., *Kirk.* (J. F.)
117 **C. anglica** L., *Kirk.* (F. R. C.)
127 **Subularia aquatica** L., *Kirk.* (F. R. C.)
128 **Thlaspi arvense** L., *Kirk.* (F. R. C.)
132 **Teesdalia nudicaulis** Br., *Kirk.* (M'A.) *Dumf.* (J. W.)
155 **V. silvatica** Fr. var. **Riviniana** *Kirk.* (M'A.), common in sub-alpine localities. Var. **flavicornis** Forst., *Kirk.* (F. R. C.)
157 **Viola canina** Auct., *Kirk.*, very rare (F.R.C.)
168 **Polygala depressa**, *Kirk.*, hills and coast (F. R. C.)
198 **Cerastium semidecandrum**, *Kirk.*, Colvend coast (J. F.)
200 **C. triviale** Link. var. **pentandrum**, *Kirk.*, rare (F. R. C.)
218 **Alsine verna** Bart., *Kirk.*, rediscovered in the old station at Colvend in the very month the flora was published.
493 **Epilobium obscurum** Schreb., *Kirk.*, rather rare (F. R. C.)
509 **Callitriche stagnalis** Scop., *Kirk.*, common (F. R. C.)
510 **C. hamulata** Kuetz., *Kirk.*, pretty frequent (F. R. C.)
512 **C. autumnalis** *Kirk.*, rare, Carlingwark Loch (F. R. C.)
524 **Saxifraga stellaris** L., var. **integrifolia** Hooker, *Kirk.*, rare, noticed in the Carsphairn Woods alone, at about 1800 feet (M'A.)
678 **Centaurea nigra** L., var. **radians**, *Kirk.*, rare (F. R. C.)
799 **Hieracium vulgatum** Fries., *Kirk.* (M'A.)
802 **H. tridentatum** Fries., *Kirk.* (M'A.)
807 **H. corymbosum** Fries,, *Kirk.* (M'A.)
844 **Pyrola secunda** L., *Kirk.*, new station (M'A.)
853 **Erythraea Centaurium**, var. **capitata** Koch (named by Babington), *Kirk.*, rare (F. R. C. and R. W.)
898 **Linaria minor** Desf., *Dumf.* (F. W. G.)
917 **Veronica montana** L., *Kirk.*, in abundance (R. W.)
936 **Orobanche rubra** Sm., *Kirk.*, (M'A.)
1035 **Utricularia intermedia** Hayne, *Kirk.*, as frequent as any other species (F. R. C.)
1052 **Centunculus minimus** L., *Kirk.*, very rare (F. R. C.)
1094 **Rumex conglomeratus** Murr., *Kirk.*, not common (F. R. C.)
1167 **Populus Tremula** L., *Kirk.*, in a wild glen at Carsphairn, probably indigenous.
1227 **Potamogeton lucens** L., var. **acuminatus**, *Kirk.*, River Tarff (F. R. C.)
P. Zizii Rath., *Kirk.*, River Tarff (F.R.C.)
1229 **P. praelongus** Wulfen., *Kirk.*, in River Tarff (F. R. C.)
1236 **P. mucronatus** Schrad., *Kirk.*, Carlingwark Loch (F. R. C.)
1327 **P. pusillus** L., var. **tenuissimus**, *Kirk.*, in quantities in a mill-dam at Kelton (F. R. C.)

Note **P. lucens** L., and **P. pectinatus** L., recorded by Gray in "Topographical Botany," have not been collected of recent years.

1301 **Malaxis paludosa** Sw., *Kirk.*, rare, (M'A.)
Allium carinatum L., *Kirk.* (F. R. C.), and *Dumf.* (R. W.)
1371 **Juncus obtusiflorus** Ehrh., *Kirk.*, new station at Colvend (M'A.)
1384 **Cladium Mariscus**, *Kirk.*, new station at Boreland (F. R. C.)
1441 **Carex aquatilis** Wahl., var. **Watsoni**, *Kirk.*, old station confirmed (M'A.)
1515 **Calamagrostis lanceolata** Roth., *Kirk.*, rare (M'A.)

The following Characeæ have been noticed by the writer, all in Kirkcudbrightshire :—

Chara fragilis Desv., var. **barbata**, the commonest form ; var. **brachyphylla**, rare, as yet observed in only one locality close to the sea; var. **capillacea**, in the Glenkens (M'A.), and in Kelton in abundanee.

Chara polyacantha, very rare, in turbid peaty lochs in Kelton.

Nitella opaca, fairly common in steamlets and lochs.

N. translucens, a very tall and well-developed plant, in Meiklewood Loch, Tongland.

[In the report for 1883 of the Botanical Record Club is a list by Mr. G. C. Druce of plants found by him in Kirkcudbrightshire in 1883, and not recorded in *Top. Bot.*, Ed. 2, in which the following additions to the county lists are recorded, mostly from Creeside or near Creetown, and all were vouched by specimens :—**Fumaria Boraei** Jord., **Silene maritima** L., **Cerastium triviale** var. near **Holosteoides**, **Rubus rhamnifolius** W. and N., **Rosa mollissima** Willd., and var. **cœrulea** Baker, **R. dumalis** Bechst. and **R. dumetorum** Thuill, **Myriophyllum alterniflorum**, **Callitriche platycarpa**, **Myrrhis odorata** L., possibly native; **Galium Witheringii**, **G. boreale**, **Asperula odorata** L., **Crepis paludosa** L., **Arctium intermedium** Lange, **Carduus crispus** L., **Lamium intermedium** L., **Galeopsis tetrahit** L., **Atriplex hastata** (type), **A. deltoidea**, **A. angustifolia** L., **Rumex obtusifolius** (Friesii), **Salix aurita** L., **Sclerochloa maritima** Linde, **Triticum acutum** D.C.—Ed. *Scot. Nat.*]

MYCOLOGIA SCOTICA—Supplement.

By REV. J. STEVENSON.

(*Continued from* S. N., 1885, *p.* 25.)

---

* **Agaricus (Psilocybe) areolatus** Kl. *Fr. Hym. Eur. p.* 298. *C. Hbk. n.* 414. *S. Mycol. Scot. n.* 391. Faldon-

side, Melrose. W. B. Boyd. Springwood Park, Kelso. Not recorded since the time of Klotsch.

3020. A. (Panaeolus) fimicola Fr. *Hym. Eur. p.* 312. *C. Hbk. n.* 446. *B. & Br. n.* 1259.

On rich grassy ground. May—June.

East.	—	—	Tay	—	—	—
West.	—	—	—	—		

Glamis. J. S.
England. Europe.

3021. Cortinarius (Phlegmacium) serarius, Fr. *Hym. Eur. p.* 350.

Pileus fleshy, convexo-flattened, gibbous, *unpolished, viscid, opaque;* stem solid, equal, fibrillose, shining, and, as well as the flesh, white; gills arcuato-adfixed (decurrent with a tooth), crowded, whitish-clay colour.

Stem 4 in. long, flesh wholly fibrous. Pileus 3-4 in. broad, even, indeed, and smooth, but its appearance is unpolished, as it were, pruinato-silky, colour *reddish-tan*, by which especially it is distinguished. Flesh under the gills, which are 3 lin. broad, variegated with a hyaline line.

In woods. Sep.

East.	—	—	—	—	Moray	—
West.	—	—	—	—		

Greeshop, &c., Forres. Rev. Dr. Keith.
Europe.

3022. C. (Telamonia) impennis, Fr. *Hym. Eur. p.* 376.

Pileus *fleshy, convex, obtuse, rigid, become smooth*, somewhat brick colour, changing colour; stem solid, curt, somewhat bulbous, pallid, ringed in the form of a zone and violaceous at the apex, furnished with a white cortina; gills adnate, then emarginate, distant, thick, violaceous, soon becoming purple, at length watery cinnamon.

Stem 2 in. long, $\frac{1}{2}$ in. thick, often cylindrical, fibrillose, ring incomplete. Pileus fleshy, especially at the disc, at first umber-fuliginous, then brick colour or brick-red (when young the colour is almost that of *Ag. butyraceus*), *not becoming hoary*, when young silky round the margins, at length rimose.

In meadows under alders. Sep.

East. — — — — Moray —
West. — — — —

Waterford, Forres. Rev. Dr. Keith.
Europe.

3023. C. (Tel.) incisus, Fr. *Hym. Eur. p.* 384. *B. & Br. n.* 1272.

Pileus slightly fleshy, *conico-convex*, then flattened, umbonate, naked, soon *innately fibrillose or scaly*, hygrophanous (tawny) and, as well as the somewhat stuffed, equal, fibroso-fibrillose stem, ferruginous, *veil woven in the form of a ring and white or obsolete;* gills adnate, distinct, scarcely crowded, cinnamon-ferruginous.

Gregarius, changeable in form. Stem 1 in. (when elongated and flexuous 2—4 in.) long, 1—2 lin. thick. Pileus commonly tawny-ferruginous, but when young also date-brown, olivaceous-fuscous, &c., very much torn in the form of scales and cracks, unless when it is dried at the first and then it is shining.

In woods. Sep.
East. — — — — Moray —
West. — — — —

Greeshop, Forres. Rev. Dr. Keith.
England. Europe.

3024. Lactarius flexuosus, Fr. *Hym. Eur. p.* 427.

Pileus compact, convex, bent inwards and repand, *dry*, smooth, at length rivuloso-scaly, opaque, lurid, becoming pale; stem solid, obese, unequal; gills *thick*, *distant*, *light-yellow;* milk acrid, white.

Firm, hard. Stem commonly 1 in. thick.

In pine woods, &c. Sep.—Oct.
East. — — Tay — Moray —
West. — — — —

Rothiemurchus. Rev. Dr. Keith. Glamis. J. S.
Europe.

3025. L. capsicum, Schulz. *Fr. Hym. Eur. p.* 428.

Pileus compact, pulvinate, dry, chestnut, margin closely involute, stem solid, firm, whitish, *striate with tawny or rufescent fibres;* gills adnato-decurrent, somewhat crowded, tawny, somewhat orange: milk white, acrid.

A very robust species. Stem about 1 in. thick; pileus 3 in. broad, paler at the disc. The gills are said to be anastomosing. Flesh becoming yellow, turning fuscous when exposed to the air.

In wood. Sep.

East. — — — — — —
West. Solway — — —

Dumfries. J. S.
Europe.

3026. L. picinus, Fr. *Hym. Eur. p.* 435.

Pileus fleshy, rigid, *become convexo-plane*, umbonate, continuous, *fuscous-umber*, *at first velvety-villous*, then become smooth at the disc, even; stem stuffed, somewhat spongy, even, smooth, paler; gills adnate, very crowded, ochraceous; milk acrid, white.

Distinguished by stem being commonly 2—3 in. long and scarcely ½ in. thick. *Spores ochraceous.*

In pine woods, &c. Sep.

East. — — — — Moray —
West. — — — —

Rothiemurchus. Rev. Dr. Keith.
England. Europe.

3027. L.lilacinus, Lasch. *Fr. Hym. Eur. p.* 438. *Grevillea, Vol.* VIII., *p.* 98.

Pileus fleshy, thin, convex, then depressed, papillate, *floccose when dry*, granulose, not zoned, *lilac-rose;* stem stuffed, then hollow, *white-mealy*, pallid; gills adnate, somewhat distant, pallid flesh-colour; milk acrid, white.

Fragile, copiously milky, pileus 2 in. broad, becoming pale.

In wood. Sep.

East. — Forth — — — —
West. — — — —

Hawthornden. C. B. Plowright.
England. Europe.

3028. Marasmius erythropus Fr. *Hym. Eur. p.* 470 *C. Hbk. n.* 660.

Among leaves in mixed wood. Sep.

East. — — — — Moray —
West. — — — —

Brodie. Rev. Dr. Keith.
England. Europe.

3029. Hydnum nigrum Fr. *Hym. Eur. p.* 605. *C. Hbk. n.* 847.

In fir woods. Sep.

East.	—	—	—	—	Moray	—
West.	—	—	—	—		

Rothiemurchus. Rev. Dr. Keith.
England. Europe.

3030. Tremellodon gelatinosum, Scop. *Fr. Hym. Eur. p.* 618. (Hydnum gelatinosum, *C. Hbk. n.* 854.)

On fir sawdust. Rare. Sep.

East.	—	—	—	—	—	—
West.	Solway	—	—	—		

Terreagles. Dumfries Fungus Show.
England. Europe.

(*To be continued.*)

NEW SPHÆROPSIDEÆ FROM SCOTLAND.

By Prof. JAMES W. H. TRAIL.

In venturing to describe as new certain fungi that I have found near Aberdeen, in January 1885, I have not forgotten that they belong to a group, the members of which are probably only conditions of Pyrenomycetes; yet they are sufficiently distinct from those previously described to make it desirable to denote them by special designations. I have compared them with the collections in the Kew Herbarium and with the descriptions in the recently-published third volume of Saccardo's *Sylloge Fungorum.* Dr. M. C. Cooke has also kindly informed me that he believes them to be undescribed.

The classification employed in Saccardo's work cannot be regarded as more than artificial and provisional, yet it is usually convenient; and in the work are collected descriptions of all the known Sphæropsideæ (several probably repeated oftener than once under different names). The new species fall naturally enough into the genera there adopted, and I shall therefore refer them to these genera as follows:—

Diplodina Ammophilæ. Perithecia scattered in the spaces between the nerves, oval, opening by a slightly papillate ostiolum on back of leaf, dark; spores hyalines broadly fusiform, 30 by 12μ., uniseptate (cells very distinctly outlined), each end of the spore bears a short mucoid appendage as in *Darluca*. On the Links near Aberdeen, in dead leaves of Ammophila arundinacea.

The spores would rather indicate *Darluca* as the genus for this fungus; but it has immersed perithecia, and is not parasitic, though, indeed, this latter character is not found in all the species of *Darluca*.

Hendersonia Equiseti. Perithecia subdermal with a small ostiolum, nearly spherical, about 180μ. in diameter; spores pale brown, fusiform, or nearly cylindrical, with rather obtuse ends, 12 to 20 by 2 to 3μ., 3-septate.

In dead stems of Equisetum (? limosum) near Aberdeen. The perithecia resemble those of *Sphæropsis epitricha* B. and Br., which also is found in Equisetum stems, but the latter species has simple spores.

Stagonospora Heleocharidis. Perithecia scattered, subdermal, with a small ostiolum, nearly spherical, 130 to 170μ. in diameter, spores pale yellowish, fusiform, 30 to 40 by 6 to 7μ., 5-7-septate. In dead leaves and stems of Heleocharis palustris in the neighbourhood of Aberdeen; common.

Stagonospora paludosa S. and Sp. (Sacc. 2475). A fungus that agrees pretty well with Saccardo's description is common in dead leaves of Carex ampullacea near Aberdeen. My specimens may be described as follows:—

Perithecia scattered, subdermal, but nearly free from surrounding tissues, with small ostiolum, about 220μ. in diameter; spores pale yellowish, fusiform, 42 to 52 by 8μ. 7-9-septate.

Doubtless numerous other Sphæropsideæ will be met with in Scotland when carefully sought for; but of greater importance than adding to their number is the determination of their relation to the more matured forms of fungi.

NOTES ON SCOTTISH PLANTS.

By G. C. DRUCE, F.L.S.

Melampyrum pratense var. hians.—While working Wigtonshire in 1883, in order to draw up a catalogue of its commoner plants for the Record Club

I found by the Cree side a form of *pratense* which is described on p. 35 (1884) of *The Naturalist*, and which differs from other forms of pratense by its *deep yellow* corolla and *open lips with the palate so low as not to close entrance to tube.* This variety has since been found in Westmoreland and Cumberland. The Rev. H. P. Reader has this year discovered it in Northumberland. It will probably be found in many counties of Scotland if looked for. This plant may be the cause of the frequent mistakes in naming *M. pratense* as *sylvaticum.*

On a New Variety of Carex pilulifera found in Forfar, South Aberdeen, and East Perth.—While searching Corrie Ceannmor or Ceannder, in Glen Callater, South Aberdeen, in 1878, I found, at an elevation of about 2800 feet, a sedge which puzzled me a good deal, but which I referred to *pilulifera.* I sent it to Mr. H. S. Watson for his opinion, but he simply marked it *C. pilulifera* var. Four years after I found the same form in Glen Phee; and the next year (1873) met with it in Canlochan, and on Cairn of Daimh, E. Perth. Previous to this, Dr. Lees had described a var. *saxumbra* of *pilulifera* from Yorkshire, and Prof. Babington had recorded it also from Glen Callater. Thinking this might be connected with my plants, I sent them to Mr. H. Ridley, who marked them *C. Leesii (C. saxumbra Lees.)* Later on Dr. Lees came to see me, and I showed him the specimens, but he refused to acknowledge them as his *saxumbra,* from which they differed in the shape of perigynia, and shorter leaves and bracts.

In the report of the Botanical Record Club for 1883, page 52, Dr. Lees has described this alpine form of *pilulifera* under the name *C. pilulifera* var. *adusta* Lees.

It differs from the type in its smaller size, and more rigid and stout habit. The spikelets are "scorched-looking purple brown," the bracts are short and stiff, "The glumes are *lanceolate acute,* dark purple-brown in colour, with a paler, stout dorsal rib, which is prolonged into a strongly serrate awn *wanting* the *paler* membranous border of true *pilulifera.*" The perigynia are greenish brown, sparsely asperous, ovate, gradually prolonged into a rather long, rough bifid beak (not obonic and short-beaked as in type.)"

As Dr. Lees says, it is probably an alpine form educed by harsh stational and climatic influences.

On the Oxfordshire chalk downs I found a form with the lanceolate glumes of the above, but in other respects it did not vary from the type.

Phleum Michelii All.—On p. 267 of the October No. (1884) of *The Scottish Naturalist,* I referred to the above as being represented in Miss Palmer's collection by *Alopecurus alpinus,* and suggested that Lady Aylesford might have mislabelled it. During the last week I have received from Miss Palmer the plants labelled *Alopecurus alpinus,* which I see are specimens of *Phleum Michelii,* so that a transposition of labels has probably taken place.

BRYOLOGICAL NOTES FROM GLENDEVON AND STRATHEARN.

By W. MARTIN.

At one period, interesting accounts of "moss-trooping" expeditions appeared in the pages of *The Scottish Naturalist*; but such are now conspicuous by their

absence. History is ever repeating itself. Achilles keeps within his tent, and Troy still presents a proud front to the foe.

> "Why is it that men care not for green mosses
> Except to pack their crates?
> Why pass unheeding by this lowly tribe,
> The meekest of earth's children?"

Whether we regard the capsule, which under the microscope is often found to be a wondrous piece of architecture; the gracefully curved seta, which an artist might envy; the leaves of endless variety of form and texture; or the rich colouring, they are a most interesting study. The moss upon the dry wall gives but a faint idea of what may be found upon the moist mountain side, where the *embarras de richesse* often presses upon the bryologist. By the side of the road from Loch Tay to Glen Lyon, skirting the side of Ben Lawers, large patches of *Bryum pallens* Swartz, *Bartramia fontana* L., and *Sphagna* of various colours form indeed a splendid mosaic.

> "In the rocky glens where Devon
> Dashes on its seaward way."

many of the large boulders which obstruct the course of the stream are crowned with a shining red tuft of *Bryum pallens* Swartz., set round with *Bartramia fontana* L., a ruby encompassed with emeralds; and the effect is very pleasing. Besides those mosses which have been mentioned, there are many others, in which the colouring is very rich; *Bryum argenteum* L. and *Bryum julaceum* Schpr. are arrayed in glittering apparel of silver; *Bryum alpinum* L. is shining red as if varnished; and *Hookeria lucens* Sm. can boast of robes glossy as the finest silk. To give some idea of the variety of form which prevails among mosses, it may be enough to mention such names as *Fern Moss*, *Feather Moss*, *Palm Tree Moss*, *Tail Moss*, and *Tufted Moss*, which are truly descriptive, and not mere fancy appellations. Nor ought their wonderful powers of vitality to be forgotten. Often in the long dry days of summer they appear withered and dead; but if a shower fall upon them, they are again fresh and flourishing. Many species too are at their best in winter, so that when

> "The violet round the mossed grey stone
> Hath hid her weary head,"

and all her fair companions have bent to the destroyer, the botanist need not discontinue field work.

The following rare species have been gathered in this district. Some time ago a visit was paid to Ben Chonzie, and upon the stones by the side of the brawling Turret a moss of most attractive appearance was found. It was of a very rich, deep green colour, and looked as if it had been varnished. A distinguished Scottish bryologist, to whom it was sent, thought at first it was a new species, but afterwards referred it to *Bryum pallens* Swartz, or, to use his own words, "something thereabout." The moss was next sent to an eminent English bryologist, and his opinion was as follows:—"Probably this is one of the many forms of the ever varying Bryum pseudo-triquetrum." The plant was next submitted to Dr. Braithwaite, who sent the following reply: "Barren Brya are most difficult to identify but your specimen certainly does not belong

to *Bryum pallens* and from *Bryum pseudo-triquetrum* it differs *toto cælo*. I can only refer it to *Bryum Mildeanum* Juratz.—a plant found long ago by Taylor in Ireland, and by Spruce in Teesdale. The only difference I find is, that your plant has a stouter nerve, and also a shorter more abrupt point to the leaf, but in areolation the two quite agree."

Concerning another find made about the same time the Rev. J. Fergusson of Fern thus wrote :—"Your plant is *Hypnum filicinum* L., var. *vallisclausae* Brid. quite a rarity in Scotland, and far from common anywhere. I have often wished to have undoubted specimens from the north of the Tweed, and yours are the first which have come to hand." The plant was found growing upon stones in one of the feeders of the May among the Ochils ; and, strange to say, still another variety of the same *Hypnum filicinum* L., has been found in the same locality. This latest found variety is a weak-leaved form, which Dr. Braithwaite thinks may probably be *trichodes*. In Glendevon there is a waterfall known as the Black Linn—a wildly beautiful and pictorially effective scene. Through the narrow ravine, the Devon water rushes over its rock bound channel, until it is drawn into the treacherous depths of the dark shadowless pool, from which it again emerges dancing and foaming over its shallow outlet. By the side of this fall, a form of *Encalypta vulgaris* Hedw. has been gathered, which is very different from the ordinary one. In its general aspect it is like *E. ciliata* Hedw. but the calyptra is not ciliate ; nor is the stem yellow. The peristome was also present, a thing rarely seen in *E. vulgaris* Hedw. In the same neighbourhood was found a moss, which is quite a cross between *Hypnum filicinum* L., and *Thuidium decipiens* De Not., but nearer the former, except in the upper part of the stem, where the leaves are almost perfectly identical with those of the latter. In the Heugh of Coul, a wild ravine among the Ochils near Auchterarder, a variety of *Eurhynchium crassinervium* Tayl. has been gathered, which the Rev. J. Fergusson has named *E. crassinervium* var. *Martini*. It lies close to *E. confertum* var. *Daldaniarum*—an Italian variety. The leaf howe er is near that of *E. crassi nervium*.

Viola tricolor L. subsp. Curtisii Forst., near Aberdeen.—On consulting Hooker's *Students' Flora* (Ed. 3), or *Topographical Botany* (Ed. 2), we find the distribution of this violet, in Great Britain, given as almost exclusively western, or "from Clyde to Cornwall," and again in Ireland. Though it has been found on Ross Links in Northumberland, it has not been recorded from any part of Scotland save the west coast south of the Clyde. Yet, my own experience leads me to believe that it will be found in many localities, among the sand-dunes so frequent on the east coast of Scotland, and that it is probably the common form of Viola tricolor in such localities. It certainly is so along the sandy coast north from Aberdeen, where I had observed it as a well-marked form before I had learned to identify the plant. In addition to the characters noted in the *Students' Flora*, as distinguishing V. Curtisii from true V. tricolor, the Aberdeenshire plants are usually more or less hairy and of a peculiar dull-green colour, and are dwarfed in all parts, as indeed might be expected from their habitat.

JAMES W. H. TRAIL.

GEOLOGY.

GEOLOGY OF THE ISLAND OF EIGG.

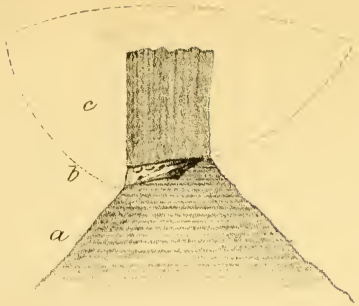
By JAMES DURHAM F.G.S.

(With a Plate).

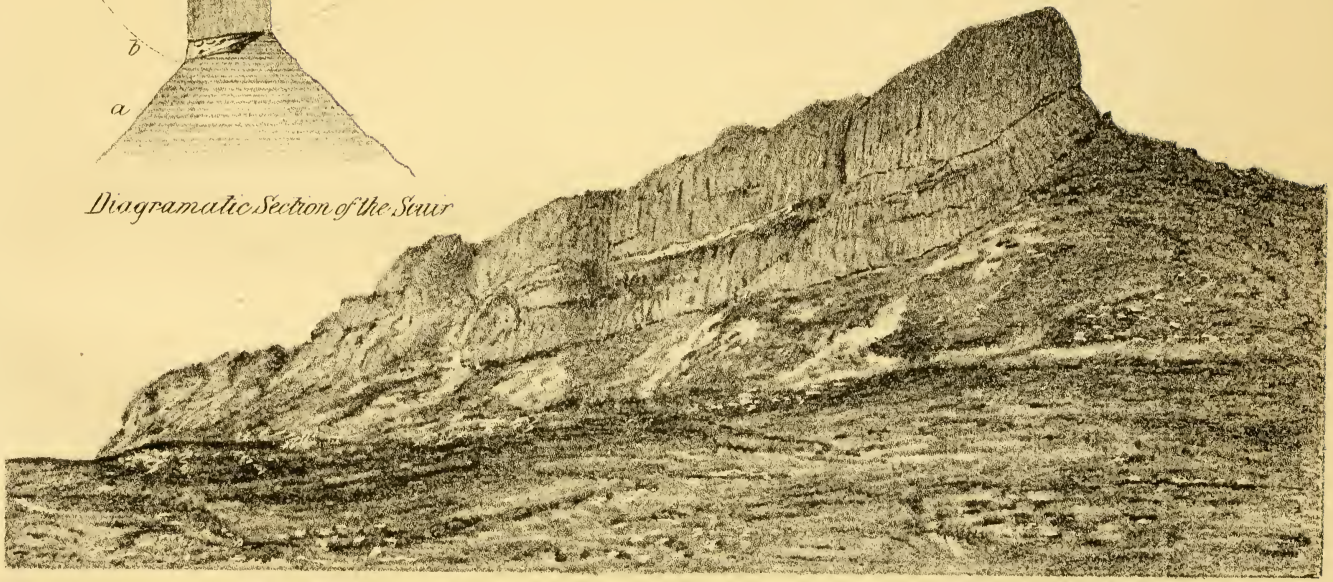
AMONG the varied and picturesque, though sometimes grotesque, forms assumed by the islands of the Inner Hebrides, perhaps none is so striking as that of Eigg, especially when seen from the south or east. From either point of view the Scuir, a stupendous wall of rock, is seen running along the higher part of the southern end of the island, its bold and precipitous front suggesting one of these old lines of fortification which are sometimes seen encircling and crowning lofty rocky eminences; but beside the gigantic proportions of the Scuir of Eigg all such structures are utterly insignificant.

Remarkable as the scenery of Eigg is, it is far surpassed in interest by its geology, or, in other words, its history, as told by these rocks whose peculiar forms so readily arrest our attention.

Eigg is situated about midway between the great islands of Mull and Skye; and is about 7 miles from Arisaig, the nearest point on the mainland. It is about 5 miles long; and ranges from 1½ to three miles in width. The highest point in the island, the top of the Scuir, is about 1,300 feet above the sea. From the base of the Scuir to the middle of the island the ground slopes gently down; and to the north of the road to Laig it again rises until the highest northern part somewhat exceeds the height of the base of the Scuir. Round most part of the shores of the island the rocks rise precipitously from the sea; but in the low middle part the ascent, either from the landing place on the east side or the beautiful bay of Laig on the west, is gentle and easy. The steep cliffs which thus almost completely surround the island are in many places extremely grand and imposing, and, at the same



Diagramatic Section of the Scuir



THE SCUIR OF EIGG.

From a Photograph by Mr W.N. Walker F.G.S.

time furnish excellent sections of the rocks which form the island.

The main geological features of Eigg are simple enough. The great mass of the island is composed of sheets of basalt and dolerite, piled one on the top of the other to the height of nearly 1,000 feet in some parts, while dykes of the same rocks cut through these sheets in all directions. This volcanic mass is underlain on the north and west sides by yellow sandstones with shales, on the top of which is a thick stratum of clay. These stratified rocks contain abundant organic remains. At the south end of the island the basalts &c., are overlain by the rock of the Scuir, a mass of columnar pitchstone-porphyry. Near the Scuir dykes of pitchstone and obsidian intersect the basaltic rocks. An acid lava is likewise met with near both ends of the island.

In order to trace the geological history of this interesting island it is necessary to go far back in the "record of the rocks," as far back, indeed, as the middle of its great secondary division to the age of the Middle Oolite, when we find that where Eigg now stands there was an estuary or shallow-sea in which was being laid down white or yellowish sands with gravel and boulders and other shallow-water formations. The direction in which the land lay from which this material was carried we do not know ; but, in all probability, it was from the ancient mountains of Scotland, which then, as now, marked the eastern limits of the sea ; at anyrate the shores of that old sea were not distant, as the gravel and plant-remains included in the sandstone amply testify. By-and-bye the conditions in some way changed ; and fine clay was deposited on the top of the white sands. (This Professor Judd has identified as the equivalent of the Oxford Clay.)

The fossils included in these sedimentary rocks show that during these depositions the sea teemed with life, numerous *belemnites* testify to the presence of extinct species of cuttle fishes which must have literally swarmed in these waters; while *ammonites* of various species, and *Gryphia incurva* and allied forms are found in great profusion. Considerable quantities of the bones of reptiles have been discovered, remains of some of the remarkable Jurassic forms which have proved such a rich field of study to the naturalist and a kind of happy hunting-ground for the evolutionist.

After the Oxford Clay was deposited, there comes a vast break in the records of the history of the island. All through the Upper Oolite, the Greensand and the Cretaceous periods, across the break between the Secondary and Tertiary divisions of the rocks, and

probably up to the middle of the Eocene age, Eigg has no geological history that can be read by us to-day. Whether these successive systems were laid down on the ancient plain, on which Eigg stands, we do not know for certain; but, as among the materials blown out of the neighbouring extinct volcano of Mull, numerous chalk flints are found, it seems probable that Cretaceous rocks had, at one time, been superimposed upon these older Oolitic strata, and had since been mostly removed by denudation. At anyrate in early Tertiary times a plain of Jurassic rocks spread all over the region now occupied by the Inner Hebrides, probably a flat prairie land, as, from the soft and uniform character of these rocks, they are readily plained down by denuding agencies.

At this time the great mountains of Skye and Rum and Mull

> "Ulva dark and Colonsay
> And all the group of islets gay
> That guard famed Staffa round,"

as well as "famed Staffa" itself had no existence whatever, or existed potentially, only as so much volcanic ammmunition buried deep in the bowels of the earth, while the gneissic mass of Iona probably stood a great isolated hill in the far extending plain.

Probably about the middle of the Eocene period this plain became the scene of one of the most tremendous exhibitions of volcanic phenomena of which there is any geological record. In what are now Skye, Rum, Ardnamurchan and Mull fissures opened in the ground, from which gases, previously confined under enormous pressure, rushed with terrific violence, blowing far into the air a vast quantity of fragments of the lava in which they had been imprisoned, along with portions of the rocks through which they had been erupted; these fragments, for the most part, rained down round the respective orifices, but were also scattered far and near over the ground, so that specimens of the rocks of all the formations from the Laurentian Gneiss to the Chalk are found among the ruins of these volcanoes. As the eruption continued great piles of pieces of lava and the stratified rocks were formed round the orifices, that is to say great crater cones were formed; and by-and-bye the lava welled up, and bursting forth either through the loose material of the craters or the rocks in their neighbourhood, poured out over the plain.

The earliest lava streams that flowed from the Hebridean volcanoes were of the acid class; of low specific gravity and no great fluidity, and would consequently not spread far from the

points of eruption; so, in all probability, this outflow did not cover the plain so completely as those of subsequent eruptions; still, from the near proximity of the volcano of Rum, it is not likely that Eigg escaped the fiery deluge altogether; and in fact, as has been stated, acid lavas are found at more than one point in the island, necessarily but insignificant remains of the original lava stream. By-and-bye these volcanoes quieted down and became extinct, or at least dormant, and remained so for a very long time, so long, indeed, that not only were the cones of the craters completely removed, but the very subterranean sources of these volcanoes were dissected and laid bare by denudation. This can be well observed in Mull, where the lavas of the second outburst are seen to be in contact with the deep-seated rocks from which these early lavas flowed.

The second eruption or series ot eruptions of these volcanoes appears to have been on an enormous scale, and to have lasted, with very considerable interruptions, through a great period. Not only were immense crater cones formed, but lava streams of great volume flowed out for many miles around them, so that the whole plain was gradually buried for many hundreds of feet under sheets of these lavas.

The lavas of the second eruption were all of the basaltic type, which are of great density and fluidity, and flow freely outwards from their sources.

It was during this eruption that practically the whole mass of Eigg was laid down. From the volcano of Rum vast sheets of lava flowed out over the plain, probably until they came into contact with similar streams from the other volcanoes. In this way more than 2,000 feet of basalt must have been piled up sheet above sheet over all the area described. In many of the fine natural sections in Eigg the successive sheets and their varying character are well exposed to view.

Some of our most distinguished geologists have expressed the opinion that the basalts of the Hebrides were not ejected exactly in the manner I have endeavoured to describe, that is to say with the usual symptoms and accompaniments of volcanic activity, but were thrown out on the surface of the earth by what are called "fissure eruptions;" and that the lava simply flowed out from fissures without the formation of craters or the ejectment of scorial or other volcanic fragmental debris. On the other hand, quite as competent geological authorities maintain that no eruption of lava has taken place without these accompaniments either in the

Hebrides or anywhere else. Without venturing to express an opinion upon the general question I feel convinced that the great eruptions of lava that formed most of the Inner Hebrides were accompanied by the ejectment of the scoriæ, &c., on a very great scale at some, if not all the points I have indicated.

When we bear in mind that in Skye, Rum, Ardnamurchan and Mull, we find masses of acid lavas whose indifferent fluidity confines them to the neighbourhood of the point of outflow, we have an indication that these are the positions of the fissures through which the lavas were ejected, and as deep-seated basic rocks are found in contact with deep-seated acid rocks at the same places, we have further valuable support to the hypothesis.

Then, in Mull for example, we meet with phenomena that are at least more easily accounted for on the supposition that craters had existed than on any other. The great mountain of Ben More, as well as some of the neighbouring hills, seems to be almost entirely composed of volcanic cinders intersected by numerous sheets and dykes of basalt, while tuffs and scoriaceous rocks are found in patches all over the island; and near Dunessan is a consolidated stream of volcanic mud containing numerous fragments of chalk and chalk-flints. The mud seems to be composed of fine volcanic dust, while the chalk and flints were probably blown out of a neighbouring crater; the chalk is much indurated and closely resembles bits of limestone hardened by heat, such as I have seen among the ejecta of more recent volcanoes.

Of course, as far as Eigg is concerned, this is merely a digression; as no one disputes either the nature or origin of the basalts and dolerites of which it is so largely built up.

A famous section in the basalts at Ardtun in Mull shows that very considerable intervals occurred during the series of eruptions, for here we find quantities of plant-remains embedded in the mud of a lake bottom between sheets of basalt, which indicates a period of rest between the lava-flows of sufficient length to allow denuding agencies to form vegetable soil on which trees of considerable size flourished; and this must have been no inconsiderable time, as the striæ engraved on these rocks during the glacial period have not yet been erased. As the leaf-beds of Mull are repeated several times one above the other with sheets of lava between, it is evident that these periods of rest were frequent as well as prolonged. Another valuable feature of these leaf-beds is that they supply us with a geological date for the age of these basaltic

eruptions, as the plants have been identified by paleontologists as belonging to the Miocene or middle Tertiary period.

When the last sheet of basaltic lava had been ejected from these Hebridean volcanoes their time of great activity was ended. Long ages afterwards the hills and valleys, which denudation had carved out of the basaltic plateau, trembled at the shock of the earthquake, and resounded to the roar of craters, while fiery torrents poured themselves down the hillside; but these phenomena were quite insignificant when compared with those of the previous eruptions. The great basaltic volcanoes had long been silent, and had been mostly removed by denudation when little parasitic cones formed on the wasted remains of their mighty predecessors sent forth these comparatively tiny streams of acid lava. It is to this final display of volcanic energy that the rock of the Scuir is to be attributed.

The Scuir is entirely composed of beautifully formed columns of pitchstone-porphyry, which are usually vertical, but are often found lying at every conceivable angle. The earliest observers at once recognised it to be different from the main mass of the island, and were in consequence greatly puzzled to account for it. In endeavouring to do so they suggested some ingenious theories. Considering that dykes of pitchstone are of frequent occurrence in Eigg, it is not surprising that they considered the Scuir to be a gigantic intruder of this kind. They supposed that, at one time, that basaltic plateau was as high, at least, as the top of the Scuir, and that the pitchstone burst up through it; at once forming and filling up a vast crack in the basaltic beds, and that by-and-bye denudation removed the surrounding rocks leaving the harder and more intractable rock of the Scuir behind. Both M'Culloch and Hugh Miller adopted this not unreasonable hypothesis.

It was, however, reserved for Dr. Archibald Geikie to find the true solution of the problem, which he did in the following interesting manner. An excavation was made under the Scuir where the pitchstone-porphyry comes in contact with the basalt, when he discovered that the Scuir is underlain by a conglomerate; an examination of the constituents of this conglomerate proved it to be the bed of an ancient river, a river, moreover, which had flowed a long way, from the northward through a forest-clad land; for embedded in the conglomerate were pieces of wood, twigs and leaves; while it was partly composed of Laurentian gneiss and Cumbrian sandstone, indicating that the river had probably flowed from the north Highlands where these formations are well represented, through a vanished land whose place is now, for the most part,

occupied by the sea. How long that river had flowed, and how deep it had cut its valley we do not know; but at length from one of these lesser craters, probably situated upon the wasted remains of the volcano of Rum, torrents of lava were poured into the river valley, filling it up and burying its bed under many hundreds of feet of black glassy rock. If we ask "Where is now the wooded land through which that ancient river flowed? Where are the hills that formed the sides of its valley?" The only answer that science can give us is—"The winter's cold, the summer's heat, the ice, the rain, and the tempest have wasted them away."

Such then is the history of the remarkable island as told by its rocks; and there exist few if any more impressive records of the terrestrial changes produced by the unobtrusive but unresting action of the forces of denudation than Eigg and its Scuir. In the words of Dr. Geikie "subterranean movements may be called in to account for narrow gorges or deep glens or profound sea-lochs; but no subterranean movement will ever explain the history of the Scuir of Eigg, which will remain as striking a memorial of denudation as it is a landmark amid the scenery of our wild western shores."

THE REPTILIFEROUS SANDSTONES OF ELGINSHIRE, &c.

AT the first Aberdeen meeting of the British Association (1859), the question arose as to the geological age of these Sandstones. While "stratiography" led to the supposition that they were the upper beds of the Old Red, palæontology seemed to fix them in the Triassic formation. The Association will meet a second time in the "Granite city," ere this *questio vexata* be settled to general satisfaction. During the quarter of a century that has elapsed between the two meetings, not a few remains, both of *Holoptychius* and of reptiles, have been gathered from the white sandstones in the neighbourhood of Elgin; so close have they been found to lie to each other that both have been found in the same quarry, although not in the same bed or stratum.

The untold geological ages, during which the whole Carboniferous and Permian systems were being deposited, make one expect to see a marked line of demarcation between the two. No such broad unmistakable line has yet been detected. There are a

few localities where it might be hopefully sought for, if it really exist; these are:

1. In the Bishopmill quarry. In the Elgin Museum there is a slab, indicating, from footprints, the presence of reptiles; and several Holoptychian remains have also been got from Bishopmill. The best is now in the cabinet of James Powrie of Reswallie.

2. On the same ridge as Bishopmill—about a mile to the west, and due south of Newspynie church—is the Millstone quarry, which has lately been opened up and worked to a greater extent than formerly. In it fine specimens of fish and reptile have been found by the workmen; and they are now in the Museum at Elgin. This quarry claims the special attention of those who desire to throw light on the subject.

3. In the quarry near Nairn, and on the east side of the river, plates of Pterichthys are not rare; and, from it also, there is a block of sandstone, now in the Elgin Museum, which presents markings looked upon by some as caused by reptilian feet.

4. The fine section, on the northern shore of the Moray Firth, from the undoubted Old Red beds of Guinies to Portmahomack, where footprints have been got, offers a fair field to fix, if possible, the spot where the two formations meet.

5. One other locality may be named, although not so promising, viz., that which lies between the well known reptiliferous beds of Lossiemouth and the links of Stotfield, where Mr. Linn detected fish-scales.

In 1859, the Elgin district was visited by Murchison, Lyell, Nicol, Ramsay, Harkness and others, who took different views as to the age of those reptiliferous sandstones. Hitherto, the question has, in some measure, been held as an open one; but it is time that it be closed and set at rest. The coming Aberdeen meeting of the British Association may perhaps tend to do this, and prove the soundness, or otherwise, of some words of Sir Roderick Murchison, suggested by his first visit to this now famed locality, viz "Field work for ever! and perhaps the proud palæontologists will be obliged to bow to stratigraphical sequence." It would not perhaps be out of place were visitors to these sandstone beds to keep before them the opening address at Montreal, (given in "Nature" for 4th September), by W. T Blackford F.R.S., in which are adduced "remarkable exceptions to the rule that similarity of faunas and floras in fossiliferous formations throughout the surface of the earth would imply identity of geological age;" and we are told, "that the practice, so common among

palæontologists, of positively asserting as a known fact the geological age of organisms from beds of which the geological position is not clearly determined, is very much to be deprecated.' —*Communicated.*

MEETINGS AND PROCEEDINGS OF SCOTTISH SCIENTIFIC SOCIETIES.

[Notices of meetings for insertion in the *Scottish Naturalist* should be sent to the Editor before the commencement of the month preceding date of issue. If later, they will be held over till the next number. Secretaries of Scotch Scientific Societies will much assist the Editor if they will send abstracts of meetings for publications.]

Reports of meetings of the Aberdeen Natural History Society and of the Dundee Naturalists' Society have to be held over till next number through pressure on space.

BANFFSHIRE FIELD CLUB.—*January* 29.—Mr. Horne, of the Scottish Geological Survey, addressed the meeting on the geological formation of the northwest of Sutherlandshire. He narrated the views expressed by geologists from M'Culloch downwards, and gave a *resumé* of the arguments pro and con. He then proceeded to detail the results arrived at by himself and Mr. Peach; and stated that Professor Nicol's views had proved to be well founded, though for a time set aside by Murchison's adverse opinion.

Mr. Horne thereafter reported on the geological specimens in the Banff Museum.

DOLLAR LITERARY AND SCIENTIFIC SOCIETY.—*January* 14.—Mr. Thom, Principal of Dollar Institution, lectured on **Our Prehistoric Ancestors**. In the course of his address he summarised clearly the conclusions now generally entertained in regard to the origin and past history of the earth, more especially in the later period, as shown by Kent's cavern and other localities in which recent fossils have been found. The lessons drawn from all sources concerning prehistoric man in Britain were summed up in :—" We have no evidence to show that he was anatomically different from the man of to-day. He was an expert hunter, and able even to attack such animals as the mammoth and rhinoceros. He was armed with spears, tipped with flint and bone, and with daggers of reindeer antler. The handles of his weapons were often beautifully carved. With all this artistic taste, however, he seems to have been utterly devoid of anything like civilisation, lived like a beast of prey, entirely upon wild animals, and for countless ages made no more impression upon the earth than one of the victims of his well-aimed stone or flint-pointed spear."

February 4.—Rev. Mr. Paul lectured on **Castle Campbell**, a former stronghold of the Argyle family among the Ochils, and reviewed its past history and fortunes.

EDINBURGH BOTANICAL SOCIETY.—*February* 12.—The following communications were read :—**The Geographical Distribution of Algæ of the Firth of Forth**, with exhibition of specimens by John Rattray, M.A., B.Sc. ; **On the Development of Bifoliar Spurs into Ordinary Buds in Pinus sylvestris**, by Professor Dickson ; **Note on the Occurrence of Carex salina, var. kattegatensis**, Fr., by A. Bennett, F.L.S. ; **Report on the Excursion of the Alpine Botanical Club**, by Wm. Craig, M.D. ; **Report on Temperatures for December and January at the Royal Botanic Institution of Glasgow**, by Robert Bullen ; **Report on the Progress of Vegetation at the Royal Botanic Garden, Edinburgh, for January, 1885**, by Robert Lindsay. From the last paper we learn that the past winter has been backward, despite its comparative mildness. Of forty selected plants, whose dates of flowering in the garden are sytematically observed, only two were in flower at the end of January, as opposed to sixteen at the same date in 1884. On the rock-garden eight species and varieties flowered in January, 1885, and eighteen in January, 1884.

———

The INVERNESS FIELD CLUB made an excursion on Saturday, 22nd September. Between thirty and forty members were present. The party drove to the Pass of Inverfarigaig, stopping on the way at Dores Schoolhouse to see a fine collection of fossils and local antiquities belonging to Mr. Stewart. Proceeding through the pass, a fine gorge of indurated and waterworm sandstones and conglomerate clothed with birches, they took the road to the right, which leads to the Foyers valley, stopping on the way to examine an old lime quarry and a fine cliff of graphic granite exposed near it. Time did not permit a careful examination of the Foyers valley ; so after a visit to the Falls of Foyers, the members dined together in the Foyers Hotel, and returned to Inverness in the evening.

———

MONTROSE SCIENTIFIC AND FIELD CLUB.—*January* 27.—Dr. Howden read a paper on **The Aims of a Naturalists' Field Club**, which we print elsewhere *in extenso*.

February 10.—The subject was **The Seaweeds of the Forfarshire Coast**, by Dr. Crichton of Arbroath.

———

PERTHSHIRE SOCIETY OF NATURAL SCIENCE.—*December* 4.—A note from Mr. J. G. Millais was read relative to personal observations in the woods of Murthly of a flock of **Parrot Crossbills**, from which it seemed that this species had nested there. Mr. Millais also mentioned that he had lately shot a *Reeve* near Murthly, and the following birds in the basin of the Tay, viz. :—*Roseate Tern, Green Sandpiper, Ivory Gull, Iceland Gull, Buffon's Skua*, and *Purple Gallinule*.

Dr. Buchanan White submitted a **Report from the Delegates of the Society to the Meeting of the East of Scotland Union of Naturalists' Societies at Dundee**; Mr. Robert and Mr. Rufus D. Pullar submitted one as delegates to the meeting of the British Association at Montreal, and another as delegates to the meeting of the American Association for the advancement of Science at Philadelphia.

As these various meetings of learned Societies have been fully reported in scientific journals, we need not recapitulate these well-executed reports.

Mr. James Stewart, L.D.S., followed with a paper on the **Comparative Anatomy of the Teeth**, in which, after vindicating the importance and value of the study of comparative Anatomy, he gave an account of the teeth and of the leading modifications undergone by them in the great classes of Fishes, Amphibia, and Reptiles.

January 8.—Mr. Stewart continued his lecture on **Teeth**, dwelling on the characters and modifications of these organs in the Mammalia.

Dr. Trotter contributed a paper on **The Diatoms of the Tay**, based on personal observations, and dealing more especially with those of the neighbourhood of Perth. Around the city are sandy ridges, which in many places rest upon an extensive bed of brick clay. In many places the spicules of sponges abound in this layer. Here and there are deposits of blue clay that had formed in hollows of the brick clay ; and these yield many diatoms, almost exclusively of marine or brackish-water types. Perth stands on deposits of these different clays.

January 22.—A largely-attended conversazione was held in the Museum buildings, and the newly-arranged cases were the object of much attention, particularly those containing the birds of Perthshire along with their nests and eggs. Several microscopes were in use during the evening.

February 7.—Mr H. Coates exhibited a snail-slug (*Testacella haliotidea* Drap. var. *scutulum*), which had been sent to him from near Kirkcaldy by Mr. W. D. Sang. The species has not previously been found in Britain north of Durham. It seems thoroughly established (probably naturalised) near Kirkcaldy, though seldom seen, except early on wet mornings in spring and autumn. He also exhibited a shell of *Helix nemoralis*, found at Invergowrie, of which the last whorl had been quite displaced so as to resemble one shell growing within another (but the inside was so repaired as to be smooth) ; and a shell of *Planorbis vortex*, from Errol, in which the last whorl is bent abruptly to one side, and is quite detached from the previous whorl.

Mr. Coates afterwards read a paper on **Shells ; their Structure, Growth, and Uses**, in which he discussed the nature of shells, and defined them as hard external coverings peculiar to the mollusca, serving at once as a "dwelling place and a citadel." The connection of the shell with the animal, its mode of formation and growth, and the uses to which it may be put, were more or less fully dealt with.

At each meeting several members were added to the Society, and numerous donations to the Society's very excellent local museum were announced. Among these a number of Perthshire *mammals* were a response to the appeal for aid made by the President (Dr. Buchanan White) in a preceding meeting.

SCIENTIFIC JOURNALS.

JOURNAL OF BOTANY (*August*) **Marsupella sparsifolia** Lindb. by W. H. Pearson, describes and figures a liverwort from Loch-na-gar in Aberdeenshire; **Scottish Plants and Topographical Botany**, by Prof. J. W. H. Trail and John Roy, is a list of additions and corrections to the records in H. C. Watson's *Topographical Botany*, ed. II. (Baker and Newbould) for the counties of Forfar, Kincardine, Aberdeen, S. and N. Banff, and Elgin; **Petasites officinalis** Moench., by G. Nicholson, calls attention to dicœcism in this plant, and indicates the differences between the male plants and the much less common female plants. The female plants are recorded from Glasgow, Edinburgh, and Aberdeen; male plants alone were sent the writer from Orkney. (*September*) **Perthshire Plants and Topographical Botany** by Dr. F. Buchanan White, gives additions and corrections to the records for Perthshire in its various divisions of east, mid, and west Perth. (*October*) **Shetland Plants**, by H. N. Ridley, records *Eryngium maritimum* from Fitful Head, and also a variety of *Veronica officinalis* approaching *V. hirsuta* Hopkirk. (*December*, 1884) **Additions to the Recorded Flora of Skye** and **Plants Recorded in Westerness additional to "Topographical Botany** by the Revs. W. R. Linton and E. F. Linton. (*January*, 1885.) **Myosotis alpestris in Forfarshire**, by F. Buchanan White, M.D., notes the record in the report of the Botanical Record Club for 1883 of M. alpestris in Canlochan by Revs. H. E. Fox and E. F. Linton; and accounts for its occurrence by the fact that the seeds of this plant, as also of various other alpines, were shown in Canlochan and on Ben Lawers, by a horticulturist, with the result that Erinus alpinus, Primula auricula, and other strangers were found in the former locality in 1880 by the Edinburgh Botanical Society. None of the introduced species have appeared on Ben Lawers. It is believed that the only seeds sown were those of showy species in common cultivation. (*February*) **New British and Irish Carices**, by Arthur Bennett, notes as Scotch C. salina Wahl., var. kattegatensis Fries; C. Goodenovii Gay, var. juncella Fr. from Isle of Skye; C. vesicaria L., var. dichroa Anders. (See earlier Nos. of *Scottish Naturalist.*)

GREVILLEA (*December*, 1884.) **On Fries' Nomenclature of Colours**, by Henry T. Wharton; **New British Fungi**, by M. C. Cooke, notes from Scotland only *Entorhiza cypericola* (Magn) Weber, and *Melanotænium endogenum* Unger, both extracted from the last number of the *Scottish Naturalist*, but with the latter fungus erroneously referred to Galium *Mollugo* instead of *G. verum* as its host in Scotland; **New and Rare British Fungi**, by W. Phillips and Charles B. Plowright, describes from Scotland (from Rev. Dr. Keith of Forres) *Agaricus* (*Clitocybe*) *vermicularis* Fr. *A.* (*Hypholoma*) *hypoxanthus* sp. n., *Nidularia confluens* Fr. and Nordh., *Septoria Stellariæ* Rob. and Desm., (common near Aberdeen also, J. W. H. T.); *Æcidium Jacobææ* Grev. (*Scot. Nat.*, 1884, p. 284), is referred to *Puccinia Schroeteriana* Plow. and Magn. instead of to *P. dioica* Magn., to which Mr. Plowright originally was inclined to refer it. (In *Quarterly Journal of Microscopical Science* for January, Mr. Plowright describes it as new under name of *P. Schæleriana*). (*March*) **New British Fungi**, by Dr. M. C. Cooke, notes *Agaricus* (*Collybia*) *velutipes*

Fr., var. *rubescens*, Cooke, from Largo, found by W. G. Smith. **New and Rare British Fungi**, by W. Phillips and C. B. Plowright describes the following species new to Scotland, sent to them by Dr. Keith, all from Forres save where mentioned specially—*Ceoma Laricis*, Westd. on larch leaves; *Peziza* (*Humaria*) *oocardii*, Kalchb. on damp wood; *Cenangium urceoliformis*, Karst. (from Grantown on stems of Vaccinurim Vitis-Idaea; *Diaporthe* (*Tetrastaga*) *obscurans*, Sacc. on ash; *Leptosphaeria praetermissa*, Karst. on Rubus Idaeus: *Zignoëlla insculpta*, Fr. on holly-twigs; *Fenestella bipapillata*, Tul. on beech; and from A. Croall on dead potato-stems at Stirling, *Didymosphaeria Winteri*, Niessl, and *Ophiobolus vulgaris*, Sacc.

SCIENCE GOSSIP (*January* 1885).—**A New British Puccinia**, by W. B. Grove, describes and figures the Uredo and mesospores of *P. Sonchi* Desm. on *Sonchus oleraceus*, from near Birmingham. A striking peculiarity is the existence of a row of paraphyses surrounding the spores, under the cuticle. (*February*) **Night-heron (Nycticorax griseus L.) in Scotland**, by J. M. Campbell, records the capture of an immature female at Loch Creran in Argyleshire, believed to be the first occurrence of this species in the West Highlands. **Rossia macrosoma Delle Chiaje**, by J. M. Campbell, records the addition to the fauna of the West of Scotland of this cuttle-fish from Loch Creran. **Daubenton's Bat in Renfrewshire**, by — Taylor.

THE ZOOLOGIST (*July.*) **Stock Dove in Perthshire**, by T. Marshall; **Greater Forked-Beard** (*Phycis furcatus*) **on the Banffshire coast**, by Thomas Edward. (*August*) **A New Species of British Wren**, by Henry Seebohm, with figure and description of a new form of wren peculiar to the island of St. Kilda, and named here *Troglodytes hirtensis*; **Rose-coloured Pastor** (*P. roseus*) **n Sutherlandshire** and **Golden Plover with White Primaries** by H. A. Macpherson; **Opah-Fish in Shetland**; **Lumpetus lumpetriformis off East Coast of Scotland**, by Dr. F. Day (from Proc. Zool. Soc. Lond). (*September*) **Weasel** (plentiful) **in Skye**, and **Greenland Falcon in Skye**; by H. A. Macpherson; **The St. Kilda Wren**, by Rd. M. Barrington. (*November*) **Dipper's Nest on the top of a Boulder**, by Thomas Edward.

JOURNAL OF CONCHOLOGY (*October* 1884).—**The Land and Fresh Water Shells of Caithness**, by C. W. Peach, is a reprint of a paper read before the Royal Physical Society of Edinburgh, March 26, 1864, but believed to have been printed only in a newspaper report. In it are included from the parish of Wick in Caithness, *Sphaerium corneum*, *Pisidium nitidum*, *Unio margaritifera*, *Valvata piscinalis*, *Planorbis nautileus*, *P. albus*, *P. glaber*, *P. spirorbis*, *P. contortus*, *Limnaea peregra*, *L. truncatula*, *Ancylus fluviatilis*, *Arion ater*, *A. hortensis*, *Limax flavus*, *L. agrestis*, *L. parvulus*, *Succinea elegans*, *Vitrina pellucida*, *Zonites cellarius*, *Z. alliarius*, *Z. nitidulus*, *Z. crystallinus*, *Helix nemoralis v. hortensis*, *H. arbustorum*, *H. rotundata*, *Pupa umbilicata*, *Clausilia rugosa*, *Cochlicopa rupestris*; and from Sutherlandshire, at Durness, *Helix rupestris*, *H. cricetorum*, and *Bulimus acutus*.

ENTOMOLOGIST, 1883.—*February* (p. 45) **Supposed occurrence of Anarta melaleuca in Scotland**, by Wm. Watkins, in a collection purchased by him ; believed to have been captured in Scotland, but captor dead. *March* (p. 62) **Ypsipetes elutata**, by Wm. Reid, Pitcaple, Aberdeenshire. records dark form reared from larvæ taken on ling in Aberdeenshire, and larger form in lower woods feeding on sallow. *June* (p. 138) **New British Trichopteron**, by J. J. King, records from near Dumfries, taken by Mr Service, *Mesophylax aspersus* Ramb. var. *July* (p. 161) **Lepidoptera, near Edinburgh**, by A. E. J. Carter, butterflies scarce, moths more plentiful, Bombyces 4, Geometers 11, Noctuae 30, nothing specially noteworthy. *October* (p. 235) **Sphinx Convolvuli in Aberdeen**, by John Mundie ; **Acherontia Atropos near Edinburgh**, by A. E. J. Carter. *November* (pp. 245-46) **Lepidoptera near Melrose**. by Wilfred W. O. Beveridge, records numerous species, but accuracy of list seems doubtful. Most noteworthy are Vanessa Cardui, V. polychloros, Larentia suffumata, Cidaria pyraliata, Thera simulata, Odontia dilutata, Plusia iota (very plentiful), larvæ of Notodonta camelina common on Birch, and of Arctia villica and of A. fuliginosa on almost every wayside herb.

"Entomologist."—(*January* 1884).—**The Macro-lepidoptera of Unst**, by J. Jenner-Weir, F.L.S., F.Z.S., records captures made by Mr M'Arthur in Unst during 1883, from the end of May till the end of September, and supplements former papers referred to in *Scottish Naturalist*. Several vary considerably as compared even with the same species from the Mainland of Shetland. The following species are new to the records for Shetland :—*Sphinx Convolvuli*, *Agrotis cursoria*, *A. lucernea*, *Noctua glareosa*, *N. xanthographa*, *Hadena exulis*, and coloured figures are given of varieties of these. (*July*) **Rannoch**, by John T. Carrington, F.L.S. (with maps), is an interesting account of this renowned Perthshire district from the point of view of a Lepidopterist. **The Genera Hydrochus, Ochthebius, and Hydraena**, by Rev. W. W. Fowler, M.A., F.L.S., mentions the habits, modes of capture, and distinguishing characters and habitats of an obscure and difficult group of water-beetles. The following are specially recorded from Scotland :— *H. brevis* Herbst., from Perth and Dumfries ; *Hydraena nigrita* Germ., from Glasgow ; *H. angustata* Sturm., from Falkirk and Glasgow ; *H. gracilis* Germ., *H. atricapilla* Wat., from Ochil Hills. Several other species are recorded as common throughout Britain. (*September*) **A Week's Collecting in Unst**, by Charles A. Briggs, records the captures of Lepidoptera, made during a stay from 9th to 19th July ; of these *Mamestra Brassicæ*, *Agrotis suffusa*, *Triphæna subsequa*, *Apamea oculea*, and *Hadena oleracea* are new to Shetland. **Crymodes exulis in Unst**, by E. R. Curzon. (*October*) **Rannoch in June**, by A. H. Jones, deals specially with the *Tortrices*. **Description of a Eupithecia new to science (E. Curzoni**, Gregson), by C. S. Gregson, describes the larva, pupa, and imago of a "Pug" moth, taken by Mr Roper-Curzon feeding on *Calluna vulgaris* at Balta Sound in Unst. The form was figured in the *Entomologist* vol. XIV., pl. I, fs. 2 and 3, and was regarded as a variety of *E. nanata* or of *E. satyrata*. **Epunda nigra in Perthshire**, by Elizabeth Cross. (*December*) **Eupithecia nanata var. Curzoni**, by H. M'Arthur, asserts that the supposed new species is no more than a form of *E. nanata*. An editorial note refers to an article in the *Stettin Entomologische Zeitung* (XLV. 353-75), by August Hoffmann, on *The Lepidoptera of the Shetland Isles, with notices of*

the occurrence of the species in other northern countries, in the north and central German mountains, and in the Swiss Alps. In this paper the above *Eupithecia* is regarded as a dark variety of *E. nanata*, probably nearest the form *obscurata* Stgr.

"Entomologist." — (*January* 1885). — **Cidaria flavicinctata double-brooded,** by Mrs. Elizabeth Cross, notes emergence in November of a moth bred from Ova obtained from Rannoch. (*February*) **Eupithecia Curzoni** Gregson, by C. S. Gregson, defends right of this Shetland insect to a name as distinct from *E. nanata*, an opinion founded on differences in wings (colour and form), and in larva (colour and markings, form and habits). (*March*) **Eupithecia Curzoni,** by J. B. Hodgkinson, considers it to be a northern form of *E. callunaria* (E. satyrata). **On the variation of Eupithecia nanata,** by J. Tutt, remarks on the variability of *E. nanata* near Garelochhead, where some forms grade into *E. Curzoni*, so completely that the moths seem indistinguishable.

STETTINER ENTOMOLOGISCHE ZEITUNG, XLV. (1884), **Unst ein lepidopterischer Luckenbusser,** by C. A. Dohrn (l.c. pp. 186-88), is a notice of the article in the January number (1884) of the *Entomologist*, translating the remarks on those forms of special interest to continental entomologists, but not adding to what is there said about them. **Lepidopteren von den Shetland-Inseln, mit Notizen uber, das Vorkommen der Arten in andern nordischen Landern, auf nord und mitteldeutschen Gebirgen und in den Schweizer Alpen,** by August Hoffmann in Hannover (l.c. pp. 253-75), relates to a subject of so great interest to Scotch entomologists that we intend to give a translation of the entire article in the *Scottish Naturalist.*

JOURNAL OF THE SCOTTISH METEOROLOGICAL SOCIETY. Third series, No. I., with tables for the year 1883, Edinburgh 1884. **Meteorology of Ben Nevis,** First Report, by Alexander Buchan. **Preliminary Report on some Observations made in connection with Scottish Fisheries during the Summer of 1883 (1) At Loch Fyne,** by W. A. Herdman, D. Sc., &c.; **(2) At Peterhead,** by W. E. Hoyle, M.A.; **(3) At Eyemouth,** by Frank E. Beddard, M.A.; **(4) At some of the Scottish Lochs,** by Rev. Dr A. M. Norman. The three former reports detail the methods of observation; the last bears especially on the Entomostracan fauna. The middle water of the lakes is tenanted by species of *Diaptomus*, *Cyclops*, and *Daphnia*, along with *Leptodora hyalina*, *Bythotrephes longimanus* and *Holopedium gibberum*, and, in some lochs, large numbers of *Diaphanasoma*. *Sida* affects the water plants along the margins, and *Bosmina* the shallow water nearly free of vegetation. **Preliminary Work at the Scottish Marine Station, Granton; Report on the Work of the Scottish Marine Station for Scientific Research,** both by J. T. Cunningham; **Tidal Variations in Temperature at the Scottish Marine Station,** by Hugh R. Mill; **Reports on Relation of Herring Fishery and Salmon Fishery to Meteorology, Report on the Meteorology of Scotland during 1883,** and **Report of Observers' Notes on the State of Agriculture, Public Health, &c.** by Alexander Buchan.

INSECTA SCOTICA.

THE TRICHOPTERA OF SCOTLAND.

By JAMES J. KING and KENNETH J. MORTON.

HYDROPTILIDÆ.

AGRAYLEA.

MULTIPUNCTATA Curt. Frequent. Margins of lakes, canals, and large rivers.

DISTRIBUTION—EAST. o Forth o o o o o o

WEST. o o o o o

ALLOTRICHIA.

PALLICORNIS Eaton. Rare. Streams.

DISTRIBUTION—EAST. o o o o o o o o

WEST. o Clyde o o o

HYDROPTILA.

SPARSA Curt. Common. Streams.

DISTRIBUTION—EAST. o o o o Moray o o o

WEST. o o o o Hebrides.

FEMORALIS Eaton. Frequent. In well-wooded glens.

DISTRIBUTION—EAST. o o o o o o o o

WEST. o Clyde o o o

LONGISPINA M'Lach. Frequent. Sluggish streams.

DISTRIBUTION—EAST. o o o o o o o o

WEST. o Clyde Argyle o o

FORCIPATA Eaton. Common. Rivers and lakes.

DISTRIBUTION—EAST. o Forth o o Moray o o o

WEST. o Clyde Argyle o o

ITHYTRICHIA.

LAMELLARIS Eaton. Frequent. Rivers.

DISTRIBUTION—EAST. o o o o Moray o o o

WEST. o o o o o

ORTHOTRICHIA.

ANGUSTELLA M'Lach. Frequent. Standing water and large rivers.

DISTRIBUTION—EAST. o o o o Moray o o o

WEST. o o o o o

OXYETHIRA.

COSTALIS Curt. Common. Stagnant waters.

DISTRIBUTION—EAST. o o o o Moray o o o
WEST. o Clyde Argyle o o

The following additional localities are based on notes published, or species taken since the appearance of the first part of this list :

FROM	TAY.—	Chætopteryx villosa.
„	SUTHERLAND.—	Limnophilus extricatus.
„	ZETLAND.—	Phryganea varia, Limnophilus auricula, L. sparsus, Mesophylax impunctatus var. Zetlandicus, Halesus radiatus, Drusus annulatus.
„	SOLWAY.—	Halesus radiatus, H. digitatus, Lepidostoma hirtum, Leptocerus aterrimus, L. cinereus.
„	ARGYLE.—	Phryganea grandis, P. varia, Colpotaulius incisus, Limnophilus rhombicus, L. borealis, L. marmoratus, L. lunatus, L. vittatus, L. auricula, L. extricatus, L. luridus, L. sparsus, Sericostoma personatum, Crunœcia irrorata, Lepidostoma hirtum, Berœa pullata, B. maurus, Leptocerus fulvus.
„	WEST ROSS.—	Phryganea obsoleta.
„	HEBRIDES.—	Limnophilus luridus, Berœa pullata, Leptocerus bilineatus, Wormaldia occipitalis, Cyrnus trimaculatus, Lype phæopa.

The total number of species of Trichoptera known to us as occurring in Scotland, and above enumerated, is thus 125, or four-fifths of the number at present known to inhabit the British Isles.

For the sake of comparison we give a table shewing the number of representatives each family has in the Scottish and British lists.

	In Scotland.	In British Isles.
Phryganeidæ, ...	7	9
Limnophilidæ, ...	44	52
Sericostomatidæ, ...	7	9
Leptoceridæ, ...	26	33
Hydropsychidæ, ...	24	32
Rhyacophilidæ, ...	8	9
Hydroptilidæ, ...	9	11
	125	155

In conclusion, our thanks are due to the following gentlemen—Prof. Trail, F.L.S., Messrs. R. M'Lachlan, F.R.S., Robert Service and Alfred Beaumont, who have supplied us with information and specimens for examination.

OBITUARY.

ALEXANDER CROALL.

AMONG those that have done most to extend the knowledge of Scotch botany in the generation now passing from among us, a high rank must be assigned to Mr. Alexander Croall, who died, after a long illness, on the 19th May last, in Stirling. In Dr. Smiles' recent work, *Men of Invention and Industry*, an account of his life will be found, written with the usual felicity of style of the author. Mr. Croall was at one time a parish schoolmaster in the neighbourhood of Montrose. Here he devoted his spare moments earnestly to his favourite pursuit of botany, and on the recommendation of Sir William Hooker, to whom he had become known, he was employed to prepare sets of the plants of Braemar, both flowering plants and cryptogams, at the desire of the Queen and of Prince Albert. He prepared a considerable number of sets, which have mostly been deposited in public herbaria. The specimens in these sets are well-selected and carefully prepared.

In 1859 he undertook, along with Mr. Johnstone, the preparation of a large work on British Algæ, under the title, "British Sea-weeds, Nature-printed." It appeared in four large 8vo volumes, with nature-printed plates, from drawings by him, of all the species that he could procure; those of which he was unable to obtain specimens are illustrated by woodcuts from other works. The book at once gave him scientific reputation. For some time he held the position of librarian to the Derby Museum, and had charge of the herbarium connected with it. On the establishment of the Smith Institute in Stirling in 1874, he was appointed curator in it, and, after a time librarian of the Macfarlane Free Library, and retained these posts until his death. He had reached his seventy-sixth year. On the formation of the Stirling Field Club (now the Archæological and Natural History Society of Stirling) some years ago, he was elected President, an honour held by him till his

death. To his unceasing interest and efforts for its welfare the Club owes much of its progress and success. We believe that in all relations of life he was distinguished by courtesy and readiness to assist others, no less than by the thorough and efficient discharge of the duties that fell to him. He leaves a widow and family. His only son is a minister of the Presbyterian Church in England.

[Since the above was put into type we have been favoured with a sketch of Mr. Croall's life, by the Rev. Mr. Goldie, read before the Archæological and Natural History Society of Stirling, on June 6th. It will appear in our next issue.]

ON THE WORK OF LOCAL NATURALISTS' SOCIETIES.

By F. BUCHANAN WHITE, M.D., F.L.S.

ONE of the chief objects of each Society is (or ought to be) the study of the natural history of its district; and, doubtless, each Society does more or less of this work. But only in too many cases this work is, in at least some respects, imperfect. Imperfect because of want of uniformity in details, imperfect because one subject has been thoroughly worked while others have been untouched; imperfect because certain districts have been well investigated, while others have not been explored; imperfect because the relationships of one district to another have not been considered. To overcome these causes of imperfection, the work of each Society should be done in a systematic manner, and on a plan common, to the utmost extent possible, to all similar Societies.

It would be well that in each district a basis for future work should be laid by the publication, to at least members of the Society, of reports on the existing state of knowledge of the natural history, in its widest sense, of the district. From these reports some idea could be formed of what has been accomplished, and of what remains to be done; and the energies of the Society could be directed to those fields that most require to be wrought out.

The work that lies before each Society is the preparation and

publication ultimately of exhaustive accounts of the fauna and flora, the geology, mineralogy, and meteorology of the district. With this view, and with the preliminary reports as a foundation, committees should be formed to continue the work in each department, and each committee should include in it all the members of the Union who are, or wish to become, students of the subjects of which it has charge. Each committee should appoint the most competent of its members to be director or superintendent of the work. It might not be convenient for the committees to meet frequently, but the business could be carried on by correspondence with the director. The biological committees should proceed to obtain information, and to prepare catalogues as follows :—

(1.)—Of all that has been written and published on the subject, *i.e.*, a complete Bibliography of it, in so far as relates to the district.

(2.)—Of the collections, public and private, of specimens of the species collected in the district.

(3.)—Of the names and addresses of persons that are working, or have worked, at the subject in the district, including those no longer resident in it.

(4.)—Of all the species known to have occurred in the district, with any notes of interest in reference to their modes of life, occurrence, &c.

The Committee should also collect information and prepare a statement as to the extent that the various parts of the district have been investigated.

Having accomplished this preliminary work, the next business of the biological Committees would be to prepare exhaustive catalogues of the species. And with reference to this there is one point that cannot be too strongly insisted on, namely, the importance of uniformity in the method of treatment of the various catalogues. If one catalogue is prepared in one way, another in a different manner, and a third on yet a different plan, much of their value will be lost in consequence of the impossibility of comparing the results. The plan of the catalogues is a matter that requires mature consideration, and as a contribution to this consideration, I offer the following suggestions for the treatment. I shall first indicate the chief points of information that should be given in the catalogue, and afterwards discuss some of the details. The catalogue then should give :—

(1.)—The scientific name of the species, with the author's name.

(2.)—The horizontal range.

(3.)—The vertical range.

(4.)—The habitat, and an indication of the commonness or rarity of the species, and, in the case of its being rare, a list of localities, with name of authority for the occurrence.

(5.)—A statement as to the distribution north, south, east or west outside of the district. If the range of the species in any direction is terminated in the district, this should be mentioned.

(6.)—With regard to the migratory species, the seasons at which they appear should be mentioned as well as whether they breed in the district.

(7.)—Variations of the species in the district.

These seven items embrace the most important facts that require to be stated in the catalogue, but in addition to them some others may be given if necessary. These would include

(8.)—Date of first record.

(9.)—The local names.

(10.)—Local legends and local uses.

I shall now proceed to give some notes explanatory of what is required under each of the above headings.

1.—*The name of the species.* Care must be taken that the correct name is ascertained. Better omit the species altogether than run the risk of making the catalogue unreliable by inserting a doubtful name.

2.—*The horizontal range.* How this is to be indicated is a matter of very great importance. You will therefore kindly pardon me if I dwell on it at some length. Let us take for example the district of the East of Scotland Union, which, as you know, includes the counties of Fife, Kinross, Perth, Forfar, Kincardine, and Aberdeen. To indicate the horizontal range of a species, we may take each of those counties and mention the distribution in it. That would be one way. Or we may adopt the sub-provinces into which the late H. C. Watson has in his works on the Phyto-geography or Geographical Botany of Britain divided the district. These are two, as follows:—The South-east Highlands, which includes Fife and Kinross; Stirling; West Perth and Clackmannan; Mid Perth; and East Perth. The Mid-east

Highlands, embracing Forfar ; Kincardine ; South Aberdeen ; and North Aberdeen. The objections to both of these methods of division of the districts is that they are entirely artificial, while in the case of the Watsonian sub-provinces other counties than those in our district are included. A third plan remains which has the merit of having natural boundaries to a large extent, and is one that I sketched out in the *Scottish Naturalist* some years ago, and which has since been adopted and used by several naturalists. The objection to it is that the district of the Union while including the whole of two natural areas, also includes part of another. The natural areas entirely included in the district are the catchment basins of the Tay and of the Dee,—the former including all the country drained by the Tay and other rivers between Fifeness and Dunnotar ; and the latter the country drained by the Dee and other rivers between Dunnotar and Pitsligo. At first sight it may seem unnatural to associate the rivers of North Forfarshire and South Kincardineshire with the Tay, but if we could have seen the country during that distant period when there was a considerable extension of the land to the eastward, we would probably have found that these rivers were then all joined to the Tay. In like manner the rivers of Aberdeenshire were tributaries of the Dee. The natural area which is only partly included in the Union is that drained by the Forth, and includes South Fifeshire and Kinross, as well as part of Perthshire.

So far as concerns the division of the district into faunistic areas, it is to be regretted that circumstances have led to its extension beyond the areas of Tay and Dee. (Our friends from Fifeshire will please note that this is to be regretted merely on account of the division of the district). But as it has been so extended it seems to me desirable that the extension should be so far continued as to include all the country draining into the north side of the river Forth. After all this will add but a very small extent of country to the district of the Union and will give us a compact natural area, to which the name "North Forth" may be applied. It must not be forgotten, however, that if natural areas are to be adopted, the boundaries of Perthshire will require a little rectification. A very small part of Perthshire drains into Loch Lomond, and may well be abandoned to our friends in the west. On the other hand, part of the catchment basin of the Tay is in Inverness-

shire, and should be included in Perthshire (as indeed it is in the "Flora" of that county).

If we adopt this mode of recording the horizontal range of a species, the areas into which the district is divided will be as follows :—

1.—North Forth.

2.—Tay.

3.—Dee.

This is not only the more philosophic method of divison, as being best calculated to illustrate the natural distribution of species, but one that is in harmony with several works, treating of the fauna or flora, that have already been published.

I am rather inclined to think that it may be found desirable, while adopting these main divisions, to sub-divide them again, using the catchment basins of the tributary rivers as the sub-areas. This is, however, a matter for consideration, and one which I will not take up at present.

Another matter for consideration is how far seawards is the district of the Union to be extended.

3.—*The vertical range of a species.* This is both an important and an interesting feature of the distribution, and one that has several aspects. As regards terrestial species, we must trace the limits of the distribution up the hills in the case of lowland species, and both upwards and downwards in the case of alpine species. As regards aquatic and especially marine organisms, the limits of their distribution downwards or upwards have also to be traced.

The importance of recording the vertical range, so far at least as regards terrestial plants and animals, is very considerable when we remember that the Union includes in its district the most alpine ranges of mountains in Britian, and that though it has not the very highest point of land, yet that it possesses by far the largest tract of very elevated country, by reason of which the distribution of species is greatly affected. The vertical range should be recorded in feet, and as regards the upward range of lowland species it is scarcely necessary to indicate it when it is under 1000 feet. But as regards the downward range of alpine species, this should be recorded as low as it can be traced.

4.—*Habitat and abundance.* By habitat is meant the kind of place where a species occurs, as *e.g.*, "sea-shore" "rocks" "marshes," "fir-woods," &c. The indication of this is simple

enough, but with the other part of this section there is a considerable amount of difficulty. In the first place a uniform standard is required by which the comparative abundance (or the reverse) of a species can be judged. In the second place, the terms indicating the comparative abundance must have definite meanings, and not be used indiscriminately. It is probable that in many cases a species may happen to be abundant in one area, and rare or absent in others. The terms indicating the abundance will not, moreover, stand as signifying independent facts, but must always be controlled by the statements as to the habitat and the vertical and horizontal ranges. For instance, supposing we have a species indicated as "common" in all three areas, we must not jump to the conclusion that it is common throughout the whole of these areas, but looking to the statement of the habitat, find that it is a species of the sea-shore. "Common" in this case would, therefore, mean common wherever the nature of its habitat permitted it to occur.

It will be desirable, therefore, to have a code of terms with definite meanings drawn up before the catalogues are taken in hand.

Another point in this section demands attention. As you are aware, not all the animals and plants that now appear to be "natives" of this country are really indigenous inhabitants, but some of them have been introduced—accidentally or purposely—by the agency of man. In some cases it is easy to decide whether a species is native or naturalised, but in others it is a matter of considerable difficulty. Moreover, there are degrees of naturalisation—some species having been long and thoroughly established; others only endeavouring to make good their footing, and still struggling for a place. It is important, therefore, that an opinion should be expressed as to the nativity or otherwise of the species, and its degree of naturalisation if a naturalised one.

5. *Distribution outside the District.*—It may be assumed that not many species (if indeed any) are really restricted in their distribution to the district, but that they also occur elsewhere. What their distribution is outside, has in many cases an important bearing upon their distribution inside the district; and it is, therefore, desirable that some information at least should be given as to this. Such information will relate to the distribution in Britain, and to the distribution elsewhere. It need scarcely be mentioned that *minute* details of the exotic distribution are not necessary.

6. *Migratory Species.*—It seems unnecessary to say anything in explanation of this section.

7. *Variations of species in the District.*—The variations that species are subject to, form several distinct classes, and in connection with the theory of evolution, are of much importance. It is, therefore, desirable not only that the variations that occur within our bounds should be studied, but that a definite method of recording their occurrence should be adopted. The classification of forms which depart from the type of the species is not altogether easy. What some naturalists consider to be a good and distinct species, is considered by others to form only a sub-species, or even to be unworthy of the latter rank. If, therefore, so much difficulty attends the definition of a species, there is at least as much in defining the grades of the variations.

Beginning with the species itself, the following are the more important grades :—

1. The Species (or super-species).
2. The Sub-Species.
3. The Local Race, or Variety.
4. The Aberration.
5. The Abnormality.

In addition to these, cases are often met with presenting slight differences, which, being almost intangible, are difficult to characterise, but which as showing possibly the beginnings of, or the reversions from, more important variations, are worthy of careful study.

Many species are ordinarily so fairly constant and uniform in colour and structure, that they may be said to offer no variations from the type or characteristic form unless it be an occasional abnormality. By an abnormality is meant a departure from the characters of the type sufficiently great to be more or less noticeable, but which is of such rare occurrence that it may perhaps be observed once only and never again. An albino form (in the true sense) is an abnormality, but it may take other aspects. Between the aberration and the abnormality there is often only the degree of a greater frequency of recurrence. That is to say, the abnormality, by showing a tendency to become perpetuated, or at least to recur not unfrequently, becomes an aberration. The term "variety" is often used in the same sense as we have used "aberration," but may more conveniently be applied to the next grade

of variation. If the aberration becomes constant—that is to say, hereditary, producing its like generation after generation, without reverting, it forms a local race or variety proper. It is to be noted that in some cases the form may occur as an aberration in some localities, and as a local race or variety in others. Closely allied to the local race is the sub-species—so closely allied indeed that they may often be, and indeed are, considered identical. The sub-species has, however, more claims to specific distinction, and, in fact, the term is used not in the sense altogether of a rank inferior to a species, but rather to indicate a closer alliance amongst themselves between certain species of a genus than that which they have with the other species of the same genus. The characters which the sub-species have in common constitute the character of the super, or aggregate species, and one super species may contain any number of sub-species, each of which may have its local races aberrations, and abnormalities, while in like manner a local race may have its aberrations or abnormalities, and an aberration may have an abnormality.

It should be distinctly remembered that, as in the case of the genus and species, all these inferior groups are artificial, and used merely for the purposes of classification. I do not know if I have made the matter very plain, but I daresay you have caught the drift of my argument, which is briefly this, that in our local catalogues we should not be content with simply recording the occurrence of a species, but endeavour to show what relation in structure and colour the local individuals of that species bear to the species in general. Having indicated the nature of this relationship, it will then remain to try to discover, in the case of variations, the cause of such variation. The remaining three sections do not call for much remark on my part, beyond this, that if the local names, &c., are to be recorded, as most assuredly they should be, no time should be lost in obtaining information, as they are fast being forgotten, and will soon be buried in oblivion.

From this brief sketch of what is suggested should be the method of cataloguing the fauna and flora of any district, it will be seen that each Society has a good deal of work before it. But when it has been done there will be the satisfaction of knowing that a good work has been accomplished, and that materials have been amassed from which it may be possible to learn something of certain great problems which are yet unsolved, and amongst

which are the causes of the present distribution of our fauna and flora.

In my remarks on the work of Societies I have not indicated how geological and meteorological work should be carried on. The details of this I leave to the respective Committees, but in doing so, would urge upon them, as upon all, the desirability of uniformity.

THE SCIENTIFIC METHOD IN BIOLOGICAL CLASSIFICATION. TERMINOLOGY (Concluded).

By Rev. WILLIAM L. DAVIDSON.

HERE, under Rule III., may be raised the question of the propriety or advisability of changing the name of a group (either of animals or of plants), when once the name is commonly acknowledged and well-established. It is notorious that many biological names are offensive hybrids; yet, speaking generally, we may confidently say that no change of name should be made on such a ground as this; neither should any be effected solely for the sake of euphony. For, although these grounds would be quite sufficient to justify our rejection of a name at its first introduction, the case is different when the word has acquired the sanction of accepted usage. There are three cases, however, where a change becomes legitimate, if not imperative—even at the risk of introducing a disturbing element. These are :—(1) When the original name was imposed on a false principle, or has become suggestive of a misleading idea; (2) when the group itself has, through fresh knowledge and discovery, come to be so remodelled (widened or contracted) as to be virtually a different group; (3) when the name transgresses the accepted principle on which group-names proceed.

The first of these cases covers such changes in Terminology as have been necessitated by the passage from the Artificial to the Natural System of Classification, or which mark advances in the natural classification itself; as well as all instances where a name with a misleading connotation has been exchanged for another of an unobjectionable kind. For this reason, it was right, when the

fundamental division of plants came to be based on embryology, that the names significant of that fact (viz., dicotyledons and monocotyledons) should take precedence of all others; just as it was a gain in zoology to exchange such a misleading word as Cuvier's *Articulata* for the more exact name *Annulosa.*

The second of the above cases is equally clear, and is comparatively common, and must continue to arise so long as knowledge continues to accumulate, and fresh discoveries to be made. For example, Cuvier's *Radiata*, in the animal world, answered the purpose very well so long as the Cuvierian sub-kingdoms represented the highest classifying achievement. But, whenever the groups designated by that term came to be re-arranged in accordance with fuller knowledge and more accurate discriminations, the term itself had to be discarded; and, to have retained it after its distinctive meaning was gone, or to have appropriated it to a portion of what it formerly denoted, would have been misleading in the extreme and unscientific. So with similar instances both in zoology and in botany: a change in name should accompany a change of grouping; but, when no change in grouping is effected, it is confusing in the highest degree to tamper with the terminology, even when by so doing we introduce a linguistic improvement.

The other great exception is the third of the cases above referred to—when a particular name transgresses the accepted principle of naming. An excellent example is found in the Natural Orders of Botany. It is a well-known fact that the botanical orders are designated from some typical genus of the order—as when the genus Ranunculus gives us Ranunculaceæ, or the genus Papaver Papaveraceæ, or the genus Scrophularia Scrophulariaceæ; and in this way the ordinal name is made to indicate a significant peculiarity: it embodies a reference to one characteristic genus of the order. But, as matter of fact, several of the ordinal names have been imposed irrespective of this consideration, and thereby unnecessary confusion has been introduced. A case in point is the Labiatæ. There is no such *genus* as the Labiates, or lipped flowers at all; neither is the name itself absolutely distinctive of the order to which it is applied. For the Labiates are by no means all lipped flowers, while there are many lipped flowers outside the Labiate family. It was, therefore, with great reason that Lindley proposed to supplant the term Labiatæ by the term

Lamiatæ ; for the Lamiums are a genus quite representative of the order, and, by designating the group Lamiatæ, we carry out the general principle of ordinal naming consistently—just as we do so when we supplant Cruciferæ by Brassicaceæ, or Compositæ by Asteraceæ.

Such, then, are the principles applicable to Terminology, and such are their bearings on classification. It only now remains to add that much has still to be done before the classificatory sciences can be said to have made full and thorough application of them.

THE RELATIONSHIP OF PALAEONTOLOGY TO BIOLOGY.

By R. J. HARVEY GIBSON, M.A.

EACH of the two great departments of Natural Science, known as Palaeontology and Biology, includes a vast array of facts, connected by a series of hypotheses for which the facts afford foundations of greater or of less stability. The facts have been ascertained, and the hypotheses have been advanced in both departments by a host of observers, amongst whom we may number some of the most famous men in history.

It is not my intention to investigate the accuracy of the facts, or the validity of the inferences, either in Palaeontology or in Biology. Rather I desire to accept as beyond question the accuracy and validity of both series of phenomena, and to draw certain general conclusions, bearing more especially on the relationship of the two series to each other.

Even at the risk of being tedious, it is always preferable, I think, in any attempt to demonstrate some new aspect of scientific inquiry, to proceed from the known to the unknown ; and to lead up to new conclusions, whatsoever they may be, through conclusions well established, rather than to proceed at once to the exposition of previously unexplained phenomena.

First then—What is Palaeontology ?

From a host of definitions, scattered through the various geological text-books, I select that of Dr. Archibald Geikie given in his valuable text-book of Geology, 1882. It is as follows :—

"Palaeontology treats of the structure, affinities, classification,

and distribution in time of the forms of plant and animal life embedded in the rocks of the earth's crust."

The definition is followed by explanatory remarks to which I shall afterwards refer.

What in the next place is Biology? How is it defined?

I shall cite only Professor Huxley's definition in the article Biology, Encyclopædia Britannica, 9th Ed. It is:—"The Biological Sciences are those which deal with phenomena manifested by living matter."

