

PROCEEDINGS

OF THE

NATURAL HISTORY SOCIETY OF GLASGOW

PROCEEDINGS
OF THE
NATURAL HISTORY SOCIETY
OF GLASGOW

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PROCEEDINGS

OF THE

NATURAL HISTORY SOCIETY OF GLASGOW.

SESSION 1869-70.

THE EIGHTEENTH ANNUAL GENERAL MEETING, ANDERSON'S
UNIVERSITY BUILDINGS, SEPTEMBER 28TH, 1869.

Professor John Young, M.D., F.G.S., Vice-President, in the chair.

The Treasurer and Librarian submitted their Annual Reports, the accounts of the former shewing a balance in favour of the Society of £104 Os. 9½d. The following gentlemen were elected office-bearers for the session:—Professor John Young, M.D., F.G.S., President; Professor Alexander Dickson, M.D., and David Robertson, F.G.S., Vice-Presidents; Robert Gray, Secretary; Thomas S. Hutcheson, Treasurer; James A. Mahony, Librarian; Hugh Colquhoun, M.D., Rev. James E. Somerville, B.D., Robert Mason, Thomas Chapman, James Stirton, M.D., John Alexander, Edward R. Alston, F.Z.S., and George Thomson, Members of Council.

Mr R. J. Bennett was elected a resident member.

SPECIMENS EXHIBITED.

Mr John Young, F.G.S., exhibited two specimens of a longicorn beetle, *Acanthocinus ædilis*, captured under somewhat singular circumstances. One was found last month in Rosebank pit, near Coatbridge, at a depth of 147 fathoms from the surface; the other was taken in one of the railway carriages on the Greenock line about a fortnight later. Both specimens have been presented to the Hunterian Museum,—the first, by Dr George Buchanan, Glasgow; the second, by Mr Martin, Inspector of Poor, Kirkintilloch. This beetle possesses the longest antennæ of any known British species,

these organs being upwards of four times the length of the body. It burrows under the bark of certain kinds of fir trees, and as far as yet ascertained, Perthshire seems to be the district where the greatest number of specimens has hitherto been obtained. Mr Young suggested that the specimen found in the pit may have been carried down with wood in the egg or larval state, and there hatched. The other specimen may also have been brought into the district amongst wood.

Mr Thomas Chapman exhibited the living larvæ with cocoons of *Platysamia cecropia*, a North American silk moth, and gave some interesting observations on the habits of the species.

Mr Robert Gray exhibited a second specimen of the Spotted Sandpiper, (*Totanus macularius*), killed in Aberdeenshire in August 1867, and stated that this specimen is perhaps the third or fourth British example.

PAPERS READ.

I.—*On a fresh water Polyzoan belonging to the genus Alcyonella, discovered in St. Germain's Loch, near Maryhill, in August, 1869.*

By Mr JOHN YOUNG, F.G.S.

Professor Allman of Edinburgh, who has described all the known British species of fresh-water Polyzoa, mentions but three species of *Alcyonella* as having been found in Britain, only one of which has hitherto been met with in Scotland, viz., *A. fungosa*. Examples of the species found by Mr Young in St. Germain's Loch having been forwarded to Professor Allman by Prof. Alexander Dickson, an opinion has been expressed that they belong to a new and undescribed species. Mr Young gave a description of the mode of occurrence and the habits of this beautiful organism, stating that he had found it growing in patches upon the bark, and clustered round the twigs of dead trees thrown into the water of the loch. Several specimens, which he had kept alive for three weeks, had afforded him an opportunity of watching their movements. The organisms when fully expanded gave the twigs on which they were clustered an appearance as if covered with the finest down of a pale yellowish-white colour. Their tentacles, which are numerous, are arranged somewhat in the form of a crescent-shaped fan when seen in the expanded state through a glass. They seem to be sensitive to strong sun-light, and they flourish best when placed in a window with a northern exposure. On the

slightest motion of the twigs to which they are attached they suddenly withdraw themselves into their tubes, but begin to creep out again after a few moments rest.

II.—*Observations on a mode of identifying certain Post-tertiary fossils.*

By Mr DAVID ROBERTSON, F.G.S.

The subject was fully illustrated by a carefully-prepared series of mounted specimens of the various parts of Echinoderms, and also of bones of fish, chiefly otolites.

Professor Young then delivered a brief opening address, in the course of which he drew a comparison between geology at the beginning of the century, and biology at the present day.

OCTOBER 26TH, 1869.

Professor John Young, M.D., F.G.S., President, in the chair.

SPECIMENS EXHIBITED.

Mr James Ramsay exhibited a number of rare British plants, gathered by himself in the month of August last, at Muirhouses and Kelvinside, both localities in the immediate vicinity of Glasgow. The collection included specimens of the following:—

FROM MUIRHOUSES.

<i>Centaurea Calcitrapa,</i>	. . .	Star Thistle.
<i>Cichorium Intybus,</i>	. . .	Chicory.
<i>Hordeum murinum,</i>	. . .	Wall Barley.
<i>Sisymbrium Irio,</i>	. . .	London Rocket.
<i>Malva rotundifolia,</i>	. . .	Round-leaved Mallow.
<i>Erysimum cheiranthoides,</i>	.	Treacle Mustard.
<i>Senebiera Coronopus,</i>	. . .	Swine's Cress.
<i>Melilotus parviflora,</i>	. . .	Small-flowered Melilot.
<i>Trifolium resupinatum,</i>	. .	Reversed Trefoil.
<i>Trifolium ochroleucum,</i>	. .	Sulphur Trefoil.
<i>Anthemis Cotula,</i>	. . . .	Stinking Chamomile.

FROM KELVINSIDE.

<i>Melilotus parviflora,</i>	. . .	Small-flowered Melilot.
<i>Medicago falcata,</i>	. . . .	Sickle Medick.
<i>Anthemis arvensis,</i>	. . . .	Corn Chamomile.
<i>Beta maritima,</i>	. . . .	Sea Beet.

Mr Thomas Chapman exhibited a book of original drawings of plants and insects inhabiting the island of Taboga in the Bay of Panama, and read descriptive notices of them by Dr Macdowall, corresponding member.

Professor Young exhibited a series of fishes, including 19 species from Indian seas, being a portion of a valuable donation recently presented to the Hunterian Museum by Dr Allen Thomson. In this collection, Dr Young had found specimens varying in many of their characters from species already described.

Mr Robert Gray exhibited a specimen of the Little Stint (*Tringa minuta*), sent by Mr W. C. Angus of Aberdeen, corresponding member, who had observed flocks of this species annually near that city.

Mr Gray also called attention to the following birds from the cabinet of Mr John A. Harvie Brown, corresponding member—Starling (*albino*), Yellow Hammer (*melanoid variety*), and Rook (*pieb variety*). He also submitted to the inspection of the meeting a photograph of urns and bones, lately taken from several graves of ancient Britons discovered in Cumbræ, and read a short notice of them, sent by Mr John Levack, corresponding member.

Mr John Young, F.G.S., exhibited an interesting example of *Productus longispinus* (Sowerby), which he had discovered in a cavity of weathered Carboniferous limestone at Cunningham, Bedland, on the Rye water, Dalry. This specimen was so beautifully preserved that it showed in their natural position the long spines projecting in relief from the ventral valve as if it was a recent shell. Mr Young called attention to the fine state in which the *Producti* are found weathered out from the