The two subjects are obviously not on an equal footing. Palaeontology is a division of Geology, or is, at least, tacked on to that science; Biology on the other hand stands distinct.

Let us glance briefly at their historical development, and endeavour to see how that explains their position.

In considering first of all the science of Geology, we may pass over without remark, as outside our present subject, the long period in its history during which it developed out of a mass of tradition and imagination into a more or less definite body of scientific truth, under the influence of the early Italian school.

Strangely enough the first memoir which might be termed scientific on a geological subject, was palaeontological, and was published by Fracastoro in 1520. His contention was that fossils found in the rocks were the remains of organisms previously existent on the earth's surface, and entombed on their death by natural causes.

With the exception however of this work, and the observations and opinions of the few Italian thinkers who brought to the study of Geology minds free from prejudice, a sketch of the progress of geological enquiry from the close of the sixteenth to the middle of the eighteenth century, is the history of a constant and violent struggle of new opinions, which form the most self-evident propositions of Geology as we understand it, against doctrines, either emanating from minds to which no propositions however ridiculous seemed unworthy of the ordeal of argumentation, or sanctioned by the implicit faith of many generations, and supposed to rest on Scriptural authority.

At length towards the end of the eighteenth century the key-note of modern Geology was sounded when Genevelli exclaimed before the Academy of Cremona, "I hold in utter abomination, most learned Academicians! those systems which are built with their

foundations in the air, and cannot be propped up without a miracle; and I undertake, with the assistance of Moro, to explain to you how these marine animals were transported into mountains by natural causes."

The careful observations of Moro, Gesner and Micheli, of Pallas, Saussure and many others, form a refreshing contrast to the absurd hypotheses of their predecessors; and in their works, though Palaeontology still occupies the chief place, we see gradually springing up a desire to apply the same methods of reasoning to the phenomena of mineralogy and of structural and dynamical Geology.

The advent of Werner raised Mineralogy to the chief place among the sciences of the inorganic world. Dynamic Geology received its first scientific exposition at the hands of Hutton and Playfair. Experimental Geology was founded by James Hall; while Desmarest first grasped the conception of a physical geography of the Earth's surface. But by all these investigators Geology, meaning the study of the structure and mode of origin of the strata of the earth's crust, was looked upon as a subordinate division of the subject to which each was severally devoted. Probably, William Smith, an English surveyor who lived at the close of the eighteenth century, was the first to treat the science of Geology in a truly scientific manner; certainly it is to his genius that we owe the demonstration of the use of fossils to the Geologist, and the indication of the proper place that Palaeontology should hold in Geological enquiry.

As now understood, Geology embraces seven more or less distinct inter-dependent subdivisions. These are :—

I. COSMOGONY, which treats of the earth as a whole, its relation to other heavenly bodies, its own particular movements and probable origin.

II. GEOGNOSY, which describes the constituent parts of the earth, the minerals and rocks of which it is composed.

III. DYNAMICAL GEOLOGY, which embraces an investigation of the operations which lead to the formation, alteration, and disturbance of rocks.

IV. STRUCTURAL GEOLOGY, which deals with the architecture of the earth, and the mode of arrangements of the various materials composing its crust. Structural Geology is thus the statical aspect of Dynamical Geology.

V. PALAEONTOLOGICAL GEOLOGY, which has already been defined.

VI. STRATIGRAPHICAL GEOLOGY, or Geological History, which endeavours to work out the chronological succession of the great formations that form the land-surface of the globe.

VII. PHYSIOGRAPHY, which traces the gradual development of the stratigraphical features presented to us.

Palaeontology therefore, which to the first geologists meant all Geology, and round which the battle of reason *versus* dogma and prejudice raged for centuries, has gradually sunk from its higher place to occupy that of a dependency of Geology proper; though forming a basis, as was first shewn by William Smith, for the elaboration of another section, that of Stratigraphical Geology.

But now I wish to advocate a further step, namely, the severance of Palaeontology, as such, from Geology altogether. Under what department of science is Palaeontology then to be included?

Before answering that question, it is necessary to have a clear notion of the general scope of Biology and of the origin of the term.

Since the demonstration of the fundamental sameness of protoplasm as forming the physical basis of life, whether animal or vegetable, it has become customary to unite the two sciences of Zoology and Botany under the one science of Biology; a custom which must be followed ere long by the recognition of the essential relation of Psychology and Sociology to the same general science. In fact as Professor Huxley puts it, "It must be allowed that no natural boundary separates the subject-matter of these sciences from that of Biology."

Living matter and the products of its metamorphosis may, according to the biologist, be regarded under four aspects. 1. Morphological, 2. Physiological, 3. Distributional, and 4. Etiological. In other words every living thing has structure, function, habitat, and relationships. These then are the phenomena with the consideration of which the Biological sciences are occupied.

Now, when we talk of studying the phenomena manifested by living things, what do we really mean? Save the external features we cannot study the morphology of living things at all. The very act of examination is, and must be preceded by the death of the organ and organism, except where the tissues are so transparent

as to admit of examination without dissection. Do we study the physiology of living things then? Save of the more apparent functions of locomotion, and the more obvious developmental changes, do we really know anything of the physiology of plants and of animals? Are not, as Professor Burdon Sanderson says, the structure and functions of active living protoplasm entirely unknown? The phenomena of distribution might be equally well studied in the dead as in the living matter. The phenomena of Etiology we cannot treat of otherwise than by inference.

I by no means wish to argue that the definition of Biology given above is unsuitable or erroneous. On the contrary I am willing to accept it with the proviso, that, in dealing with the phenomena of Biology, we understand these phenomena which we may, from an examination of the dead forms, supplemented by such general results as we are able to obtain from a study of living forms, legitimately infer to be characteristic of the plant or animal in its active living state.

But if the view I have taken be accepted, why may not the Biologist discuss the remains of organisms buried in the crusts of the earth from the same four points of view? Where indeed will the Palaeontologist draw the line of demarcation between fossil and recent beings?

The past life of our globe passes by gradations more or less insensible, according to the completeness of Geological Records, into the life of the present. Life in all its fundamental principles has been one since it first appeared. The conditions under which it originated, we may not as yet have grasped; but there can be no doubt that the physical basis, which, in obedience to the laws of variation, produced the trilobites of the Silurian, or the ammonites of the Jurassic, was the same as that which, under similar laws, forms the basis of life in the innumerable varieties presented by the different species of living plants and animals.

(*To be continued.*)

ZOOLOGY.

STRAY NOTES ON THE PEARL MUSSEL.

By WILLIAM JAPP, F.S.A.

(*Concluded.*)

THE favourite habitat of the pearl mussels is a smooth stream, with a gravelly bottom. Their natural preference is to burrow: and it has been found that where a piece of water has been almost depopulated by too severe fishing, very soon a new colony may be seen taking up the position, and studding the bottom of the river in myriads. Such a gravelly bottom gives also the favourite feeding ground of the mollusc. Though at times they are obliged to take refuge in clay, on it they are much poorer and leaner than on the gravel. They are able, like trout, to adapt themselves in the colour, to that of the bottom on which they live; so that, if the clay is blue the mussel becomes blue; and even the pearls in such mussels assume a bluish tint. They have a great capacity for food; and when in health and in a suitable locality, they are often crammed with it.

They are very conservative in their location: and it is believed that if nothing disturbs them, they can be identified as occupying the same upright position for thirty years or more. If by any chance the trunk of a tree has become fixed across the bed of the stream, so as to act like a croy, making the current less rapid, mussels will soon occupy this sheltered spot, and will at once burrow a couple of inches into the gravel, and will adapt themselves to the requirements of their surroundings. There are all kinds and conditions of river-beds, just as there are all kinds and conditions of soils on the earth's surface; and mussels like the monks of old, soon find out and take possession of the most eligible sites. The Isla bottom is richer than the Tay. The Tay mussel is of the same variety as that from Balquhidder, though

varying in size from different localities, caused by local differences in the surroundings.

Mr. Farquharson believes that mussels may reach quite a patriarchal age, and that they may even live hundreds of years. They have been found deep in the gravel, even, in railway excavations, at a depth of twenty feet, to which depth it has been supposed that they have burrowed, though something must be allowed for subsequent deposition of sediment. Mr. Farquharson some years ago tried an experiment. He selected about a thousand shells; and from each of these he chipped off a piece of the shell, and thereafter replaced them in the stream. I guess this operation has something to do with the attempt to make them produce pearls: but on this subject I must reveal no secrets. About eighteen years afterwards he found that these mussels had grown only one inch, so that they might still be said to be in their teens. On this calculation it would require a hundred and forty-four years for a mussel to reach its full size, since the average length of a mature shell is eight inches.

A full grown mussel can protrude itself to a couple of inches from the opening of its shell. When so protruded the eyes may be seen peeping out. The excreta are green like the contents of the stomach, which apparently undergo little change in digestion. The stomach can contain about an ounce of food at a time.

It is sometimes difficult to haul the creature out of its burrow: but the difficulty is lessened when the burrow is in loose gravel.

In a mussel-bed shells of all ages and sizes are brought up by the drag-net, which is often used in fishing for them. The question of the mortality of the creatures has been in passing touched upon already, in the reference to the great age attained by them. We are taught by statistics that the average life of the human race is thirty-five years; but Mr. Farquharson's experience makes him conclude that the mussels show a much less mortality than mankind. He has examined myriads of mussels in a year, yet in all his long experience he has found only two or three dead ones. This goes to show that if the mussel is not intellectual, it has at least the possession of long life, accompanied by all the pleasures of the gratification of its appetites.

They are able to move from place to place; though what the motive may be is very doubtful. One may trace on the muddy

river beds the zigzag marks left by them on their mysterious errands.

The above notes are only jottings taken over the counter of Mr. Farquharson's shop, in the course of conversation with the worthy old man, who has fished for pearls for half a century.

I have now only a word to say in conclusion about the experiment that brought him and myself into personal contact. The place selected on my property is a convenient bend in the River Isla. The bend, forming a right angle, has gathered an alluvial deposit, in which I hope the mussels will thrive long after I am gone. I am glad to say that careful scrutiny has revealed only one dead shell in the place of deposit, or below the "Reekie Linn," showing, I hope, that the mussels have continued to thrive. The absence of dead bodies is a very encouraging sign at least, and by-and-bye I trust that I may be able to make further observations upon their habits in this locality.

British Phytophagous Hymenoptera. By Peter Cameron, Vol. II.—In this Magazine (Vol. I., n. ser., p. 204.), we have already called attention to the first volume of this valuable work, which is appearing among the publications of the Ray Society. The second volume has recently been published, and fully sustains the high position taken by its predecessor. It deals with the very large genus *Nematus*, and with its allies, thus including the sawflies most difficult to distinguish from one another. The gall-makers among the sawflies fall under this group. There are numerous plates, some devoted to coloured figures of the insects; others to the larvæ and their modes of life, and others to the saws of the females. The species have the localities carefully added; most are found in Scotland. Much information regarding he life-history of the various insects will be found in the volume.

The Algæ of the Firth of Forth. By George W. Traill (Joppa). Mr. Traill, in this small work, has furnished a valuable list of the seaweeds of one of the richest portions of the Scotch coasts—a list, the completeness of which is very largely due to his own unwearied assiduity in working out the flora at all seasons, for several years past. He has been peculiarly successful in his search for many of the more minute forms, as well as in finding the algæ bearing reproductive organs; and he has added not a few species to the British lists. For these reasons its value is much enhanced, as well as by the fact that in it he has indicated, under each of the epiphytic species, all the species of larger seaweeds on which he has found them growing. Seven or eight of the scarcer kinds are represented by neat and well-selected specimens, on sheets at the end of the pamphlet. When a re-issue is required, as we hope it will be soon, we trust that the author will add, from his own experience, notes on the more interesting species; and also that he will depart from the *alphabetical* in favour of a *natural* arrangement of the species.

PHYTOLOGY.

PLANTS OF ICELAND AND OF THE FAROE ISLANDS NOT KNOWN AS BRITISH.

By ARTHUR BENNETT, F.L.S.

(*Continued.*)

[Mr. Bennett has pointed out to me that, unfortunately, an error has crept into the previous part of this article, on p. 66. Under **Campanula rotundifolia** L., var. **arctica** (lines six and five from bottom), instead of "the W. Iceland plant being different from the British," read "the W. Ireland plant being different from the Icelandic, *i.e.*, A. G. More's var. *speciosa* from W. Ireland, named v. *arctica* of Lange in Babington's Manual, Ed. 8, is nothing like the true *arctica* of Lange, as shown by careful comparison of types from the describers." Ed., *Scot. Nat.*]

The following plants from the Faroe Islands are not yet known as British :—

Ranunculus nivalis L. ; **R. glacialis** L. ; **R. acris** L., var. **pumila** Whlb. Does this occur on Lochnagar?

Cardamine pratensis L., var., **speciosa** Hartm.

Arabis alpina L.

Draba hirta L.; **D. corymbosa** R. Br. ; **D. trichella** Fr., referred here by Rostrup, is placed under **rupestris** by Nyman. ? **D. lapponica** D.C.

Cochlearia arctica (D.C.) Fr.

Melandrium diurum (Sibth) Fr., vars. **expallens** Lange, and **parviflorum** Rostr.

Cerastium triviale Link., var. **anomalum** Hartm. ; **C. latifolium** L. (The true *C. latifolium* L. is not British, *fide* "Student's Flora, Ed. 3.) This is probably *C. arcticum* Lange, Fl. Danica, t. 2962. In Lange's "Conspectus

Floræ Groenlandicæ," he recognises the plant of Iceland, Spitzbergen, and Norway as his plant, and not *latifolium* L. What is the Scotch *C. latifolium* L. ?

Halianthus Peploides (L.) Fr., var. **major** Rostrup.

Sagina subulata Wimmer, var. **glabra.**

Hypericum pulchrum L., var. **procumbens.**

Alchemilla fissa Schummel, 2 forms.

Potentilla ambigua Gaud. ; a sub-species of **maculata.**

Spiraea Ulmaria L., var. **concolor** Lange.

Epilobium alpinum L., var. **dasycarpum** Hartm.

? Saxifraga tricuspidata Rottb. (Nyman & Trevelyan).

Archangelica officinalis Hoffm., probably as **A. Norvegica** Rupr., a sub-sp.

Leontodon obliquum Fr.

Matricaria inodora L., var. **borealis** Hartm.

Gnaphalium supinum L. ; var. **pusillum** Hartm.

Vaccinium uliginosum L., var. **pubescens** Wormskiold (sp.) ; **V. Vitis-Idæa** L., var. **pumila.**

Veronica officinalis L., var. **glabrata** Fr.; **V. artica** Lange.

Thymus Serpyllum L., var. **borealis** Lange.

Plantago lanceolata L., vars. **depressa** and **eriophylla** D.; **P. maritima** L., vars. **dentata** Fl. Dan, and **ciliata** Rich.

Polygonum viviparum L., var. **alpina** Hartm.

Kœnigia islandica L.

Rumex acetosa L., var. **alpina.**

Atriplex Babingtonii Wood, var. **virescens** Lange (Caithness, J. Grant).

Salix arctica Br.; **S. herbacea** L., var. **fruticosa** Fr.

Orchis sambucina L.

Juncus lamprocarpus L., var. **repens** Lange ; **J. bufonius** L., var. **parvulus.**

Luzula maxima (Ehrh.), Desv. var. **gracilis.**

Sparganium natans L. (Fr.)

Carex hyperborea Drej.; **C. rigida** Good, var. **infuscata** Drej.; **C. turfosa** Fr.; **C. halophila** Fr. ; **C. Lyngbyei** Horn. ; **C. pilulifera** L., var. **longibracteata** Lange ; **C. binervis** Sm., var. **alpina** Drej. I have specimens from Sutherland that agree with Drejer's description in his "Revisio," but I have not seen type specimens.

Poa alpina L., var. **nodosa**, Hartm.
Glyceria fluitans Br., var. **tritica.**
Agrostis alba L., vars. **maritima** Mey, and **gigantea** Rchd.; **A. vulgaris** With., var. **aristata**; **A. canina** L., vars. **pallida** Rchb., **mutica** Hartm., and **montana** Hartm.?
Anthoxanthum odoratum L., var. **major** Lange.

We have then for Iceland, of plants not British, 62 species and 30 varieties; or, rigidly excluding all doubtful forms, the numbers will be 52 species and 30 varieties.

For the Faroes we have of plants not British 20 species and 39 varieties; or, again rigidly excluding doubtful plants, 13 species and 39 varieties.

For Iceland these numbers may be compared with Professor Babington's "Revision," where he gives 62 species as not British; but he includes among these *Sedum villosum* L., and *Draba muralis* D. C., both of which are British. Taking his figures it would seem that I was not justified in my remark respecting the large proportion of doubtful plants; but it must be remembered that I have excluded from my list many species reported by one or other of the writers on Icelandic botany, from Kœnig and Rottbœll to the present time, else it would have been much larger.

NOTES ON BRITISH CLADONIÆ.

By Dr. JAMES STIRTON, F.L.S.

TO Mr. James M'Andrew of New Galloway, I am almost entirely indebted for the materials whereby I have been enabled to make the following observations on the Scottish Cladoniæ.

Within the last two years he has sent me upwards of 250 specimens, many of which are in fine condition, inasmuch as he has followed out his researches at all seasons, and has thus been enabled to select specimens in perfect condition. The interests of botany would be largely enhanced if there were a few such indefatigable botanists as Mr M'Andrew scattered over Scotland.

The district of which New Galloway may be said to be the centre is peculiarly rich in Cladoniæ. The country is open, and diversified by hill and dale and loch, while the woods properly so called are detached, as well as in various stages of growth. Much

the larger proportion of the ground is still in a natural, uncultivated state. Above all there are no collieries or chemical factories, the gases from which, especially acid gases, are so destructive of lichens.

The group which is best developed is that clustered around *Cladonia squamosa*; and it is remarkable that the forms belonging to both *Cl. squamosa* and *Cl. subsquamosa* are nearly equally represented. Perhaps those under the latter species are the more luxuriant and varied. Of *Cl. subsquamosa* I possess 24 specimens, in all of which, and at all stages of growth, the reactions Ky, C— are remarkably distinct and vivid. The yellow reaction by K is instantaneous and permanent. This yellow reaction in a certain proportion ultimately merges to a fixed red or ferrugineous red. Of this after reaction I have hitherto taken no account in the discrimination of Cladoniæ.

In several instances, the corresponding forms of *Cl. squamosa* and *subquamosa* grow closely associated and even intermingled, while, in such instances, there is not the slightest trace of yellow produced by K on the specimens of the former lichen.

Taking as my basis Prof. Th. Fries's diagnoses of *Cl. squamosa* and its allies as given on pp. 75 and 76 Lich. Scand. (1872), I propose to distinguish the corresponding forms of *Cl. subsquamosa.* It is remarkable that Fries had not, at the date of the publication of his work, seen any of the forms of *Cl. subsquamosa.* His words are, "Thallum reagentiis solitis numquam vidimus tinctum." Whether he has since detected any I am not aware.

First as regards the form allied to *C. asperella* (Flk.). This is beautifully represented in Mr. M'Andrew's collection, is in fine condition and, for the most, covered with apothecia.

Cl. subsquamosa (Nyl.) * *furfurosa* (Strn). Similis *Cl. asperellæ* (Flk.) sed thallo Kfl., C—. Apothecia cymoso-conferta, juniora pallide fuscescentia, plana, marginata, dein convexiuscula, fusconigra et sæpe medio pertusa. Phyllocladia basalia, pauca vel interdum nulla visibilia (Coll. M'Andrew No 1).

Cl. subsquamosa * *dilatata* (Strn.).

Podetia sursum incrassata, lævigata, sed phyllocladiis laciniatis sparse vestita, hinc inde lacunose impressa vel-foveolata, simplicia vel superne fastigiato-ramosa. Phyllocladia basalia crenato-incisa. Th. Kfl. C—.

Prope New Galloway (Coll. M'Andrew No. 4).

Cl. subsquamosa * *sublactea* (Strn.)

Similis *Cl. lacteæ* (Flk.). Podetia albida vel lactea, molliuscula, sursum incrassatula. Phyllocladia basalia ampla longa, laciniato-dissecta. Th. Kfl. C—.

Prope New Galloway, in Coll. M'Andrew No. 2, data.

Cl. subsquamosa * *deflexa* (Strn.).

Podetia squamulosa, squamulis crenato-incisis plerumque *deflexis*, sursum incrassatula, superne fastigiato-ramosa. Kfl. C—.

Cl. subsquamosa * *phyllina* (Strn.).

Similis *Cl. frondosæ* (Del.) sicut in Fries. Lich. Scand. p. 76 definitae. Phyllocladia basalia laciniato-lobata, adscendentia imbricata, in cæspitem densum depressum congesta; podetia brevia deformia, squamulis parvulis densissime vestita.

Prope New Galloway a cel. J. M'Andrew lecta. Th. Kfl., C-—.

Cl. subsquamosa * *cristata* (Strn.).

Podetia, squamulis minutis vel furfuraceis vestita, gracilia, ramosa fere ut in *Cl. crispata*, margine prolifera, axillis et apicibus plerumque infundibuliformibus, et aperturis margine cristatis. Phyllocladia basalia pauca.

Cl. subsquamosa * *spilota* (Strn.).

Podetia vage ramosa sed sæpe superne fastigiato-ramosa, infra nigrescentia vel nigra, et hinc inde albo-maculata ut in *Cl. degenerante*, phyllocladiis crenato-incisis plerumque unilateralibus laxe vestita; axillæ hiantes; apothecia parviora. Supra terram muscosam.

Prope New Galloway (M'Andrew).

Cl subsquamosa * *compressula* (Strn).

Podetia prostrata vel adscendentia sæpe compressiuscula, mollia, albida, phyllocladiis longis inciso-crenatis aut laciniato-dissectis, plerumque unilateralibus sparse vestita. Apothecia aggregata sæpius pallidiora.

Supra muscos emortuos prope New Galloway (Coll. M'Andrew, No. 222).

Cladonia attenuata (Affm.) is not represented in the collection, unless by a few stems, whose apices although not attenuated as in *Cl. attenuata*, are yet not infundibuliform but divided somewhat in the manner of *Cl. furcata*.

This form may meanwhile hold the name *Cl. spicata* (Strn.)

Under *Cl. furcata*, I possess several curious forms from Mr. M'Andrew, all of whose reactions are K—, C—.

Cl. furcata * *Cl. diffissa.*

Phyllocladia basalia mediocria vel parva, crebriuscula. Podetia basi simplicia, rigida, erecta, crassiuscula, (1-2·5) cm. alta, cartilagineo-corticata, interdum apicem versus nonnihil furfuracea, glauco-vel spadiceo-virentia, acute et subdichotome ramosa, ramis subfastigiatis; axillæ perviæ, ramorum apices pervii infundibuliformes; apothecia fusca, primum planiuscula, dein convexa, mediocria (latit. circiter ·5 mm.), interdum congesta. Coll. M'A. 90.

This lichen, owing to the pervious axillæ and open infundibuliform apices, can be associated only with *Cl. furcata*. It has, however, entirely the habit of a short rigid *Cl. gracilis*, more especially as the infundibuliform apices present very much the appearance of scyphi with their coronæ of apothecia.

Cladonia arborea sp. n.

Phyllocladia basalia pauca laciniata. Podetia erecta, infra simplicia vel rarissime semel divisa, robusta, brevia (alt. ·5-1 poll.) superne incrassata, lævigata, esquamulosa vel basi squamulis parvis, paucis interdum vestita, scyphifera; scyphi irregulares, margine radiato-ramosi, ramis fastigiatis et irregulariter ramulosis, sæpe repetito-ramulosis apicibus infundibuliformibus et fructiferis; apothecia fusca mediocria.

Ad terram Lochar Moss prope Dumfries a cl. J. M'Andrew lecta (No. 113).

This lichen also has much the aspect of a state of *Cl. gracilis* but I fear all the cups are perforated as in the preceding, at least the secondary ones are so. It is certainly a very singular form.

Cladonia furcata * *Cl. contexta* (Strn.).

Podetia robusta, ramosa axillis perviis, hinc inde rimata, pallida vel fuscescenti-pallida.

Similis *Cl. furcatæ* sed apotheciis majoribus (latit. ·6-1·2 mm.) fuscis, sporis longioribus, ·012-·021 × ·003-·0035 mm. Supra Bennan prope New Galloway (No. 29).

Cladonia furcata * *Cl. commixta.*

Podetia pallida vel glaucescenti-pallida vel etiam pallide fus cescentia (præsertim infra), ramosa, ramis plerumque recurvis et fissuris longitudinaliter hiascentibus terebratis et ramis ramulisque apotheciis terminatis.

Prope New Galloway (Coll. M'A. 96). This Cladonia partakes of the characters of *recurva*, *corymbosa* and *stricta*.

THE FLORA AND FAUNA OF SNOW AND ICE.

By JOHN ROY.

(*Read before the Aberdeen Natural History Society on 17th Feb.*, 1885.)

I SCARCELY think it necessary to offer any apology for laying the following brief notes before the Society. They are culled from the latest work by Baron Nordenskiold, the celebrated Swedish explorer. This treatise, entitled "Studier och Forskningar," has not yet appeared in English, to my knowledge. The part relating to the snow and ice vegetation has been written by Prof. Veit Brecher Wittrock, of the University of Upsala, and the points I mean to bring before you are from his paper. My object is to call attention to the possibility of getting some of the species enumerated in Dr. Wittrock's list on our own mountains. Of course, we have no glaciers, and, therefore, no possibility of obtaining those species which are confined to ice. None of our hill-tops are above the limit of perpetual snow; but on several of them certain snow wreaths are nearly permanent; for instance, one between Ben Macdhui and Cairngorm, and another on the summit of Braeriach. On Ben Nevis wreaths must be still more nearly permanent. In 1843, Dr. Dickie found the *Red Snow* on Ben Macdhui; and it was reported long ago from Appin, a report I have great difficulty in believing. I think some other species must have been mistaken for it, more especially as the locality was somewhere near the sea-level. I have no doubt the *red snow* will be found on our hills again, if looked for. What I would ask those that have the opportunity of being in those elevated regions in the month of August to do is to gather the dark-coloured, dusty-looking stuff which is often seen on the surface of the snow. Even with the aid of the lens there may not appear to be anything of a vegetable nature in it. Still, many things may be concealed there,

and I shall be very glad indeed to carefully examine any samples which may be entrusted to my care. Of course, it would be well to collect as far from the margins of the wreaths as possible. The samples collected should be put in a small bottle, or preserved in some other way that would keep them moist.

Red Snow has long been well known to Arctic voyagers. The first notice I find of it is by John Davis, who saw it on August 6th, 1585, in the Straits which bear his name. He says of Mount Raleigh :—"The cliffs whereof were as orient as gold." This is recorded in Hakluyt "Voyages," Vol. III., p. 101. Frederick Martens observed it in Spitzbergen in 1671. The nature of it was investigated by De Saussure in the Alps of Savoy in 1760. In 1778, it was observed at St. Bernard. It is recorded by Captain Ross from the West Coast of Greenland, at 75° 57′ N.L., in immense quantities, so much so, that a place there got the name of "Crimson Cliffs." He also found that it penetrated the snow to a considerable depth. Robert Brown, in the Appendix to Captain Ross's "Voyages of Discovery," gave it a place among algæ. Some botanists thought it a fungus. Baron F. A. Wrangel called it *Uredo nivalis*. Lichtenstein thought it was a zoophyte; and both he and others believed that it fell from the sky. C. A. Agardh assigned it to the genus *Protococcus*, with Bauer's specific name *nivalis*. Agardh also gave it the very appropriate popular name *Snœns blomma*, *flower of the snow*. Shuttleworth observed it in 1839 on the Grimsel in the Bernese Alps; and Carl Vogt saw it in the same region in 1840. He looked upon it as an Infusorian, and gave it the name of *Discerœa nivalis*. Passing over several names, we find Perty, in 1852, describing it under the name of *Hysginum nivalis*, with a leaning towards a belief in its being an animal.

It might be mentioned that Captain Parry in 1827 found it as far north as 82° N., far to the north of Spitzbergen. In 1838, however, Martius and Bravais, of the French Expedition to Spitzbergen, besides the well-known *red snow*, discovered *green snow*. Then W. P. Schimper, the well-known bryologist, discovered *green snow* on the Grimsel in the Swiss Alps, from the 20-30th August, 1848. It is also believed to have been observed on the coast of Greenland by Scoresby.

In 1822, Sommerfelt gathered the *red snow* on Solvaagtinden in Nordland, at a height of 3000 ft. above sea-level. He gave

the name of *Sphærella nivalis*. It was found in Russian Lapland by Middendorf on July 27th, 1840, and towards the northern extremity of the Ural mountains by Schrenk on the 15th of August, 1848. Since then it has been found on the Pyrenees and the Carpathians, on Sierra Nevada, in California, and in the Antarctic regions, so that it may, like so many of the algæ, fairly be regarded as cosmopolitan.

In 1870, Professor Nordenskiold's expedition to Greenland took place. He was accompanied by Professor Berggren. They added considerably to the Snow-Flora. One of their most remarkable additions is a Desmid, *Ancylonema Nordenskioldii*, Berg., the type, as well as the only species, of a new genus of plants. It is further remarkable as being found on ice only, not on snow. In many places on the inland ice it was found in great abundance, giving a purplish-brown colour to the ice. Other algæ were mixed with the fine sand called *Kryokonit* (ice-dust), by Nordenskiold. This dust in many places forms a thin covering on the ice, and is often found in considerable quantities at the bottom of the deep, narrow pits, which form so peculiar a feature of the inland ice in Greenland. Nordenskiold looks upon these algæ, and especially the little *Ancylonema*, as performing a very important part in the ice economy. He says: "The dark mass absorbs a larger portion of the sun's rays than the white ice, and produces deep holes in ice, which in a great degree conduce to its melting;" and, after remarking that the *Ancylonema* may once have performed the same office in Scandinavia, he proceeds to say: "We have perhaps to thank this plant that the ice deserts which formerly covered Europe and America with a coating of ice have given place to shady woods and undulating fields of corn."

Several samples of "Kryokonit" collected in S. Greenland were found to contain a number of the germinating spores of *Sphærella nivalis*. During the winter of 1880-81, Prof. Wittrock was fortunate enough to succeed in getting some of these spores to develop themselves; hence he looked upon them as resting spores. They seem to suffer no harm from being frozen in the ice and snow during the greater part of the year, or from being dried up for some months by the heat of the sun. During a large portion of the year these plants are enveloped in constant darkness and gloom, when the temperature sinks very low. Dr. Kjellmann, at Mossel Bay, in Spitzbergen, on February 14, 1873, found the

snow to be at – 32° C. (= – 25½° F.), and the air at the same to be at – 35° C. (= – 31° F.). But at another period they enjoy perpetual light; and during this period the sun's rays, though falling very obliquely, exercise a powerful influence. At midday the temperature in the sun, in a sheltered spot, is very high. Nordenskiold found that the warmth of the air a short distance above the surface of the ice at midday in July rose to 25° or 30° C. (= 77° or 86° F.). With temperatures like these, it is evident that a great melting of the surface of the glaciers and fields of snow must take place. The water thus formed from the snow and ice, though not much above 0°C. (= 32° F.), *i.e.*, the freezing point of water, is amply sufficient to satisfy the demands for warmth of this class of organisms, which may be considered among the simplest in the vegetable kingdom. Though we may be inclined to look upon the conditions of their existence as singularly hard, yet they evidently thrive under them in a most remarkable manner. "Probably," it is remarked, "there is no other species on earth which is richer in individuals than *red snow*." Dr. Wittrock gives descriptions of several of these plants, including, where known, their fructification. The chief general characteristics of this singular flora of snow and ice may be briefly indicated. It consists almost entirely of microscopic *algæ*, of extremely low organization; most of the species are unicellular; sometimes they are solitary; at other times they occur in colonies. The fructification is asexual and of one kind. They are generally of bright colours. The "snow-flower" is blood-red; *Ancylonema Nordenskjöldii*, purplish-brown; many *Conferveæ* and *Desmidieæ* are bright green.

The genera and species which are known to occur are shown in the accompanying table, which was drawn up by Professor Wittrock. It is interesting as showing the Ice flora separately from the Snow flora. Many more species are found on snow than on ice; their proportion is nearly four to one. The most common plant is the *red snow*; next to it is *Ancylonema Nordenskjoldii*. The latter species is found on ice only, and indeed is the only species absolutely confined to ice. There are only two species of *Phycochromophyceæ* on ice, while ten species are found on snow. The snows of Spitzbergen are rich in *Conferveæ*; while those in Lapland are rich in *Desmidieæ*. In the middle north the *Phycochroms* prevail. *Bacterium Termo* is occasionally found within the limits of the ice and snow flora; and *Chytridium Hæmatococci*

Al. Br., may also belong to the Arctic flora, having been found parasitic on *Sphærella nivalis* on the Bernese glacier in Switzerland. Of *Diatoms* four species have been noticed in Scandinavia and the Arctic regions. This is in marked contrast to the Mont Blanc glaciers, where Brun detected no fewer than 95 species. *Desmidieæ* are better represented in the north. For instance, *Penium* and *Cosmarium* are each represented by two species, and *Ancylonema*, *Cylindrocystis*, *Pegatophila*, *Docidium*, *Tetmemorus*, *Staurastrum*, *Euastrum*, *Bambusina*, are each represented by one species. Professor Nordstedt has kindly placed a small quantity of "kryokonit" in my hands, collected by himself on the Justedal glacier in Nordfjord, Norway, containing *Ancylonema*; and from this I have been able to add one more species to the ice flora—viz., *Euastrum sublobatum*, Ralf., making two species of this genus. Particulars of the other genera of algæ will be found on the accompanying list. Of mosses no fully developed example has been met with, but their *protonemata* are not uncommon.

A few minute members of the animal world have also been obtained. In 1872-73, Dr. Kjellman, when with the Swedish Polar Expedition, found a *Podura* at Fairhaven, in Spitzbergen, agreeing with the *Podura nivalis* of Lin.—*snœloppan* the Swedes call them. On the Swiss high snow-fields is another Podurid, *glacier-loppan*, *Desoria saltans* of Nicolet (*Isotoma saltans*, Lubbock). Carl Vogt found among red snow on the glaciers of the Aar, a Tardigrade of the genus *Macrobiotus*. On red snow on the Bernese Alps a Rotatorian, a var. of Ehrenberg's *Philodina roseola* was found. From red snow gathered on the Alkhorn, in Spitzbergen, one species of the family *Anguillulidæ* was found. It was submitted to the eminent zoologist, Dr. Carl Aurivillius, who named it *Aphelenchus nivalis*. These four species may be looked upon as comprising all we know at present of the Snow and Ice Fauna.

FLORA OF SNOW-FIELDS.

Norway, on Dovre Mts.—Chroococcus turgidus (Kg.) Naeg., Glaeocapsa squamulosa Breb., G. magma (Breb) Kg. Scytonema gracile Kg. f. minor; Stignonema crustaceum (Ag.) Kirchn., *var.* nivale Wittr., Sphaerella nivalis (Bauer) Somerf., *abundant.*

Sweden, at Vallidalen, in Lulea, Lappmark.—Chroococcus turgidus, Stigonema crustaceum, *var.* nivale, Penium gelidum Wittr.,

P. leptodermum Wittr., Pagetophila Spangbergiana Wittr., Docidium sp., Tetmemorus lævis (Kg.) Ralfs, Cosmarium hexastichum Lund, *var.* Nordstedtii Wittr., Euastrum crassicolle Lund, *var.* nivale Wittr., Staurastrum, sp., Bambusina Borreri (Ralfs), Clev., Sphaerella nivalis, *abundant;* Oocystis solitaria Wittr., *var.* pachyderma ; Conferva bombycina Ag., Conferva sp,, protonema of a moss.

Spitzbergen, from three Snow-Fields.—Glaeocapsa ianthina Naeg., G. sanguinea (Ag.) Kg., G. Ralfsii (Harv.) Kg., Oscillaria glacialis Wittr., Scytonema myochroum Ag., Navicula seminulum Grun., ? Stauroneis minutissima Lagerst, Cylindrocystis, Brebissonii Menegh., Sphærella nivalis, *abundant*, and *var.* lateritia Wittr., *abundant on fiela on the Alkhorn*, Pleurococcus vulgaris Men., *var.* cohærens Wittr., *abundant at Fairhaven*, Glæotila mucosa (Leibl.) Kg., Ulothrix variabilis Kg., U. discifera Kjellm, *var.* nivalis Wittr., Hormiscia zonata (W. & M.) Aresch., Cladophora nana Wittr., C. Kjellmaniana Wittr., protonema of a moss.

Siberia, at Cape Vankaremo.—Cylindrocystis Brebissonii, and Sphærella nivalis, *both abundant.*

North Greenland.—Navicula nodosa Ehr., Chlamydomonas flavovirens Rostaf, *plentiful ;* Conferva bombycina, Ag., and *var.* minor Wille.

FLORA OF ICE.

Norway, Glaciers.—Glæocapsa magma, Ancylonema Nordenskioldii Berggr., *abundant on Justedals glaciers, along with var.* Berggrenii Wittr., Euastrum sublobatum Ralfs, Sphærella nivalis.

South Greenland, Ice-Streams and Inland Ice.—Ancylonema Nordenskioldii, Cylindrocystis Brebissonii, *abundant at Kornak's Sædra*, Sphærella nivalis, *abundant*, ? Pleurococcus vulgaris, *var.* cohærens.

North Greenland, Inland Ice.—Scytonema gracile Kg., f. minor, *abundant* ; Nitzschia tenuis Sm., *var.* parva Rabenh, Ancylonema Nordenskioldii, *abundant along with var.* Berggrenii, Cosmarium Nymannianum Grun., Zygnema sp., Sphærella nivalis, ? Pleurococcus vulgaris Men., *var.* cohærens.

MYCOLOGIA SCOTICA—Supplement.

By Rev. J. STEVENSON, and Prof. J. W. H. TRAIL.

(*Continued from* S. N., 1885, *p.* 75.)

(*All the measurements, except where expressly specified, are in thousandths of a millimetre.*)

3031. **Badhamia fulvescens** Cooke. *Grevillea, Vol.* IV. *p.* 69.

Peridia sessile, subglobose, scattered, or 3-6 together, tawny-ochre, towards the base clad with a delicate white pubescence ; spores pale brown, minute, ovate.

Spores 7½ diam. The cysts investing the spores are quite distinct.

On old sacking. Sep.

East. — — Tay — — —

West. — — — —

Dupplin Castle, Perth. Dr. M. C. Cooke.

This species was accidentally omitted at an earlier date.

3032. **Cytospora foliicola** Lib. (Exs. 64); Sacc. *Sylloge Fung.* III. 1602. Stroma black, subcutaneous, forming conspicuous spots, conico-depressed, with a few immersed perithecia, opening by a central pore, centre of wart rendered white, because of extruded spores, spermatia unicellular, hyaline, 14-15 by 2-3, cylindrical with rounded ends, 2-guttulate, intermixed with slender basidia as long as the spores.

On leaves of *Vinca minor*, killing the leaves. Nov.—March.

East. — — — Dee — — — —

West. — — — — — —

Plentiful in Persley Den, near Aberdeen. J. W. H. Trail.

Europe.

3033. **Phoma superflua** Sacc. *Mich.* I. *p.* 522, Sacc. *Syll. Fung.* III. 826. Perithecia gregarious, subspherical, 90 diam.; subdermal, dark brown; spermatia nearly cylindrical with rounded ends, straight or slightly curved, 10-14 by 3½-4, 1-3-guttulate, or very faintly 1-3-septate, hyaline.

On dead stems of *Scabiosa succisa.* May.

East. — — — Dee — — — —

West. — — — — — —

Near Aberdeen.. J. W. H. Trail.

Europe (France).

3034. **Diplodia obsoleta** Karst. *Symb. Myc. Fenn.* XV. *p.* 157, Sacc. *Syll. Fung.* III. 2045. Perithecia spherical, 140-150 diam., subgregarious, for a time subdermal, usually with a small papilla; spermatia oblong, straight or slightly curved, 7-10 by 2½, yellowish, septum nearly obsolete, or none.

In dead stems of *potato.* Nov.

East. — — — Dee — — — —

West. — — — — — —

Aberdeen. J. W. H. Trail.

Finland.

3035. **Ascochyta teretiuscula** Sacc. and Roum. *Mich.* II. *p.* 621, Sacc. *Syll. Fung.* III. 2243.

No spots formed, perithecia innate, scattered, opening by a pore, spherical, 180 diam. ; spermatia cylindrical, rounded at the ends, 10·14 by 2½-3, 1-septate, hyaline, faintly yellowish.

In the leaves of *Luzula sylvatica.* Feb.

East.	—	—	—	Dee	—	—	—	—
West.	—	—	—	—	—	—		

In various places in the neighbourhood of Aberdeen. J. W. H. Trail.

Europe (Ardennes).

3036. Diplodina Ammophilæ Trail, *Scot. Nat.* 1885, *p.* 76.

In dead leaves of *Ammophila arundinacea.* Feb.

East.	—	—	—	Dee	—	—	—	—
West.	—	—	—	—	—	—		

Sandy Links, near Aberdeen. J. W. H. Trail.

(The Genus DIPLODINA is characterised (Sacc. *Syll. Fung.* III. *p.* 411), as having subcutaneous perithecia, becoming erumpent, subspherical, papillate, smooth, black ; spermatia ellipsoid or oblong, 1-septate, hyaline.)

3037. Hendersonia Sparganii **Niessl**, *Vorarb. crypt. Mähr u. Oesterr. Schlesien, p.* 34 ; Sacc. l.c. 2377.

Perithecia scattered, hemispherical, papillate, dark brown, 180 diam. ; spermatia fusiform, straight, ends obtuse, 13-18 by 2½-4, 3-septate.

On dead stems of *Sparganium ramosum.* March.

East.	—	—	—	Dee	—	—	—	—
West.	—	—	—	—	—	—		

Near Aberdeen. J. W. H. Trail.

3038. H. culmiseda Sacc., *Syll. F.* III. 2392 (=*H. culmicola* Cke. *Precurs. Monogr. Hendersoniæ, p.* 23).

Perithecia subspherical, immersed, about 300 diam. ; gregarious but not in contact, dark brown ; ostiola scarcely prominent ; spermatia 14-20 by 5-6, broadly fusiform, straight or slightly curved, 3-septate, fuscous.

On dead stems of *Phragmites communis.* June.

East.	—	—	Tay	—	—	—	—	
West.	—	—	—	—	—			

Rescobie, Forfarshire. J. W. H. Trail.

? England.

(This species approaches very near *H. Phragmitis* Desm., hardly differing except in the latter having smaller perithecia, 170 diam., and slightly broader spermatia, 15-20 by 7.)

3039. H. Equiseti Trail, *Scot. Nat.* 1885, *p.* 76.

In dead stems of *Equisetum* (*? limosum*). Feb.

East. — — — Dee — — — —

West. — — — — — —

Bank of River Don, near Aberdeen. J. W. H. Trail.

(*To be continued.*)

SCHŒNUS FERRUGINEUS L., A FLOWERING PLANT NEW TO BRITAIN.

(By F. BUCHANAN WHITE, M.D., F.L.S.)

HAVING recently begun to examine the Perthshire Cyperaceæ, I was much pleased to find among some plants kindly collected for me by my friend, Mr. James Brebner, Rector of the Harris Academy, Dundee, specimens of *Schœnus ferrugineus* L., a species that has not hitherto been recorded as British. Mr. Brebner collected the specimens beside Loch Tummel, Perthshire, on July 15th, 1884.

Schœnus ferrugineus bears a little resemblance to depauperated examples of *S. nigricans*, but is quite a distinct species. The spikelets are about two in number (sometimes only one); the lower bract is about the same length, or a little shorter than the spike, and is erect, and not somewhat oblique as in *S. nigricans;* and the glumes are quite (or almost quite) smooth on the dorsal keel. The hypogynous bristles are said to be longer than the nut, but my specimens are only in flower, and therefore not in a condition to show this character. The whole plant is more slender than *S. nigricans*, and should be easily recognised by the characters I have mentioned if found elsewhere, as is not improbable.

The European distribution of *S. ferrugineus* is, according to Nyman, from Sweden and south Norway to south-east France, Thrace, and middle Russia.

The Loch Tummel specimens vary from 7 to 11 inches in length, and much resemble German and Swiss examples in my herbarium.

Sparganium neglectum Beeby as a Probable Scotch Plant.—In the *Journal of Botany*, January, 1885, p. 26, Mr. W. H. Beeby describes as new, under the above name, a Sparganium which is extremely like *S. ramosum* Huds., and had hitherto been overlooked as that species. The distinctive mark is that in *S. neglectum* the ripe carpels are obovate-acuminate, with a long beak, while in *S. ramosum* the carpels are obconical, with the apex very truncate or rounded, and the beak short.

S. neglectum is plentiful in Surrey, and is described (as *S. ramosum*) by Leighton from Shropshire. It should be looked for in Scotch localities also. I have a specimen from near Aberdeen in which the fruits, though immature, agree with those of *S. neglectum* as described above.

James W. H. Trail.

GEOLOGY.

THE AGE OF THE HIGHLANDS.

PROFESSOR Charles Lapworth in an article in the April number of the *Geological Magazine*, 1885, entitled "On the close of the Highland Controversy," writes in words which we quote in full because of the great importance of the question in its bearings on geological problems in Scotland :

"We are now for the first time in a position to take stock, as it were, of the common acquisitions of all parties on the subjects of the stratigraphy and metamorphism of the rocks of the North-west Highlands. The more vital conclusions laid down in the Report of Messrs. Peach & Horne, or incidently covered by it, are summarised below. It will be apparent on testing the references given (which include merely a single citation for the different investigators in each case) that they are in thorough accord with similar conclusions arrived at by one or by many of the opponents of the Murchisonian hypothesis, a circumstance which affords a strong presumption of their general correctness, and a high probability that they will soon be accepted by all.

SYNOPSIS OF OUR PRESENT IDEAS OF THE GEOLOGY OF THE ROCKS OF THE WEST HIGHLANDS.

(*a*) THE SEQUENCE.

1. The unaltered Palæozoic rocks of North-west Sutherland and Ross consist of four[1] main members—the Torridon Sandstone, the Quartzite, the Fucoid Group, and the Durness Limestone.

2. These major groups admit of subdivision into several recognizable zones,[2] capable of being easily identified upon the ground.

[1] Nicol, *Quart. Journ. Geol. Soc.*, 1856, p. 20, &c., Hicks, *Q.J.G.S.*, 1878, p. 813, Callaway, *Q.J.G.S.*, 1883, p. 358, &c ; Lapworth, *Geol. Mag.*, 1883, p. 123, &c.

[2] Lapworth, *Geol. Mag.*, 1883, p. 126, &c., Callaway, *Q.J.G.S.*, 1883, p. 358, &c.

3. The Durness-Eriboll Limestone is the newest sedimentary rock[1] in the district.

4. The Upper Quartzite and Upper Limestone of Murchison are non-existent ;[2] the so-called Upper Quartzite is the lower Quartzite repeated, and the so called Upper Limestone is in reality a repetition of a part of the Durness Limestone itself.

(*b*) THE STRATIGRAPHY.

5. There is no[3] conformable upward succession, as held by Murchison and his followers, from the Silurian Rocks into the Eastern Gneissic series.

6. In some spots the basement beds of the local Palæozoic rocks rest unconformably[4] upon one member of the Eastern metamorphic series, while

7. Generally speaking, the line of junction of the unaltered Palæozoic rocks and the Eastern Metamorphic series is a great fault[5] and overthrust, along which

8. The Eastern Metamorphic series has been forced[6] over the Silurian rocks by Earth-movements which have acted since Lower Silurian (Ordovician) times.

9. The schists and gneisses of Sango Bay and Farrid Head, which repose locally upon the Durness Limestones, do not form part of a continuous sedimentary succession. They are a part of the Easter or Upper Gneissic series, and they are separated from the Durness Limestone by planes of fault.[7]

10. As these Schists, &c., of Sango Bay are similar in character and arrangement to the zones of pressure—schists occurring above the great overthrust in Eriboll, [8] nearly ten miles to the S.E. they afford a rough index of the enormous distance to which the meta-

---

[1] Nicol, *Q.J.G.S.*, 1861, p. 88, &c. ; Callaway, *Q.J.G.S.*, 1881, p. 244, Lapworth, *Geol. Mag.* 1883, p. 127.

[2] Nicol, *Q.J.G.S.*, 1861, p. 91, &c., Hudleston, *Geol. Mag.*, 1882, p. 394, Lapworth, *Geol. Mag.*, 1883, p. 127, Callaway, *Q.J.G.S.*, 1883 p. 367.

[3] Nicol, *Q.J.G.S.*, 1861, p. 86, Hicks, *Q.J.G.S.*, 1883, p. 137, Callaway, *Q.J.G.S.*, 1883, p. 357, Lapworth, *Geol. Mag.*, 1883, p. 127.

[4] Lapworth, *Geol. Mag.*, 1883, p. 127, Callaway, *Q.J.G.S.*, 1883 p. 407, compare Hicks, *Geol. Mag.* 1880, p. 21.

[5] Nicol, *Q.J.G.S.*, 1861, p. 86, Callaway, *Q.J.G.S.*, 1883, p. 357, &c., Hicks, *Q.J.G.S.*, 1883, p. 157, Lapworth, *Q.J.G.S.*, 1883, p. 421.

[6] Callaway, *Q.J.G.S.*, 1883, p. 410, Lapworth, *l.c.* ; compare Nicol, *Q.J.G.S.*, 1861, p. 110, and Hicks *Geol. Mag.*, 1880, p. 17.

[7] Nicol, *Q.J.G.S.*, 1861, p. 87-88, Callaway, *l.c.* 1883, p. 241, Lapworth, see *Appendix*.

[8] Lapworth, 1884, see *Appendix*, p. 104.

morphic rocks have been forced over the underlying sedimentary and unaltered deposits.

11. Much of the Eastern Gneiss is merely the Archæan [1] gneiss repeated; the Logan rock of the Assynt district is generally the Archæan [2] brought up from below the sedimentaries, and the Arnaboll rock of Eriboll [3] is a part of the same Archæan (Hebridean) gneiss.

THE METAMORPHISM.

12. The petrological, lithological, and mineralogical distinctions between the Hebridean gneiss and the Logan [4] and Arnaboll Rocks and their equivalents are primarily due to the extraordinary mechanical disturbances [5] to which the latter have been subjected.

13. The planes of schistosity in the Eastern Metamorphic schists, &c., between and above the great fault-planes, are not planes of bedding; [6] they are planes of shearing and cleavage, gliding planes (thrust-planes) along which the rocks have yielded to the lateral crust-pressure.

14. By the agency of this lateral earth-thrust, the Archæan, the plutonic, and included patches of sedimentary rocks have been locally sheared and flattened out into rocks resembling hälle flintas [7] and rhyolites, even finely-laminated shales.

15. This Eastern Metamorphic series of Sutherland and Ross not only contains Archæan rocks, but also local patches of metamorphosed Palæozoic, [8] intrusive, and segregatory rocks, together with local patches of material probably compounded of all these in different degrees. [9]

16. This Eastern Metamorphic series has received its present strike pseudo-bedding and its present foliated and mineralogical characteristics through the agency of the crust movements which have operated within the district since Lower Silurian times.[10]

Some of these conclusions may appear startling at first sight to these who have not followed with interest and appreciation the

[1] Nicol *Q.J.G.S.*, 1861, p. 95, Hicks, *Q.J.G.S.*, 1878, p. 818, &c., &c.,
[2] Bonney, Huddleston, *Proc. Geol. Assoc.*, 1879, p. 75, *Q.J.G.S.*, 1880, p. 95; Callaway, *ibid.*, 1883, p. 410.
[3] Lapworth, *Q.J.G.S.*, 1883, p. 422, &c.
[4] Compare Bonney, *Q.J.G.S.*, 1880, p. 95, &c.
[5] Lapworth, 1884, see *Appendix*, p. 103.
[6] Lapworth, 1884, *l.c.* Compare also Bonney, *Q.J.G.S.*, 1883, p. 415, &c.
[7] Lapworth, *l.c.* 1884.
[8] Compare Hicks, 1883, *Q.J.G.S.*, p. 147.
[9] Lapworth, 1884, *ibid.*, p. 104.
[10] Lapworth, 1884, *ibid.*, p. 105.

more recent developments of our knowledge of the geological phenomena of mountain districts. But they agree precisely with the results which have been already worked out by extra-British investigators. The stratigraphy of the North-west Highlands, as I have more than once suggested, is precisely of the same character as that so admirably described and illustrated by Heim [1] in his magnificent work upon the Alps of Central Switzerland. The metamorphic phenomena of the north-west, too, are identical with those so minutely detailed and photographed in Lehmann's most valuable work on the metamorphic rocks of the Saxon [2] Erzgebirge. Continental geologists, British amateurs, and the officers of the Geological Survey are now at one and the same point. They stand together on the shore of a new world of geological discovery, full of the richest promise."

REVIEW.

THE LOGIC OF DEFINITION.

By Rev. WILLIAM L. DAVIDSON.

Though Logic as a subject of special study hardly falls within our ken, yet we cannot pass this work in silence.

The whole book well repays careful perusal, but to biologists the chapters of most value are those upon biological classification and definition. Mr. Davidson looks at these subjects from the side of the logician, but with an intelligent appreciation of the special conditions under which biologists work out their problems, and of the requirements that must be fulfilled to meet these special conditions. From this standpoint he detects and exposes the many defects that disfigure even the best works on the sciences of Botany and Zoology, faults so great that when our attention is directed to them we can but wonder that they could have been overlooked in even the worst manuals, and yet that are proved fully by examples from the most esteemed works in these sciences. Among these faults in *classification* we are forced to recognise carelessness, inaccuracy, defect, redundancy, and mention of characters under wrong grades; while in *Definition* we have pointed out to us loose and vague (or even inaccurate) use of terms, besides the frequency in biological terminology of the use of the same word in several meanings, and

[1] Heim, *Mechanismus der Gebirgebildung*, Basel, 1878.
[2] Lehmann, *Entstehung der Altkrystalischen Schiefergesteine*, Bonn., 1884

of the employment of several words as practically equivalent. The existence of defects in method must have been perceived by many a biologist, the first step to provide a remedy is to obtain a clear view of the evils, and not only has Mr. Davidson given us this, but he has also indicated how to overcome them. We heartily commend the *Logic of Definition* to the careful study of all from whom we hope for further advance in the fields of science, assured that they will find their reward in its study, and will agree with us that a debt of gratitude from botanists and zoologists alike is due to its author.

SCOTTISH SCIENTIFIC SOCIETIES.

ABERDEEN NATURAL HISTORY SOCIETY, Nov. 18, 1884.—*Annual Meeting.*—The reports indicated that the Society is doing useful work. In the session 1883-84 there were six meetings, and during the summer two excursions were made, viz., in June to Braes of Gight on the River Ythan, and in July to the Loch of Park, about 12 miles from Aberdeen. The object of the latter excursion was to investigate the plants growing in the loch. It was found that the greater part of it does not exceed three feet in depth of water. The shallows are densely overgrown with *Myriophyllum alterniflorum*, *Lobelia Dortmanna*, *Alisma Plantago*; and several of the taller Monocotyledons, such as *Typha latifolia*, *Scirpus lacustris*, &c., are plentiful around its swampy shores, but it proved poor in *Potamogetons*, and in the other water-plants that occur in the East Perthshire lochs so plentifully. *Juncus Balticus* formerly grew beside the water, but a search failed to detect it there last summer.

December 5th. The President, Prof. James W. H. Trail, gave an account of a visit to Canada and the N.E. States, in August and September, in connection with the meeting of the British Association in Montreal, to which he had been commissioned as delegate from the Society. Mr. Alexander Murray thereafter read some observations **On a Larva that Burrows in the Leaves of the Common Sunflower,** with special reference to the means of defence against the visits of injurious insects enjoyed by this plant.

January 20th, 1885.—Prof. H. Alleyne Nicholson lectured on **Hydractiniæ and their Allies both Recent and Fossil,** and rendered a somewhat difficult subject at once clear and interesting to all his audience. The lecture was illustrated by diagrams and specimens.

February 17th.—The Secretary, Mr. John Roy, read a paper on **The Flora and Fauna of Snow and Ice,** which we print in full elsewhere. Mr. F. G. Ogilvie, M.A., gave a resumé of the volume recently issued by the United States Geological Survey, and described at some length the wonderful **Grand Canon of the Colorado River,** as detailed in the Report.

March 17th.—Mr Alex. G. Jamieson, M.A., gave an account of **Seals**

and Seal-fishing, from personal experiences in the course of the summer of 1884.

April 21st.—On the motion of Prof. Trail, a Committee of the Society was appointed "to assist the Aberdeen Local Executive Committee of the British Association in the preparation of a Local Natural History Exhibition during the meeting of the British Association in Aberdeen in September." In absence of any museum of the local fauna, flora, and geology, Aberdeen is at present lagging behind other towns of smaller population and wealth; but it is hoped that the approaching meeting will be an incentive to remedy this defect. A paper was read from Mr. A. Stephen Wilson, **On the Potato Sclerotiet**, that, at present, much discussed body, familiar (at least in name) to readers of the *Gardeners' Chronicle*, and of the *Journal of Botany*. Prof. Trail made a communication on **Recent Additions to the Flowering Plants and the Fungi of North-East Scotland**, and exhibited specimens of the more interesting, including *Viola Curtisii*, *Geum macrophyllum* (well established in one locality near Aberdeen), and a considerable number of micro-fungi. Mr. F. G. Ogilvie called attention to *Hull's Atlas of Historical Geology*. Arrangements with regard to excursions, &c., were remitted to the council.

TRANSACTIONS OF THE NATURAL HISTORY SOCIETY OF ABERDEEN, 1885.—This Society has since its origin acted upon the rule of publishing only such of the papers read before it as refer to the fauna, flora, or geology of the north-east of Scotland, giving preference to those that relate especially to the counties around Aberdeen. Of the papers that are included in the recently-published *Transactions*, one or two are modified and extended from articles that have appeared in the pages of this *Magazine*. The articles in the part are:—**Introduction**, by John Roy, being a list of subjects on which papers have been read or lectures delivered before the Society since 1878; **Supplementary List of Fungi found in the Province of Moray** (Nos. 1041-1295) by Rev. James Keith, LL.D.; **Additions and Corrections to Topographical Botany, ed. 2, for the Counties from Forfar to Elgin, inclusive**, by Prof. James W. H. Trail and John Roy; **List of introduced Plants and Casuals observed in N.E. Scotland, especially in Dee**, by Prof. Trail, **Scottish Galls**, by Prof. Trail; **Preliminary List of the Echinodermata of the N.E. Coast of Scotland**, by George Sim; **Additions to Catalogue of Fish found in the Vicinity of Aberdeen**, and **Additions to List of the Crustacea of the N.E. of Scotland**, by Geo. Sim.

DUMFRIES-SHIRE AND GALLOWAY NATURAL HISTORY AND ANTIQUARIAN SOCIETY. — Session 1884-5.—The fourth meeting of the session was held on 2nd January, 1885, when communications were read on (1) "**Notes on some Trichoptera from the Stewartry**," by Mr. J. J. King; (2) "**Notes on the Town's Common Mills and their History**," by Mr. J. Barbour, V.P.

The fifth meeting was held on Friday, 6th February, when the following communications were read :—(1) "**The Botany of the Broads and Fens of East Anglia,**" by Mr. A. Bennett, F.L.S. ; (2) "**The Influence of Trees on Climate or Rainfall,**" by Mr. Peter Gray.

The sixth meeting was held on the 6th of March, when four papers were read on the following subjects :—(1) "**Early Notices of the Use of Tobacco in Britain,**" by Rector Chinnock ; (2) "**Notes on the Rocks and Fossil Remains in the Moffat District,**" by Mr. J. Dairon, F.G.S. ; (3) "**Memoir of Mr. Gatt, Minister of Graitney, 1730-87,**" by Mr. J. Gibson Starke, V.P. ; (4) "**Modern Egypt,**" by J. A. S. Grant, M.D., Bey.

On April 3rd, the last winter meeting of the session was held. Dr. Gilchrist (President) occupied the chair. There was a large attendance of members.—Mr. Rutherford exhibited specimens of the Red Admiral (*Vanessa Atalanta*) and the Painted Lady (*Cynthia Cardui*) butterflies, and remarked that these species were very rare in the district last summer.—Communications :—1. Mr. F. R. Coles read an interesting paper entitled "**A Leaflet from the Book of Nature,**" in which he pointed out the necessity of careful observation on the part of the student of nature, and the benefits derived by those who pursue the study. 2. A paper on the "**Arctic Shell Beds of the Clyde**" was read by Mr. R. W. Macfadzean, in which he described the different deposits found at Garvel Park, and compared them with those of similar beds in Scandinavia and N.E. America. He contended that, after the deposition of the Drift and Loess, there occurred, in this quarter of the globe, a second and less severe glacial period, followed by a gradual rise, and subsequent fall, of sea level. These changes had been comparatively rapid, and were accompanied by changes of climate. 3. Mr. G. F. Black contributed a paper on the "**Ancient Lake-Dwellings of Scotland,**" making especial reference to those of Lochlea and Tarbolton. 4. Mr. Barbour, V.P., read a short communication on "**Lovely Polly Stewart,**" in which he gave extracts from the will of Catherine Stewart referring to Polly, and also particulars respecting her and her family, not generally known.

The first field meeting of the session was held on May 2nd, when Spottes Glen, the Policies, and the Moat of Urr, were visited. Vegetation was a little more forward than at the same date last year, and plants of *Veronica Chamædrys*, *Lychnis diurna*, *Geum rivale*, and *Bunium flexuosum* were found in blossom ; but the only rarity was *Geranium lucidum*, which had not been previously recorded from that locality.

May 22nd, 1885.—A special meeting was held on this date, when it was unanimously decided to complete the arrangement with the Presbytery, &c. of Dumfries, for renting the Presbytery House for 15 years, for the purpose of holding the Society's meetings in it, and of forming there a museum for the specimens belonging to the Society.

DUNDEE NATURALISTS' SOCIETY.—The following subjects were discussed since 1st January, 1885. On *14th January* Mr. John Rattray, M.A. read a paper on **Diatoms.** *January 28th*, Prof. J. W. H. Trail

lectured on **Microscopic Fungi**, selecting certain types, the life-histories of which he described to illustrate the methods of classification employed in the group, and the chief defects of these methods; and he also pointed out briefly the methods employed for lessening or preventing injuries caused by Fungi to economic produce.

February 11th, Mr. R. J. Harvey Gibson, M.A., sent a paper on the **Relationship of Palaeontology to Biology**, which was read by Prof. D'Arcy Thompson. The author discussed the relation of Palaeontology with the kindred subjects, and emphatically supported its claim to be grouped with the biological rather than with the geological sciences. He showed that, while in the outset Palaeontological formed almost the whole of geological knowledge, it came gradually to form a subordinate part of the province of the geologist, and the time was now come when it might be wholly taken away and studied together with the science of living organisms. The need of using the facts of Palaeontology in classification and in the study of distribution was fully shown. As regards classification, the author argued that the hypothesis of evolution gave the only true idea of a natural classification in the shape of a pedigree or family tree. In the matter of distribution the geological record allowed us to connect the animal distribution of at least the Tertiary period with that of the present time. Certain new devices for representing a scheme of classification, notably the transparent solid of Professor Haddon and an actual tree of wires devised by the author, were described. He in conclusion, urged the need of biologists approaching their subject with broad views and wide knowledge of their subject rather than as specialists devoted to the exclusive study of a narrow group.

February 25th, Mr. J. T. Cunningham, of the Scottish Marine Station, Granton, read a lecture on **Marine Zoology**. After some introductory remarks on the importance to all of a knowledge of Zoology and of the laws that regulate animal life the lecturer entered upon the more special side of his subject; and went on to review the present state of our knowledge of Marine Zoology from a purely intellectual standpoint, how it had reached its present state, and what were the prominent questions that would occupy the attention of zoologists in the immediate future. The belief that the ocean at a depth below 300 fathoms was destitute of living beings, and the somewhat later belief that deep sea dredgings would disclose palaeozoic and mesozoic forms no longer existing in shallower seas, have been proved erroneous, and the hoped-for aid in bridging many gaps in the pedigrees of animals in this way has been disappointed.

But though the results of the "Challenger" expedition and of other like expeditions have not fulfilled, in this direction, the hopes entertained for a time by their more sanguine advocates, the additions to what was previously known in the fields of embryology and comparative anatomy have been very great and have cast much light on the mutual relationships of the various groups of animals. Reference was made to the theory supported by Dr. Dohrn that the ancestors of Verterbrata were worm-like creatures that crawled on what corresponded to the *dorsal* surface of Verterbrates. Mr. Cunningham thereafter went on to speak of the study of Marine Zoology as affecting the fisheries of the country. He stated that

Zoologists believe that trawling does not injure the spawn of fishes, since the spawning beds are not trawled over because of the rocky nature of the sea-bottom selected by some fish *e.g.*, herring. The spawn of other fish floats and is hatched near the surface of the water, and is therefore not liable to be injured by the trawl. Several interesting specimens from the Granton Station were exhibited.

March 11th, Prof. D'Arcy Thompson lectured on **Larval Forms**, &c.

EAST OF SCOTLAND UNION OF NATURALISTS' SOCIETIES.—The reports of the meeting of the Union in Dundee in 1884 have been published since our last issue. They form a valuable store of information as to what has yet been done in the past, in the East of Scotland, from Fife to Aberdeen inclusive, in almost all branches of Natural Science.

A number of recorders have reported on the separate departments, under the various headings: 1. Has the subject been investigated, and in how far? 2. What parts of it more especially require investigation, as regards the district, and as regards the subject? 3. What is the probable richness of the district? 4. Have any important works on the subject (as regards the district) been published? 5. Have you any suggestions to make for work that should be taken in hand at once?

It was resolved that the reports in question should only be preliminary and not enter into very great detail; but despite this, they form a valuable store of information in almost all branches of Natural Science in the counties of the Union, under the headings above noted. We understand that it is intended to continue, and to extend these reports in future, with the object of ultimately forming complete records of the Zoology, Botany, Mineralogy, Geology, and Meteorology of the East of Scotland, with a complete Bibliography of articles, as well as of larger works, that have been published in the past on the several sciences in that region.

In this *Magazine* (vol. I. pp. 193-94) the departments and the names of the recorders are enumerated; hence we shall not repeat them here; though recorders are required for certain groups of Insects, for Myriapoda, for Lichens, and for Mosses. The Inaugural address of the President, Dr. Buchanan White, is most thoroughly worthy of careful perusal and consideration by all who interest themselves in the question of the best methods of utilising the working power of local societies in the direction of making permanent additions to the information already recorded for each district. The suggestions embodied in it primarily sketch out the work to be undertaken by the Union; but they are so applicable to the requirements of any Natural History Society, that we reprint elsewhere in this *Magazine* (pp. 98-106) a portion of the address, slightly altered in the wording to adapt it to the circumstances of all societies, under the heading "On the Scientific Work of Local Natural History Societies," believing that it will be of interest and of use to many readers beyond the limits of the Union. The latter part of the address is occupied with the consideration of the great groups under which plants fall naturally when we look to their distribution, *viz.* Maritime, Lowland, Indifferent, and Alpine, with suggestions as to the causes that may have led to the

separation, and to the preference of certain plants for the one class of these localities rather than for some other. The whole address is filled with the spirit of two of its sentences, "We must not be content to accept without question the fact of an animal or plant occurring in our district. We must endeavour to ascertain *whence it came, and how it happens to be where it is.*"

We may with confidence predict for the **Union** a useful and prosperous existence while it adheres to the lines on which it was originated, and on which the reports of the first meeting show it to be conducted.

It has been determined to accept the invitation of the Kirkcaldy Naturalists' Society, to hold the next meeting in Kirkcaldy on 4th and 5th September, 1885; and Dr. James Geikie has intimated his acceptance of the Presidentship. Mr. William D. Sang, Kirkcaldy has accepted the offices of Secretary and Treasurer for the ensuing year.

It is requested that members willing to read papers at the meeting in September will communicate their intention as early as possible to Mr. Sang.

TRANSACTIONS AND PROCEEDINGS OF THE EDINBURGH BOTANICAL SOCIETY. Vol XVI. part 1, (Sessions xlvii.-xlviii.), though published this year, contains papers read from 9th Nov., 1882, till July 1884. They are as follows, being grouped into subjects for convenience:—Obituary Notices of **Thomas H. Corry** (Cambridge); **Prof. George Dickie** (Aberdeen); **Prof. Oswald Heer** (Zurich); **Rev. John G. Macvicar D.D.**; **Dr. Richard Parnell**; **Dr. John L. Paterson** (Bahia, Brazil); **John Sadler**; **Dr. James R. Scott** (Kelso); **Prof. Allen Thomson** (Glasgow); and **Mr. George H. K. Thwaites** (Ceylon).

Records of Localities:—Note on Rubus Idæus, var Leesii (near St. Andrews), and notice of some plants from Invernessshire, by Dr. Mactier; sketch notes of the Flora of Berwickshire, by Charles Stuart M.D.; notes on plant localities in the seaward district of Berwickshire, Rev. George Macfarlane; on certain additional localities for Cornish plants, by Thomas H. Corry; notes of meetings of the Scottish Alpine Club, at Loch Awe in July, 1882, by W. B. Boyd, in the Braemar Highlands in August, 1883, by Dr. Stuart; the May Island, its Archæology, its Algoid Flora, its Phanerogams and Higher Cryptogams, by John Rattray A.M., B. Sc. On the Algæ of Granton Quarry, by J. R.; Statistics of the Topographical Botany of Scotland, with suggestions as to further work, by Symington Grieve (summary of numerical results from Watson's "Topographical Botany," ed. 2).

Phenological Observations and Cultivation:—Experiences in the cultivation of Alpine and other plants suited for the Rockery, and Herbaceous plants in the mixed border, by W. B. Boyd; Growth of half-hardy plants on the east coast of Arran, by Rev. Dr. Landsborough; Phytophenological observations, by W. C. Crawford; Report on temperatures and open-air vegetation at the Royal Botanic Garden, Edinburgh, from October 1882 to June 1884, with Register of Flowering of certain selected plants, by John Sadler and Robert Lindsay.

Morphology and Physiology:—The multi-nucleated condition of

the vegetable cell, with some special researches relating to cell-morphology, by Allan E. Grant; on the oil-bodies of Jungermannieæ, by John Rattray; on the Germination of Podophyllum Emodi, and on the occurrence of Foliage-leaves in Ruscus androgynus, with some structural and morphological observations, both by Prof. Dickson.

Teratology:—On a divarication of the Common Primrose with the calyx divided into linear segments, by Charles Howie; on an abnormal form of Listera cordata, by Thomas H. Corry.

Geological Botany:—On the affinities of Pothocites Pat., with the description of a specimen from Glencartholm, Eskdale, by Robert Kidston, (appeared in the Ann. Mag. Nat. Hist. in May, 1883); on the coal incrusting the large Pinaceous fossil stems in front of the Herbarium, Royal Botanic Garden, and its bearing on the question of the formation of coal, by Andrew Taylor.

PERTHSHIRE SOCIETY OF NATURAL SCIENCE.

March 5th.—Annual Meeting.—From the annual report the Society is in a prosperous condition, and has added largely to its membership during the past year.

Eight long excursions were made in the course of the preceding summer; six ordinary meetings were held, and a conversazione on 22nd January proved highly successful. The increase in the number of specimens received for the Society's Museum rendered it necessary to have new cases constructed, and the Museum had to be closed to the public for between three and four months, but during the year it was visited by about 7000 persons. So cordial assistance has been given in extending the collections that already the need of an additional hall for their exhibition is urgently felt.

The Society expressed the great regret felt on the retirement from the office of secretary of Mr. John Young, C. E., who had since 1874 discharged its duties with great benefit to the Society.

In his Presidential Address, Dr. Buchanan White dealt with the present condition, and the possible future, of the Museum. In the past three years the collections have been almost wholly formed; before 1881 the Society had no place in which to keep specimens. The census of specimens on March 5th, 1885, was in the *Index* collection upwards of 2,000, (including drawings and models) of which 900 are geological, 700 zoological, and 400 botanical. In the *Perthshire* or *Local* collection those now available for study are about 15,000, belonging to 1,712 species out of about 2,300 known to occur in Perthshire. They are divided thus, the number of specimens in each group coming first, then the number of species represented, and lastly, in brackets, the number of species in the group known to have been found in Perthshire:—

Mammals 100, 62 (39); Birds 329, 169 (219); Bird's Eggs 420, 62 (111); Birds' Nests 92, 48 (111); Reptiles and Amphibians 15, 6 (8); Freshwater fishes 48, 18 (23); Land and Freshwater Mollusca 3604, 54 (58); Lepidoptera 2085, 447 (849); Flowering Plants and Ferns, about 8000, about 900; Native Timber Trees 197, 19 (19).

There are in addition to the above several thousand specimens of the Invertebrata and of Cryptogamic plants awaiting arrangement, and also space for

their proper exhibition. Dr. White dwelt upon the pressing need of extension of the buildings, which could be effected, including fittings, probably for about £1500, so as to provide the accommodation required for a considerable time. There can be little doubt that so energetic a body as the Society has proved itself to be in the past will succeed in carrying out this very desirable undertaking.

April 2nd. A donation of £150 to the funds of the Society from the "Duncan Trustees" was intimated. Dr. F. B. White exhibited a skull of a common rat in which three of the teeth had reached an excessive length, so that those in the upper jaw almost formed rings. Rev. A. Campbell, Errol, read a paper on **The climate of the British Islands, with special reference to Perthshire.** He afterwards undertook to prepare each year a summary of meteorological observations in Perthshire, with observations of the effects of each season in stimulating or retarding vegetation.

Prof. Allen Harker, Cirencester, followed with a paper, **On some Fresh-water Annelids,** from rain-pools on the dry Oolitic Cotteswold Hills. He He described especially the habits of a small red worm, probably *Tubifex rivulorum* Lamarck.

SCIENTIFIC JOURNALS.

JOURNAL OF BOTANY.—(March, 1885.)—**Notes on the British Characeæ for 1884,** by Henry and James Groves; the following species and localities are recorded from Scotland:—*Chara fragilis* Desv., from Wigtown, Lanark, Easterness, Westerness, Dumbarton, and West Ross; *Ch. aspera* Willd., mid-Perth, Easterness; *C. contraria* Kütz, Skye; *C. hispida* L., Easterness; *C. vulgaris* L., Haddington, Easterness; var. *papillata*, Easterness; *Nitella translucens* Agardh, Stirling; *N. flexilis* Agardh, Stirling; var. *crassa*, mid-Perth; *N. opaca* Agardh, Berwick, Stirling, Ebudes N., Ross E. and W.

ANNALS AND MAGAZINE OF NATURAL HISTORY, (February, 1885).—**Notes from the St. Andrew's Marine Laboratory,** by Prof. M'Intosh, "*On the British species of Cyanea and the Reproduction of Mytilus edulis;*" *April*, **Notices of British Fungi, XXX.,** by Rev. M. J. Berkeley and C. E. Broome, enumerates the following from Scotch localities:—*A.* (*Clitocybe*) *fumosus* Pers., sent from Roxburgh, by Rev. D. Paul, so dark brown as to seem qute different from type; *A.* (*Pholiota*) *subluteus*, Fl. Dan. from Faldonside (Rev. D. Paul, and W. B. Boyd), "an interesting addition to the list of British Agarics;" *Marasmius varicosus* Fr., Tarland, Aberdeenshire, amongst moss (M. J. B.).

ENTOMOLOGIST'S MONTHLY MAGAZINE, (March, 1885)—**Notes on British Typhlocybidæ,** by James Edwards, enumerates *Dicranoneura aureola* from Carices in Findhorn Marsh near Forres. At the meeting of the Entomological Society of London, on 18th Feb., 1885 Mr. J. W. Slater exhibited a specimen of *Lycaena chryseis*, one of three said to have been taken in July, 1878, by Mr. Mutch in Culter Marsh, Aberdeenshire. Mr. Elwes stated that the specimen resembled the variety known as *Stieberi* Gerhard, from Lapland. (Further information in regard to this capture is desirable). **Notes on the Nitidulidæ of Great Britain,** by Rev

W. W. Fowler, run through the parts for March, April, and May ; *Meligethes subrugosus* Gyll, is recorded from Galloway, and several are recorded as common, and generally distributed from Britain, though not specially recorded as Scotch, *April*, **Boreus hyemalis L. near Killin**, by James J. King (recorded in April number of *Scottish Naturalist*); **Occurrence of Hydroptila longispina M'Lach. in Scotland**, by J. J. King (from Loch Goilhead, Fortingal, and Loch Awe, where it occurred in fair numbers in July, 1884).

Report for 1883 of the BOTANICAL RECORD CLUB. (Manchester : James Collins & Co. 1884.) Edited by F. A. Lees.—This useful report adds considerably to the county lists to be found in the 2d Ed. of "*Topographical Botany*;" and in addition there are numerous records of localities from counties in which the same species had been already found. As in former years, the records have been vouched by specimens. There are numerous records from Scotland—from Wigtown (74), by C. Bailey and by G. C. Druce ; East Perth (89), Forfar (90), by G. C. Druce ; Argyle (98), by Parsons ; Clyde Isles (00), Ebudes South (02), by Rev. A. Ley ; Ebudes Mid (03), by C. Bailey : Ross West (05), by C. Bailey and G. C. Druce ; Sutherland (07) and Caithness (09), by James Grant. The numbers refer to the counties and vice-counties of Topographical Botany (omitting Wigtown, for which they are very numerous). The additions are as follows :—T. maritimum 05,07, Stellaria graminea 07, C. tetrandrum 05, Geranium sanguineum 09, Trifolium procumbens 07, T. minus 07, L. major 09, Ornithopus perpusillus 89, Vicia hirsuta 07, Geum intermedium 89, Rubus saxatilis 07, R. plicatus 02, Rubus Radula 73 (Kirkcudbright), Rosa involuta 89, 02 (*Sabini* less hairy than usual —J. G. Baker), R. dumalis 89, R. dumetorum 89, R. Reuteri and R. subcristata 00, Alchemilla alpina 07, Epilobium parviflorum 09, E. obscurum 98, Circæa lutetiana 02, Hippuris vulgaris 07, Callitriche vernalis 02, C. hamulata 02, Ribes petræum 09 (probably introduced—*Ed. Scot. Nat.*), Parnassia palnatris 07, Hedera Helix 07, Sanicula Europæa 07, Lonicera Periclymenum 07, Crepis paludosa 02, Hieracium murorum 00, H. cæsium 88, H. iricum 89, H. crocatum 09, Lobelia Dortmanna , Vaccinium uliginosum, and V. oxycoccos—all 89, Gentiana amarella 07, Veronica humifusa 89, V. agrestis 07, V. polita 00, Bartsia odontites 07, B. verna 02, Euphrasia officinalis and E. gracilis 05, Mentha aquatica 07, Teucrium Scorodonia 07, Lamium intermedium 89, Stachys palustris and S. ambigua 07, Myosotis repens 02, 05.

M. alpestris 90 (error, due to seed sown in Canlochan, vide p. 91, *Scot. Nat.*, April, 1885), **M. arvensis** 07, **M. versicolor** 74, **Utricularia intermedia** 02, **Glaux maritima** and **Plantago major** 74, **Polygonum Persicaria** 07, **Hippophae Rhamnoides** 74, **Euphorbia Peplus** 07, **Salix pentandra** 07, **S. cinerea** 07, **S. caprea** 09, **Myrica Gale** 74, **Orchis Conopsea** 05,07, **Potamogeton natans** 07, **Zannichellia pedunculata** 90, **Lemna minor** 89, **Sparganium affine** 02, **Typha latifolia** 09 (? native.—*Ed. Scot. Nat.*), **Juncus glaucus** 74, **J. acutiflorus** 07, **J. nigritellus** 74, **J. Gerardi** 02, **Schœnus nigricans**, 74 and 89, **Scirpus setaceus** 07, **Heleocharis uniglumis** 09, **H. cæspitosus** 74, **Carex dioica** 02, **C. arenaria** 05, **C. rigida** 89, **C.**

acuta 00, **C. fulva** 05, **C. panicea** 74, 00, and 05, **C. vaginata** 50, **C. ampullacea** 07, **C. paludosa** var. 09 (an **C. salina** var. **Kattegatensis**.—*Ed. Scot. Nat.*), **Agrostis alba** 74, **Aira cæspitosa** 07, **Molinia cœrulea** 07, **Glyceria plicata** 00, **Dactylis glomerata** 07, **Festuca sciuroides** 89, **F. rubra** 05, **Bromus asper** 02, **Cystopteris fragilis** 07, **Polystichum aculeatum** 07, **Nephrodium affine** 00, **Lastræa æmula** 98, **Asplenium Adiantum-nigrum** 07. Equisetum palustre 07, Chara aspera 89, Ch. fragilis 05, C. vulgaris 90, Nitella opaca 89, N. flexilis 89, 92.

In the "New Locality List," there are notes on various species, of interest to those engaged in the study of variations among our native plants. Several of these relate to Scotttsh plants, and we extract the following: —**Ranunculus confervoides** Fr., from Fingask Loch, East Perth —A. Sturrock and G. C. Druce. "I see only a depauperated form of *R. circinatus*."—G. C. D. "I consider it a starved alpine state of *trichophyllus*."—F. A. Lees. "Not *circinatus*."—J. G. Baker. **Caltha palustris** L., var. **minor**, from Glas Maol, alt. circa 2,800 feet. "This seems to differ from *minor* in its rooting at every node as distinctly as *C. radicans* Forst.; but it differs (from the latter) in the leaves, which are those of normal *minor*, crenately not triangularly dental." **Gnaphalium "sylvaticum** L., var. **alpestre,"** Glen Dole, Forfar—G. C. Druce. "An intermediate between *eusylvaticum* and *norvegicum*. Leaves of barren shoot (from same root-stock as the other) broader than usual, those of flowering shoot narrow, all slightly cottony above."—F. A. Lees. **Zannichellia palustris** L., var. **pedunculata** Rabh., Rescobie Loch, Forfarshire—G. C. Druce. "Cannot well come under either *macro-* or *brachy-stemon* Gay, as the nucules are long-pedicelled. . . . . The long curved-style nucules are, however, not so pronouncedly muricate on the dorsal aspect, nor quite so concave on the ventral, as in ordinary *pedunculata*, though this may be because not yet fully ripe. It may prove to be *gibberosa* Rchb., but in the state sent is not muricated on the ventral ridge."—F. A. Lees. **Carex flava** a. **genuina** Towns. Arran—A. Ley. Sent as *lepidocarpa*. For the distinctive characters of the varieties of this sedge, see Mr. Townsend's paper in *Journ. Bot.*, 1881, x., p. 161. **Carex pilulifera** L., var. **adusta**, Lees, Canlochan, Corrie Ceannder, and Cairn-y-Dainsh—G. C. Druce. "Probably an alpine form, educed by harsh stational and climatic influences (vide p. 77 of this Magazine).

Under the heading of *County Catalogues* is a list for Kirkcudbright of additions to the county-list in "*Top. Bot.*," Ed. 2 (vide *Scot. Nat.*, N.S. ii., p. 69), and a long list for Wigtownshire. Both lists are founded on the observations of our contributor, Mr. G. C. Druce, during a visit to these counties in 1883. "The catalogue of Wigtownshire plants fills up the only gap in the counties of Britain for which no list of common plants has been supplied to Mr. H. C. Watson, or to the Record Club." "There is little in the flora to suggest its northern situation." "In mountain flowers, it is almost destitute." Mr. Charles Bailey also visited Wigtownshire in the autumn of 1883, and contributes a list (with specimens) of plants, of which 10 species or varieties were not observed by Mr. Druce.

OBITUARY.

WE are much grieved to have to record the death of two young medical graduates of Aberdeen University on service in the tropics, the one in Borneo, the other in Sierra Leone. They were alike in possessing a strong love of natural science, and in giving promise of valuable results following from their pursuit of it; alike also in taking a distinguished position in passing through their studies at their University, both in arts and in medicine, with honourable distinction; and alike in their estimable personal qualities. Both were induced to undertake duties in tropical lands largely because of their love of nature.

NATHANIEL CAMERON, A.M. M.D. of Aberdeen University, adds another to the list of valuable lives that have fallen victims to the climate of Sierra Leone. He was a native of Abernethy on Speyside, and received the earlier part of his education in Tomintoul Public School: He thereafter passed through the curricula in arts and in medicine in the University of Aberdeen, winning alike the esteem and friendship of his fellow students by his personal qualities, and a high place by his talents in the class lists. In 1876 he took the degrees of M.B. and C.M. with honourable distinction. For a year he held the position of Assistant Demonstator in the class of Antomy, in the University. He thence went to Macclesfield Infirmary, where he was resident physician for some months. In 1878 he entered the Army Medical Service, and elected to serve on the West Coast of Africa, where he had been stationed during three years of service, with the alternate years of furlough at home.

The year 1884 was spent by him at home; he then had apparently not suffered at all from the climate, and expressed himself as much pleased with the service. He returned to Sierra Leone in January last, and his friends were grieved to learn recently that he died in Towerhill Barracks, on 10th June, of fever, at the age of 34.

Dr. Cameron had a strong liking for the study of the Natural Sciences, more especially of Geology, to which he devoted him-

self both before he went to West Africa and during his furloughs to learn the Science thoroughly in the great centres for its study in Britain. In Sierra Leone and at Cape Coast Castle he pursued his studies to their application, striving to work out the geological structure of these lands under difficulties that can be appreciated only by those that have tried geological investigations in the tropics.

We understand that his will gives one collection of fossils, minerals, &c., from West Africa to the British Museum, and another from the same country to the Aberdeen University.

His death is felt by all who knew him to be a loss to themselves of a trusted friend, and to Natural Science of one that, had his life been spared, would have added much to what is known concerning the Geology of the Western Coast of Africa, and would also have advanced much whatever branch of Natural Science he studied, for to him work had become a necessity, as well as a pleasure.

As a physician and surgeon we believe that he was regarded with absolute trust by all under his charge.

Dr. Donald Manson Fraser became known to the writer of this notice in 1876, when just completing his studies in the arts curriculum. In graduating he gained *honours* in natural science, and shared the first place in this department with a fellow student with whom he worked much,—Dr. Walker, now in the service of the British North Borneo Company. The two friends went through their medical studies together, and showed a strong aptitude especially for botanical studies, and each of them held the position of class assistant to the Professor of Botany in the University. While students they were active members of the Aberdeen Natural History Society. On the completion of his studies Dr. Fraser had, like most young men in like circumstances, to enter on the practice of his profession, and to lay aside scientific pursuits for a time; but, three years ago, the Directors of the British North Borneo Company desiring the services of a medical man with a love for, and knowledge of botanical studies, Dr. Fraser was recommended, and received the appointment. He proved excellently fitted for the position, and enjoyed the life, not neglecting the opportunities of scientific work afforded by it; but on the 12th May, 1885, he was killed in an attack by the natives on a party that he was accompanying. We extract the following account of the sad event from the *British North Borneo Herald*:—

The Government launch Kimanis arrived at Sandakan before daybreak on the 15th of May, from the West Coast, bringing the most sad and unexpected intelligence of an *emeute* in the Kawang river, in the vicinity of Papar, resulting in the loss of valuable lives. It appears that on the 10th instant, Resident Davies, Captain de Fontaine, Dr. Fraser, Assistant Resident Little, and Mr J. E. J. Wheatley with a party of constabulary arrived at Kawana, which was selected as the most direct and convenient point of departure for an expedition to the village of a Murut chief, one Bandurong. Messengers were at once sent to Papar to bring in 50 Dusuns to act as baggage carriers for the party, but only 30 came, and the Bajow headmen of Kawang were asked to supply the deficiency. The headmen relucantly promised to use their influence, but it was plain that the service was very unpopular with the people, and thereupon the Resident announced that a fine would be imposed if the requisition were not complied with The Bajows of the coast are noted cattle robbers, and the Dusun carriers from Papar recognised a buffalo which had recently been stolen, and laid their case before the Resident, who ordered the buffalo to be returned to its owners. This action, though of course unavoidable, had a tendency to further augment the ill-feeling brought about by the demand for baggage carriers. Amongst the Bajows were recognised the noted cattle thieves—Sahat and Bagul Puteh. Orang Kaya Awang, an agent of Pangeran Roup, who has been influenced against the Company's Government by persons in Brunei, was also seen going about amongst the villagers. He was an inhabitant of the Kinarut river, which is not under the Company's jurisdiction. On the 12th instant, as it was found impossible to obtain the required number of baggage carriers, it was proposed to defer the departure of the expedition pending further communication with Papar. The stores were ordered to be put back in the house of the Datu of the village, and the men of the constabulary were "dismissed." The Europeans and the officers of the constabulary were standing about under a tree in a large plain near the village, when two men came up, with muskets in their hands, and entered into an apparently friendly conversation with Dr. Fraser. Without any warning, one of the men suddenly discharged his musket killing the doctor instantaneously. An alarm was occasioned. Seven Bajows, friends of the two men alluded to, and including Orang Kaya Awang and the two cattle thieves above mentioned, at once *amoked*

and speared fatally Jemadhar Asa Singh, Sergeant-Major Narain Singh, and Private Jendah Singh. They then endeavoured to escape by rushing across the plain towards the jungle, when Captain De Fontaine in the most plucky manner pursued them. All this happened in the space of a few minutes only, and no one had time to support Captain De Fontaine before he tripped up and fell on the ground, when the Bajows turned on him and inflicted no less than nine spear wounds on different parts of his body, three of his assailants falling, however, to his revolver. By this time the Sikhs, who were at some little distance off, had seized their rifles and opened fire, killing three others of the Bajows, and wounding the remaining two, who succeeded in making good their escape to the jungle. Mr. Little, son of Dr. Little, of Singapore, had at the commencement of the *melee* received a spear wound, penetrating the fleshy part of his arm and slightly injuring his side. He disposed of his opponent with his revolver. None of the Bajow villagers took part in the disturbance, with the exception of the nine *amokers*, and consequently no punishment was inflicted on the village ; but the chief Datu Dullah accompanied the Resident to Gaya. It was found that eight privates were wounded some of them severely.

Dr. Fraser, was married in Singapore last year, but was left a widower a few months before his death.

THE LATE ALEXANDER CROALL.

A meeting of the Stirling Natural History and Archæological Society, specially summoned to record the loss sustained by it through the death of the president, Mr. Alexander Croall, was held in the Smith Institute, on Tuesday, 2nd June. The Rev. Mr. Goldie, vice-president, took the chair, and there was a fair attendance of ladies and gentlemen. Mr. Goldie having stated the object for which the meeting was called, read the following memorial notice of Mr. Croall's life and labours :—

"We meet this evening under the shadow of a great loss in the removal by death of our accomplished and much esteemed acting president, Mr. Alexander Croall. We cannot say that the event was unexpected, for though hopes were entertained by some up till a recent date that he might again appear amongst us, it has been evident to practised eyes for some time that his end was ap-

proaching. Probably but for him this society had never existed, and certainly but for his wise and earnest management the society had not done its work so well. Our acting president from the first, he never was absent from his place in the meetings of the council or of the society except when prevented by illness. He was a hard worker in the interests of the society. His time, talents, and extensive information were always at our service. He contributed a number of papers of special interest and value. He gave a tone to all our meetings. His spirit and example were stimulating, and there are members who will be ready to acknowledge their indebtedness to him in their respective departments of study. Nothing was indifferent to him, and every subject brought before us secured his interest and his sympathy. He was most anxious that we should work up the botany, zoology, geology, and archæology of the district, hence the committees that were formed, and the Saturday excursions of which, even when beyond the three score and ten years, he was the leading spirit. He thought the society should be mainly local in its researches and its aims, should observe and record what was interesting, and hence he preferred brief papers on local subjects, the reading of which gave rise to questions and discussions. But though the society had never fully realised his idea, he was most grateful for what had been accomplished. We cannot as yet fully realise the influence he has exerted, and the work he has done amongst us, and consequently cannot fully realise the loss we have sustained by his removal.

"It is understood that some time ago an eminent literary man, had offered to write a memoir of Mr. Croall, but Mr. Croall declined, preferring to do the work himself, and he was engaged upon it when overtaken by his last illness. The narrative, however, comes no further down than 1835. We can now only suppose how interesting the work would have been, written by one who was such an ardent lover and keen observer of nature, and who would have invested his pages with the charms of delicate feeling and fancy. He has, however, left sufficient materials for a complete memoir which cannot fail to be interesting and valuable, and which, it is to be hoped, will be given to the world with the least possible delay.

"I have been favoured with the following genial and interesting notice by Dr. Howden, the accomplished Superintendent of Sunnyside Asylum, Montrose, an intimate friend and a great admirer of our late president. "Alexander Croall was born near Brechin in

1809. He served his apprenticeship as a joiner, and, at a very early age, displayed a love for books and natural history. When young his health was delicate, and he probably abandoned his trade on that account, [and studied for nearly two sessions at the University of Aberdeen.] The first school he taught was in Ferry Street, Montrose, and the next was in a "clay biggin," at Loanhead, 2½ miles from Montrose, to which he was appointed in 1839. In September, 1841, he was appointed to the parish school of Guthrie. From that he went to Stratton's School in Montrose, when I first knew him in 1857. About 1859 he was transferred to the new Sessional Schoolhouse built at Loanhead, and it was while there that he wrote most of 'The British Seaweeds.' I have not been able to find any of his early intimate friends in Montrose, but many remember him forty years ago as an enthusiastic Naturalist and the leading spirit in the 'Scientific Institute,' members of which have survived the long since defunct society. It was a common practice with him in those days to start for the hills on a Friday, or any other night before a school holiday, at twelve o'clock so that he might be on the the botanising ground by daylight, and get home the same evening after a walk of 30 or 40 miles. During the autumn holidays, he made prolonged excursions to Clova, Deeside, &c., and on those occasions he commonly slept on the heather, carrying his slender commissariat in his pocket. While he was a recognised authority in botany, and numbered among his correspondents Balfour, Dickie, Hooker, Darwin, and other eminent botanists, he had a very wide and accurate knowledge of natural science generally, and probably knew the zoology of this (the Montrose) district better than any one else. About the year 1855, he was employed by Sir William Hooker to prepare a Herbarium of the plants of Braemar for Her Majesty the Queen, but his great work was the "British Sea Weeds: Nature Printed," published by Bradbury and Evans in 1860. Modest, truthful, and honest himself, Croall credited others with the same qualities often to his own loss. The 'British Sea Weeds' was nominally the joint production of W. G. Johnstone and Alexander Croall, but I have reason to know that nearly the whole of the work devolved on Croall, while the remuneration went to Johnstone, who died, or in some other way conveniently vanished before accounts were squared between them. I knew Croall intimately when he was preparing this book. His days were spent in the drudgery of teaching an

elementary school, while the nights were devoted to literary work, leaving him little time for sleep. The microscopic drawings were by himself, as was also the letterpress. The illustrations were nature printed. It may be here added by way of note that this beautiful process has been lost to science by the death of its inventor, Mr. Bradbury.

Although Mr. Croall had at an early age manifested a love for natural science, it was not until he was a teacher that he began in real earnest the study of botany, incited thereto by hearing a journeyman gardener read a paper on 'Plants.' From that time, until the end of his days, he prosecuted the study with great ardour. As a member of the 'Montrose Scientific Institute' already referred to, he took charge of the botanical, while Dr. Gilchrist, afterwards of the Crichton Institution, Dumfries, took charge of the geological department. Mr. Croall had also charge of the entomological department, and made a valuable collection of insects, which, on leaving the place, he presented as a free gift to the Montrose Museum. In 1863, he was appointed librarian to the City of Derby Library and Keeper of the Museum and Herbarium. So long as he remained in England, he, when time allowed, prosecuted his favourite studies, and during his holidays took excursions into Cornwall, and other counties, gathering treasures wherever he went."

"In 1873, he was appointed curator of the Smith Institute, Stirling, which with its picture gallery, its Museum, and latterly its extensive library, situated in a district rich in objects of natural science and of archaeology, was most congenial to his tastes. Never was there a happier appointment, and never was a man more happy in his situation. The trustees, to their credit, placed unbounded confidence in him, and so thoroughly did he identify himself with the place that his name and that of the Institute had become, in the popular mind, almost synonomous terms. People from all parts consulted him on many subjects—objects rather—of natural science and of archæology, and he met them in such a genial spirit that he seemed really to thank them for giving him the trouble. No one consulted him on such occasions without being impressed with the extent and accuracy of his information, and with his kindly obliging disposition.

"From what has been said a fair idea may be obtained of Mr. Croall's scientific enthusiasm; and it only remains that we give a

general statement of his scientific attainments, and in doing so I am almost entirely indebted to one who knew Mr. Croall intimately, and is himself no mean naturalist. Before going further, however, I may say that Mr. Croall, latterly at least, took a deep interest in archaeology—the archaeology of this district especially—and knew not a little of it as a science. But he was most at home in the region of nature. He knew something of mineralogy, and in geology he was anything but a tyro, although he had not given the same attention to it as to some other branches of science. As we have been told already, he was a good zoologist, especially in conchology and entomology. He was, however, strongest in botany. He had made a special study of the fungi and lichens, and he was an expert in mosses, and his name frequently appears in Dr. Braithwaite's 'British Moss Flora,' now in course of publication. His great work on 'British Sea Weeds' has already been referred to. His knowledge of the flowering plants was most extensive, and he may fairly be regarded as one of the best of British botanists. He has left a valuable scientific collection behind him. The specimens belong to this district—and he had explored the country round, and made himself especially acquainted with its flora—the specimens so acquired he has bequeathed to this Society, and I am sure we receive them with gratitude, and will treasure them not only for their own value, but for their donor's sake. However the other specimens may be disposed of, I am certain they will be treated with more respect than the valuable collection of Robert Dick, which I saw lying like so much rubbish in a public room in Thurso.* Mr. Croall has also left a garden of wild flowers gathered in various parts, some of them not to be found in Scotland. It is well worthy of a visit, and botanists may regard it as worthy of preservation.

"Mr Croall, I need hardly say, was a man of shrewd and patient intellect, keen to observe, to analyse and generalise, but slow to speculate. He was a man of facts, not of fancies. He never bridged a chasm by conjecture, but waited until it was filled up by facts. He deprecated the putting forth of mere hypotheses as if

*This is not so now. Dick's collection, we understand, has since been properly arranged under the superintendence of Mr. Gunn, a subscription having been raised for that purpose. The Stirling Natural History and Archaeological Society can claim some credit in the matter, one of its members being a prominent subscriber.—ED. *S. J. & A.*

they were established theories. Being anxious to ascertain his attitude with reference to the doctrine of evolution, I put the question to him on the last occasion on which I spoke with him on any scientific subject. His reply, as usual, was moderate and cautious. He did not think that parties on either side were in a position to dogmatise. Evolution was a good working hypothesis, but little more as yet. In his own department of botany there were endless 'sportings' or variations in plants, but so far as he knew, no undoubted transformation of species had as yet been discovered. Still we should keep our minds open for further light. One thing he was certain of, facts alone, and not speculations would settle the question if it ever was to be settled.

"Mr. Croall was a man of singularly beautiful and attractive character. His amiability, modesty, courtesy, charity, unselfishness were conspicuous. Dr. Howden says in the letter from which I have already quoted—'Croall's modesty amounted to bashfulness, and tho' his extensive and accurate knowledge fitted him for a foremost place as a scientist, he shrank from asking favours, or seeking what worldly advancement his accomplishments well entitled him to. Gentleness and charity were eminent characteristics of his nature, and he was never heard to say a disparaging or unkind word of any one, and I could hardly imagine that he ever had an enemy.' This is just Mr. Croall as we knew him. And his fine natural character was hallowed by his Christian spirit—for he was a Christian in the truest sense of that word. In him the religious and scientific characters were remarkably combined. He was the man whom Henry Kirke White longed to see—

> 'Oh ! I would walk a weary journey to the furthest verge
> Of the big world, to kiss that good man's hand,
> Who in the blaze of wisdom and of art,
> Preserves a lowly mind ; and to his God,
> Feeling the Sense of his own littleness,
> Is as a child in meek simplicity.' "

ON THE AIMS AND USES OF PROVINCIAL MUSEUMS, AND THEIR RELATION TO PROVINCIAL SCIENTIFIC SOCIETIES.

By Professor JAMES W. H. TRAIL.

IT may be thought and said by some that the uses of provincial scientific societies and museums are so fully recognised that there is more risk of over than of under-estimating their importance

in the advancement of scientific pursuits among us; but this belief cannot be entertained seriously by any one who has realised how far the efforts of the most successful have been from the attainment of an ideal of even a moderate kind. Very few societies set steadily before them a definite aim; and in almost all published "Transactions," the titles show that the range of subjects discussed is so wide as to be very unlikely to leave permanent results of value towards fulfilling the objects that should be aimed at by provincial societies. It is true that in large societies, such as the Royal Societies of London and other metropolitan cities, the range of topics must be wide, because in them all departments of science are represented, without reference to the special places of meeting; and it may be urged that provincial societies represent similar needs, and should consider similar subjects, only restricted, to some extent, by circumstances. In support of this position, a good deal might be said; but it must be evident to all that consider the matter fairly that in fact the circumstances are very different for metropolitan and for provincial societies. Discoveries and theories of a comprehensive and far-reaching kind, and that are independent of locality, naturally are presented to the large metropolitan audiences, and are published in "Transactions," in which they can receive adequate illustration and treatment. On the other hand, these large societies are not suited for the consideration of topics such as naturally should occupy much of the attention and labour of provincial meetings. The former cannot with advantage study the fauna, flora, geology, or antiquities of any limited area of country; while it is by means of such labours in the district of which their places of meeting are the centres, and by publishing the results of such work, that provincial societies can best assist in the progress of scientific research, and can establish their rightful and honourable place in the scientific army of our land.

We fear that it will be long ere this truth is fully recognised, often though it has been proclaimed; and so strongly do we feel the waste of much power that might be most usefully employed, that we venture to reiterate them, and to press them even, at the risk of saying what may, to some, seem but useless iteration. There is little risk of its ever being carried to excess in our provincial societies.

Assuming, then, that the above aims ought to be of paramount

importance, it may be well to consider in what ways they can be most fully carried into effect. In some societies, the only permanent record of work done by the members is to be found in publications that appear at more or less regular intervals ; while in others there is no record kept beyond the unpublished minutes. Even in the former case, the circulation of the publications is usually so limited that the papers reach but a small proportion of the scientific public ; and they are very apt to remain unknown to those to whom they would be of special interest. The recent action towards affiliating the various societies with the British Association, and the publication, in the "Transactions" of that body, of, at least, the titles of the papers read during the year in the smaller societies, will do much to render their work accessible.

Yet, even under any circumstances as regards facility of publication, a still more valuable work would be done in the elucidation of the fauna, flora, and geology of our country, were each society to keep constantly in view the very great value and interest of museums in which the chief aim has been to bring together a complete series of all the natural products of the surrounding country, along with types selected to show clearly the leading groups of animals, plants, minerals, and strata, and their distribution over the world.

The uses of a museum are manifold, if it has been formed under careful supervision, and worked out on well-considered lines from the commencement ; but the formation of a museum is a work of time ; and it is seldom in the power of any one person to carry it from its earliest beginnings to its full maturity, even when of small size, and devoted to a single department of science. The critical period in the history of a museum is, however, at its origin ; for, on the care exercised in forming the original plan, its success and usefulness chiefly depend ; and much labour is necessary before it can be brought into the right track, should it have been begun on a wrong one.

It is very desirable that there should be, at least, one large and complete museum in the most accessible centre for the whole country ; and in this museum should be contained collections of the utmost possible completeness, in all departments of Natural Science. In no way can specialists work out the details in the study of which they are engaged, unless they have access to the

material supplied by large collections and a complete library; and to provide these for themselves, even in a very limited subject, is not only beyond the means of most, but is practically beyond the power of the wealthiest, since many of the specimens and of the books required are to be found only in public collections and libraries. The British Museum is one of the best examples of a museum, in which *local* must be subordinated to *general* collections, and where both these and the national library afford every facility that can be obtained by specialists in Great Britain.

But such a museum as this must stand alone in a country, as a national undertaking; though a few large towns may follow with museums on similar lines, however far behind. For provincial museums in general to aim at such completeness is simply to ensure utter and deserved failure. The expense involved in providing buildings, and in forming and keeping up the collections, would be far beyond the means of any town, however wealthy; nor are more than a very few such museums required in a country.

The educational value of a provincial Natural History Museum to the residents in the locality, depends upon the care with which the specimens in it have been chosen to display readily the important characters of structure and distribution of the great groups of animals and plants, and the great facts in the sciences of geology and mineralogy. These great general facts are rendered clear to students, and to the non-scientific public, far more successfully by well-selected series, including comparatively few types, than they could be by loading the shelves with very large series of each group. Now, it is only educational series of this kind that are required for the representation of the natural history of the world in provincial museums. Efforts to go much beyond this are likely rather to diminish than to increase their usefulness, and add much to the expense incurred in sustaining the museum. Valuable and extensive collections in special departments of science are worth acceptance, should they be offered to the directors of local museums; but isolated specimens from beyond the bounds of the district should be declined, unless they help to complete the type collections, or are of considerable intrinsic value.

If contributions of all kinds are accepted, and have places assigned to them in the museum, the certain result will be that it

becomes a repository of rubbish, amidst which may be discovered only an occasional attempt at arrangement, and here and there a specimen of value. To one who understands, in some measure, what a museum may be made, there are few things more depressing than a visit to such a one as may be too frequently met with in small towns, where animals of all kinds, stones, weapons, coins, and articles of furniture are intermixed as they might be in some nightmare, without even the semblance of order or plan in their arrangement. The fault of such museums is that they have been begun without any definite plan in the minds of the originators as to what they shall include, and have been added to omnivorously, everything having been accepted, however little suited to that already within the room. The result of this want of system is that in a comparatively short time, the space, which may at first have seemed too ample, is crammed; and each new acquisition has to be pushed into some corner, whether among the things to which it is most akin or not.

In a well-planned museum, on the other hand, the precise objects to which it is to be devoted are sketched out beforehand, and the due amount of room is assigned to each. No matter though for a time the space seems too great, and the empty shelves stare at the visitor with a kind of mute reproach. This is a far more healthy condition than overcrowding; and the very fact that they are standing empty is at once an incentive to the directors of the museum to do their utmost to have them filled with suitable objects, and to the public to assist in so filling them. It is, from its commencement, adapted to serve as a place of instruction to the visitor; for attention is not diverted from objects of real value by a crowd of nearly worthless articles, and even while still very incomplete, the relations of the various groups, and the plan running through the whole, may be traced without difficulty. As an excellent example of a well-organised museum, suitable as a model for almost all provincial towns, that of the Perthshire Society of Natural Science may be selected for notice; but the method followed in its arrangement has been so well described by Dr. Buchanan White, in a series of articles in the last volume of this Magazine, that it is needless to recapitulate an account of it here. From the success of that museum, we may learn also how short a time is necessary to enable a society, when really in earnest, to bring into existence collections that would be

creditable as the result of many years' work, instead of being formed in two or three.

But let us turn now to the educational value of a museum from another, and not less important, point of view. It ought not merely to convey to visitors a correct idea of the leading facts in science, but also to facilitate the study of the productions—animal, vegetable, and mineral—of the surrounding district; so that each one, studying it matters not what special group in that locality, should be able to find in it a full record of what has been already done in that group by his predecessors in the locality, and should be induced to add to that record by extending the collections in the department in which he is himself proficient. By such a combination of general facts, with minute accuracy in such details as can be verified by each thorough worker, it is alone possible to make a museum a valuable addition to the teaching resources of the place in which it is. Then only can it be expected to lead others to become naturalists—not mere collectors, solicitous only to accumulate a miscellaneous mass of what, to themselves as well as to others, is little better than rubbish. Not the mere amount accumulated, but the success with which the lessons that may be drawn from the collections are displayed, constitutes a museum worthy of the name. And how much can be learned from a thoroughly equipped museum, can be appreciated only after spending a considerable time in the study of the objects in one so equipped.

To the scientific visitor the advantage is not less than to the residents in visiting a museum of the kind we have been advocating the establishment of in provincial towns. There are many questions of the utmost interest connected with the distribution of the fauna and the flora of any country, and the variations that species undergo in different localities. The causes of these variations, and peculiarities in distribution, may frequently be solved by a comparison of good collections from a number of localities, differing from one another in soil, in climate, in exposure, and in many other particulars; and often a single district will afford localities varying widely from one another in all these conditions. For example, the provinces that have been proposed as natural divisions of Scotland—*e.g.*, Tay or Dee—contain in themselves districts varying in soil, in altitude, in exposure, in shelter from wind, in rainfall, and in temperature. Collections from each dis-

trict ought to be included in central museums—*i.e.*, in such localities as would render them most accessible to residents in all parts of the districts, and would also be most easy of access to scientific travellers. From such collections, made in even a single province, much could be learned of the effect on each animal or plant of the different conditions just enumerated. Conclusions thus arrived at, based on large series of specimens, would probably be found to apply to facts of variation and of distribution in wider areas ; and, at least, they would afford working hypotheses—most useful of aids when sufficiently restrained, and not assumed to be truths without proof.

There are few methods of giving stability to, and furthering the work of, Natural History Societies, so efficacious as the establishment of a thoroughly good museum, in which the one great aim has been to make perfect collections from the district embraced by each Society. In the fulfilment of this aim all the members can take part ; each can do something for the object of common solicitude to all ; and the fact of sharing in this common solicitude forms a strong bond among the members. The field, even in a limited area of country, is practically unlimited ; for there is no prospect of exhausting the material requiring to be wrought out, however constant the labour devoted to it. The collections existing in it are a most valuable assistance to members studying groups well represented in the museum, and save much expenditure of useless labour—useless, that is, in merely doing again what had been done before, but had been forgotten in the absence of such a record as collections supply. Where any department had not been previously studied in the district, this fact would be at once rendered evident by its absence from the museum ; and the existence of the blank would be a powerful stimulus to members of the Society to try to fill it. It is quite unnecessary to do more than refer to the great advantage that the use of a well-equipped museum is to every Naturalists' Society, in affording the means of illustrating the papers read before it ; and the advantage of possessing, in permanent and most valuable form, the results of (frequently) many years' work on the part of many of its most laborious and successful members. If there is no public institution of the kind to which local collections can be presented, they are apt to be allowed to go to ruin on the death of the worker, and all record of much good work is entirely lost.

It may be that to some of our readers what has been said may seem needless, or even hurtful, as tending to discourage many that would wish to be liberal donors, but who would shrink from offering what may be refused by the directors of museums managed on such principles. But there is little risk of a result prejudicial to the best interests of the institutions; while it would be a very great advantage to be free from the burden of accumulations of material useless at the best, and even injurious as interfering with the efficient fulfilment of the chief uses of the museums to the districts, to the scientific public, and most of all to Societies that undertake the work of forming them.

THE RELATIONSHIP OF PALAEONTOLOGY TO BIOLOGY.

By R J. HARVEY GIBSON, M.A.

(Concluded.)

I HOLD then that Palaeontology is a branch of Biology, and not a subdivision of Geology. I hold that a discussion of the structure, affinities, classification, and distribution in time of fossils is a biological problem, not a geological one. I would even go the length of advocating the abolition of the term Palaeontology, since its use is calculated to emphasise the separation of the study of fossils from the study of recent forms, a separation that should not exist.

How, then, is Biology to be arranged so as to include this new mass of material? Simply enough. By the admission of the essentially genealogical nature of classification, and the introduction into that classification of the different groups of plants and animals that lived in past ages. If the doctrine of Evolution be true, if all living forms be descended from common ancestors, then all ancient forms must be entitled to a place in a biological classification. That many such forms will for long remain in a doubtful relation to the general tree is a misfortune, due to circumstances beyond our control. But that need not hinder us from attempting such a classification. It does not do so even in the present state of Zoological knowledge; though there are many forms whose nearest relationships have not as yet been definitely decided upon.

We shall be unable, it is true, to give an account of the soft

parts of ancient living things. We shall be unable to do more than guess at their habits and mode of life, again a misfortune; but this is no reason, it seems to me, why we should omit to describe those parts which are left, in a general account of the plant and animal worlds.

On the other hand the subject of Etiology can be discussed with every prospect of attaining the most interesting and important results, as instanced in the Etiology of the Herbivora and of the birds as worked out by Huxley and Marsh respectively.

It is in the subject of Distribution, however, that the importance of uniting Palaeontology and Biology is especially apparent.

Distribution may be either Geological or Geographical, that is to say it treats of the distribution of plants and of animals in time or in space. The true relationship of these two phases of the Distribution question does not seem to me to be sufficiently well brought out in textbooks. We are apt to think of Distribution in time as merely the order in which different grades of organisms have appeared on the globe, and Distribution in space as a census of the inhabitants of the different sections into which the surface of the land has been divided. But distribution in time is something more than that, and the two aspects of the subject, though apparently as disconnected as depth and breadth, are in reality inseparable.

History has been defined as "statistics in movement;" statistics as "history in repose." And in geological history as in civil history this is true. Geographical distribution is a statistic. Each period in the history of the earth has its own geographical distribution of organisms. These are all statistics, and since there is an indefinite number of separate "horizons" in the succession of rocks we may say there is an indefinite number also of statistics of Geographical Distribution. The sum of them piled on each other forms Distribution in time or Geological History. Geographical Distribution as we understand it therefore is simply the last census of living things, the first preserved otherwise than by the rocks themselves. Here, again, imperfections in the geological record, destruction of entire series of strata, and ignorance of the geological history of the crust of the earth save in certain parts, prevent us from attaining as perfect a knowledge of past Geographical Distribution as we should wish, but nevertheless the main features of Geographical Distribution in the Tertiary

period at least seem in a fair way of being arrived at; and no doubt, as further research is made by the various National Surveys, the doubtful points relative to that period will be cleared up; and knowledge will be more and more increased with regard to the secondary and primary periods of geological history.

If the subject of Palaeontology then be simply a branch of the wider Science of Biology, in what sense may a Geologist treat of the fossils which he will constantly meet with in his examination of the earth's crust? Obviously from two points of view. First, and less important, in so far as they form actual rock-masses, *i.e.*, limestone and chalk. Secondly, as guides to the establishment of the correct order of superposition of strata.

In the remarks with which Dr. Geikie follows up his definition of Palaeontology, he refers in few words to the biological as contrasted with the physical aspects of Palaeontology, and consistently discusses under the head of Palaeontology only the physical aspect of the subject. The biological aspect is, however, dealt with fully in the section on Stratigraphical Geology, a procedure which is justifiable on the ground that biologists have not yet learnt that it is their duty to furnish the geologists with a complete account of the structure, affinities and classification of extinct forms so far as circumstances permit them to do so.

Hitherto I have treated this subject solely from a theoretical point of view; and although in theory it may seem advisable to unite Biology and Palaeontology, yet in practice it might be inexpedient to alter their present status.

I shall endeavour now to show that not only is it possible and expedient to unite the study and teaching of Palaeontology and Biology, but that the advantages to be gained by such a union are such as to fully justify the alterations that would be required.

There can be no question, I think, but that the gain to Geology would be great. For not only would the time at present spent on palaeontological studies be available for the study of the more important phenomena of structural and dynamical Geology, but the geologist would be spared the necessity, and perfectly needless labour, of acquiring a knowledge at first-hand, of the innumerable fossils, whose meaningless names must have suggested emphatically enough that they are the veritable dry bones of Biology.

Now that the order of superposition of rocks has been ascertained, what need to repeat in every course of lectures, in every

textbook, the lists of the names of the various forms of plant and animal life found in these strata. All further discovery of the presence in, or absence from, certain strata of certain fossils is a biological discovery, and has to be discussed under the distribution in time of the group to which the discovery refers. It would be always instructive no doubt to indicate the leading features of the organic world at the same time as the characteristic physical features of any epoch; but all details I would leave to be studied under Biology.

Looked at from the Biological side what are the advantages to be gained by this rearrangement?

The advantages it seems to me are many; and first, with regard to classification.

It is only of late years that a true conception has been arrived at, as to what classification really is. For ages physiological classifications, which introduced such absurdities as the grouping together of whales and fish, of birds and bats, were discussed seriously. Artificial classifications like that of Linnaeus, founded on the morphology of the organ or system, failed of necessity to throw any light on the phenomena of plant or of animal phyllogeny. The accurate morphological researches of Cuvier, the embryological work of Von Baer, and the profound generalisations of Lamarck and Darwin were needed ere classification was seen in its true light.

"Some deeper bond is included in classification" says Darwin, "than mere resemblance. I believe that community of descent, the one known cause of close similarity in organic things, is that bond."

But acceptance of the view of community of descent from a generalised ancestral stock of necessity signifies the acceptance of the unity and continuity of plant and animal life since its origin. It means that all the innumerable plant and animal forms that exist now, that have existed in past ages, whether preserved in the rocks or not, are leaves, twigs, branches, of one great tree, whose roots are hid deep in the unknown pregeological time, whose latest blossoms are unfolding around us to-day.

"We can understand," writes our great master in Biology, "how it is that all the forms of life, ancient and recent, make together a few grand classes; we can understand from the continued tendency to divergence of character, why the more ancient a form is,

the more it generally differs from those now living; why ancient and extinct forms often tend to fill up gaps between existing forms; sometimes blending two groups previously classed as distinct into one, but more commonly bringing them a little closer together. The more ancient a form is, the more nearly will it be related to, and consequently resemble, the common progenitor of groups, since become widely divergent. Extinct forms are seldom directly intermediate between existing forms; but are intermediate only by a long and circuitous course through other extinct and different forms. We can clearly see why the organic remains of closely consecutive formations are closely allied; for they are closely linked together by generation. We can clearly see why the remains of an intermediate formation are intermediate in character."

No greater step toward the embodiment of such teaching as this in actual result, can I think be made, than by the amplification of our zoological and botanical tables of classification by the addition of the animals and plants that lived in past ages. Innumerable problems will no doubt at once suggest themselves; and there will be very many groups of extinct forms whose precise position on such a classification will be most difficult to determine. These difficulties may however, it seems to me, be in great measure got over by, in the first place, always adopting an arboreal or genealogical form of classification, and by absolutely discarding the unmeaning, if not actually pernicious, tabular arrangement; and secondly, by the judicious use of such expressed or unexpressed hypothetical links as are made use of, for example, by Balfour in his explanation of the phyllogeny of the Chordata. Probably also were biologists ready to tackle the problem of the structure and affinities of fossil organisms, their knowledge of recent forms might enable them to suggest solutions of difficulties which the experience of geologists might never have led them to guess at. Witness the recent demonstration of the Arachnoid affinities of Limulus and of the extinct Trilobites and Eurypterida.

ZOOLOGY.

THE LEPIDOPTERA OF THE SHETLAND ISLANDS,

WITH REMARKS UPON THE OCCURRENCE OF THE SPECIES IN OTHER NORTHERN REGIONS, IN THE MOUNTAINS OF THE NORTH AND MIDDLE OF GERMANY, AND IN THE SWISS ALPS.

By AUGUST HOFFMAN in Hanover.

(Translated from the *Stettiner Entomologische Zeitung* XLV., 1884, pp. 253-75.)

IN the autumn of 1883, I received from Mr. H. MacArthur some consignments of Lepidoptera, which he had collected in the Shetland Islands. These had a very great interest for me, on account of the many points of resemblance, which I found in their varieties, to those of the Upper Harz Mountains.

The Shetland Islands, consisting of four larger islands, viz., Mainland, Yell, Fetlar, and Unst, and many smaller ones, lie to the N.N.E. of Scotland, between 59°8 and 60°52 North, about the same latitude as the southern point of Greenland, thus being upon the border of the Arctic Region.

Mr. MacArthur's captures, collected from the Islands of Mainland and Unst, during the years:—1880, from the end of April to the end of August; 1881, from the beginning of May to the middle of September; and 1883, from the end of May to the beginning of September, have already been discussed in the *Entomologist*, as under:—

1880, pp. 249-251 and 289-293; 1881, pp. 278-281; 1884, pp. 1-4, by Messrs J. Jenner Weir (Macrolepidoptera) and Howard Vaughan (Microlepidoptera). The very valuable remarks of these gentlemen have been written from an English point of view—that is to say, from the point of view that the majority of English collectors take up; they treat the collections from the Shetland Islands in

comparison with the British Lepidopterou-Fauna alone, though they deserve, I believe, a wider treatment. Since, besides, English Entomological Journals, such as the *Entomologist*, are not accessible to every German entomologist, the following treatise by me upon the subject may not be considered superfluous.

I have subjoined notices to my work with regard to the geographical and vertical range of the species in question. I intend by this less to state where especially any species occurs, because the work of the brothers Speyer, *The Geographical Range of Butterflies*, as well as the catalogue by Staudinger and Wocke, gives thorough information upon that point, than to determine which of the species in question reaches its greatest diffusion under the same or similar conditions of climate as those in which they occur in the far North, and in the higher mountain regions; and upon this point, at the conclusion, I will give a tabulated synopsis.

For this purpose I have made use of the following works :—

Dr. O. Staudinger—*Reise nach Island*, in *Stettiner Entomologische Zeitung*, 1857.

Dr. O. Staudinger—*Beitrag zur Lepidopteren-Fauna Grœnlands*, l.c. 1857.

Dr. O. Staudinger and Dr. Wocke—*Reise nach Finnmarken*, l.c. 1861, 1862.

Dr. M. F. Wocke—*Ein Beitrag zur Lepidopteren-Fauna Norwegens*, l.c. 1864.

H. B. Moeschler—*Beitræge zur Schmetterlings-Fauna von Labrador*, l.c. 1870, 1874, 1883.

J. G. Schilde—*Lepidopterologische Mittheilungen aus Nord-Finnland*, l.c. 1873, 1874.

Dr. Heinrich Frey– *Die Lepidopteren der Schweiz*, 1880.

Dr. Adolf Speyer and August Speyer—*Die Geographische Verbreitung der Schmetterlinge Deutschlands und der Schweiz*, 1858, 1862.

Dr. O. Staudinger and Dr. Wocke—*Katalog der Lepidopteren des Europaischen Faunengebiets*, 1871.

and also of information kindly communicated to me by letter by Dr. M. Standfuss, Parchwitz, upon the occurrence of the species in the higher parts of the Silesian Mountains (from about 4000 feet upwards).

The remarks bearing upon the Upper Harz Mountains are the

result of personal observation, since I have investigated the fauna of these mountains from about 2500 feet upwards.

The abbreviations used in the course of the article are as follows :—

Stgr. Isl., observed by Dr. Staudinger in Iceland under any form.

Stgr. Grönl., given by Dr. Staudinger as appearing in Greenland under any form.

Stgr. and Wk. Lap., noticed by Dr. Staudinger and Dr. Wocke in Norwegian Lapland (Finmark), &c.

Wk. Norv. Alp., noticed by Dr. Wocke in the Dovrefield Mountains.

Mosch. Labr., given by Möschler as appearing in Labrador, &c.

Sch. Fen., noticed by Schilde in North Finnland, &c.

Frey Alp., given by Prof. Frey as appearing in the Swiss Alps, &c., from about 4000 feet upwards.

Stdfs. Sil. Mont., given by Dr. Standfuss as appearing in the Silesian Mountains from about 4000 feet upwards.

H. Herc. Mont., noticed by me in the Upper Harz Mountains, &c., from about 2500 feet upwards.

Spr. Verbr., Dr. Ad. and Aug. Speyer, "Geographical Range," &c.

Strg. and Wk. Cat., Staudinger and Wocke's Catalogue.

By the addition of one of the previous localities, take for example Fen. or Lap., it is indicated that the species, or a form belonging to it, is recorded in the preceding works as appearing in Finnland or in Lapland.

After this my paper gives a review of the appearance of the species :—

1. In the Polar and Arctic region (in Staudinger's sense)—Iceland, Greenland, Lapland, Labrador, Finnland;

2. In the Alpine region of a northern mountain, Dovrefield;

3. In the higher tracts of the mountains of the north and middle of Germany, the Upper Harz and Silesian Mountains;

4. In the upper and lower Alpine region, and in the lower snowy zone (in Frey's sense)—the Swiss Alps.

Those species of which I have had a great number here for comparison are marked with * ; my remarks upon these kinds are also based on personal observations ; as regards the rest, I follow communications made to me by letter by Mr. MacArthur, and also the works of Messrs Jenner Weir, and Howard Vaughan.

In those cases where the nomenclature used in England differs

from our own, (Staudinger and Wocke), I have added in brackets the names common in England.

1. **Vanessa Atalanta** L. (*Pyrameis Atalanta* L.) Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.; Spr. Verbr. Lap. Ordinary form; in July.

2. **Vanessa Cardui** L. (*Pyrameis Cardui* L.) Mosch. Labr.; Sch. Fen.; Frey Alp.; Stdfs. Sil. Mont.; Spr. Verbr. Lap. Ordinary form, end of July, rare.

3. **Sphinx Convolvuli** L. Frey Alp.; Stdfs. Sil. Mont.; Spr. Verbr.; Herc. Mont. (Height uncertain.) Ordinary form, August.

* 4. **Nemeophila Plantaginis** L. Stgr. and Wk. Lap.; Sch. Fen.; Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.

I saw only male examples of this species, which belonged to the ordinary form; some showed only a slight deviation in so far as the ground-colour of the upper wings seemed to be a clear whitish-yellow, and restricted the extent of the black marking, whilst that of the under wing remained yellow. Dr. Staudinger has remarked the same in Lapland; and I have captured specimens in the Upper Harz Mountains, in which the pale colour reduced the black to a minimum. The varieties *hospita* Schiff. and *matronalis* Fr. were not noticed in the Shetland Islands. June.

* 5. **Hepialus Humuli** L. and Aberr. **Hethlandica.** Stgr. Wk. Norv. Alp.; Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont. According to Mr. M'Arthur, the type form is prevalent in the Shetland Islands, whilst the male form with the female markings on the upper wings (*Hethlandica*) appears in all transitions of ground-colour, from the purest white male to the deep red-yellow or brown-yellow of the upper wings, which usually appears in the female insect of the type-form. I therefore refer *Hethlandica* as an aberration to *Humuli*. The *Entomologist* gives a very interesting series of figures of this Shetland form, 1880, plate 3.

I had here four examples of the Aberr. *Hethlandica* in characteristic varieties for comparison; and give a short description of these four specimens, passing in order from that, which stands nearest (in colour) to the female moth, on to that through which the transition to the white form of the male is best shown. They are as follows:—

1. Ground-colour of the upper wings yellowish, the female

markings strongly carried out in reddish-yellow; the under wings a dark gray, with a tinge of red; head and thorax covered with red and yellow hairs; the fringes of both wings also a red-yellow. This specimen, at the first glance, could scarcely be distinguished from a small female, if it were not characterised as a male by the form of the wings and by the hair-tuft on the hinder tibiae.

2. Upper wings yellow; the female markings are indicated in a red-brown instead of red-yellow; under wings a gray-black, with a scarcely perceptible suffusion of white; head and thorax with red-brown hairs, and both wings bordered with red-brown.

3. Upper wings dark yellow, with the female markings in brown; under wings a blackish-gray, with a white suffusion; both wings bordered with brown; head and thorax with yellow-brown hairs.

4. Upper wings white; veins dusted with yellow-brown; the female markings a dirty brown; under wings gray, with a dense white suffusion, so that the ground-colour is merely indicated; both the wings bordered with black-brown; head and thorax with yellowish-gray hairs.

All four specimens have the wings blackish below, with white specks, just as in the small white male of the type-form.

In the aberrations described the markings of the female are clearly perceptible, but one also finds small white males in which the female markings are discernible only in pale yellow. *Entomologist*, 1880; plate 3, figs. 4 and 6.

The pure white form of the male of *Hepialus Humuli*, which, as mentioned before, is prevalent in the islands, and which also I had here for comparison, is distinguished from our native specimens, and from those of the Upper Harz, by the dark grayish-yellow hairs on the head and thorax, and in both also the wings have almost black borders. The female shows only a somewhat cloudier yellow than in German specimens. It appears to be the view of English inquirers that, at first, both the sexes were of the same colour, that therefore the ab. *Hethlandica* was the primitive male form, and that a modification into the white form of the male had taken place through sexual selection. *Vide* Jenner Weir, *Entomologist*, 1880, pp. 251. Time of flight is June and July.

* 6. **Hepialus Velleda** Hb. var. Wk. Norv. Alp.; Sch. Fen.; Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.; Spr. Verbr. Lap.

The Shetland form is very different from that of our Lowlands;

it appears, however, to be identical with the form from the Upper Harz Mountains. I saw only four males and two females, they were like dark specimens from the Upper Harz Mountains. *Entomologist*, 1880; plate 4, figs. 16 and 17. Time of flight is June and July.

The Upper Harz form is, on the whole, smaller than that of the North German Lowlands; and whilst the latter is pretty constant in its yellow-brown colour, the scale of the colours in the former in the males, (the females vary less), grades from the deepest black-brown in the ground-colour of the upper wings, through red-brown and red-yellow to a pale leather-yellow. In the dark specimens, the white bands have often a silvery lustre, and look like washed-out spots on the blackish under wings. Such specimens have a very variegated appearance. The pale examples show often quite faded markings, they thus approach the ab. *Gallicus* Ld. Since the latter is found on the Riesengebirge, I have no doubt that it occurs also on the Upper Harz Mountains. I have also got it from the Island of Arran, on the West Coast of Scotland. As yet it has not been observed in the Shetland Islands. The larva of *Hepialus Velleda* I find, in all the books accessible to me, given as living in the root of *Pteris aquilina*. That is correct as regards the Lowland form, which appears in the woods where *Pteris aquilina* grows. It is, however, quite wrong for the form found in the Upper Harz, for there *Velleda* flies in company with *Hepialus Humuli* at a height of 2500 feet above the meadows, and where no *Pteris aquilina* is to be found for miles around. I suppose that the larva there lives upon the roots of *Meum Athamanticum* or of a species of *Rumex*, which is found in abundance in the meadows. I have also seen newly-emerged moths creep out of these plants, especially from Meum. The time of flight of this species is at sunset, and lasts scarcely twenty minutes, afterwards one can only find a few females still laying eggs. The pairing takes place vehemently; often from ten to twenty males swarm round a newly-emerged female, like bees before the door of a hive. When the pairing is over, the remaining males disappear very fast. Dr. Struve has noticed the same in *Hepialus Pyrenaicus*. I have made the preceding statements, because I suppose that on other mountains, as well as on those in the Far North, the mode of life of this species is the same.

* 7. **Agrotis strigula** Thnb.. (*Agrotis porphyrea* Sv.) Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.

Larger and darker than our Lowland specimens; but exactly like those of the Upper Harz. August.

8. **Agrotis pronuba** L. (*Triphæna pronuba* L.) Stgr. Isl.; Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.

Ordinary form. End of June and July.

* 9. **Agrotis hyperborea**, var. *alpina* Westw. (*Pachnobia alpina* Westw.); Stgr. and Wk. Lap.; Wk. Norv. Alp.; Sch. Fen.; Frey Alp.; Stdfs. Sil. Mont.

Duller coloured and less variegated than the *alpina* of the Scottish Highlands, and therefore more like the type-form *hyperborea*. July. (*Entomologist*, 1880; plate 4, figs. 14 and 15.)

I received from Mr. MacArthur a very well-preserved larva, which exactly, even to the minutest detail, corresponds with Dr. Staudinger's description of the larva of *hyperborea*. (*Stett. Ent. Zeit.*, 1881, p. 361.) Dr. Staudinger writes:—"Above, on each side, runs a pale line, on the inside of which, at the beginning of each segment, lies a short black streak." In my larva, the black streaks are first visible on the fourth segment, they become more marked up to the tenth segment, and with the middle line of the back at the end of each segment form regular wedges, which are thus turned with the points backwards. Dr. Staudinger writes farther:—"The two last black streaks converge backwards." In my larva they run exactly like the others, but are weaker. In these respects the larva of the Shetland form is different from that of the Lapland form. But as I possess only one specimen, as I said before, I could not determine whether these characteristics were constant. The larva, according to Mr. MacArthur, lives hidden under moss, and feeds on the young branches of a species of Vaccinium.

10. **Agrotis C-nigrum** L. (*Noctua C-nigrum* L.) Frey Alp.; Stdfs. Sil. Mont.; Spr. Verbr. Lap. Ordinary form. July, rare.

* 11. **Agrotis xanthographa** Sv. var. (*Noctua xanthographa* SV.). I have, through the kindness of Dr. Staudinger, got this species from the most different places; among them one pair is a pale gray, with a light yellow tinge of Sicilen. I possess, in my own collection, a number of varieties of this species; but in none do I find any approach to the Shetland form, the upper wings of which have very coarse scales, and are a deep black-brown, with

a reddish tinge. The orbicular and reniform stigmas show a yellowish tinge.

Mr. MacArthur writes me that he has caught even darker specimens than those which he sent to me for examination. Flies in August.

* 12. **Agrotis festiva** var. *conflua* Tr. (*Noctua festiva* var. *conflua* Tr.); Stgr. Isl.; Stgr. and Wk. Lap.; Wk. Norv. Alp.; Sch. Fen.; Mosch. Labr.; Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.

On the authority of Dr. Rössler, I place *conflua* as a variety of *festiva*. I saw eight specimens of this form from the Shetland Islands, which were just as different from the *conflua* of Altvater, of the Norwegian mountains and of Lapland, as they varied greatly among themselves, especially in the colour. In the next place, the Shetland form has narrower wings, and the point of the upper wing is more prolonged. This does not appear so clearly in the figures in the *Entomologist*, 1884 (plate 1, figs. 8, 9, and 10), as it did in the specimens which I saw. In colour, they vary from a dark gray-brown through red-brown to a reddish leather-yellow. Time of flight is in July.

According to Dr. Staudinger, very similar varieties appear in Iceland. Dr. Rössler regards conflua as a mountain form of festiva, because the eggs of *conflua* brought by Dr. v. Bodemeyer to Wiessbaden produced *festiva* in all varieties, but no *conflua*. At Dr. v. Bodemeyer's, I saw some of those specimens, which had emerged as a second generation in late autumn, but which, in my opinion, are more nearly related to the *conflua* than to the typical *festiva* of our Lowlands. Dr. Rössler has certainly examined a great number, and has formed his opinions upon them. Dr. Standfuss writes to me that Dr. Wocke has also brought up a second generation of *conflua* from Altvater, which more or less form a transition to *festiva*. This certainly speaks in favour of the near relationship of the two forms; in the wild state the distinctness of the forms is always constant.

From information kindly supplied by Dr. Standfuss, *festiva* alone appears in the true Alps; and he certainly found two larvæ at a height of over 4000 feet, and reared *festiva* from them, which did not in the least differ from those of the Lowlands.

Conflua is said never to have been caught or reared in the Alps; while farther east upon the snow-covered mountains, and upon

Altvater, at a considerable height, it appears to take the place of *festiva.*

Upon the moors of the Upper Harz, a very small pale form of the *festiva* appears, which, however, certainly belongs to this species. I have never found in it any approach to *conflua.*

Professor Frey gives the most varied localities for *festiva*, from the lower region of the Swiss territory, and up to Sils-Maria in the Upper Engadine at a height of about 5500 feet, as well as upon the border between the lower and upper Alpine regions (in Frey's sense); but for *conflua* he gives only the Bernese Alps, without mentioning the height, Belchen, Engelberg, and Eigenthal. The last three localities, with a height of about 3000 feet, lie upon the border between the lower and upper mountain regions (in Frey's sense).

I will just point out that, for these considerations, *conflua* cannot be referred with absolute certainty as a mere mountain form to *festiva*, since the latter has been observed commonly in the mountains, at the same height as *conflua*, sometimes indeed even higher.

With regard to accelerated development, I may further remark that I have seen at Dr. Bodemeyer's a number of *Agrotis Rubi* View (*bella* Bkh.), also reared with abundance of food and artificial warmth, which were very large, and resembled *Agrotis florida* Schmidt, but did not quite agree with that form.

Dr. Rössler tries to give an explanation of such modifications in his work, "*Die Schuppenflugler*, &c." (introduction, page 9), which certainly deserves every attention. Probably, we shall be able to attain full certainty on these questions, only when we have succeeded in rearing several generations from the egg.

13. **Agrotis glareosa** Esp. var. (*Noctua Glareosa* Esp.) One specimen, with dark brown instead of gray ground colour. *Entomologist*, 1884; plate 1, fig. 1; August.

14. **Agrotis lucernea** L. Frey, Alp.; Stgr. and Wk. Cat. Fen.; Norv. Alp. (Dovrefield), according to Staudinger. Large and dark examples. July, rare.

* 15. **Agrotis cursoria** Hufn. and aberr. **sagitta** Stgr.; aberr. **obscura** Stgr.; Stgr. and Wk. Cat. Fen.

The *cursoria* of the Shetland Islands (I saw four specimens) are smaller than our North German examples, for the most part uniformly greenish yellow brown; but darker brown specimens

also occur with white stigmas, whitish front margin, and whitish mid-vein (*sagitta*) (*Entomologist*, 1884; plate 1, fig. 3); also, quite uniformly dark-brown specimens occur, in which only the stigmas have a margin of yellow. (*obscura*). (*Entomologist*, 1884; August and September; plate 1, fig. 2.)

16. **Agrotis occulta** L. (*Aplecta Occulta* L.) Stgr. Grönl.; Mösch. Labr.; Sch. Fen.; Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.; Stgr. and Wk. Cat. Lap. Pale specimens occur like those of the South of England. The black form of the Scottish mountains, which appears also with us in mountainous regions, e.g. Upper Harz, was not captured. July.

17. **Chareas graminis** L. Stgr. Isl.; Stgr. Grönl.; Stgr. and Wk. Lap.; Sch. Fen.; Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.; Stgr. and Wk. Cat. Labr. Ordinary form, end of July and August. Unfortunately I was unable to examine this species, among which there are said to be very dark specimens, probably Latenai, which also appears in the Upper Harz, along with the type form, in May and June.

* 18. **Dianthoecia nana** Hufn. var. (*Dianthoecia conspersa* S.V.) Wk. Norv. Alp.; Frey Alp.; Stdfs. Sil. Mont.; Spr. Verbr. Lap.

The darkest specimens of this curious Shetland form could scarcely be considered as nana, were it not that the paler ones formed a transition. I saw three males, which in comparison with the type form must be characterised in the following way:— Ground colour, a paler or darker lead grey, washed over with a greenish yellow. The white marks of the type form are visible on the upper wings of the palest specimen, as well as the orbicular and reniform stigmas; the white spots on the inner margin and the white outlines of the wavy lines are also faintly shown; and traces of white colouring are found on head, collar, shoulder-lappets, and nuchal crest. In the second specimen, white markings quite disappear from the wings, and only on the head and thorax do they still remain visible. In the third (darkest) specimen, the white colouring has entirely disappeared even from the head and thorax, and the colour is simply leaden grey, washed over with faint greenish yellow. The orbicular and reniform stigmas are outlined with black; the two double cross lines and the arrow marking of the wavy lines are black. Mr. MacArthur answers my question, whether the common form does not also occur in the islands.

"*Conspersa* (*nana*) are all dark; the common form does not occur there, though some specimens are somewhat paler than those that I sent you." The figures in the *Entomologist*, 1880, plate 4, Nos. 12 and 13, represent pale specimens; the colours as given are somewhat too yellow, when compared with those that I have examined here.

This variety is especially noteworthy in that it is not a mere darkening that has taken place. Even the darkest specimen that I possess does not show the deep blue-black ground-colour of the type form, against which the white stands out so clearly. The dark spots of the marking have rather become fainter, that is duller leaden coloured, and the white spots, if I may say so, have become greenish yellow, so that the colours seem to have approached each other to produce such a uniformity. Time of flight is June.

19. **Luperina Haworthii** Curt.? (*Celaena Haworthii* Curt.) H. Herc. Mont.; Stgr. and Wk. Cat., Fen., Lap.

The ground colour of the specimens is said to be redder and more sharply defined than in the usual form, so that they would exactly correspond to specimens from the Upper Harz. August.

20. **Hadena adusta** Esp. Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.

This species is described in the same way as the last, and therefore corresponds to the specimens of the Upper Harz. End of June and July.

* 21. **Hadena exulis** Lef. Stgr. Isl.; Stgr. Grönl.; Wk. Norv. Alp.; Mosch. Labr.; Sch. Fen.; (?) Frey Alp.; (?) H. Herc. Mont.

It appears to be more and more becoming the general belief that the forms *Zeta* Tr., *Pernix* H. G., *Maillardii* and *exulis* Lf., belong to one species. Prof. Frey expresses himself of this opinion as to the relationship of *Pernix*, *Maillardi*, and *exulis*. Unfortunately, as I have not the material, I can form no opinion upon this difficult question. It was for this reason that, when treating of distribution, I introduced the statement bearing on that of *Maillardii* with a query.

Of the few specimens caught upon the Shetland Islands, I have seen only a somewhat rubbed example, which approaches closely to *Maillardii* in the cut of its wings, and nearly reaches the size of this form. The colouring is gray brown; all the cross lines are indicated by dirty yellow; and the stigmas are filled up in the same way. The reniform stigma towards the mid-vein is dirty

white. The figures (*Entomologist*, 1884; plate 1, figs. 6 and 7) are very characteristic for the forms. I could not compare the little form No. 5. Specimens from Labrador and Iceland, which I received from Dr. Staudinger, are very different from these forms. From the great inclination to vary, which this form possesses, it would be useless to state the differences of the few specimens. My statement in regard to the appearance of *Maillardii* in the Upper Harz is founded upon a somewhat rubbed example, which Mr. Muhlenpfordt caught there, and which may be referred to this form with considerable certainty, but which perhaps belongs to *Zeta-Pernix*. *Exulis* flies in the Shetland Islands about the end of July.

* 22. **Hadena furva** Sv. (*Mamestra furva* Sv.) Frey Alp.; Stgr. and Wk. Cat. Fen. Smaller and darker than specimens from the Swiss Alps. Flies in August and September.

23. **Hadena monoglypha** Hufn. (*Xylophasia polyodon* L.) Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.

Ordinary form; flies in June and July.

24. **Hadena basilinea** Sv. (*Apamea basilinea* Sv.) Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.

Ordinary form; flies in July.

25. **Hadena fasciuncula** Hw. (*Miana fasciuncula* Hw.) Ordinary English form. Flies in July. One example.

26. **Hydrœcia micacea** Esp.; H. Herc. Mont.

Some specimens are said to show a darker red than the ordinary form. Flies in July. Rare.

27. **Caradrina quadripunctata** F. (*Caradrina cubicularis* Sv.) Sch. Fen.; Frey Alp.; Stdfs. Sil. Mont.

Ordinary form. Flies in July.

* 28. **Dasypolia templi** Thnb. (?) Frey Alp. Wallis (without mentioning the height); Stdfs. Sil. Mont.; Stgr. and Wk. Cat. Fen.

The specimens that I saw are not different from the ordinary form, but a very much darker example is said to have been caught. Flies in September.

* 29. **Plusia gamma** L. Stgr. Grönl.; Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.

Ordinary form. Flies in May and September.

* 30. **Anarta melanopa** Thnb. Stgr. and Wk. Lap.; Wk. Norv. Alp.; Mosch. Labr.; Frey Alp.

Northern form. Smaller than specimens from the Swiss Alps

The upper wings are strongly suffused with yellow; the lower wings are white, with a black median spot and rather broad black marginal band. Time of flight is June.

31. **Anaitis paludata**(?) var. imbutata Hb. (*Carsia imbutata* Hb.) Stgr. and Wk. Lap.; Mosch. Labr.; Sch. Fen.; Frey Alp.; H. Herc. Mont.; Wk. Norv. Mont.

Unfortunately, I have not seen the specimens. Since Mr. Jenner Weir does not specially mention this species, I assume that the specimens are identical with the Scottish ones, and therefore they belong to the form with strong pencillings much mixed with red, since this form also occurs on the Harz. Information as to the time of flight is wanting to me; probably it is the end of July and beginning of August.

* 32. **Lygris testata** L. var. (*Cidaria testata* L.) Sch. Fen.; Stdfs. Sil. Mont.; H. Herc. Mont.

The specimens that I saw are essentially different from those of our Lowlands. The beautiful agate-red of the upper wings is modified into a reddish brown, and the bluish dash of colour appears deeper; the whole colouring is therefore duller. I have reared a quite similar example from the Upper Harz; and Mr. Fuess, one of our collectors, tells me that he has taken this species, with the same dull dark colours, in the Island of Borkum also. Dr. Staudinger writes me explicitly that some specimens caught at Bodô, on the Saltenfiord, do not differ from those of Germany. Time of flight is 10th September.

* 33. **Cidaria immanata** Hw. and abb. *marmorata* Hw. Frey Alp.; Stdfs. Sil. Mont.; Stgr. and Wk. Cat. Isl.

I saw sixteen specimens from the mainland of Shetland, and four from Unst; the former varied considerably from one another; but in all the sixteen the markings were very distinct; while in the specimens from Unst the colours appeared more uniform and the markings rather faded.

In most examples a red-yellow ground-colour prevails on the upper wings; the basal and middle areas are black, more or less broken up into bands, and both are marked off on the side next the root of the wing by distinct white zig-zag lines. From Dr. Staudinger I obtained Icelandic specimens, which have more of a whitish ground colour, while the basal and middle areas are uniformly black.

There has been much controversy as to the relation of *C.*

immanata to *C. truncata* Hufn. (*russata* S.N.). In my opinion the two species cannot be kept separate merely by markings and by colour, since both are subject to vary in the highest degree. In *immanata*, however, the median area is more sharply zig-zagged, and sends out a larger and sharper tooth towards the margin. But the cut of the wings seems a more reliable character, yet one will not detect this unless he compares a considerable number of both species. The upper wings of *immanata* are always narrower and more sharply cut, and their tips are more prolonged than in *truncata*. I have found this distinction confirmed in twenty *immanata* from the Shetland Islands, and in three examples from Iceland, as against an equal number of *truncata* from the island of Arran, and at least thirty or forty examples of this species from Hanover, the Upper Harz, and Denmark.

Dr. Staudinger gives in the short diagnoses of his "Katalog" for *truncata* "sp. major," and for *immanata* "sp. minor," but this is not always applicable, since the *immanata* of the Shetland Islands were larger than the *truncata* from Arran, and were not smaller than examples of the latter from here (Hanover), and from the Upper Harz. It is very noteworthy that in the Shetland Islands only *C. immanata* has been taken, while in the Hebrides *C. truncata* alone is said to occur. I know that many good entomologists are in favour of uniting *immanata* and *truncata*, as, e.g., Drs. Wocke and Standfuss, who have certainly offered weighty arguments in favour of their opinion. Unfortunately, I could not compare examples from the Alps, where both species are said to occur, so I have been able only to prove in how far the two forms are related to one another in the material which was available to me for comparison.

In the Shetland Islands immanata is on the wing in August and September.

* 34. **Cidaria munitata** Hb. var. (*Coremia munitata* Hb.) Stgr. Isl.; Stgr. and Wk. Lap.; Wk. Norv. Alp.; Mösch. Labr.; Sch. Fen.; Frey Alp.

Of this variety I saw four males, which were all alike. The whole insect appears to be washed over with reddish yellow, so that no white appears. The outline of the red-brown median area is less distinct than usual. Mr. MacArthur tells me that *munitata* occurs in Shetland under this form alone. It is figured in the *Entomologist*, 1880; tab. 4, fig. 9. Mr. Schilde, from his own

statement, appears to have taken a similar specimen in Finnland, but only as an aberration, among others of the usual colour. Time of flight is July.

* 35. **Cidaria didymata** L. (*Larentia didymata.*) Wk. Norv. Alp.; Sch. Fen.; Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.

I saw three males and two females. The males are darker than with us (in Hanover); the colour of the females inclines more to yellowish. Spread of wing somewhat greater. The species occurs in almost the same form in the Upper Harz. Flies in August.

36. **Cidaria fluctuata** L. (*Melanippe fluctuata* L.) Stgr. and Wk. Lap.; Wk. Norv. Alp.; Sch. Fen.; Frey Alp.; Stdfs. Sil. Mont.

Apparently only one specimen of this species was taken in the islands; it is figured in the *Entomologist*, 1880; tab. 4, fig. 6. It appears to be quite dark, smaller, and with more pointed wings than our (Hanoverian) form. Mr. Schilde has captured a small specimen with rather sharp-tipped wings in Finnland also. Dr. Staudinger mentions for Lapland, and Prof. Frey for the Simplon and Gadmen valleys, a form with almost pure white ground colour (*Sempionaria* Rä), hence the species must vary exceedingly. Flies in June.

To be continued.

SCIENTIFIC JOURNAL.

ENTOMOLOGIST'S MONTHLY MAGAZINE.—*July*, 1885.—**Beræa pullata** and **Cruncecia irrorata bred** (from Scotch localities), by Kenneth J. Morton; **A Synopsis of the British Species of Cimbicidina, Hylotomina, Lophyrina, and Lydina**, by P. Cameron, running through July, August, and September numbers, gives tables of the genera and species of sawflies under the above groups, since there is no prospect of the third volume of the "Monograph of British Phytophagous Hymenoptera," before three years from now. The Scotch species are enumerated among the others. *August.*—**On the Occurrence in Britain of Nepticula Nylandriella, probably new to our Fauna** (in Sutherlandshire in May); **On the Larvæ of Coccyx taedana and Euchromia flammeana and arbutana**, rather common on **Arctostaphylos uva-ursi**, in Sutherlandshire; both notes by A. F. Griffith. **Lepidostoma hirtum bred**, from a quadrangular case, by K. J. Morton. *September.*—**A Great Swarm of Hydropsyche instabilis, Curt in Inverness-shire**, by J. J. King; **The Nitidulidæ of Great Britain** (concluded), by Rev. W. W. Fowler. In this instalment of the paper the following species are recorded from Scotland:—*Ips quadripustulata* L. from Aviemore, Rannoch, Braemar, Falkirk, Alvie, and Forres; *Litvophagus ferrugineus* Fabr., from Braemar. Aviemore, and Rannoch; *Rhizophagus depressus* Fabr., and *R. ferrugineus* Payk, widely distributed; *R. nitidulus* Fab., from Rannoch; *R. dispar* Gyll., from Braemar, Aviemore, and Rannoch; *R. bipustulatus* Fabr., common; *R. politus* from Aviemore.

PHYTOLOGY.

NEW SCOTTISH FLOWERING PLANTS.

By Ar. BENNETT, F.L.S.

Calamagrostis strigosa, Hartm, in Caithness.

IN Dr. Smiles "Life of Robert Dick of Thurso" will be found a record of his finding, at Loch Duran, in Caithness, a grass that Dick called "The Lapland Reed" (*Calamagrostis lapponica* of Hooker, not of Wahlenberg).

In 1883 I called Mr. J. Grant's (of Wick) attention to this note, and he wrote "The loch is now (1883) drained, so I fear the plant may be lost." It was not, however, until July of this year that Mr. Grant was enabled to carefully search the ground formerly covered by the loch and its borders. He was fortunate enough to refind the plant, and, on his sending me fresh specimens, I found that on examination they could not be referred to Hooker's plant, which is *C. stricta* Nutt. var. *Hookeri* Syme of the 3 ed. of "English Botany"; but must belong to either the *C. strigosa*, Hartm. or *C. borealis*, Læstadius, but as I had not specimens of either, I asked Mr. N. E. Brown of the Kew Herbarium to compare them, and his answer was "The plant is *C. strigosa* Hartm., for although the ligule is not quite so acute as in the typical plant, yet I do not see what else it can be." The plant was first described by Wahlenberg in his "Flora Lapponica" 1812-26, page 29, tab. 2," under the name of *Arundo strigosa*.

I give a few particulars of its distribution, etc.

Calamagrostis strigosa, Hartm. in 4th ed. of "Scandinavian Flora, 1843, and (according to Nyman, 1st ed., p. 46), 11th ed. (1879) page 517.

Andersson, *Gramineæ Scandinaviæ*, p. 97, fig. 99. Blytt, *Norsk Flor.* p. 136. *Norges Flora* p. 86. Fries *Summa Veg. Scandinav.*, p. 241. Fries *Herbarium Normale*, fasc. 8, No. 86.

It occurs at Alten in Finmark, about 70 N. Lat., Karesuando in Tornea Lapland at 66½° N., Trondhjem in North Norway, 63° 20′ N., and, if General Munro and Sir J. D. Hooker are correct in referring *C. aleutica* of Bongard, and C. Nutkaensis of Trin. to this species, its distribution extends to West and N. E. America, and N. E. Asia. Sir J. D. Hooker in his paper on "Arctic plants" (p. 307) gives *strigosa* as a Greenland species; but it is quite unknown as such to Prof. Lange, who in his "Conspectus Fl. Grœnlandicæ" doubts its occurrence.

According to Horneman its Norwegian name is "Stivhaaret Roer.," that is stiff-haired reed. Andersson under *C. lapponica*, Wahl. has a note "In Scotia adest forma nostræ plantæ valde similis" and under *C. Halleriana* "etiam ad Petropolim, indicatio in Anglia deest."

There seems no reason against the occurrence in Scotland of others of the Scandinavian species, but their determination is difficult; and there is much divergence of opinions among their authors as to whether they should be ranked as species, as varieties, or, in some cases as hybrids. Andersson considers the nearest ally of *strigosa* to be *C. stricta*, Nutt. (*Deyeuxia neglecta* Kunth). It differs from *stricta* by the larger and more acute glumes, the armature of the pedicels, length of hairs of the florets, and the more acute ligule, and in minor points, and in habit.

Since the loss of the Forfar station C. stricta Nutt is a desideratum of the Scotch Flora; surely it will be found again.

Carex elongata L. in Scotland.

Mr. J. M'Andrew has sent me specimens of the above species from Kenmore Holms in Kirkcudbrightshire; the station in which he found *Calamagrostis lanceolata*, Roth last year. This is an interesting addition to the Scotch Flora, its most northern station hitherto known being in Cumberland.

It may occur yet farther north, since in Scandinavia it is found in all the Swedish provinces, and in North and South Norway; but it does not seem to be a Lapland plant.

There has been some confusion between alpine forms of this, and of other species in the Islandic and other Floras. May it not be that some of its forms have been passed by in Scotland?

ON MYURIUM HEBRIDARUM AND OTHER MOSSES IN THE HEBRIDES.

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

THIS year I paid a visit to the Outer Hebrides mainly for the purpose of investigating the Lichen Flora of the Atlantic sea-board. I was miserably disappointed. Foiled in this direction, I turned my attention to their Moss Flora.

On the 8th of August Dr. Dougall and I arrived at Creagorry Hotel, on the southern shore of Benbecula, and within 200 yards of the ford to South Uist. On the following Tuesday we traversed extensive sandy-dunes on the western shore in order to secure the rare and beautiful moss *Myurium Hebridarum*, but failed utterly. The only moss of any consequence seen was *Bryum Marratii*. After several hours of weary and unprofitable wandering we made a detour towards the numerous lochs so thickly scattered over this strange island. From the summit of Ruival (the only eminence of any consequence) at an elevation of 400 feet we counted 52 lochs. The shores of at least a dozen of these were diligently investigated without seeing a trace of the moss. *Campylopus brevipilus* was met at almost every step, as well as the pretty flowering plant, *Anagallis tenella*, and, in many of the lochs, *Sparganium natans* and *Potamogeton filiformis* were plentiful, and proved a great annoyance and interruption to my companion's sport as a fisher.

The shores of several of these lochs showed, besides, *Osmunda regalis* in abundance and more especially did this fern affect the smaller islands that dotted their surfaces; while here and there, on the grassy slopes, was detected the beautiful *Ophioglossum vulgatum*. We desisted from our search.

Next day proving suitable for fishing, we agreed to try Loch Bee on the northern shore of South Uist. We were fairly successful, but the boat being rather leaky our gillie proposed to row ashore and empty it by capsizing. Not ten yards from the spot where we grounded we picked up a tuft of the Myurium, and within 200 yards could have filled our fishing baskets with it. The waters of Loch Bee are brackish, inasmuch as the sea effects an entrance at high water, both on its eastern and western shores.

It is rather curious that *Schistidium maritimum* grows along with the Myurium, and for the most part at a lower level. I might include a third—viz., *Mnium hornum*. The Myurium was never found below high water mark, thus affording a presumption that the brackish water was injurious to it; and yet throughout the Hebrides it never grows far from such brackish water. According to my experience the moss has not been found at a greater elevation above the surface of the water than from 20 to 30 feet. An apparent exception to this rule might be adduced in the case of Loch Coruisk in Skye. As is well known this loch is between 40 and 50 feet above sea-level at high water, and its mouth not more than 150 yards horizontally from the sea-beach.

At a little distance from the outlet of this loch on both sides the Myurium is found sparingly. It is only where the salt spray during storms can directly find access to it that the moss grows, and even then in a stunted condition. In this situation it is evidently losing its hold, and threatens to become extinct.

After finding the moss in South Uist, we devoted another day to its detection in Benbecula. We were successful. On stating to our gillie the conditions necessary to its growth, he took us to a loch on the east coast having direct communication with the sea only during spring tides. Here the moss was found under exactly the same circumstances and amid the same surroundings. Stimulated with this success, we took an opportunity, on our homeward voyage, to make a run to two lochs near Lochboisdale, but were unsuccessful. To both the sea had direct access with each tide. As we were to be detained in Barra for nearly three hours we agreed to explore a loch on its west coast, whose connections with the sea were reported to be rather distant. We found the moss in great luxuriance, perhaps in the finest condition of all the stations. The water tasted slightly brackish.

I have now this moss from Skye, North Uist, Benbecula, South Uist, Barra, Teneriffe, and the Azores, *i.e.*, from the Mid-Atlantic Ridge and from nowhere else.

I shall be happy to supply Bryologists with specimens of the Myurium.

5 Newton Terrace, Glasgow.

THE POTATO SCLEROTIET.

By A. STEPHEN WILSON, C.E.

WHAT is a Sclerotium? The best known and most easily found sclerotium, is the one called *Ergot*,—the sclerotium of *Claviceps purpurea*, Tul. Its structure can be fully determined only by watching its growth from the earliest stage up to maturity. In the earlier stages this body is quite white, and is seen to consist of an interior axis of sponge-like mycelium, enclosed in enormous numbers of small oblong spores. These become agglutinated around the axis, and the whole gradually assumes a dark purple colour. Another sclerotium which is very easily found in April on dead leaves of turnips and other plants, is that of *Typhula incarnata*. This also is at first perfectly white. It may be found below the snow in February upon dead leaves, of a size little more than visible to the naked eye, and it gradually grows to the bulk sometimes of a tare seed, and is of a brown colour. But the structure of this sclerotium is not the same as ergot. It originates on the point of a line of mycelium. This line begins to branch, and the branches immediately begin to branch; and the ramification is so close, that the lines of mycelium, instead of running away out into a loose web, form a solid ball. In this case there is no axis, and there are no spores. In some other sclerotia the mass is hollow in the interior, with many loose lines of mycelium pointing inwards.

It is thus evident that all sclerotia, admitted as sclerotia, are not formed on the same plan: so that if a small body is found in the leaves and tubers and haulms of the potato, bearing some resemblance to the sclerotium of *Typhula incarnata*, there is no great impropriety in calling it a sclerotium until the theory of its existence has been worked out. But the body which has actually been found in the potato tissues, and most perfectly developed in the leaves, is so small compared with other sclerotia, that there seem some propriety in calling it a *sclerotiet*, to indicate its microscopic dimensions.

Considerable controversy has taken place as to the structure of this minute body. When the statement was first made that this little ball was the sclerotium from which the mycelium of *Peronos-*

pora infestans originated, it was natural that it should be denied. Accordingly, materials were put into the hands of Mr. George Murray, by the Scientific Committee of the Royal Horticultural Society, and that observer, taking to his assistance Dr. Flight of the British Museum, tested the so-called *sclerotiets,* and declared them to be merely masses of oxalate of time.

Oxalate of lime is intimately associated with many minute fungi; some of the myxomycetes are covered with its crystals, as are also some of the Pezizae. In the *Peziza crucifera*, every hair is surmounted by a crystal of oxalate of lime. There is thus no improbability in the assumption that the sclerotiet may be associated with oxalate of lime. It has accordingly now been found, in opposition to Mr. Murray and Dr. Flight that the body found in the potato leaf, instead of being simply a mass of lime is in reality a plasmodium, *coated* with crystals of oxalate of lime. No one has done more to demonstrate this point than Professor Trail; but it has been fully acquiesced in by Mr. Worthington G. Smith and Mr. Greenwood Pim. Mr. Murray has replied that the oxalate of lime instead of forming the coat, forms the core. From this position also he has now, by the same observers, been completely dislodged; and the bodies are declared to be balls of some kind of plasm, covered over with a coat of irregularly formed crystals. These crystals are known to be the oxalate of lime because they do not dissolve by application of acetic acid, as the carbonate of lime does. They resist acetic acid but rapidly give way to nitric acid.

Such, briefly stated, is the present position on this point of structure; but there is no proof thus far, that these "encrusted plasmodia," are bodies having an arrested vitality like a sclerotium. Observation of their germination can alone establish this contention. The present note cannot go into this department; but may conclude with a few hints to any one fascinated with the desire to penetrate the mysteries of nature. The difficulty of course is to see the lines of mycelium arising from the so-called sclerotiet. The bodies cannot be seen at all in the leaves till they are macerated for a few days in water and gently squeezed between two glass slides. Then the lines of mycelium at their origin are so fine that unless they are separated from the leaf tissue they cannot be seen at all; a sufficient power cannot get within focus of them. The best method yet hit upon is to strip the cuticle from the lower

side of the leaf in the hope that a sclerotiet or a part of it may be torn up along with the mycelium attached to it. If a piece is laid on a slide, it will be seen how the conidiophores of the Peronospora come out at the stomata. The cuticle must be stripped off with a pincers near the edge of a black spot from the still green portion of the leaf, after the disease has begun. One, two, three, and up to nine stalks may be seen coming from a single stoma; and the question is what are these granular masses at the thin ends of them? It has to be established that they are portions of breaking-up sclerotiets, before it is fully proved that the sclerotiets are resting states of the *P. infestans*. This cannot be done by any one who wishes to try, till the autumn brings disease; but during the summer he may become familiar with the bodies in their incubating stage, and will then be prepared to settle the question whether disease commences with their germination.

MYCOLOGIA SCOTICA—Supplement.

By REV. J. STEVENSON and Professor J. W. H. TRAIL.

(*Continued from S. N.*, 1885, *p.* 130.)

(*All measurements, except where specified, are in thousandths of a millimetre.*)

3040. **Stagonospora Caricis** (Oud) Sacc. *Syll. Fung.* III. 2471.

Perithecia numerous, but not in contact, subdermal, 140 diam.; opening by apical pore, rather membranous, brown; spermatia nearly hyaline, fusiform with rather obtuse ends, 35-45 by 6, mostly 4-septate.

On dead leaves of *Carex* (*lævigata ?*). May.

East. — — — Dee — — — —

West. — — — — — —

Drumoak, near Aberdeen. J. W. H. Trail.

Europe (Netherlands).

3041. **S. paludosa**, S. and Sp. (Sacc. *Syll. Fung.* III. 2475, Trail, *Scot. Nat.* 1885, *p.* 76).

Perithecia numerous, but scattered, subdermal, nearly free from surrounding tissues; subglobose, with small ostiolum, about 220 diam.; spermatia pale yellowish, fusiform, 42-52 by 8, 7-9-septate.

Common in dead leaves of *Carex ampullacea*. Jan.—Apr.

East.	—	—	—	Dee	—	—	—	—
West.	—	—	—	—	—	—	—	—

Near Aberdeen. J. W. H. Trail.

Europe (North Italy, on C. riparia).

3042. S. Heleocharidis Trail, *Scot. Nat.* 1885, *p.* 76.

In dead stems and leaves of *Heleocharis palustris*. Jan.—March.

East.	—	—	—	Dee	—	—	—	—
West.	—	—	—	—	—	—		

Common near Aberdeen. J. W. H. Trail.

3043. Septoria Stellariæ, Rob. and Desm. *Not.* XIV. *p.* 22, Sacc. *Syll. Fung.* III. 2806, Phil. and Plowr. *Grevillea* XIII. *p.* 50.

Amphigenous; perithecia minute, opening by a pore. brown; spermatia filiform, curved, 50-60 by 1, indistinctly septate, hyaline.

In leaves of Stellaria media, and S. graminea.

East.	—	—	—	Dee	Moray	—	—	—
West.	—	—	—	—	—	—		

Forres, 1882. Rev. Dr. Keith. Near Aberdeen. J. W. H. Trail.

Europe (France and Italy), and Siberia.

3044. Septoria Violæ West. Sacc. *Syll. Fung.* III. 2811.

Perithecia numerous, in round, brown-margined, pale spots on upper surface of leaf, minute, pale brown; spermatia elongate-fusiform, 25-30 by 2½-3, rarely reaching 42 by 4½, straight or curved, faintly 3- (rarely 4-6-) septate, hyaline.

In dying leaves of *Viola sylvatica*.

East.	—	—	—	Dee	—	—	—	—
West.	—	—	—	—	—	—		

On Links near Aberdeen. J. W. H. Trail.

Obs. This plant agrees in spots and perithecia with *Phyllosticta Violæ* Desm. (Cooke, *Hbk.* 1352, *Scot. Nat.* VI. 118), but in the latter the spores are subcylindric, and 10 long.

* **S. Ficariæ**, Desm. *Mycol. Scotica* 1142, Cke. *Hbk.* 1324.

On *Ranunculus Flammula*, on the Links near Aberdeen, a Septoria occurs that agrees in all essential points with this species, though its perithecia are 110 to 120 in diam., and its spermatia are 35-45 by 1¼-1½, being rather larger than in type. J. W. H. Trail.

3045. S. Menyanthes Desm. *C. Hbk.* n° 1325.

On fading leaves of *Menyanthes trifoliata.* August and September.

East.	—	—	--	Dee	—	—	—	—
West.	—	—	—	—	—	—	—	—

Common near Aberdeen and near Peterhead. J. W. H. Trail. England, Belgium, France, Siberia.

3046. **S. Petroselini** Desm. *Ann. Mag. N. Hist.* (Sacc. *Syll. Fung.* II. 2876).

On discoloured, brownish or pale, amphigenous spots; perithecia hemispherical, 70-130 diam., thin, brownish; ostiolum prominent; spermatia 25-50 by 1½-2, filiform, straight or slightly curved, hyaline; continuous, or very faintly 3 or 4-septate.

In leaves of *Petroselinum sativum.*

East.	—	—	Tay	Dee	—	—	—	—
West.	—	—	—	—	—	—		

Aberdeen. J. W. H. Trail. Glamis. J. S. (in Berkeley's Herbarium at Kew).

Europe. South America.

3047. **S. dolichospora** Trail, sp. n.

Perithecia scattered, subdermal, oval-lenticular, 280 by 240, opening by a prominent pore, pale brown, pore in a darker ring; spermatia very long, filiform-fusiform, 120-130 by 2-2½, flexuous or much curved, hyaline but faintly yellowish, pluriguttulate, or septa very faint, but numerous (9 to 12).

Obs. This species differs from all allied forms in the length of the spermatia, and in their tenuity. *S. lacustris* Sacc. and Thüm. approaches nearest it, but has spermatia 75-85 by 3-3½).

In dead drifted stems of *Scirpus lacustris.* May

East.	—	—	—	Dee	—	—	—	—
West.	—	—	—	—	—	—		

Loch of Park, not far from Aberdeen. J. W. H. Trail.

3048. **Rhabdospora pleosporoides** Sacc. *Mich.* I. *p.* 120 (*Septoria*), var. *rubescens* Karst., *Symb. Myc.* XV. *p.* 151, Sacc. *Syll. Fung.* III. 3199.

Perithecia on a dull reddish spot on the dead stems, subdermal, globoso depressed, ostiolum short; spermatia slender fusiform, usually curved, 25-30 by 1½-2, pluriguttulate.

On dead stem of Angelica sylvestris. May

East.	—	—	—	Dee	—	—	—	—
West.	—	—	—	—	—	—		

Near Aberdeen, and at Park. J. W. H. Trail.
Europe, the variety in Finland.

3049. **R. Cirsii** Karst. *Symb. Myc.* XV. *p.* 151, Sacc. *Syl. Fung.* III. 3218.

Perithecia brown, scattered, numerous, subspherical or depressed, 400 diam. ; often depressed around base of prominent ostiolum, which ultimately becomes more than half as long as perithecium itself ; spermatia filiform, straight, rarely curved, 40-45 by 1-1½, septa faint or absent, pluriguttulate.

On dead stems of *Carduus palustris.*

East. — — — Dee — — — —
West. — — — — — —

Near Aberdeen. J. W. H. Trail.
Europe (Finland).

3050. **Gloeosporium Gei** Trail, sp. n.

Spots brown, about 200-300 diam. ; scattered, opening by a pore ; spermatia very numerous, hyaline, fusiform or elliptical acute, 7-9 by 2-2½, straight or slightly curved, continuous, hyaline, or with 2 guttæ, supported on crowded, slender spermatiophores.

In dead stems of *Geum urbanum.* Dec.

East. — — — Dee — — — —
West. — — — — — —

Near Aberdeen. J. W. H. Trail.

* **Coryneum microstictum** B. and Br. is abundant in the neighbourhood of Aberdeen, April-May, on *Rose* twigs and fruits. J. W. H. Trail.

* **Asterosporium Hoffmanni** Kunze, *Myc. Scot.*, n° 1178. Common on *Beech* twigs near Aberdeen in February. J. W. H. Trail.

3051. **Tetraploa aristata** B. and Br. Cke. *Hbk.* n° 1451.

On leaf-sheaths of *Phalaris arundinacea.*

East. — — — Dee — — — —
West. — — — — — —

Near Aberdeen, scarce. J. W. H. Trail.
England.

3052. **Echinobotryum atrum** Corda. Cke. *Hbk.* n° 1452.

On Stysanus Stemonitis on rotting plants.

East. — — — Dee — — — —
West. — — — — — —

Old Aberdeen, not very abundant. J. W. H. Trail.

Obs. Reinke and Berthold (*Zersetz. d. Kartoffel durch Pilze*, 1879, *p.* 54), regard this as a form of fruit of S. stemonitis.

3053. Gymnosporium arundinis Corda. Cke. *Hbk.* n° 1453.

On dead stems of *Phragmites communis.* May

East. — — — Dee — — — —

West. — — — — — —

On coast between Cove and Aberdeen. J. W. H. Trail.

3053. Phragmidium violaceum Schultz.

Plowright, *Science Gossip*, 1883, *p.* 13; Trail, *Scot. Nat.*, 1884 (Jan.), *p.* 123.

Æcidio-spores in roundish or elongated scattered groups; spores in short chains, round or elliptical, echinulate, orange yellow, 19-30 by 17-24. *Uredo-spores* in rather large, roundish, cushion-shaped, scattered (rarely confluent) sori; spores yellow, round, seldom elliptical or ovate, with a thick, coarsely echinulate epispore, 17-32 by 17-24. *Teleuto-spores* 3-5-(usually 4-) celled, 105 by 35, warty, tipped with a paler subglobose or conical papilla, stalk long, dilated at base. (Scotch examples have spores 70-90 by 25-30. J. W. H. Trail.)

On the lower surface of leaves of brambles (*Rubus fruticosus*); on the upper surface opposite each sorus there is usually a red-brown spot.

East. — — Tay Dee — — — —

West. Solway — — — — —

Common around Aberdeen, near Guthrie in Forfarshire, and near Dumfries. This species is the only one that I have met with on brambles in Scotland, in the above localities. J. W. H. T. This is probably the form denoted by the name *Ph. bulbosum* Schl. in *Mycologia Scotica*, n° 1210, but perhaps another species occurs with it—viz., *Ph. Rubi* Pers. The latter species has been detected by Mr. Plowright in specimens sent him from Yorkshire (*Science Gossip*, 1883, *p.* 12). It differs from *Ph. violaceum* in the æcidio-spores being rounder (18-22 diam.), the uredo-spores narrower (17-32 by 12-20), and the teleuto-spores, in *small* round sori, being 3-8-(usually 5-6-) celled; slightly longer, and ending in a longer cone or papilla. This form should be looked for in Scotland.

3055. Puccinia Thalictri Chev. (*Flor. Paris*, I. *p.* 417); Winter's *Pilze*, Vol. I. *p.* 177; Trail, *Scot. Nat.*, 1884, *p.* 118.

Spots none, but diseased parts paler green; and whole plant often tall, with narrowed leaf-segments; sori hypophyllous numerous, suborbicular, soon naked, dark brown; spores

30-42 by 15-24, on rather long deciduous stalks; cell-walls rather thick, dark brown, beset with pointed warts, cells separated by a deep constriction, upper usually round, lower varying in form from spherical to clavate; only teleutospores are known. Is much like *P. Anemones.*

On *Thalictrum minus* var. *montanum.* Sep.

East.	—	—	Tay	—	—	—
West.	—	—	—	—		

Rannoch. J. W. H. Trail.
Europe.

* **1235** var. **P. Hieracii** Schum.

(Winter, in Rabenhorst's *Cryptogamen Flora, die Pilze, p* 207), says that this differs from normal P. compositarum only in absence of known æcidium, and in the uredo being accompanied by spermogonia.

On *Hieracium vulgatum* and *H. Pilosella.* Aug.

East.	--	—	—	Dee	—	—
West.	—	—	—	—		

Aberdeen and Braemar. J. W. H. Trail.
Europe.

3056. Cæoma Laricis (West.) Phil. and Plow. *Grevillea*, Vol. XIII. *p.* 73.

Sori small, ½ to 5 mill. long, on yellow spots, surrounded by the white epidermis; spores roundish or elliptical, often rather angular, finely verrucose, orange yellow, 16-24 by 12-17.

Around the periphery of the sori are numerous somewhat clavate empty cells, crowded together and super-imposed on one another.

On *Pinus Larix* L. May.

East.	—	—	—	—	Moray	—
West.	—	—	—	—		

Forres, 1884. Rev. Dr. Keith.
England. Europe.

* **Uredo Pirolæ** Gmel. (=**Trichobasis Pyrolæ** B.) is abundant on *Pyrola media,* a few miles north of Aberdeen. J. W. H. Trail.

3057. Protomyces rhizobius Trail, *Scot. Nat.* 1884 (*Jan.*), *p.* 125.

Spores spherical, 30-33 diam.; cell-wall very thick (10-12), nearly hyaline or pale brown; they are dispersed through the cortex of the roots of *Poa annua*, and are associated with what seems to be a delicate mycelium. They are much larger than the cells of the root. May-June.

East.	—	—	—	Dee	—	—		
West.	—	—	—	—				

Common at Old Aberdeen in poor soil. J. W. H. Trail.

3058. Doassansia Alismatis Cornu. *Ann. Sc. Nat.* 1883, *p.* 285, *pl.* 16, *figs.* 1-4. Trail, *Scot. Nat.* 1884, *pp.* 124 and 180.

In spots in dying leaves of *Alisma Plantago.*

East.	—	—	Tay	Dee	—	—	—	—
West.	—	—	—	—	—	—		

At Cults, near Aberdeen. J. W. H. Trail. Fern in Forfarshire (Rev. J. Fergusson, in Mr. Berkeley's *Herbarium* at Kew, *sub nom.* **Protomyces Alismatis** B. and Br).

3059. Entyloma Calendulæ Oud. Trail, *Scot. Nat.* 1884, *pp.* 124-25.

In round pale spots, $\frac{1}{4}$-$\frac{1}{2}$ inch across (afterwards turning brown and dry), in leaves of *Hieracium vulgatum.* Autumn.

East.	—	—	? Tay	Dee	—	—	—	—
West.	—	—	—	—	—	—		

Near Aberdeen, common. J. W. H. Trail. In Berkeley's *Herbarium* is a specimen (*sub nom.* **Protomyces Hieracii** B.) sent by Rev. Mark Anderson from Noran Woods in Fife.

3060. E. canescens Schröt. (*Beitr. z. Biologie d. Pflanzen*, II., *p.* 372. Trail, *Scot. Nat.* 1884, *pp.* 125, 180 (=**Protomyces Fergussoni** B. and Br. *vide Mycol. Scotica*, n° 1324).

In round pale spots, $\frac{1}{16}$-$\frac{1}{8}$ inch across (turning brown, or becoming white from formation of conidia over their surface), in leaves of *Myosotis arvensis* and of *M. palustris.*

East.	—	—	Tay	Dee	Moray	—	—	—
West.	—	—	—	—	—	—		

Fern, Forfarshire, and New Pitsligo, Aberdeenshire. Rev. J. Fergusson. Near Aberdeen, and at Ellon. J. W. H. Trail. Forres. Rev. Dr. Keith.

To be continued.

SCOTTISH SCIENTIFIC SOCIETIES.

EAST OF SCOTLAND UNION OF NATURALISTS' SOCIETIES.—The annual meeting was held in Kirkcaldy on *4th* and *5th September.* A full report of the proceedings will appear in our next number (*January*), and will include the address of the President, Professor James Geikie. See notice on second page of the wrapper of this (*October*) number.

MEETING OF BRITISH ASSOCIATION IN ABERDEEN.—(*September 9th* to *16th.*)—Space makes it necessary to postpone till our January issue any notice of this meeting, which was of special interest to Scottish scientists alike because of its being held in Scotland, and because of the number of papers read upon subjects relating to Scotland.

EAST OF SCOTLAND UNION OF NATURALISTS' SOCIETIES.

MEETINGS IN KIRKCALDY, 1885.

Council Meeting.

A meeting of Council was held in the Town Hall, on Friday, 4th September, 1885, at 12 o'clock.

Present—Dr. F. Buchanan White in the chair; Dr. J. S. Crichton; Dr. Howden; Messrs. Robert Pullar, George Russell, James Shepherd, Professor J. W. H. Trail, Messrs. J. Martin White, and W. D. Sang (hon. secretary).

The minute of last Council meeting having been read and approved, the question of the assessment to be levied for the next session was discussed.

Mr. Shepherd proposed and Dr. Crichton seconded, that the assessment on the several societies should be fourpence per head, which was agreed to.

Dr. Crichton proposed and Dr. Howden seconded, that the Union should arrange, if possible, for the publication of the Reports in the *Scottish Naturalist.* Professor Trail, the editor, having cordially assented to this proposal, and stated that the Reports could be reprinted in pamphlet form for distribution to members of the Union, it was decided that this form of publication should be adopted, and that, in consideration thereof a sum not exceeding £10 should be contributed to defray expenses of the magazine.

It was unanimously agreed that the next Annual Meeting should be held in Aberdeen, and that the date should be left to the Aberdeen Society to determine.

The Secretary read a letter from Professor T. G. Bonney intimating that the Union had been recommended for election as one of the Corresponding Societies of the British Association, and asking that a Delegate of the Union be named to be present at the Aberdeen meeting of the Association.

On the motion of Dr. F. B. White, Dr. Howden was elected

Delegate, and the Secretary was instructed to take the necessary steps to have his appointment certified out.

It was unanimously resolved with reference to the Scientific Reports that the Council in returning their thanks to the various reporters for their past work, recommend that the authority given to these gentlemen at last annual meeting should be continued, and that the further Reports should be made on the lines sketched out in the first Presidential Address.

It was unanimously agreed that Professor Trail, Dr. F. B. White, and the Secretary should be the publication Committee, with full powers to decide what shall be published, and to take steps to obtain the assistance of members to collect all the information, scattered through books and periodicals, relating to the Natural History of the district, in view of the preparation of full index-lists, for future publication in the Proceedings of the Union.

Annual General Meeting.

The Annual General Meeting was held in the Town Hall, Kirkcaldy, on Friday, 4th September, 1885, at 14.30 o'clock (2.30 p.m.) —Dr. F. Buchanan White in the chair.

The minutes of last annual meeting, and of all the meetings of Council since, having been read and approved, Dr. F. B. White introduced as President for the year Professor James Geikie, who gave the Presidential Address.

The following Papers and Reports were then read:—

"Meteorology," .....by Mr. David Cunningham, M. Inst. C E., Dundee.
"Sprats,"..... ,, Dr. F. Buchanan White, F.L.S., Perth.
"Mollusca," ..... ,, Mr. Henry Coates, Perth.
"Birds of the District," ..... ,, Col. Drummond Hay, C.M.Z.S., Perth.
"Fungi of the District,"..... ,, Professor J. W. H. Trail, F.L.S., Aberdeen.
"Flora of Fife and Kinross," ,, Mr. Charles Howie, Largo.

In the evening the guests from the sister-societies were most hospitably entertained to dinner by the members of the Kirkcaldy Natural History Society; and at 20 o'clock (8 p.m.), a conversazione was held in the Corn Exchange, and was the scene of a large gathering of naturalists and their friends. A great variety of

curious and interesting objects had been brought together by the exertions of members of the Kirkcaldy Society, and the arrangements were so diversified as to prevent the pleasure of the evening from ever flagging.

Concluding Meeting.

A meeting of the Union was held in the Town Hall, Kirkcaldy, on Saturday, 5th September, 1885, at 20 o'clock (8 p.m.)—Professor James Geikie in the chair.

Reports of the Geological and Botanical Excursions to Burntisland were given by Professor Geikie and Mr. W. S. Blackstock. Mr. J. T. Cunningham, Mr. John Rattray, and Mr. H. J. Gifford gave the report of the Dredging Expedition on the Forth.

On the motion of the Chairman, a vote of thanks was accorded to the Kirkcaldy Naturalists' Society for the arrangements made for the reception of the Union.

The Chairman having intimated that the next Annual Meeting of the Union would be held in Aberdeen, the meeting was brought to a close by a hearty vote of thanks to the President.

PRESIDENTIAL ADDRESS TO THE EAST OF SCOTLAND UNION OF NATURALISTS' SOCIETIES.

By Professor JAMES GEIKIE, F.R.S., F.G.S., &c.

Read on 4th September, 1885.

I HAVE to congratulate you upon the great success which has attended the formation of this Union. It is a happy idea, happily carried out, and one which is sure to have the happiest results. If the lines laid down by Dr. Buchanan White in his inaugural address of last year be only faithfully followed, there can be no doubt that we shall in a few years know much more than we do at present of the botany, zoology, and geology of the east of Scotland. The scheme of work proposed by Dr. White is comprehensive and complete, and I earnestly hope that the thoughtful enthusiasm of my predecessor will stir up each Society in the Union to do its utmost towards the accomplishment of his ambitious design. Of this I am quite sure, that the work is well within the ability of the Union. Its elaboration will doubtless

take many years, but naturalists build not for themselves alone, but for their successors; and to them work is, or ought to be, its own reward. Now, what is the nature of that work in which we are called upon to engage? We do not, of course, suppose that the aim and end of this Union is simply to obtain a complete census of all the rocks, minerals, fossils, and species of plant and animals, occurring in the East of Scotland. Many of us, it is true, find our chief delight in the important and essential work of collecting and cataloguing; and it is well that it should be so. Others, however, will not rest satisfied with observations, but by the very constitution of their minds, are compelled to ask themselves what these observations mean. In illustration of this I need go no further than the President's address last year. His intimate knowledge of the plant-life of the basin of the Tay has only been acquired after long years of careful exploration, during which, few if any species can have escaped his notice; and we see how various features in the distribution of those plants have incited him to ask how and why certain forms occupy their present habitats. From observing the plants themselves he has been led to inquire into the origin of their distribution. This is one of the high questions to the solution of which the various Societies of this Union are expected to contribute. Hitherto these higher lines of research and thought have been followed by only a few inquirers; and the data at the command of each have necessarily been more or less limited. Hence our knowledge of the origin of the geographical distribution of British plants and animals has not advanced so rapidly as that of other branches of natural science. Some general sketches we have had, sketches often suggestive and inspiring, but the details neeessary for an exhaustive review of the subject are still lacking. What I conceive then to be one of the chief aims of this Union, is the careful and exhaustive collection of data, which shall render possible the elaboration of a complete natural history of the East of Scotland. This history will begin with the geology of the region; and will trace out the gradual evolution of the land—showing what changes in geographical and climatic conditions have taken place from time to time, since the oldest of our aqueous rocks began to be laid down, pointing out how the configuration of the surface, the nature of the soil, the drainage and even the climate of the present, are dependent upon the rocks and the mode of their arrangement. Not only so, but

the history to be eventually compiled through the labours of this Union, will, as I believe, track the sources of our existing flora and fauna and the various stages in their immigration, and will show what effect the later geological changes had in determining the existing geographical distribution of species. The area embraced by the Union is wide enough surely to allow of these, and other important matters, being worked out in detail. In this connection it has appeared to me, that I might on this occasion indicate certain lines of research, which from a geological point of view, seem to promise no little aid to botanists and zoologists, in their endeavours to read the history of our flora and fauna. I am not going to inflict upon you any account of the geology of the East of Scotland. It is too long a story, and is one of those tales which will not bear much compression. Nevertheless, it is necessary to refer to some of the leading geological features of the district, for the purpose of impressing upon naturalists certain facts which they cannot well ignore if they wish to tell us all that we should like to know about the geographical distribution of our plants and animals. When one looks at the area under the supervision of this Union, one must be struck with the notable variety of its outline or surface-configuration. In the north and west it embraces a large portion of the Highlands; in the south and south-east it includes a most typical region of the Lowlands. A rapid glance at the geological structure of these districts, would show us that the Highland area is composed for the most part of hard crystalline and sub-crystalline rocks; while the rocks most abundantly met with in the Lowlands are sandstone and shales. Again, we should find that the isolated hills and belts of high ground which diversify the surface of the latter area, consist chiefly of crystalline rocks. Now, those crystalline and fragmental rocks of the Highland and Lowland districts are of very diverse composition, some being composed largely of silicates of the alkalies and alkaline earths, while others consist chiefly of silica or of clay, or of admixtures of these and other mineralogical constituents. Only in a few places does carbonate of lime form any considerable rock-masses.

As everyone knows, the soils of a country are composed of disintegrated and altered rock-materials mixed with some proportion of organic matter. Under the action of frost, rain, and decaying organic matter rocks are broken up, and their mineral constituents more or less chemically altered; so that the character

of a soil is necessarily determined by that of the rocks from which it has been derived. Hence, as we pass across a country from one geological formation to another, we find that the soils take on a different character with every change in the distribution of the underlying rocks. Speaking generally, the rocks in the East of Scotland are disposed in narrow and broad belts, which extend from south-west to north-east; so that when we traverse the land from north-west to south-east, or across the strike, we encounter a greater variety of soils than we do when the same area is crossed at right angles to that direction, namely from south-west to north-east. But although a south-west and north-east trend is common to all the strata in the East of Scotland, there are yet certain rock-masses which are very irregular in the mode of their occurrence. This is the case, for example, with the granites of Aberdeen and Forfar, and, to a less extent, with many of the igneous rocks of the Lowland area particularly with those of Fife. More than this, we find that the distribution of the soils does not always follow precisely that of the underlying rocks. In every stream and river-course for example, disintegrated material is swept from higher to lower levels, so that the soil of a valley-bottom may differ very considerably from that which the underlying rocks would have supplied. Again, rain is continually washing down soil from the steeper slopes of the land, and hence soils derived from the decomposition of one set of rocks may come to overlie rocks of a totally different kind. In short, it cannot be too constantly kept in mind that all soil is constantly travelling from higher to lower levels. Now this travelling of the soil, which we see taking place before our eyes, was effected occasionally in a very wholesale fashion during former geological periods: with the result that the influence of the underlying solid rocks upon the composition of the overlying soils has often been obscured, or even entirely set aside. During the Ice-age the whole of the area under review was subjected to the long-continued action of glacial erosion. Before the advent of those sterile conditions, the soils and sub-soils of our country must have attained a great thickness. For unnumbered æons the rocks had been subjected to the influence of the weather—to the mechanical and chemical action of rain and frost, and doubtless, to the action of the organic forces also. Hence long before the Ice-age arrived, our hills and valleys must have been thickly clothed with the ruins of rocks, just as is the case in our own day with those

land surfaces that have never experienced glaciation. All this loose material was swept forward under the ice-sheet which mantled Scotland; and the solid rocks themselves were bared, abraded, and quarried by the ice. When the ice melted away, its ground-moraine was left sprinkled over hill-tops and slopes, and spread in more or less continuous sheets over the low-lying and gently undulating regions. Thus wide areas of solid rock are now and again buried under great depths of materials which are more or less foreign to the district in which they occur. The debris of the Highland region, for example, is thickly spread in Strathmore, while material derived from the degradation of the rocks of Strathmore is met with all over the area of the Sidlaw Hills. Thus, throughout wide tracts in East Scotland the vegetable soils are not derived directly from the disintegration and decomposition of the underlying solid rocks, but from the weathering of ancient morainic and fluvio-glacial accumulations, much of which consists of travelled material. Hence we may expect to meet with very different kinds of soil distributed over the surface of one and the same geological formation. I think it is partly because of this that naturalists have somewhat undervalued the influence of geological structure upon the distribution of our flora and fauna. They look at a geological map, and see broad belts of mica-schist, or slate, or sandstone, or igneous rock, as the case may be, represented as extending for great distances, and yet these variously coloured bands of rock do not seem to correspond to any relative changes in the distribution of plants and animals. But a very cursory examination of the subsoils will show that these are frequently made up to a large extent of material derived from some neighbouring district—so that debris from the immediately underlying solid rocks may enter but meagrely into the composition of the vegetable soil. When this simple fact is borne in mind, naturalists will hesitate to conclude that geological structure is not one of the factors with which they have to deal. Now it would be a very great aid to botanists and zoologists if they had prepared for their use geological maps which showed not only the distribution of the "solid" rocks, but that of the overlying superficial accumulations. By-and-by the Geological Surveyors shall have completed their work; and the maps issued by them will be of great service to local geologists, who will find that however careful and exhaustive a general survey may be, it

yet cannot be expected to leave nothing for local observers to accomplish. From the maps of the Survey we shall get the general geological structure, the direction of glaciation, and the distribution of superficial deposits. With these data for a groundwork, it should not be difficult for the local observers in each Society of the Union to construct correct soil-maps of their respective districts. Were this accomplished for the East of Scotland, we should soon be able to ascertain to what extent geological structure influences the distribution of species.

It goes without saying, however, that soil is not the only factor which naturalists have to take into account. Every farmer knows that good soil is of little avail if it be not favourably placed. The same soil under diverse conditions may support very different floras. The physical features of the surface, therefore, have to be noted; the relative height above the sea, rainfall, temperature, and all that comes under climatic conditions, must likewise be considered. Very slight differences sometimes give rise to strong contrasts in the flora of a district. Thus I have frequently observed in hilly districts, where all the conditions of soil and drainage were similar over a wide region, that those slopes which faced the direction of the rainy winds were clothed with the densest and thickest turf or peat. This is strikingly marked in the case of the peat-covered hills of western Galloway, where, on the slopes looking westward, the peat-bogs are fresh and growing; while on the eastward slopes they are often dried up, and in many cases are being gradually disintegrated and denuded away. Naturally, then, we shall expect to find that climatic conditions everywhere modify the influence of the soil in the distribution of species.

I have suggested to the geologists of the Union the construction of soil-maps of the district. It would be a great matter to obtain rough analyses of the various typical soils. This might often be done by the geologists themselves. Let them select their specimens from the bottom of the soil-bed and the upper portion of the subsoil. By carefully washing and sifting, they will soon take out the microscopic or coarser ingredients, the nature of which will readily be determined by the eye or with the aid of a lens. The finer residue could then be examined under the microscope, and some simple chemical tests would soon detect any matter that remained in solution. Very often a microscopic inspection alone would suffice to show the general composition of a soil. If, for

example, we found a dark brown soil made up of disintegrated basalt-rock, our knowledge of the constitution of the minerals composing such a rock would enable us to form an approximately correct notion of the chemical character of the soil. In short, where no superficial deposits occur, and the soil is evidently derived from the disintegration of the rocks *in situ*, it is obvious that a correct knowledge of the composition of these must give us a reliable clue to the character of the overlying subsoils and soils. Again, by carefully examining the percentages of the various rock-fragments occurring in the boulder-clay of a district, we might form some reliable conclusion as to the average character and composition of the overlying soil.

The soils in the east of Scotland not only vary as regards their chemical composition, but they also differ considerably in colour. Let anyone stand on some commanding eminence when the farmers are busy with their ploughs, and he will often be struck by the variety of tints which he sees in the bare fields. Could we strip the whole land of its vegetable covering, similar varieties of colour in rock and soil would everywhere meet our gaze. Many of these tints are due to the presence of ferric and hydrous ferric oxide in variable proportions. And it might be worth the while of our naturalists to consider whether these colours of rock and soil have had any influence upon the colour of animals—whether they may not sometimes have induced in these unconscious mimicry. Here again the suggested soil-maps of which I have spoken would be of great service to working naturalists.

Having now pointed out in the briefest way possible the kind of geological evidence which naturalists must keep in view when they are trying to account for the distribution and character of species, I shall pass to another part of the subject, and endeavour to show how the origin of the present geographical distribution of our flora and fauna must likewise be considered from a geological point of view. It is just about as certain as anything can be that our flora and fauna did not originate in Britain. All our plants and animals are immigrants, and immigrants of a very recent date. This can be readily proved, and, if so, it is obviously important to the naturalist that he should ascertain if possible what were the physical and climatic conditions under which that recent immigration took place. It may be a relief to him to know that he does not need to travel further back in time than the Ice-age ; but he

will find that, comparatively short though the period be that separates that age from the present, it was yet crowded with changes and vicissitudes. Many of these have left their marks upon the surface of the land, while others are to be read in the present distribution of our plants and animals. And I cannot but believe that when these living fossils (if I may so call them) come to be more carefully studied in their various relations, we shall know much more than we do at present concerning some of the more recent climatic and geographical changes of North-Western Europe.

Of the flora and fauna which existed in Scotland in pre-glacial times, no unequivocal relic has come down to us; but we may infer from what is known of the pre-glacial plants and animals of England and the Continent that the assemblage of species here was, in a general way, much the same as at present. During inter-glacial times a somewhat similar flora and fauna characterised our land; but the last ice-sheet which overflowed Scotland made a clean sweep of every living thing, so that the history of the present flora and fauna dates only from the latter end of the glacial period. The geographical and climatic conditions of late glacial and post-glacial times, so far as I have been able to read them, can be very shortly summed up. They had unquestionably an overpowering influence in producing the present distribution of species, and I have long been of opinion that when naturalists shall have exhaustively studied our flora and fauna, they will be able to throw much more light upon the succession of changes to which I refer.

The gradual disappearance of glacial conditions in our area was accompanied and followed by some degree of submergence; so that Middle Scotland in late glacial times stood at a lower level than it does now, by 100 feet or thereabout. This was the period during which the 100 feet terrace of our great firths was formed, of which distinct traces occur in the Firth of Tay, in the valley of the Eden, and in the Firth of Forth. Followed inland, this terrace passes into tumultuous glacial gravel and sand—and sheets of sand loam, and clay—deposits which are associated, as in Strathmore, with morainic hills and ridges of sand and gravel. Scotland at this period must have presented a dreary aspect. Perennial snows and ice-fields covered all our mountain-regions, down the valleys of which flowed great glaciers that reached the sea-level. The Ochils and the Sidlaws were likewise covered with snow; and in summer time heavy torrents descended

the slopes, and accumulated huge *cones de dejection* at the foot of the hills. These are nowhere better developed than in the valley of the Earn, opposite the mountain tracks of such streams as the Water of May and Dunning Burn. It is obvious that under such physical conditions the flora and fauna of Scotland must have been scanty in the extreme. What plants and animals may then have existed here we cannot tell—the only organic relics of the period which have come down to us being of marine origin.

Snowfields and glaciers, however, eventually melted away, and the sea at the same time retreated, so that eventually the British area became united to the Continent. Now, you all know the general history of the introduction of our present flora and fauna. First came the arctic-alpine forms; and these, as the climate improved, were gradually succeeded by the present temperate species. Step by step the arctic-alpine plants were driven northward or compelled to retreat up the mountains, whither the Germanic forms could not or would not follow. But this general statement does not exhaust the matter; the passage from late glacial times to the present was by no means so simple as many suppose. It is certainly not true that our climate has become continuously milder since the close of the glacial period. There have been decided oscillations of climate since the deposition of our 100 feet terrace, oscillations comparable to, but less pronounced than, those which distinguished the Ice-age itself. As the evidence of such post-glacial changes has not attracted the attention which it deserves, I may be allowed very briefly to indicate its general character.

One of the most remarkable of post-glacial accumulations is the buried "forest-bed" of the Tay valley. It would be notable enough even if it were an isolated phenomenon, but it is only a sample of what may be seen at many different points on the coasts of the British Islands and the adjoining shores of the Continent. There can be little doubt that the buried trees of the Tay and Earn, and those which occur in a similar position in the post-glacial accumulations of the Forth valley, grew at a time when a dense forest-growth covered all North-Western Europe and wide regions which are now submerged. The relics of this forest-growth are now met with not only in the so-called sunk forests of maritime districts, but underneath the older peat-bogs of our own and other countries. From the evidence of these tur-

baries we gather that forests of deciduous trees extended far north of their present range, and reached elevations which the same trees cannot now attain in these latitudes. Spitzbergen, the Faeröe Islands, and Iceland have each preserved relics of this genial post-glacial period. Nor is the evidence confined to our peat-bogs and buried trees. Proofs of milder conditions having obtained in early post-glacial times are afforded by the marine organic remains of raised beaches, particularly by the shell-beds of Norway and Spitzbergen, and by those of Nova Scotia and New England on the other side of the Atlantic. And similar evidence is supplied by the remarkable colonies of southern forms that are met with now and again in northern seas. From these and other phenomena it would appear that, in early post-glacial times, warm water flowed in much larger volume than is now the case into the arctic circle; while the climate of North-Western Europe was certainly more genial than at present.

The succeeding stage in the history of post-glacial times is, it seems to me, not less strongly marked. Some twenty years ago, after much wandering over the uplands of Southern Scotland, which, as many of you know, abound in peat bogs, I got the first glimpse of post-glacial climatic changes, and gave some account of my observations and conclusions; which, however, failed to attract the attention of British botanists. In succeeding years I continued to investigate the matter, and was gratified to find that a study of post-glacial fluviatile and marine alluvia exactly bore out the conclusions which had already been suggested by the phenomena of our peat. These conclusions may be briefly summarised here; as I would fain prevail upon some of our botanists to take up the matter. The trees buried under the bogs proved, as I then thought, and still believe, the former existence of continental conditions of climate for our area. But I held further that the overlying peat was in itself evidence of changed climatic conditions. It spoke of a wet, ungenial climate; and I associated these conditions with the insulation of the British area. When I began to study peat bogs it was, and may still be, the prevalent belief that all the buried trees, or the major portion of them at least, had been destroyed by man's hand. The overthrow of our ancient woodlands was attributed partly to the Romans, and partly to our "auld enemies of England." But I found that only a small proportion of the forest-lands could have been displenished

in this way. Again and again the trees examined by me showed that they had fallen from natural decay. And in many cases, especially upon the tops and slopes of hills, the peat mosses contained no trace of trees, or at most, only a few stunted trunks and brushwood. No one could deny that the overthrow of large trees upon the low ground and plains, from whatever cause, would obstruct the drainage, form marshes, and so give rise to the growth of peat. But here were many cases where no such stoppage of the drainage could have taken place—where only thin scrub grew, and where the steepness of the slopes must have sufficed to prevent any arrest of the surface drainage. Thus, even if we allowed that all the great forest trees of the low-lying districts had been destroyed by man, and the overlying bogs to have originated through the obstruction of the drainage caused by the fallen trunks, we had still to account for the existence of widespread and thick peat-mosses on hill-tops and considerable slopes. Considerations such as these led me to conclude that the presence of the overlying peat-mosses looked at in a broad way, was the result of changed climatic conditions, which, while less favourable to the growth of forest trees, encouraged the extension of bog-forming plants. And from the occurrence of successive layers of trees in not a few bogs, I suspected that there might have been in post-glacial times alternations of genial and ungenial conditions. But when I wrote my first paper on the subject, the data bearing on this particular point were too few or too little known to justify me in formulating this conclusion. Later investigations in the valleys of the Forth and Tay, however, considerably cleared up the matter: and I was preparing this new material for publication, when Axel Blytt, the well-known Norwegian botanist, issued his admirable essay on the immigration of the Norwegian flora. From this paper I learned that Blytt had independently come to the same general conclusions, from a study of the geographical distribution of the existing Norwegian flora.

The genial post-glacial epoch which nourished the great trees of which I have been speaking, was succeeded, then, by an epoch of wet and ungenial conditions. It is remarkable that at the same time the British area became insulated, and the sea advanced upon the land to a greater extent than is now the case. To this epoch belongs the formation of the 45-50 ft. sea-beach and of the major portion of the Carse-clays, etc., of the Tay and Forth. That

the climate was cold and wet may be inferred from the following facts: (1) The Carse-clays contain occasionally (but only rarely) ice-floated erratics; while the clays themselves have all the appearance of fluvio-glacial deposits. The sediment was probably largely derived from the erosion of the Highland area by glacier-ice. (2) When the Carse-beds are followed up the valleys they pass into coarse river gravels, and these last in the Highland area are associated with terminal moraines. At the time the Carse-clays were being deposited, local glaciers existed in our Highland glens. (3) The underlying forest-bed is largely made up of drifted material. Trunks and sticks, etc., all bear evidence of having been floated down the valley by river-action just when the Carse-beds were beginning to accumulate. The whole appearance of the drifted wood of the Tay and Forth valleys, and of the beds in which it occurs, bespeaks the action of larger streams and rivers than exist at the present day in these valleys. (4) Again, in the interior of the country, the "buried forests" are covered with a more or less thick sheet of peat—formed of marsh-loving plants. In short, there would appear to have been a kind of relapse to glacial conditions. During the preceding genial post-glacial epoch perennial snows or ice fields seem to have been unknown in Scotland—at all events no trace of their former presence has been recognized. Judging from the evidence supplied by the buried trees, the raised-beaches, and so forth, one can hardly doubt that the climate of what we may call the first forest-epoch of post-glacial times was more genial and equable than that which we now enjoy. And it is not less clearly proved that the climatic conditions which supervened upon the close of that epoch were much colder and wetter than those we experience at present. During the first forest-epoch the British area was connected with the Continent; while the succeeding cold and humid epoch was ushered in, or accompanied by the submergence of wide tracts in North-western Europe, and by the gradual insulation of our lands. It was during this latter epoch, as I have said, that the 45-50 ft. beach of Scotland was formed. At that time Neolithic man lived upon our coast-lands, his kitchen middens, being now met with ranged along the line of the old sea margin.

The cold and humid climatic conditions under which he lived, eventually passed away, and were succeeded by drier and more genial conditions, which once more favoured the extension of

trees. The bogs began in many places to dry up, and were gradually overspread by great forests. But this second genial post-glacial epoch, if we may rely upon the evidence of the upper buried forests of our peat-mosses and marine alluvia, was hardly so genial as that of the earlier forest-epoch. In the Norwegian bogs, for example, the lower buried forests consist principally of leafy trees, while those in the upper beds are almost wholly conifers. But that the climate was more favourable to forest-growth than at present, is shown by the vertical and horizontal range attained by the trees of the second forest-epoch. What is true of Norway is equally true of England and Ireland, and, so far as the evidence goes, of Scotland also. It is further important to note that this recurrence of drier and more genial conditions was accompanied by an extension of land-surface. The sea re-treated to a greater distance than at present, the forests of the second epoch growing over wide tracts which are now submerged. But to what extent that elevation of the land, or retreat of the sea, was carried we cannot tell. There is no evidence, however, to show that Britain again became continental.

To this second forest-epoch succeeded, as before, colder and more humid conditions. Once more the trees became restricted in their vertical and horizontal range; while, at the same time, peat-mosses increased and overspread wide regions, which were formerly covered by forests. Again, as before, the sea advanced upon the land. It is to this later period that the formation of our lower-level Carse-clays and the 25-30 ft. beach belongs. When these lower-level Carse-deposits are followed up the valleys, they merge into tumultuous river-gravels, which have much the same appearance as those which are contemporaneous with the Carse-beds of the 45 to 50 ft. level. Thus, in the Tay-valley, ancient river-gravels occur at three distinct levels. Those at the highest level belong to late glacial times; and were laid down during the final retreat of the great glaciers of the Ice-age proper. Then followed a prolonged interval of denudation, corresponding to the genial continental epoch, when the late glacial gravel-terraces were eroded, and often entirely demolished. To this epoch succeeded one of colder and more humid conditions, when the sea advanced to the 45-50 ft. level, and the tumultuous river-gravels of the second terrace were formed. Again the sea retreated, milder conditions ensued; and the second river-terrace suffered

extensive erosion in an epoch corresponding to the second forest period. Once more the sea invaded the land, and a humid climate prevailed; and then the third well-marked terrace of coarse gravels was accumulated.

The latest geological change to which I shall refer was the final retreat of the sea to its present level. My early investigations into the history of our peat-mosses led me to conclude that in our day the rate at which these bogs are wasting away under the influence of sub-aerial agents much exceeds their rate of growth. And Professor Blytt has formed the same opinion with regard to the peat-bogs of Scandinavia. I do not, of course, mean to affirm that peat-mosses are everywhere becoming disintegrated, and weathering away. In many places where they are favoured by their position, and by climatic conditions, they seem to be flourishing; but, looked at generally, there can be no doubt that this is exceptional. And the final disappearance of our bogs, through the action of the weather, is only a question of time. Should present conditions continue, our hills must by-and-bye become entirely divested of any peaty covering. We appear, therefore, to be living under drier conditions than obtained when the trees of the second forest-epoch were being slowly entombed by the the npward growth of the bog-plants. Are these less humid conditions the result of natural causes, or have they been brought about by the drainage operations of our agriculturists? These operations must undoubtedly have influenced the result, but many considerations lead to the conclusion that they are not the sole cause of the present drying up and shrinking of our bogs. I think it can be shown that the wide denuded channels and hollows by which our hill-peat is so frequently traversed, existed long before our present systems of drainage became general. The bogs of hills and hill-slopes had been broken up, and hollows and gutters washed out in them in early historical times; for they are mentioned, by old writers, as the hiding-places of thieves and desperadoes; and they also formed a more or less secure retreat for hunted Nonconformists in the unhappy times of the Solemn League and Covenant. I incline, therefore, to the opinion that the general waste of our peat-mosses had set in long before the work of our farmers could have begun to tell, that, in short, this waste is an evidence of change of climate induced by natural causes.

Thus it will be seen that, since the close of the Ice age, our country has experienced several considerable geographical and climatic changes, and that all these changes have been effected within the lifetime of the existing fauna and flora of North-western Europe.

First, there was a gradual passing away of glacial conditions, accompanied and followed by a general increase of the land, which united our islands among themselves and to the continent. During these continental conditions our area was invaded in succession by the arctic-alpine and temperate faunas and floras, the climate becoming eventually very genial, so that the land was covered with immense forests, which reached elevations and spread far north into latitudes that are now beyond the range of the same trees.

Second. This genial continental epoch eventually came to a close. Enormous tracts of low-lying land became submerged; and the British area was insulated. A cold humid climate now ensued; local glaciers came down our mountain-glens, and in some places reached the sea level, our coast-line being then some 50 feet lower than at present. The forests now disappeared from wide areas, and were replaced by bogs and morasses.

Third. By-and-bye these cold and humid conditions passed away; and the climate again assumed a drier and more genial character, the sea at the same time retreating, and our shores extending farther seawards than they do now. This epoch was marked by the drying up of bogs and morasses, and a general renewed extension of forests. The climate, although apparently not so genial as that of the earlier forest-epoch, was yet more favourable to the growth of trees than the present epoch.

Fourth. A great change of which the geologist has clear proof was the renewed advance of the sea, and the formation of the 25-30 ft. beaches. This change was accompanied by a deterioration of the climate, which again became colder and wetter. Once more the vertical and horizontal range of the forests was restricted; while bogs and morasses covered wide areas formerly occupied by timber trees.

Fifth. The latest change of which we have any geological evidence was the final retreat of the sea to its present limits, a change which seems to have been accompanied by less humid climatic conditions.

Such, then, are the principal geographical and climatic changes to which the geological phenomena of post-glacial and recent accumulations seem to bear witness. The evidence is clear enough so far as it goes; but you will observe that, after all, the geologist can give only the meagre outlines of a picture. For the details which are wanted to give life and colour to the picture, we must rely upon our zoologists and botanists. It is to them that we look for the further elucidation of this interesting history. Already much has been done, chiefly by foreign naturalists, to extend our knowledge of post-glacial events.

Professor Blytt, after studying the distribution of the Norwegian flora, had formulated the belief in alternating dry and humid conditions having supervened in post-glacial times. By following out a totally different line of research he was led independently to the same conclusion as myself. And what Blytt has done for Norway, surely our naturalists might achieve for Scotland.

It is with the hope of inciting some of the workers in this East of Scotland Union to undertake the task that I have ventured to give this rapid and imperfect sketch of post-glacial climatic and geographical changes. If there be any foundation for the views I have brought before you, it is almost certain that these views will be corroborated and greatly extended by a more complete and detailed knowledge than we yet have of the character and distribution of our plants and animals. I have often wondered why our botanists should have so entirely neglected the minute study of our peat-mosses: for I cannot but believe that the history of post-glacial Scotland is in large measure locked up, as it were, in those turbaries. When one knows how much has been done to work out the history of the continental peat-bogs by such observers as Steenstrup in Denmark, Blytt in Norway, Nathorst in Sweden, Grisebach in Germany, and Fliche in France, one cannot but wish that some of our Scottish naturalists would undertake the examination of our own peat-mosses. Surely the task is not too hard. Peat is not composed of extinct species of plants; the animal remains now and again associated with them are all, (with the exception of one or two large vertebrates), living forms, although some of the species both of plants and animals, may no longer live in Britain. In dealing with the constituents of our peat, therefore, one has to do not with extinct but with existing forms. And surely comparisons between the organic remains of

our post-glacial accumulations, and the flora and fauna of our own day, could not fail to throw much light upon the origin, character, and distribution of the latter.

Perhaps, I may be allowed to point out the kind of evidence that geologists are in quest of. It is our belief that the low grounds of Scotland were in early post-glacial times clothed with an arctic-alpine flora, and you are well aware upon what inferences that belief is founded. Hitherto, however, we have failed to detect any relics of that flora in our post-glacial deposits. Such remains, however, have been met with again and again, chiefly by Dr. Nathorst, under the peat-bogs of the Continent. Now it can hardly be doubted that, if our bogs were carefully examined by botanists, similar discoveries would be made here. Special search therefore should be made in the bottom layers of the peat and the fresh-water clays which occasionally underlie our bogs. Then, a careful examination of the trees underneath the peat is much to be desired. The species and dimensions of the trees, the nature of the soil, the position of the bog, and its elevation above the sea should all be carefully noted. It should also be ascertained whether the trees have fallen by man's hand or through natural decay. The structure of the over-lying peat should likewise be carefully determined. A mere list of the constituent plants will not suffice. The observer must give a section of the bog—noting the species and their relative abundance at particular levels. This, I need hardly stop to remark, is essential; for the succession of plants, and the relative preponderance of certain species must throw light upon the conditions under which the peat was accumulated. The occurrence of trees or buried forests at successive levels in the peat ought also to be carefully inquired into. Even when no such trees are present in the middle of the peat, still we may sometimes note a more or less definite layer characterised by the apparent absence of sphagnum and its allies, and by the predominance of certain plants which indicate less humid conditions than the true bog-forming mosses. Search should also be made for animal organisms. I have often found the wing-cases of beetles buried in peat, and now and again the remains of birds and small mammals occur, as also human relics, and occasional traces of former cultivation.

Such are some of the points in which geologists are specially interested; and I earnestly hope that the naturalists of this Union

will take the matter up, and that ere long through their labours our knowledge of post-glacial Scotland will be greatly increased.

Before closing this address, I should like to say a few words to the geologists of the Union. The mapping-out of the various rock-masses and geological formations of the east of Scotland by the Government Geological Survey is now far advanced, so that we are saved the labour of producing reliable geological maps. But the mere mapping-out of the rocks does not, by any means, leave nothing for the local geologists to accomplish. Many difficult problems will still remain for solution. The question of metamorphism, for example, is one which will long remain open; and each of us may do something towards explaining the origin of our crystalline schists by careful detailed examination of the rocks in the field, and by subsequent critical study of them under the microscope. The phenomena of the igneous rocks of the east of Scotland also afford a wide field of study, and one which the labours of the Geological Survey will certainly not exhaust. The petrological examination of these rocks, as my friend Mr. Durham in his Report remarks, will well repay the observer. An adequate study of the igneous rocks of the Sidlaws, for example, which I mapped for the Survey, would entail many long years of assiduous labour. It would be well, also, for local geologists to note every new exposure of rock, especially such sections as tend to modify the boundary lines upon the maps of the Geological Survey. Notice of these new exposures should then be sent to the Geological Survey Office that the necessary corrections of the maps may be made; for it is clearly in the interests of all that the work of a great Government Survey should be as perfect and complete as it can be made. With regard to the glacial and post-glacial deposits, we have still, as I have said, much to learn. The main features of glacial history as at present known, are not, I think, likely to be much modified. That the till or boulder-clay is the *moraine profonde* of an extensive ice-sheet seems to me as well proved as we can expect any fact in geological history to be. That the Glacial period consisted of an alternation of cold and genial epochs has also, I think, been demonstrated both for Europe and North America. But when we come to the deposits pertaining to late glacial times, to those, namely, which were laid down when the great glaciers of the Ice-age proper were slowly melting away—we encounter phenomena which have been variously ex-

plained, and which cannot be said to be yet well understood. This arises chiefly from the great difficulty we experience in trying to realize the physical conditions. In our attempts to explain the appearance of the deposits in question, we compare them with what we know of the morainic and fluvio-morainic accumulations of the Alps, and when it is found that our late glacial deposits often exceed these in bulk, some of us are inclined to deny their glacial origin altogether, and to credit their formation to the sea, in whose mysterious depths it is supposed similar accumulations may be in progress. But surely the dissolution of an enormous ice-sheet must have given rise to formations as greatly exceeding the morainic and fluvio-morainic deposits of the present puny alpine glaciers, as our till or boulder-clay supasses in importance all the moraines, whether superficial or sub-glacial, that are at present forming in the mountain-valleys of Switzerland. Having traversed all the glaciated regions of the East of Scotland, I must say I have seen nothing, save our marine-terraces, that I could not parallel with similar phenomena in North Italy and Switzerland. The great hills and ridges of gravel and sand which seem to sweep out from the mouths of the Highland glens, and to dilate, as it were, upon the low grounds of Strathmore, are of precisely the same character as the sand-and-gravel moraines that circle round the lower ends of the Italian lakes. And, just as these last pass laterally into wide sheets of gravel, sand, clay, and loam, so do the morainic accumulations of Strathmore. The wide flats of sand, loam, etc., which sweep along the northern base of the Sidlaws, are simply the fluviatile sediments of the water derived from the melting snows and ice of late glacial times.

I must not, however, go further into this matter at present, but may conclude my remarks upon it by drawing the attention of our geologists to a very remarkable late glacial accumulation, the origin of which has too often been taken for granted. I refer to the raised beach which occurs at a height of 100 feet upon the coast of Forfarshire. This beach may be followed more or less persistently from the mouth of the Tay nearly to Arbroath. But in many places it is much denuded, and forms no marked feature, so that its presence can be detected only in sections. Here and there, however, it makes a conspicuous feature, as at Carnoustie, where it attains half a mile in breadth. The terrace is composed chiefly of well-rounded gravel and shingle, which here and there

give place to sand. No continuous section of the deposits is visible; but the finer-grained portions appear to be more or less well-bedded. The coarser gravel and shingle, however, show no distinct bedded arrangement. Although I searched every exposure for organic remains I could not find any. The deposits appear to be quite unfossiliferous. Are we justified, therefore, in supposing that this terrace is an old sea-beach? Surely if marine organisms lived off the Forfarshire coast at the time these deposits were being accumulated, some trace of them should now be met with. The post-glacial raised beaches all contain such relics in greater or less abundance, and why, therefore, should this older or late glacial terrace be apparently as destitute of them as any fluviatile accumulation? Here, then, is a problem for local geologists to solve. It has greatly puzzled me, and I have no explanation to offer, that carries complete conviction to myself. Possibly the absence of marine relics is more apparent than real; and some lucky observer may yet succeed in detecting fossils. One explanation of the phenomena however, has occurred to me, and I throw it out now, for the consideration of my geological friends of the Dundee Naturalists' Society. It is obvious that the terrace marks an old water-level and that it belongs to the close of the Ice-age. If it be of marine origin, then it is likewise obvious that before it could have been formed the great Scoto-Scandinavian ice-sheet that occupied the basin of the North Sea must already have disappeared. But, as I have said, the terrace contains no evidence of such marine conditions. Now is it not possible that the deposits in question may have been laid down before the ice-sheet had entirely melted away? If we suppose the surface of the ice-sheet to have been gradually lowered by ablation it is obvious that the land would be the first to reappear, for the ice which covered it would not be so thick as that which occupied the basin of the North Sea. There probably was a time, then, towards the close of the last Ice-age when the lowgrounds of Scotland were denuded of their glacial covering, while the ice-sheet, greatly reduced in thickness, continued to occupy the depression of the North Sea. At that time permanent snowfields would still cover our mountains and hills; and great glaciers would still flow down our valleys to join the attenuated Scoto-Scandinavian ice-sheet. The enormous accumulations of shingle and gravel, belonging to the period of retreat of the icefields, show that notwithstanding the severity of

the climate the summer thawings must have given rise to great torrential floods. Freshwater would descend in all directions towards the ice-sheet: and the body of water would be increased by the ablation of the ice-sheet itself. In this way a broad sea would extend along the land-margin and even overflow wide areas of the attenuated ice-sheet. And this sea would be fresh, even although it stood at the same level as, and was continuous with, the salt water which probably at that time occupied the open area of the North Sea-basin lying towards the South. Now the deposits of the Carnoustie terrace are just such accumulations as would be likely to be laid down upon the bed of such a sea. It is possible, indeed, that the water by which they were spread out was of a torrential character, that it flowed like a large river between the land on the one side and the ice-sheet on the other. As tending partly to confirm this view, I may point to the suggestive fact that here and there mounds and sheets of gravel and sand come down from the higher grounds and merge with the deposits of the terrace. These gravels, etc., are certainly of torrential origin and they are similar in character to the terrace accumulations. And the suggestion forces itself upon one that the water which carried them forward was merely a lateral feeder of the much larger body of water by which the terrace-beds were formed.

Whether this be or be not the true explanation of the apparently unfossiliferous terrace or so-called raised-beach in question, future investigation must be left to determine. I refer to the matter merely as an example of the many problems connected with the geology of the East of Scotland, which still await solution.

There is yet another matter which I would bring to the notice of geologists and that is the preparation of catalogues of minerals and fossils found in the district embraced by the Union. It would be extremely useful to have such lists; we should see from them what has already been done, and how much yet remains to be accomplished. It is true that fossils are by no means common in the district. But one does not yet despair of their discovery even in regions where they have not yet been met with. It would be advisable to note every locality where any, even the most meagre trace of organic structure is obtained. It is only by piecing all the evidence together that we can hope to form an adequate conception of the conditions under which our sedimentary formations were accumulated. With regard to the

minerals I can only repeat what my friend, the Rev. W. Peyton said in his Report, namely, that in every case the nature of the rock, gangue, or matrix in which minerals occur should be noted. Finally, I would strongly urge the advisability of each Society becoming possessed of one or more good petrological microscopes, so as to encourage the study of the minute characters of minerals and rocks. This is a field of work in which very much remains to be done, and in which young geologists, blessed with good eyes and assiduity, may hope to advance the science and win laurels for themselves. Let me, however, add one word of caution. The microscope is an admirable and, indeed, indispensable servant. Do not let it become your master. Never imagine that an adequate knowledge of rocks is to be obtained by the microscopic examination of thin slices only. A mere description of hand-specimens is not enough; the rock itself must be studied in the field, and viewed in all its relations and aspects; the weathered and altered portions must be scrutinized as carefully as those that are freshest. If this had always been done, we should have been spared much useless and misleading nomenclature. We should not then have found three different portions of one and the same rock-mass described as if they were three separate and distinct rock-species.

I fear, I have detained you too long, and will now bring these somewhat discursive remarks to a close by expressing the hope that this Union may become every year more fruitful in results. May it quicken a generous emulation and strengthen and sustain he spirit of research and love of truth in our midst.

ON THE BETTER UTILISATION OF THE SPRATS OF THE TAY AND FORTH.

By F. BUCHANAN WHITE, M.D., F.L.S.

IT is with considerable hesitation that I venture to bring under your notice the subject of the following note, since it is not in any sense a scientific one, and hence objection may be taken to its discussion at a meeting devoted to natural history. As, however, it deals with the uses to which one of the animals indigenous in our district may be put, and as the matter is of some

economic importance, I think the subject is not altogether beyond the scope of the Union.

As you are aware, the Firths of Tay and Forth are visited by immense shoals of the Sprat (*Clupea sprattus*). In such large quantities are these little fish taken that the chief use to which they are put in the district bordering on these firths is as manure. I had hoped to have been able to make some attempt to ascertain some statistics as to the quantity of sprats captured, the amounts used directly for food and as manure, the cost of the fishing, and the prices obtained; but want of time through press of other business has prevented me doing so.

On first thoughts the idea that fish are captured merely for use as manure is a repulsive one, and many people are very indignant that so much cheap and nutritious food should be used for such a purpose. But on second thoughts it is evident that, provided no better use can be found for the sprats, their utilisation as manure is only less directly their use as food, and that hence indignation on the subject is rather misapplied. It is probable (but on this point I am doubtful) that there are difficulties in the way of placing sprats, to the full extent of the quantity captured, in the food market, or of obtaining a sufficient sale for them there. But are there no other food uses to which they can be put? I think there are, and the object of this note is to point out some of these. Most of the information on this point I have derived from an essay by Mr. C. W. Harding, C.E., of King's Lynn, who, seeing the report of the first meeting of our Union, kindly sent me some papers on various fishery subjects. These papers I have placed in the hands of our Secretary, and any member who is interested may obtain a sight of them from him.

After pointing out that by far the greater quantity of sprats that are taken in our estuaries are used for manure, Mr. Harding describes the uses to which they are put in Norway. The chief of these is their transformation into anchovies, principally for exportation to Denmark, Hamburg, and England. After describing the process of manufacture, Mr. Harding proceeds to give an estimate of the cost and of the profit, the latter being on a moderate calculation at the rate of about £13 13s. 6d. for every ton of sprats manufactured. Of these "anchovies," 800,000 barrels of 20 gallons each are exported from Norway annually. (The date of the essay is 1881.) Besides converting sprats into

anchovies (*i.e.*, preserving them with spices) they can also be made into sardines in oil at a less cost than the anchovies. It is to be remarked that most of the sardines in oil sold in this country are only sprats, menhadden, and pilchard. Mr. Harding says that he inquired if sprats were ever used as manure in Norway, and was told that they were far too valuable for that. He also says that these Norwegian anchovies are a far greater delicacy than the spurious sardines sold in this country.

I have only to add that since the date of Mr. Harding's essay the part of "Dr. Day's British Fishes" which includes the sprat has been published (1883), and in it the author remarks that "an important trade appears to be springing up at Lowestoft, where they [the sprats] are being tinned as anchovies." I conclude by asking if what is done in Norway and Lowestoft cannot be equally and as profitably done on the Tay or the Forth?

Report on the Bibliography of the Land and Freshwater Mollusca of the Counties of Aberdeen, Kincardine, Forfar, Fife, Kinross, and Perth.

By HENRY COATES, F.R.P.S.

The following bibliography cannot be considered an exhaustive catalogue of all that has been published with reference to the land and freshwater mollusca of the counties embraced in the Union. The limited time and opportunities at the disposal of the compiler rendered this impossible, so that it is complete only so far as his information goes. There may be references in other Journals and Transactions of Societies to which he has not had access. Should any of the readers of the *Scottish Naturalist* be aware of such omissions, he will be glad if they will bring them under his notice, in order that a supplementary list may be prepared. He has to acknowledge his indebtedness to members of the Union who have forwarded publications for his perusal, and also to Mr. Wm. Denison Roebuck, Leeds, for valuable information.

The following abbreviations are employed to denote the Magazines referred to :—

A.N.H. Annals and Magazine of Natural History.
B.A.R. British Association Reports.
J.C. Journal of Conchology.
M.Z.B. Magazine of Zoology and Botany.
P.S.N.S. Proceedings of the Perthshire Society of Natural Science.
S.N. Scottish Naturalist.
T.A. Transactions of Aberdeen Natural History Society.
Z. Zoologist.

1837. Edward Forbes.

Neritina fluviatilis, Paludina achatina, vivipara and *impura* in Fife and Kinross. M.Z.B., Vol. I., p. 201.

1840. William Thompson.

"Catalogue of Irish Mollusca," notices Limnæa peregra var. lacustris. A.N.H., Vol. VI., p. 118.

1843. William Macgillivray, M.A.

"A History of the Molluscous Animals of the Counties of Aberdeen, Kincardine, and Banff." London, 8vo.

1852. C. W. Peach.

"On some Fishes, Crustacea, and Mollusca, found at Peterhead." B.A.R., p. 78.

1853. Forbes and Hanley.

"History of British Mollusca and their Shells." Vol. II., pp. 127, 152; Vol. III., p. 5; Vol. IV., pp. 18, 61, 105, 153, 159.

1853. James Taylor.

"List of Land and Freshwater Mollusca in Aberdeenshire and Kincardineshire. Z., Vol. XI., p. 3878.

1854. Dr. George Gordon.

"A List of the Mollusca hitherto found in the Province of Moray, and in the Moray Firth." Z., Vol. XII., pp. 421, 502, 3454, 3480, and 3781.

1854. Rev. Dr. George Gordon.

Notice of *Helix caperata*. Z., Vol. XII., p. 4454.

1855. William Macgillivray.

"Natural History of Deeside and Braemar." 8vo., pp. 416 to 421.

1858. Dixon and Watson.

"Book of British Shells." p. 48.

1859. Dr. Dickie.

"Remarks on the Mollusca of Aberdeenshire." B.A.R., p. 147.

1862. J. Gwyn Jeffreys.

"British Conchology." Vol. I.

Sphaerium corneum, var. *flavescens*, *Bithinia tentaculata*, *Planorbis albus*, *Physa fontinalis*, *Limnæa palustris*, *Ancylus fluviatilis*, *A. lacustris*, *Helix aculeata*, *H. fusca*, *H. rotundata*, var. *alba*, all in Aberdeenshire, and *Vertigo minutissima* in Fifeshire.

1866. Ralph Tate.

"Plain and Easy Account of British Mollusks."

Unio margaritifer in the Tay.

Pisidium pulchellum and *Helix aspersa* in Aberdeenshire.

Vertigo minutissima in Fifeshire, p. 160.

Limnaea peregra, var. *Burnetti*, in Aberdeenshire, at altitude of 1742 feet, p. 188.

1869. J. Gwyn Jeffreys.

"British Conchology." Vol. V.

Zonites excavatus at Perth. (F. B. White), p. 157. [This should have been "Ross-shire," *fide* F.B.W.]

Helix fusca in Kincardine and Aberdeen (Macgillivray), p. 159; *Helix rotundata*, var. *alba*, in Perthshire (F. B. White), p. 159; and *Vertigo substriata*, *Balia perversa*, of large size, and *Clausilia laminata* at Perth (F. B. White), pp. 160-161.

1869. Young.

Proceedings of the Natural History Society of Glasgow. Vol. I., p. 240.

Azeca tridens at Bridge of Allan.

1869. W. Herd.

P.S.N.S. Series I., p. 15.

Anodonta cygnea, with var. *incrassata* and *Unio margaritifer*, at Perth.

1869. J. Dawson.

"Shells of the genus *Helix* found in Perthshire" (11 species enumerated). P.S.N.S., first series, p. 15.

1870. F. B. White.

"Species added to the Local Lists during the session, 1869-70." P.S.N.S., Series I., p. 15.

These include *Physa hypnorum*, *Ancylus lacustris* with var. *albida*, *Pupa muscorum*, *Planorbis nautileus*, *P. nitidus*, *Pisidium nitidum*, *Anodonta cygnea*, with var. *incrassata*, *Helix nemoralis*, var. *alpestris*.

1870. F. B. White.

Vertigo antivertigo at Perth. P.S.N.S., Series I., p. 77.

1870. J. M'Farlane.

Helix aculeata at Perth. P.S.N.S., Series I., p. 77.

"The Mollusca of the Ponds of the District." P.S.N.S., Series I., p. 84.

1870. F. B. White.

"Mollusca got during Excursion to Methven." P.S.N.S., Series I., p. 98.

"*Helix lamellata* at Birnam, Perthshire." P.S.N.S., Series I., p. 99.

Limnaea glabra at Perth. S.N., Vol I., p. 26.

1871. R. Dawson, M.A.

"Catalogue of the Mollusca of Aberdeen, Banff, and Moray, and of the neighbouring seas."

A Paper communicated to the Aberdeen Nat. Hist. Society. Printed for the Society. 71 species, Land and Freshwater, enumerated.

1872. J. W. H. Trail.

Reversed variety of *Helix nemoralis*, var. *hortensis*, at Aberdeen. S.N., Vol. I., p. 155.

1873. F. B. White.

"List of Scottish Land and Freshwater Mollusca, with hints on collecting." S.N. Vol. II., pp. 162, 205.

Limax marginatus, (*L. arborum*), on Ben Lawers, Perthshire, at altitude of 3000 feet; *Zonites cellarius*, vars. *complanatus* and *eompartus*, at Perth; *Z. excavatus*, in Aberdeenshire; *Z. crystallinus*, at Perth; *Helix arbustorum*. var. *alpestris*, in Perthshire and Aberdeenshire; *H. arbustorum*, var. *flavescens*, and *H. nemoralis*, var. *minor*, in Perthshire; *H. hispida*, var. *albida*, at Perth; *H. fusca*, in Aberdeen, Kincardine, and Perth; *H. pulchella*, var. *costata*, at Perth; *H. rotundata*, var. *alba*, at Aberdeen and Perth; *Cochlicopa*

lubrica, var. *lubricoides*, and *Clausilia laminata*, at Perth *C. perversa*, on Ben Lawers, at altitude of 2400 feet; *C perversa*, vars. *Everetti* and *tumidula*, and *Vertigo antivertigo*, at Perth; *V. minuta*, at Balmerino, Fife; *Planorbis nautileus*, at Perth; *P. vortex*, at Perth and Aberdeen; *Physa fontinalis*, var. *curta*, in Perthshire; *P. hypnorum* and *Limnaea peregra*, var. *decollata*, in Perthshire; *L. peregra*, var. *oblonga*, in Fifeshire; *L. glabra*, type and var. *decollata*, and *Ancylus lacustris*, var. *albida*, in Perthshire; *Bithinia tentaculata*, in Aberdeenshire; *Anodonta cygnea*, var. *incrassata*, and *Unio margaritifer*, vars. *sinuata* and *Roissyi*, in Perthshire; *Sphaerium corneum*, in Aberdeenshire.

1875. **Henry Coates.**

"Captures of Helicidæ at Moulin, near Pitlochry, Perthshire." S.N., Vol. III., p. 160.

1875. **J. E. Harting.**

"Rambles in Search of Shells." p. 35.

1878. **F. B. White.**

"Glen Tilt, its Fauna and Flora." S.N., Vol. IV., p. 246.

[Great abundance of *Helix arbustorum* and *H. nemoralis;* also, *H. arbustorum*, var. *alpestris*. Altitude of Mollusca.]

1878. **Prof. J. W. H. Trail.**

"Bibliography of Dee." T.A., p. 18.

1879. **J. S. Gibbons.**

"*Helix hortensis*, var. *arenicola*, in Aberdeenshire." J.C., Vol. II., p. 264.

1879. **J. W. Taylor.**

"Note on *Cochlicopa tridens* (Pulteney)." J.C., Vol. II., p. 220. [Occurrence of var. *Nouletiana* at Bridge of Allan noted.]

1880. **Richard Rimmer.**

"British Mollusca." pp. 3, 16, 17, 29, 39, 53, 67, 102, 104, 106, 129, 139, 167, 173, 177, 179, 182.

1881. **J. W. Taylor.**

"Life History of *Helix arbustorum*." J.C., pp. 247, 251, 253, 258.

[Recorded from Fifeshire, Kincardineshire, Kinross, and Perthshire.]

1881. Henry Coates.

"The Pearl Mussel of the Tay (*Unio margaritifer*)." P.S.N.S., New Series, Vol. I., p. 11.

1881. William Japp.

Unio margaritifer in the Isla, Forfarshire. P.S.N.S., Vol. I., p. 24.

1882. Henry Coates.

"Notes on the Mollusca of Perthshire." P.S.N.S., Vol. I., p. 72.

[Catalogue of 51 species, with notes on habitat, &c.]

1882. R. Scharff.

J.C., Vol. III., p. 285.

Limnaea peregra, *L. truncatula*, *Helix nemoralis*, *H. rotundata*, *H. pulchella*, *Zonites alliarius*, *Z. nitidulus*, *Pupa umbilicata*, and *Cochlicopa lubrica*, in Fifeshire.

1882. F. B. White.

P.S.N.S., Vol. I., p. 81.

Limnaea limosa, *Physa fontinalis*, *Planorbis albus*, *P. contortus*, *Valvata piscinalis*, and *Cyclas cornea*, in Perthshire.

1882. J. W. Taylor.

Additional Notes on *Helix arbustorum*. J.C., Vol. III., p. 303.

[Var. *alpestris*, in Perthshire, at 500-600 feet (H. Coates) ; var. *fusca*, in Perthshire (Hey).]

1883. F. B. White.

Helix fusca in Perthshire. P.S.N.S., Vol. I., p. 114.

1884. Henry Coates.

Varieties of *Helix nemoralis* in Perthshire. P.S.N.S., Vol. I., p. 145.

[Varieties enumerated: *quinquefasciata*, *hortensis*, *minor*, *hortensis-lutea*, *libellula*, *castanea*, *hyalozonata*, *cincta*, and *coalita*.]

Helix lamellata in Perthshire. P.S.N.S., Vol. I., p. 169, and S.N., Vol. II. (New Series), p. 40.

Helix aspersa, varieties of *H. nemoralis*, *H. hispida*, and *Succinea* sp,, in Perthshire. P.S.N.S., Vol. I,, p. 173, and S.N., Vol. II. (New Series), p. 407.

1884. W. Denison Roebuck and J. W. Taylor.

"The present state of knowledge of the Distribution of Land and Freshwater Mollusca in Britain." J.C., Vol. IV., p. 180.

1885. J. W. Taylor and W. Denison Roebuck.

"Census of the Authenticated Distribution of British Land and Freshwater Mollusca." J.C., Vol. IV., p. 319.

1885. Henry Coates.

Testacella haliotidea, var. *scutulum*, at Kirkcaldy. P.S.N.S., Vol. I., p. 194, and S.N., Vol. II. (New Series), p. 95.

Contorted specimens of *Helix nemoralis* and *Planorbis vortex*, in Perthshire. P.S.N.S., Vol. I., p. 194, and S.N., Vol. II. (New Series). p. 90.

"Preliminary Report on Land and Freshwater Mollusca." East of Scotland Union Reports for 1884, p. 33.

"*Helix arbustorum*, vars. *alpestris* and *flavescens*, and *Limax* (*Lehmania*) *arborum*, in Glen Tilt, Perthshire." P.S.N.S., Vol. I., p. 215.

Helix aspersa in Breadalbane, Perthshire. Id., p. 216.

Arion ater on Stuc a Chroin, Perthshire. Id., p. 217.

1885. William Japp.

"Stray Notes on the Pearl Mussel." [In the Isla, Forfarshire.] S.N., Vol. II., (New Series), pp. 62 and 113.

REPORT ON THE FUNGI OF THE EAST OF SCOTLAND.

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

IN the subjoined report I have taken the *Mycologia Scotica* as a basis, and have made lists of all the species that have been added to the flora of two districts there recognised—viz., Dee and Tay—so far as I have been able to obtain information up to the beginning of September. (They are continued, for the sake of completeness, to include my own work to the beginning of Decem-

ber, 1885.) In these lists names in *italics* denote species not yet recorded for Scotland, and those marked thus (*n*) denote additions not yet recorded for the districts. Notices of the occurrence of the remaining species in each district will be found in the *Scottish Naturalist*, chiefly in the numerous supplements to *Mycologia Scotica*, issued for a time by Mr. Stevenson alone, and latterly by Mr. Stevenson and myself conjointly.

The additions to "Tay" are the result chiefly of the work of Mr. Stevenson in Forfarshire, and of Dr. F. B. White in Perthshire; but I have been able to add a few from the neighbourhood of Montrose.

The list for "Dee" rests almost entirely on my own work among the fungi in the neighbourhood of Aberdeen during the past two or three years. I have found the microscopic groups quite a wide enough field of study, and accordingly have done little among the Hymenomycetes and the Helvellacei, which in "Dee" still greatly need working out, and that they will repay study we may infer from the wonderful results of Dr. Keith's labours among them in the neighbouring province of "Moray."

A large proportion of the species in the subjoined lists were new to the flora of Scotland when published from the districts of "Dee" and "Tay" in the supplements; and a considerable number were new to the British lists, several never having been previously described. A glance at the present lists will show that a considerable portion of the species in that for Dee are still unpublished records.

I regret that I have no information for the part of the province of "Forth" that lies within the bounds of the Union. There does not seem to be any worker in the Fungi now resident in that part of the East of Scotland. Let us hope that this will not long continue to be the case, and that some worthy successor to Greville may resume the study of Mycology in "Forth," so well begun by him.

The nomenclature and arrangement have been retained as near as possible to those in the *Mycologia Scotica* for convenience of reference; but a few changes have been introduced where allied forms were widely separated under the arrangement there employed, and where, as under *Peronospora*, species were placed under manifestly wrong genera. It must be borne in mind, however, that a very considerable portion of the fungi enumerated as

distinct species are in fact only less fully developed forms of species referred, when matured, to widely different groups. In the present state of our knowledge, there is a practical advantage in treating them as distinct, if their mutual relations are not forgotten, since many of them are seldom met with in all the forms, and many, indeed most, of the lower forms cannot yet be referred to their mature conditions.

Probably in no long time it will be possible to issue a satisfactory and reliable *Mycologia Scotica*, and Mr. Stevenson deserves our thanks for the important advances made by him in securing a basis for this.

PROVINCE OF DEE.

Hymenomycetes.

*n*Agaricus carcharias Pers., *n*A. metachrous Fr., A. Saundersii Fr., *n*A. melinoides Fr.
Paxillus atrotomentosus Batsch.
*n*Russula Queletii Fr.
Polyporus pubescens Schum.
*n*Typhula Grevillei Fr.
*n*Næmatelia virescens Corda.
Exobasidium Rhododendri Cr. (=E. vaccinii Wor. var.)

Myxomycetes.

Fuligo varians Sommf.
*n*Craterium leucocephalum Pers.
*n*Chondrioderma Michelii Lib.
*n*Comatricha Friesiana De Bary.
Plasmodiophora Brassicæ Wor.

Coniomycetes.

n Leptostroma donacinum Sacc? var. *majus* Trail; *L. Juncacearum* Sacc.
Cytospora foliicola Lib.
Phoma superflua Sacc., *n*P. Asteriscus Berk., *n*P. Samarorum Desm.
Ascochyta teretiuscula S. and R.
Coniothyrium conoideum Sacc. (in same perithecia with Leptosphaeria conoidea De Not.)
Diplodia obsoleta Karst.
Diplodina Ammophilæ Trail.
Hendersonia Sparganii Niessl, H. culmiseda Sacc., H. Equiseti Trail.
Stagonospora Caricis (Oud.) Sacc., S. paludosa S. & Sp., S. Heleocharidis Trail; S. Typhoidearum (Desm.) Sacc. (This is Darluca Typhoidearum, B. and Br. in Cook's *Handbook*, No. 1286.)
n Vermicularia trichella Grev.
Melasmia alnea Lev

*n*Septoria Heraclei Fckl., S. Petroselini Desm., S. Hederæ Desm., S. Stellariæ R. and D., *S. Anemones* Desm., S. Violæ West.
S. menyanthes Desm., S. scabiosæcola Desm.
S. Lysimachiæ West., S. dolichospora Trail.
Rhabdospora pleosporoides Sacc. var. rubescens Karst, R. Cirsii Karst.
n Dinemasporium graminum Lev., *n*D. hispidulum Schrad. var. herbarum Cooke.
Asteroma Ulmi Kl., *n*A. Prunellæ Purt., *n*A. Rosæ D.C.
Glœosporium Gei Trail.
Coryneum microstictum B. and Br.
Asterosporium Hoffmanni Kunze.
n Cylindrosporium rhabdosporum B. and Br.

Torulacei.

*n*Torula herbarum Link, *n*T. Graminis Desm.
Septonema elongatispora Preuss.
Tetraploa aristata B. and Br.
Echinobotryum atrum Corda.
Gymnosporium Arundinis Corda.

Pucciniaei.

Phragmidium violaceum Schultz, *n*P. obtusum Fr.
*n*Triphragmium ulmariæ Link.
Puccinia arundinacea Hedw., P. striola Link, P. Baryi (B. and Br.) Winter. P. Luzulæ Lib., P. mixta Fckl., P. amphibii Fckl., P. Oxyriæ Fckl., P. Cirsii Lasch., P. variabilis Grev., P. Galiorum Link, P. acuminata Fckl.
*n*P. Ægopodii Link, P. Chryosplenii Grev., P. Lychnidearum Link (with the forms P. Stellariæ Fckl. and P. Saginæ Fckl.), P. Fabæ Link., P. fallens Cooke.
Uromyces Alliorum DC. (a form of Puccinia mixta Fckl.), U. apiculosa Lev., U. Geranii Berk., U. intrusa Lev., U. Polygoni Fckl.
Uredo Potentillarum DC., U. Statices Desm., U. Caryophyllacearum Johnst., U. Vacciniorum Pers., U. alliorum DC. (along with Puccinia mixta Fckl.)
Coleosporium Tussilaginis Lev., C. Petasitis Lev., C. Senecionis Fr., C. Campanulæ Lev., C. Sonchi-arvensis Lev.
*n*Melampsora salicina Lev.
Lecythea mixta Lev., L. Saliceti Lev., L. Valerianæ Berk.
Trichobasis Pyrolæ Berk., T. Fabæ Lev., T. suaveolens Lev.
Peridermium Pini Chev. and the var. acicolum Link.
Æcidium leucospermum DC., Æ. Behenis DC., Æ. Galii Pers.
Æ. Valerianacearum Duby. Æ. compositarum Mart., vars. Taraxaci Grev., Jacobææ Grev., and *n* Lapsanæ Purt., Æ. Saniculæ Carm., Æ. Geranii DC.

Chytridiacei.

Synchitrium Anemones Wor., S. Mercurialis Fckl., S. Taraxaci De Bary and Wor.
Schinzia Alni Wor.

Ustilaginei.

Ustilago hypodytes Fr., U. vinosa Tul.
Doassansia Alismatis Cornu.
Entyloma Ungerianum De Bary (nec. *Myc. Scot.*, No. 1343), E. Ficariæ F. v. Waldh. (=Ungeriarum, *Myc. Scot.*, No. 1343), E. Calendulæ Oud., E. canescens Schrot. (=Protomyces Fergussoni B. and Br., *Myc. Scot.*, No. 1324).
Thecaphora Trailii Cooke.
Tilletia sphaerococca F. v. Waldh. (Glen Cluny, ? in Braemar).
Melanotænium endogenum Ung.
Entorrhiza cypericola (Magn.) Weber.
Protomyces macrosporus Ung., P. pachydermus Thuem., P. rhizobius Trail.

Hyphomycetes.

Isaria brachiata Schum.
*n*Stilbum vulgare Tode.
*n*Epicoccum neglectum Desm.
Dendryphium ramosum Cooke.
Macrosporium sarcinula B. and Br. (a condition of Pleospora herbarum probably).
*n*Gonatosporium puccinioides Corda.
*n*Sporodum conopleoides Corda.
n Peronospora pygmæa Ung., P. gangliformis Berk., *n* P. arborescens Berk., *n* P. affinis Rossm., P. Alsinearum Casp.
*n*P. Trifoliorum De Bary, *n*P. Ficariæ Tul., P. calotheca De Bary, P. sordida Berk., *P. Myosotidis* De Bary.
*n*Cystopus spinulosus De Bary.
Pythium Equiseti Sadeb.
Orularia spheroidea Sacc., *n*O. Veronicæ (Fckl.), O. Syringæ Berk., *O. Bistortæ* (Fckl.).
Ramularia (*Didymaria*) *didyma* Unger, *n*R. (D.) rufibasis B. and Br. (=R. destructiva Ph. and Pl.), R. pruinosa Speg., *R. variabilis* Fckl., R. Valerianæ (Speg.) Sacc., *R. Heraclei* Sacc., *R. Urticæ* Ces., R. calcea Desm., *R. pratensis* Sacc., R. Cochleariæ Cooke, *R. Menthæcola* sp.n., *n* R. intertitialis (=Peronospora insterstitialis B. and Br.).
Cercospora Mercurialis Pass.
*n*Polyactis cinerea Berk.
Oidium chartarum Link.
Stysanus stemonitis Corda.
Dactylium spirale B. and B. White, D. modestum, B. and B. White.
*n*Fusidium griseum Link.
*n*Zygodesmus fuscus Corda.
Myxotrichum chartarum Kunze.
*n*Chætopsis Wauchii Grev.
Pilacre faginea B. and Br.

Ascomycetes.

*n*Peziza Wilkommii Hart (=P. calycina var. Laricis, *Myc. Scot.*, No. 1610). P. apala B. and Br., *n*P. Curreiana Tul., P. cyathoidea Bull. var. *n*Solani Pers., *n*P. fusarioides Berk., P. arenevaga Desm., *n*P. sulphurea Pers., *n*P. erumpens Grev.

*n*Helotium claroflavum Berk., *n*H. herbarum Fr.

*n*Patellaria rhabarbarina Berk.

Cenangium Rubi Fr.

Taphrina aurea Fr.

Exoascus turgidus Sadeb., E. flavus Sadeb. (=Ascomyces Tosquinetii, *Myc. Scot.*, No. 1771), E. Pruni Fckl. (=Ascomyces Pruni, *Myc. Scot.*, No. 1770).

*n*Phacidium repandum Fr.

Rhytisma salicinum Fr., Rh. acerinum, var. punctatum Fr., Ephelis radicalis Ph. and Pl.

*n*Lophodermium arundinaceum Schrad. (=Hysterium arundinaceum, *Myc. Scot.*, No. 1809.)

*n*Sporomega cladophila Corda.

Stegia Ilicis Fr.

*n*Trochila craterium Fr.

Sphaerotheca Castagnei Lev., *S. Epilobii* De Bary.

Phyllactinia guttata Lev.

Uncinula bicornis Lev.

*n*Podosphæra Kunzii Lev. ; *n*P. clandestina Lev.

Microsphæra Hedwigii Lev.

Erysiphe horridula Lev. (hardly distinct from E. lamprocarpa Lev.).

E. umbelliferarum De Bary, *E. Galeopsidis* DC.

Chætomium elatum Kunze.

Capnodium Citri B. and D. (in greenhouse), *C. quercinum* (Pers.), B. and D., both in conidiophorous state only.

*n*Hypocrea rufa Fr. (in form of *n*Trichoderma viride.)

Nectria Rousseliana Mont., *n*N. sanguinea Fr.

Dothidea Podagrariæ Fr.

Stigmatea Potentillæ Fr.

*n*Xylaria carpophila Fr.

*n*Sphaeria (Crytosphæria) millepunctata Grev.

Gnomoniella devexa (Desm.) Sacc.

*n*Sphærella innumerella Karst., *S. isariphora* (Desm.) De Not.

Didymella Barbieri (West.), Sacc.

*n*Melanopsamma (Lasiosphæria) Ruborum Lib.

Venturia inæqualis (Cke.) West., V. Alchemillæ (Grev.), B. and Br.

Leptosphaeria Typharum (Desm.) Karst, *L. Triglochinicola* (Carr,, Sacc., *n*L. nigrans (Desm.) Ces. and De Not., *n*L. derasa (B. and Br.) Thuem.

*n*Ophiobolus porphyrogonus (Tode) Sacc. (=Sphaeria rubella, *Myc. Scot.*, No. 2098), *n*O. acuminatus (Sow.) Duby (=S. acuminata, *Myc. Scot.*, No. 2099).

PROVINCE OF TAY.

Hymenomycetes.

Agaricus mappa Fr., A. ermineus Fr., A. immundus Berk., A. brevipes Bull., A. Trogii Fr., A. platyphyllus Fr., A. fusipes Bull. var. oedematopus Schaeff., A. luteoalbus Bolt., A. hepaticus Batsch, A. hypnophilus Berk., A. pisciodorus Ces., A. caperatus Pers., A. aurivellus Batsch, A. subsquarrosus Fr., A. radicosus Bull., A. hirsutus Lasch, A. asterosporus Quel., A. sinapizans Fr., A. glutinosus Lindgr., A. astragalinus Fr., A. minutus Quel., A. alveolus Lasch, A. elaecodes Fr., A. pyrotrichus Holmsk., A. conopileus Fr., A. fimicola Fr.
Coprinus radians Fr., C. lagopus Fr.
Cortinarius turbinatus Fr., C. saginus Fr., C tabularis Fr., C. cinnabarinus Fr., C. flexipes Pers., C. limonius Fr., C. germanus Fr.
Hygrophorus subradiatus Schum. var. lacmus Fr.
Lactarius vietus Fr., L. flexuosus Fr.
Russula fellea Fr., R. Queletii Fr.
Panus torulosus Fr.
Trametes Pini Brot.
Hydnum scrobiculatum Fr., H. cyathiforme Schaeff.
Dacrymyces chrysocomus Bull.
Exobasidium Rhododendri Cr. (not really distinguishable from *E. Vaccinii*).

Gasteromycetes.

Geaster rufescens Fr.

Myxomycetes.

Badhamia fulvescens Cooke.
Plasmodiophora Brassicæ Wor.

Coniomycetes.

Stagonospora arenaria Sacc., var. *minor* Trail.
Melasmia alnea Lev.
Phyllosticta Violæ Desm.
Glœosporium Cytisi B. and Br.

Torulacei.

Torula splendens Cooke, T. sporendonema B. and Br.

Pucciniaei.

Phragmidium violaceum Schultz.
Puccinia amphibii Fckl., P. malvacearum Corda.
P. Pimpinellæ Link., P. Thalictri Chev.
Uredo Statices Desm.
Coleosporium Senecionis Fr.

Chytridiacei.

Æcidium depauperatum Vize.

Synchitrium Mercurialis Fckl., S. Taraxaci De Bary and Wor.
Schinzia Alni Wor.

Ustilagineae.

Ustilago Succisæ Magn.
Doassansia Alismatis Cornu.
Entyloma Ungerianum De Bary (nec. *Myc. Scot.*, No. 1343).
E. Ficariæ F. v. Waldh. (E. Ungeriarum, *Myc. Scot.*, 1343).
E. calendulæ Oud., E. canescens Schrot. (Protomyces Fergussoni B. and Bk., *Myc. Scot.*, No. 1324).
Protomyces pachydermus Thuem.

Hyphomycetes.

Isaria felina Fr.
*n*Peronospora affinis Berk.
Sporocybe alternata Berk.
Helminthosporium nanum Nees.
Macrosporium Sarcinula B. and Br. (a condition of Pleospora herbarum probably).
Triposporium elegans Corda.
Sporodum conopleoides Corda.

Physomycetes.

Mucor phycomyces Ehb.

Ascomycetes.

Peziza Roumegueri Karst., P. Wilkommii Hart. (=*P. calycina*, var. *Laricis*, *Myc. Scot.*, No. 1610).
P. strobilina Fr.
Sphaerotheca Epilobii De Bary.
Erysiphe Galeopsidis D.C., *E. Astragali* D.C.
Acrospermum compressum Tode.
Polystigma rubrum Pers.
Sporormia minima Awd.
Sphæria persistens B. and Br., S. nigrella Fr.

ON LOCAL MUSEUMS.

By Professor C. C. BABINGTON, F.R.S., F.L.S., &c.

I have read with much interest the Editor's remarks upon Local Museums in the October number of this Journal. His views seem to me to be very sound. How sad it is to be led into a local museum by some local man, and manifestly expected to praise it; but finding there a room filled with such a miscellaneous mass of objects as Dr. Trail has described, to be obliged to express very moderate admiration of it, whilst our friendly guide is evidently

expecting enthusiastic praise. Local collectors have done their best according to their imperfect information and judgment, but have lamentably failed in making a collection of scientific value or educational use.

I should say, as Dr. Trail does, make a collection of typical specimens illustrative of the kingdoms, or better of one kingdom, of nature; and reject all untypical specimens; and, as a rule, do not insert anything lower than genera. Then, make as perfect a collection, extending to species, and even to varieties, as can be obtained of the animals, plants, and minerals found in the district, be it a county, or be it otherwise. This will form a collection of very great value to the naturalist, and of much interest to the casual visitor to the museum. Neither naturalists nor visitors go to local museums to see such a miscellaneous collection as Dr. Trail has described; they usually want to learn what has been found in and about the place where the museum is situated. And the student is similarly satisfied for he can then determine the name and character of any specimen that he may find, and can also see and study types of groups not represented in his district.

One more point must be impressed upon everyone. The museum must be placed in charge of some permanent public body, which will look to its preservation. If this is not done all the labour spent on it will probably be lost. Its enthusiastic collectors die or leave the district; no one troubles himself about it; dust and insects get in; and all goes to ruin, for want of even the little attention that a public body would pay to its preservation.

There is another matter of importance noticed by Dr. Trail. I mean the publication of papers of value communicated to local societies. As is well remarked, they publish Transactions, which no one sees, except a few local people. We, who live at a distance, never hear of the papers, of however great value they may be; or if we do hear of them, we are quite unable to obtain access to more than a meagre abstract in some better circulated Journal.

Why should not a representative body be formed to examine all such papers, and if the paper is reported favourably upon, to recommend it for publication, in Scotland in the *Scottish Naturalist*, and in England in some similar journal. Of course, the reporters on the papers need no more be known than they are in the great scientific societies, which always refer their papers before accepting them for publication. It seems to me that such a plan as this is deserving of consideration; and I, therefore, throw out the suggestion.

PHYTOLOGY.

NEW MOSSES FROM SCOTLAND.

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

Campylopus brevipilus grows in great luxuriance in the Island of Benbecula, to such an extent, indeed, that it may fairly be estimated as constituting about a sixth part of the vegetation of the lower lands bordering on the sea. On the higher grounds it is sparser, and assumes different aspects; but, on the whole, the tufts, while still as dense as usual, have the individual stems quickly delapsing or separating in the hand (just as in *Grimmia funalis*). The stems themselves are much more robust, as well as longer, and, with the leaves attached, quickly assume a dark or purplish-dark colour beneath the apex, and down to the point of attachment, resembling much *C. atrovirens*, and having a habit quite different from the typical state of *C. brevipilus*. The extreme state of this condition has no hair points on any part of the stem, and does not show the growth interrupted in the successive years. In this condition, also, there are no auricles, or scarcely any, to be seen at the base. A few colourless cells (two or three of which are occasionally slightly tinged with red next the nerve), having the usual thin irregular walls, are pretty often seen quite at base, as in all the so-called non-auricular species, but these are at times wanting or are left behind on the stem in the act of separation. The leaves are, in consequence, somewhat narrowed at base, and the nerve a little upwards occupies about one-third of their breadth. The rest of the areolation corresponds to that seen in the usual state of *C. brevipilus*. The apices of the leaves have very often coloured or colourless teeth, which are also, in many instances, to be seen on the back of the nerve near summit. Such a state is so strongly differentiated from the type that I have been tempted to raise it to the rank of a sub-species under the name **Campylopus pelidnus**. It is certainly much more deserving of specific distinction than *C. paradoxus*.

There is another Campylopus found on Benbecula which has puzzled me considerably; viewed casually, it might well be taken for a state of *C. Schwarzii*. The stems are densely tufted, so densely, indeed, as to give the impression of *C. compactus*, without, however, the slightest trace of the red tomentum of the latter. Indeed, tomentum is singularly absent, only a few colourless radicles are seen here and there on the lower leaves. The stems are from one to two inches in length. The leaves have no auricles, and are narrowed at base. The basal areolation is narrowly cylindrical near the margin, more broadly so close to the nerve. The nerve near base occupies two-thirds, or even three-fourths, the breadth of leaf, and is predominant for the upper three-fourths. The leaves in their upper parts are not convolute, as in *C. compactus*, but are flattish, and the apex is entire on edge and back, and is not hair pointed.

I propose, meanwhile at least, to give to this moss the name

Campylopus symplectus.

Both mosses have been found only in a barren state.

I possess *Grimmiæ* from various parts of Scotland, whose leaves become strongly and quickly recurved on being moistened. One group is from the Lowlands, and all its members may be included under *G. subsquarrosa*. As the specimens from Moncreiffe Hill and Dumbuck, near Bowling, form the original types of *G. subsquarrosa*, they are now taken as tests in the discrimination of what I am inclined to view as a second species of this group. In this latter the leaves are much more strongly reflexed on the application of moisture, to a degree, indeed, that may be termed circinato-reflexed, and they remain so much longer. In a dry state the leaves are erecto-patent, and not appressed. The tufts, in colour and consistency, have much the appearance of those of *G. Hartmanni*, and, viewed casually in a dry state, are very apt to be mistaken for them.

The leaves of this moss are much narrower, and the apices are quite sharply pointed, while the margin is strongly reflexed in the lower half, those of *G. subsquarrosa* being nearly plain in the same situation. The areolation of the latter at base is pellucid and rectangular for a considerable space, but that of the moss under consideration is bluntly quadrangular, and is often greenish, although not sinuous as in *G. Hartmanni*. The upper areolation is minute, dense, and opaque in all. That of *G. Hartmanni*,

while dense above, has each cell very constricted in the middle, while the outlines of the cells in the other two are merely somewhat irregular, but not constricted.

The apex of the typical specimens of *G. subsquarrosa* is bluntish, and the hair point is even rather flat at its insertion, but this is not so in **Grimmia retracta**, the name I propose to give to the moss under discussion. Found beside Loch Tay, July, 1866.

MYCOLOGIA SCOTICA—Supplement.

By REV. J. STEVENSON and Prof. JAMES W. H. TRAIL.

(*Continued from S. N.*, 1885, *p.* 192.)

(*All measurements, except where specified, are in thousandths of a millimetre.*)

3064. E. Ungerianum De By. (**Protomyces microsporus** Unger). Trail, *Scot. Nat.* 1884, *p.* 228 (*nec.* 1343, *Mycol. Scotica*).

In yellowish green, afterwards brown, outgrowths, $\frac{1}{25}$-$\frac{1}{8}$ inch across, *convex above, concave below*, in leaves of *Ranunculus repens*, and, less often, of *R. acris*; spores densely crowded in the tissues of the spots, globular or oval, 12-20 diam.; outer surface marked with ridges, hyaline to pale brown. July-Oct.

East. — — Tay Dee Moray — — —
West. Solway — — — — —

Local, but frequently abundant. J. W. H. Trail. The plant of *Mycologia Scotica* is the *next* species, not this one.

3061. E. Ficariæ F. v. Waldh. Trail, *Scot. Nat.* 1884, *p.* 228 (=**E. Ungeriarum** *Mycol. Scot.* 1343, *nec.* de Bary; and conidia=**Cylindrosporium Ficariæ** B., *Mycol. Scot.* 1186).

In *flat* spots ($\frac{1}{25}$-$\frac{1}{8}$ inch across), at first pale green, then whitish, because of development of sporidia from spores still in leaf, afterwards brown; spores rounded or polygonal, 8-12 diam.; germinating readily, surface nearly smooth, wall rather thin; colourless to pale brown.

In leaves of *Ranunculus Ficaria*, often associated with *Peronospora Ficariæ*. May-July.

East.	—	—	Tay	Dee	Moray	—	—	—
West.	—	—	—	—	—	—		

Plentiful wherever looked for. J. W. H. Trail.

3062. **Melanotænium endogenum** (Unger) *Exantheme d. Pflanzen.* Trail, *Scot. Nat.* 1884, *p.* 243.

In stems of *Galium verum*, causing the plants to remain stunted and erect, and to resemble miniature Equisetum palustre in habit. The stems become dull purple or blackish, either throughout, or at the nodes, with only dark streaks in the internodes. The leaves are sickly yellowish-green, with midribs, at base below, dull purple. The flowers are seldom developed. The cortex of the stem is crowded with spores of the fungus, usually in groups. The spores are rounded, or frequently more or less angular, from mutual pressure; are usually dark brown, and moderately thick walled, and vary from 17 by 12 to 25 by 20.

East.	—	—	—	Dee	—	—	—	—
West.	—	—	—	—	—	—		

Frequent on Sandy Links, near Aberdeen, and at Muchalls on cliffs. J. W. H. Trail. Probably this fungus is common along our sandy coasts.

3063. **Entorrhiza cypericola** (Magnus) Weber. *Bot. Zeit.* 1884, *pp.* 369-79. Trail, *Scot. Nat.* 1884, *pp.* 241-43.

Causes swellings in the tips of roots of *Juncus bufonius*. These are usually white, oval, smooth or nearly so, and vary from the size of a pin-head to that of a pea. After a time they become brown. The cells of the inner cortex are enlarged, and are occupied by spores connected by very delicate mycelium filaments. The spores are round or oval, and reach 20 by 17. They have a thin endo-spore, and a yellow or red-yellow epispore bearing low warts.

East.	—	—	—	Dee	—	—	—	—
West.	—	? Clyde	—	—	—	—		

Near Aberdeen, in one or two places. J. W. H. Trail. Prof. B. Balfour tells me that he has found considerably larger branched tumours on roots of *Juncus* (*lamprocarpus?*) near Glasgow, which apparently are caused by the same, or by an allied, species of fungus.

3064. **Tilletia bullata** Fckl. *Sym. Myc. p.* 40. *Grevillea, Vol.* V. *p.* 118.

Epiphyllous. Sori bullate, orbicular, purplish-black; spores globose, purplish-brown; epispore minutely granulated. *Caeoma Bistortarum*, Libert Exs. 88.

A very interesting and apparently rare species, found by

Libert on *Polygonum bistorta*, and by Fuckel on *Polygonum viviparum*. Spores 15 diam.

On leaves of *Rumex obtusifolius*.

East. — — — — — —
West. — Clyde. — —

Glasgow. R. H. Paterson.
Europe.

(This species was inadvertently omitted from former lists.)

3065. T. sphaerococca F. v. Waldh. [*Bull. Mosc.* 1867, *p.* 255. *Grevillea*, *Vol.* XII. *p.* 99.

Mycelium black. Spores globose or obtuse-ovoid (26-30), dark brown reticulations of the epispore more prominent than in Tilletia caries. *Mem. sur les Ustilag*, *p.* 254.

In the Ovaries of *Agrostis pumila*.

East. — — — ? Dee. — — — —
West. — — — — — —

Glen Cluny. F. C. S. Roper.
Europe.

BRITISH ASSOCIATION.

The meeting of the British Association held in Aberdeen, from 9th to 16th September, 1885, was not less successful than its predecessors, coming though it did after such a meeting as that in Montreal the previous year. It is true that it was not distinguished by any startling announcements of new scientific discoveries ; but these are rare at any time, nor does one nowadays look to a meeting of the British Association as the occasion that will give them birth.

But, bearing in mind the real nature and aims of the gathering, that it comes together annually, less with the intention of discussing science than to afford to its members the opportunity of making or of renewing friendships, and to spread among the residents in and around the place of meeting some intelligent appreciation of science, without demanding of them a profound knowledge of any part of it, the meeting of 1885 may be held to have quite fulfilled its aims. The preparations made for entertaining the guests, and for excursions were sufficient ; and seemed to meet the approval of all, save of the usual contingent of grumblers among the too

numerous campfollowers, who are seldom absent from this their autumn holiday. The only serious *contretemps* that occurred was that one of the days devoted to excursions proved wet and stormy But supplies for the mind, no less than for the body, were provided; and the general interest of the papers and their numbers did not in any degree fall short of former years. As was to be anticipated, Scotchmen took a prominent part in the reading of papers. Of course, a large proportion of the papers bore upon subjects not peculiarly Scotch; but, as will be seen from the list of headings below, a considerable number of papers of really local interest were read, especially in the Geological section.

Of Scientific Exhibitions there were several. Besides the Museums in the University buildings, a loan exhibition was shown, restricted to specimens from Scotland north of the Tay. There were many interesting and valuable objects included in it, thanks to the kindness of the directors of the Museums of Forres, Elgin, Banff, and Montrose, the Dundee Naturalists' Society, and many private individuals, through whose generous assistance some idea of the fauna, flora, and geology of the north of Scotland could be gained by the strangers during even the few days spent in Aberdeen.

The presidential addresses dealt largely with the educational bearings of scientific studies. Professor M'Intosh, of St. Andrews University, however, took as the subject of his interesting address, the phosphorescence of marine animals; and Professor Judd, in the Geological section, spoke "On some Great Problems in Highland Geology," summing up the conclusion generally admitted by Geologists within the past year or two, and adverted to in previous numbers of this Journal. In his address he bestowed on the late Professor Nicol the tribute due to him for the accuracy of the conclusions to which he had come in regard to this most difficult problem, and which were for many years not allowed a hearing because of the influence of Murchison in opposition to them.

Space will not permit the insertion of more than the headings of the local Scotch papers read before the meeting.

GEOLOGY.

Bonney, Prof. T. G.—"On Bastite-Serpentine and Troktolite in Aberdeenshire, with a note on the Rock of the *Black Dog*."

Buchanan, J. T.—"Depth and Temperature of some Scottish Lakes."

Cadell, H.—"The Oil-Shales of the Lothians."
„ "Recent Advances in West Lothian Geology."
Davidson, Rev. Dr.—"The Bass of Inverurie, the remains of an ancient alluvial bed."
Gunn, John—"A description of the rocks of Central Caithness."
Howden, Dr. J. C.—"Notes on the Glacial Deposits of Montrose."
Lapworth, Prof. C.—"The Great Highland Controversy, its Causes, Course, and Consequences."
Macadam, Prof. W. J.—"The Aberdeenshire Diatomaceous deposits, their extent, chemical composition, and industrial uses, with notes on similar deposits elsewhere in Scotland."
„ „ —"Description of a Mineral from Loch Bruithaic, Inverness-shire."
Macfarlane, Dr. J.—"On a microscopic fungus in fossil wood from Bowling."
Melvin, J.—"The parallel roads of Lochaber."
Mitchell, Rev. Dr. H.—"Exhibition of specimens of Fish from the Lower Old Red Sandstone of Forfarshire."
Peach, B. N. and Horne, John—"The Geology of Durness and Eriboll, with special reference to the Highland Controversy."
„ „ —"Further evidence of the existence of Ice in the North Sea Basin, based on the exploration of the Wyville Thomson Ridge, by Dr. John Murray, and on the occurrence of Shelly Boulder Clay in North Ronaldshay, found by Dr. Traill."
Phillips, J. Gordon.—"The Elgin Sandstones."
Ross, Alexander—"Notes on the Rocks of St. Kilda."
Smith, Wm.—"The movement of sand in Aberdeen Bay."
Tragnair, Dr. Ramsay—"On a new Reptile, recently discovered at New Spynie, near Elgin."

BIOLOGY.

M'Intosh, Prof. Wm.—"On the structure and arrangement of the Marine Laboratory in St. Andrews."
„ „ —"General remarks on 9 months work at the St. Andrews Laboratory."
„ „ —"On certain processes formed by *Cerapus* on *Tubularia* at St. Andrews."
„ „ —"On a new British *Staurocephalus* Whitstable."

„ „ —"On remarkable structures resembling ova from deep water."

„ „ —"On the ova of the Skulpin."

Struthers, Prof. John—"On the Tay Whale (*Megaptera longimana*) and other whales recently obtained in the district."

BOTANY.

Bruce, Rev. W. S.—"Flora of Banffshire."

Grant, James—"Flora of Caithness."

Mackenzie, Jas.—"Flora of Elgin."

Wilson, William—"On Aberdeenshire plants as food for animals."

In the Anthropological section also there were several papers of local interest read; they dealt chiefly with archæological subjects.

During the week, two conferences of delegates of Corresponding local Societies were held; but the attendance at both was disappointingly small; and it was resolved to call the attention of the Societies to the need of a more lively interest being manifested in the matter of sending delegates that would take part in the work of the conferences, and to the risk of Societies that were unrepresented being cut off the roll of Corresponding Societies.

Dr. Garson submitted a request for assistance, such as could be supplied by local societies with little difficulty, to the committee of the British Association appointed "for the purpose of defining the Racial Characters of the Inhabitants of the British Isles."

Professor Hillhouse represented the danger of extirpation in which rare plants are exposed, and requested that local societies should co-operate to prevent such an evil being done.

Mr. de Rance submitted requests for information regarding boulders, erosion of coasts, and underground waters, all solely in England and Wales.

Want of space in this number makes it necessary to hold over to the next number several papers, namely:—**British Marine Algæ**, by E. M. Holmes, F.L.S., F.R.B.S.E., &c.; **Plants of West Ross**, by G. C. Druce, F.L.S.; **Forms of Carex new to Scotland**, by Ar. Bennett, F.L.S.; **Mycologia Scotica, Supplement**, and conclusion of **The Lepidoptera of the Shetland Islands**, by A. Hoffmann; besides several Reports of Local Societies. For these papers and reports we beg to thank our contributors very sincerely, and we venture to hope a continuance of their kind assistance to render this Magazine useful, and valuable.

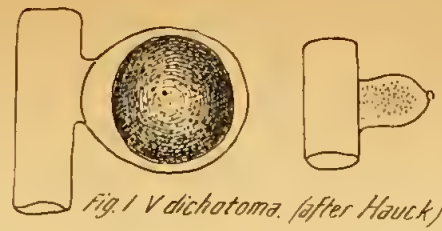


Fig. 1 V dichotoma. (after Hauck)

Fig 2. V Thuretu. (after Farlow)

Fig 3 V. synandra. (after Woronin.)

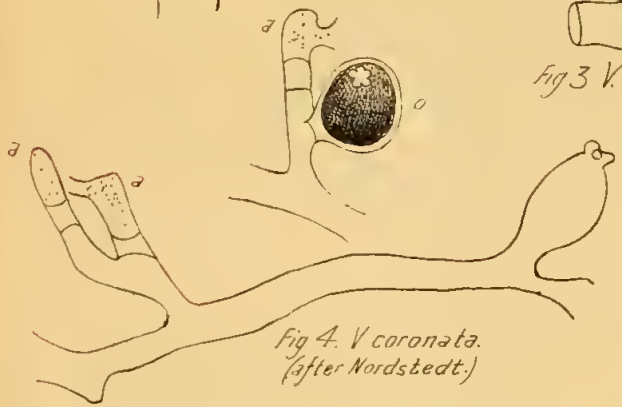


Fig 4. V coronata. (after Nordstedt.)

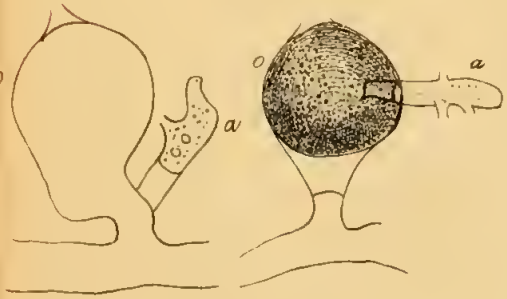


Fig. 5. V intermedia. (after Nordstedt.)

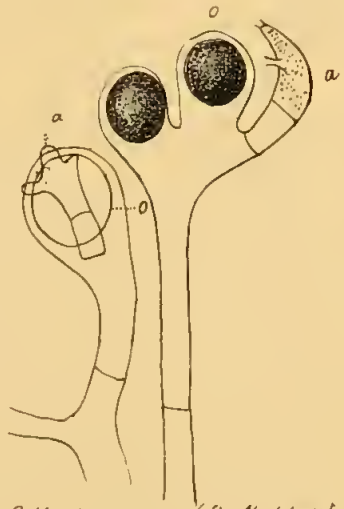


Fig 6 V. sphærospora (after Nordstedt)

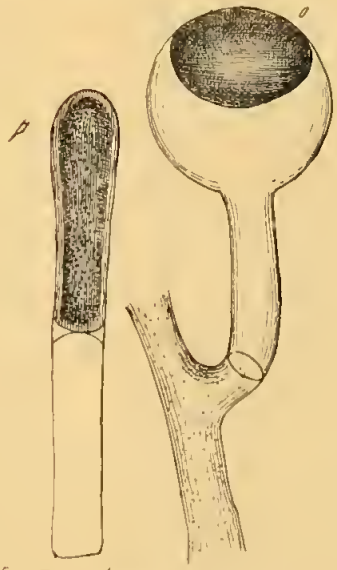


Fig. 7. V. pilobaloides (after Thuret) with propagulum (p.)

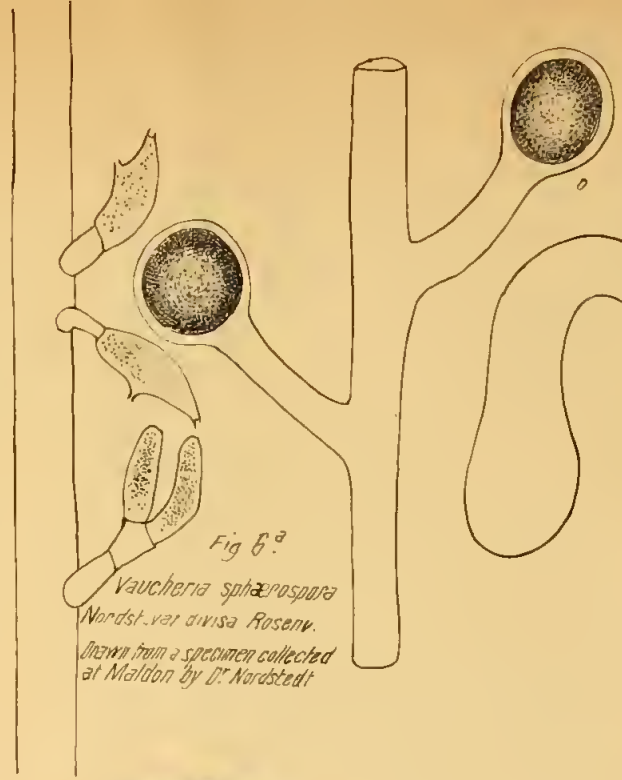


Fig 8ª Vaucheria sphærospora Nordst. var divisa Rosenv. Drawn from a specimen collected at Maldon by Dr Nordstedt

Fig 8 V litorea (after Nordstedt)

OBITUARY.

JOHN FRANCIS CAMPBELL (of Islay), F.G.S., was a well-known geologist some years ago, but for some time he had published little.

Born on 29th December, 1821, he at first seemed likely to inherit a large estate, but shortly after he came of age he lost it. He therefore studied law, but in 1855 he became private secretary to the Duke of Argyle, and afterwards to the Mines Commission, and the Lighthouse Commission; and from 1860-80 he held posts in the Queen's household. He died at Cannes on 11th February, 1885. His duties required frequent journeys into Iceland, Scandinavia, through Russia, Egypt, Syria, India, and Eastern Asia.

His natural taste led him to the study of Geology, for which his journeys afforded him numerous opportunities. His books are, however, more directed to pointing out defects in the work of others than to original investigations.

They are, "My Circular Notes," "Frost and Fire," "Glaciation," "Something from the Gold-diggings of Sutherland." In them geological observations are mingled with incidents of his travels.

He also interested himself greatly in the folk-lore of the West Highlanders, the results of which were published in well-known books, entitled "Popular Tales of the West Highlands." Besides the above, he occupied himself with solar physics, and invented a heliometer, which has received high praise from eminent physicists.

THOMAS DAVIDSON, L.L.D., F.R.S., had for years been recognised as the leading authority on "Brachiopoda," and especially on the fossil species. On this group of animals he wrote standard works, several of which were published by the Palæontographical Society, while others were published in France. Dr. Davidson was born in Edinburgh in 1817, of a good family in Midlothian; but he was taken to France at an early age, and there he was for the most part educated, though for a brief period he was a student in the

University of Edinburgh. Among his teachers were several of the best known leaders of science in Paris. He also studied art in Paris and in Rome, and employed his artistic talents in the illustration of his writings on the Brachiopoda.

It is understood that his valuable collections are to be deposited in the British Museum.

Dr. J. Gilchrist, for over thirty years superintendent in the Crichton Institution in Dumfries, died on Monday, 7th December, 1885. Throughout his life he took a warm interest in Natural Science, and in antiquarian researches; and the active part he took in promoting such studies in the south of Scotland, renders his death a great loss to the Dumfries & Galloway Antiquarian Society, of which he was President at the time of his death, and had been so during several years. We quote from the *Dumfries Herald* a notice of him as a scientist. "Perhaps it was as a scientist we knew him best. His favourite studies were geology and mineralogy, but he had more than a mere general knowledge of most of the principal branches of natural science. His great work in this district was the establishing of a Natural History and Antiquarian Society for Dumfriesshire and Galloway, which was instituted on the 20th November, 1862. According to the first volume of Transactions, Dr. Gilchrist convened a meeting of gentlemen interested in the cultivation of natural history and antiquarian research, with the result that a vigorous society was started into life, the original committee being Mr. Thos. Aird, Mr. M'Diarmid, Dr. Gilchrist, Mr. Thorburn, Mr. M'Ilwraith, Mr. W. G. Gibson, Provost Caldow, Mr. M'Dowal, Rev. Mr. Goold, and Dr. Dickson.

"The deceased gentleman, who had passed the age of three-score years and ten, lived a life of great activity, and even in his later years he had an elasticity of step and a buoyancy of spirit which might have been envied by much younger men. He was a man of reflective habits, a vigorous thinker, while his quickness of apprehension and tenacity of memory greatly assisted him in those scientific pursuits to the study of which he abandoned himself with ardour. As a geologist, he was able to give us much invaluable information relating to our district; and in him many a young student found a ready teacher in those subjects with which the Doctor had a special acquaintance. Last winter he organised and conducted at his own house classes in natural history, to

which all members of the Antiquarian Society were most heartily welcomed. Socially, Dr. Gilchrist was of a most genial disposition. He held the respect of all who had intercourse with him, as well as the esteem of all who knew him, and few men will be more generally missed in local intellectual circles."

JOHN WATSON LAIDLAY, another Scottish Naturalist, also has died during the recent year. Born in Glasgow on 27th March, 1808, when 17 years old he went to India, to his uncles, silk factors and indigo planters. In 1849 he returned from India, and lived partly in London, partly at Seacliff in Haddingtonshire.

His favourite pursuits were chemistry, geology, meteorology, and the study of oriental languages; and he published a number of papers on them in the Journal of the "Bengal Asiatic Society." Perhaps the most interesting publication ("Trans. Scottish Archæological Society," 1870-71) by him on a purely Scottish investigation related to the supposed rise of the east coast of Scotland. By the discovery of the ruins of a prehistoric dwelling on a rock near Seacliff, only 23 feet above high water mark, he showed that the land could not have been much lowered since its formation, else it would have been destroyed by the sea.

He presented a collection of shells, and also coins and other antiquities to the National Museums.

He died on March 5th, 1885, leaving five sons and two daughters.

CHARLES WILLIAM PEACH, late of H.M. Customs, and for many years one of the most assiduous and successful marine zoologists of Great Britain, died in Edinburgh on the 28th February, 1886, in his 86th year. A notice of his labours, which added largely to our knowledge of the marine fauna of Scotland, will appear in our next issue.

ZOOLOGY.

THE LEPIDOPTERA OF THE SHETLAND ISLANDS.

By AUGUST HOFFMANN.

(*Concluded from page* 179.)

37. **Cidaria Montanata**, var. Shetlandica J.W. (*Melanippe montanata* var. *Shetlandica* J.W.) Stgr. and Wk. Lap.; Wk. Norv. Alp.; Mosch. Lab.; Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.

Of this form, called by Mr. Jenner Weir var. *Shetlandica*, I have seen 4 examples. It is figured in the Entomologist, 1883, pl. 4, figs, 10, 11. There occurs in it a darkening of the white ground-colour of the anterior wings, due to suffusion with brownish-yellow; but the white remains as a border to the sharply defined middle area, which is broken up into bands: and there remain also the wavy white lines: the insects thus have a very variegated bright aspect. It is curious that in the Shetland Islands the colours and marking of this species are more vivid and more distinct; while the Northern specimens of the same form show a tendency in the markings to disappear, and in the colours to become pale (var. Lapponica Stgr.). Montanata is said to appear in the Shetland Islands only in the form described above. The specimens are markedly smaller than ours (Hanover). Time of flight is July.

38. **Cidaria Cæsiata** SV. (*Larentia Cæsiata* SV.) Stgr. Isl.; Stgr. and Wk. Lap.; Wk. Norv. Alp.; Mosch. Labr.; Sch. Fen.; Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.

Unfortunately, I could not examine any specimens of this species from the Shetland Islands. Since Mr. Jenner Weir does not especially mention this species, I conclude that the Shetland specimens do not differ in any way from those of the rest of Scotland, and that therefore probably the species will also appear there in all transitions to the aberr. *annosata* Zett. and aberr. *glaciata* Germ. Time of flight is July.

39. **Cidaria Adæquata** Bkh. (*Emmelesia blandiata* SV.) Stgr. and Wk. Lap.; Sch. Fen.; Frey Alp.; Stdfs. Sil. Mont.

Ordinary form, only with somewhat sharply defined markings. Time of flight is July.

40. **Cidaria Albulata** Schiff. and aberr. *Thules* J.W. (*Emmelesia albulata* Schiff. and aberr. *Thules* J.W.) Stgr. and Wk. Lap.; Wk. Norv. Alp.; Sch. Fen.; Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.

This species also in the Shetland Islands exhibits a very interesting modification. It shows a tendency to a yellowish leaden-gray ground colour, which in some examples supplants the white on the upper and under wings (aberr. *Thules* J.W.). The figures in the Entomologist 1880, pl. 4, figs 4 and 5, show the commencement of a transition to such specimens; I possess some markedly darker, as well as the ordinary form from the Shetland Islands. Mr. MacArthur writes me in answer to a question—"*Albulata* varies from the ordinary form up to the dark specimens." I therefore regard *Thules* J.W. as an aberr. of *albulata*. It flies in July.

I received from Dr. Staudinger a very pale pair of specimens from the Caucasus. The male especially is almost snow-white, but the yellowish bands are indicated; and they offer a curious contrast to the deep leaden-gray specimens of the Shetland Islands; yet even these have the characteristic sheen on the wings which is peculiar to *albulata*. Dr. Staudinger writes that he has met with the species near Bossekop (Lapland), flying over the meadows in almost fabulous numbers. I also found them, ten years ago, on the meadows of the Upper Harz in millions, but since that time, it has always been rare there; the insect must therefore appear only periodically in such numbers.

41. **Cidaria Bilineata** L. (*Camptogramma bilineata* L.) Stdfs. Sil. Mont.

Somewhat more dull-coloured than our specimens (Hanover.) It flies in July. *Entomologist*, 1880, plate 4, fig. 8.

42. **Eupithecia Venosata** F. var.; Wk. Norv. Alp.; Frey Alp.; Stdfs. Sil. Mont.

I saw 6 specimens of this variety from the Shetland Islands. The insect, at the first glance, gives quite a different impression from our *venosata*, and yet it is hard to say in what the difference consists. The ground-colour of the wings is less transparent, not reddish-gray but brownish-gray. The two cross-stripes, usually

white, which bound the middle area, are likewise suffused with clear brownish-gray, thus they are not so distinct, while the middle spot is smaller and more like a line; and the broad network, which in our *venosata* is very conspicuous on the front margin, is much finer and less dark in the Shetland form; so that, on the whole, a greater uniformity in markings and colour is brought about. This form is figured in the *Entomologist* 1880, plate 4, fig. 7. It flies in June.

43. **Eupithecia ? Nanata** Hb. var.; Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.; Stgr. and Wk. Cat. Fen.

I received 6 specimens of this curious form, which were all alike. Dr. Staudinger, to whom I sent a pair, writes, "A form of *Eupithecia* new to me, perhaps only a dark *nanata*." This form certainly comes nearest to the *nanata* aberr. *obscurata* Stgr.; but it differs from this in so many important points, that it cannot be united with it. The insect is larger, stronger, and somewhat broader-winged than *nanata*; the fringes are very long, especially at the inner angles of the wings; the colouring is a deep-brown gray, with a somewhat reddish tinge. The wing-scales are coarser and the whole marking more faded; so that the white cross-lines do not stand out so clearly. The wavy line is very distinct, and has, as in Nanata in cell 1, b., a distinct, white, wider part; on the other hand, the white oblique line at the point of the wings is wanting, as in *hyperboreata* Stgr. The bands, which enclose the middle area, are very marked and run straighter, and the outer one does not meet the margin so abruptly. In my opinion, this Shetland form deserves a special name. Whether it should be regarded as a peculiar species, or should be referred to *nanata* as a variety, I do not dare to decide. It flies in June.

44. **Scoparia Ambigualis** Tr. Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.

Ordinary Form. June and July.

45. **Scoparia Alpina** Stt.

Figured in the *Entomologist* 1880, plate 4, figs. 1 and 2. It flies in June.

46. **Scoparia Crataegella** Hb. var.; Stdfs. Sil. Mont.

A small dark specimen, determined by Dr. Staudinger as belonging to this species. Probably caught along with *ambigualis*, as I received the specimen under this name.

47. **Crambus Pratellus** L. Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.

Ordinary form. It flies in July.

48. **Crambus Culmellus** L. Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.

Ordinary form. It flies in June and July.

49. **Tortrix Musculana** Hb., var. (*Cnephasia musculana* Hb.) Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.; Stgr. and Wk. Cat. Lap.

I received 6 specimens of this species, which had a curious appearance. The insect is scarcely two-thirds the size of our specimens (Hanover). The ground-colour of the upper wings is a clear silvery-gray, and the basal area is bounded by an angular, brown band. In one specimen, the brown middle-band is much darker and more sharply bordered than usual. It flies in July.

50. **Sciaphila Osseana** Sc. (*Aphelia pratana* Hb.) m. Stgr. Isl.; Stgr. and Wk. Lap.; Wk. Norv. Alp.; Mosch. Labr.; Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.

I received only 2 specimens; they are redder than examples from Hanover and the Upper Harz; yet straw-coloured specimens marked with distinct dark specks are said to occur, like those that Dr. Staudinger has noticed in Iceland. Flies in August and September.

51. **Cochylis Thuleana** Va. (*Eupœcilia Thuleana* Va.)

A new species described by Mr. Howard Vaughan, in the *Entomologist*, 1880, p. 293, and figured, plate 4, fig. 3. In our system it must be ranked in the genus Cochylis, along with *affinitana* Dbl. Caught in June, in the most inaccessible places of the rocky coast of the Mainland.

52. **Cochylis Badiana.** (*Argyrolepia cnicana* Dbld.) (?) var. cnicana Dbl. Frey Alp.; Stgr. and Wk. Cat. Lap.

A single, large, deeply-coloured specimen was caught. Flies in June.

53. **Penthina Schulziana** F. (*Mixodia Schulziana* Stgr. and Wk. Lp.; Wk. Norv. Alp.; Frey Alp.; Stdfs. Sil. Mont.; H Herc. Mont.

Brightly coloured, but somewhat smaller than the Scottish form. Time of flight is June.

54. **Aphelia Lanceolana** Hb. (*Bacha Lanceolana* Hb.) Frey Alp.; H. Herc. Mont.

In the two specimens that I saw, on the upper wings the spots on the fold and on the cross-vein and the bar from the tip of the wing were very dark, and almost united; so that the general effect was that of a band running from the base over the cross-vein to the tip of the wing. The time of flight is July.

55. **Endemis Littoralis** Curt. (*Sericoris littoralis* Curt.) Beautiful red-brown, and brightly marked. Flies in June and July.

56. **Grapholitha Succedana** St. (*Catoptria ulicetana* Hw.) Frey Alp.

This is said to vary more strongly than the English form, but not to be so brightly marked as specimens from some Scottish localities. It flies in June and July.

57. **Steganoptycha Mercuriana** Hb. (*Pamplusia monticolana* Wlk.) Stgr. and Wk. Lap.; Wk. Norv. Alp.; Frey Alp.; Stgr. and Wk. Cat. Fen.

Dark red-brown, and much more distinctly marked than specimens from the Alps. Time of flight is July.

58. **Phoxopteryx Unguicella** L. (*Ph. unguicana* Fb.) Stgr. and Wk. Lap.; Frey Alp.; Stdfs. Sil. Mont.

Ordinary form. It flies in June.

59. **Dichrorhampha Plumbeana** Tr. (*D. tanacetana* St.) Frey Alp.; H. Herc. Mont.

Ground-colour somewhat redder than in the English form. It flies in June.

60. **Blabophanes Rusticella** Hb. (*Tinea rusticella* Hb.) Stgr. Isl.; Stgr. and Wk. Lap.; Wk. Norv. Alp.; Moschl. Labr.; Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.; Stgr. and Wk. Cat. Fen.

Ordinary form. Time of flight is June.

61. **Gelechia Ericetella** Hb. Stgr. and Wk. Lap.; Wk. Norv. Alp.; Frey Alp.; Stdfs. Sil. Mont.; H. Herc. Mont.

A somewhat pale form. It flies in June and July.

62. **Glyphipteryx Cladiella** Stt. Ordinary English form. I have no record as to time of flight.

The species described above fall, in respect to the countries referred to, under nine groups, as in the following table:—

9. Agrotis festiva, Chareas graminis, Cidaria cæsiata, Blabophanes rusticella.

8. Agrotis occulta, Hadena exulis, Sciaphila osseana.

7. Vanessa Cardui, Hepialus Velleda, Anaitis paludata, Cidaria munitata, C. albulata.

6. Nemeophila Plantaginis, Agrotis hyperborea, Mamestra dentina, Cidaria didymata, C. fluctuata, Penthina Schulziana, Gelechia ericetella.

5. Vanessa Atalanta, Hepialus Humuli, Agrotis pronuba, Dianthecia nana, Plusia Gamma, Anarta melanopa, Cidaria adaequata, Eupithecia nanata, Tortrix musculana, Steganoptycha mercuriana.

4. Sphinx Convolvuli, Agrotis strigula, A. C-nigrum, A. lucernea, Luperina Haworthii, Hadena adusta, H. monoglypha, H. basilinea, Caradrina quadripunctata, Dasypolia templi, Lygris testata, Cidaria immanata, Eupithecia venosata, Scoparia ambigualis, Crambus pratellus, C. culmellus, Phoxopteryx unguicella.

3. Hadena furva, Cochylis badiana, Aphelia lanceolana, Dichrorhampha plumbagana.

2. Agrotis cursoria, Hydroecia micacea, Cidaria bilineata, Scoparia crataegella, Grapholitha succedana.

1. Agrotis xanthographa, A. glareosa, Hadena fasciuncula, Scoparia alpina, Cochylis Thuleana, Endemis littoralis, Glyphipteryx cladiella.

In the above arrangement of groups the species brought together under group 9 have the widest distribution, viz., over 9 countries. The species of group 1, which has the narrowest distribution, have been observed only in the Shetland Islands.

The preceding table makes no claim to absolute accuracy; and it has indeed some very grave errors, *e.g.*, *Plusia Gamma* has certainly a wider distribution than is shown by its place in group 5. But on the whole the list gives a fair idea of the kind of distribution of the species under similar climatic conditions; and this was, in truth, the chief aim of this paper.

In conclusion—the Lepidopterous fauna of the Shetland Islands shows a less northern character than their comparatively high latitude would lead one to expect. All the butterflies of the genera *Argynnis*, *Erebia*, *Œneis*, &c., characteristic of the north, are absent, as are also the greater part of the northern *Agrotidæ*, *Hadenidæ*, *Anartæ* and *Plusiæ*. The fauna of the Shetland Islands seems quite to be an outpost of the peculiarly middle-European fauna of Britain, pushed forward towards the Arctic circle; a fact which may be most easily explained by the probable

union in former times of the Shetland Islands to the Scottish mainland, and by the not-to-be-under-valued influence of the Gulf Stream.

The importance of the fauna lies in the very interesting varieties that it exhibits, and all entomologists must thank Mr. M'Arthur for his continued and careful researches in this distant locality, carried through under difficult circumstances.

A NEW GALL-MIDGE (*Hormomyia Abrotani* sp. n.).

By Prof. J. W. H. TRAIL.

In October, 1884, I found on a plant of *Artemisia Abrotanum* (Southernwood), in a garden in Old Aberdeen, numerous small galls on the leaves, usually on the upper surface near the origins of the lobes ; frequently half a dozen or more occurred on a leaf. They are like a rifle bullet in shape, fixed to the leaf by one side, with the tip free. Their size is only $\frac{1}{16}$ by $\frac{1}{40}$ inch. The free wall is thin. The surface is like that of the leaf ; the colour was yellowish-green or dull reddish-green. In each lived an orange-red larva, which almost filled the central cavity. From galls kept in a box during the winter a number of the midges, of both sexes, emerged. They seem to come nearest to *Cecidomyia foliorum* H. Lw., but differ in so many points from that species, as described by Loew, that I venture to regard them as unnamed, and propose to call them *Hormomyia Abrotani*. I subjoin a description.

Hormomyia Abrotani sp. n.

Male, brown, without red or darker spots, eyes black. Thorax humped in front. Antennæ 14-jointed, joints elliptical, stalked, with a circle of long hairs on each. Wings narrow at the base, but suddenly widened at about $\frac{1}{4}$ of their length, grey, concolorous throughout, with darker veins ; 1st vein not *very* near costa, which is not much wider after the vein has joined it ; 2nd vein hardly to be made out at the base, the very oblique pale cross-veinlet looking like the basal part of it ; the 2nd vein is slightly curved in its more distant half, and does not quite reach the outer margin of the wing ; if continued, it would reach this at, or a little behind, the middle ; 3rd vein is distinct in its basal half, but stops abruptly before the point where the fork is usually situated, and shows no trace of either branch. Halteres pale grey. Legs long and slender, uniform brownish. Length of male insect $\frac{1}{25}$ inch (1 mm.)

Female resembles male, except in larger size ($\frac{1}{16}$ inch, or $1\frac{1}{2}$ mm., with ovipositor exserted), and in the uniformly brownish red abdomen, with a long telescope ovipositor, which is red towards the tip. The antennæ are alike in the two sexes. The abdomen in both males and females bears only pale inconspicuous hairs.

The above description is taken from dried insects.

PHYTOLOGY.

PLANTS OF WEST ROSS.

By G. CLARIDGE DRUCE, F.L.S.

IN July, 1881, at the request of the late Mr. H. C. Watson, I undertook to make a catalogue of the common plants for the vice county of West Ross, No. 105. This list, after the death of Mr. Watson, was sent with voucher specimens to the Bot. Rec. Club, and published in their report for 1880. In the second edition of *Topographical Botany*, it was quoted with a few accidental omissions as far as *Ericaceæ*. It being slightly difficult for non-members to refer to the Record Club's reports, the plants of the West Ross list omitted in *Top. Bot.*, ed. i j., are enumerated below :—

Trollius europœus, L., Mam Ratachan. *Nymphæa alba*, L. Loch Coulin. *Cardamine hirsuta*, L., Loch Carron side. † *Barbarea vulgaris*, L., Strome. *Drosera anglica*, Huds., locally common. *D. obovata*, M. and K., Loch Coulin, Kintail, &c. *Polygala vulgaris*, L., Scuir Ourauch. *P. depressa*, W., common. *Cerastium alpestre*, Syme, Scuir na Cairan. † *Acer Pseudoplatanus*, L., Loch Duich. *Vicia sylvatica*, L., Keppoch. *Rubus affinis*, W. and N., Strome. *Rosa cærulea*, Baker, Loch Duich. † *Pyrus Malus*, L., Strome. *Myriophyllum alterniflorum*, D.C., Loch Maree. *Callitriche stagnalis*, Scop., Kinlochewe. *Callitriche hamulata*, Kütz., Loch Alsh. *C. pedunculata*, D.C., Kinlochewe. † *Ribes Grossularia*, L., Strome. † *Chaerophyllum temulum*, L., Loch Duich. † *Scabiosa arvensis*, L., Dornie. † *Doronicum Pardalianches*, L., Shiel. *Petasites vulgaris* Desf., Loch Duich. *Leontodon pratensis*, K., Mam Ratachan. *Scrophularia nodosa*, L., Achnashellach. *Digitalis purpurea*, L., Dornie, &c. † *Mimulus guttatus*, D.C., Crowe of Kintail, quite naturalised. *Veronica arvensis*, L., Strome. *V. serpyllifolia*, L., Glen Shiel, &c. *V. officinalis*, L., Glen Docharty. *V. Chamædrys*, L., common. *V. scutellata*, L., Loch Clare. *V.*

Beccabunga, L., rare, Dornie. *Euphrasia officinalis*, L., Glen Shiel. *Bartsia odontites*, Huds., Loch Duich. *Pedicularis palustris*, L., common. *P. sylvatica*, L., common. *Rhinanthus Crista-galli*, L., Kinlochewe, &c. *Melampyrum sylvaticum*, L., Strome. *Mentha hirsuta*, L., Glen Docharty. *M. arvensis*, L., Loch Duich side. *Thymus serpyllum*, Fr., common. *Prunella vulgaris*, L., common. *Scutellaria galericulata*, L., Strome. *Stachys palustris*, L., Keppoch. *S. sylvatica*, L., Kinlochewe, rare. *Galeopsis Tetrahit*, L., Dornie. *Lamium purpureum*, L., Dornie, very rare. *Ajuga reptans*, L., Ben Slioch. *Teucrium Scorodonia*, L., Ben Slioch. *Myosotis cæspitosa*, Sch., common. *M. arvensis*, Hoff., Achnashellach. *M. versicolor*, R., common. *Pinguicula vulgaris*, L., common. *P. vulgaris*, L., *var., a very large flowered form, the plant itself larger than usual, with petals much more contiguous, occurred on the north-western slopes of Scuir na Cairn, at more than 2000 feet above the sea.* *Primula vulgaris*, Huds., Glen Shiel, &c. *Lysimachia nemorum*, L., Ben Slioch. *Glaux maritima*, L., Loch Carron. *Armeria maritima*, W., Loch Carron. *Plantago major*, L. *P. lanceolata*, L. *P. maritima*, L., common. *Littorella lacustris*, L., Loch Maree. *Chenopodium album*, L., Loch Carron *Chenopodium Bonus-Henricus*, L., Dornie. *Atriplex Smithii*, Syme, Strome. *Atriplex Babingtonii*, Woods, Loch Carron side. *Rumex conglomeratus*, Murr., Strome. *R. crispus*, L., Strome. *R. obtusi*folius, Auct., Dornie. *R. acetosa*, L., and *R. Acetosella*, L., abundant. *Oxyria reniformis*, Hook, Scuir Ouran. *Polygonum aviculare*, L., Dornie. *P. Hydropiper*, L., Kinlochewe. *P. Persicaria*, L., Strome. *P. lapathifolium*, L., Kinlochewe. *P. amphibium*, L., *terrestre*, Dornie, rare. *Empetrum nigrum*, L., abundant. *Urtica dioica*, L., Kintail, rare. † *Ulmus suberosa*, Ehrh., Strome, one tree. *U. montana*, Sm., Loch Duich. *Quercus sessiliflora*, Sal., Loch Coulin. † *Fagus sylvatica*, L., Loch Duich. *Corylus Avellana*, L., Strome. *Alnus glutinosa*, L., common. *Betula verrucosa*, Ehrh., Loch Duich. *B. glutinosa*, Fr., common. *B. pubescens*, Ehrh., Ben Slioch. *Myrica Gale*, L., abundant. *Populus tremula*, L., Glen Elchaig. ‡ *P. nigra*, L., Loch Duich. *Salix viminalis*, L., Strome. † *S. rubra*, Huds., Strome. *S. cinerea*, L., common. *S. aurita* L., Glen Shiel. *S. Caprea*, L., Strome. *Juniperus nana*, W., Ben Slioch. *Sparganium ramosum*, Huds., Dornie. *Sparganium simplex*,

Huds., Loch Maree. *S. minimum*, Fr., Loch Alsh. *Lemna minor*, L., Mollan. *Potamogeton polygonifolius*, Pour., Glen Docharty. *Zostera marina*, L., Jeantown. *Triglochin palustre*, L., Glen Docharty. *Triglochin maritimum*, L., Attadale. *Orchis mascula*, L., Strome. *Orchis maculata*, L., common. *O. incarnata*, L., Loch Duich. *Habenaria bifolia*, Bab., Loch Torridon. *Iris Pseudacorus*, L., Achmore. *Scilla nutans*, Sm., Strome. *Allium ursinum*, L., Strome. *Narthecium ossifragum*, Huds., abundant. *Luzula pilosa*, W., Glen Docharty. *L. sylvatica*, Gaud., Falls of Glomak. *L. multiflora*, K., common. *L. congesta* Lej., common. *L. campestris*, D.C., common. *L. spicata*, D.C., Ben Eay. *Juncus conglomeratus*, L., abundant. *J. effusus*, L., abundant. *J. acutiflorus*, Ehrh., abundant. *J. lamprocarpus*, Ehrh. *J. supinus*, Mœnch, abundant. *J. bufonius*, L. *J. squarrosus*, L., common. *J. compressus*, Jacq., Attadale. *Scirpus acicularis*, L., Kinlochewe. *Scirpus pauciflorus*, Light., Kinlochewe. *S. cæspitosa*, L., abundant. *S. fluitans*, L., Loch Coulin. *S. lacustris*, L., Loch Coulin. *S. multicaulis*, L., Loch Coulin. *S. maritimus*, L., Loch Duich. *Eriophorum vaginatum*, L., common. *E. augustifolium*, Roth., abundant. *Carex dioica*, L., Glen Shiel. *C. pulicaris*, L., abundant. *C. rupestris*, L., Glen Shiel. *C. pauciflora*, Lightf., Ben Eay. *C. echinata*, Murr., common. *C. remota*, L., Loch Coulin. *C. curta*, Good., Loch Duich. *C. ovalis*, Good., Glen Shiel. *C. rigida*, Good., Ben Slioch. *C. vulgaris*, Fries, common. *C. glauca*, Scop., common. *C. pilulifera*, L., common. *C. panicea*, L., common. *C. vaginata*, T., Ben Slioch. *C. pallescens*, L., Scuir Ouran. *C. sylvatica*, L., Strome. *C. binervis*, Sm., common. *C. Hornschuchiana*, Hoppe, Loch Maree, &c. *C. flava*, L., common. *C. ampullacea*, Good., common, and also a variety with involute leaves, Ben Eay. *Anthoxanthum odoratum*, L., common. *Digraphis arundinacea*, Trin., Dornie. *Alopecurus geniculatus*, L., Kinlochewe. *A. pratensis*, L., Dornie. *Phleum pratense*, L., Kinlochewe. *Agrostis alba*, L., Strome. *Agrostis vulgaris*, With., abundant. *Aira cæspitosa*, L., abundant. *Aira flexuosa*, L., common. *A. montana*, Huds, Scuir Ouran. *A. præcox*, L., Keppoch. † *Avena fatua*, L., Strome. *Avena elatior*, L., Attadale. *Holcus mollis*, L., Strome. *Holcus lanatus*, L., common. *Triodia decumbens*. B., Craig More. *Molinia cærulea*, M., abundant. *Glyceria fluitans*, Br., Dornie. *Poa annua*, L., com-

mon. *P. nemoralis*, L., Strome. *P. pratensis*, L., common. *P. trivialis*, L., Strome. *Cynosurus cristatus*, L., Kinlochewe, not common. *Dactylis glomerata*, L., Kinlochewe. *Festuca ovina*, L., common. *F. duriuscula*, L., Ben Eay. *F. arenaria*, Osb., Loch Duich. *Bromus giganteus*, L., Strome. *B. mollis*, L., Strome. *Triticum caninum*, Huds., Strome. *T. repens*, L., Dornie. *T. acutum*, D.C., Loch Duich. *Lolium perenne*, L., Dornie. † *L. italicum*, Br., Kinlochewe. *Nardus stricta*, L., common. *Pteris aquilina*, L., common. *Cryptogramme crispa*, Br., Scuir Ouran. *Lomaria Spicant*, Desv., common. *Asplenium Ruta muraria*, L., common. *Asplenium Trichomanes*, L., common. *Asplenium Adiantum-nigrum*, L., common. *Athyrium Filix-fœmina*, Bernh., common. *Cystopteris fragilis*, B., Glen Shiel. *Aspidium lobatum*, Sw., Strome. *Nephrodium Filix-mas*, Rich., Glen Docharty. *N. spinulosum*, Desv., Scuir Ouran. *N. dilatatum*, Desv., common. *N. nanum*, Newm., Strome. *N. Oreopteris*, Desv., common. *N. æmulans*, Back, Glen Docharty. *Polypodium vulgare*, L., Strome. *P. Phegopteris*, L., Strome, &c. *P. Dryopteris*, L., Loch Clare. *Osmunda regalis*, L., Duncraig. *Lycopodium clavatum*, L., Carnasong, &c. *L. alpinum*, L., common. *L. complanatum*, L., Scuir Ouran. *L. Selago*, L., common. *Selaginella Selaginoides*, Gray, Glen Shiel. *Isoetes lacustris*, L., Loch Maree. *Equisetum arvense*, L., Kinlochewe. *E. palustre*, L., Loch Clare. *E. sylvaticum*, L., common. *E. limosum*, L., Loch Coulin. *Nitella opaca* Br., Loch Maree.

Total number of species and varieties observed, 374.

Species previously recorded, ...	10
Introduced, marked †, ...	24
Phanerogams not previously recorded, ...	296
Filices, &c., ...	28
Varieties, ...	16
	374

ON CERTAIN MOSSES OF THE GENUS DICRANUM.

By Dr. JAMES STIRTON, F.L.S.

DR. BRAITHWAITE, in his admirable work on British Mosses, has rather summarily and, in my opinion, arbitrarily disposed of a difficulty which twenty years ago exercised,

for a considerable time, the ingenuity of Mr. Wilson, Mr. M'Kinlay and myself. I allude to the endeavours then made towards reconciling the curiously graduated forms or varieties (call them what you will) of *Dicranum circinatum* (Wils.).

I trust I may be pardoned if I reopen the whole question, and state candidly the conclusions then arrived at, as well as endeavour to throw, what I consider, additional light on the subject.

Mr. M'Kinlay and myself detected nearly simultaneously a series of forms of what Mr. Wilson determined as his *D. circinatum.* In order the better to understand what follows, it will be as well to indicate the series of forms by numbers from 1 up to 9, No. 1 indicating the normal condition of *D. circinatum.*

On Ben Voirlich by Loch Lomond, and on Ben Donagh near the head of Lochgoil, this moss was discovered under nearly similar conditions, and generally on the ground beneath shelving rocks. The patches spread continuously inwards from a little beyond the verge of these rocks, to which the sun's rays had direct access, up to where each was in contact with the ground; in other words, they spread as far in as possible. In several instances this extension inwards amounted to two feet. So far as I can recall, the shady parts of the ground on which the moss grew were free from any other kinds of vegetation.

In the normal form, No. 1, the leaves are strongly falcate or circinate, and the characters, microscopic and otherwise, are such as are described by Dr. Braithwaite in Parts 6 and 7 of his work, with the addition, however, in this form, as well as throughout the series, of a cluster of largish pellucid, generally hexagonal cells with thin irregular walls, disposed between the nerve and the marginal smaller cells, and below the large rectangular cells. This cluster of cells is apt to be lacerated, or indeed, to remain on the stem, unless care be taken to separate the leaf slowly and in a direction gradually backwards. This may be the reason why Dr. Braithwaite has omitted mention of this group of cells, a group, however, of considerable importance in the question of affinities, and one which I shall call the auricular group. In this moss the group is not strictly auricular, but inasmuch as it is the analogue of what is truly the auricular group in others, *e.g.*, in *D. longirostre*, &c., I shall retain the term; and, besides, I shall designate it *central* when situated close to the nerve, and *lateral* when marginal, or bulging beyond the general margin. I am strongly of

the belief that the development of this peculiar group of cells has much to do with the deciduousness of the leaves. In No. 1 this group is least developed, and shows itself merely in the narrow interval between the nerve and the sloping base of the large rectangular cells, which occupy much the larger portion of the expanded bases of the leaves.

In No. 2, bordering on No. 1, but a little further inwards from the light, the moss is quite as robust, and the leaves are not deciduous; but they are less falcate and are decidedly so only near the apices of stems. The bases are expanded and the auricles are more manifest and have cells with a reddish tinge here and there. In almost all instances where the leaves are straight the spinous condition of the back of the arista near the apex is shown.

No. 3 is similar to No. 2, but the leaves have a slight tendency here and there to become deciduous, and the spinous condition of the arista is more obvious. The upper margin of the expanded base is still entire.

No. 4 is similar to No. 2 and equally robust, but the leaves are scarcely at all falcate. The bases of the leaves are much, and even suddenly, expanded, and their upper margin is serrated. The arista is closely spinulose on the back as in *D. aristatum*. The leaves are slightly deciduous.

No. 5 slender; the leaves are nearly straight and more deciduous. Nerve broader, being one-third breadth of base. Arista quite as in *D. aristatum*.

In No. 6, the arista bears spines on the back only here and there. The auricles are better developed and more lateral.

No. 7 is slender. Auricles much developed, even bulging at times beyond the marginal base, and hollow. Arista more spinulose than in the preceding.

No. 8 with apices of stems often bare of leaves, and stump-like as in *D. longirostre*, and otherwise having almost all the characteristics of this moss. The auricles are now much developed, and the arista is smooth (not spinulose) on back, and toothed only near the apex. Perhaps the base of leaf is rather more expanded than in *D. longirostre*.

It is noticeable in this series that those leaves whose bases have been previously detached from the stem have few or none of the spinulosities so manifest on many of those still firmly adherent

to it; this holds true also in tufts of *D. aristatum* in the usual lowland habitats.

Such is a brief outline of the characters observed in the various parts of one of these tufts from without inwards. Besides the gradations indicated, there are others intermediate between them which the eye can appreciate, but which cannot be adequately described; in fact the transitions are too finely shaded off to admit of a *hiatus* in almost any direction; and the mind is almost irresistibly drawn to the conclusion that the series represents states or conditions of one and the same plant.

But the series is not yet completed. On rocks fully exposed to the sunlight, and covered by a sprinkling of earth, there grows the most robust form (or species) of all, in situations not far from the other habitats already spoken of.

In this, the robust stems which are often dichotomously branched, are, in a dried state, of a tawny colour above, and of a dark, dusky brown, or even black, below. The leaves are not deciduous, but are firmly attached to the stem, are longer than any of the others, slightly secund or even, slightly falcate, especially at the apex of the stem, have no expanded bases, but are lanceolate throughout or lanceolate-acuminate. The bases are similar microscopically to those of *D. circinatum*, although the rectangular median cells are fewer and larger, while the marginal cells are similar. The auricles are central, feebly developed, and colourless. The nerve is broad and flat, being one-third base of leaf, predominant upwards; margin involute above; arista spinulose on back and margin, especially in the younger leaves, and quite as much so as in *D. aristatum*. In the older leaves these pellucid unicellular spines or teeth are fewer, and at times disappear as in *D. longirostre*. I distinguish this by the name *D. capnodes*.

It is somewhat extraordinary that in the Lowlands, such as Lennoxtown woods, there occurs a curious form of *D. aristatum*, analogous to the species just described; viz., where the leaves are nearly lanceolate throughout, including the base. In this form the irregular auricular spaces are sometimes well developed, although they are much oftener absent, presumably because they remain on the stem in the act of separation. Let this form be distinguished by the name *D. notabile*.

I possess another *Dicranum* whose characteristics cannot, in my opinion, be reconciled to those of *D. arcticum* (Sch.), with which,

in this country, at least, it has hitherto been identified. Of this moss I have specimens from near the summit of Ben Macdhui, gathered in 1868 by the late Mr. George E. Hunt, from near the summit of Ben Nevis by myself in 1866, and from the Breadalbane mountains by Mr. James M'Andrew, in July, 1885.

This moss differs from all states of *D. arcticum* that I have seen in respect of the stems, which are much more laxly tufted and longer, varying from 2 to 4 inches in length. The leaves are more distantly placed on the stem, are broader and longer, more longly acuminate, straight, and somewhat spreading when dry, as well as spirally twisted in the upper half. The main distinction, however, between the two is in the areolation, which in the moss under consideration resembles much that of *D. scoparium*, but has none of the lateral connecting pores. This areolation is narrowly cylindrical throughout, and is in parallel rows, but towards the base is somewhat sinuous, and has several (2-4) minute oil globules disposed pretty constantly, and in linear series, in each cell. In *D. arcticum* there is only one globule or nucleus seen near one of the angles. The dimensions of these cells vary thus, (·045-·09) × (·0055-·009) mm.; while in *D. arcticum* they vary, (·045-·075) × (·009-·015) mm., *i.e.*, their breadth is about twice as much in the latter, whose apical cells become also, as a rule, much shorter and broader. In the moss in question the alar cells are large, and of a deep red colour, while in *D. arcticum* they are orange or reddish-orange. The nerve is narrow, ·05-·08 mm. in breadth, and becomes lost in the upper fifth. The back of nerve and margin are entire throughout, and smooth, not papillose. The margin is involute, and often nearly overlaps in the middle third, while the apex is very fine, and tapering. There is no tomentum on the stem. I propose to distinguish this moss by the name *D. hypselum.*

BRITISH MARINE ALGÆ.

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

[Note.—Two plates of figures to illustrate this paper are issued with this Number of the *Scottish Naturalist.*]

ON comparing the Marine Flora of the British Islands with that of the neighbouring coasts of Norway and of France, one is struck by the fact that a large number of species occurring on these shores have not yet been detected in Great Britain. A

few years ago I determined to search for the missing species, and, with the help of a few friends, I have succeeded in adding nearly 100 species of marine algæ to the British Flora. To Mr. G. W. Traill, of Edinburgh, and Mr. E. Batters, F.L.S., of Berwick-on-Tweed, I am especially indebted for the assiduous manner in which they have examined the marine flora of the districts in which they live.

There are, however, still many species that probably occur on the Scottish coast, but of which I have not yet seen specimens. Believing that there are many algologists in Great Britain who would recognise these plants, if furnished with a description of their characters and an outline of their form and structure, I wish to call attention from time to time, as opportunity presents itself, to the seaweeds likely to occur in Scotland, and I know of no more appropriate means of doing so than through the columns of the *Scottish Naturalist.* The visit of Dr. O. Nordstedt to this country during the month of July last year, directed my attention to the genus *Vaucheria*, which, as regards the marine species, has hitherto been very little investigated in Britain. The figures in Harvey's *Phycologia Britannica* represent plants imperfectly known to that prince of algologists, since, except his *V. velutina* Ag., they were seen by him only in the dried state.

The following remarks concerning Harvey's figures may, perhaps, clear the way for further elucidation of the species of this genus.

Vaucheria marina, t. 350. A, represents *Derbesia marina*, Sol. *Ann. Sc. Nat.* (3), *Vol. VII., p.* 158.

Vaucheria submarina, t. 350. B, represents only the fronds bearing antheridia, of *V. dichotoma*, var. *submarina* Ag. This plant I have seen growing abundantly at Weymouth, where it covers the mud at low water for several acres, near the Isle of Portland. Its habit of growth is, however, different from that of all the other marine species that I have seen. The threads are sparingly dichotomous, quite erect when under water, but running together into points when exposed to the air, so that a tuft of threads can be taken between the finger and thumb and pulled out of the black mud to the length of 2 or 3 inches. It can thus be cleaned with tolerable ease. The threads stand about 1½ inch above the sandy mud, and are coarse and of a dark green colour, and they never form the dense, intricate, velvety cushions so common in

other species. The capsular fruit, or oogonia, are spherical, and sessile on the side of the erect thread (see Fig. 1), and occur often on the same tuft with the antheridia, but on distinct threads. I have already issued this plant with both kinds of fruit in my *Fasc. Alg. Brit. rar. II.* The fruit in this species, as in most others of the marine *Vaucheriæ*, is found from August to November.

Harvey's figure of *V. velutina* Ag., *Phyc. Brit.*, t. 351, is considered by Dr. Nordstedt to represent two species; the right-hand figure at the base, with sessile oogonia, he refers to *V. sphærophora*, Nordst., the left-hand figure to *V. Thuretii*, but as Harvey does not figure the antheridia, it is impossible to decide this point.

Having thus disposed of the marine species already described as British, I may venture to translate, for the benefit of those British algologists to whom the scattered literature on the subject is not easily accessible, Dr. Nordstedt's classification, as given in the *Botaniska Notiser*, 1879, and afterwards to describe more in detail the species which he has discovered during his recent flying visit to this country. The additional species likely to be found in Britain by those that have time and will take the trouble to search for them, may thus be described and illustrated :—

VAUCHERIA.

I. Antheridia sessile, not separated from the thallus by a short empty cell.

A. **Tubuligeræ.** Antheridia not hooked at the end, elongate, cylindrical or barrel-shaped, with an apical pore; red pigment-body not collected in the middle of the mature oospore.

(a.) *Oogonia globular.*

1. *Vaucheria dichotoma* Ag.—Dioicous, oogonia sessile, horizontal; antheridia ovate, conical, horizontal. (Fig. 1).

2. *V. Thuretii*, Woronin.—Monoicous; oogonia sometimes stalked, sometimes sessile, oospore filling up only the upper rounded portion of the oogonium. (Fig. 2).

II. Antheridia separated from the thallus by a short empty cell.

A. **Androphoreæ.** Antheridia numerous and hooked, sessile on an enlarged chlorophyll cell or androphore, which is attached by a short empty intervening cell to the side of the thallus.

3. *Vaucheria synandra*, Woron.—Oogonia globular, with an elongated decurved (lateral) mouth. (Fig. 3).

B. **Piloboloideæ.** Antheridia not furnished with an intervening chlorophyll cell, but only with the short empty cell.

(a.) *Oogonia attached directly to the thallus.*

4. *V. coronata*, Nordst.—Oogonia crowned with several tubular mouths; antheridia with one, or rarely two, lateral openings. (Fig. 4).

5. *V. intermedia*, Nordst.—Oogonia nearly sessile, globular; oospore globular; antheridia numerous, obtuse at the apex. (Fig. 5).

6. *V. sphærospora*, Nordst.—Oogonia globular, with an elongated cylindrical base; oospore spherical, antheridia acute at the apex. (Fig. 6).

Var. *dioica*, Rosenv.—Antheridia on distinct threads. (Fig. 6 a).

7. *V. piloboloides*, Thur.—Oogonia globular, with an elongated cylindrical base; oospore lens-shaped, *not filling* the upper portion of the oogonium; antheridia long, cylindrical, with one or two short conical tubular openings on the side, and one on the apex. (Fig. 7).

8. *V. litorea*, Hofm., *Bangia* Ag.—Dioicous, oogonia at the apex of a curved branch, often containing between the oospore and the thallus a chlorophyll cell, which often contains a brown pigment. (Fig. 8).

There are two other species which differ from the foregoing in the di-poly-chotomous branching of the thallus, but their organs of fructification are unknown; these are *V. tuberosa*, A. Braun, and *V. trifurcata*, Ktz.

Dr. Nordstedt also characterises the following species, *V. aversa*, Hass., *V. ornithocephala*, Ag., *V. pachyderma*. Walz., *V. sessilis*, D.C., *V. geminata*, Walz., *V. hamata*, Walz., *V. terrestis*, Lyngb., *V. uncinata*, Ktz., and *V. Debaryana*, Woron. ined.

These are, however, not marine species, except *V. hamata*, which has been rarely found intermixed with *V. Thuretii*. But this species is more frequently found inland, and, as it belongs to the same section as the other terrestrial species, it need not be described here. The following species have been detected in this country by Dr. Nordstedt:—

V. Thuretii, Woron. (Fig. 2). Portree, Skye; Brough, near Hull; Ballachulish; Greenod, near Ulverstone; in fruit, Aug., 1885.

This species grows in spreading, short, dense turfs in salt marshes, amongst grass which is sometimes entirely submerged. It is monoicous, the oogonia are either sessile or on short lateral branches, and are obovoid or pear-shaped. The antheridia are sessile, lancet-shaped, and scattered along with the oogonia near the tips of the branches. Farlow believes that he has seen on this species the asexual fruit, in the form of oval spores, smaller than the oospores, borne at the tips of short branches given off at right angles to the main filaments. The short branches fall off with the spores, and the latter after some time escape from the ruptured end of the cell. They are motionless, and are destitute of cilia.

V. synandra, Woron. (Fig. 3). Greenod, near Ulverstone; Dr. O. Nordstedt, Aug., 1885.

This species grows near high-water mark, on soft mud, in extensive patches about 1 inch high. The oogonia occur on the same threads as the antheridia, and close to the latter. The species is easily recognised when in fruit by the enlarged chlorophyll cell attached to the thallus by a short empty cell, and bearing a number of hooked antheridia on its surface. The oogonium is also furnished with a decurved hooked beak. The asexual spores are densely ciliated.

Vaucheria sphærospora, Nordst. Dr. Nordstedt does not appear to have found the typical plant in this country, but he met with the var. *dioica*, Rosenv., abundantly, at Maldon, in Essex; in fruit in Aug., 1885. (Fig. 6; var. *dioica* Fig. 6 a).

The description given by Harvey of his *V. velutina*, Ag., applies tolerably well to this plant. It forms a short, pale green, dense, spreading turf, on sandy mud in creeks, where the water is somewhat brackish. The tufts are densely intricate, with short erect lateral ramuli. It is visible about $\frac{1}{4}$ inch above the mud. The oogonia are pear-shaped, tapering into a well-marked pedicel, the oospore being globular, and nearly filling the swollen head of the oogonium. The antheridia in the var. *dioica* are scattered on distinct threads, sometimes several near together, and sometimes two, or even three, on one transparent intervening cell. The antheridia are irregularly lancet-shaped, acute, with one terminal, and one or two lateral openings. It differs from all the other marine species in containing a chlorophyll cell in the pedicel of the oogonium. The oogonium generally terminates in a short recurved branch, and is separated from the thallus by a colourless

intervening cell; oospores obovate or subglobose; antheridia cylindrical, erect, scattered on distinct threads, with an apical, and two or more lateral openings (see Fig. 6 a). The plant grows generally in ditches overflowed at high tide by sea water.

Vaucheria litorea, Hofm. (Fig. 8). Dr. Nordstedt met with this species at Inverness, at Greenod, near Ulverstone, and in Caermarthen.

It differs as follows from *Vaucheria piloboloides*, Thur. The latter species, as seen growing at Weymouth, forms small loose patches a few inches in extent, on the edge of sandy ledges, in pools near low water mark, each thread standing up distinctly like so many pins in a pin-cushion, the stems, however, are matted below, so that it is very difficult to wash clean, so as to preserve its habit of growth. The antheridia I have not observed, although the asexual reproductive organs, or propagula, appear to be not uncommon (see Fig. 8). The oogonia are distinct from those of *V. sphærospora* by being lens-shaped, instead of globular. The antheridia are described as terminating short branches, cylindrical, with an apical, and several lateral, shortly conical apertures.

The marine species which may yet be discovered in Britain are as follows :—

V. intermedia, Nordst.

This much resembles *V. sphærospora*, but has nearly sessile oogonia, with obtuse, cylindrical antheridia, either immediately beneath, or attached to, the oogonium itself (see Fig. 5).

V. coronata, Nordst. (Fig. 4).

This species is easily recognised by the circlet of short prominent apertures that exist on the apex of the oogonium, which is nearly sessile, the oospore occupying the centre of the cavity, but not filling it; the antheridia are sometimes close to the oogonium, and sometimes at a distance from it, but on the same thread; they are cylindrical, with one, or sometimes two, lateral openings (see Fig. 4). *V. coronata* has a cæspitose habit like *V. sphærospora*, but it grows in wetter places, and is often intermixed with *V. intermedia*. It is less compact than *V. synandra*.

The majority of the maritime species of the genus form dense spreading green turfs, extending for several feet over the muddy sloping sides of estuaries or creeks, into which a small fresh-water stream enters. Some form patches among grass and thrift in mudflats, and a few are found at lowest tide mark (*V. dichotoma*,

V. piloboloides). They are generally rooted in black mud, which is full of worms and other animals, from which it is exceedingly difficult to free them. I find the most convenient plan to mount them for the herbarium is to cut a square piece out of the turf with a sharp knife, and to hold it with the lower side upwards under a tap till washed fairly clean; it is then laid on paper, pressed lightly under bibulous paper, and then allowed to dry. For purposes of microscopical examination one or two fruit-bearing branches may be teased out on mica. In the turfy species the fructification is generally at the base of the green portion, or even hidden in the mud. In *V. dichotoma* it is on the upper portion of the threads. But in order to make out the structure well the best plan is to immerse a small piece as soon as cleaned in a saturated solution of picric acid in water. This acid is easily obtained from any dealer in chemicals.

I shall be glad to receive any *fruiting* specimens of this genus found in Great Britain for identification. Such specimens should be sent in a tube, and preserved in a solution of picric acid as above described.*

MYCOLOGIA SCOTICA (Supplement).

By Rev. J. STEVENSON and Prof. J. W. H. TRAIL.

(*Continued from S.N.*, 1886, *p.* 237.)

(*All measurements, except where specified, are in thousandths of a millimetre.*)

3066. Chondrioderma (Leangium) Trevelyani (Grev.) *Scot. Crypt. Flora*, t. 132, Cke. *Hbk.* 1111 (sub nom. *Diderma Trevelyani* Fr.), Cooke, *Myxomycetes of Great Britain*, p. 40, Rostafinski's Monogr., 182.

On *Mnium undulatum* (= *Bryum ligulatum* Schreb.), Autumn.

East. — Forth. — — — — — —

West. — — — —

* Bottles in wooden cases, suitable for sending by post, can be obtained at a cheap rate at Messrs. H. Roths & Co., Mitre Court, Fenchurch St., London, E.C.

"Woods about Edinburgh, exceedingly rare."—Greville. Omitted from *Mycologia Scotica.*

England (Northumberland).

3067. **Phoma Strobi** (B. and Br.) Sacc., *Syll. Fung.* III., No. 603; = *Sphæropsis Strobi* (B. and Br.); *Ann N.H.*, No. 421; *Cke. Hbk.*, 1246; *Grevillea* XIV., p. 29, No. 82.

In leaves of *Pinus Strobus.*

East.	—	—	Tay	—	—	—	—
West.	—	—	—	—				

Glamis.

England.

3068. **Neottiospora Caricum** Desm., *Cke. Hbk.*, 1360. *Grevillea* XIV., p. 33, No. 165. Sacc. *Syll. Fung.* III., 1294.

In dead leaves of *Carices.*

East.	—	—	—	—	Moray	—	—	—
West.	—	—	—	—				

England, Continental Europe.

3069. **Cytispora Chrysosperma** (Pers.), Fr. S.M. II., p. 542; Cooke in *Grevillea* XIV., p. 69, No. 332. Saccardo *Syll. Fung.* III., No. 1519; a state of *Valsa sordida* Nit., *fide* Saccardo *l.c.*

Stroma sub-dermal, subconical, rather large, olive grey. On the epiderm bursting, the stroma appears as a small dull-coloured, irregular disk, with a black central ostiolum, through which there protrudes a gelatinous golden-yellow thread of sausage-shaped (allantoid) hyaline sporidia, each about 4×1.

On decorticated branches of *Populus alba,* &c.

East.	—	—	—	—	—	—	—	—
West.	—	Clyde	—	—				

Glasgow.

England, Continental Europe, North America.

3070. **Ceuthospora phacidioides,** Grev., Scot. *Crypt. Flora,* V., t. 253, Saccardo *Syll. Fung.* III., No. 1618, *Cke. Hbk.*, p. 465. *Grevillea,* XIV., p. 70, No. 360.

On leaves of Holly *(Ilex Aquifolium).*

Believed to be an imperfect condition of *Phacidium Ilicis* Fr. (*Mycologia Scotica*, No. 1781).

East. — Forth — — — — — — —
West. — — — —

Edinburgh.

England, Continental Europe.

3071. Coniothyrium conoideum, Sacc. *Michel*, I., p. 203, *Syll. Fung.*, III., No. 1780. Perithecia scattered, subdermal, becoming bare by falling off of epiderm, conical, about 180 diam., black, shining; sporules elliptical or sausage-shaped, 5-7 by $2\frac{1}{2}$-3 (described by Saccardo as $3\frac{1}{2}$ by $2\frac{1}{2}$), pale yellowish brown.

On dead stems of *Angelica silvestris*, associated, in the same perithecia, with *Leptosphæria Doliolum*, var. *conoidea*, of which it is evidently a condition.

December.

East. — — — Dee — — — —
West. — — — —

Near Aberdeen—J. W. H. Trail.

Europe (Italy and France).

3072. Stagonospora arenaria Sacc., *Michelia*, I., p. 124, *Syll. Fung.* III., No. 2476, var. **minor.**

Perithecia in groups, at first subcutaneous, elliptical, about 240 by 200, dark brown, ostiolum very short, spores fusiform or subcylindrical, straight or curved slightly, ends blunt, 3-septate, hyaline, with a faint yellow tinge, 22-25 by 3-$3\frac{1}{2}$. (In the type the measurements are given as 30-35×$3\frac{1}{2}$-4.)

In stem of *Elymus arenarius.* June.

East. — — Tay — — — — —
West. — — — —

Lunan, near Montrose—J. W. H. Trail.

Europe (Denmark).

3073. Camarosporium Laburni Sacc. and Roum, *Syll. Fung.*, III., No. 2496.

Perithecia crowded in groups, at first subdermal, afterwards bursting through, and becoming exposed, globose, about 300 to 400 diam., shortly papillate, sporidia oblong, much like those of *Pleospora herbarum*, multiseptate, 28-33 by 9-10, brown. This is an incomplete stage of *Cucurbitaria Laburni.*

On branches of Laburnum.

East. — — — Dee — — — —
West. — — — —

Near Aberdeen—J. W. H. Trail.

England, France.

3074. Camarosporium metableticum, Trail, sp.n.—Perithecia innate, scattered, subglobose, about 250 diam., ostiolum very short; sporidia sooty-brown, very variable, ovoid, elliptical or trapezoidal, not or scarcely constricted in the middle, ends pointed or round, usually about 30 by 12 or 13 (three sporidia from a single perithecium measured respectively 20 by 12, 30 by 9, and 33 by 15); septa usually 5 or 6 transverse (may vary from 3 to 7), and 1 lengthwise in from 1 to 4 of the cells in the middle; some of the narrower sporidia have *only* transverse septa, and the broader ones may have 2 longitudinal septa in one or more cells.

In dead leaves of *Ammophila arundinacea*. Dec.

East. — — — Dee — — — —
West. — — — —

On the Links, near Aberdeen—J. W. H. Trail.

3075. Septoria Anemones Desm., Exs., No. 940, Sacc., *Syll. Fung.*, III., p. 521, No. 2828.

On leaves in a dry brown spot; perithecia gregarious, distinct, sunk in the tissues, dark brown, rather thin, nearly spherical, diameter about 100, opening by an ostiolum, with very short neck, on upper surface of leaf. Sporidia hyaline, 20-21 by 1, filiform, not or faintly septate.

On *Anemone nemorosa*. June.

East. — — — Dee — — — —
West. — — — —

Near Aboyne, on leaves in which were resting-spores of *Peronospora pygmaea*, Berk.; found by Mr. G. Brebner.

Europe.

3076. Leptostroma donacinum, Sacc., *Michel*, II., p. 35 *Syll. Fung.*, III., No. 3417, var. **majus.**

Perithecia, 1 to 2 mm. long. by $\frac{1}{5}$ to $\frac{1}{3}$ mm. broad, elliptical, or slightly irregular, shining black, with a hardly perceptible slit (when dry); sporules, 4-5 by 1-1$\frac{1}{2}$.

terete, hyaline, supported on basidia twice or thrice as as long as themselves. (The type has perithecia $\frac{1}{4}$-$\frac{1}{2}$ by $\frac{1}{10}$ mm.).

On dead culm of a grass. December.

East. — — — Dee — — — —
West. — — — —

Near Aberdeen—J. W. H. Trail.

Europe.

This agrees so well with *L. donacinum*, as described by Saccardo, except in size of perithecia, that I cannot venture to regard it as more than a variety of Saccardo's species.

FORMS OF CAREX NEW TO SCOTLAND.

Carex rigida *Good. var.* **inferalpina**, Lœst.

Among a fine series of Carices gathered in Forfar and Aberdeenshire last July by Mr. F. J. Hanbury, I found specimens of the above variety from "the little Culrannock, Forfarshire." It occurs in Lapland, scattered over the upper Alpine region.

Carex aquatilis, *Wahlb. vars.* **cuspidata**, *Lœst.*, **epigejos** *Lœst.*, *and* **virescens** *And.*

The var. *cuspidata* occurs in Caithness, on the banks of the Wick river, along with *C. salina* and *C. aquatilis* var. *Watsoni*. To the former of these it bears much resemblance. It was gathered in Tornea Lappmark by Lœstadius (*Bidrag till kännedomen om växt i Torneo Lappmark*, 1860), and by Lundeberg in Western Bothnia, whence I have seen specimens in Dr. Almquist's herbarium. It may be satisfactory to state that Dr. Almquist concurs in the determination of the specimens.

Dr. White has sent me specimens from Perthshire of the varieties *epigejos* Lœst. and *virescens* And.

Carex helvola Blytt. A plant gathered by the late Prof. Balfour, on Lochnagar, on 11th Aug., 1846, and regarded as *C. curta* var. *alpicola*, proves to be *C. helvola*. Dr. A. Blytt has confirmed this identification.

ARTHUR BENNETT.

Possible New Scotch Betula.—Scotch botanists should look out for a Betula "forming low bushes about a foot high, at 1500 feet above the sea, on Ben Vachart, near Struy, Inverness-shire" (J. Ball, 1839 !), and found also, perhaps, by myself on Ben Aven, Braemar, in 1842. In both cases bad barren specimens were found. It may be *B. humilis* Schrk. I would especially direct attention to Mr. Ball's plant.

C. C. BABINGTON.

MEETINGS OF SCOTTISH SCIENTIFIC SOCIETIES.

THE CRYPTOGAMIC SOCIETY OF SCOTLAND held its eleventh Annual Conference at Corrie, Island of Arran, on the 29th ult. and succeeding days. The weather was unfavourable throughout. Fungi were not abundant. This, however, was owing rather to a continuation of barren seasons than to soil or climate. Arran is rich in ferns. *Trichomanes radicans* has been gathered on the island. *Hymenophyllum Tunbridgense*, much less frequent in Scotland than in England, was found growing luxuriantly. *Hymenophytlum unilaterale*, more extended in its distribution, was also abundant. Some idea of the climate of the island may be formed from the fact that Palms, Camelias, Myrtles, Heaths, Fuschias, &c., have been grown in the open air, uninjured, through a long succession of winters.

At the business meeting of the Society—Dr. Flaxman Spurrell in the chair—it was resolved to publish a volume of "Transactions" after the next Annual Conference, which will take place at Aberdeen in the autumn of next year, under the presidency of Professor J. W. H. Trail.

DUMFRIES-SHIRE AND GALLOWAY NATURAL HISTORY AND ANTIQUARIAN SOCIETY.—Session 1885-86. Oct. 2nd.—The opening meeting was held in new rooms acquired by the Society by arrangement with the Presbytery and the Town Council of Dumfries. We are glad to learn that the Society has been able to provide accommodation of the formation of a museum, and that the local products of the district are to receive special attention. A library is also in course of formation by the Society.

From the reports submitted we observe that the business of the meetings is shared in by an increasing number of members, 21 communications, by 14 members, having been read at the seven winter meetings. These papers included local antiquities as well as the local fauna and flora. Six summer field meetings were held; and attendances at both summer and winter meetings was larger than in any previous year. Arrangements were made during the year whereby the new rooms were obtained on a 15 years' lease, at a nominal rent. The papers read at the various meetings during 1881-83 were published in November 1884, and those of 1883-85 are ready for being put into the printer's hands. The Treasurer reported a satisfactory balance sheet.

November 6th.—The following papers were read:—**List of Kirkcudbrightshire Mollusks**, (L. & F. W.) with remarks, by Mr. F. R. Coles; **Notes on Local Ornithology**, Mr. W. Hastings; **A Day on Ben Lawers**, Mr. J. M'Andrew; **The Botany of Sanquhar District**, Dr. A. Davidson. No report on these has been received.

December 4th.—Mr. T. Brown read a paper on the **Birds of Tyndron Parish**, 86 in number, and exhibited one or more eggs of all but five of the species. The writer's personal observations on the birds were of great interest; but they cannot be condensed; and our space unfortunately does not allow of quoting them at full length. We understand that the *Marsh tit*, the *Pied fly-*

catcher, and the *Stockdove*, are additions to the county lists ; the two latter were found nesting in Tyndron.

Mr. George F. Black read an exhaustive account of **Notes on the Ruthwell Cross**, in Annandale; and Mr. W. Hastings gave an instalment of **Notes on local Ornithology**, made during the year. He notes scarcity of swifts ; while sandmartins and cuckoos were unusually numerous. An unfledged woodcock was obtained from Galloway in June, a ruff from Carlaverock, and a quail, in October, a grey grouse-hen, a duck, resembling a Pochard, but apparently not described as British, and several gannets from various parts of the country are among the birds noted. We are glad to see that he has observed a great increase in the number of the small birds since they were thinned by the severe winter some five years since.

INVERNESS FIELD CLUB.—A meeting of this Club was held in the Free Library on Thursday evening. Mr. William Mackay, solicitor, occupied the chair, and there was a good attendance. Mr. Mackay, in delivering his retiring address, took for his subject "Certain Superstitious Customs noticed in Highland Church Records of the 17th century." He gave an account from the Presbytery records of Dingwall, of the custom of sacrificing bulls to St. Mourie, or Maolbhrubha, at Mourie's Island in Loch Maree ; and in doing so, he took occasion to point out that the "poore ones," who were in the habit of receiving the sacrifices of offerings made to Mourie, were improperly called "deviles" by Dr. Kennedy in his "Days of the Fathers in Ross-shire," and "devilans" by Dr. Arthur Mitchell in his "Past in the Present." These gentlemen, Mr. Mackay remarked, had misread the record, for the word therein applied to the "poore one"—"derilan"—was, he thought, an old Gaelic word meaning the poor or afflicted ones. In the vocabulary appended to Kirk's Bible, "deireoil" is given as Gaelic for afflicted, and that, Mr. Mackay was of opinion, was the word that applied to the receivers of the sacrifices. He also gave instances of traces of fire worship. On the 26th June, 1655, the Presbytery of Dingwall ordained "that the several brethren intimate to their congregations that they desist from the superstitious abuses used on St. John's Day by burning torches through their corns, and fire in their towns, and thereafter fixing their stakes in their kail yards." Mr. Mackay then referred to the adoration of holy wells, and quoted from the Presbytery records of Dingwall and Inverness, and from Synod records of Moray to show how prevalent the custom was, and what difficulty the clergy had in putting an end to it.—At same meeting, Mr. Ross laid before the members some beautiful bronze ornaments and articles found near Croy by Mr. Shearer. They were, 1st, Portions of penannular brooches made of bronze with the sunk pannels filled in with solid plates of gold, ornamented with fillagree work. One specimen was really exquisite in its workmanship, and rivals the Dunbeath one now in the Antiquarian Museum, Edinburgh. 2nd. There was a bronze ornament in fragments like a buckle or bracelet. 3rd. An amber ring seven-eighths of an inch in diameter. 4th. Portion of an Anglo-Roman bead and a silver coin of Coenwalff or Mercia. 5th. A blue glass ring seven-sixteenths of an inch in diameter. He also showed a splendid bronze dagger or javelin-head found at Clava. The blade was about 15 inches long and 2 wide. There

was also exhibited a finely carved iron stirrup found on Culloden Moor. These two articles were sent for the Society by Mr. Snowie.

Mr. Ross also exhibited a splendid collection of 41 Mexican arrow heads of quartz, obsidian, and flint. They were sent by Mr. Douglas of Ballindalloch.

On the New Station for Zoisite at Garve, by Dr. Aitken.—After mentioning Mr. Bell's discovery of the mineral in a Quartz block by the side of the road, and Mr. Ivison Macadam's analysis of it, Dr. Aitken went on to point out that the mineral really occurred in a Quartz vein in the Gneiss. He then indicated the conditions under which the mineral had been found in the district—always in relation to limestone—and the geological relations of the vein at Garve, in which, however, it did not seem to stand in relation to lime. The point of interest, therefore, in connection with the mineral in this locality is the condition under which it has been found—that it is not to be looked for merely associated with limestone, but in any vein of segregation in rocks, provided the materials exist for its formation in the surrounding rocks.

PERTHSHIRE SOCIETY OF NATURAL SCIENCE.

Thursday, Nov. 12th, 1885.—The President, Dr. Buchanan White, read an opening address, in which he reviewed the work of the previous summer. He noticed the discovery, by Mr. James Brebner of Dundee, of *Schoenus ferrugineus* L., in Strathtummel, *Carex ustulata* Wahl. on Ben Heargarnich in Glen Lyon, of *Polypodium flexile* Moore in Glen Lyon, and of *Astragalus alpinus* L., in flower on a hill in East Perthshire; and by Mr. Meldrum, near Perth, of *Cynoglossum montanum*, *Erythraea Centaurium*, *Carex remota*, *Ranunculus arvensis*, &c. Other scarce Perthshire plants observed during the summer are *Campanula glomerata*, and *Carex laevigata*, the former near Linn of Campsie, the latter on the Earn below Crieff. He then went on to bespeak assistance from the members in preparing specimens for the herbarium, the geological collections, &c.; and quoted very favourable opinions of the museum expressed by Prof. Flower of the British Museum, and by Canon Tristran. Dr. Trotter then read a paper on **"The Fossil Diatoms of the Tay Basin,"** being an account of the alluvial beds of the Perth Basin, and of the microscopic organisms, chiefly Diatoms, found in them. From an examination of these organisms and beds he concluded that for a very long time the basin of the Tay was the estuary of a large river, opening to the sea by a narrow mouth, and that there had been two successive rapid upheavals of about 25 feet each.

December 3rd. Mr. Coats exhibited several scarce species and varieties of marine shells from the Firth of Forth, amongst which were *Natica Islandica*, *Trophon truncatus*, *Solen pellucidus*, *Purpura lapillus* var. *imbricata*, and *Mytilus edulis* var. *pellucida*. Mr. Pullar gave a report on the meeting of the British Association in Aberdeen, and Dr. Buchanan White on the meeting of the East of Scotland Union of Naturalists' Societies at Kirkcaldy, in September. Dr. White called special attention to the prosecution of the local bibliography of the East of Scotland, and to the necessity of co-operation in effecting the work. Rev. R. Graham, LL.D., read a paper on **The After-glow, or Extraordinary Sunsets of 1883-84,** in which he reviewed the various theories proposed to account for the colours; and upheld the theory

that our whole solar system was passing through a gigantic cometic field, the matter in which occasioned the glow.

Thursday, Jan. 7th, 1886, was devoted to **The Natural History of Kinnoull Hill**, which was treated very exhaustively, as follows :—*Introductory* by Dr. F. Buchanan White ; *Geology* by Prof. James Geikie ; *The Flowering Plants* by Mr. James Coates ; *The Ferns, Mosses, and Fungi* by Dr. F. B. White ; the *Insects* by Mr. S. T. Ellison ; the *Molluscs* by Mr. Henry Coats ; and the *Vertebrates* by Dr. F. B. White. The idea seems a good one ; and the results were such as might have been looked for in such a method of treatment.

Thursday, Jan. 21st.—An enjoyable conversazione was held from 7 to 10 p.m., by members and their friends.

PUBLICATIONS OF SCOTTISH SCIENTIFIC SOCIETIES.

PROCEEDINGS OF THE BERWICKSHIRE NATURALISTS' CLUB. Of the new volume of these valuable proceedings, a considerable part is, as usual, occupied with papers of antiquarian interest, but there are a number relating to the sciences included in our pages, and these we shall now enumerate. The presidential address, by Commander F. M. Norman, deals with, first, **Darwinism and Revealed Religion**, from the point of view that these are opposed to each other (a point of view which we believe erroneous) ; and then passes on to the **Salmon Disease**, insisting on the necessity of the complete destruction of the bodies of diseased fish. Next follows a report of 52 pages on the Meetings of the Club in the year 1884, by the President, who also contributes a paper on **Embedded Reptiles**, with reference to frogs and toads found living in cavities of rocks, and other massive bodies. The other papers in this part may best be grouped according to their subjects. The first is an *Obituary memoir of Ralph Carr-Ellison of Dunstan Hill and Hedgeley*, with a list of papers written by him,

Botanical.—List of Fungi found in 1884, and not hitherto recorded from the Border District, by Rev. David Paul, recording 16 additions to the Hymenomycetes of the district. **Notes on the Marine Algæ of Berwick-on-Tweed**, by E. A. L. Batters, records 18 species new to Berwick ; of which *Elachista Areschougii*, *Cladophora arctiuscula*, and *Codiolum longipes* are new to Britain. **Alnmouth list of Marine Algæ**, by Andrew Amory.

Zoological.—On Lepidoptera in Roxburghshire, Part II., by Adam Elliot. **Records of the Migrations, Local Movements, and Occurrence of Birds on the Borders for 1882-83 and 1884-85**, a series of reports by James Hardy, Robert Renton, Dr. Charles Stuart, John Aitchison, and George Bolam. **Ornithological Notes,**

by George Bolam. **On the occurrence of the Diving-spider (Argyroneta aquatica) in Haddingtonshire,** by Archibald Gray.

Geological.—On the finding of Shells in the Boulder-clay near Berwick-on-Tweed, by William Gunn. Mr. Hardy contributes notes on the plants and birds of Henderland, and of St. Mary's Loch, in a paper entitled **The tomb of Cockburn of Henderland and its Vicinity**; and in a paper of **Miscellanea** he mentions *Motella tricirrhata* from the Berwickshire coast, *Coccus Fagi* in Rovensworth Woods, *Aneurus laevis* at Gibside, *Boreus hyemalis* in Berwickshire, *Linnæa borealis* near Longformacus (with a comparison of the plants with others from Mellerstane, Strath-Spey, and Canada), *Trientalis Europaea* as a Lammermoor plant, *Splachnum sphæricum* on Greenlaw Moor, and *Andreæa rupestris*, on Lammermoor hills.

Want of space forbids a notice of the antiquarian papers; but they also deserve perusal. We are glad to see that Mr. Hardy is, as ever, well to the front among their authors.

TRANSACTIONS OF THE GEOLOGICAL SOCIETY OF GLASGOW. Vol. VII. Part II., 1882-83, 1883-84.—We have received the new part of the excellent Transactions of this Society. We must not attempt to do more in our limited space than to indicate the papers that deal with Scotland, leaving a closer acquaintance with the contents to be gained by a reference to the volume itself. It may be noted in passing that this part completes Vol. VII., and that it contains the index of the volume. The articles on Scotch subjects are as follows:—**Volcanic Disturbance of the Ironstone Measures in the vicinity of Dalry during the Carboniferous Period,** by Robert Craig; **Biographical Sketch of the late Robert Slimon, L.R.C.P. and S.,** by John R. S. Hunter LL.D.; **On the Identity of Ceramopora (Berenicea) megastoma, M'Coy, with Fistulipora minor M'Coy,** by John Young; **A Bed of Post-glacial Clay, exposed by dredging in the harbour of Girvan, Ayrshire,** by David Forsyth; **Notes on Ure's Millepore, Tabulipora Urii J. Young (Cellepora Urii Flem.),** by John Young; **Three Month's Tent Life among the Silurian Hills of Logan Water, Lesmahagow,** by J. R. S. Hunter; **Notes on the occurrence of Leda arctica, Lyonsia arenosa, and other Organic Remains in the Post-Pliocene Clays of Garvel Park, Greenock,** by Thomas Scott and James Steel; **Cleaves Cove, Dalry, Ayrshire, its Explorations and History,** by John Smith; **Geological Observations, in the Parish of East Kilbride, Lanarkshire,** by Andrew Patton; **On the Geology of Androssan and West Kilbride,** by Dugald Bell; **Notes on the Sphaerulite Rock of Corriegills, and the Banded Pitchstone of Invercloy, Arran,** by D. C. Glen, and John Young; **The Silurian Rocks of the Girvan District,** by David Forsyth; **Note on Favosites (?) (Calamopora) dentifera Phillips,** by John Young; **Review of the Southern Silurian question,** by Ar. Macconochie; **The Silurian Districts of Leadhills and**

Wanlockhead, their early and recent Mining History, by J. R. S. Hunter; **On a Specimen of Psephodus magnus Agass. from the Carboniferous Limestone of East Kilbride, Lanarkshire,** by R. H. Traquair, M.D.; **Notes on a Fossiliferous Shale, a little way below the Cloch Lighthouse,** by Thomas Scott.

PROCEEDINGS OF THE PERTHSHIRE SOCIETY OF NATURAL SCIENCE. Vol. I. Part V., 1884-85.—We have already in this Magazine, in the numbers for April and July, 1885, noticed the papers read at several of the earlier meetings of this energetic Society, and published in the part of the Proceedings now under review; hence we shall now only mention the titles of these papers, viz., **Museum Notes,—I. Perthshire Mammalia,** by Dr. Buchanan White. **Report of Delegates** *to the Meetings of the East of Scotland Union of Naturalists' Societies* (Dr. Buchanan White), to the Montreal Meeting of the *British Association* (Mr. Robert Pullar), and to the Philadelphia Meeting of the *American Association for the Advancement of Science* (Mr. Rufus D. Pullar). **Comparative Anatomy of the Teeth,** by James Stewart, L.D.S. **The Diatoms of the Tay,** by Dr. Trotter. **Shells, their Structure, Growth, and Uses,** by Henry Coates; who also exhibited *Testacella haliotidea*, var. *scutulum* from Kirkcaldy, a remarkably repaired shell of *Helix nemoralis*, and contorted variety of *Planorbis vortex* from Errol. **Presidential Address** by Dr. Buchanan White, on the Museum belonging to the Society, and the urgent need of extension. **The Climate of the British Islands, with special reference to Perthshire,** by Rev. A. Campbell. **On some Fresh-water Annelids** (*Tubifex*), by Prof. Allen Harker. **Note on a supposed New British Willow** (probably Salix spuria Schleicher, a hybrid between *S. lapponum* and *S. arbuscula*), by Dr. Buchanan White. **The Native Timber Trees of Perthshire** (19 species), by W. Lindsay. The Museum is still being rapidly added to, alike in the local and in the index collections; and we observe that the need of increased accommodation is much felt.

The following excursions were made:—On May 21st, to the lower end of Glentilt. On June 13th, to Ardoch, near which were found *Carex irrigua*, *Eriophorum vaginatum*, and *Stellaria nemorum*. On June 27th, to Acharn and the shores of Loch Tay. The party had an opportunity of seeing, in Mr. D. Dewar's collection of Perthshire mammals and birds, a wild cat, obtained near Remony in the spring of 1885. Among the plants found during the day were *Festuca sylvatica*, *Subularia aquatica*, *Carex vesicaria*. On July 18th, to Stuc-a-chroin, one of the peaks of Ben Voirlich; in this excursion were found *Saxifraga nivalis*, *Juncus biglumis*, *Hieracium* (?) *holosericeum*. The rare moth, *Scoparia alpina*, also turned up. On July 25th, to West Bank of Tay, from Grandtully to Dalguise. On August 8th, to the Linn of Campsie, when several rare plants were observed, including *Neottia Nidus-avis*. On August 22nd, to North Bank of Earn, from Forteviot downwards; on this day were observed *Epipactis latifolia*, *Erythraea Centaurium*, *Limnanthemum Nymphæoides*, *Carex paludosa* and *C. remota*.

SCIENTIFIC JOURNALS.

ZOOLOGIST (1885).—(P. 69) **Night Heron in Scotland**, and (p. 72) **Rossia Macrosoma in Argyleshire** (both from Loch Creran), by J. M. Campbell; (p. 97-100) **Habits of the Limpet** (observed at Granton Marine Station), by J. R. Davis; (p. 114) **Marsh Harrier in Dumbartonshire**, by James Lumsden; (p. 190) **The Glaucous Gull in Skye**, by H. A. Macpherson; (p. 386) **Ringouzels in Gardens** (abundant in Strathnaver, Sutherland), by S. G. Reid; (pp. 408-414) **On some Variations in Helix arbustorum Linn.**, by B. B. Woodward, is a paper on the chief variations detected in a collection from Brora in Sutherland; (p. 434) **Pied Flycatcher and Night Heron in Clackmannanshire** (near Alloa), by W. Erskine; (pp. 492-496) **Sixth Report on the Migration of Birds in the Spring and Autumn of 1884**, relates to several lighthouse observations, &c., from Scotland, as well as from England. It confirms earlier reports on the same subject. 1886 (*January*).—**American Golden Plover and Richard's Pipit in Scotland** (in Perthshire), by J. Guille Millais. (*February*) **Glaucous Gull in Skye**, by H. A. Macpherson. (*March*) **Ivory Gull and Little Auk in Caithness**, by W. Read; **Pine Marten in Scotland**, a specimen shot in the Black Mount Forest, exhibited by Mr. James Lumsden.

JOURNAL OF CONCHOLOGY, 1885.—(*January*) **Clausilia rugosa monstr. dextrorsum in Stirlingshire**, at Slamannan; **Variation in Lehmannia arboreum**, by Wm. Denison Roebuck, records this slug from Berwick (81), Sutherland East (107), and Caithness (109), *April* and *July* (pp. 319-336), **Census of the Anthenticated Distribution of British Land and Freshwater Mollusca**, by John W. Taylor and W. Denison Roebuck, enumerates the counties and vice-counties for which these authors have "authenticated records, that is, such as are verified by specimens which have passed under our own examination. This process secures uniformity of value in the results." They conclude with the words: "It will be seen on perusal of the above census that the principal places to be regarded as among the uninvestigated and dark corners of the kingdom are Scotland and Ireland, Mid-Wales and the eastern and south-western counties of England, specimens from any of which districts will be of unusual value and importance." The decision to rely solely on specimens examined by the authors themselves, to the extent of omitting all mention of such careful work as that recorded in Mr. H. Coates' report in our January number, is to be regretted, as such records might be easily indicated without risk of confusion with those authenticated by the authors. We cordially commend to our readers in Scotland to aid the authors of the census by sending specimens from Scotland for their examination. **Marine Mollusca at Oban**, by R. D. Darbishire. *October*. In **Proceedings of the Conchological Society** are recorded *Helix hortensis* and *H. nemoralis* from Maybole in Ayrshire, *H. lamellata* from

Inverary, *H. nemoralis* and *H. ericetorum*, with the var. *minor*, from the Island of Islay, and *Sphaerium corneum* from Alford, Aberdeenshire.

ENTOMOLOGISTS' MONTHLY MAGAZINE (*July*).—**Beraea pullata** and **Crunœcia irrorata bred** (from Scotland), by Kenneth J. Morton. **A Synopsis of the British Species of** (sawflies belonging to the groups) **Cimbicidina, Hylotomina, Lophyrina, and Lydina**, is published by Peter Cameron, because of inevitable delay, for at least three years, in the publication of vol. III. of his *Monograph of British Phytophagous Hymenoptera*. This paper runs on through the numbers for August, September, October, and November, but will not be referred to again. (*August*) **On the Occurrence in Britain of Ornix fagivora and Nepticula Nylandriella** (in Sutherlandshire, rather common in May on trunks of mountain-ash), by A. F. Griffith. **On the Larvæ of Coccyx tædana and Euchromia flammeana and arbutana** (all from *Arctostaphylos Uva-ursi* in Sutherland), by A. F. Griffith. (*September*) **The Nitidulidæ of Great Britain** (concluded this month), by the Rev. W. W. Fowler, notes *Ips 4-pustulatus* L., *Pityophagus ferrugineus* Fabr., and *Rhizophagus dispar* Gyll., from several Scotch localities, *R. ferrugineus* Payk. and *R. bipustulatus* Fabr., as widely distributed; *R. nitidulus* Fabr. at Rannoch, and *R. politus* Hell. at Aviemore. **A Great Swarm of Hydropsyche instabilis Curt. in Inverness-shire**, by J. J. King, the insects extended in a cloud for five miles down Glen Tromie. (*November*) **Drepanopteryx Phalaenoides L. in Scotland: a Re-discovery** (near Cleghorn, Lanarkshire), by Kenneth J. Morton. (*Dec.*) **Pterostoma palpina in Roxburghshire**, by A. Elliott (recorded erroneously as new to Scotland), see *Scott. Nat.* II. p. 87. (*January, February, March*, 1886.) **A Hundred New British Species of Diptera**, by G. H. Verrall. Many of the species are from Scotch localities, and these we enumerate below as follows:—*Boletina trivittata* Mg., Loch Maree and Tongue, in June; *Scatopse inermis* Ruthe, Gairloch: *Antocha opalizans* Ost. Sack., at Tongue; *Empeda nubila*, Arran; *Rhypholophus similis* Stæg, Braemar; *Limnophila punctum* Mg., Rannoch; *Rhamphomyia spissirostris* Fln., Tongue; *Rh. fumipennis*, Muchalls and Rannoch; *Rh. plumipes* Fln., Rannoch; *Rh. simplex* Ztt., Aberlady and Inverness; *Oreogeton flavipes* Mg., Braemar; *Clinocera plectrum* Mik, Braemar; *Tachydromia stigmatella*, Ztt., Braemar; *Micromorphus albipes* Ztt., Aberlady; *Syrphus lapponicus* Ztt., Pitlochry; *Chrysogaster virescens* Lw., Rannoch and Loch Maree; *Pyrellia cyanicolor* Ztt., Loch Maree and Rannoch; *Haematobia stimulans* Mg., Rannoch, Gairloch, and Arran; *Spilogaster trigonalis* Mg., Tongue; *S. pertusa* Mg., Braemar; *Anthomyia sylvestris* Fln., Aberlady; *A. striolata* Fln., Aberlady; *A. discreta* Mg., Aberdeen and Tongue; *Chirosia albitarsis* Ztt., Loch Maree and Tongue; *Themira spinosa* n.sp. (described), Loch Maree and Tongue; *T. minor* Hal., Loch Maree; *Spilographa hamifera* Lw.; *Tephritis vespertina*, bred by Dr. W. A. Vice from heads of *Hypochœris radicata* from Banchory, also at Rannoch; *T. conura* Lw., reared by Dr. Vice from heads of *Carduus palustris* from Banchory, also from Pitlochry; *T. conjuncta* Lw., Aberdeen and Rannoch. (*January*) London Entom. Society (*Dec. 2nd*, 1885), Mr. Porritt exhibited a melanic variety of *Luperina testacea* from

Glasgow. (*March*) South London Entom. and Nat. Hist. Society (21*st Jan.* 1886), Mr. South exhibited *Noctua neglecta*, with its variety *castanea* Esp. from Perthshire. (4*th Feb.*), Mr. South exhibited *Emmelesia albulata* from Dumbarton, Rannoch, and Shetland.

SCIENCE GOSSIP (*March* to *December*, 1885).—(P. 68) **Dolerite and Horneblende-schist**, being notice of a paper read by J. Harris Teale, in reference to the transition from dolerite into horneblende-schist at Scourie, in Sutherland; (p. 92) notice of a paper by Prof. J. F. Blake, in the "Proceedings of the Geologists' Association," on the **Archaean Rocks of the North-West Highlands**; (p. 131 and p. 159) **Holiday Rambles through Wigtonshire**, by J. Claridge Druce; (p. 213) **Fossil Algæ at Kirkcaldy**, by John Sang, relates to fossil stems found at Kirkcaldy in an excavation. Mr. Sang proposes to name the plant *Halophytis magnum*. Microscopic sections are very like those of *Laminaria*; (p. 280) **The Geology of Corstorphine Hill, near Edinburgh**, by Alexander Johnstone, stated to show the close relationship of diorite to gabbro; (p. 281) **Andersonian Naturalists' Society**. On 25th August a meeting was held in Anderson's College, Glasgow, at which a Society was formed under the above name, with Mr. Wm. Cumming, West End College, Chryston, by Glasgow, as secretary. **Starling eating Earwigs**, by F. Brebner. (*January* to *March*, 1886). (P. 19) **The Bottle-Nose Whale** (*Hyperoodon rostratus*) by Js. Simpson; a specimen stranded near Dunbar, 5th Dec., and purchased for Edinburgh University.

GREVILLEA (*Sept. and Decem.*, 1885).—**British Sphaeropsideæ**, by Dr. M. C. Cooke, is a list of species found in the British Islands, and among them are some not recorded—in the *Mycologia Scotica* and its supplements in the *Scottish Naturalist*. *Phoma Strobi*, B. and Br., on leaves and cones of *Pinus Strobus*, Glamis; *Neottiospora Caricum*, Desm., on dead *Carices*, Moray; *Cytispora chrysosperma*, Pers., on *Populus alba*, Glasgow; *Ceuthospora phacidioides* Grev., on Holly leaves, Edinburgh. In **Synopsis Pyrenomycetum** (Vol. XIV. pp. 46-47), Dr. Cooke records *Valsa* (*Chorostate*) *punctata*, Cooke, on branches of *Tilia* and *Salix*, Edinburgh, and *Valsa* (*C.*) *olivæstroma*, Cooke, on branches of *Prunus Avium*, Jedburgh (Jerdon).

THE GEOLOGICAL MAGAZINE (*March*).—**On the recent discovery of the Wing of a Cockroach and two Scorpions in Rocks of Silurian Age**, by Herbert Goss, refers to the Scorpion found by Dr. Hunter, in the Ludlow beds of Lesmahagow, Lanarkshire. **On some recent views concerning the Geology of the North-west Highlands**, by Dr. Henry Hicks (read 2d January, 1885, to *Geologists' Association*). (*April*).—**The Tertiary and Older Peridotites of Scotland**, by John W. Judd (read 11th February, 1885).—(*June*) Abstract of paper read (12th March) before *Geological Society of Glasgow*, by John Young, F.G.S., on **Cone-in-Cone-structure**. (*August*) **On a Specimen of Psephodus magnus Agassiz, from the Carboniferous Limestone of East Kilbride, Lanarkshire**, by R. H. Traquair, M.D., F.R.S.; **On a New Species of Helmintho-**

chiton from the Upper Bala (Silurian) of Girvan, Ayrshire, by Henry Woodward, F.R.S. (named here *H. Grayiae*). Abstract of paper in *Trans. Roy. Soc., Edinburgh* (XXXII., pp. 359-388, with 2 plates), on **The Old Red Sandstone Volcanic Rocks of Scotland**, by B. N. Peach and John Horne. "The authors observe that the most interesting feature connected with the Old Red Sandstone formation in Shetland is the evidence of prolonged vocanic activity in those northern isles. . . . The absence of any intercalations of sandstones, flagstones, or shales, save near the fault at Brei Wick and Rooeness Voe, indicates that the subaqueous eruptions must have been well nigh continuous for a time in that portion of the basin."

REVIEWS.

OUTLINES OF GEOLOGY.*

UNDER this title Professor James Geikie has published a text-book for the use of "junior students and general readers," and as, doubtless, many of the readers of the *Scottish Naturalist* are inclined to place themselves in this class, they may be glad to hear of a work which, while giving them all the latest information, is not so abstruse as to deter them from the study.

Beginning with the phenomena most familiar to him, the reader is made acquainted with the various agents which have acted and are acting upon the earth's crust, and is shown the various modifications brought about by the instrumentality of the atmosphere, of water in its various forms, and of animal and plant life. Having studied these, a classification of the modern products of these surface agents is presented to him; a comparison made with the rocks whose origin is supposed to have been similar; and their practical identity pointed out.

From the more familiar phenomena the reader passes on to those less familiar to him, and is introduced to the action of modern volcanoes and the products resulting from them. The latter are shown to have all the essential characters of the crystalline igneous rocks, and the deduction follows that these must have had a similar origin. A description of some other crystalline rocks of a different character is then given, with reasons for their origin. A chapter on earth movements (earthquakes, &c.) concludes the account of Dynamical Geology.

To Structural Geology, or that part of the science which deals with the architecture of the earth's crust, six chapters are devoted, and the subject is very fully considered and well illustrated. The effects produced by "faults" upon outcrops at the surface are often rather puzzling to beginners. Dr. Geikie explains the matter very lucidly, illustrating it by a series of original models which will enable the student to readily comprehend the effects of the action. From the value of these alone, apart from its other merits, the "Outlines" ought to have a place in the library of every teacher, as well as student, of geology.

* *Outlines of Geology: an Introduction to the Science.* By J. Geikie, LL.D., F.R.S. London: Stanford. 1886.

In the department of Historical Geology the chief feature of the work is the summaries of the climatic and geographical conditions which obtained during each period. Without going into too minute details—which are rather too apt to confuse a general reader—a broad view is given of the kinds of life which successively existed, of the climate, and of the distribution of land and sea.

The great aim of the author throughout the book has been to attain clearness and to keep up the interest of the reader; and we think we can congratulate him on having succeeded in doing so. We should not omit to notice that which always adds to the attractiveness of a book—namely, the numerous illustrations, about 400 in number.

OUR INSECT ENEMIES.

By THEODORE WOOD.

THE Society for promoting Christian Knowledge has for many years done good work in promoting the dissemination of greater facilities for gaining a knowledge of the objects that surround us on every side. By means of publishing very useful and cheap small books upon various branches of science, the Society has earned a claim to the goodwill of the community.

The little work now under review is not unworthy of its predecessors; and though a good many books have been written to popularise in some measure the very important subject of which it treats, this addition is likely to be of real use in extending a truer understanding, and in raising the popular belief in the value of a knowledge of our insect foes. A few more illustrations might have aided the tyro in difficulties, even though there are numerous woodcuts given in the work. The letterpress is interestingly written, and shows that Mr. Wood inherits the powers of his father, the well-known popular writer on Natural History.

Those desirous to possess a good check list of *British Marine Mollusca* will find their wishes met in a list just published by A. Somerville, B.S.c., F.L.S. It follows closely Jeffrey's *British Conchology*, but has alterations and additions to 1885. The varieties of each species are mentioned in smaller type. Indenting the varietal names would facilitate reference to the list by bringing the specific names into more prominence. The price of the list is 3d., or 2s. 6d. per dozen, from A. Stenhouse, University, Glasgow.

ADDITIONAL RECORDS OF PLANTS FROM SCOTLAND.

Since the publication of "Topographical Botany, Ed. II., with occasional notes.

By AR. BENNETT, F.L.S.

I HAVE endeavoured in these records to bring together the scattered notices of Scottish plants up to the end of 1885. Of very many of the species mentioned below, specimens have

passed through my hands as indicated by the mark ! ; many have been recorded in the Reports of the Botanical Exchange or Record Clubs ; and are from sources believed to be trustworthy ; and for a large number of records I am indebted to the Rev. W. W. Newbould. Other records have been rejected, on various grounds ; though they may ultimately prove, on further evidence, to merit a place in the Scotch flora. In regard to several of the species I have added notes, which in many cases are suggestive rather than affirmative.

The nomenclature and the sequence of species are the same as in "Topographical Botany." So, too, the counties and vice-counties into which Scotland is divided are the same as in that work. For brevity it has been found necessary to denote them by the numbers there employed for them. The utmost care has been employed to prevent errors arising from the use of numerals instead of names. To facilitate reference I subjoin the list of counties and vice-counties with the number for each. As the numbers for Scotland in "Topographical Botany" run from 72 to 112, there is no risk of confusion by making use of the numbers 1 to 12, merely for those above 100, hence this is done for brevity. The numbers run as follows:—72 Dumfries, 73 Kirkcudbright, 74 Wigton, 75 Ayr, 76 Renfrew, 77 Lanark, 78 Peebles, 79 Selkirk, 80 Roxburgh, 81 Berwick, 82 Haddington, 83 Edinburgh, 84 Linlithgow, 85 Fife and Kinross, 86 Stirling, 87 West Perth, 88 mid-Perth, 89 East Perth, 90 Forfar, 91 Kincardine, 92 South Aberdeen, 93 North Aberdeen, 94 Banff, 95 Elgin, 96 Easterness, 97 Westerness, 98 Argyle, 99 Dumbarton, 100 Clyde-isles, 1 Cantire, 2 South Ebudes, 3 mid-Ebudes, 4 North Ebudes, 5 West Ross, 6 East Ross, 7 East Sutherland, 8 West Sutherland, 9 Caithness, 10 Hebrides, 11 Orkney, 12 Shetland.

The chief sources of information have been as follows,—Papers in the "Journal of Botany," the Reports of the Record Club (quoted R. C.) for 1881-82, and 1883, and of the Botanical Exchange Club (quoted E.C.), and MS. lists from Messrs. Newbould, Linton, and others who are quoted in the subsequent lists. Certain counties and vice-counties appear very frequently in these lists; and the information in regard to several of them is taken so much from one source for each, that, to save space, this has not been repeated ; and the number of the county or vice-county is given alone, except when the information for it is drawn

from some other than the usual source. The numbers with which this is done, and the authority for each are as follows :—for 72 (Dumfries) Dr. Davidson is the chief authority ; records for 73 (Kirkcudbright), and 74 (Wigton), are taken chiefly from lists supplied by Rev. W. W. Newbould ; those for 87 (West Perth), 88 (mid-Perth), and 89 (East Perth), are chiefly from a paper on "Perthshire Plants and Topographical Botany," by Dr. F. Buchanan White in the "Journal of Botany ; " those for 90 (Forfar), 91 (Kincardine), 92 (South Aberdeen), 93 (North Aberdeen), 94 (Banff), and 95 (Elgin), mostly rest on two papers, entitled "Scottish Plants and Topographical Botany," by Prof. Trail and John Roy, in the "Journal of Botany" for 1884 (August), and "List of Introduced Plants and Casuals observed in N.E. Scotland," by Prof. Trail; records for 97 (Westerness) rest chiefly on a paper by Revs. W. R. & E. F. Linton, in "Journal of Botany" for 1884, and upon M.S. of Rev. E. F. Linton ; of 98 (Argyle), on information from Mr. Newbould; of 100 (Clyde Isles), are due to Rev. A. Ley, in Record Club Reports for 1883 ; of 2 (South Ebudes), to Mr. Grieve in "Journal of Botany" for 1884 ; of 4 (North Ebudes), to same source as for 97 ; of 5 (West Ross), and 6 (East Ross), to information from Mr. Newbould; of 8 (West Sutherland), to Messrs. Fox and Hanbury in "Journal of Botany," for 1885; and for 9 (Caithness), to Mr. J. Grant of Wick. † signifies that the plants under notice have been introduced into the district to whose number it is affixed.

Dicotyledons.

Thalictrum minus (agg.), 74, *R.C.* 1883, 89. T. maritimum (seg.), 94, 5 & 7, R.C. 1883. T. montanum (seg.), 88, 89. T. majus, 74.

Ranunculus aquatilis (agg.), 74, 88, 89, 5, 8. R. heterophyllus, 88, 89. R. peltatus, 72 and 73 *Coles*, 74, 88, 89, 91, 93, 6 *Druce*. R. trichophyllus, 72 and 73 *Coles*, 88, 89. R. Drouettii, 73 *Coles*, 88, 89, 2, 8. R. penicillatus, 74, 88, 89. R. Baudotii, 89. R. circinatus, 87, 88, 89. R. fluitans, 94. R. hederaceus, 74, 8 *Miller*. R. Ficaria, 74, 2. R. Flammula, 74. R. reptans, 93. R. Lingua, 89. R. auricomus, 89. R. acris, 74. R. repens, 74. R. bulbosus, 8 *Miller*. R. hirsutus, 74 (93 *casual*). R. sceleratus, 88, 89. R. arvensis, 89.

Caltha palustris, 74, var. Guerangerii 89, C. radicans, 90.

Trollius Europaeus, 74, 5.

Berberis vulgaris, 2 *Ley, R.C.*, 1883, †.

Nymphaea alba, 74 *Druce, R.C.*, 1883, 88, 89, 5.

Nuphar lutea, 74, 88, 89, 5. N. intermedia Auct. angl., 72, 92. N. "pumila," 89, 9, *Grant! Hanbury!*

Our smaller yellow Water-lilies want careful examination and comparison, and materials must be got together. I have invoked the aid of Dr. Caspary; and I have some interesting notes from him. He has my own specimens at present for examination, and I hope to give a note on them at some future date.

Papaver dubium, 73, 74, 5. P. Lecoquii, 6. P. rhoeas, 88, 89.

Corydalis claviculata, 89.

Fumaria pallidiflora, 89. F. Boraei, 73 *Druce, R.C.* 1883, 74 88, 89. F. confusa, 89, 100. F. officinalis, 74, 2, 7. F. micrantha, 89, 91, 92, 93.

Coronopus Ruellii, 94.

Thlaspi arvense, 73 *Coles*, 89. T. alpestre, 88, 89.

Capsella bursa-pastoris, 74, 97, 8.

Teesdalia nudicaulis, 72 *Coles*, 73 *M'Andrew*, 89.

Lepidium campestre, 88, 89.

Cochlearia officinalis, 74, 98, *R.C.*, 1883, 6 *Druce*. C. alpina, 94, 4, 8 *Miller*! C. Danica, 73 *Fraser*.

Subularia aquatica, 73 *Coles*.

Draba rupestris, 89 *H. T. Mennell!* D. incana, 87, 89. D. verna, 2.

Cardamine amara, 89, C. pratensis, 74, 7. C. hirsuta, 74, 3 *Bailey*, 5, 7 and 8 *Miller*. C. sylvatica, 92, 6 *Druce*, 8.

Arabis petræa, 88 *recent confirmation*, 94. A. hirsuta, 8.

Turritis glabra, 88 *doubtful native*.

Barbarea vulgaris, 74, 89, 9 *Hanbury!*

Nasturtium officinale, 74, 97, 9. N. terrestre, 74, 88. N. Sylvestre, 73 *M'Andrew* 1885 !, 88.

Sisymbrium officinale, 97. S. Sophia, 88 *casual*.

Sinapis arvensis, 97. S. alba, 73, 74.

Raphanus Raphanistrum, 97, 4, 7.

Reseda luteola, 9 *Hanbury!*

Helianthemum vulgare, 74, 93.

Viola palustris, 74. V. Reichenbachiana, 88. V. canina (seg.) 73 *Coles*. V. tricolor, 74, 7. V. Curtisii, 92 *Trail!* 8 !, 9 ! V. lutea, 4, 9.

Drosera rotundifolia, 74, 7 *Grant*, *R.C.* 1884. D. obovata, 4 ! D. anglica, 73 *Coles*, 74, 89, 5 *Druce* !

Polygala eu-vulgaris, 87, 90 *Druce!* 92, 96, 97, 5, 6, *all Newbould*, 7 and 8 ! *Miller*. P. oxyptera, 88, *is an erroneous record*; *neither Mr. Miller nor myself can tell how Mr. Watson inserted it.*

P. depressa, 73 *Coles*, 74, 87, 90, and 92 *Druce*, *R.C.* 1881-82, 97, 2 *Ley*, *R.C.* 1884, 4, 5, 6.

Elatine hexandra, 92.

Dianthus Armeria, 72.

Silene inflata, 74. S. maritima, 73 *Druce*, *R.C.* 1883, 74.

S. anglica, 80 † Brotherston, 88 *requires confirmation.*

Lychnis Viscaria, 88. L. Flos-cuculi, 74. L. diurna, 74, 97, 7. L. vespertina, 74, 2, 8 !

Sagina apetala, 73, 74. S. maritima, 73, 74, 2. S. saxatilis, 89 *Mennell!* S. subulata, 74 *Bailey*, *R.C.* 1883, 93, 97. S. nodosa, 97.

Spergula arvensis, 74 *Bailey*, *R.C.* 1883.

Honkenja peploides. 74.

Spergularia marina, 73. 74. S. marginata 74, 97 and 4. S. neglecta 87 *Drummond!*, 4. S. rubra, 74 *Bailey*, *R.C.* 1883, 89, 98 *Bailey*, *R.C.* 1883, 2.

Arenaria serpyllifolia, 7 *Miller*. A. verna, 73 *Coles!* 89 *Mennell!* A. rubella 89 *Mennell!* A. trinervia 9 !

Stellaria media, 74. S. holostea, 74, 97. S. graminea, 74, 7 Grant. S. uliginosa, 73, 74.

Cerastium glomeratum, 74, 97. C. triviale, 74. C. semidecandrum 93, 6 *Druce*, *R.C.* 1881-82. C tetrandrum, 94, 5 *Bailey*, *R.C.* 1883, 8 ! C arvense, 74.

Cerastium latifolium Auct. angl. It seems clear that our plants are not the true *latifolium* L., but some of them may prove to be *C. glaciale*, as Mr. Backhouse is inclined to think. I should be much obliged for good specimens of our *latifolium* to submit to Dr. Lange for comparison with his C. *arcticum*, which is found in Iceland, Greenland, and, probably, the Faroes.

Linum catharticum, 74.

Malva sylvestris, 73, 74. M. rotundifolia 80, *R.C.* 1881-82, 90 to 93 *not native*, 6 †. M. moschata, 90 †, 91 †, 92 †.

Hypericum Androsaemum, 80 *Brotherston*, 87. H. perforatum, 2, 7. H. quadrangulum, 74, 97. H. dubium, 73 H. humifusum, 74. H. pulchrum, 74. H. hirsutum, 72.

Erodium cicutarium, 87.

Geranium pyrenaicum, 88 and 89 escape. G. pusillum, 88. G.

molle, 74, 97, 98. G. columbinum, 89. G. Robertianum, 74, 97. G. sanguineum, 93, 2, 9.

Oxalis acetosella, 74.

Rhamnus catharticus. 91, †, 92, †. R. Frangula. 93 *not native.*

Ulex Europaeus, 74. U. eu-nanus, 72 *Fingland!*

Genista anglica, 74.

Anthyllis vulneraria. 74, 5 *Bailey, R. C.* 1883, 7 *Miller.*

Medicago lupulina, 88, 8 !

Melilotus officinalis, 88 and 89 †. M. vulgaris, 88.

Trifolium repens, 74. T. pratense, 74. T. medium, 74, 7 and 8 *Miller.* T. arvense, 88 *delete?* T. striatum, 91 *delete?* T. procumbens, 73, 74, 4, 7 *Grant, R.C.* 1883. T. minus, 73, 74, 90, 6 *Druce*, 7 *Grant, R.C.* 1883, 8 *Miller.*

Lotus corniculatus, 74. L. tenuis, 92. L. major, 74, 9.

Astragalus glycyphyllus, 88. A. hypoglottis, 88, 94, 2. A. alpinus, 89 *Brebner, ex Dr. F. B. White. Is it extinct in Forfar? I have a specimen gathered there in 1872 by the late Mr. Sadler.*

Oxytropis uralensis, 88, 89 *Brebner ex Dr. F. B. White.*

Ornithopus perpusillus, 89, 90 *delete?*, 93 †.

Onobrychis sativa, 90 †.

Vicia Orobus, 84 Turner !, 89. V. cracca, 74. V. angustifolia, 73, 74. V. lutea, 88 *much needs to be confirmed.* V. sepium, 7 *Miller.* V. hirsuta, 74, 7 *Grant.*

Lathyrus Aphaca, 88 and 89 casual, 92 †. L. pratensis, 7 *Miller.* L. sylvestris, 91 !

Orobus tuberosus, 74, 7 *Miller.*

Prunus spinosa, 74, 9 *Grant!* (*? wild*). P. Padus, 88. P. Avium, 89.

Spiræa Ulmaria, 74, 7 *Miller.* S. Filipendula, "*Caithness*" *in* "*Topographical Botany.*"

Dr. Lees (R. C.) says "hardly wild, but it grows on the sea cliff among grass and other vegetation."

Geum urbanum, 74, 97. G. intermedium, 72. 73, 74, 97. G. rivale. 74, 7 *Miller*, 8.

Sibbaldia procumbens, 93 *requires confirmation.*

Potentilla anserina. 74. 97. P. reptans, 74, 87. P. Tormentilla, 73, 74. P. procumbens, 72, 88, 89, 92. P. Fragariastrum, 74, 2.

Comarum palustre, 97, 7 *Miller.*

Fragaria vesca, 74, 98.

Rubus saxatilis, 7 *Grant, R.C.* 1883. R. Idæus, 74.

Only two of the fruticose *Rubi* are recorded for the extreme north of Scotland

in "Topographical Botany," viz. *R. adscitus* from 7 (E. Sutherland), and *R. fissus* from 11 (Orkney). It seems probable that others, *e.g.*, *suberectus*, *fissus*, &c., will be found. One of the sub-species occurs at Scourie in 8 (W. Sutherland).

R. suberectus, 88, 89, 92. R. fissus, 87, 88, 92. R. plicatus, 89, 91, 92, 2 *Ley*, *R.C.* 1883. R. affinis, 88, 89. R. hemistemon, 88. R. Lindleianus, 5 and 6. R. rhamnifolius, 73 and 74 *R.C.* 1883, 88. 92. R. latifolius. 89. R. thyrsoideus, 92. R. hirtifolius, 88. R. villicaulis, 88. R. adscitus, 88. R. macrophyllus, 88. R. Hystrix, 89. R. Radula, 73 *Druce*, *R.C.* 1883, 74, 89, 91. R. Koehleri verus, 74, 82 and 83 *Newbould*, 88. R. Koehleri pallidus, 88. R. Lejeunii, 88. R. Balfourianus, 89. R. corylifolius *typical*, 73, 74, 88, 89, 91, 92, 4. R. corylifolius var. *conjungens*, 89. R. corylifolius var. *purpureus*, 89. R. tuberculatus, 88. R. cæsium, 74, 91, *not known in Perth*, F. B. W.

Rosa spinosissima, 74 *Druce*, *R.C.* 1883, 88, 89, 97. R. hibernica, 88. R. Sabini, 74, 89, 97, 2 *Ley*. R. mollissima, 72 !, 73 *Druce*, 74, 90 *Druce*, *R.C.* 1881-82, 97, 4, 6 *Druce*, *R.C.* 1881-82. R. tomentosa, 72, 74, 88, 89, 4, 9. R. micrantha, 9 ! *Dick*. R. rubiginosa, 89 and 90 "*Druce indigenous*" *ex Newbould*. R. canina, 74, 97, 4.

Agrimonia Eupatoria, 74, 97, 4.

Alchemilla vulgaris, 74. 8. A. alpina, 7 *Grant*, *R.C.* 1883. A. arvensis, 74, 89, 97.

Crataegus Oxyacantha, 74.

Pyrus Malus, 74, 87, 88, 89, 2, 6. P. scandica, 6 † *Druce*, *R.C.* 1883. P. Aucuparia, 74, 9 *Hanbury*.

Epilobium angustifolium, 6 *Druce*. E. hirsutum, 74. E. parviflorum, 73, 74, 6 *Druce*, 9 ! E. montanum, 74. E. eu-tetragonum, 88 *requires verification*. E. obscurum, 73, 74, 88 *Druce*, *R.C.* 1881, 97, 98 *Bailey*, *R.C.* 1883. E. alsinifolium. 91.

Circæa lutetiana, 89, 92 and 93 *require confirmation*, 2 *Ley*, *R.C.* 1883. C. intermedia, 92, and probably 93. C. alpina *delete*?, 91 to 94 *require confirmation*.

Hippuris vulgaris, 7 *Grant R.C.* 1883.

Myriophyllum spicatum, 73 *Coles !*. 74, 80 *Brotherston*, *R.C.* 1881-82. 87, 90 *Newbould*, 92 *Miller !*, 9 !. M. alterniflorum, 73 *Druce*, *R.C.* 1883. 74 *Druce*, 90, 91, 94, 5 and 6 *Druce*, *R.C.* 1881-82.

Callitriche platycarpa, 72, 73 *Coles !*, 97, 7 and 8 *Miller !*, 9 *Grant !*. C. autumnalis, 73 *Coles !*, 74 *Bailey*, *R.C.* 1883, 88, 92, 94, 5 *Druce*, *ex Newbould*.

Ceratophyllum aquaticum, 88.
Peplis Portula, 74, *R.C.* 1883, 86.
Montia fontana, 74, 98.
Scleranthus annuus, 74.
Ribes petræum, 9.
Sedum Rhodiola. 94, S. Telephium, 74. S. Fabaria, 87, 88, 89, 91, 92, 93, *all* †. S. anglicum, 74, 88, 8 *Miller!*. S. acre, 74.
Saxifraga stellaris, 73 *Coles!* S. nivalis, 87. S. Hirculus, 92 *is erroneous*. S. oppositifolia, 94. S. tridactylites, 87 "*still there?*"
Parnassia palustris, 74, 7 *Grant*, *R.C.* 1883.
Hedera Helix, 74, 97, 98, 7 *Grant*, *R.C.* 1883.
Hydrocotyle vulgaris, 74, 89, 97, 7 and 8 *Miller!*.
Sanicula Europæa, 74, 89, 97, 7 *R.C.* 1883.
Eryngium maritimum, 91 and 93 *extinct*, 12 *delete?*.
Conium maculatum, 74, 88.
Smyrnium Olusatrum, 94 †.
Helosciadium nodiflorum, 74. H. inundatum, 74, 88.
Ægopodium Podagraria, 74.
Bunium flexuosum, 74, 7 *Miller*.
Pimpinella Saxifraga, 74. P. magna, 87 †, *fide Newbould*.
Œnanthe fistulosa, 72 "*not found of late, if ever.*" Œ. crocata 97.
Æthusa Cynapium, 88, 89.
Ligusticum scoticum, 73 *Coles and M'Andrew*, 8 *Miller*.
Angelica sylvestris, 74.
Daucus Carota, 74, 87, 97.
Torilis Anthriscus, 97.
Scandix Pecten-Veneris, 88.
Anthriscus vulgaris, 94. A. sylvestris, 73, 74.
Sambucus nigra, 74, 89, 7 and 8 *Miller*, "*near houses,*" 9 *Hanbury*.
Viburnum Opulus, 91 †, 92 †.
Lonicera Periclymenum, 7 *Grant*, *R.C.* 1883.
Linnæa borealis, 89 *delete?*, 93.
Galium verum, 74. G. palustre 74. G. uliginosum, 73, 74, 2, 9 *instead of* 6. G. erectum, 88, 89. G. Mollugo, 72 *Fingland!*, 73, 74. G. Aparine, 74. G. boreale, 73, *R.C.* 1883, 74.
Sherardia arvensis, 74, 8 *Miller!*
Asperula odorata, 74, 97, 8 *Miller!*
Valeriana officinalis, 74, 8 *Miller!*
Valerianella olitoria, 8.
Dipsacus sylvestris, 89.
Scabiosa succisa, 74, 4.

Knautia arvensis, 2.

Leontodon autumnalis, 72, 73, 74. L. hispidus, 88 *needs confirmation*, 8 and 9 *Hanbury*.

Hypochoeris radicata, 74.

Lactuca virosa, 85.

Sonchus arvensis, 74. S. asper, 89, 92, 93, 6. S. oleraceus, 73, 74, 97, 98 *all Newbould*.

Crepis virens, 73, 74. C. paludosa, 73 *Druce, R.C.* 1883, 97, 2 *Ley, R.C.* 1883, 7 and 8 ! *Miller*.

Hieracium, *in this genus* B *signifies that the specimens were named by Mr. Backhouse*. H. Pilosella, 74. H. holosericeum, 89 in "*Topographical Botany*," *is erroneous*, 94. H. nigrescens, 89, 94. H. chrysanthemum, 88, 5 *Druce ex Newbould*. H. murorum (seg.), 88, 89, 94, 100 *Ley, R.C.* 1883, 7 *Miller !* H. cæsium, 88, 89, 94, 5 *Newbould*. H. vulgatum (seg.), 73 *M'Andrew*, 94, 6 *Druce, R.C.* 1881-82, 7 *Miller !*, 9 !. H. gothicum, 88, 89, 4 B. H. pallidum, 85 *Boswell !*, 4 B, 8 ! B. H. anglicum, 4, 5, 8 B, 9 ! B, 11 *Johnston*. H. iricum, 88, 89, 90 ! *Ewing* B, 4. H. prenanthoides, 89, 90, 91, 94, 95 *Gordon*. H. strictum Auct. angl., 89 *Linton*, B. *says* "*H. strictum I believe*," 9 ! H. crocatum, 72 ! B, 73 *Coles*, 96 *Townsend !*, 97 !, B, 4, 5, 9 ! B. H. tridentatum, 73 *Coles !*, 88. H. corymbosum, 73 *M'Andrew*, B, 85 *Bailey, R.C.* 1881-82, 91, 4 !, 7 *Miller !* B, 9 ! B. H. boreale, 72 ! B, 74. H. norvegicum Fr., 9 *Hanbury, determined by Dr. Almquist of Stockholm*.

It is certain that our *Hieracia* will be added to when the extreme north of Scotland has been thoroughly searched. Several Scandinavian species are likely to occur ; but their correct determination is not easy without access to the *Exsiccata* of Fries and Lindenberg. I shall be very grateful for good specimens that cannot be determined by the usual manuals.

Taraxacum erythrospermum, 92. T. lævigatum, 92, 9 *Hanbury*. T. palustre, 4, 8 !

Arnoseris pusilla, 88 "*not recently*."

Lapsana communis, 74, 97.

Arctium minus (Bab. Manual), 73, 74, 90, and 92 *all Newbould*, 97, 6. A. intermedium, 74.

Probably alterations in names will be necessary in this genus.

Serratula tinctoria, 88 †.

Carduus nutans, 89. C. crispus, 73 *Druce, R.C.* 1883, 74, 88, 89. C. tenuiflorus, 73, 6 *Druce, R.C.* 1881-82. C. lanceolatus, 73, 74, 98. C. palustris, 74, 98, 4, 8. C. arvensis, 74.

Carlina vulgaris, 2.

Centaurea Cyanus, 87. C. Scabiosa, 8 *confirmed by Hanbury.*

Bidens cernua, 88, 89. B. tripartita, 88, 89.

Eupatorium cannabinum, 74.

Artemisia Absinthium, 6. A. vulgaris, 74, 97.

Gnaphalium sylvaticum, 74. G. supinum, 4. G. uliginosum, 74.

Filago minima, 74 *Bailey.* F. germanica, 72 *Coles.*

Petasites vulgaris, 74, 87, 4.

Tussilago Farfara, 74.

Aster Tripolium, 74.

Solidago Virgaurea, 93, 98.

Senecio vulgaris, 74, 97. S. sylvaticus, 74. S. viscosus, 88, 89, 94. S. Jacobæa, 74. S. aquaticus, 74, 97.

Inula Helenium, 97 "*apparently native.*"

Bellis perennis, 74.

Chrysanthemum leucanthemum, 74.

Matricaria inodora, 74.

Anthemis arvensis, 6 *Druce, K.C.* 1881.

Achillea Millefolium, 74.

Campanula rotundifolia, 74.

Jasione montana, 74.

Lobelia Dortmanna, 74, 89.

Erica Tetralix, 74. E. cinerea, 74.

Calluna vulgaris, 74.

Menziesia cærulea, 88 *still there in* 1879, *Miss A. Crawford!*

Azalea procumbens, 9 *at* 2,300 *ft.*

Andromeda polifolia, 74.

Arbutus alpina, 88, 90, 92 *of very doubtful occurrence in these vice-counties.*

Vaccinium Myrtillus, 74. V. uliginosum, 89. V. Vitis-idaea, 73 *Fraser,* 11 *Johnston!* V. Oxycoccos, 74, 89.

Pyrola media, 89. P. minor, 74, 89. P. secunda, 73 *Coles.* P. uniflora, 97!

Pyrola rotundifolia L. v. arenaria Koch (*P. serotina* Miq) "Scott" in Nyman's Conspectus, p. 492. (Nyman separates this from the Lancashire plant, which he calls *P. maritima* Kenyon). Where in Scotland does this occur? Is it on the sands of Barry? I shall be much obliged to any Scottish Botanist for *P. rotundifolia* from sands by the sea. Nyman gives for *serotina* "Ins. Nordern," an island off the German coast, whence I have beautiful specimens from Drs. Focke and Buchanan.

To be continued.

OBITUARY.

THE present year, 1886, has a melancholy interest to Naturalists in Scotland because of the death within three months of three men who had distinguished themselves by the assiduity and success with which they pursued the study of the natural products of Scotland. All of them were keen observers, and all have by their observations advanced in no small degree those branches of science to which they most devoted themselves. Probably few biographies are read with greater interest than that of THOMAS EDWARD, A.L.S., of Banff. Scarcely less interesting is that of CHARLES WILLIAM PEACH, A.L.S., as told in Smiles' "Robert Dick, Baker of Thurso." Both published occasional papers; but the real value of their work can best be judged by references to such books as Murchison's "Siluria," Bate and Westwood's "British Sessile-eyed Crustacea," and others, in which the authors acknowledge their debt for information supplied by one or both of these naturalists. Not less meritorious as an observer, but with a better basis of education to build on, and giving great promise of eminence in the critical investigation of the Scotch flora, was Abraham Sturrock, whose premature death gives cause to lament the loss of one from whose labours valuable results were to be looked for.

CHARLES WILLIAM PEACH was born at Wansford in Northamptonshire in 1800. His father was then a saddler, but subsequently became an inn-keeper. As a child Peach was taught in a dame's school, and afterwards in the village school, taught, or rather not taught, by a sawyer who had had to give up his trade of sawyer and had taken to teaching. When twelve, Peach was sent to school in Lincolnshire; there he remained till he reached the age of fifteen, when he left school finally, and returned to help with the work of the inn. In 1824, he got a post as private in the coast-guard at Weybourn in Norfolk. He had not previously seen the sea. A very fine example of a zoophyte (*Antennularia*

antennina), on the chimney-piece in the parlour of the inn at Weybourn in which he lived, excited his interest, and turned his tastes towards Natural History, and he began to collect the marine products, and the peebles, around Weybourn, attracted by their beauty. He was soon transferred to Sherringham; where he became acquainted with the Rev. J. Layton. This gentleman lent him books, and assisted him in beginning those studies in which he afterwards distinguished himself. Among the books was a work on British Zoophytes, the descriptions and engravings in which Mr. Peach copied for his own use. He also assisted Mr. Layton to explore the cliffs and forest-bed of the Norfolk coast, and to collect the series of elephants' teeth and bones from that locality now in the British Museum.

He had various removes from place to place; and when about 30 years of age, while at Cley, he married. He had by this time risen to have charge of the station. Soon he was sent to Lyme Regis in Dorsetshire; and thereafter successively to stations in Devon and in Cornwall. He constantly pursued his investigations of the marine fauna and flora; and added much to earlier records. Dr. Johnston, in the second edition of his "History of British Zoophytes," bears frequent testimony to the assistance he received from Peach; and works by various other writers upon the marine fauna bear evidence to his assiduity and success in this field, not a few species bearing his name. Charles Darwin, in his work on British Cirrhipedia, quotes his observations on points in the life-history of the Acorn-shells (*Balani*) of the Cornish coast. While stationed in Cornwall, he examined the rocks along the coast at east and west Looe, Polperro, Fowey, and elsewhere. It had previously been supposed that they were non-fossiliferous; but he found numerous fossils in them belonging to the Old Red Sandstone period; and correctly determined these to be fish remains.

In 1841, he attended a meeting of the British Association at Plymouth; and read a paper "On the Organic Fossils of Cornwall." In later years he frequently attended the meetings, and took part in the proceedings. He soon gained recognition by the value and accuracy of his scientific labour. He was promoted to the position of Landing Waiter at Fowey, with a salary of £100 a year. While there, his scientific merits were recognised by his election as an honorary member of the various scientific societies in Cornwall, and he added extensive series of Devonian fossils to the

collections of the Royal Geological Society of Cornwall. By superintending and adding to the Natural History collections of the Polytechnic Institution in Falmouth, he earned enough to purchase a microscope in 1844, opening up to him new possibilities of work.

In 1849 began his connection with Scotland. In that year he was appointed Comptroller of Customs in Peterhead, with a salary of £120; and in 1853 he was transferred to Wick, where he remained on duty until changes in the Customs Department caused him to retire in 1867. He removed from Wick to Edinburgh in 1865, and made his home there for the remainder of his long and active life.

Peterhead is favourably situated for investigations in marine zoology; and to these Peach directed his chief attention during his stay in that town; the neighbourhood being less attractive geologically. He discovered several fishes not previously found off the north-east of Scotland, and watched the habits of such animals as could be observed in the rock-pools with which the coast abounds.

From Wick he had to travel round a great extent of the northern coast of Scotland in search of wrecks; and he never lost an opportunity, while on these journeys, of investigating the rocks for fossils. He was intimate with Robert Dick, the Thurso baker, botanist, and geologist; and kept up a close correspondence with him, much of their work being done in common. Peach's attention was now again specially directed to geology; though zoology was not laid wholly aside. In 1854 he made a most important discovery of shells and corals in the limestone rocks of Durness in Sutherland. Previous to this discovery, it had been supposed that the rocks of the Highlands and of the north-west of Scotland were entirely devoid of fossils; for though obscure remains had been found by Macculloch in the quartz rocks of Sutherlandshire, their nature had been far too obscure for determination even as of organic origin. The Durness fossils were of such a nature as to show that the formation containing them must belong to the Lower Silurian. This discovery has given rise indirectly to the very interesting controversy carried on for the past two or three years in regard to the Scotch Highlands, which has been noticed on several occasions in this Magazine, from 1883 onwards. In 1858 he accompanied Sir Roderick Murchison to the Orkney and

Shetland Islands; and on the return journey went with him to the Durness limestone. Sir Roderick in a paper, read in the same year at the meeting of the British Association in Leeds, drew attention to the importance of Peach's discovery as giving a clue to the age of the strata; though the true succession of the formations was misinterpreted by him and by most geologists, owing to causes that have been finally rendered clear in the controversy above referred to.

On Mr. Peach's retirement in 1861, the change rendered him very seriously ill; but after a time he recovered, and applied himself with vigour to his favourite pursuits. He shared in Gwyn Jeffreys' dredging voyages to the Shetland Islands, and collected the Polyzoa. After his removal to Edinburgh, he made valuable discoveries among the plant-remains of the strata of the Lothians and Fife. For a time he was President of the Royal Physical Society of Edinburgh; and in 1871-74 he was presented with the Neill prize, in the gift of the Royal Society of Edinburgh, in recognition of his discoveries, and of the addition by his labours of about 20 species of *Echini*, *Medusæ*, and *Sponges* to the British fauna. In 1868 he was elected an Associate of the Linnean Society. His published scientific papers have been numerous and valuable. He died in Edinburgh on 28th Feb. 1886, in his 86th year, leaving a son, Mr. B. N. Peach, well known for his work in the Geological Survey of Scotland, and for his papers on Geology and Paleontology.

Thomas Edward is a name widely and honourably known, thanks to the biography by Dr. Smiles; which is read, not only in English-speaking countries, but also in translations into more than one European language. The history of his life teaches, like that of C. W. Peach, how true it is that the progress of science can be advanced, and the most unfavourable conditions overcome, and even turned to account, by ability and resolution. In many respects these two men resembled one another. In the strength of their love for all the productions of Nature, and in their excellence as observers, as well as in the width of their investigations, they were much alike. Though Peach's discoveries were largely made in the strata of the earlier geological formations, and comparatively little among land animals and plants, while Edward's related in great part to the latter groups, yet they both made im-

portant additions to the British marine fauna; and these additions have been frequently acknowledged by specialists, to whom assistance of the utmost value was rendered by both of these naturalists.

Of both it may be said, with truth, that they were born naturalists, with whom the love of Nature was a ruling and uncontrollable passion. In Thomas Edward it showed itself at an extremely early age, if his biography is to be fully relied on; and even if some of the earlier stories in it have to be discounted a good deal, to make allowance for unconscious exaggerations, yet the ruling passion was evident long before the age when any very strong taste can usually be recognised in boys. Of him it may truly be said that he loved Nature not wisely, but too well; since his irresistible inclination to make pets of creatures (such as newts, caterpillars, and the like), dreaded and abhorred by the general community, frequently brought him into disgrace in his early years; and interfered, directly and indirectly, with his education. Nor were his troubles at an end after he had grown up; for his pursuit of knowledge under difficulties occupied far more of his time than a tradesman could well spare with due attention to health; and also led him into financial difficulties, that proved nearly ruinous to him.

He was born on Christmas Day, 1814, in Gosport; where his father was serving with the Fifeshire militia, during the troubled times that preceded Waterloo. His father was a native of Fife; his mother belonged to Aberdeen. His father, after his return from military service, settled in Kettle, in Fife; but in a short time he removed to Aberdeen, where he continued to work as a linen-weaver. Aberdeen then, was a much smaller town than it is now; and the railway stations and reclaimed ground now cover what was then open ground or tidal mudflats. These formed Tom Edward's favourite hunting-grounds. Here, or in the Denburn, a stream now covered in, he used to find insects, horse-leeches, and other creatures even more dreaded by his neighbours. These creatures he was in the habit of bringing home; but they used to escape, and roused such wrath in those whose houses they invaded, that he was forbidden to bring them home; and those that he brought were destroyed, and thrown out of doors. Often he visited the woods and dens, *e.g.*, Rubislaw Den, in his search for nests or for rarities; and whenever he could,

he beguiled school-fellows to accompany him on these expeditions ; but usually, he found it hardly possibly to induce other boys to go with him, after they had experienced the punishments to which they were treated on their return home. The efforts to restrain his wandering habits, and to make him attend school, and the failure of every attempt of the kind, are amusingly told in Smiles' book. In fact, he came to be regarded as incorrigible ; and his parents must have been sorely tried with him. Even by the age of six, it is said, he was dismissed from three schools. The pets he brought with him were the cause of disgrace in two schools ; and the suspicion that he had brought a "Maggie monyfeet," or centipede, that bit his teacher one day when Edward happened to be at school, led to his being severely thrashed, and then to his expulsion on his persisting in the assertion of his innocence on this occasion. This seems to have terminated his education at school; and what he learned afterwards, he had to pick up as best he could. This subsequently stood much in the way of his studies, when it would have been of inestimable value to him to have been able to make use readily of such scientific works as he could obtain access to ; but the means of proper elementary training were never again within his reach.

While a mere child, he was employed in a tobacco-spinner's at wages beginning at 1s. 2d. a week ; in the two years he was there, his wages were raised to 1s. 6d. He then got employment at Grandholm mills on the Don, near Aberdeen, at a considerable rise of wages, but with long hours of work. Despite the long hours, he continued to spend a good deal of time in the woods and waste-ground for several miles around the works. In the mills he remained for about two years ; and he used to look back to this as one of the happiest periods of his life.

When eleven years old, he was bound apprentice for six years to a shoemaker, Charles Beggs, in the Gallowgate, Aberdeen, a man who could do his work well, but who was very frequently drunk, and was often cruel. He had a special aversion to Edward's tastes ; and used to destroy such specimens as he brought into the shop in his pockets. He twice killed the boy's pets ; and on the second occasion Edward went home, and refused to return to the shop, despite the threat of a prosecution for his broken indenture.

He next tried to get away as a cabin-boy, but could not do so

without his father's consent; and that he could not obtain. At last, he returned to shoemaking, under a new master of a kindlier disposition than the last one. Having a good deal of spare time, he continued his rambles; and he also made a garden of a bit of waste-ground at the back of the house in which he lived. He also read all the books that he could obtain; and he began to stuff animals; the first he operated on was a mole.

Work became difficult to get; and Edward tried one shop after another. When he was about seventeen years of age, he attempted, unsuccessfully, to go to America as a stowaway. In 1831, he enlisted in the Aberdeenshire militia; and went through his training with only one misadventure. A scarce butterfly having passed while he was on parade on the links, he left the ranks in chase of it; but soon found himself under arrest. The offence was excused with only an admonition. When about twenty years old, he settled in Banff, in which town he spent almost all the rest of his life. His tastes brought difficulties upon him there also, as his landlady would not allow him to keep caterpillars or other vermin in his lodgings, and his shopmates were as little partial to them in the shop. When twenty-three years old he married, though his wages were only about 9s. 6d. a week. The step proved fortunate for him. When he had a pleasant home, he began to collect specimens, which he had before been unable to preserve. A gun was bought for 4s. 6d.; it was so rickety that he had to tie the barrel to the stock with twine.

His rambles had to be made at night, after his day's work was over; and he snatched a few hours' sleep wherever he happened to be, when the night was too dark for him to be able to continue his observations. Sometimes he took shelter in unused houses, at other times in the old castle of the Boyne, or in other ruins, or in holes in banks (occasionally the lairs of foxes or of badgers), or under tombstones, or he slept unsheltered on the open shingle or sandy beach. In these night-quarters, he was often visited by strange bed-fellows; and in his rambles he had frequent opportunities of observing habits of creatures seldom to be seen in the light of day.

He was, however, much hampered by the difficulty of getting information as to the names of the creatures he was observing, as he had no friend able to assist him with information or with books. He had three favourite rounds from Banff, one eastward,

and another west along the coast, and the third inland. Along his routes, he was accustomed to place numerous traps for insects, in the form of dead moles, fish, or other animals: and these yielded him a plentiful return. His collections suffered grievously at times. Nearly 1,000 insects were destroyed by mice or rats on one occasion; and about 2,000 dried specimens of plants, the result of eight years' work, were ruined by cats, which had got into the box. The preparation of his numerous specimens was carried on at odd times, and in the intervals between jobs; and in these intervals, also, he made cases for holding them.

He exhibited his collections in Banff on Brandon Fair day, 1845. They included animals of all kinds, terrestrial and marine, as well as plants; all collected by himself in his rambles. The exhibition left him a small profit. He exhibited the collections again next year, and obtained a larger return; and he resolved to try his success in the same venture in Aberdeen. With this view, he rented a shop in Union Street, and removed his collections, which now filled six carts, to Aberdeen in 1846. The venture failed, owing to the want of appreciation of such objects in Aberdeen. Ruin seemed imminent; and in despair he thought of drowning himself, and went towards the mouth of the Don, along the beach. But on the sands, he observed, almost unconsciously, a bird unknown to him among some sanderlings. Old habits reasserted themselves, and he followed the birds; and while doing this the despair passed off, never to return. He sold his collections for £20 10s., and returned to Banff. There he resumed shoemaking. In the following year he began again to collect the products of the district. Once more he followed his well-known rounds, and spent such time as he could spare from his trade among the beasts and plants; and gradually he accumulated a new collection. In these expeditions he met with many strange and disagreeable experiences; and occasionally risked his life; but space forbids entering on these here. By a fall from a cliff at Tarlair, he sustained injuries that rendered him unfit for work for two or three weeks; and he had to sell a part of his new collection to obtain a livelihood for himself and his family during this time. He was encouraged by the Rev. James Smith of Monquhitter to publish accounts of his experiences; and was assisted by him with books and information. He sent frequent short articles to the local papers; and these brought him speci-

mens of rare animals or plants from persons desirous to have them named. Among them were various rare birds. In 1850, Mr. Smith sent to the *Zoologist* a notice of sanderlings shot by Edward on Boyndie sands, and other notes re-written from material supplied by him. Edward himself afterwards contributed articles to the *Zoologist*, the *Naturalist*, and other scientific journals. Despite the disadvantages of want of early education, his style of writing was vivid and interesting; and the fact, that what he wrote was founded on personal investigations, gave it reality and value. One of his great defects, due to imperfect education, was the liability to identify his captures wrongly; hence the names given by him, if not authenticated by his scientific correspondents, are not to be wholly relied on when they relate to rare species.

In 1858, he was again unable to work, this time through an attack of rheumatic fever with ulcerated throat, and he had once more to sell part of his collections. He then gave up the idea of forming another collection; and resolved to devote his attention to the marine fauna of the Banffshire coast. By setting traps in the form of old pots, kettles, and such like, filled with rags, straw, or other rubbish, and sunk in rock-pools, or in deeper water, he caught many creatures. Watching the incoming waves, searching shore *debris*, opening the stomachs of fish, and examining the lines of fishermen, all added to his knowledge; and he accumulated large numbers of crustaceans, fishes, zoophytes, and other marine animals, many of which were new to science. He corresponded largely with Mr. Jonathan Couch upon fishes, with Mr. Spence Bate and Mr. Norman upon crustacea, and with other naturalists on other groups; and many are the references in works on marine zoology to specimens and information derived from him. Several species bear his name, in recognition of his labours.

In 1866, he was admitted Associate of the Linnean Society; and several smaller societies followed suit. In 1868, his health, which had been long and severely tried by the exposure incurred in his nocturnal rambles, failed altogether for a time; and he found himself forced to give up his favourite pursuits. But he could not remain idle; so he turned his attention to antiquities. He discovered a large "kitchen midden" at Boyndie, near Banff, from which he unearthed a number of curious and interesting relics.

In 1876, Dr. Smiles published his biography; and soon circumstances changed with Edward. He received a pension of £50 for life; and considerable sums were sent to him by readers of the book. In 1877, he was presented with £333 in Aberdeen. For thirty years he was connected with the Banff Museum, and did much to increase the collections in it. His salary in it was little more than nominal; but on resigning his curatorship, a piece of plate was presented to him in recognition of his services.

To the last, he retained his keen powers of observation. Latterly, he devoted his attention chiefly to plants, and found a number of local and rare species near Banff and Aberdeen.

His habits were very temperate; and he was a good husband and father. He died of bronchitis, on 27th April, 1886, leaving a family of one son and ten daughters, eight of whom have been or are married.

Abraham Sturrock was an excellent example of those students who struggle successfully with early difficulties, and raise themselves to honourable positions—a class, fortunately, in which Scotland has never been wanting. He was born in September, 1843, at Padanarum, near Forfar. Though one of a family of fourteen, and the son of parents in poor circumstances, he received a good elementary education at Craichie School. He then spent five years as a pupil-teacher in the East Borough School, Forfar. Thence he went to the Free Church Training College in Edinburgh; and gained honourable distinction there. To obtain the sum required to pay his expenses during his training as a pupil-teacher, and afterwards, he was accustomed to hire himself out as a scythesman during harvest. Five years were spent as assistant in schools, and in 1866-69 he attended the Arts Curriculum in the University of Aberdeen. He then got the charge of a school at Ladybank in Fife, and about 1872 he was appointed to the Parish School of Rattray, where he remained till his death. He had never showed any special inclination for scientific pursuits before he went to Rattray. Here, by the advice of the Rev. Mr. Herdman, who strongly urged him to do so, he began to study the botany of the parish. In August, 1874, along with Mr. Robb, he discovered in the Loch of Cluny, *Naias flexilis*, a plant till then known in the British Isles only from an Irish lake. This discovery probably decided him to devote his time to the fresh

water flora of Perthshire and Forfarshire ; and he obtained results of the utmost value, several additions being made by him to the Scottish fresh-water flowering plants. Two of his discoveries were named in his honour—*Potamogeton Sturrockii*, and *Chara fragilis var. Sturrockii*. He also collected and investigated the very difficult genus *Rubus*, and other groups with critical species.

About ten years ago he endeavoured to save two of his pupils from being drowned ; and in consequence he suffered severely from a rheumatic attack. He seems never to have fully recovered from this. After an illness of three weeks, he died on 13th March, 1886, leaving a widow and seven children.

He was a most useful member of the Perthshire Society of Natural Science for several years ; and the Society at its meeting on 1st April recorded its sense of the great loss it has sustained in his death. The loss to the progress of botanical investigation in Scotland is not a small one ; for there was reason to expect valuable results had Mr. Sturrock's life been spared.

Mrs. Sturrock has generously presented his herbarium to the P. S. N. S. Museum, in which its contents give it a special value.

George Ogilvie Forbes, M.D., for seventeen years Professor of Physiology in the University of Aberdeen, died on the 25th June at his residence of Boyndie, near Banff. He resigned his professorship in 1877 because of ill-health, which became confirmed, and rendered him unable to continue the scientific pursuits to which he devoted his earlier years. We shall give an account of his life and work in our next issue.

ZOOLOGY.

LIST OF SCOTTISH CYNIPIDÆ THAT FORM GALLS ON OAKS.

(*Extracted from "The Fauna of Scotland, Hymenoptera," Part II.*)

By PETER CAMERON.

[As the subject is one to which special attention has been paid in the *Scottish Naturalist* in past years, we have extracted Mr. Cameron's list of the Cynipidæ that form oak galls as being the latest and most complete summary of the subject by the entomologist best acquainted with the British gall-flies and their galls. The nomenclature is in accordance with Dr. Adler's conclusions in regard to dimorphism among gall-flies and their galls, and the names adopted are those sanctioned by Dr. Mayr of Vienna, so well-known for his labours in this field of study. The same name is given to both forms of the dimorphic species, being determined by priority, to whichever of the two forms it was first applied. It is, however, convenient to denote the galls by differential names; hence, the name formerly regarded as specific, but now sunk, is given in brackets in each case for the gall which it was used to indicate. Mr. Cameron does not indicate in his list whether he has obtained examples from Scotland of both forms of each of the dimorphic species, or whether any are inserted because one of the forms has been found, and the other may be assumed to exist in the same localities.—Ed. *Scottish Naturalist.*]

1. **Neuroterus baccarum** L., "currant gall" on leaves and catkins.
   (*N. lenticularis*, Oliv., "spangle gall" on leaves.) Abundant everywhere.
2. **N. fumipennis**, Htg., on leaves.
   (*Spathegaster tricolor*, Htg., on leaves.) Local, but widespread.

3. **N. numismatis,** Oliv., "silk-button gall," on leaves.
   (*Spath. vesicatrix*, Schl., in leaves.) Abundant.
4. **N. læviusculus,** Schenck, on leaves.
   (*S. albipes*, Schenck, on leaves.) Common in Clyde district.
5. **N. aprilinus,** Gir., in buds. Rare in May, Cadder.
6. **Dryophanta folii** L., on leaves. Local, chiefly in South Scotland.
7. **D. divisa,** Htg., on leaves. Common.
8. **D. longiventris,** Htg., on leaves, never showing red rings. Common, but local.
9. **Biorhiza aptera,** Fab., on roots.
   (*Dryoteras terminalis*, Fab., "oak apples," on branches.) Common, but local.
10. **Trigonaspis megaptera,** Panz., on trunks.
    (*Biorhiza renum*, Gir., on leaves.) Common.
11. **Andricus gemmæ** L., "Artichoke gall," on branches.
    (*A. pilosus*, Adler, on catkins.) Common.
12. **A. inflator,** Htg., in terminal buds.
    (*A. globuli*, Htg., in buds.) Local, but wide-spread.
13. **A. radicis,** Fab., on roots and stems.
    (*A. noduli*, Htg., in twigs.) Common in Clyde district.
14. **A. testaceipes,** Htg., swelling of mid-rib.
    (*A. Sieboldii*, Htg., on young branches, under earth or vegetation.) Local, not uncommon.
15. **A. corticis,** Htg., in bark of roots, or of wounds in trunks.
    (*A. gemmatus*, Adler, in buds.) Local, but wide-spread.
16. **A. collaris,** Htg., in buds.
    (*A. curvator*, Htg., in mid-ribs or twigs.) Abundant.
17. **A. ramuli** L., "cotton gall," on catkins.
    (*A. autumnalis*, Htg., in buds.) Local all over Scotland.
18. **A. cirratus,** Adler, on catkins.
    (*A. callidoma*, Mayr, in buds, stalked.) Apparently rare.
19. **A. Malpighii,** Adler, in buds.
    (*A. nudus*, Adler, on catkins.) Rare, in Clyde district.
20. **A. amenti,** Gir., on catkins. Rare, Ballater.
21. **A. ostreus,** Gir., on leaves. Common (perhaps is agamic form of *N. aprilinus*.)
22. **A. seminationis,** Adler, on leaf margins. Rare, at Cadder.
23. **A. albopunctata,** Schl., in buds. Common.

24. A. **solitaria,** Fonsc, spindle-shaped bud-gall. Rare, in Clyde district.
25. A. **marginalis,** Adler, on edges of leaves. Common.
26. A. **quadrilineatus,** Htg., on catkins. Common.

SCOTTISH OAK GALLS.

By Professor JAMES W. H. TRAIL.

THE following is an attempt to supply a useful key to determine to which species of the gall-makers any of the galls likely to be found in Scotland belongs. It is confined to those of the Cynipidæ, with the exception of two galls of gall-midges at the head of the key. In it are included the galls of all the insects in Mr. Cameron's list, in both forms; though I am not aware that both forms have been detected in Scotland in all the species in which they are believed to occur on the Continent. In constructing the key, I have made considerable use of Mr. Cameron's synopsis in the "Fauna of Scotland, Hymenoptera;" but I have endeavoured to work out a more simple and complete arrangement than it follows. I trust that this effort may assist beginners in the fascinating study of the oak galls. As regards those names with one word in brackets, e.g. *A.* (*noduli*) *radicis*, the name in brackets is that by which the form of gall under notice was originally named; and the last name is that by which both broods of the insect are now known.

1. Open pseudogalls in leaves and leafy buds (of Gall midges), 2.
   True galls, with closed cavities (of Cynipidæ), 3.
2. Leaves of bud stunted and twisted, with larvæ between them. *Cécidomyia Quercus* Binnie.
   Lobes of full-grown leaf folded backwards, and slightly fleshy, and pale. *C.* (*Diplosis*) *dryobia* F. Lw.
3. On roots, 4.
   On stems, 5.
   In twigs or young branches, 6.
   In buds, 7.
   On leaves, 22.
   On catkins, 37.

In acorns, distorted and stunted. *Andricus sp.?*

4. On main root near ground, brown, roundish hard, one or two inches across, many-chambered. *Andricus radicis.*

Sunk in groups in bark of main root, conical above, the top falling off when old; autumn and winter. *A. corticis.*

In clusters on side roots, soft and red when fresh, brown and hard when dry, from one to ten chambers in each; autumn and winter. *Biorhiza aptera.*

5. In bark, or in young wood of stems, where wounded, Gall like form on roots; autumn. *A. corticis.*

Swellings at wounds in stems, like the gall of this insect on roots; autumn. *A. radicis.*

6. Sunk in substance of twigs, causing gouty swellings; July. *A.* (*noduli*) *radicis*, and *A. testaceipes*, rarely.

On young branches covered with earth or vegetation, galls crowded, but distinct, conical, hard, woody, furrowed and brown when old, but fleshy and reddish when young. *A.* [(*Sieboldii*) *testaceipes.*

7. On very small buds on trunks, almost seeming to be stem-galls, 8.

In lateral or terminal buds on twigs, 9.

8. Globular, pea-sized, fleshy, red or yellowish, among moss near base of stem; May and June. *Trigonaspis megaptera.*

Oblong, about 2 mm. long, greenish, but covered with rather long white hairs; May and Jun. *Dryophanta* (*similis*) [*longiventris.*

Oblong, rounded at tip, 2 or 3 mm. long, violet, with short velvety white hairs; in adventitious buds near base of trunk; June. *D.* (*Taschenbergii*) *folii.*

9. Many-chambered, large, often over 1 in. across, yellowish or reddish, spongy and soft when fresh, terminal; May and June. *Biorhiza* (*terminalis*) *aptera.*

One-chambered (rarely with two or three inner galls), 10.

10. Small brown inner gall, lies in the large chamber of, and separate from outer, except at one point, 11.

Yellow globular inner gall nearly fills cavity of brown, rather hairy, outer gall, which is size of a pea, on buds; autumn. *Andricus Clementinæ.*

No separable inner gall, 12.

11. Terminal swellings of twigs, central cavity covered above with

thin membrane ; inner gall egg-shaped, at bottom of cavity ; June. *Andricus inflator.*

Terminal, closed all round, rather twisted ; inner gall (or occasionally 2 or 3 galls), somewhat kidney-shaped ; May and June. *A. curvator.*

12. Galls on distinct stalks, spindle-shaped, 13.

Galls sessile, 14.

13. Peduncle about as long as the gall, thin, 7 to 12 mm. long, green ; June to August. *A. callidoma.*

Peduncle very short, otherwise as in last species ; October. *A. Malpighii.*

14. Gall enclosed in enlarged bracts or leaf scales, like a small artichoke, the mass being about 25 mm. long ; autumn. *A. gemmæ.*

Leaf scales not enlarged, surrounding ripe gall, at least to half its height, 15.

Leaf scales small, hardly concealing any part of gall, 20.

15. Oval or spindle-shaped, longer than broad, 16.

About as broad as long, 19.

16. 5 to 8 mm. long, surface covered with yellowish-brown woolly hairs ; July. *Andricus solitaria.*

Bare, not hairy, 17.

17. 5 or 6 mm. long, oval, green, spotted with white ; May and June. *A. albopunctata.*

Not spotted, or with only minute white dots, 18.

18. 6 or 8 mm. long, green, with red longitudinal ridges ; October. *A. Malpighii.*

2 or 3 mm. long, oval, pale yellow or red-brown, ending in a nipple-like tip, which is often darker ; autumn. *A. [collaris.*

2 or 3 mm. long, ovate, brown, tip not nipple-like or darker ; autumn. *A. autumnalis.*

19. Irregularly pea-shaped, 5 to 8 mm. long, yellowish or pale green, thin walled, with one or few chambers ; April and May. *Neuroterus aprilinus.*

Globular, 3 or 4 mm. across, ends in a blunt yellow or red cone above, which alone projects from leaf scales, green and smooth, surface reticulated when dry ; autumn. *Andricus [globuli.*

2 or 3 mm. across; other characters as given under 18. *A. collaris.*

20. Globular when mature, brown, firm, about 12 to 25 mm. diameter, not falling off when dry, very thick walled; autumn. *Cynips Kollari.*

As broad as long, globular or slightly pointed, pea-sized, fleshy, red or yellowish, bare; May and June. *Trigonaspis megaptera.*

Longer than broad, ovate or oval, not over 4 mm. long, 21.

21. About 4 mm. long, broader above, yellowish green or reddish, with minute white dots, bare; May. *Dryophanta (verrucosa) divisa.*

About 3 mm. long, ovate, rounded above, violet, covered with short, velvety, whitish hairs; June. *D. (Taschenbergii) folii.*

About 2 mm. long, ovate, pointed above, dull greenish, covered with rather long white hairs; May and June. *(D. similis) longiventris.*

Very small, 1 or 2 mm. long, oval, very thin, green, then brown; June. *Andricus (gemmatus) corticis.*

22. On the lower surface, not showing at all above; autumn, 23.

Showing on both surfaces through the laminæ; May and June. 29.

Swellings of petiole, mid-rib, or larger veins; June, July, or August. 31.

On margins of leaf, 32.

23. Attached to mid-rib or chief veins, often solitary, 24.

Attached to leaf surface between larger veins, gregarious, 27.

24. Situated between two brown scales, which remain on vein after gall has fallen; oval, about 2 mm. long, pale green or yellow, with small red spots, smooth, brittle. *Andricus ostreus.*

Not situated between membraneous scales, 25.

25. Globular, 8 to 12 mm. diameter, yellowish-green or red on one side, soft and fleshy when fresh, thick walled. *Dryophanta folii.*

Depressed spheres, hard and woody, from 4 to 7 mm. diameter, 26.

Kidney-shaped, 1 or 2 mm. long, pale green or yellowish, crowded. *Trigonaspis (renum) megaptera.*

26. 5 to 9 mm. diameter, pale yellow, with red side or red belts,

skin rough, with small prominences. *Dryophanta* [*longiventris.*

4 to 5 mm. diameter, pale yellow, or one side reddish or brown-red, shining, bare. *D. divisa.*

27. Flattened, lenticular, circular, becoming more convex after falling from the leaves, 28.

Circular, about 2 mm. across, depressed in centre, covered with adpressed silky brown hairs. *Neuroterus numismatis.*

28. Nearly hairless on both surfaces, pale green to red, margin turned up, often scattered. *N. læviusculus.*

Side next leaf smooth, other side covered with rusty brown hairs, edges flat. *N.* (*lenticularis*) *baccarum.*

Side next leaf hairy, edges curled up, red. *N. fumipennis.*

29. Pea-sized, irregularly globular, green, with small brown inner gall in large chamber of outer gall. *Andricus curvator.*

Globular, projecting much on lower, slightly on upper surface, 30.

Circular, about 4 mm. across, no inner gall, sunk in leaf, scarcely projecting on either surface, green, no inner gall. *N.* (*vesicatrix*) *numismatis.*

30. About 5 mm. diameter, green, streaked with red or purple, juicy and soft, smooth, bare. *N. baccarum.*

About 4 mm. diameter, soft, covered with long white hairs. *N.* (*tricolor*) *fumipennis.*

31. Inner gall in pea-sized swelling, as under 29 ; June. *Andricus* [*curvator.*

Oval swelling on mid-rib, 2 or 3 mm. long, green, no inner gall ; August. *A.* (*testaceipes*) *Sieboldii.*

Similar galls (*fide* Mayr) often produce *A.* (*noduli*) *radicis.*

32. On margins of leaf, sessile, 33.

Spindle-shaped, 6 to 8 mm. long, on short stalk, green, with red longitudinal lines ; June to October. *A. seminationis.*

33. Smooth, ovoid, 1 or 2 mm. long, greenish yellow ; June and July. *Neuroterus* (*albipes*) *lævusculus.*

Oval, broader above, 4 mm. long, granular, shining, greenish yellow or reddish, with pale dots ; May. *Dryophanta* (*verrucosa*) *divisa.*

Oval, or ovate, 3 or 4 mm. long, irregularly ribbed lengthwise, green or red-brown ; June and July. *Andricus marginalis.*

34. Hairy, 35.

Bare, 37.

35. Concealed by white hairs, forming a mass like cotton wadding, 36.

Hairs not long enough to conceal the galls, which remain distinct, and are about 2 mm. long; June. *A. amenti.* (The galls of *A. pilosus* cannot be distinguished from these by means of Adler's description.)

36. In small groups, cottony tufts of hairs, small; June. *A.* (*cirrhatus*) *callidoma.*

Crowded in masses, 20 to 25 mm. in breadth; June. *A.* [*ramuli.*

37. Globular, pea-sized, succulent, green, with red or purplish streaks; May and June. *Neuroterus baccarum.*

Spindle-shaped, 6 or 8 mm. long, pointed, green, with red ridges; June. *Andricus seminationis.*

Oval, or oblong, obtuse, 3 or 4 mm. long, green, or dull red-brown, keeled along the sides; June. *A. quadrilineatus.*

Oval, pointed, 1 or 1½ mm. long, bare, or with a few small hairs at tip, green, becoming yellow; June. *A.* (*nudus*) [*Malpighii.*

OCCURRENCE OF THE RED-SHOULDERED STARLING IN RANNOCH, PERTHSHIRE.

On the 10th of this month (May, 1886), Donald Cameron, who is employed on the property of Sir Robert Menzies, Bart., in watching a young plantation on Loch Ericht side, observed a strange bird, which he first saw near his bothy door, among the grass and heather; and which he afterwards shot close to the shore of the loch, where a small burn, which passes the bothy, enters the loch about a mile from its north-west end. The shot used was, unfortunately, so large that the bird was considerably damaged for preservation, the tail feathers being much cut, and the bill injured. The head-keeper at Rannoch Lodge writes to me that he believes he had seen the same bird, or one like it, once or twice flying about the same place previously, but could not make out what it was. Sir Robert Menzies, who happened to be up at the loch a day or two afterwards, sent me the bird in the flesh, and it turned out to be a female of the Red-shouldered starling of North-America (*Agelæus phœniceus*) No male bird was seen to accompany it. Knowing the bird in that country, I was at once enabled to identify it. A remarkable character in this species is the great difference in size and colour in the sexes. The female is a very

much smaller bird than the male, and of much more sombre plumage, the whole length being only 7¼ inches, with an expanse of wing of 9 inches; whereas the male is fully 9 in length and 14 in extent, with the plumage glossy black; and across the lesser wing coverts passes a rich band of reddish cream, shading into brilliant scarlet, from which it takes its name. In the female sent me (which may be taken as a type-specimen, as it was an adult bird), the plumage is brown, much streaked underneath; the upper parts dark brown, with the exception of the tail, which has the feathers broadly margined with light brown, and a yellowish streak passing over the eyes. The plumage has thus rather a mottled appearance. On the smaller wing coverts exists merely the slightest rudiment of red in the situation where, in the male, this colour is so brilliant.

Though these birds have much of the true starling in their habits, they differ greatly in the form of the bill, which is conical and sharply pointed, a form seeming to approach that of some of the finches.

It is not easy to account for the appearance of this bird in the locality in which it was found—a wild spot in the middle of the Highlands, without an inhabitated house for miles, if we except a shooting lodge at some distance, the bothy above mentioned, and a shepherd's hut on the hill-side. What could have brought it there? The prevailing winds for some time past had been strong from the eastward, so it is not likely to have been driven recently across the Atlantic during its northern migration. Nor is there any appearance of its being an escape from confinement; nor is that very likely to be the case, the males being generally the ones in demand as cage-birds, from the beauty of their plumage. Could it have been driven out of its course in the autumn during its southern migration, and have remained all winter? Yet it scarcely seems probable that it should have survived our last severe and cold winter, unless it had moved further south. It was, however, in very poor condition, though quite healthy, with the ovary scarcely, if at all, developed. In the eastern States, during winter, the red-shouldered starling does not remain north of Virginia or Maryland, which, it must be recollected, though in a latitude corresponding to Central Portugal, is sometimes visited with severe frosts, as was the case in this present year.

In conclusion, I may state that this interesting specimen will be placed in the Perthshire Society's Museum in Tay Street, Perth, where anyone may have the opportunity of seeing it.

H. M. DRUMMOND HAY.

SEGGIEDEN, 20*th May*, 1866.

TENGMALM'S OWL (*Noctua Tengmalmi*).—A specimen of this rare visitor was killed near Peterhead, on the 3rd February. The extreme length of this, an adult female, was 9 inches; the breadth, from tip to tip of the wings, 21½ inches, and the weight 3¾ ounces.

March 13*th*, 1886. G. SIM, FYVIE.

PHYTOLOGY.

ADDITIONAL RECORDS OF PLANTS FROM SCOTLAND.

By AR. BENNETT, F.L.S.

(*Continued.*)

Ilex Aquifolium, 74.

Ligustrum vulgare, 74, 87 to 89 "*always planted.*"

Fraxinus excelsior, 74, 87, 4 †, 7 † *Miller*, 8.

Vinca minor, 88 †, 89 †.

Gentiana amarella, 88, 89, 94, 7 *Grant, R.C.* 1883; G. campestris, 74.

Erythræa Centaurium, 74, 88, 89, *record in* "*Top. Bot.*" *for* 92 *is founded on error.* E. littoralis, 6 *Druce, R.C.* 1883.

Menyanthes trifoliata, 74.

Convolvulus arvensis, 87, 88, 89; C. sepium, 74.

Solanum Dulcamara, 74.

Verbascum Thapsus, 89, *for* 88 *recorded as doubtful native,* 11 *in Miller's catalogue.* V. nigrum, 89 *casual.*

Veronica arvensis, 74; V. serpyllifolia, 74, 05 *Druce,* 7 *Miller*; V. humifusa, 89 and 5 *Druce, R.C.* 1883; V. saxatilis, 94 *Croall*; V. scutellata, 74, 97, 5; V. Anagallis, 74, 88, 89; V. Beccabunga, 74, 5, 8; V. officinalis, 74, 7 *Miller*; V. montana, 88, 89; V. Chamaedrys, 74, 5; V. agrestis, 74, 4 †, 7 *Grant, R.C.* 1883, 8; V. polita, 74, 88, 89, 92, 100; V. Buxbaumii, 74, 89, 91, 93, 94.

Bartsia Odontites, 74, 5, 7 *Grant, R.C.* 1883.

Euphrasia officinalis, 74, 5 *Bailey, R.C.* 1883.

Rhinanthus crista-galli, 74, 5, 7 *Miller*, 9! R. major, 11.

Melampyrum pratense, 74, 7 *Miller*; M. sylvaticum, 87, 5.

Pedicularis palustris, 74, 5; P. sylvatica, 74, 5.

Scrophularia nodosa, 97; S. Balbisii, 74; S. Ehrharti, 85 *Bailey, R.C.* 1881-82.

Digitalis purpurea, 74, 5, 7 *Miller.*

Linaria vulgaris, 74, 87, 89, 94 †; L. minor, 72 *Coles.*

Orobanche rubra, 73 *M'Andrew*, 2.

A species occurs in 98 (Argyle) which is not *O. rubra*, but my specimen is too bad to allow of certainty, though I think it may be *O. elatior*.

Lathræa squamaria, 88, 89.

Lycopus europæus, 88, 92.

Mentha sylvestris, 88; M. piperata, 73 *Coles*! †, 88, 89; M. aquatica, 73 *Coles!* 74, 87, 7, *R.C.* 1883; M. sativa, 74, *88*, *89*; M. arvensis, 74, 5.

Thymus serpyllum, 74, 4 (form *Chamædrys*).

Origanum vulgare, 74, 89.

Calamintha Acinos, 88, 89.

Teucrium Scorodonia, 74, 5, 7 *Grant*, *R.C.* 1883, 9!

Ajuga reptans, 74, 5.

Lamium album, 88, 91, 92, 94; L. amplexicaule, 74, 89; L. intermedium, 73 and 89 *Druce*, *R.C.* 1883, 91, 3 "*Iona*," *Straker!* 8; L. purpureum, 74, 97, 5; L. incisum, 87, 88, 89, 11.

Galeopsis Ladanum, 89; G. Tetrahit, 73 *Druce*, *R.C.* 1883, 74, 5, 7 *Miller*; G. versicolor, 95, 4, 11.

Betonica officinalis, 88.

Stachys palustris, 74, 98, 5, 7 *Grant*, *R.C.* 1883; S. ambigua, 82, 2, 4, *R.C.* 1883, 7 *Grant*, *R.C.* 1883; S. sylvatica, 74, 5; S. arvensis, 74, 88.

Glechoma hederacea, 89.

Prunella vulgaris, 74, 5.

Scutellaria galericulata, 74, 87, 89, 5.

Myosotis palustris, 74, 87, 88, 91, 93, 2 †, 9; M. repens, 74, 97, 3 *Bailey*, *R.C.* 1883, 4, 5 *Bailey l.c.*, 8; M. cæspitosa, 74, 5; M. alpestris (90, "sown in Caenlochan Glen"); M. arvensis, 73, 74, 5, 7 *Miller and Grant*; M. collina, 88, 89, 2; M. versicolor, 74, 4, 5, 7 and 8 *Miller*.

Lithospermum arvense, 88, 89; L. officinale, 11 (? native, Ar. B.).

Symphytum officinale, 88, 91 †, 92 †, 93 †; S. tuberosum, 88, 89.

Asperugo procumbens, 93 †.

Cynoglossum officinale, 88, 89, 94 †; C. sylvaticum, 89.

Echium vulgare, 88, 89, 11.

Pinguicula vulgaris, 74, 5.

Utricularia vulgaris, 88, 89. U. neglecta should be sought for

in Scotland. I have it from Cheshire, and have seen it from Anglesea in Dillenius' Herbarium. U. intermedia, 73 *Coles*, 88, 89, 2 *Ley*, *R.C.* 1883; U. minor, 88, 89, 8 *Miller!*

Primula vulgaris, 74, 5, 7 *Miller;* P. veris, 74, 87, 88!, 89.

Trientalis Europæa, 9!

Lysimachia Nummularia, 89 †? L. nemorum, 74, 5, 7 *Miller.*

Anagallis arvensis, 89, 2, 11; A. tenella, 88.

Centunculus minimus 73, 87, 89, 97.

Glaux maritima, 74, 89, 5.

Armeria maritima, 74, 89, 5.

Plantago major, 74, 5; P. media, 87, 88, 89, 92, 93, *casual in all of them;* P. lanceolata, 74, 5; P. Coronopus, 74, 89, 97, 4.

Littorella lacustris, 74, 89, 97, 5.

Chenopodium album, 73, 74, 97, 98, 4, 5; C. Bonus-Henricus, 74, 88 and 89, "scarcely indigenous," 5.

Atriplex Babingtonii, 89, 96 *Druce*, *R.C.* 1881-82, 5, 6, 8, 9! A. patula, 73 *Druce*, *R.C.* 1883; A. deltoidea, 73 *Druce l.c.*, 74; A. angustifolia, 73 *Druce*, *l.c.*, 87, 88; A. erecta, 73.

Salsola kali, 74.

Salicornia herbacea, 73, 74.

Polygonum Bistorta, 88 and 89, "*only as an outcast;*" P. amphibium, 74, 5, 8; P. lapathifolium, 74, 89, 5; P. Persicaria, 74, 89, 98, 5, 7 *Grant*, 8 *Miller;* P. Hydropiper, 74, 89, 5; P. minus, 88, 89; P. aviculare, 74, 97, 5; P. Convolvulus, 74, 97, 4.

Rumex Hydrolapathum, 89; R. crispus, 73, 74, 5; R. aquaticus, 73, 74, 5; R. conspersus, 88, 91 *Nicholson!* R. pratensis, 88, 89; R. obtusifolius, 73 *Druce*, *R.C.* 1883, 97, 5; R. nemorosus, 89, 92, 93, 94; R. conglomeratus, 73 *Coles*, 89, 5; R. acetosa, 74, 5; R. acetosella, 74, 5.

Oxyria reniformis, 5 *Druce*, 8.

Hippophae rhamnoides, 73, *R.C.* 1883.

Euphorbia Helioscopia, 74; E. Peplus, 74, 91, 7 *Grant.*

Mercurialis perennis, 74, 97.

Urtica urens, 73, 74, 8 *Miller;* U. dioica, 74, 97, 5, 7 *Miller.*

Humulus Lupulus, 74, 90 †, 91 †, 92 †.

Ulmus montana, 73, 74, 5, 9 *Hanbury;* U. suberosa, 7.

Quercus pedunculata, 73, 74, 97; Q. sessiliflora, 74, 89 *Druce*, 5.

Corylus Avellana, 74, 98, 5.

Alnus glutinosa, 74, 5.

Betula verrucosa, 88, 89, 5, 6; B. glutinosa, 74, 88, 97, 5.

Populus Tremula, 73 *Coles*, 5.

Salix pentandra, 5, 7 *Grant, R.C.* 1883; S. alba, 73, 74, 88, 89, 4† *Linton;* S. triandra, 89; S. undulata, 77 *M'Kay, E.C.*, 1872-74, 88; S. Capræa, 11; S. cinerea, 73, 74, 4, 6 *Druce*, 7 *Miller!* 8 and 9 *Grant!* S. aurita, 73, 74, 5; S. nigricans, 72, 74, 11? S. laurina, 97! 4; S. phylicifolia 72! 4, 9 *fide Leefe*; S. ambigua, 92, 4 *Grieve!* 6 *Druce*; S. repens, 74; S. Lapponum, 94.

Myrica Gale, 74, 98 *Webb.*

CONIFERÆ.

Pinus sylvestris, 74, 2.

Juniperus communis, 5; J. nana, 88, 89.

Taxus baccata, 74, 89.

MONOCOTYLEDONS.

Neottia Nidus-Avis, 95.

Listera ovata, 74, 93, 4, 7 *Grant, R.C.* 1883, 11.

Orchis mascula, 74, 4, 5, 8! 11; O. pyramidalis 73 *fide Coles;* O. maialis, 74, 90 *Newbould*, 8 *Miller!* 9 *Hanbury*! O. incarnata, 74, 91, 92, 93, 5, 6 *Druce*, 8, 9! O. maculata, 74, 5; O. Conopsea, 74, 5 *Bailey, R.C.* 1883, 7 *Grant, R.C.*, 1883.

Habenaria bifolia, 90, 91, 4, 5, 6, 8! *Hanbury;* H. chlorantha, 80 *Brotherston*, 90, 97; H. viridis, 9; 96 *Grieve, Ex. Club*, 1882; H. albida, 7 *Miller*, 8!

Ophrys apifera, 77 *Newbould.*

Malaxis paludosa, 73 *M'Andrew*, 95. 8; delete 7 in "Top. Bot."

Iris Pseudacorus, 73, 74, 89, 5.

Narcissus Pseudo-Narcissus, 88 †, 92 †, 93 †.

Allium oleraceum, 91! A. carinatum, 72, "*planted some years ago*," 73 *Coles*, "*seemingly well established;*" A. vineale, 93; A. ursinum, 74, 97, 5.

Gagea lutea, 92, 95.

Narthecium ossifragum, 74, 5.

Hyacinthus non-scriptus, 74, 97, 5, 8 *Miller.*

Paris quadrifolia, 9!

Tofieldia palustris, 87; 95 *requires confirmation.*

Anacharis Alsinastrum, *well established in* 90, 91, 92.

Alisma Plantago, 74.

Butomus umbellatus, 88, "*probably native.*"

Triglochin maritimum, 74, 97, 5; T. palustre, 74, 5, 7 *Miller.*

Scheuchzeria palustris, 88, "probably extinct."

Under the genus *Potamogeton*, I have enumerated all the counties and vice-counties from which I have seen specimens, putting those not recorded in "Top. Botany" in italics, with the names of the collectors of the specimens seen by me from each of the latter.

Potamogeton pectinatus, 80 *Brotherston*, 83, 84, 95, 9, 11; P. filiformis, 81, *83*, 85, *88 Sturrock*, 90, *96 Groves*, 8, 9; P. pusillus, 72, 73, 74, 76, 77, 80, 81, 82, 83, 85, *87*, *88*, *F. B. White*, 89, 90, 91, 92, *98 Bailey*, 99, *100 Hunt*, 9, 11; P. compressus, 73, *77 in Herb. Trin. Coll., Dublin*, 85, 90, 99; P. obtusifolius, *72 Fingland*, 73, 80, 81, 82, 87, 88, 89, 90, 91, *92 Trail*; P. zosterifolius, 90 (*any information regarding this as a Perthshire plant will be acceptable to Dr. Buchanan White and to myself*); P. crispus, 72, 73, *74 Druce*, 76, 80, 81, 82, 83, 85, *86 Coles*, 88, 89, 90, 92, 9, 11; P. perfoliatus, 73, 76, *79 Brotherston*, 80, 81, *84 Webb*, 85, 87, 88, 89, 90, 92, 95, *96 Stables, in Glasgow Herb.*, 7, 8, 9, 11, 12; P. lucens, 80, 81, 83, 85, 87, 88, 89, 90, *98*; P. decipiens, 80, 81, *88 Sturrock*, 90; P. prælongus, 73, 80, 85, 88 *Linton, at 2500 feet*, 89, 90, 96, 4 *Grieve* (Isle of Rum), 9; P. heterophyllus, 72, 73, 74, 79, 81, 85, 87, 88, 89, 90, 92, 93, *94 Miller*, 95, 96, 98, 100, 8, 9, 11; P. nitens, 88, 89, 90, *92*, *8 Hanbury*, 11; P. Zizii, 73, 79, 80, 89, 90 (87, "*no record,*" *F. B. White*); P. rufescens, 72, 73, *74 Druce*, 77, 81, *Renton!* 83, 85, *87 F. B. White*, 88, 89, 90, 92, 93, *100 Hunt, in Dr. Moore's Herb.*, 9; P. natans (true), *74 Druce*, *76*, 77, 80, 81, 82, 83, *84 A. C. Christie*, 85, *87*, 88, 89, 90, *91*, 92, *93*, *98 Bailey*, 100, *6 Bailey*, *7 Grant*, 8, 9, 11, 12; P. polygonifolius, *73*, *74 Bailey*, 81, 83, 85, 87, 88, 89, 90, 91, 92, 93, 96, 97 *Linton*, 98, 100, 4, *5 Bailey*, *6 Druce*, 8, 9, 11, 12; P. plantagineus, *72 F. B. White*, *80 Brotherston*, 82, 100.

Zanichellia palustris, 88; Z. pedicellata, 90 *Druce, R.C., 1883.*

Zostera marina, 74, 5.

Naias flexilis, 88, should be sought elsewhere also in deep lochs, and will almost certainly be found in them. Last autumn it was discovered near Killarney by the Rev. E. F. Linton.

Lemna minor, 74, 88, 89, 5.

Arum maculatum, 88 †, 89 †.

Sparganium minimum, 73 *M'Andrew*, 87, 89 *F. B. White*, 91 *Croall!* 9; S. affine, 74, 98 *Grieve*, 2 *Ley*, *R.C.* *1883*, 4; S. simplex, 88, 89, 5; S. ramosum (agg.), 74, 88, 89, 5; S. ramosum (*excluding S. neglectum Beeby*), 85 *Trail*, 86 *Kidston*, 88 *F. B. White*, 92 *Trail*. *Mr. Beeby has as yet seen no specimen of* S. neglectum from Scotland. The whole of our Spargania need to be collected with well-ripened fruit; it is probable that we possess the true S. fluitans Fr., as well as, perhaps, one or two other Scandinavian species, but they can be discriminated only when the fruit is ripe.

Typha latifolia, 88, 89, 92 †, 93 †, 9.

Juncus conglomeratus, 74, 97, 98, 5, *all Newbould*, 8; J. effusus, 74, 5; J. glaucus, 74, *R.C.* 1883. 8; J. balticus, 9! *Grant* and *Hanbury;* J. acutiflorus, 74, 4 *Grieve!* 5, 7 *Grant*, *R.C.* 1883; J. lamprocarpus, 74, 97, 4, 5; J. supinus, 73 *Coles*, 74, 5; J. Gerardi, 89, 97, 2 *Ley*, 6 *Druce*, 8 *Miller*! The specimens that I have seen from 8 and 9 are true *J. Gerardi;* I have not seen true *J. compressus* from Scotland. J. bufonius, 74, 4, 5; J. squarrosus, 74, 5; J. castaneus, 96 *Dr. Barry*! J. trifidus, 89; J. triglumis, 94 *Croall*!

Luzula sylvatica, 74, 5; L. pilosa, 74, 5; L. campestris, 74, 5, 7! L. congesta, 74, 89, 4, 5, 6, 8 *Miller;* L. arcuata, 89; L. spicata, 5.

Cladium Mariscus, 73 *Coles*.

Schoenus nigricans, 74 and 89 *Druce*, *R.C.* 1883; S. ferrugineus Linn., 89, found in 1884 by Mr. Brebner beside Loch Tummel, and determined by Dr. F. Buchanan White in 1885, *Scot. Nat.*, 1885, p. 130.

Rhynchospora alba, 86 *Croall!* 90 to 95 require confirmation; strange if it is really absent from these districts.

Blysmus rufus, 97, 6 *Druce*.

Scirpus lacustris, 74, 87, 97, 5; S. maritimus, 73 and 74 *Druce*, 89, 5; S. setaceus, 74, 97, 4, 7 *Grant*, *R.C.* 1883; S. acicularis, 74, 5, 12? *A. C. Christie*, *in Trans. Ed. Bot. Soc.*; S. palustris, 74, 97, 8; S. uniglumis, 97, 4, 9; S. multicaulis, 74, 97, 5; S. pauciflorus, 97, 4, 5, 11 *Johnston;* S. cæspitosus, 74, 5; S. fluitans, 87, 89, 94.

Eriophorum alpinum. In the herbarium of Rev. Hugh Davies, the author of "Welsh Botanology," there is a specimen of this plant

labelled "Glamis Bog near Forfar." Is this the same locality as Restennet moss?

E. vaginatum, 74, 5; E. angustifolium, 74, 5; E. latifolium, 88, 97.

Carex dioica, 74 *Druce!* 2 *Ley, R.C.* 1883, 5 *Druce;* C. pulicaris, 74, 5, 7 *Miller;* C. pauciflora, 87, 5 *Druce*! 11.

"Mr. Grant of Wick writes that Robert Dick's specimens of C. pauciflora are from "Dunnet Sands, Caithness." Unfortunately he has not had an opportunity of examining them carefully. The locality is unusual in Britain; and I should not be surprised if they prove to be *C. microglochin.*

C. incurva, 11; C. stellulata *var.* Grypos, 89 *Linton,* probably elsewhere on mountains; C. stellulata (type), 74, 5, 7; C. leporina, 94; C. curta, 74, 89, 96! 97 *Bailey,* 5; C. helvola, 92 *Balfour*! C. elongata, 73 *M'Andrew: a good addition to the Scotch flora; it will not improbably be found still further north;* C. remota, 74, 92, 97, 5; C. intermedia, 72 *Fingland*! 92; C. arenaria, 73, 74, 5 *Bailey;* C. muricata, 74, 7 *Miller*! C. vulpina, 72 *Fingland,* 74; C. teretiuscula, 88, 8! C. paniculata, 89, 91, 94; C. vulgaris, 73 *M'Andrew*! 74, 9! C. rigida, 4 *Grieve*! 5 *Druce, R.C.* 1881-2; C. rigida *var.* inferalpina (Laestad, *Nov. Act. Upsal. 11,* 90, *at Little Culrannoch, Hanbury and Fox*! *This is liable to be passed over as C. aquatilis, and I suspect the plant mentioned by Syme* (*Eng. Bot., Ed. III.*), *from "Little Craigendal," is this plant*). C. salina, *var.* kattegattensis (Fr.), 9 *Grant*! (*Scot. Nat.,* 1885, p. 68), *very plentiful, growing with C. aquatilis, var. Watsoni, and other Cyperaceæ.*

C. aquatilis, 72 *Coles and M'Andrew,* 73 *M'Andrew.*

"95 Moray" in "Top. Botany," is an error, and should be "95 Elgin." Some idea of the rapid progress made in recording the distribution of this species in Scotland may be formed on contrasting the records in "Cybele Britannica," 1859, p. 310 (where it stands for Forfar and Aberdeen only, the then known stations being separated by the boundary of the counties, and by the bridge of Clova), with our present records for 15 counties. I have not been able to obtain the mountain form to cultivate besides the var. *Watsoni.* Contrasting the Dumfries and the Caithness specimens, they prove to differ in the length and thickness of their spikes, the northern plants approaching the sub-sp. *obtusa* Blytt, from the Sogne Fjiord in Norway. There is less difference between the Caithness specimens and plants from Lough Allen in Ireland, far less than between specimens from the Varanger Fjiord in Finmark, and others from the South of Norway. In Scandinavia it is very variable. In the "Botanical Gazette" for 1851, p. 23, Mr. M'Laren suggested the division of *C. aquatilis*

into three forms. It would be well if some Scotch botanist would examine his specimens in Edinburgh; as, doubtless, when he read his paper before the Edinburgh Botanical Society he presented specimens. Is the Elgin plant *aquatilis?* I should be much obliged for specimens from that country. The variety, or form, *cuspidata* Laestad occurs in Caithness, Hanbury sp. !

C. stricta, 90 *Croall!* 92 *Miller! from Glen Callater, named by Almquist.* C. acuta, 100 *Ley, R.C.* 1883. (9 Dick?)

Mr. Grant tells me that there are specimens in Dick's herbarium at Thurso, that he believes to be true *acuta*. It has been recently recorded from Iceland by Strömfelt. Mr. Bailey of U. S. A., records it from Greenland, but I do not know his authority; it is not accepted by Dr. Lange.

C. euflava, 90, 91, 4, 6, 8 ! C. lepidocarpa, E.B. non Tausch, 90 ! 91. C. lepidocarpa Tausch, 9. C. Œderi, 91, 97, 98 *Linton!* 9 *!* C. extensa *var.* minor 8 ! C. pallescens, 72 *Fingland*, 74, 5. C. fulva, 4, 5 *Druce*, 9. C. binervis, 72, 74, 5, 7 *Miller!* C. distans, 11 *confirmed Boswell*, 1875. C. laevigata, 98 *Bailey* ! C. panicea, 74, 100, 5, *all R.C.* 1883. C. vaginata, 94, 5 *Druce*, 9 !

I was disposed to name Mr. Grant's specimens *C. pelia* F. O. Lang (not Lange, as Dr. Christ writes in his "List of European species of Carex"), but Sir J. D. Hooker was inclined to name it *vaginata*. The subsequent receipt from Dr. A. Blytt of beautiful specimens of *C. pelia* has led me to agree with Sir J. D. Hooker. A specimen from Perth was named *C. pelia* by Dr. Christ, "a dep. var. of *panicea*," but Dr. Blytt's specimens show that the true *pelia* looks fairly distinct as a sub-species.

C. limosa (seg.), 72 *Fingland!* 89 *Sturrock!* 4 ! 8 *Miller!* C. rariflora.

The Sutherland plants referred to this are *limosa* from 6 stations. "C. limosa, Ben Loyal, 1833, W. H. Campbell!" has the spikes shorter and darker than usual, yet there is no real difference between them and others from Badcall Moss, and from Ben Hope, 1883! Certainly no specimens yet seen from Sutherlandshire are *C. stygia* Fr.

C. ustulata, 88 *Brebner, ex Dr. F. B. White!* C. sylvatica, 74, 88, 89, 91. C. pendula, 72. C. glauca, 74, 5, 8 *Miller!* C. præcox, 74, 2, 4, 8 *Miller!* C. pilulifera, 74, 97, 5, 7 *Grant!* C. pilulifera *var.* Leesii, 92. *Babington's Manual, 8th Ed.* 1881. "C. pilulifera, Ben Mac, Suth. 6, 8, 33, W. H. Campbell!" with only ordinary bracts.

The fruit in this specimen is exactly as drawn in the "Journal of Botany," 1881, plate 218, for the var. *Leesii*. The fruit of *var. longi-bracteata* Lange ! from "Scania" comes half-way between the typical *pilulifera* and *Leesii*, though Dr. Lange does not mention any peculiarity in the fruit of his variety. (Haand. i. den Danske Fl. Ed. 3, 1864, p. 694.)

C. filiformis, 97 *Grant.* C. hirta, 74. C. ampullacea, 74, 5, 7 *Miller.* C. vesicaria, 72 *Fingland,* 74 *Druce!* 90, 99 *A. C. Christie!* C. vesicaria *var.* dichroa, 88 *Druce!* C. paludosa, 72 *Fingland!*

Several Scandinavian Carices may yet be expected to occur in Scotland. The varieties of *acuta*, *rigida*, *stricta*, and *vulgaris* should be carefully examined for the Friesian plants *prolixa*, *turfosa*, *tricostata*, *limula*, &c.; but good specimens alone are of use when such critical plants are to be determined.

Phalaris arundinacea, 74, 5, 8.

Anthoxanthum odoratum, 74, 5, 7 *Miller.*

Phleum pratense, 5.

Alopecurus pratensis, 5, 8. A. geniculatus, 74, 97, 5, 8 *Miller.*

Agrostis canina, 89. A. vulgaris, 74, 5. A. nigra, 91 *Syme!* A. alba, 74 *Bailey*, 5.

Phragmites communis, 74. 89, 97, 5.

Arundo Calamagrostis, 73 *M'Andrew!* (*Scot. Nat.*, 1884). A. strigosa, 9 *Grant!* (*Scot. Nat.*, 1883).

Aira cæspitosa, 74, 5, 7 *Grant*; A. flexuosa, 74, 5; A. uliginosa, 94, 96 *Grieve*; A. caryophyllea, 74; A. præcox, 74, 5.

Avena fatua, 74, 5†; A. pubescens, 4, 8; A. flavescens, 72.

Arrhenatherum avenaceum, 74, 5, 8 *Miller.*

Holcus lanatus, 74, 5; H. mollis, 74, 97, 5.

Triodia decumbens, 74, 97, 5.

Melica uniflora, 74, 92.

Molinia cærulea, 74, 5, 7 *Grant, R.C.* 1883.

Catabrosa aquatica, 88, 89, 9 *Hanbury!*

Glyceria aquatica, 89; G. fluitans, 74, 5; G. plicata, 89, "extinct," 100.

Sclerochloa maritima, 73 *Druce*, 74, 97, 9 *Grant*, 2 *forms*; S. distans, 92.

S. Borreri ought to be found in Scotland. According to Lange it occurs in Greenland. Groenlund records it for Iceland, but it is not given for the Faroes; it is also Scandinavian. The above authors refer *S. conferta* Fr. to Babington's plants; but Nyman makes a sub-species of it, and gives it for "Suec. mer. occ." only. It occurs in Holland and Bohuslan.

Poa annua, 74, 5; P. alpina, 4; P. laxa, 90; P. laxa *var.* stricta, 90; P. pratensis, 74, 97, 5; P. trivialis, 74, 5; P. nemoralis, 72 *Brown!* 74, 94. *var.* glaucantha, 4.

Briza media, 74.

Cynosurus cristatus, 74, 5.

Dactylis glomerata, 74, 5, 7 *Grant, R.C.*, 1883.

Festuca sciuroides, 74, 89, 8 *Miller*; F. ovina, 74, 5; F. duriuscula, 73, 74, 97, 98 *all Newbould*; 5 *Bailey, R.C.*, 1883, 8 *Miller*; F. rubra, 74, 8 *Miller!*; F. sylvatica, 72 *T. Brown!*; F. "elatior," 74; F. pratensis, 74.

The genus Festuca wants careful revision according to Hackel's monograph. Good specimens should be gathered everywhere.

Bromus giganteus, 72 *T. Brown!*; B. asper, 89, 97, 2 *Ley*, 9; B. commutatus, 74; B. mollis, 74, 5.

Brachypodium sylvaticum, 74, 89, 97, 5.

Triticum repens, 74, 5; T. "acutum," 73, 74, 5, 6 *Druce, R.C.* 1881-82; T. junceum, 74, 93 *Miller*, 8!

Our seaside species of Triticum want further examination: they are by no means settled. Have we true *acutum* of De Candolle?

Elymus arenarius, 85 *delete? Bailey, R.C.*, 1881-82.

Nardus stricta, 74, 5.

Psamma baltica should be looked for on the east coast of Scotland. It occurs in Gothland, &c. It is not always easily distinguished from our common seaside species.

FILICES.

Woodsia hyperborea, 4.

Polypodium vulgare, 74, 5; P. dryopteris, 5; P. calcareum, 88.

Allosurus crispus, 93, 5.

Cystopteris fragilis, 72 *Coles*, 5, 7 *Grant, R.C.*, 1883.

Polystichum lobatum, 94, 97, 5, 7 *Grant, R.C.*, 1883.

Lastrea Oreopteris, 93, 94, 5; L. Filix-mas, 74, 97, 5; L. spinulosa, 74, 90, 91, 5, 6 *Druce*; L. dilatata, 6 *Druce*, 8 *Miller! fide Baker*; L. æmula, 98 *R.C.*, 1883, 5 (*Caithness? R. Dick*).

Athyrium Filix-fœmina, 74, 97, 5, 6.

Asplenium viride, 94; A. Trichomanes, 74, 97, 5.; A. marinum, 8 *Miller!* A. Adiantum-nigrum, 74, 5, 7 *Grant, R.C.* 1883. A. Ruta-muraria, 5.

Scolopendrium vulgare, 8 *Miller!*

Blechnum boreale, 74, 98, 5.

Pteris aquilina, 74, 5.

Hymenophyllum Wilsoni, delete "or 93."

Osmunda regalis, 97 Webb, delete "or 06."

Botrychium lunaria, 8 *Miller!*

Ophioglossum vulgare, 80 *Brotherston, R.C.*, 1881-82.

Lycopodium clavatum, 5, 8 *Miller*; L. annotinum, 91; L.

complanatum, 5 *Druce*; L. alpinum, 5; L. Selago, 5: L. selaginoides, 93, 94, 5.

Isoetes lacustris, 74 *Bailey, R.C.* 1883, 5.

Equisetum maximum, 74 *Druce!* E. umbrosum, 72; E. arvense, 73; E. sylvaticum, 74, 8; E. palustre, 74, 5, 7 *Grant, R.C.* 1883; E. limosum, 74, 97, 5, *all Newbould*, 8!: E. variegatum, 92.

SUPPLEMENT.

Since the first part of this paper was published, I have obtained the following additional records for the species included in it. The records for Orkney (11) are on the authority of "A New List of the Flowering Plants and Ferns of Orkney," by W. Irvine Fortescue, published in the *Scottish Naturalist*, Vol. VI,, and new series, Vol. I. (1882-84.) Several records for Orkney are introduced into the second part of this paper, on the same authority.

Cochlearia alpina, 11.

Barbarea vulgaris, 11.

Viola canina "flavicornis." 12 (*Shetland*), *M. Middleton, New Club.*

Polygala calcarea, 8. Sutherland W. *Hanbury!*

This great extension to the known range of the plant is on the authority of Prof. A. W. Bennett, who speaks decidedly of the name.

Spergularia rubra, 11.

Geranium sylvaticum, 11.

Lathyrus pratensis, 96 *Grieve.*

Epilobium parviflorum. 11 (*Macnab.*)

Circæa alpina, 11.

Pimpinella Saxifraga, 11.

Sium angustifolium, 11.

Œnanthe fistulosa, 72.

Mr. Fingland has answered the doubt expressed in the first part of this paper by sending specimens from Dumfries-shire.

Sherardia arvensis, 11.

Leontodon hirtus, 72, *Dr. Davidson, M.S.*

Hieracium Saxifragum Fr., 72 *Backhouse!* 9 (Caithness) *Grant?*

H. murorum (seg.), 11. H. vulgatum (seg.) 11.

Campanula glomerata. Perth, *Linn of Campsie. Scot. Nat.*, April, 1886.

Pyrola rotundifolia, 11.

NOTES FROM THE HEBARIUM OF THE PERTHSHIRE NATURAL HISTORY MUSEUM.

By F. BUCHANAN WHITE, M.D. F.L.S.

IN studying the plants of Perthshire, and comparing them with specimens from other sources, and with the descriptions in various British and European Floras, I have come across a few varieties either not recorded for Britain, or, apparently, altogether undescribed. These, of course, will be duly noticed in the Flora of Perthshire; but in the meantime, it seems desirable to direct the attention of other students of Scottish botany to them in order that their distribution may be observed.

Apropos of the *Flora of Perthshire*, it is hoped that publication will not be delayed much longer; but, since of late years every season has brought to light some species unrecorded for the county—the field being so wide, and the workers so few—nothing has been lost, and a good deal has been gained by the delay.

Ranunculus Flammula L. Specimens accidentally growing in four feet of water—accidentally, since part of the bank seems to have fallen into the water—had the leaf stalks very long, and the blades short, and in the lower leaves very broad in proportion, thus:—Stalk, 3¾ inches long; blade, 1 inch long ¼-½ inch broad. This alteration in the form of the leaves seems interesting, in view of Mr. F. C. S. Roper's observations (Linn. Soc. Journ., xxi., p. 380) on the submerged leaves of *Ranunculus Lingua*. In these submerged leaves, which, however, Mr Roper considers modifications of the äerial leaves, the lengthening of the stalk and the widening and shortening of the blade is very marked.

Nasturtium palustre D.C. Most of our specimens have deeply pinnatifid leaves, with the segments dentate, and the terminal one usually larger, and always so in the lower leaves. These are probably var. *pinnatifidum* Tanoch.

Cardamine flexuosa with

a. *genuina* G. and Gr., *Fl. de France.* Upper leaves with oblong leaflets, almost or quite entire.

b. *umbrosa* G. and Gr., *Fl. de France.* Leaflets, even the upper, broadly oval, angular or incised. Plant branchy, diffuse.

Both forms occur, but the var. *umbrosa* seems to be the commoner.

Sisymbrium officinale Scop.

var. *leiocarpum* D.C. Pods glabrous or nearly so. I have met with this twice—a single plant collected at Aberfeldy (perhaps there may have been more of it, but I had not discovered at the time that such a form occurred), and a number of specimens on the ruins of Innerpeffray Castle. Under the belief that it was undescribed, I had given this variety a name (thinking that it deserved one as much as, but no more than, similar forms of other Cruciferæ), but Mr. A. Bennet found specimens in his herbarium named var. *leiocarpum* D.C. To him I am indebted for a note of the distribution, which is wide but not general, probably because the form is overlooked. I see that Professor Babington alludes in his Manual to the fact that the pods are sometimes glabrous, so he appears to have met with it.

Subularia aquatica L. Though usually characterised as "stemless," there is sometimes a distinct though short stem.

Geranium sylvaticum L. Flowers sometimes very small, with petals about as long as the calyx. Perhaps this is var. *parviflorum*. A. Blytt. *Norges Flora III.*, p. 1105.

Geranium sanguineum L. On the shingly shore of Loch Rannoch a curious form of this plant grows, and has preserved its distinctive characters under cultivation for some years. This variety (which may be called *micrantha*) is altogether smaller and more procumbent than the usual form, with leaves more crowded, and their segments more tapering and acute; the flowers ¾ inch or less in diameter, and the petals scarcely longer than the sepals. In the cultivated plant the peduncles are often 2-flowered (one of the characters of *G. sanguineum* is that the peduncles are 1-flowered); the anthers seem to be sterile, and the filaments are more triangular than in the type.

Trifolium procumbens L.

a. *minus* Koch. Peduncle twice the length of the leaf.

b. *majus* Koch. Peduncle about equal in length to the leaf. Flower head usually larger, and colour darker.

Both forms occur, but var. *minus* is by far the commonest.

Trifolium dubium Sibth.

var. *pygmæum* Soy.-Will. is dwarfer, and has the middle leaflet not with a longer stalk than the lateral ones, as is usually the case.

Anthyllis vulneraria L.

Koch and Grenier and Godron recognise two forms.

1. *vulgaris* Koch. Stem hairy only at the top, and with one to two leaves or none; not branched.
2. *maritima* Koch. Taller; stem with adpressed hairs throughout, and with three or four leaves; often branched, the branches bearing flower heads at the ends.

All our specimens, though not from the neighbourhood of the sea, agree with the description of the second form.

Spiræa Ulmaria L.

Koch distinguishes 2, and Fries 3 varieties. Koch's var. *discolor* (of which he gives *S. glauca* Schultz as a synonym), and Fries' var. *nivea* are our common form with the underside of the leaves tomentose. Koch's var. *denudata* (*S. denudata* Hayne) seems to be the same as Fries' var. *viridis*, and has the underside of the leaves glabrous; but Fries mentions a var. *glauca* with leaves glaucous below, and scarcely tomentose. At a later period he seems to have considered that *nivea* and *glauca* (*S. glauca* Schultz) were just the ordinary form, and that the only variety to be retained was *denudata* Pressl. Whatever name it should bear (for it seems also to be the var. *concolor* Lange) it is not very common, but is widely distributed in Perthshire. It is to be noted that the stem leaves should be examined, for in *S. ulmaria* the radical leaves are (always?) glabrous below.

Potentilla anserina L.

Var. *sericea* Koch. Leaves silvery white, with silky hairs, on both sides. This is only an extreme form, and is scarcely worth retaining as a variety.

Potentilla maculata Pourr.

Variable. Most of our specimens agree with Koch's var. *firma* (to which he refers *P. sabauda* D.C.), of which the characters are the more stout and erect stem, the leaflets subrotund-obovate, with margins overlapping a little, and the teeth broader; but a plant from Rannoch agrees pretty well with his var. *debilis* (*P. debilis* Schleich), in the oblong-obovate more deeply incised leaflets, and the weaker and shorter flowering stems not rising much above the radical leaves.

Geum rivale L.

Plants with much paler foliage and greenish-white flowers (and retaining these characteristics in cultivation), occur in Glen Farg.

They may be, perhaps, the var. *pallidum* A. Blytt (*G. pallidum* C. A. Meyer), but I think they are merely an albino condition. A monstrosity with foliaceous sepals, and often proliferous flowers, is *G. hybridum* Wulf.; it is not uncommon.

Epilobium montanum L.

Var. *verticillatum* Koch. Leaves in threes. Very rare.

Epilobium obscurum Schreb.

To this I refer a specimen with the leaves in threes; as, though it agrees somewhat with the description of *E. trigonum* Schrk., I have little doubt but that it is *E. obscurum*.

Antennaria dioica Gært. I find two forms:—

a. *vulgaris*. Anthodes in a dense head, subsessile or shortly stalked.

b. *pedicellata*. Anthodes in a loose corymb, with stalks from ½ inch to more than 1 inch in length. This is probably merely an extreme state, but it is striking.

Carduus arvensis Curt.

a. *horridus* Koch. Leaves all undulate, pinnatifid, strongly spiny. Local, but not uncommon. All the specimens I have seen have the leaves glabrous beneath.

b. *mitis* Koch. Leaves of the stem sinuate; of the branches entire or dentate, more softly spiny. This I take to be our commonest form.

c. *vestitus* Koch. Underside of leaves with white down. What may possibly be this I found at an altitude of 2,300 ft., but there were only radical leaves. It may be a common form.

Sonchus oleraceus L.

d. *integrifolius* Wallr. Leaves not runcinate.

b. *triangularis* Wallr. Leaves runcinate-pinnatifid, terminal lobe larger, triangular.

c. *lacerus*, Wallr. Leaves pinnatifid, lobes; including the terminal one, dentate or sinuate, hence all sub-equal.

I have seen b. and c., but not a.

Sonchus arvensis L.

Var. *lævipes*, Koch. Peduncles and involucres without glandular pubescence. Rare, but perhaps overlooked. Is this var. *glabra* Lond. Cat.?

Campanula rotundifolia L.

Var. *hirta* Koch. Lower plant, with rigid hairs. Note.—The stem is usually more or less hairy near the base, but in the speci-

mens referred to this variety the leaves, or at least the lower ones, are also hairy. Rare.

Var. *velutina* D.C. The whole plant whitish, with close short hairs. Rare.

Rhinanthus crista-galli L.

Var. *Drummond-Hayi* var. nova.

Calyx pubescent, with short hairs. Stem more or less shaggy (especially at the lower part), with articulated hairs. Plant dwarf, 2-5 inches high in our specimens, not branched. Ben Lawers, alt. 3350 ft., very rare.

In the dried specimens I cannot find any constant character by which this can be distinguished from the ordinary form of *R. Crista-galli*, except the pubescent calyx. In all the books to which I have access I find no mention of any similar variety, nor can Mr. A. Bennett in any of the works that he has consulted. I have, therefore, given this form the name of my friend, Colonel Drummond-Hay of Seggieden, in memory of the many pleasant excursions we have had together, and in one of which we found the plant. I may add that I have seen specimens on several occasions, but only in one spot.

Veronica Anagallis L.

All the specimens I have examined have gland-tipped hairs on the inflorescence (*V. anagalliformis* Bor.)

Polygonum lapathifolium L.

Var. *incanum*, Koch. Underside of leaves with white down. In several places, but rather an extreme state than a true variety.

Var. *rubrum*, Gray. Flowers red. Rare.

Euphorbia exigua L.

Var. *truncata*, Koch (*E. retusa* D.C.) Leaves truncate, with an apiculus. Not common.

Juncus supinus, Mœnch.

From an examination of a large number of specimens, I am inclined to arrange the forms of this variable plant thus :—

a. (*subverticillatus*, Wulf.?) Stems usually elongate, more or less decumbent or floating. Flowers rather pale, and stamens commonly three.

b. *uliginosus*, Roth. Stems shorter, erect, or more rarely decumbent. Flowers usually darker. Stamens commonly six (when it is *J. Kochii*), rarely three.

c. *fluitans*, Lamarck. Leaves very much finer, and often

greatly elongate (sometimes more than 10 inches long). Growing in deep water—12 feet or more—densely cæspitose, and never flowering: or in shallower water, and flowering.

The comparative *length* of the filaments and anthers depends upon the age of the flower, but it is possible that the *shape* of the anthers may differ in the varieties.

Scirpus sylvaticus L.

Var. *dissitiflorus*, Sond. Spikelets mostly solitary, and, except those in the axils of the branches, on pedicels at least as long as the spikelet. Mixed with the ordinary form, but rare. I am indebted to Mr. A. Bennett for discovering that this variety had already been named.

Carex vulpina L.

Specimens from an inland wood have paler glumes, more foliaceous bracts, and less densely serrated fruit than the type, and may be the var. *nemorosa* Rebent.

Carex vulgaris Fr.

Var. *melæna*, Wimm. Very rare.

Carex atrata L.

It is noteworthy that in cultivation this species shows some remarkable features. It flowers twice in the course of the summer. The inflorescences of the first period of flowering are normal, though the plant is much larger than in the wild state, having stems 2 feet in length. The inflorescence of the second period is quite abnormal, the spikelets being more or less remote from each other, so that the head is 3 or 4 inches long; the lower spikelets have long peduncles; the lower flowers of the lower spikelets seem to be abortive, hence the spikelet is narrower below. In one wild speci men I find the lowest spikelet inserted an inch or more below the others.

Carex aquatilis, Whlnb.

Var. *epigeios*, Læst. (C. epigeios, Htn.)

This, which in appearance is somewhat intermediate between *C. aquatilis* and *C. vulgaris*, grows very sparingly in a marsh near Perth. It seems to be a late flowerer, as specimens were in good condition when other Carices were past their best. As regards the determination of this variety, Dr. Almquist, to whom Mr. Bennett sent specimens on my behalf, returns it as a form. Looking at the distribution of the variety (or sub-species, as Nyman considers it)—mountain districts of North Sweden, North Norway, and Lapland—its occurrence in a lowland locality in Scotland is somewhat strange.

Var. *virescens*, And. Chiefly remarkable for the short glumes of the female spikelets. I have not seen Andersson's description, and am indebted to Mr. Bennett for the name, which has been confirmed by Dr. Almquist.

Deschampsia cæspitosa, Beauv.

The characters given for the varieties are so inconstant (while different books give different varieties), that it is difficult to know where to place some of our specimens. In the meantime I arrange our forms thus :—

a. *genuina*. The ordinary lowland form, with flowers more or less dark coloured.

b. *pallida*, Koch (*altissima*, Lam.) A large, long-leafed, pale (yellowish white and green) flowered form, from shady places.

c. *brevifolia*, Parn. Short-leafed, flowers usually dark coloured.

High mountain specimens of this have smaller, closer panicles, with often 3 florets in the spikelet. I find that in all our forms 3 florets sometimes occur; but in these mountain plants their occurrence is certainly more constant. In Mr. Cosmo Melville's variety *Voirlichensis* of *D. flexuosa*, 3 florets in the spikelet are always present; so it would seem that the characters of the genus must be amended.

Agropyron repens, Beauv.

Under this I wish to call attention to a plant collected on Ben Lawers by Mr Cosmo Melville, and which will probably be found elsewhere if looked for. The specimen is in very bad condition unfortunately, but comes nearest to *A. repens*. The spikelets are apparently about 2-flowered; the glumes and lower pales shortly awned; the ribs of empty glumes more scabrid; and the ribs of the flower glumes stronger and more scabrid. The most important character, and one to which I have found nothing similar in any of the numerous specimens of *A. repens* and *A. caninum* that I have examined, is that the pale (that is, the upper pale of some authors), has the two ribs more densely ciliate, and excurrent some way below the tip of the pale, with two rough awns, which about equal or surpass the ciliate triangular sub-acute and seemingly entire tip of the pale. Can this be *A. alpinum*, Don M.S. ?

Since this was written I have called Mr. Cosmo Melville's attention to the plant, the result being that he has compared his own specimen (which is in better condition) with *A. violaceum* Horn. and finds no essential difference. *A. violaceum* is a Norwegian species and to it Nyman refers with a ? Don's *alpinum*.

MYCOLOGIA SCOTICA (Supplement).

By Rev. J. STEVENSON and Prof. J. W. H. TRAIL.

(*Continued from S. N.*, 1886, *p.* 268.)

(*All measurements, except where specified, are in thousandths of a millimetre.*)

3077. Phoma macrocapsa, sp.n., Trail—Perithecia subdermal, circular, diameter 600-700, depressed, not exceeding 250 in height (exclusive of ostiolum about 100-150 long), dark brown, sporidia hyaline, oblong, nearly straight, 4 by 1½.

On last year's stems of *Mercurialis perennis*. May.

East, — — — Dee — — — —
West, — — — —

Near Old Aberdeen—J. W. H. Trail.

3078. Cytispora carphosperma, Fr. S.M. II., p. 545; Sacc, *Syll. F.* III., p. 274. Spots blackish, subdermal, circular; stroma waxy, dull grey, inclosing spaces usually filled with grey contents; perithecium central, ill-defined, opening as a dark spot in centre of erumpent grey disk. Sporidia oozing out in a long filament—at first yellow, then becoming dull orange; sporidia nearly hyaline, sausage-shaped, about 5-6 by 1.

In bark of dead branch of Pear tree, spots numerous, but not crowded. May.

East, — — — Dee — — — —
West. — — — —

Old Aberdeen—J. W. H. Trail.
England, Europe.

3079. Septoria Adoxæ, Fckl. *Symb. App.* II., p. 21; Sacc. *Syll. Fung.* III., p. 543.

Perithecia scattered or subgregarious, sometimes on withered spots, at length free, very black, bluntly conical, situated on a flattened base, minute; ostiolum blunt, perforated; sporidia cylindrical, mostly straight, 2-3-celled, hyaline, 32-36×4.

On leaves of *Adoxa moschatellina.*

East, — — — — Moray — — —
West, — — — —

"Forres, Rev. J. Keith," *Grevillea*, 1886, p. 132.

Germany.

3080. **Septoria Cerastii**, Rob. and Desm. XVII. *Not.*, p. 21; Sacc, *Syll. Fung.* III., p. 518. Spots pale yellowish or ashy grey, perithecia on stems and on leaves, on both surfaces, in the spots, flattened spheres, diam. 80, black, opening by an apical pore. Sporidia 30-40 by 1, straight or very slightly curved, hyaline, faintly spotted, exuding in slender white cirrhi.

On *Cerastium triviale*, on fading leaves and stems.

East, — — Tay — — — — —
West, — — — —

On "*Cerastium*, Menmuir" *Grevillea*, 1886, p. 102.

Belgium, Italy, France.

3081. **S. lamiicola**, Sacc. *Mich.* I., p. 180; *Syll. Fung.* III., p. 538.

Spots indefinite, at length white with a red margin; perithecia punctiform, few, brown; sporidia filiform, tortuous, 50 by 1, distinctly 3-5-septate, hyaline.

In leaves of *Lamium album*, &c.

East, — — Tay — — — — —
West, — — — —

On *Lamium.* Glamis. *Grevillea*, 1886, p. 103.

England.

Italy, France.

3082. **S. gracillima** (Cooke), Sacc. *Syll. Fung.* III., p. 566. (*Darluca gracillima*: Cooke *Praecurs. ad Monogr. Hendersoniarum*, p. 26.) Perithecia? Sporidia linear, straight, multinucleate, 30×2.

On Carex, near Edinburgh, *Grevillea*, 1886, p. 104.

3083. **Leptostroma scirpinum**, Fr. *Obs.* II., p. 357; Sacc. *Syll. Fung.* III., p. 644.

Orbicular, opaque, umbonate in centre, at length falling off, leaving a white disk.

East, — — Tay — — — — —
West, — — — —

"On Carices, Glamis." *Grevillea*, 1886, p. 106.

England.

Sweden, Germany, Portugal, Italy, Siberia.

3084. L. herbarum (Fr.), Link *Handb.* III., p. 345. Sacc. *Syll. Fung.* III., p. 645.

Perithecia gregarious, plano-convex, lanceolate, sometimes conjoined; covered at first with the thin epiderm, marked with an obscure fissure lengthwise, dark fuscous, shining; sporidia hyaline, slightly curved, and narrowing to the ends, 4-6 by 1-1½.

On dying or dead stems of herbaceous plants, *e.g.*, *Teucrium*.

East, Tweed, Forth, — Dee — — — —
West, — — — —

"Kinross, Berwick." *Grevillea*, 1886, p. 106. Banchory, beside the Dee—J. W. H. Trail.

Sweden, France, Germany, Siberia.

3085. Discosia artocreas (Tode), Fr. *Summa*, p. 423; Sacc. *Syll. Fung.* III., p. 653.

Perithecia gregarious, black, shining, orbicular, at first smooth and convex, soon depressed around the punctiform ostiolum, afterwards collapsed, plicate, and wrinkled; sporidia slightly curved, sub-cylindrical, with rounded ends, 14-22 by 2-3½, emitting from near each end a bristle 10 or 15 long, hyaline or yellowish.

On leaves of *Fagus*, &c.

East, — — Tay — — — — —
West, — — — —

"Perth," *Grevillea*, 1886, p. 107.

3086. Glœosporium paradoxum (De Not.) Fuck. *Symb.* p. 277. Sacc. *Syll. Fung.* III., p. 707.

Spots none or obscure; pustules disk-like, crowded, covered with epiderm on both surfaces; conidia ovoid, somewhat truncate at the base, 8 by 5-6, hyaline, supported on cylindrical hyaline foot-stalks, in tufts 12-15 by 6.

On leaves of *Hedera Helix.*

East, — — — Tay — — — —
West, — — — —

"Den of Airlie," *Grevillea*, 1884, p. 124.

Europe.

3087. **Libertella betulina**, Desm., Sacc. *Syll.* p. 745. *Naemaspora aurea* Fr. *Syst. Myc.* III., p. 478. Pustules expanded, celluloso-gyrose, golden-yellow; conidia nearly straight, fusiform, golden-yellow, sharp at both ends, a little shorter than in *Libertella faginea.*

In bark of dry branches of *Betula alba.*

East, — — — Tay — — — —
West, — — — —

"Glamis," *Grevillea*, 1886, p. 126.

Europe, North America.

3088. **Didymosporium profusum** (Grev.) Fr., Sacc. *Syll. Fung.* III., 763. *Stilbospora profusa*, Grev. *Scot. Crypt. Flora*, t. 212, f. 1.

"Pustules gregarious, or collected in little groups, diam. 400-700, erumpent, conical, bursting in the centre; conidia small, ovoid-oblong, uniseptate, at first hyaline, then olivaceous, at length dark fuscous, somewhat constricted, rounded at each end, or more tapering below; 20-25 by 9-10." Grove, in *Scot. Nat.*, 1886, p. 332.

In bark of Beech and Sycamore (*Acer Pseudoplatanus*).

East, — Forth — — — — — —
West, — — — —

Edinburgh (Greville).

England, Sweden.

3089. **Stilbospora macrosperma**, Pers., *Syn.*, p. 96. Sacc. *Syll. Fung.* III., 772.

Pustules subdermal, black, then prominent and erumpent; conidia oblong-ellipsoid, 4-septate, scarcely constricted, pale sooty brown.

On branches of Oaks.

East, — — — — — — — —
West, — — Argyle —

"Appin," *Grevillea*, 1886, p. 127.
Germany, Portugal (on bark of *Alnus glutinosa*).

Puccinia verrucosa, Schum. (= *P. Glechomatis* D.C., *Mycologia Scotica*, No. 1225). Puccinia found by Dr Keith on a leaf of *Prunella vulgaris* on Ben Lawers has been identified by me as *P. verrucosa*; it has not previously been recorded from this food-plant. (J. W. H. T.)

3090. **P. caulincola**, Schn., 48th. *Jahrsb. d. Schles. Ges.* 1870, p. 120. Only teleutospores found; æcidium is recorded from Germany, as scattered hemispherical, afterwards cup-shaped, only slightly prominent, with erect pale irregularly cut margin. Spores polygonal or rounded or elongate, covered with very fine warts, yellow-brown, 7-24 by 12-20. Teleutospores in elongate swellings on the stems, leaf-stalks, and lower surface of mid-ribs; on long slender stalks, which readily fall off; spores broadly oval, rounded and not thickened at the apex, or slightly thickened and pointed; scarcely constricted in the middle; 25-32 by 15-21, smooth, brown, paler than in *P. Menthæ*.

On Wild Thyme (*Thymus Serpyllum*). July—September.

East, — — — Dee — — — —
West, — — — —

Ballater, and Links near Aberdeen.
Germany.

To be continued.

Cerastium latifolium Auct. Angl.

In the April number of *The Scottish Naturalist* I made the remark that our plant was clearly not the *Cerastium latifolium* L. of continental authors. Since that was written I have submitted three specimens of our plant to Dr. Lange; unfortunately they were all poor specimens, but are the only ones I possess. Of one from Caenlochan Glen (gathered by Mr. H. T. Mennell), he observes, "*C. alpinum*, typical;" of another from Ben-muic-dhui (found by Mr. A. Croall), "*C. alpinum*, more pubescent;" and last, of one from a mountain near

Ben-muic-dhui (gathered by Mr. F. J. Hanbury), he remarks, "Is really like my *C. arcticum* from Greenland and Iceland, but seeds are required to certainly determine it; these are quite different from *C. latifolium* L. being *C. alpinum*, and *C. arcticum*, Lange." Mr. Hanbury kindly took his sheet of specimens to Kew; but there is no specimen of *arcticum* there from Lange, (probably it is there under some other name for the Arctic Expeditions); so we had to content ourselves with comparing the specimens with the beautiful plate of *C. arcticum* in "Flora Danica." So far as it was possible to come to a conclusion, I quite think the plant is that of Lange. It now is necessary to gather plants in good fruit to decide the question of what *C. latifolium Auct Angl.* really includes.

ARTHUR BENNETT.

A Neglected Scotch Fungus.

In the "Scottish Cryptogamic Flora," vol. iv., t. 212, f. 1, published in 1826, Greville figures a fungus, which he names *Stilbospora profusa*. In the "Systema Mycologicum" of Fries, in 1832, this was re-named *Didymosporium profusum*. But, for some reason unknown to me, it has not been mentioned by any succeeding British author so far as I can ascertain.

In December last I found what is evidently the same fungus on the inside of bark of sycamore at Sutton Coldfield, near Birmingham. The description is as follows:—Pustules gregarious, or collected in little groups, 400 to 700 diam., erumpent, conical, black, bursting in the centre; conidia small, ovoid-oblong, uniseptate, at first hyaline, then olivaceous, at length dark fuscous, somewhat constricted, rounded at each end, or more tapering below; 20-25 by 9-10. (The measurements are in thousandths of a millimetre).

W. B. GROVE, B.A.

MEETINGS OF SCOTTISH SCIENTIFIC SOCIETIES.

ABERDEEN NATURAL HISTORY SOCIETY—SESSION 1885-86.

17th Nov. 1885.—The President (Professor James W. H. Trail) spoke on Natural History Museums, with special reference to Aberdeen, remarking that though they had been long in moving in the matter, he thought it was possible to have a good local museum, and that it would not be very difficult to form one. He referred to the exhibition in Gray's School of Art, under the auspices of the Society, during the visit of the British Association, and stated

that it was largely taken advantage of by the working classes, and he believed that if they had a permanent museum it would tend to further an interest in scientific pursuits.

15th Dec.—Mr. Robert Gray, Peterhead, read a paper on the Greenland Whale—its nature and habits, calling special attention to such points as—Whether it respired while asleep, whether it slept under water, and as to its geographical range. The paper embodied the results of the writer's own observations in the Arctic Regions, as well as those of his father and grandfather.

19th Jan., 1886.—The Secretary (Mr. John Roy) read an account of a visit to the Lake region in the west of Sutherland, which he made in July last in company with Dr. Nordstedt, the eminent Swedish algologist. *Utricularia intermèdia* and *Lycopodium inundatum* were observed in several places; and a lady showed them specimens of *Vicia Orobus* found in the same district. These plants are believed to be new to Sutherland. Large numbers of Desmids and other algæ were found, of which lists were submitted. Skye was afterwards visited. More Desmidian rarities were found there than in Sutherland, especially in the south of the Island. *Saxifraga nivalis* was observed in the north-west at the low altitude of 1,200 feet, much lower than it has been noticed elsewhere in Britain.

Mr. Murray read an account of the Society's excursion to St. Cyrus in July last, noting the chief plants found, as well as remarking on the geology of that famous locality.

Mr. Roy read a few notes on algæ added to the flora of this district during 1885. The more noteworthy plants were—*Hydrurus fætidus*, detected by Dr. Nordstedt, in company with the writer, in the Cluny, at Castleton, Braemar; *Spirogyra peliospora*, Wittr, *Sp. punctata*, Cleve, and *Gonium sociale*, near Dinnet; *Volvox minor*, on Scotston Moor, where *V. globator* has long been known to occur; also, *Coleochæte irregularis* and *Scenedesmus radiatus* were found near Dinnet.

16th Feb.—Dr. Trail read a paper on the proposed Natural History Museum for Aberdeen, in which he explained the present position of the movement, and the steps necessary to be taken in order to promote its success.

Mr. Roy read a few critical notes on the Desmidian literature which has appeared both at home and abroad during the last five years.

16th March.—Professor Nicholson gave a lecture on the Geology of Esthonia in the west of Russia, which was very fully illustrated by drawings and specimens. He commenced by explaining why he went and how he got there. Then followed a general description of the surface, next a detailed account of the various formations of the fossils they contain; and he closed with notes on the occupation and habits of the people, modes of travelling, &c.

20th April.—Mr. Jamieson read a paper on the food of the sea trout, giving, along with his own observations, an account of all that is known on the subject.

PROCEEDINGS AND TRANSACTIONS OF THE NATURAL HISTORY SOCIETY OF GLASGOW.

[New Series, Vol. 1, Part 1, 1885; Part 2, 1886; and index to First Series, Vols. 1-5, 1851-1883.]

SINCE our last notice of the publications of this—one of the most energetic of Scottish scientific societies—the above have been issued. The index to Vols. 1-5 is calculated to add very greatly to the usefulness of these volumes, and to facilitate reference to the mass of information contained in them. Its execution is such as to reflect great credit on Mr. M'Kay, by whom it was drawn up.

Vol. 1 of the new series is in no way inferior to the earlier volumes, and contains numerous original articles of interest. Most of these deal with Scotch botany and zoology. Space restricts us here to an enumeration of their headings, with a brief notice of the subjects; where not indicated with sufficient clearness by the headings, such notices are placed within brackets. In Part 1 the separate articles are as follows:—

Notes on (the Habits of) the Common Limpet, by David Robertson, F.L.S.; Experiments with Chilian Seed-Potatoes (grown in Scotland), by Thomas King; then follow three papers by Peter Cameron, viz., On the origin of the Forms of Galls; On the habits of Euura *olim* Cryptocampus, and On the occurrence of Microdon mutabilis L. in the West of Scotland. A few notes on the Mammals and Birds of Rousay, one of the Orkney Islands, by T. E. Buckley, F.Z.S., extends over pp. 44-76. Notes on Silene Maritima (relating to variations in number of the styles), by Thomas Scott. Meteorological Notes for 1883, and Remarks on the state of Vegetation in the Public Parks of Glasgow, by D. M'Lellan. The Topknots (*Rhombus*), by W. Anderson Smith. Some instances of the retarded migration of Swallows, by William C. Angus. The Mistletoe, by R. Turner.

In the "Transactions" in Part 2 are contained the following:—Disappearance of the Chough (Pyrrhocorax graculus L.), from the Stewartry of Kirkcudbright, by Robert Service. Meteorological Notes for 1884, and remarks on the state of Vegetation in the Public Parks of Glasgow, by D. M'Lellan. Jottings from my Note-book; Talitrus Locusta L. (habits and food); and Notes on Pedicellariæ, by David Robertson, F.L.S. The Medlar, Apple, and Quince, Remarks on the structure of their Fruit, by Thomas King. Domestic habits of the Butterfish (Blennius Gunnellus L.) Experiments with Chilian Seed-Potatoes—Report for 1884, by Thomas King. A curious dwelling for a Hermit Crab (*Pagurus Thompsoni*, in the

centre of a sponge that had grown up and dissolved the *Turritella* shell, in which the crab had previously lived, by Thomas Scott, with a plate.) **Notes on some Plants of the Clyde district,** by D. A. Boyd. **A Week at Glen Shee,** by Peter Ewing (is an account of a botanical visit to the Spital, and the hills and glens in its vicinity). **Notes on the Neuroptera of Argyllshire,** by James J. F. X. King. **Notes on the Algæ of the Kildonan Shore, Arran,** by David Gregorson, F.E.I.S. **The external configuration of Plants in relation to Wind Pressure and Water Currents,** by Alexander S. Wilson, M.A., B.Sc. **Thomas Hopkirk of Dalbeth, a Sketch of his Life and Botanical Work,** by Robert Turner (with a portrait, pp. 196-259, is an appreciative memoir of one of the most distinguished of Scotch botanists, with an "attempt to estimate the amount of difference that has arisen in the Flora of the district since his time, and to account for it.") **Notes on a Hybrid between a Black Cock and a Pheasant,** by W. Craibe Angus, with a plate.

The **Fauna of Scotland,** with special reference to Clydesdale and the Western District, is continued as a separately paged appendix, including **Hymenoptera,** Part 2., by Peter Cameron. During the six years that have elapsed since the publication of Part 1, Mr. Cameron has been able to add 59 species to the list of Scottish Sawflies, 32 being additions to Clydesdale. The Cynipidæ are next treated of, on the basis of the works of Drs. Adler and Mayr. A synopsis of the Gall-making genera, and another of the Scottish Oak-galls are included, and add largely to our information upon the group of gall-makers. We give elsewhere in this number the list of Scottish Oak-gall-makers. The number of species of Cynipidæ now recorded from Scotland by Mr. Cameron stands as follows:—Gall-makers, 36; Inquilines, 14; Parasites, 71. (*Allotriina*, 28; *Eucoilides*, 24; *Anacharides*, 11; *Figitides*, 8.) Among the parasitic forms the following are described as new species:—*Allotria ancylocera*, *A. maculicollis*, *A. basimacula*, *A. caledonica*, *Kleditoma striata*, *K. picipes*.

In the "Proceedings" of the society are numerous notices of considerable interest. On 15th May, 1883, Mr. Ewing exhibited several **Hepaticae,** of which a list is given from different new localities; among them were *Cephalozia Lammersiana* Hübn. from Loch Lomond, *Fossombronia caespitiformis* De Not. from Cumbernauld, and *Metzgeria conjugata* Lindb., from Kinross-shire, all three believed by him to be new to Scotch lists. 31st July; Mr. Turner gave a list of **flowering plants** observed in a few hours visit to the **Lesser Cumbrae.** Mr. Cameron exhibited specimens of several species of **Sawflies,** including *Dineura stilata;* and pointed out that in this species about 70 p.c. show the neuration of the wings characteristic of the genus *Nematus*, apparently as the result of the mode of folding of the wings while in the pupa. Mr. W. Goodwin described a method of **Double-staining Vegetable Tissues.** 14th August, Mr. J. Steel submitted a list of **Fresh-water Mollusca** from the Port-Dundas and Fir-hill Timber-basins of the Forth and Clyde Canal. 27th November, Mr. Cameron exhibited several rare **Ichneumons,** including *Oresbius castaneus* Marsh, an alpine species from the top of Goatfell, Arran; *Hemiteles marginatus* Bridg.,

bred from cocoons of *Apanteles sericeus*, itself a parasite on a larva that fed on Juniper in the Clyde District, and *Phrygadneum tarsatum* Bridg. from Lamlash. 18th December, Mr. W. C. Angus exhibited **Sabine's Gull** (*Gavia Sabini*), from Loch Speline, Mull, as new to Scotland, Little Gull (*Larus minutus*), from North Uist, Golden Eagle (*A. Chrysaetos*), found dead, floating near Lamlash, and a pied immature male Grouse (*L. scoticus*). 29th January, 1884; Mr. T. Scott exhibited, from the neighbourhood of Greenock, the following **Mollusca**—*Helix rotundata* var. *alba*, and var. *pyramidalis*, *H. arbustorum* var. *alpestris*, and *Pisidium nitidum*. 3rd June, Mr. King exhibited **Hydroptila femoralis** Eaton, from near Port-Glasgow, new to Scotland (taken on 31st May). 29th July, Mr. Ewing gave a list (here published) of the **Rarer Plants seen on Ben Lawers and Creag an Lochan**, between 18th and 22nd July. 30th September, Mr. King reported *Agaricus infundibuliformis* var. *membranaceus*, and *A. platyphyllus*, not recorded from Clyde in "Mycologia Scotica." 25th November, Mr. Ewing exhibited a specimen of *Ranunculus reptans* from Loch Leven; and stated that personal observations extending for some time had led him to the belief that it is only a form of *R. Flammula*, due to peculiarity of habitat. 30th December; Mr. T. Scott exhibited specimens of *Cytheropteron humile* Brady from the Firth of Clyde, an addition to marine *Ostracoda*. 27th January, 1885; Mr. King exhibited living specimens of *Cœcilius Dalii* M'Lach, taken by him on Camellias in Glasgow, and of *Agrypria Pagetana* Curt., from near Glasgow. 24th February; the following **Mosses** were exhibited in fruit:—*Pogonatum nanum*, *Encalypta vulgaris* var. *pilifera*, and *E. streptocarpa*, the latter from near Killin. 31st March; Mr. T. Scott exhibited some **Crustacea** from Greenock District; and Mr. Boyd showed **Mosses** (enumerated) from Kilbride and Milngavie. Mr. King showed *Boreus hyemalis* from Killin, and *Hydroptila longispina* M'Lach. (new to Scotland) from Loch Awe, Lochgoilhead, and Fortingal.

NEW WORKS ON BRITISH CRYPTOGAMS.

We are rejoiced to see the first volume of the long-expected **British Fungi, Hymenomycetes**, by Rev. J. Stevenson. There was great need for the work; which in the execution does not fall short of the high expectations entertained in anticipation. Space unfortunately prevents a review of it in this number.

A work on **British Desmidieæ** has been commenced by the indefatigable Dr. M. C. Cooke, uniform in style with his **British Fresh-water Algæ**. It will contain coloured figures of the species on 80 plates; and will, doubtless, be very useful to students of the group. Intending subscribers should communicate with the author.

EAST OF SCOTLAND UNION OF NATURALISTS' SOCIETIES.

ABSTRACT MINUTES.

THE Council of the Union met, on the 26th June, 1886, in Aberdeen. The Secretary intimated that during the year the Aberdeen Philosophical Society had joined the Union. He read an intimation that the Committee respecting Corresponding Societies of the British Association had recommended the Union as a Corresponding Society. It was agreed to elect Dr. Howden, or, failing him, Mr. Pullar, as Delegate for the year.

The Secretary intimated a desire on the part of the Kirkcaldy Naturalists' Society that Clause 4 of the Constitution of the Union should in future stand as follows: —"The business of the Union shall be conducted by the President, along with a Council of Representative Members. Each Society shall be represented by two Delegates if its membership is below 100, and by one additional Delegate for each additional hundred or fraction of one hundred members—the Delegates to be elected annually by each Society in the Union. The Council shall appoint one of its members to act as Secretary and Treasurer." The Council unanimously resolved to recommend the change to the consideration of the next General Meeting.

It was resolved to arrange for a three days' excursion to Braemar on 3rd, 4th, and 5th August, and the Secretary was instructed to obtain the names of those members desirous to join.

It was resolved to undertake the preparation of a Bibliography of the Fauna, Flora, and Geology of the East of Scotland, and that, with this view, a list of the more important periodicals and works in which information is contained should be drawn up and circulated among the members, with a note, asking each member to mark the book or books he is willing to index for the Bibliography.

6th AUGUST, 1881.—The Council met in Aberdeen, Prof. Trail

in the Chair. A Committee (Dr. Buchanan White, Prof. Trail, and Mr. W. D. Sang, Convener) was appointed to co-operate with the Secretaries of the various Societies to ascertain what steps should be taken to improve the distribution of Reports, Notices, and Circulars among the members. Prof. Trail was reappointed Editor of the Transactions. It was agreed to continue the arrangements for publication with the *Scottish Naturalist.*

The assessment for the year was fixed at 4d. per member.

The Secretary intimated that few replies had been received in answer to the circular requesting aid in the preparation of the Bibliography of the district;—and further arrangements were postponed to a future meeting.

Dr. Buchanan White, on behalf of the Perthshire Society of Natural Science, cordially invited the Union to meet in Perth in 1887, and it was agreed to accept the invitation.

The Annual General Meeting was held in the Anatomical Classroom in Aberdeen University, at 14 o'clock (2 p.m.) Prof. J. W. H. Trail in the Chair.

The minutes of all meetings since the last General Meeting having been read and approved, the President delivered his Address to a fair audience.

Dr. Struthers gave a discourse on the Tay Whale (*Megaptera longimana*), and other whales that have been taken on the Scotch coasts; and dwelt largely on the numerous rudimentary structures met with in whales. His lecture was copiously illustrated with diagrams and preparations.

Dr. Buchanan White reported on the Braemar excursion, and on recent discoveries among the Flowering Plants of Perthshire.

Col. Drummond Hay intimated, by letter, that his report on the Birds of the East of Scotland would be ready for printing this year.

Dr. Howden reported on the Fishes of the East Coast of Scotland; and as Delegate of the Union to the British Association in 1885, reported on the work of the Association.

Notes on Mosses of the North of Scotland, and specimens to accompany them, were sent by Mrs. Farquharson of Haughton.

Mr. Roy reported on the progress of his Catalogue of Algæ of the district; and the President submitted a report on additions to the records of Fungi of the district made since December, 1885.

The recommendation from the Kirkcaldy Naturalists' Society,

relative to the Constitution of the Union, was unanimously adopted.

A vote of thanks to the President closed the proceedings.

In the evening, the Aberdeen Natural History and Philosophical Societies entertained their friends at a conversazione in the University Buildings in Aberdeen. The University Museums were thrown open; and numerous microscopic objects and other articles of interest were exhibited in the large hall and in the Anatomical rooms. Among these were a very fine series of antiquarian relics from the North-East of Scotland, exhibited by Mr. John Rae; rare mosses, lent by Mrs. Farquharson of Haughton; botanical models, and a beautiful series of sections of wood so thin as to permit of being exhibited by transmitted light; a large collection of Crustacea, and another of food of fishes, both from the North-East of Scotland, and both exhibited by Mr. Sim; and a collection of Lepidoptera from Aberdeen and Kincardine, presented to Aberdeen University several years ago by Prof. J. W. H. Trail.

REPORT OF THE EXCURSION TO BRAEMAR.

By F. BUCHANAN WHITE, M.D. F.L.S.

THOUGH the excursion of the Union did not properly begin till August 3rd, when the members met in Braemar, yet as some of those who took part in it did some botanising on August 2nd, I purpose beginning this report with an account of that day's work.

August 2nd.—Arrived in the afternoon at the Spittal of Glenshee, and ascended Meal Odhar, in search of *Carex rariflora*. My companion, Mr. Peter Ewing, believed that during a previous excursion he had seen this interesting sedge within the Perthshire boundaries; but as he was not sure of the exact line of the march, it was desirable that, if possible, we should verify the occurrence of the plant in Perthshire. This we succeeded in doing. On the same hill we observed *Veronica alpina*, *Loiseleuria procumbens*, *Sibbaldia procumbens*, *Poa alpina*, &c. On another hill Mr. Ewing showed me *Epipactis ovalis*, which we

had discovered in this, its second Scottish station, the previous year. Near the same place, I found the pretty and rare moss, *Anacalypta latifolia*, and the local *Galium sylvestre*, a plant very liable to be passed over as a hill form of *G. saxatile*.

August 3rd.—Having a few hours to spare before starting for Braemar, we visited the station for *Thlaspi alpestre*, and saw a few plants of it. As this plant appears to be very scarce in Glenshee, it is to be hoped that botanists will give it a chance of becoming more abundant. After making some observations on the altitudes attained by some common plants, we crossed the Cairnwell to Braemar, and met the rest of the party. In the evening we visited the old station for *Galium Mollugo*, which still retains its ground; but searched in vain for *Aira uliginosa* in a place where it used to be abundant.

August 4th.—Making an early start, we drove to the foot of Lochnagar, on which we spent ten hours. After picking up *Betula nana*, which some of the party had not seen before, we explored a burn on the White Mounts, near which *Carex vaginata* was noticed growing in large beds on flat ground. Many of the specimens belonged to the so-called var. *borealis*, of which the chief distinction is that the male spike is bent at right angles to the stem. Descending the rocks on the north side of the hills, we proceeded to Loch an Eoin, finding in one of the other lochs *Isoetes lacustris* at an elevation of about 2,750 feet, a much higher altitude than is given for it.

Ascending the burn from Loch an Eoin, a careful but fruitless search was made for *Carex helvola*, which is supposed to have been found in the neighbourhood. *Carex lagopina* was found in the well-known station, but not much of it was seen. *Carex rariflora* was also found. Passing over the summit of Lochnagar, the great ravine was descended, and the rocks in it were explored. The special plants of the hill were observed, including *Saxfraga rivularis*, *Mulgedium alpinum* (which is, we are glad to say, still abundant), *Gnaphalium norvegicnm*, *Poa laxa*, &c. Amongst the debris the Parseley Fern was in great beauty, as, though so late in the summer, many of the fronds were just beginning to uncurl. As the mist showed signs of descending, a rush was now made to regain the ridge, which was done by ascending the rocks on the southern side of the corrie. Without further adventures, save that in the mist, the road to Ballater instead of that to

Castleton, was nearly taken by mistake, the party descended the hill.

August 5th.—Drove again to Loch Callater and went up Glen Callater to the corrie of Loch Kandor. In Loch Callater a quantity of *Isoetes echinospora* was observed. On entering the corrie of Loch Kandor one of the first plants to attract attention was *Rhinanthus crista-galli*, var. *Drummond-Hayi*, recently described (from Ben Lawers) in the *Scottish Naturalist*. This variety, which seems to be constant in its characters, has this year been observed on several hills in Perthshire, Aberdeenshire (it occurs on Lochnagar), and Inverness-shire. The whole day was spent in the corrie. Amongst the plants noticed were *Salix lanata* (several forms), *S. lapponum* (also in variety), *S. nigricans*, several forms, and *S. reticulata*, which seems to retain here more of its wooliness than in Breadalbane. *Carex atrata*, which was common, seems to be less dark in hue than in Perthshire. Other species seen were *Carex rupestris* (which is widely spread in the corrie), *C. vaginata*, *Veronica alpina* (with *Puccinia saxifragarum* infesting it), *Grimmia atrata*, a pretty crisped form of *Pseudathyrium alpestre*, &c.

With the Corrie the excursion may be said to have terminated, as the party went to Aberdeen early on the morning of August 6th. It may be added that some specimens of *Hieracium* and of *Carex* yet await examination.

EXCURSIONS.

On August 7th.—The heavy rain in the morning threatened to prevent the excursions arranged for under the auspices of the East of Scotland Union of Naturalists' Societies from being held, but by nine o'clock the sky gave promise of a fine day, and the excursionists assembled at the times and places announced, in connection with the trips to Scotston and Whitestripes, and Stonehaven and Dunnottar Castle. An excursion to Ballater, for which Mr. Roy had undertaken to act as guide, had been contemplated, but as no one appeared to take advantage of the opportunity of visiting Deeside, this excursion fell through.

The party for Dunnottar, with Professor Trail, numbered ten. Leaving Aberdeen at 9.45 they reached Stonehaven about 10.30, and took the opportunity, not before enjoyed by several of the party, of passing through the interesting old town of Stonehaven, and visiting the harbour, where a busy scene was presented, as is usual at this period of summer. The vicinity was redolent of ancient and fish-like smells, and the quays crowded with barrels and other characteristic features of a thriving fishing port. Leaving the harbour, the

party arrived in no long time at the historical ruins of Dunnottar—ruins that excite the admiration of even the most prosaic in the magnificence of their site and in their extent, and appeal far more powerfully to the imagination of every one acquainted with their connection with the history of Scotland, from the days of Wallace onwards through many a stormy century of struggles for existence and for liberty. The sufferings of the martyrs for conscience sake, and the constancy to their convictions of these earnest men, came vividly before the mind's-eye of those who stood within the miserable dungeon into which forty-two prisoners were lowered through a hole, and in which they were confined. It is difficult, however, to realise how life could be sustained when one looks at the only inlets for air, and at the filthy floor, with its oozing pool of water, and thinks of what it must have been, crowded with so many persons that there could scarcely have been even standing-room for all. The chapel, the kitchen, the bakery and brewhouse, the reception rooms, the officers' room, the wells, and all the other buildings of interest were in turn visited. A considerable part of the armoury has of late years fallen; and the action of the weather has so worn many of the softer stones of which the walls are built that probably no very long time will be sufficient to bring about the fall of large portions of the ruins. The black henbane (*Hyoscyamus niger*) formerly grew about the ruins in some abundance; but a search failed to disclose it on this day. A few plants of the wallflower and of the clustered bell-flower (*Campanula glomerata*), and profusion of the Burnet saxifrage (*Pimpinella saxifraga*) were observed growing upon the ruins.

Having completed their survey of Dunnottar, the party proceeded to the beach, noticing with interest the conglomerate of which the rock is composed. The wonderful hardness of the matrix in which the pebbles are embedded is very remarkable, but still more remarkable is the fact that many of the pebbles have been crushed or broken, apparently under great pressure, and the fragments, after having slid a little way over one another, have been recemented. A heavy shower fell between one and two o'clock in the afternoon; but, fortunately for the excursionists, shelter was at hand in one of the caves near the castle.

The rocks in the bay to the north of Dunnottar were visited after the shower ceased, and as the tide was low, seaweed-collecting was actively proceeded with. The rock pools were full of a considerable variety of forms, most of them frequent along our rocky coasts, but a good many of considerable interest. Among those gathered were several kinds of *Fucus*, the curious *Himanthalia lorea* with its frond much like a Scotch cap attached by the tassel to rocks, and bearing fixed to its middle, long, thong-like, reproductive organs, often nearly covered with parasitic *Elachistae*, the rounded yellowish masses of *Leathesia tuberiformis*, from the size of a pea to that of a walnut, and like soft cartilage in consistence. There were many graceful green or red species, *e.g.*, *Cladophora glaucescens*, recently added to the flora of the east of Scotland, *Ceramium rubrum*, varying extremely in appearance, *Desmarestia aculeata*, and many others. The following is a complete list of the species picked up in the course of the afternoon by Dr. Crichton:

Halidrys siliquosa, *Fucus vesiculosus*, *F. serratus*, *F. canaliculatus*, *F. nodosus*, *Himanthalia lorea*, *Desmarestia aculeata*, *Laminaria digitata* (washed

ashore), *L. flexicaulis*, *L. saccharina*, *Chorda filum*, *Dictyosiphon foeniculaceus*, *Asperococcus compressus*, *Chordaria flagelliformis*, *Mesogloia virescens*, *Leathesia tuberiformis*, *Elachista fucicola*, *E. scutulata* (on *Hæmanthalia*), *Ectocarpus littoralis*, *Polysiphonia nigrescens*, *P. urceolata*, and var. *patens* (on *Laminaria digitata*), *P. fastigiata*, *Laurencia caespitosa*, *Corallina officinalis*, *Melobesia polymorpha*, *Delesseria alata*, *D.* (*Maugeria*) *sanguinea* (washed ashore), *Rhodymenia palmata*, *Plocamium coccineum*, *Gymnogongrus* (*Ahnfeldtia*) *plicata*, *Chondrus crispus*, *Chylocladia articulata*, *Furcellaria fastigiata*, *Iridæa* (*Schizymenia*) *edulis*, *Dumontia filiformis*, *Ceramium rubrum*, *Ptilota plumosa*, *Callithamnion polyspermum*, *Enteromorpha compressa*, *Ulva latissima*, *Cladophora rupestris*, *C. glaucescens*, with *Ectocarpus siliculosus* growing upon it.

The conglomerate does not afford the crevices suited to the habits of most marine animals; and the pools proved less rich in them than in sea-weeds; anemones, hermit and other crabs, two or three kinds of sponges, sea worms, some kinds of shells, small fishes, and a fine seaurchin (*Echinus sphæra*) were turned out in the search for seaside treasures. The heavy rain rendered botanising on the sloping sea-braes impracticable till it was nearly time to return to Stonehaven; but a short search on them disclosed several interesting flowering plants, such as the Hemp Agrimony (*Eupatorium cannabinum*), a handsome composite plant with pink flowers, the Wood Vetch, and the Common Agrimony. The rain had brought out several kinds of snails to enjoy the moisture. The most interesting of these was the Bristly Snail (*Helix hispida*), a small species which has the shell covered with short erect pale hairs. After a most enjoyable day, the excursionists returned to Aberdeen about 18 o'clock (6 p.m.)

The party that visited Scotston Moor and Whitestripes Moss, under the guidance of Mr. Murray, were nine in number. They enjoyed glorious weather, and had a successful day's botanising over the best ground for the purpose in the vicinity of Aberdeen. The variety in the nature of the moor, from swampy ground to dry heaths, affords suitable conditions of growth for a very considerable diversity of plants. In the woods near at hand grow the beautiful little *Linnæa borealis* (the plant selected by the great naturalist Linnæus as his emblem and to bear his name), *Goodyera repens*, and other plants much in request by southern botanists. On an old road across the moor those initiated may find the two smallest British flowering plants—viz., the Chaffweed (*Centunculus minimus*) and the Flax-seed (*Radiola millegrana*). The beginning of August is too late for many of the plants on the moor; but the excursionists found in flower the Red Bartsia (*Bartsia Odontites*), the Grass of Parnassus (*Parnassia palustris*), the Knotted Pearl-wort (*Sagina nodosa*), the Field Gentian (*Gentiana campestris*), the Black Bogrush (*Schœnus nigricans*), and the English Sundew (*Drosera Anglica*), one of the fly-eating plants. Three other insect-eating plants grow on Scotston Moor, viz., the Round-leaved Sundew (*D. rotundifolia*), the Butterwort (*Pinguicula vulgaris*), and the small Bladderwort (*Utricularia minor*). Several mosses were also picked up in fruit, including *Dicranum squarrosum*, *Leucobryum glaucum*, *Hypnum aduncum*, *Atrichum undulatum*, and *Bartramia fontana*. In Whitestripes moss the old peat-holes were found of much interest. In one the small Bladderwort (*Utricularia minor*) was in fine flower; and in several the

common Bladderwort (*U. vulgaris*) was seen, though not in flower. These plants seem frequently to pass years without flowering, and then to burst into abundant blossom. The Water Milfoils (*Myriophyllum alternifolium*), and Marestail (*Hippuris vulgaris*) are plentiful and flower freely in many of the holes, and show well the distinction in appearance between submerged and aerial leaves. The very local Small Burreed (*Sparganium minimum*) grows in one or two holes, and there is plenty of the Branched Burreed (*S. ramosum*).

PRESIDENT'S ADDRESS.

By Prof. TRAIL.

ON THE WORK OF THE UNION.

In the present address, I will not attempt to rival the admirable addresses of our first president, Dr. Buchanan White, and of my immediate predecessor, Professor Geikie; but will follow in their footsteps in endeavouring to suggest methods by which the members of the Union can, if desirous, carry forward the work which all have at heart, and to indicate how with most success an abundant and fruitful harvest of knowledge may be reaped. The selection of subjects has been made solely because it is necessary to limit attention to a few at present, and in full recognition of these being but a few out of many. There is room and there is work for all who seek to discover and to spread abroad a knowledge of the mysteries of the Universe. We heartily wish that every Association formed for similar ends with our own should spread and be fruitful and do good work in its own special line. Archæology is a study of the utmost interest for local societies, and we rejoice that it is proposed to form a society in the north-east of Scotland for the investigation and publication of archæological materials in the widest sense. If it preserves to posterity the folk-lore, and the traditions and historical records of this district, it will deserve well of the community. But, however wide one's sympathies may be, one's ability for useful investigation lies within but a narrow range; and it is right that each one who addresses this Union should confine himself to matters with which he has made himself, at least in a measure, familiar, and in treating which he is entitled to hope that he may aid the work of his fellow-members.

There is complete agreement among all interested in the welfare of societies such as form the East ot Scotland Union, that the great objects for which the societies exist are to afford all practicable encouragement and facilities for the acquirement of knowledge to each of their members, and to advance the sum of human knowledge as a whole, in so far as that can be accomplished by original investigations, carried on in connection with the society, and facilitated by co-operation of the members. Only by such co-operation is it possible to gain the full benefits of work in societies, as contrasted with work done by isolated individuals.

It is cause for regret that this beneficial effect of societies is only an ideal in most provincial societies. The work to which a society devotes itself may be literary, or may be in great measure confined to some physical science; or it may be antiquarian; or more generally it relates to the sciences of geology, zoology, and botany, often associated with archæology. It is seldom that any discovery of a very far-reaching kind is first made known in any local society or published in its transactions; since such discoveries tend to be brought forward in large societies, or in journals important enough to secure for them a wide and general circulation. But while startling discoveries are not to be looked for in the publications of provincial societies, good work of permanent value may be, and often is, done in them in adding to human knowledge by the careful and minute investigation of the district in which each society is situated, whatever be the science or sciences that find most favour among its members.

It is well that the progress of human knowledge in all departments should be made known very widely, and that those persons in each society best fitted to do so by their special studies should call attention to, and should explain to their fellow-members, the nature and scope of the great discoveries made by the great leaders of progress. But if the work of societies is confined to acquiring a knowledge of the results attained by others, without an effort to advance the sum of human knowledge by their own labours, or to repay in some measure the obligations under which they lie, the effect will be of necessity evil to the highest aims of the societies; and the original interest in their welfare will rapidly diminish, and will die out wholly in no long time. Societies, if healthy, will manifest their vitality by the value of the original

work done by them, and not merely by the amount of intellectual food consumed in them without visible result.

In the case of provincial societies there can be little doubt that, at the present time at least, among the most productive subjects of study is the wide field afforded by the exhaustive investigation of what lies closest at hand. There is no need to search painfully for something to investigate. The materials are everywhere around us with which to build up a portion of the great edifice of human knowledge; but the builders are few and weak. Among the data from which information in regard to the laws that rule living organisms may be gathered are the existing distribution of animals and of plants, and the variations that follow changes in the environments amongst which they live. It is not easy to solve such problems; yet on their successful solution there will follow a very great advance in the clearness of our conceptions of the laws that regulate or modify the form and the structure of living beings. But to comprehend fully the nature of the problems to be solved, and to discover their solution, will necessitate long-continued and most careful observations, and far-reaching conceptions of the physical and chemical forces, both in their present manifestations and in their modes of action in the past history of our globe, and, it may be, of the whole universe. Such observations can be carried to a successful issue, and can lead to well-founded conclusions only when they are undertaken by many observers, working under various conditions. Hence careful observations from any area, however limited, will add to the material ready to the hands of builders of the future temple of science.

No field is too barren to yield a harvest in the realms of natural science if it be but thoroughly wrought; nor may any society plead with truth that it is not in a position to do good and enduring work. Let each society undertake earnestly and conscientiously to learn what can be discovered of the products of its own neighbourhood; and, however poor the fauna and flora may seem, or however little interest may seem to belong to the geology or to the antiquities of that neighbourhood, a short experience will suffice to prove how erroneous were first estimates, and to suggest subjects of inquiry sufficient to engage the members of the society in long-continued original observations, productive of valuable results, and far surpassing in interest any mere attempts to comprehend the work of others, apart from original investigation.[1]

To render the work of local societies as important as it ought to be, it is desirable either that each society should publish papers, or else that several societies should unite to publish in common the papers selected by a Publication Committee as worthy of permanent preservation. Much useful work is lost sight of if no record of the papers read is kept, save in the minutes of each society; and there is far less inducement to careful preparation of the papers read at the meetings if it is known that they will never come before a public larger than the few who hear them read. On the other hand, it is very unadvisable to publish everything that is brought before a society. This is very evident from an inspection of the transactions of such bodies as do so, whether from the desire to produce a large record of work, or through unwillingness to offend contributors. It is a heavy tax on one's time and patience to wade through page after page of chaff to pick up the few grains that are worth the storing. To render the work of local societies of value it is very desirable that certain preparatory work should be carried through, and that certain accessories fitted to promote the successful issue of their labours should be first attended to. To one or two of these I have now to ask your attention for a little; and I shall deal with them as if they related solely to the biological sciences that are most familiar to myself; but they apply equally to all other branches that are usually included in the programmes of such societies as form this Union.

In pursuing original investigations of any kind it is, of course, most desirable to possess a full knowledge of what has been already made public in regard to it. It has doubtless happened to many of us that we have sought to procure such information, to prevent the loss of time consequent on doing over again what has been already done by others. One early experiences the difficulty of gleaning from scattered books and periodicals the information desired, and one often finds that interesting matter has been overlooked in some work that has escaped notice, which, had it been discovered in time, would have saved a good deal of labour.

Such experiences soon press upon the more earnest workers the conviction that among the most valuable aids to progress in any branch is a good bibliography, or classified index to all the sources of information upon that branch in books and magazines. For example, the student of the Mollusca of the East of Scotland will

find an excellent Bibliography of the Land and Fresh-water Shells among the "Transactions of the Union for 1885." Mr. Henry Coates deserves very hearty thanks for the labour expended upon this list, and also for having made a beginning in so desirable a direction; and it is earnestly wished that similar bibliographies of other groups should follow with as little delay as possible.

To some it may seem that the work of the bibliographer is hardly more than mechanical, and that it is beneath the dignity of scientific students; but in truth this view is very erroneous. A well-prepared index greatly facilitates, if it is not indispensable to, the work of students. To prepare such an index in the very nature of things requires a wide acquaintance with the sources of information upon the subject in question. If each specialist does the work wholly for himself, he might well despair in contemplation of the mass of books to be consulted, often with little, if any, return for much labour. If prepared by a single observer unassisted, the index, must remain defective and unsatisfactory, alike to its compiler and to those who make use of it. But index-making can be rendered at once more pleasant and more thorough by division of labour. If the books and periodicals that must be consulted are portioned out among a number of workers, the share that falls to each can quite be overtaken; and in a comparatively short time the work will be completed, and a reliable index be placed within reach of all.

A circular has been issued by the Council of the Union specifying the more important works and periodicals in which information is contained relating to the biology and geology of the East of Scotland; and volunteer compilers have been asked for, to permit of the work being completed in these departments. The list in the circular is by no means complete, but it is a beginning; and additions can readily be made to it; and suggestions towards rendering it more complete are much desired by the Council.

Each of the works named in the list, or to be added to it, should be taken in hand by a compiler, who should note all references to whatever comes under the scope included in the widest interpretation of the term Bibliography of Biology and of Geology in the East of Scotland. Each separate article should be noticed; its heading should be given in full; and there should also be a brief indication of the scope and value of the articles. References should be added to notes, however brief, in which any real infor-

mation is given. The title and page of the book, and the year of publication, should be noted. The references should be assorted, and should be distributed to the recorders for the various branches.

The recorders, when they have received reports from the compilers, should then put the information supplied to them into a systematic form suitable for easy and ready reference. With cordial co-operation on the part of compilers and of recorders, a good index might be prepared, in the course of a year or two, for almost all departments of the zoology, botany, geology, and archæology of the east of Scotland.

There is still need of assistance from compilers; and help will be gladly accepted if volunteers will communicate with Mr. Sang.

Another object of importance urged ably in the first presidental address is the preparation of preliminary lists of the products of the district, so as to permit of an estimate of how much has yet to be done. The preliminary reports submitted at the meeting of the Union in 1884 should be referred to for what had been done up to that time, and also for a statement of what most requires to be taken in hand in each department. Since these reports were written some advance has been made here and there; but substantially they are still quite reliable.

Now, as then, the recorders will be very glad of any information or assistance from any members of the Union who may be able to give such. The preparation of lists of species is being gone on with, and the varieties met with in our district are also under observation.

But even more important than the formation of a complete bibliography and lists of the fauna and flora, geology, mineraology, and archæology of the east of Scotland, in exerting an influence for good, and in supplying a powerful stimulus towards raising the level of the work done by societies, is the formation of a good museum in each centre of the population, and connected with each society.

So long as the meetings of the societies are productive of no more permanent result than the reading of papers, even if these are subsequently printed, and afforded the limited circulation which is given in the "Transactions," much work is lost sight of, and does not in any degree tend to place the local students of natural science on a higher level, or to render the way more easy

to beginners, who, with a little encouragement and aid over their earlier difficulties, would do good work in their turn. To one who is not already a specialist a list of names conveys little information, and gives little help; but the study of a carefully-selected and well-arranged museum gives both assistance and pleasure to even the tyro who has the desire to learn from it; while even the adept finds a visit to such a museum profitable.

The value of museums as auxiliaries in public education has been appreciated far more fully in England than in Scotland; and there are few English towns, even of small size, where there is not one. In a good many towns they are supported by a rate in connection with the free libraries, while in others they depend on voluntary contributions. In the East of Scotland we are not largely provided with museums, and such as exist find it difficult to make headway. Want of appreciation of their value, and want of interest in their welfare among the general public, and consequent absence of the support that they require, is the common experience of all who endeavour to promote them.

There is a museum in our district which affords an example of what may be done in a few years by energetic and judicious efforts, directed to the attainment of success on a plan not too ambitious to permit of being achieved. That museum is the excellent one formed by the Perthshire Society of Natural Science. It approaches very near the ideal of what a provincial museum should be; chiefly, because it was begun on a definite plan, and was carried on strictly upon that plan, so that in it everything has its proper place. It is thus free from the heterogenous assemblage of objects so apt to form the contents of museums that grow up by the mere aggregation of the miscellaneous gifts of years —gifts, the motive of which too often seems to be merely to clear houses of accumulations brought together by former generations, but that are felt by their latter possessors to be encumbrances.

A really valuable gift is made when some person ascertains what is required for the completion of the collections, and then proceeds to fill the blank. Much may be done in this way by any one who selects some group (*e.g.*, grasses, ferns, butterflies and moths, or shells), and endeavours to prepare for the museum a complete collection of that group from his own neighbourhood. Such a method of giving assistance costs the donor little; whilst

it imparts an interest to his leisure and to his rambles that they never before possessed.

That this method has been followed by the Perthshire Society in forming their museum is abundantly evident, and an example has been set by its members to all of us. All honour to them for what they have done, and most of all to Dr. Buchanan White, to whose example and care the success of that museum is chiefly due.

Every society in the Union may take example by the Perthshire Society, and encouragement also, for what one has done others may surely do. Most of all is there need of so good an example in Aberdeen and in other centres where museums have still to be formed. The fact of there being a University in our midst in Aberdeen seems almost to be a hindrance to the progress of such a movement here; for too many seem to believe that the existence of the means of teaching in the University is all that can be desired for the city, and that nothing besides need be aimed at. But in an institution devoted to teaching, the museums must be adapted to the kind of instruction given in the classes in connection with which they are formed; and their contents are therefore, as a rule, too technical to be of much interest to the general public, who have not had the preparation required to fit them to benefit fully by the instruction that a specialist, or even a student, can derive from them. In Aberdeen there is need of a well-equipped museum apart from the University, and the need is no less in other towns.

We have made a commencement in Aberdeen, so far as having obtained the use of a room in the present Free Library Buildings. Cases are now in the room, and a beginning to the collections has been made; and now it rests with those who believe that a public museum in Aberdeen is a thing worth making an effort to obtain, to contribute the necessary funds and specimens to secure its success.

My connection with this movement in Aberdeen has led me to inquire into the question of what a provincial museum should consist of; and in what way a good museum is likely to benefit the public of the district in which it is formed, and what ought to be the relation of the local natural history society or societies to it. It is important that there should be no misunderstanding as to what should be included, for the want of a definite plan of

development may prove fatal to usefulness and success. It may be devoted to any one of the sciences of botany, zoology, geology, mineralogy, or archæology, or may include all; and this latter is probably the better plan, for a time at least, as it permits of collections being amassed, in anticipation of a possible division into two or more museums should the accumulations increase beyond a convenient size. The various departments in a general museum of this kind must, of course, be kept carefully apart, not mingled in one indiscriminate mass of confusion, as is too often the case in collections that aim at including things of every kind, and over which there is no proper supervision.

But, assuming that sufficient care is exercised in keeping the various classes of objects apart, there is a yet greater danger to be guarded against in a provincial museum: and that is the effort to include too much. The space that can be devoted to it is never so great as to permit of accumulating very large collections; and if the attempt be made to include representatives of any group from all parts of the world, this usually means that some other group must remain ill-represented, if represented at all. Hence a false conception of the relative importance of the various groups is apt to be formed. A still worse effect is that the products of the district in which the museum is situated are apt to be set aside in favour of objects whose chief recommendation is the distance from which they have been brought. In this way some of the most valuable ends that a museum should serve, in affording means for public education, are sacrificed to the desire for novelties.

It would be easy to quote the words of Owen, Phillips, Edward Forbes, and other leaders in science; but it will be preferable merely to summarise the conclusions arrived at by them in regard to the management of provincial museums. They all deprecate efforts to make such museums general, as this is to attempt what is far beyond the power of their promoters to accomplish. Those who wish to see large and complete collections, or to study the *minutiæ* of any natural science, must resort to National Museums such as exist in every civilized capital. These are supported by national resources, and enriched by collections presented or bequeathed to them by men of science, who have laboured and accumulated their treasures in every country and ocean in the world. Only such national institutions can hope to accumulate

with success, or to render available for study the vast materials that the world supplies.

No town can, from its own resources, afford to support such extensive collections, nor is it desirable that the attempt should be made. It is well that there should be materials of the most complete kind within reach of specialists. But in the interest of the specialists themselves it is not desirable that more than one or two museums aiming at completeness should exist in a country; for then they lose their national character; and type collections, which tend to become absorbed in the national museums on the death of the specialists who formed them, would be apt to be dispersed, instead of flowing into a readily accessible centre.

In this Union we must set aside the thought of large and world-wide collections; and must recognize that ours must be provincial museums.

The unanimous advice of those skilled in the management of public museums is that, in provincial museums, there should be two aims kept always in view. These are, *first*, the formation, for educational purposes, of a collection confined to certain carefully selected types, illustrated in the fullest detail with preparations to exhibit structure, life history, and every feature that can aid the visitors to the museum in gaining a clear conception of the facts and data of natural science; and, *second*, the preparation of purely local series, designed ultimately to be as complete as it is possible to make them.

From the latter collections a scientific stranger visiting a district could gain as good or even better knowledge of its products in an hour or two in the museum as could be done from a residence of months without this aid. But a still greater advantage follows the preparation of complete local collections, in that access to them encourages beginners; who find themselves able to identify in the museum the specimens that they have themselves found; and the earlier and more arduous portions of the ascent to knowledge are thus smoothed away for them. It is no slight gain to assist in any degree the early efforts of those who may by their labours afterwards materially advance the progress of science.

The relations between natural history societies and provincial museums ought to be close and intimate; and, if they are so, the effects on societies and museums alike will be very beneficial. The museums, being for the benefit of the public, deserve and

ought to receive, large support from the public; though, in procuring that support, much of the organisation and labour will, in almost all cases, fall on members of the societies.

I would still ask your indulgence for a little, while I endeavour to suggest certain ways, in which the societies embraced in the Union can aid each other, or can co-operate with mutual advantage in this matter. Our museums would receive valuable assistance were specialists in all parts of the district to recognise that each museum in the Union has a claim on every member in it for help, in the form of duplicate specimens, and of assistance in identifying specimens where required.

Another matter in which co-operation would help us much, is in papers. Every secretary knows the difficulty of obtaining satisfactory papers for the meetings of his society, and he has to apply to the office-bearers of his society, as a last resource, far too often. A remedy is easy. Why not let the papers read to one society be read to others, in which they would be virtually new to the members.

This address has become so discursive that a recapitulation of the points urged in it on the consideration of the Societies may not be amiss. These are—(1) the importance of forming a complete bibliography of all that relates to the east of Scotland in so far as falls under the scope of the Union. (2) The preparation of complete local lists. (3) The need of public museums in the centres of population in the east of Scotland, what they should include, what is the true relation to them of the societies, and how the societies can assist each other in forming them. (4) The exchange of papers between the societies.

One word I wish to add in conclusion that bears directly upon a hobby of my own. I shall be much indebted to all members of the society who will kindly aid me with information regarding, or specimens of diseases of plants in the district, more especially as they affect farm and garden produce. The value of such information is very great, and is constantly increasing.

REPORT ON THE ORNITHOLOGY OF THE EAST OF SCOTLAND, FROM FIFE TO ABERDEENSHIRE INCLUSIVE.

Prepared for the East of Scotland Union of Naturalists' Societies.

By Col. H. M. Drummond Hay, C.M.Z.S.

IN submitting the following report of the birds found in the eastern counties of Central Scotland, which I do at the request of the East of Scotland Naturalists' Union, it is hardly necessary for me to say, that to confine such a report to a hard and fast line of any particular county would not be giving a correct view of the bird distribution of the district. To obviate this, I have therefore adhered as much as possible to the several water-sheds, as the great valleys, together with the headlands and coast-lines, are considered by ornithologists to rule migration to a large extent, and should, in drawing up such a fauna, be strictly followed. Thus, to the North, that portion of Aberdeenshire comprised in the Buchan district, and which properly belongs to the Fauna of the Moray-Firth, is kept separate from the Dee and Don district, as also to the South, those portions falling within the water-shed of the Forth are kept distinct from that of the Tay. At the same time, I have endeavoured, as much as possible, to conform with the request made to me, in giving the individual faunas of the several counties; this is shown in the tables of distribution, as well as in the notes and summary at the end, where particular mention is made of the several species that have been found exclusively in the Buchan and Forth districts. In the latter, to avoid breaking the continuity between Perth and Fife, the intermediate counties of Clackmannan and Kinross, together with the small detached portion of Perth in the Culross district, have been included in the tables under Fife.

The following contractions are made use of in the subjoined list :—

R.—Denotes residents, or birds living in a locality more or less during the whole year.

S.—Summer migrants that breed in the locality.

W.—Winter migrants, arriving in autumn and leaving in spring.

Sp. A.—Birds that occur only during the spring or autumn migration, or both, but that do not stay in the locality.

Oc.—Occasional or periodical, but not quite regular visitants.

Ab.—Abnormal or irregular visitants, occurring only at long intervals.

Obs.—Doubtful visitants, insufficiently identified.

c, *—common ;* n,*—not common ;* r,*—rare ;* l,*—local.*

a.—Denotes those species that have only been noticed in those parts of the counties not included within the Don, Dee, and Tay basins.

b.—See note below.

	Aber-deen.	Kin-cardine.	Forfar.	Perth.	Fife.
1 Missel Thrush ...	R.c	R.c	R.c	R.c	R.c
*b*2 Song Thrush ...	R.c	R.c	R.c	R. ? c	R.c
*b*3 Redwing	W	W	W	W	W.c
4 Fieldfare	W	W	W	W	W.c
5 Blackbird	R.c	R.c	R.c	R.c	R.c
*b*6 Ring Ouzel	S.l	S.l	S.l	S.l.c	Sp.A.n.l
7 Dipper	R.c	R.c	R.c	R.c	R.c
8 Wheatear	S	S	S.c	S.l.n	S.c
9 Whinchat	S.n	S.n	S.n	S.l	S.n
*b*10 Stonechat	S.n	S.n	S.n	S.l	S.n
*b*11 Redstart	S	S	S	S.l	S.n

2. **Song Thrush** remains the winter in Aberdeen (*fide* Mr. G. Sim and Rev. T. Bell, Alford), and in Kincardine (*fide* A. H. Simpson, Esq.) Mr. Simpson and Mr. Henderson say that it remains the whole winter on the Forfarshire coast ; but in Perth, as far as I can ascertain, it leaves in October, and returns in February, except in very mild winters ; this certainly is the case in the Carse of Gowrie.

3. **Redwing** in very severe winters is driven further south than Perth.

6. **Ring Ouzel.**—In the eastern and lowland districts of Forfarshire is seen only on its passage south, late in autumn, often in the beginning of November. In Perth it is common among the mountains. Mr. Malloch says that it sometimes remains all the year in some of its habitats.

10. **Stonechat** remains in Forfar, Perth, and Fife, if the winter is not very severe.

11. **Redstart.**—Not uncommon in various parts of the Perth Highlands ; breeds freely near Rannoch Lodge.

	Aber-deen.	Kin-cardine.	Forfar.	Perth.	Fife.
*b*12 Black Redstart ...					Ab.*a*
*b*13 White-spotted Blue-throat					Ab.*a*
*b*14 Red-spotted Blue-throat	Ab				
15 Robin	R	R	R	R.c	R.c
16 Whitethroat	S	S	S.c	S.c	S.c
*b*17 Lesser Whitethroat ...	Ab			Obs.	
*b*18 Blackcap	Oc		S.n	S.c.l	S.c.l
*b*19 Garden Warbler ...	S.n		S.n	S.c.l	
20 Golden-crested Wren	R	R	R.c	R.c	R.c.l
*b*21 Chiff-chaff	Oc		Oc.	Obs.	
*b*22 Willow Wren ...	S.n	S.c	S.c	S c	S.c

12. **Black Redstart** at Kincardine on Forth, Nov. 10th, 1875, J. A. Harvie Brown, Esq., *ipse*, Proc. R. Phil. Soc. IV., p. 142.

13. **White Spotted Blue Throat** (Cyanecula Wolfi).—A specimen of this, the more southern of the Blue Throats, is described by Mr. Harvie Brown in the *Scottish Naturalist*, of January, 1882, p. 205, as having been got on the Isle of May, on the 22nd September, 1881.

14. **Red-spotted Blue Throat** (Cyanecula Suecica).—Mr. George Sim, Aberdeen, records the capture of a specimen of the northern Blue Throat at Aberdeen, 16th May, 1872, which flew on board a fisherman's boat. (*Scot. Nat.*, July, 1872, p. 226.)

17. **Lesser Whitethroat.**—Fully believed to have been seen by the late Sir Thomas Moncrieffe, a keen observer, breeding at Moncrieffe, but the nest was unfortunately destroyed before the eggs were laid. In Aberdeenshire, Mr. George Sim, Fyvie, makes mention of an example having been shot at Gourdas, Fyvie, 4th Nov., 1880, and another seen near there.—(*Scot. Nat.*, vol. vi., p. 13.)

18. **Blackcap** not reported from Kincardine, but probably found.

19. **Garden Warbler** is reported from Aberdeen by Mr. G. Sim and Rev. T. Bell.

21. **Chiff-chaff.**—Dr. Macgillivray, in his "History of Deeside," mentions the bird as found there, but considered as a rare visitor; and Mr. Gray states that Mr. Angus obtained one, on the 8th May, 1865, and in the May following he saw it at Aboyne, and again in June, 1867, at Wardhouse, near Insch.—(Bds. W. Scot., p. 98.) Is reported from Montrose by the curator of the Montrose Museum, and from Arbroath by A. H. Simpson, Esq. Nest and eggs reported from Craigie, near Perth, 1884; but the bird has never been obtained there. It is supposed to have occurred in Rannoch.

22. **Willow Wren** is the commonest of our summer migrants throughout nearly the whole district. In Perth, I have seen it breeding on the Island in Loch Lydoch, above Rannoch Moor.

	Aber-deen.	Kin-cardine.	Perth.	Forfar.	Fife.
*b*23 Wood Wren ...	Oc		S.n	S.l.c	
*b*24 Reed Warbler ...			Obs.	Obs.	
*b*25 Aquatic Warbler ...				Obs.	
26 Sedge Warbler ...	S	S.	S.l	S.l.c	S.l.c
*b*27 Grasshopper Warbler	Ab.			Ab.	
28 Hedge Sparrow ...	R.c	R.c	R.c	R.c	R.c
*b*29 Bearded Tit ...	Ab.*a*		Obs.		
*b*30 Long-tailed Titmouse	R	R	R	R.l	R.n
31 Great Titmouse ...	R	R	R.c	R.c	R.c
32 British Coal Titmouse	R	R	R.l.c	R.c	R.l.c
*b*33 Marsh Titmouse ...					Oc.
34 Blue Titmouse ...	R	R	R.c	R.c	R.c

23. Wood Wren.—Seen abundantly by me in Perth, on the wooded banks of the Lyon, near Cushieville; common also in some places round Perth, and I have observed it frequently in Athole and Strathtay. Probably overlooked in Fife. For Aberdeenshire, Mr. Horn (Procd. Nat. Hist. Soc., Glasgow), makes mention of the nest and eggs, as also a specimen being procured at Fyvie in 1862; and Mr. George Sim states that two were seen at Fyvie, and one of them shot, in the beginning of May, 1772.—(*Scot. Nat.*, July, 1872, p. 226.) These are the only instances I have been able to ascertain of it having been noticed in the above county, it can, therefore, only be considered as an occasional visitor there.

24. Reed Warbler is believed to breed in Perth, on back waters of the Tay above Kinclaven, where the birds have frequently been seen, though never obtained.

25. Aquatic Warbler.—A nest, suspended among coarse grass and rushes, was found on the banks of the Tay, above Perth, last summer, 1885. The eggs in it corresponded exactly with Seebohm's description; but the bird unfortunately was not identified.

27. Grasshopper Warbler may occur oftener than is supposed, but from its skulking habits it eludes observation. In Perth, Mr. Malloch obtained a specimen some years ago at Methven, but no others have since been got. In Aberdeen, Mr. Stuart M. Burnett has found this species among stunted fir, heath, and whins; a specimen was shot near Kintore.—(*Scot. Nat.*, July, 1871, p. 84.)

29. Bearded Tit.—A specimen is recorded as shot in Aberdeenshire by the late Thos. Edward (Zool., 3rd Ser., p. 1255). Mr. Gray alludes to this bird being catalogued as a Forfarshire species in Don's "Fauna and Flora" of that county, published early in the century.

30. British Long-tailed Titmouse, in some parts of Forfar as a winter visitant only.

33. Marsh Titmouse is reported from Fife by Mr. John Gilmour.

	Aber-deen.	Kin-cardine.	Forfar..	Perth.	Fife.
*b*35 Crested Titmouse ...			Obs.	Ab.*a*	
*b*36 Nuthatch			Obs.	Obs.	
37 Tree-creeper ...	R	R	R.c	R.c	R.c
38 Common Wren ...	R	R	R.c	R.c	R.c
*b*39 White Wagtail ...					Ab.*a*
*b*40 Pied Wagtail ...	R?	R?	R? c	R.c	R
41 Grey or Yellow Water Wagtail	R	R	R.c	R.c	R
*b*42 Yellow Wagtail ...			Obs.		Ab.
*b*43 Meadow Pipit ...	R?	R?	R?	R?	R.c
*b*44 Tree Pipit	S.n		S.n	S.l	S.l.n
*b*45 Rock Pipit	R	R	R		R.c
*b*46 Golden Oriole ...			Ab.		
*b*47 Great Grey Shrike ...	Oc.		Oc.	Oc.	Oc.

35. **Crested Titmouse** is mentioned by Yarrell as found in the Pass of Killiecrankie, but I have never been able to substantiate this, nor have I a notice of it from any other part of Perth, with the exception of two specimens got in the Forth district, in the Blairdrummond woods, by the late Dr. Saxby, in April, 1858.—(Gray, Bds. W. Scot., p. 104.)

36. **Nuthatch.**—Recorded by Don, in his "Fauna of Forfarshire," as having been got in the Tannadice woods, near Forfar, in the beginning of the century; and in Perthshire it is enumerated among the rare birds of the parish of Killin by the Rev. Patrick Grant.—(Gray, Bds. W. Scot., p. 200.)

39. **White Wagtail.**—Mr. D'Arcy W. Thompson makes mention of two of these birds having been got at Burntisland, in Oct., 1875.—(*Scot. Nat.*, vol. iv., p. 328).

40. **Pied Wagtail**, in Perth and Fife, does not always remain during winter.

42. **Yellow Wagtail.**—In Forfar one was seen, in spring of 1872, by Mr. P. Henderson; I have no authentic record of its occurrence in Perth: but in Fife a pair were identified near Anstruther, in May, 1883, by Al. Foster, Esq.; and one was obtained by Mr. Harvey Brown on the Isle of May, Oct., 1884.—(Report on Migration of Birds.)

43. **Meadow Pipet** does not always remain all winter.

44. **Tree Pipet** is not uncommon in many parts of Perth; and it extends to Athole and Strathtay.

45. **Rock Pipet** is confined to rocky shores.

46. **Golden Oriole.**—In Montrose Museum, in autumn 1885, I observed a pair of these birds, male and female, in full summer plumage, which Mr Barclay of Inchbrayock informs me were shot near Montrose about the summer of 1855.

47. **Great Grey Shrike** is not unfrequent in Forfar, Perth, and Fife.

	Aber-deen.	Kin-cardine.	Forfar.	Perth.	Fife.
*b*48 Red-backed Shrike...	Ab.*a*		Ab.		Ab.*a*
*b*49 Waxwing	Oc.		Oc.	Oc.	Oc.
*b*50 Spotted Flycatcher ...	S	S	S	S	S.c
*b*51 Pied Flycatcher ...	Oc.			Ab.	Oc.*a*
52 House Swallow ...	S	S	S.c	S.c	S.c
53 House Martin ...	S	S	S.c	S.c	S.c
54 Sand Martin ...	S	S	S.l.c	S.c	S.c
*b*55 Goldfinch			R ?	R ?	R.n
*b*56 Siskin	R	R	R.n	R.i	Oc.
57 Greenfinch	R.c	R.c	R.c	R.c	R.c
*b*58 Hawfinch	Ab.		Ab.	Ab	O.c

48. Red-backed Shrike.—A specimen was shot at Charlton, near Montrose, about 1864 or 1865 (*fide* J. A. H. B.) Mr. Gray (Bds. Scot., p. 67) alludes to one having been got near Peterhead, about the year 1883; and states that he has one in his own collection, which was killed near Cupar-Fife, in the autumn of 1861; and one is reported from the Isle of May, 5th May, 1885.—(Report on Migration, 1885.)

49. Waxwing.—A female in full plumage was shot at Seggieden, near Perth, on January 28, 1883, out of a small flock of seven or eight, which were feeding on holly berries, in company with redwings.

50. Spotted Fly-catcher is not reported from the upper parts of Aberdeen.

51. Pied Fly-catcher.—Once shot at Moncreiffe some years ago (*fide* Sir. T. M.); and has been got, with nest, in Fife, at Gibston, near Largo. Mr. Geo. Sim, Aberdeen, mentions no less than seven specimens of this species as shot in the county of Aberdeen; and, doubtless, there have been many other examples unrecorded. In May, 1872, three were shot on the Links by Mr. Alex. Mitchell; one got on Donside, one at Peterhead, one at Hazelhead in 1842, and another at Bruckley Castle in 1849.—(Gray, Bds. W. Scot., p. 70.)

55. Goldfinch.—Once plentiful in Forfar and Perth, is now nearly extinct.

56. Siskin.—Found breeding abundantly on Deeside; probably occurs in Kincardine, though not reported; breeds in Athole, but is only a winter visitant in Lowland Perth, though pretty frequent where alders abound.

58. Hawfinch has been shot near Montrose; also near Perth in winter of 1860-61. Mr. Gilmour reports it as rare and occasional in Fife, and Mr. Malloch reports having seen five together near Kinross in the beginning of May, 1885, and Mr. Gray mentions its being found in Aberdeenshire.—(Bds. W. Scot., p. 144.)

	Aber-deen.	Kin-cardine.	Forfar.	Perth.	Fife.
*b*59 House Sparrow ...	R.c	R.c	R.c	R.c	R.c
*b*60 Tree Sparrow ...	S.r	S	S		
*b*61 American White-throated Sparrow ...	Ab.				
62 Chaffinch	R.c	R.c	R.c	R.c	R.c
*b*63 Brambling	W	W	W.l	W.l	W.n
64 Brown Linnet ...	R.c	R.c	R.c	R.c	R.c
*b*65 Lesser Redpole ...	R		R.l.n	R.l	R.n
*b*66 Mountain linnet or Twite	R		W.n	R	
67 Bullfinch	R	R	R	R	R.n
*b*68 Parrot Crossbill ...				Oc.	
69 Common Crossbill ...	R		R.n	R.l	Oc.n
*b*70 American White-winged Crossbill ...				Ab.	

59. **House Sparrow** in Perth has greatly increased of late years; formerly absent from, or very rare in, the Highlands, it now abounds everywhere.

60. **Tree Sparrow** found breeding near Stonehaven by myself, and near Arbroath by A. N. Simpson, Esq.

61. **American White-throated Sparrow.**—Mr Gray (Bds. W. Scot., p. 132), alludes to an example of this American species having been shot by Alex. Mitchell, on the 17th August, 1867, on the Links at Aberdeen (Zool.. 2nd Ser., p. 1847-49.)

63. **Brambling.**—Rev. T. Bell suspects this bird may sometimes breed in Aberdeen.

65. **Lesser Redpole.**—Not reported from Kincardine, but probably found.

66. **Mountain Linnet or Twite** reported from Aberdeen by Mr. G. Sim and Rev. T. Bell as breeding there. In Perth it breeds in Rannoch (*fide* J. A. Harvie Brown, *in lit.*) Appears, in winter only, in large flocks on the braes of the Carse of Gowrie.

68. **Parrot Crossbill.**—(1880) Several of these birds were seen and shot by Mr. Millais at Murthly, where they were supposed to be breeding. One of these, a female, he kindly presented to the Museum of the P. S. N. S., Tay St., Perth.

69. **Common Crossbill** breeds on Deeside (*fide* J. A. H. B., *in lit*), and in Athole. In 1838 it appeared in large quantities in the Carse of Gowrie, many remaining until the following year; 1838 was remarkable for the super-abundance of spruce cones, which doubtless attracted them—(*Scot. Nat.*, vol. iv. p. 97.)

70. **American White-winged Crossbill.**—A small flock of seven or eight was noticed by myself in the Kinfauns woods, about 1872. This is not the first notice of these birds having been seen in Scotland, as it is mentioned by Mr. Gray that a specimen was shot at Jedburgh in Feb., 1841; and Mr. Thomas Edward records a large flock as having been seen near the town of Banff in 1859.—(Bds. W. Scot., p. 156.)

	Aber-deen.	Kin-cardine.	Forfar.	Perth.	Fife.
*b*71 Corn Bunting, ...	R.c	R.c	R.c	R.l.n	R.c
72 Yellow Bunting ...	R.c	R.c	R.c	R.c	R.c
*b*73 Cirl Bunting ...	Ab.			Obs.	
*b*74 Ortolan Bunting ...	Ab.				Ab.*a*
*b*75 Reed Bunting ...			R.n	R.c	R.c
*b*76 Snow Bunting ...	R ?	W	W	W	W
77 Skylark	R.c	R	R.n	R	R.c
*b*78 Woodlark	Oc.		Obs.		
*b*79 Shorelark					Ab.

71. **Corn Bunting.**—This bird is not very common in Perthshire, having a greater predilection for the lands adjoining the coast line; hence it is found much more abundantly in all the other counties, near the sea.

73. **Cirl Bunting.**—Mr. Angus obtained a fine male of this species, shot in Aberdeenshire, near Banchory, on Deeside, communicated to Mr. Robt. Gray (Bds. W. Scot, p. 132). The nest and eggs of this species are said to have been found on Moncreiffe Hill, near Perth; but the bird has never been got (*fide* Mr. J. Stewart, Perth).

74. **Ortolan Bunting.**—Mr. Angus obtained a pair of these birds in Aberdeen, captured in a turnip field near the sea side in the end of November, 1863; and a pair were got on the Isle of May, Autumn of 1885. A pair also remained some days on the island in the spring of the same year.—(Report on Migration, 1885.)

75. **Reed Bunting.**—Leaves Perth in severe winters.

76. **Snow Bunting** is believed to breed occasionally on the higher mountains of Aberdeen. A pair were seen by myself, evidently nesting, on the face of Ben Muic Dhui above Loch Avon, on the 21st June.

78. **Wood Lark.**—This bird, so rare in most parts, seems to be not unfrequent in Aberdeenshire; is even said to bred there, near Huntly (*fide* H. O. Forbes, *Scot. Nat.*, 1871, p. 48.) Mr. George Sim also records the capture of a female at Fyvie, on Christmas-day, 1880—(*Scot. Nat.*, 1881, p. 61); and Mr. Gray states that Mr. Angus informed him that in the last week of March he shot a male of this species near Insch, which bird Mr. Gray had seen; also, in March, 1835, Mr. Angus had noticed another. Mr. A. Nicol Simpson believes it to have been got at Arbroath.

79. **Shore Lark.**—Two were caught at a farm near St. Andrews, out of a flock which visited the estuary of the Eden in the winter of 1865; and one was shot at Oathead, St. Andrews, on 31st December, 1869, associating with meadow pipits, one of which was killed along with it (*fide* Robert Walker, *Scot. Nat.*, July 1871, p. 79). This is probably the bird alluded to by Mr. Robert Gray (Birds of W. Scot., p. 118), when he says, "on the 1st January, 1870, a specimen was shot at St. Andrews, and passed into the hands of Mr. T. W. Wardlaw Ramsay of Whitehill, and was exhibited by him before the Glasgow Nat. Hist. Society.

	Aber-deen.	Kin-cardine.	Forfar.	Perth.	Fife.
80 Common Starling ...	R.c	R.c	R.c	R.c	R.c
*b*81 Red-shouldered Starling				Ab.	
*b*82 Rose-coloured Starling	Oc.		Oc.	Oc.	
*b*83 Nutcracker	Ab.*a*				
*b*84 Jay			R.n	R	R.l.r
85 Magpie	R.c	R	R.n	R	R
86 Jack Daw	R.c	R	R.c	R.c	R
87 Carrion Crow ...	R.c	R	R.n	R	R
88 Hooded Crow ...	R.c	R	R	R	R
89 Rook	R.c	R	R.c	R.c	R.c
90 Raven	R	R	R.n	R.l	R.l.n
91 Swift	S	S.c	S.c	S	S.n
92 Nightjar	S	S	S.n	S	S.l.n
*b*93 Great Spotted Woodpecker	Oc.		Oc.	Oc.	Oc.
*b*94 Lesser Spotted Woodpecker			Ab.		

81. **Red-shouldered Starling.**—A female of this species was shot in Rannoch, Perthshire, 10th May, 1886, and was forwarded to me in the flesh by Sir Robert Menzies, Bart.—(*Scot. Nat.*, July 1886, p. 307.) This is, however, not the first notice of this bird in Scotland, as two other instances are recorded—a young male shot near Banff in 1886, and one seen in Haddington in 1871.—(Gray, Bds. of W. Scot., p. 156).

82. **Rose-coloured Starling.**—A pair attempted breeding in a burrow in a sandbank near Methlick in Aberdeen, but the nest was destroyed by boys. This bird has been several times got near Montrose ; and also in Perthshire, where three were shot at various times at Megginch, in the Carse of Gowrie. One of these is now in the P.S.N.S. Museum.

83. **Nutcracker.**—Mr. Gray mentions an example of this bird, recorded in the Statistical Account of the Parish of Peterhead, killed near that town in 1833, as being in the collection of Mr. Arbuthnot of that place.—(Bds. W. Scot., p. 188.)

84. **Jay.**—Is rapidly becoming more scarce from incessant persecution, and will soon be exterminated.

93. **Great Spotted Woodpecker.**—Vaguely reported to have bred in 1880 at Kildrummy on the Don, in Aberdeen, by Mr. Robb, gamekeeper (*comm.* J. A. H. B.), and is believed to have been formerly resident in Rannoch.

94. **Lesser Spotted Woodpecker.**—Reported by Dr. Howden to have been more than once seen near Montrose, and has been got at Craigo.

	Aber-deen.	Kin-cardine.	Forfar.	Perth.	Fife.
*b*95 Green Woodpecker	Ab.		Ab.	Ab.	Ab.
*b*96 Wryneck	Oc.r		Oc.r	Oc.r	Oc.r
*b*97 Kingfisher	Oc.r		R.n	R.r	Rn.
*b*98 Bee-eater	Ab.*a*		Ab.		
*b*99 Roller	Ab.			Ab.	
*b*100 Hoopoe	Oc.		Ab.	Ab.	Ab.
101 Cuckoo	S	S	S	S	S
*b*102 Barn Owl	R	R	R.n	R.n	R
103 Long-eared Owl ...	R.c	R	R	R?	R
104 Short-eare l Owl ...	R.n		R.n	R? n	R
*b*105 Tawny Owl ...	R.c	R.c	R.c	R.c	R
*b*106 Snowy Owl ...	Ab.*a*		Ab.		

95. **Green Woodpecker.**—There are several instances of this bird having been got in the eastern counties of the Union, from time to time.

96. **Wryneck.**—Not reported from Kincardine, but as it occasionally appears in all the other counties of the Union, it is probably to be found there also ; for its appearance in Perth (See *Scot. Nat.*, Oct., 1878, p. 333.)

97. **King-fisher.**—Used to breed in Perth, on the Almond and the Tay ; but has now become scarce, and is more an autumn and winter visitant.

98. **Bee-eater.**—Mr. Gray mentions having seen specimens of this bird from Forfarshire and from Aberdeenshire (Bds. W. Scot., p. 203). The latter are probably those alluded to by Mr. Horn as got at Peterhead and Strathbeg (Proc. Nat. Hist. Soc., Glasgow, 242). One was shot near Montrose in 1881 *(fide* Mr. Barclay).

99. **Roller.**—A pair were seen several times in 1823 or 1824, at Meggginch, in Perthshire ; and in 1882 a specimen was got at Dunkeld by Mr. J. Stewart. It is reported from Aberdeenshire by Mr. Sim. Mr. Angus, as recorded by Mr. Gray (Bds. W. Scot., p. 203), states that a fine specimen was shot, in April, 1847, at Seaton House, near Aberdeen.

100. **Hoopoe.**—Reported from Aberdeen by Mr. G. Sim : last example recorded from Forfar, was shot in the spring of 1882 by Captain Stansfeld, at Dunninald, after having been seen flying about for more than a week ; the last from Perth was shot in Craigie Wood, on the Moncreiffe estate about 1853, and the last from Fife at Elie House, on the 8th May, 1875. This bird seems not unfrequently to have been found in Aberdeenshire ; and, according to Mr. Gray (Bds. W. Scot., p. 199), perhaps more numerously there than in any other district in Scotland. Many instances of its occurrence there are recorded.

102. **Barn Owl.**—Becoming yearly less numerous in Perth *(Scot. Nat.*, 1869, p. 60.)

105. **Tawny Owl.**—The commonest owl in Perthshire.

106. **Snowy Owl.**—Mr. Sim reports one shot at Strichen, Aberdeenshire, in winter, 1862 ; and an instance is mentioned of its having been got near Montrose *(Scot, Nat.*, iv., p. 282).

	Aber-deen	Kin-cardine.	Forfar.	Perth.	Fife.
*b*107 Tengmalm's Owl ...	Ab.*a*				
*b*108 Scops Owl ...				Ab.	
*b*109 Eagle Owl	Obs.				
*b*110 Marsh Harrier ...	Obs.		Oc.	Oc.	
*b*111 Montague's Harrier			Ab.		
112 Hen Harrier ...	R		Oc.	R ? r	R ? r
*b*113 Common Buzzard ...	Oc.	Oc.	Oc.	R	R.r
*b*114 Rough-legged Buzzard	Oc.	Oc.	Oc.	R ?	R ?
*b*115 Lesser-spotted Eagle	Ab.				
116 Golden Eagle ...	R	Oc.	R	R	Oc.
*b*117 Sea Eagle	Oc.		Oc.	R ?	Oc.

107. **Tengmalm's Owl.**—Recorded (*Scot. Nat.*, 1886, p. 308) by Mr. Sim, Fyvie, as killed near Peterhead, on 2nd Feb., 1886.

108. **Scops Owl.**—A pair, male and female, were shot at Scone, in May, 1864; and are now in the possession of Mr. John Stewart, Perth.

109. **Eagle Owl.**—Reported by Rev. T. Bell, as noticed on the higher hills of Aberdeenshire. This is probably the bird alluded to by Mr. Gray (Bds. W. Scot., p. 55), as reported to him from Aberdeenshire by Mr. John Wilson, Methlick. One was also shot at Faskally, Perthshire, a few years ago; but this bird was ascertained to have escaped from confinement, indeed, it is not unlikely that the Aberdeenshire bird may also have been an escape, as Mr. Harvie Brown in a note to me says it occurs in a semi-wild and domesticated state in Glenshee, at Mr. Paterson's, Dalnaglar; and any shot or reported, are probably escapes, whether in Braemar, Forfar, or Perth.

110. **Marsh Harrier.**—A male and female were shot near Montrose in 1850 (*fide* Mr. Barclay). For its appearance in Perthshire (See *Scot. Nat.*, 1879, p. 60).

111. **Montague's Harrier.**—A fine male bird was shot near Arbroath in the spring of 1885; and in the following autumn a female of the same species was got. Both these birds, which I have seen, are in the possession of A. N. Simpson, Esq., of Mayfield, near Arbroath.

113. **Common Buzzard** is not common now, as it used to be formerly in Perth—(See *Scot. Nat.*, April, 1879, p. 57).

114. **Rough-legged Buzzard** was once common in Athole—(See *Scot. Nat.*, April, 1879, p. 58).

115. **Lesser-spotted Eagle.**—One shot in Aberdeenshire, 20th Sep., 1861—(*fide* J. A. H. B.)

117. **Sea Eagle** bred regularly in Rannoch not many years ago—(See *Scot. Nat.*, April, 1879, p. 56.)

	Aber-deen.	Kin-cardine.	Forfar.	Perth.	Fife.
*b*118 Goshawk	Ab.		Ab.		Ab.*a*
*b*119 American Goshawk				Ab.	
120 Sparrowhawk ...	R.c	R	R	R	R
*b*121 Kite	Oc.		Oc.	R?	
*b*122 Honey Buzzard ...	Oc.r	Oc.r	Oc.r	Oc.r	Oc.r
*b*123 Peregrine Falcon ...	R	R.n	R.n	R	Oc.
124 Hobby	Oc.r		Oc.r	Oc.r	
*b*125 Merlin	R.n	R.r	R.n	R	R
*b*126 Red-legged Falcon	Ab.				
*b*127 Kestrel	R.c.	R.c	R.c	R	R
*b*128 Osprey	Oc.r			Oc.	Oc.*a*
*b*129 Cormorant ...	R.c	R	R	Oc.	R
*b*130 Shag or Green Cormorant	W.n		W.		W.n

118. **Goshawk.**—Mr. George Sim records a female shot in the woods of Hazlehead, near Aberdeen, on the 22nd January, 1876 (*Scot. Nat.*, 1876, p. 265). Mr. Gray mentions the capture of a goshawk at Glamis, in a pole trap, 1865; and Dr. Macgillivray also makes mention of one having been shot in Forfarshire in 1825; in Fife, Mr. Turnbull in his "Birds of E. Lothian," records this species as having been got at Elie in 1877.

119. **American Goshawk.**—A specimen is mentioned (*Ibis.*, vol. iv.) as shot on Schiehallion by a gamekeeper in 1870, and obtained by Mr. Robert Gray at Brechin.

121. **Kite.**—Pretty common on Deeside about twenty years ago, but is now nearly extinct; it still breeds in upper districts of Perth.

122. **Honey Buzzard.**—Reported by Mr. G. Sim as breeding in Aberdeen, a nest having been taken at Ballogie on Deeside in 1867. A curiously marked specimen, with much white on it, shot at Rossie Priory, Perthshire, obtained by Col. Ogilvy of Millhill, is in the P.S.N.S. Museum.

123. **Peregrine Falcon** breeds in the higher districts of Aberdeen, and in all the higher districts of Perth, when not interfered with.

125. **Merlin** breeds on the open moor of Rannoch; a nest and eggs from there are in the P.S.N.S. Museum.

126. **Red-legged Falcon.**—Mr. Sim reports a specimen shot in Udny Aberdeenshire, on 26th May, 1856; and Mr. Gray (Bds. W. Scot., p. 31) mentions an adult female as shot in the parish of Foveran, Aberdeenshire, in the last week of May, 1866.

127. **Kestrel** used to be common in Perth; but is now much kept down.

128. **Osprey.**—Used to breed in Rannoch, and occasionally to visit Loch Tay. It is not reported from Fife proper; but Mr. Malloch saw it fishing in Loch Leven last summer, 1885.

129. **Cormorant** on Lower Tay, and occasionally on Loch Tay.

130. **Green Cormorant or Shag** probably occurs in Kincardine, though not reported.

	Aber-deen.	Kin-cardine.	Forfar.	Perth.	Fife.
*b*131 Gannet	S	S	S	Oc.	S.c
132 Heron	R.c	R	R	R.c	R
*b*133 Purple Heron ...	Ab.				
*b*134 Great White Heron	Obs.*a*				
*b*135 Little Egret ...				Ab.*a*	
*b*136 Little Bittern ...	Ab.				
*b*137 Night Heron ...	Ab.				Ab.*a*
*b*138 Bittern	Oc.	Ab.		Ab.	Ab.
*b*139 American Bittern ...	Ab.				
*b*140 White Stork ...	Ab.*a*		Ab.		
*b*141 Spoonbill	Ab.				
*b*142 Glossy Ibis ...	Ab.	Ab.			Ab.*a*

131. **Gannet** occasionally on Loch Tay.

133. **Purple Heron.**—On 28th Sep., 1872, a young male, now in Aberdeen University Museum, was shot on the Aberdeen Links *(fide* H. O. Forbes) ; and another was recorded by Dr. Macgillivray from Monquhitter, in the same county, in March, 1847 *(Scot. Nat.*, 1873, p. 10.)

134. **Great White Heron.**—Reported from Strathbeg in 1854 (Mr. Horn, Proc. Glasgow Nat. Hist, Society, p. 246). Mr. Gray makes no mention of this bird being found in Aberdeenshire.

135. **Little Egret.**—One shot on Loch Katrine, June, 1881 *(fide* J. A. Harvie Brown.)

136. **Little Bittern.**—Mr. Sim reports one, brought to him alive in 1856 in Aberdeen ; others have since been found in that county. (Gray's Bds. W. Scot., p. 278.)

137 **Night Heron.**—One shot on the Devon, Clackmannan, 23rd May, 1879 *(fide* J. A. Harvie Brown). Mr. Gray also mentions the capture of one, in immature plumage, at Mennie, about eight miles north of Aberdeen—(Bds. W. Scot., p. 283.)

138. **Bittern.**—One shot at Bogmuir, near Laurencekirk, in 1867 *(fide* Mr Barclay.) One shot near Blairgowrie a few years ago, is now in the P.S.N.S. Museum ; and another was got on the Tay near Newburgh, Fife, in the spring of 1864.

139. **American Bittern.**—One was shot at Bridge of Don, Aberdeen, by Col. Wm. Fraser, in Nov., 1854—(Gray, Bds., W. Scot., p. 283.)

140. **White Stork.**—One was shot at Ethie, near Arbroath, about 1836 *(fide* Mr. Barclay.) Dr. Macgillivray mentions a specimen killed at Monquhitter, in Aberdeenshire, in the winter of 1837-38.

141. **Spoonbill.**—Mr. Sim reports one shot on the Aberdeen Links some years ago by Mr. Mitchell.

142. **Glossy Ibis.**—Shot at Kilconquhar, Fife, Sept., 1842, recorded by Yarrell, vol., ii. 574. A second specimen at Banchory in Kincardine, 1844; and another shot at the mouth of the Ythan, Aberdeen, 4th Oct., 1880—*(Scot. Nat.*, vol. vi., 12.)

	Aber-deen.	Kin-cardine.	Forfar.	Perth.	Fife.
*b*143 Grey Lag Goose ...	W		W.r	W	W.n
*b*144 Bean Goose ...	W.r			W?	W *a*
*b*145 Pink-footed Goose...	Obs.*a*		W.n	W.c	W.c
*b*146 White-fronted Goose	W.r		W.r	W.r	W.n
*b*147 Brent Goose ...	W.c.*a*		W.n	Ab.	W
*b*148 Canadian Goose ...	Oc.			Oc.	
*b*149 Egyptian Goose ...			Oc.	Oc.	Oc.
150 Bernacle Goose ...	Ab.		Ab.	Ab.	Oc.
*b*151 Red-breasted Goose	Obs.*a*				
*b*152 Mute Swan ...			Oc.	Oc.	Oc.

143. **Grey Lag Goose** used to be abundant in the Carse of Gowrie, and still visits the district, though in much diminished numbers.

144. **Bean Goose** is reported from Aberdeen as a rare winter visitant, but I am inclined to believe that the *Pink-footed Goose* has been confounded with it. It is not reported from Forfar, though there is a specimen in Montrose Museum labelled "Bean Goose," which appeared to me to be the other species. At one time it was not uncommon in the Carse of Gowrie, but it has not been seen there for several years. It is frequent in winter in the Forth Basin at Culross; but I have no record of it from the Tay Basin in Fife.

145. **Pink-footed Goose** is still abundant in the Carse of Gowrie, where, before the formation of railways, it used to assemble in thousands.

146. **White-fronted Goose.**—Shot, in 1876, in Montrose Basin. It used to be not infrequent in the Carse of Gowrie, but has not been got there of late years.

147. **Brent Goose.**—A few generally occur at the mouth of the Tay, and occasionally in Montrose Basin. In Perth it has been got on Methven Loch and Loch Tay.

148. **Canadian Goose.**—Mr. Sim reports two shot at Aberdeen in 1863, and several instances of its occurrence in Perth, apparently wild, are known.

149. **Egyptian Goose.**—A very fine specimen, shot on the Tay at Errol, in March, 1886, is now in the P.S.N.S Museum, in Perth. It has also been shot on Montrose basin, as well as on the Earn, but probably all may only have been escapes.

151. **Red-breasted Goose.**—Recorded as seen at Strathbeg—(Mac-gillivray, Brit. Birds, iv., p. 336.)

152. **Mute Swan.**—Not uncommon, in domestication, throughout the district; and often occurs in Fife, Perth, and Forfar, in flocks, apparently wild.

	Aberdeen.	Kincardine.	Forfar.	Perth.	Fife.
*b*153 Polish Swan ...	Ab.*a*				
154 Whooper or Wild Swan	W.r		W.r	W.r	W.r
*b*155 Bewick's Swan ...	Oc.r		Oc.r	Ab.	
156 Common Sheldrake	R.c		R	R	R.c
*b*157 Ruddy Sheldrake ...			Ab.		
158 Wild Duck ...	R.c	R.c	R.c	R.c	R.c
*b*159 Gadwall	Ab.		W.r	Ab.	Oc.
*b*160 Shoveller, ...	R		R.r	R	R.n
161 Teal	R.c	R.c	R.c	R.c	R.c
*b*162 Garganey Teal ...	Ab.*a*		Ab.*a*		Ab.*a*
163 Pintail	W.r		W.n		W.n
*b*164 Wigeon	R	W	W	R	W
*b*165 Pochard	W		W.n	R	W

153. **Polish Swan.**—Recorded from Strathbeg (Mr. Horn in Proc. Nat. Hist. Soc., Glasgow, 1880, p. 254.)

155. **Bewick's Swan.**—Two on the Tay, near Dundee, 21st Oct., 1880.

157. **Ruddy Sheldrake.**—One was trapped at Barry, Forfarshire, in a burrow, in 1872; and another was shot there in April, 1887, by Mr. A. M'Andrew, and is now in the P.S.N.S. Museum in Perth. Mr. Marshall, of Arbroath, who had the bird in the flesh, and preserved it, has informed me that at least three or four have passed through his hands, got at the same place.

159. **Gadwall.**—Mr. Gray mentions this bird as found in Perth and in Aberdeen—(Bds. W. Scot., p. 366.)

160. **Shoveller.**—Breeds regularly at Methven and elsewhere in Perthshire.

162 **Garganey Teal.**—The late Mr. George Don alludes to this bird as found on Forfar Loch; and Dr. Macgillivray notices it from Montrose Basin. Mr. Harvie Brown states that it has been shot at Kincardine-on-Forth, by Mr. Singer of that place—(Gray, Bds. W. Scot., p. 372). Mr. Horn (Proc. N. H. Soc., Glasgow, 1880, p. 254) mentions it as having been seen on Loch of Strathbeg, near Peterhead.

164. **Wigeon.**—This bird is now known to breed in Rannoch; and a nest and eggs were sent to me from there last spring (1886), and are deposited in the P.S.N.S. Museum, Perth. A female from the same spot was sent to me in the first week of August, on the opening of the shooting season, and is also in the Perthshire Nat. Soc. Museum, in Perth. Hitherto its breeding localities in Scotland have only been noticed in the Western Islands, Orkney, parts of Aberdeenshire, and the extreme Northern Counties. Mr. J. Macdonald, gamekeeper, Rannoch Lodge, informs me that eight or twelve pairs breed in Rannoch regularly every year on Loch Eoch, Dirdownie, and north-west shore and islands of Loch Lyden, and that he has known six or seven to stay on Loch Eoch alone. This is the experience of upwards of ten years.

165. **Pochard.**—Breeds in several lochs in Perthshire.

	Aber-deen.	Kin-cardine.	Forfar.	Perth.	Fife.
166 Scaup	W		W	W	W
*b*167 Tufted Duck ...	W		R	R	R
168 Ferruginous or White-eyed Duck	Oc.*a*				
*b*169 Buffel-headed Duck	Ab.*a*				
*b*170 Golden Eye ...	W		W	W	W
*b*171 Harlequin Duck ...	Ab.				
172 Long-tailed Duck ...	W		W		W
*b*173 Eider Duck ...	R		R	Oc.	R.c
*b*174 King Duck ...			Oc.		Oc.
*b*175 Velvet Scoter ...	W		W		W
176 Common Scoter ...	W		W		W
*b*177 Goosander ...	W		W	R	W
178 Red-breasted Merganser	W		W.n	W.r	W
*b*179 Smew	Oc.		Oc.	Oc.	Oc.
*b*180 Wood Pigeon ...	R.c	R.c	R.c	R.c	R.c

168. **Ferruginous Duck.**—Occasional on Loch of Strathbeg—(Mr. Horn, Proc. N. H. Soc , Glasgow, 1880, p. 255.)

169. **Buffel-headed Duck.**—A male was shot, many years ago, on the Loch of Strathbeg, and is now in the Museum at Banff—(Gray, Bds., W. Scot., p. 396.)

170. **Golden Eye.**—Bred on Loch Achray in Perth (*fide* J. A. Harvie Brown), and also in a loch in Fife.

171. **Harlequin Duck.**—A male in full plumage was shot in 1858, on the Aberdeenshire coast—(Gray's Birds of W. Scotland, p. 394.)

173. **Eider Duck.**—Still breeds on Sands of Barry in Forfar and on Tentsmuir in Fife ; and is occasionally seen on Loch Tay.

174. **King Duck** is perhaps a regular winter visitant at the mouth of the Tay and St. Andrew's Bay. Two Tay-shot specimens, male and female, are in the P.S.N.S. Museum, Perth. A very interesting article on these birds in St. Andrew's Pay and the estuary of the Tay, by Mr. Robert Walker, appeared in the *Scottish Naturalist* vol. ii., p. 49.

175. **Velvet Scoter** remains so late in Forfar and Fife that it is a question whether they may not sometimes breed there. The Common Scoter is known to do so in Inverness. (Gray's Bds. W. Scot., p. 382. See *Scot. Nat.*, vol. iii., p. 348.)

177. **Goosander** has been known several times to breed in Rannoch and on Loch Ericht in Perth.

179. **Smew.**—Col. Kinloch of Logie reports a very fine male, in full plumage, shot a year or two ago in the Loch of Forfar, by Sheriff Robertson of Burnside.

180. **Wood Pigeon** arrives every autumn in flocks from Scandinavia, reaching the Fifeshire coasts and thence dispersing inland. A mighty rush of

	Aber-deen.	Kin-cardine.	Forfar.	Perth.	Fife.
*b*181 Rock Dove ...	R	R.n	R.n		
*b*182 Stock Dove ...	Oc.*a*		S.n	S.n	
*b*183 Turtle Dove ...	Oc.		Oc.	Oc.	Oc.
*b*184 Passenger Pigeon ...					Ab.
*b*185 Pallas' Sand-grouse	Ab.	Ab.	Ab.	Ab.	Ab.
186 Partridge	R.c	R.c	R.c	R.c	R.c
*b*187 Quail	Oc.		Oc.	Oc.	Oc.n
*b*188 Ptarmigan	R.c	R	R.c	R.c	
*b*189 Red-grouse ...	R	R	R.c	R.c	R
190 Black-grouse ...	R	R	R.n	R	R
*b*191 Capercaillie ...	R.n	R.n	R.n	R.c	R.n

these birds, in countless thousands, made their appearance there last season, November 29th—(Migration Report, 1885.)

181. **Rock Dove** is confined to the rocky coasts.

182. **Stock Dove.**—In Aberdeen Mr. Horn alludes to its being enumerated in Mr. Arbuthnot's list of birds of Peterhead—(Proc. N.H.S., Glasgow, 1880, p. 243.) Reported by Mr. Simpson as breeding near Arbroath. It has been got at Alyth and at Callander, from both of which places there are specimens in the P.S.N.S. Museum ; and it breeds at Dunkeld, and it also has been shot at Coupar-Angus, specimens of which I have seen.

183. **Turtle Dove.**—There are many instances of the occurrence of the turtle dove from time to time, in most, if not all, the eastern counties, but never of regular migration. Mr. A. Nicol Simpson informs me that he obtained a specimen this summer, 1886, which was caught by a fisherman on board his boat at Arbroath, and which he tells me, he has still alive and doing well.

184. **Passenger Pigeon.**—Yarrell mentions a bird of this species shot at Monimail, in Fife, 31st Dec., 1835.

185 **Pallas' Sand Grouse.**—A most extraordinary irruption of this bird from the plains of Tartary into Great Britain occurred in 1863. Many hundreds reached our coasts, from the English Channel to North Unst in Shetland, and dispersed along our eastern coasts, where numbers were destroyed. Aberdeen, Kincardine, Forfar, Perth, and Fife were all visited that summer. A flock of about thirty appeared in July near Montrose (where eleven were shot), remaining for several days on the Links, and then passed northwards along the Kincardine coast—(*fide* Mr. Barclay.)

187. **Quail.**—Formerly not uncommon in the Carse of Gowrie, where it used to breed ; the last nest known to me was found in 1832, containing sixteen eggs.

188. **Ptarmigan** is confined to the higher hills.

189. **Red Grouse** was introduced on Tents Muir in Fife by Admiral Maitland Dougal a few years ago, and have greatly increased.

191. **Capercaillie** has only of late years appeared in Aberdeen and Kincardine.

	Aberdeen.	Kincardine.	Forfar.	Perth.	Fife.
192 Water Rail ...	R		R	R?	R
*b*193 Spotted Crake ...	Oc.		Oc.	A	
194 Land Rail	S.c	S.	S.c	S	S
*b*195 Green-backed Gallinule (Porphyrio Smaragdonotus) ...				Ab.	
196 Waterhen	R.c	R	R.c	R.c	R.c
197 Coot	R.c	R	R.c	R?c	R
*b*198 Common Crane ...	Ab.a				
*b*199 Little Bustard ...	Ab.		Ab.		Ab.
*b*200 Stone Curlew ...					Ab.
201 Golden Plover ...	R	R	R.c	R	R
*b*202 Grey Plover ...	Sp.A.n		Sp.A.n	Obs.	Sp.A.n
*b*203 Lesser Ringed Plover				Obs.	Obs.
*b*204 Ringed Plover ...	R	R	R.c	S	R.c

193. **Spotted Crake.**—Frequently got in autumn on the banks of the Tay below Perth, and also on the Earn.

195. **Greenbacked Gallinule** (*Porphyrio Smaragdonotus*).—A bird of this species in full adult plumage was shot on the reed banks of the Tay near Errol, in the middle of September, 1876, by Mr. M'Innes, a butcher in the village, now, I believe, in the possession of J. G. Millais, Esq. Since then, I understand, several more have been got in England, and Mr. J. H. Gurney, junr., writes to me that he feels no doubt of this Porphyrio being a wild one, in reply to my doubts in this respect; for a full account of the capture of this bird see *Scot. Nat.*, Vol. IV., p. 37.

198. **Common Crane.**—A bird of this species is recorded by Mr. Gray (Bds. W. Scot., p. 271), as shot on Deeside by Mr. Francis Anderson, end of May, 1851, and still in that gentleman's possession.

199. **Little Bustard.**—One reported by Mr. Sim as shot on 13th November, 1873, near Old Meldrum in Aberdeen; another was shot near Montrose, 20th December, 1833, by J. Rintoull, gamekeeper (J.A.H.B. *in lit*); and another shot near St. Andrews, on 6th March, 1840, by Dr. Adamson, is now in the University Museum.

200. **Stone Curlew.**—One killed near St. Andrews, on 27th January, 1858, recorded in Turnbull's "East Lothian," is in the University Museum.

202. **Grey Plover.**—Reported from Aberdeen by Mr. Sim; and from Forfar, by Mr. P. Henderson; a specimen from Lower Tay is in the P.S.N.S. Museum, Perth.

203. **Lesser Ringed Plover.**—Reported by Mr. D. Malloch from Perth; and by Mr. P. Henderson, to have been shot in 1872, below Tayport in Fife. These require further confirmation.

204. **Ringed Plover** leaves Perth in winter, going to the coast.

	Aber-deen.	Kin-cardine.	Forfar.	Perth	Fife.
205 Dotterel	Sp.A.		Sp.A.n	S.r	Sp.A.n
206 Lapwing	R.c	R.c	R.c	R.c	R.c
207 Turnstone	Sp.A		Sp.A		R ?
208 Oyster Catcher ...	R	R.c	R.c	S.c	R.c
*b*209 Avocet	Ab.		Ab.	Ab.	Ab.*a*
*b*210 Black-winged Stilt	Ab.		Obs.		
*b*211 Red-necked Phalarope	Oc.		Oc.	S.r	Oc.r
*b*212 Grey Phalarope ...	Oc.		Oc.		
213 Woodcock	R	R	R	R.c	R.c
*b*214 Sabine's Snipe ...			Ab.		
*b*215 Double Snipe ...	Ab.		Ab.	Ab.	Ab.
216 Common Snipe ...	R.c	R.c	R.c	R.c	R.c
*b*217 Jack Snipe ...	R. ?	W	W	W	W

207. **Turnstone.**—Mr. Patrick Henderson, Dundee, informs me he had found these birds breeding at the mouth of the Tay, on Tents Muir, and has caught the young.

209. **Avocet** is reported from Aberdeen by Mr. Sim; a specimen from Montrose Basin is in Montrose Museum; one is reported by Mr. Malloch from Perth; and another from Fife, near Kirkcaldy, some years age, shot second week of August, 1862, by Mr. L. Wilson, and reported by Mr. Gilmour.

210. **Black-Winged Stilt.**—Mr. Angus, in a communication to Mr. Gray (Bds. W. Scot., p. 303), states that he distinctly saw, in the Tileburn, near the mouth of the Don, one of these birds on the 15th Sept. 1867.

211. **Red-necked Phalarope.**—A colony used to breed in Athole, where I saw them in 1856 and 1857, but I have not visited the spot for some years.

212. **Grey Phalarope.**—Reported from Montrose Basin, and mouth of the Tay in Forfar.

214. **Sabine's Snipe.**—A specimen, shot near Montrose in 1872, is in Montross Museum.

215. **Double or Solitary Snipe.**—Of this bird an example got up at my feet in Elcho Marsh, on the Tay, 3rd Sept., 1874; and I am perfectly certain of its identity, since the species is well known to me from my having frequently shot it in the Mediterranean region. It has not been seen there since.

217. **Jack Snipe** has been supposed to breed in Breadalbane; but this remains as yet doubtful. Mr. Cameron, however, states that he has good authority for the fact that the Jack Snipe is a native in Balquhidder (*Scot. Nat.*, 1877, p. 10), and on the authority of Mr. H. O. Forbes, this bird breeds near Huntly. This is doubted by the Ed. of *Scot. Nat.* (1871, p. 45). Stuart

	Aber-deen.	Kin-cardine.	Forfar.	Perth.	Fife.
*b*218 Pectoral Sandpiper	Ab.				
219 Dunlin	R	R	R.c	R.?n	R.c
*b*220 Little Stint ...	W		A.r		Ab.*a*
*b*221 Curlew Sandpiper	Oc.		Ab.	Ab.	
222 Purple Sandpiper ...	A		A.		A.n
*b*223 Knot	Sp.A		Sp.A	Sp.A	Sp.A.c
*b*224 Ruff	Sp.A		Sp.A	Oc.	Sp.A
*b*225 Sanderling ...	Sp.A		Sp.A		Sp.A.
226 Common Sandpiper	S	S	S	S.c	S.c
*b*227 Spotted Sandpiper	Obs.		Obs.		

M. Burnett, Esq. of Balbithan, states that it breeds near Inverurie, and that some remain and breed there every year. He records a nest and four eggs taken by him on the 31st May, 1848 (*Scot. Nat.*, January, 1873), and sets the matter at rest as to its breeding in this country.

218. **Pectoral Sandpiper.**—An immature specimen of this species, shot at the mouth of the Don, by Mr. Mitchell, on the 2nd October, 1867. Communicated by Mr. Angus (Gray, Bds. W. Scot., p. 321).

220. **Little Stint.**—Reported by Mr. Sim as not unfrequent in autumn at the mouths of the Don and of the Dee. Mr. Angus considers this bird a regular winter visitant.

221. **Curlew Sandpiper.**—Reported by Rev. T. Bell as once shot at Glenkindy on the Don in Aberdeen. According to Mr. Mitchell this bird would appear to be a well-known visitant in Aberdeenshire, he having frequently met with it at the mouth of the Don, and he believes it to have bred in the county—(Gray, Bds., W. Scot., p. 317). One or two have been got in Forfar at the mouth of the Tay ; one of these is now in P.S.N.S. Museum ; it has also been got by Mr. Dewar at Loch Tay in Perth.

223. **Knot** occurs, though less often than formerly, on the tidal parts of the Tay in Perth.

224. **Ruff** has been shot in Perth by Mr. Millais on the Tay at Murthly ; Mr. Malloch has seen it pretty abundant on Loch Leven shores.

225. **Sanderling.**—Though regular in its passage in autumn, it is believed to occur only as an abnormal visitor on our coasts in spring : this should be further investigated.

227. **Spotted Sandpiper.**—Mr. Angus, writing to Mr. Gray (Bds. W. Scot., p. 299), makes mention of two specimens, in the flesh, as having been left in the Aberdeen Museum in the absence of the curator in August, 1867, no particulars of which could be obtained, as the person who left them never returned. Mention is also made of this bird by the late Mr. Mollison, in the Statistical Account of the parish of Craigo, near Montrose.

	Aber-deen.	Kin-cardine.	Forfar.	Perth.	Fife.
*b*228 Green Sandpiper ...	Oc.		Oc.	Oc.	
*b*229 Wood Sandpiper ...	Ab.*a*				
*b*230 Redshank ...	R	R	R.c	R?	R.c
*b*231 Spotted Redshank...	Ab.		Ab.		
*b*232 Greenshank ...	Sp.A		Sp.A.n	S.r	Sp.A.n
233 Bar-tailed Godwit ...	Sp.A		W.c	W.r	W.c
*b*234 Black-tailed Godwit	Ab.		Ab.	Ab.	
235 Whimbrel	Sp.A		Sp.A.n		Sp.A
*b*236 Curlew	R	R	R.c	R.c	R.c
*b*237 Esquimaux Curlew	Ab.*a*	Ab.			

228. Green Sandpiper has occurred several times in Aberdeen, and has also been found on Montrose Basin and at the mouth of the Tay in Forfar; and in P.S.N.S. Museum there is a specimen shot on the banks of the Earn, and another from lower Tay.

229. Wood Sandpiper.—Mr. Sim reports one shot, on 18th May, 1868, at Loch of Strathbeg.

230. Redshank usually leaves Perth for the coast in winter.

231. Spotted Redshank.—One shot in Montrose Basin in 1880 is now in the Montrose Museum. In addition to this specimen Mr. Angus communicated to Mr. Gray (Bds. W. Scot. p. 298) the capture of one of these birds on the Old Town Links of Aberdeen, 19th Sep., 1867.

232. Greenshank.—Occurs in Aberdeen chiefly in autumn passage. In Perth it is more frequent in autumn; but it is now known to breed regularly in Rannoch, and a nest and eggs from Rannoch moor are in the P.S.N.S. Museum.

234. Black-tailed Godwit is believed to have been shot many years ago in Montrose Basin (in the late Mr Mollison's collection). In Perth, a female, showing change from summer to winter plumage, was shot in a marshy wood at Freeland, by the Rev. H. Skeete, Sept., 1810, and is now in the P.S.N.S. Museum. Mr. Gray mentions that at least in two cases it has been got in Forfarshire; and Mr. Angus in a communication to the same author mentions having shot an immature bird out of a large flock near Aberdeen, in Sept., 1867—(Bds. W. Scot., p. 305).

236. Curlew.—Generally leaves Perthshire in winter for the coast, though sometimes seen at that season on the lower part of the Tay.

237. Esquimaux Curlew.—Shot on the estate of Slains, near Ellon, Aberdeenshire, by Mr. W. Ramsay, on 28th Sep., 1878, as recorded by Mr. George Sim; also in Kincardine on the estate of Durris, 6th Sep., 1855, on same authority—(*Scot. Nat.*, 1870, p. 16.)

	Aber-deen.	Kin-cardine.	Forfar.	Perth.	Fife.
*b*238 Arctic Tern ...	S		S.n	Sr	S
239 Common Tern ...	S	S	S.c	S.c	S.c
*b*240 Roseate Tern ...	Ab.*a*		Oc.r		S.n
241 Little Tern ...	S	S	S		S.n
*b*242 Sandwich Tern ...	Oc.		S.n		S.n
*b*243 Black Tern ...	Oc.		Ab.	Ab.	Oc.
*b*244 Ivory Gull ...	Ab.				
245 Black-headed Gull	R.c	R.c	R.c	R.c	R.c
*b*246 Little Gull ...	Ab.				Ab.*a*
*b*247 Common Gull ...	R.c	R.c	R.c	R.c	R.c
*b*248 Herring Gull ...	R.c	R.c	R.c	R.c	R.c
*b*249 Lesser Black-backed Gull	Oc.		W	R	R.c

238. **Arctic Tern.**—Reported for Perth and Aberdeen by J. A. Harvie Brown.

240 **Roseate Tern.**—The only instance recorded of this bird in Aberdeen, of which I have heard, was one shot in 1840 at Strathbeg, by the late Mr. Thomas Edward, as mentioned by Mr. Horn—(Proc. Nat. Hist. Soc., Glasgow, 1880, p. 250.)

242. **Sandwich Tern** appears every season at the mouth of the Tay, but does not breed there, but goes to the Forth, where it has been known to breed.

243 **Black Tern** has been frequently noticed on the coast of Aberdeen, and was shot at the mouth of the Ythan in 1866, and twice, more recently, on the Don. It has also been got at Forfar at the mouth of the Tay; and is reported by Mr. Malloch from Perth.

244. **Ivory Gull.**—Mr. George Sim, Aberdeen, records the capture, in company with Mr. Robb, curator of the University Museum, of two of these rare birds in Aberdeen Harbour on the 18th and 19th Nov., 1874—(*Scot. Nat.*, 1875, p. 8.)

246. **Little Gull.**—One was shot at Kincardine-on-Forth by Mr T. Wells, in Dec., 1884 (*fide* J. A. Harvie Brown); and an immature specimen shot by Mr. Arthur Robb at Aberdeen, Sat., 12th Dec., 1874, when three others were observed, recorded by Mr. Geo. Sim—(*Scot. Nat.*, 1875, p. 64).

247. **Common Gull.**—Breeds on Loch Rannoch.

248. **Herring Gull.**—Breeds on Loch Rannoch.

249. **Lesser Black-backed Gull.**—Breeds in many parts of the Highlands of Perth.

	Aber-deen.	Kin-cardine.	Forfar.	Perth.	Fife.
*b*250 Greater Black-backed Gull	R		R	R	R
*b*251 Glaucous Gull ...	Oc.		W.n	Oc.	A
*b*252 Iceland Gull ...	Ab.		Ab.	Ab.	Oc.
*b*253 Kittiwake	R.c	R	R	R	R
*b*254 Great or Common Skua	Oc.*a*		Oc.r		Oc.
*b*255 Pomatorhine Skua	Oc.		A.n		Oc.
*b*256 Richardson's Skua	A.n		A.n	Oc.	Oc.
*b*257 Buffon's Skua ...	Oc.*a*		Oc.r		Oc.
*b*258 Storm Petrel ...	Oc.		Oc.	Ab.	Oc.
*b*259 Leach's Petrel ...	Ab.			Ab.	Ab.

250. **Greater Black-backed Gull.**—The young of the previous year are often seen in Forfar and Perth, hanging about the lower parts of the Tay, but the old birds do not remain and breed.

251. **Glaucous Gull** not uncommon at the mouth of the Tay in winter and early spring; three or four specimens shot there are in the Perthshire Society's Museum in Perth.

252. **Iceland Gull.**—Abundant one winter at Kincardine-on-Forth.

253. **Kittiwake.**—Does not breed in Perth, but frequents the Tay more or less all the year.

254. **Great or Common Skua.**—Occurred often in winter, 1884-85, about Kincardine-on-Forth.

255 **Pomatorhine Skua.**—In autumn, 1879, there was a remarkable irruption of this species, and of the next, in the estuary of the Tay.

256. **Richardson's Skua.**—See remarks on last species.

257. **Buffon's Skua.**—A pair of these birds are in the Perthshire Society's Museum, Perth, affirmed by Mr. Patrick Henderson, Dundee, to have been shot in the Tay estuary on the Forfarshire and Fife shores,—the one at Newport in the autumn of 1880, the other near Buddonness.

258. **Storm Petrel.**—Has, in several instances, been driven up the estuary of the Tay by bad weather, and been found dead in Perth; it has also been got on Loch Tay. Has been found dead in many parts of Perthshire after severe storms—(*Scot. Nat.*, 1882, p. 206.)

259. **Leach's or Fork-tailed Petrel.**—A specimen was caught at Girdleness Light, Aberdeen, on the night of the 16th August, 1884—(*fide* George Sim, *Scot. Nat.*, 1885, p. 10); and in Fife a fine specimen was shot on the 29th April, 1868, among the rocks nearly opposite the Club-house at St. Andrews—(*fide* Mr. Walker, *Scot. Nat.*, 1871, p. 81.)

	Aber-deen.	Kin-cardine.	Forfar.	Perth.	Fife.
*b*260 Manx Shearwater ...	Oc.		Oc.		Oc.
*b*261 Fulmar	Ab.		Ab.		Ab.
262 Razorbill	R?	R	R.c		R
*b*263 Common Guillemot	R	R	R.c	Ab.	R
*b*264 Black Guillemot ...	R	R	R.n	Ab.	R.n
*b*265 Little Auk ...	Oc.*a*		Oc.	Ab.	Oc.
*b*266 Puffin	R?		R.c	Ab.	R
267 Great Northern Diver	W		W.n	W.n	W
*b*268 Black-throated Diver	W		W.n	R	W
*b*269 Red-throated Diver	R?		W	W.r	W

260 **Manx Shearwater.**—Reported from Montrose. I have myself seen it at the mouth of the Tay.

261. **Fulmar Petrel.**—An adult specimen was got on the East Sands, St. Andrews, by Mr. R. Walker, on the 6th July, 1867; and a wounded bird was caught on the West Sands, in Oct., 1868; and one was shot on the Eden, Dec., 1870 (*Scot. Nat.*, 1871, p. 81). Another, now in the P.S.N.S. Museum, was got on the Tents Muir Sands at the mouth of the Tay in Feb., 1880.

263. **Common Guillemot** breeds plentifully in Kincardine on the cliffs called "Fowlsheugh," south of Dunottar, along with other seabirds; it has been shot several times on Loch Tay.

264. **Black Guillemot,** used to be common outside Aberdeen harbour, but I do not know of its breeding in Aberdeenshire. When stationed in Aberdeen many years ago I had frequent opportunities of observing these birds during the breeding season on the Kincardine coast, along by Cove and Muchalls, and, though I never looked for their nests, I always supposed them to be breeding among the rocks at the foot of the cliffs, as they were there the whole of the season, and I obtained them in all stages of plumage. In Perth it has been got several times on Loch Tay.

265. **Little Auk** occasionally driven up the estuary of the Tay in stormy weather; this was peculiarly the case in the very severe winter just before Christmas 1878, when large numbers spread inland from the mouth of the Tay.

266 **Puffin,** is reported by Rev. T. Bell from up the Don early in spring, no doubt driven in by stress of weather; it has been shot above the bridge at Perth.

268. **Black-throated Diver** breeds on several Perthshire lochs; a very fine nest, with two large eggs, much like those of the Great Northern Diver, are in P.S.N.S. Museum, from Rannoch.

269. **Red-throated Diver** has been got at Barry, at the mouth of the Tay, in spring, in full breeding plumage.

	Aberdeen.	Kincardine.	Forfar.	Perth.	Fife.
*b*270 Great-crested Grebe	Oc.*a*		Oc.	Oc.	Oc.
271 Red-necked Grebe	Oc.		Oc.	Oc.	Oc.
272 Sclavonian Grebe ...	Oc.		Oc.	Oc.	Oc.
*b*273 Eared Grebe ...			Ab.		
274 Little Grebe or Dabchick	R		R .n.	R	R.n

270. **Great Crested Grebe.**—Not reported from Don and Dee, but not unfrequent in Buchan.

273. **Eared Grebe.**—One shot on the Tay below Dundee at Buddonness, is now in the P.S.N.S. Museum. This is probably a commoner bird than is supposed, and is likely to have been often confounded with the Sclavonian Grebe, which it much resembles in the immature plumage; but it is easily distinguished by the form of the bill.

By the foregoing tables, the results from the various counties, with the exception of Kincardine, which has not been fully reported, are as follows :—

	Aberdeen.	Forfar.	Perth.	Fife.
Resident, ...	85	85	86	84
Summer migrants, ...	24	28	29	24
Winter migrants, ...	21	29	16	25
Spring or autumn passage only,	11	12	6	11
Occasional occurrence, ...	38	34	23	34
Abnormal, ...	45	26	20	21
Total species found, ...	224	214	180	199

As shown by the general list, the number of species enumerated in the whole district bounded by the sea on the east, the Moray Firth on the north, the Forth on the south, and the counties of Banff, Inverness, and Argyle to the west, is 274 species. From these there should be deducted, as doubtful, 18 species; and 22 that have been noticed only in Buchan, and 4 in Forth. This leaves 230 between the valleys of the Don and the Tay inclusive. With a further deduction of those which are only occasional or abnormal, it may be concluded that the Don and Dee basins, consisting of the southern parts of Aberdeen and the northern portion of Kincardine, contain 142 species, resident and of regular passage; while in the basin of the Tay, if we include

southern Kincardine, the whole of Forfar, and that portion of Perth not falling within the Forth district, and the northern part of Fife, there are 156. A few, however, of these marked as resident may possibly not always remain, but may shift according to the nature of the season.

In the above statement a difference will be found in the numbers as compared with those in the preliminary report published two years ago. This is caused in some measure by a few necessary alterations in what may be considered resident species or otherwise, distinctions often very difficult to define, also from several additions which have been made known to me since that list was drawn up causing some change, which must be the case the more a knowledge of the local ornithology of the district progresses. In conclusion, I may add, that in giving the foregoing statistics, not having been able to compile them from actual personal observation, excepting in the county of Perth, and in some parts of the other counties, but there only in a cursory way, I feel very much is due to those correspondents who have so kindly favoured me with much valuable information on the distribution of the various species, and to whom I tender my very best thanks; also I am much indebted to the various authorities from whom I have quoted, for the knowledge of many rare species which visit our shores, and especially have I been aided by a perusual of Mr. Gray's "Birds of West Scotland," in which many of our rarest birds on the east coast are enumerated, as also by that of Mr. Horn's "Notes on the Birds of the Buchan District." From both of these I have derived much valuable assistance in drawing up the present list in my report, which, however, I must leave open to others for further investigation, believing, that when circulated, as suggested in the preliminary report, to be added to, and altered, as occasion requires, a clear and perfect insight to the Bird Fauna of the Eastern Counties of Central Scotland will very soon be obtained.

I here take the opportunity of mentioning that in the preliminary report under the subject "*Bibliography*," I inadvertently omitted to make mention of Mr. Horn's papers on the ornithology of the district of Buchan, in Aberdeenshire, and that of Strathtay, in Perthshire, published in the proceedings of the Natural History Society of Glasgow, and of which, as before alluded to, I have gladly availed myself in compiling the above list.

NOTES ON MOSSES OF THE NORTH OF SCOTLAND.

By Mrs. FARQUHARSON of Haughton, F.R.M.S.

HEARING that remarks on the mosses of the North of Scotland might be of interest at the Annual General Meeting of the *East of Scotland Union of Naturalists' Societies*, I offer a few extracts from notes made during various rambles in search of specimens in the Eastern parts of the counties of Ross, Inverness, and Aberdeen; and also on specimens from the Herbaria of botanists who have collected in the counties of Caithness, Forfar, and Perth. By way of illustrating the subject, I send mounted mosses from the Herbarium which I hope shortly to have the pleasure of presenting to the new museum in Aberdeen.

The great charm universally acknowledged in mosses is their evergreen existence, rendering them especially dear to botanists in this Northern climate; where for considerably more than half the year they are the chief, if not the only, branch of botany that can be profitably studied. Who does not readily call to mind the charming effect of the *Orthotrichums* emerging from the snow-tipped dykes, their freshened foilage rendered far more conspicuous than in the more genial but drier weather, when they often present a weathered appearance? Aberdeenshire has some of the rarest of this genus in *Orthotrichum Drummondii* (*Ulota Drummondii Grev.*) and *Orthotrichum rivulare*. The *Andreæas* are also well represented in this county, the rarest species perhaps being *A. nivalis*. There is also a good number of species of *Grimmia*, one of the rarest being *G. contorta*. *Dicranella squarrosa*, rare in fruit, was found by the Rev. T. Bell in a remarkably fine state. *Philonotis fontana*, also found by the Rev. T. Bell in Keig, is also rare in fruit.

Inverness-shire I found one of the most productive moss-haunts. On the south side of Loch Laggan I was fortunate in finding the very rare *Hypnum callichroum* in fruit, and near it, also in fruit, *Hypnum crista-castrensis*.

Among the other rarieties from the same locality, I may mention *Hypnum squarrosum* in abundant fruit, *Antitrichia curtipendula* and *Philonotis adpressa*, not in fruit, and at a higher elevation.

Near Alness in Ross-shire, *Hypnum revolvens* was the most noticeable moss.

SOME REMARKS ON BRITISH SUBMARINE VAUCHERIÆ.

By Prof. O. NORDSTEDT.

IN the "Scottish Naturalist," April, 1886, Mr. E. M. Holmes has published a paper on "British Marine Algæ," and, therefore, I may here publish some remarks and additional notes in place of a complete account of this matter, as had previously been my intention.

Page 261, l.c. between nos. 7 and 8 there is a line omitted, *viz.*

(*b*) Oogonia not attached directly to the thallus, but separated from it by a short empty cell.

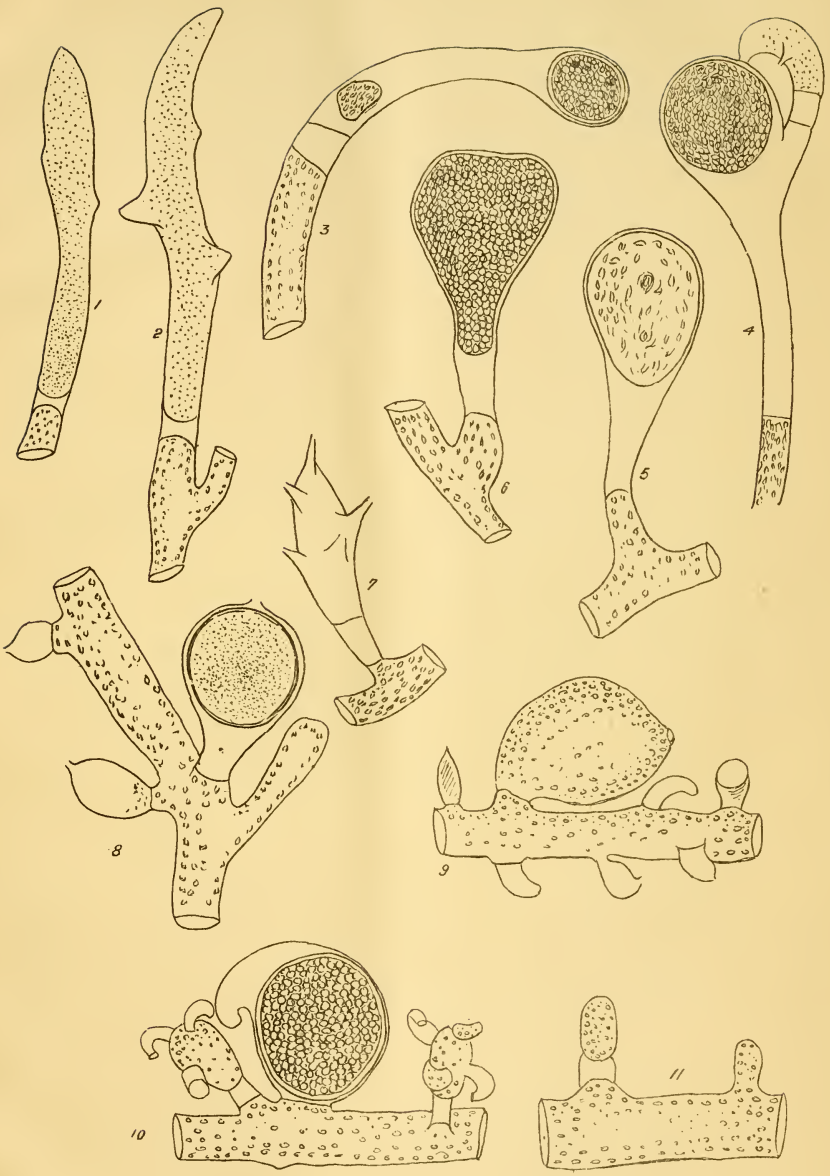
The four lines from the bottom of page 262, and the 4 lines from the top of page 263: "It differs . . . . sea water" (except fig. 6 *a.*) do not belong to *V. sphærospora*, but to *V. litorea.*

It is impossible to decide what species *V. velutina*, Harv. really is. The figures and description in "Phycol. Brit.," however, do not prevent its being *V. sphærospora.* The specimen figured l.c. tab. 321, was gathered at Cushenhall, in Ireland. A specimen from a Scottish locality, mentioned by Harvey, Appin, (on the label, *Vaucheria littoralis; V. velutina*, Ag., leg. Capt. Carmichael), I had an opportunity of examining in the Herbrium of the Royal Kew Gardens. In that I met only with *V. sphærospora.* This locality is not far from Ballachulish, where I saw the filaments of *V. sphaerospora* and *V. Thuretii* closely woven together.

The original specimens of *V. velutina*, Ag. in Herb. Agardh belong to *V. Thuretii* Woron. (cfr. "Botan. Notiser," 1878, p. 176).

Sometimes the oospore of *V. sphœospora* is monstrous, not quite globular, but obovate. Being so, it looks like *V. subsimplex*, Crouan. It is possible that *V. sphærospora* and *V. subsimplex* are identical, but, also, not quite impossible that there is a *Vaucheria* agreeing with the figures and description in "Flore du Finistere" (1867), p. 133, tab. 10, fig. 1—4.

In *V. sphaerospora*, as in most of the other submarine monoicous species, the antheridia are attached to the oogonium, or sometimes immediately beneath it, sometimes at a distance from it, on


1
2
3
4
5
6
7
8
9
10
11

the same thread or less frequently on distinct threads. In the British specimens of *V. sphaerospora* (as in those gathered by me at Kiel), the antheridia were often, but not always, at a distance from the oogonium. I met with *forma monoica* as well as *f. dioica* in Scotland: in the estuary above Portree, in Skye, and at Ballachulish; in England, at Greenod, in Lancashire (sparingly on sand); in immense quantity in the river, one mile on both sides of the bridge at Maldon, in Essex, and in smaller patches on the shore of the Thames at Kew Gardens (consequently in somewhat brackish water). In the specimens of *V. piloboloides* in E. M. Holmes' "Algæ Britannicæ rariores exsiccatæ," No. 50, (from Weymouth), I have met only with *V. sphaerospora*, (the not brownish oospore filling up the oogonium, in one example the curved antheridium was attached directly to the oogonium), and not with *V. piloboloides*. The latter species also may perhaps exist in the cited No., though I was not able to meet with it there.

Filaments of *V. sphaerospora* 0,35—60 m.m. in diam. Oospores 0, 11—13 m.m. in diam. Antheridia 0,060—75 m.m. broad, by 0,150—165 m.m. long. Oospores in the specimens from Appin 0,07—0,105 m.m. in diam.

V. synandra Woron, in "Botan. Zeitung," 1869.

Filaments 0,04—9 m.m. in diam. Oospores 0,100—125 m.m., broad by 0,125—170 m.m, long. The androphore 0,05—6 m.m., broad by 0,075—90 m.m. long.

V. litorea Hofmann Bang et Ag. (in Agardh "Spec. Alg," 1822, p. 463; Nordst. "Bot. Not.," 1879, p. 181, tab. 2, fig. 1—6; *V. clavata* Lyngb. "Hydroph. Dan.," 1817, p. 78, tab. 21, D exclus. omn. synonym).

Filaments 0,05—9 m.m. in diam. Antheridia about 0,55—65 m.m. long, by 0,055—90 (—125) m.m. broad. Oospores, rather small, 0,11—15 m.m. broad, by 0,13—17 m.m. long. Very few oogonia with oospores were seen by me. I gathered antheridia, but no oospores, in the river, between Dolgelly and Barmouth (near Ferry station), in North Wales, $18^{27}/_{6}$ 85; at the other places, both antheridia and oogonia, but very few oospores.

In the Herb. Agardh. I have seen a specimen of "*V. longipedunculata*" with description and figure, gathered by "David Moore" (in Ireland?) I never saw a description of that species published. It was the female plant of *V. litorea* (cfr. "Bot. Not.," 1879).

V. Thuretii Woron. "Bot. Zeit.," 1869.

Filaments 0,07—9 m.m. broad, Oogonia, inclined, 0,13—21 m.m. broad; oospores 0,12—20 m.m. broad, by 0,17—24 m.m. long. Antheridia oval, sometimes more or less oblique, 0,04—5 m.m. broad, by 0,06—8 m.m. long.

All the submarine *Vaucheriæ* can grow together, but often some species (*V. dichotoma*, (Lin.) Ag., *V. litorea*) are to be found at lowest tide mark, *V. sphaerospora* between tide marks, generally above half tide level, *V. Thuretti*, *intermedia* and *coronata* higher up, and *V. synandra* highest (sometimes among grass). *V. sphaerospora* can grow in spread threads on sand or in dense masses on mud. According to Woronin, in "Bot. Zeit.," vol. 27, *V. piloboloides* grows in deeper water than the above-mentioned species (probably in quite salt water).

All the measures are taken from British specimens.

[*Vaucheria ornithocephala* Agardh "Synops. Algar. Scandin," 1817, is an older name than *V. sericea* Lyngbye "Hydroph Daniæ," 1819. It is not certain that *V. sericea*, Lyngb. is the same species as *V. sericea*, Walz, and auct. recent.]

EXPLANATION OF PLATE.

Fig. 1—3. *Vaucheria litorea* Hofm. Bang et Ag.
1—2. With antheridia; 3, with a long but slender oogonium,
4—7. *V. sphaerospora* Nordst.
5—6. Monstrous form of oogonia.
7. Not quite common form of antheridia.
8—9. *V. Thuretii*, Woron.
10—11. *V. Synandra*, Woron.
11.—With two young androphores.

LUND, 5th June, 1886.

OWING to press of matter we have been forced to hold over till next number *Report upon the Fishes of the East Coast of Scotland*, by Dr. Howden; *Report on Fungi of the East of Scotland*, by Professor Trail; *A Curious Lichen from Ben Lawers*, by Dr. Stirton; *Obituaries of Dr. Ogilvie-Forbes, and of Rev. James Peter of Old Deer*; *Mycologia Scotica, Supplement*; and several reports of articles in journals, reviews, &c.

ERRATA.

In the July No. of this Magazine, p. 308, line 8 from top, instead of "brown, with the exception of the tail, which has," &c., read "brown, which, with the exception of the tail, has," &c.

P 312, line 14 from top, *sub Taxus baccata*, delete "89," inserted by a copyist's error.—[ED. *Scot. Nat.*]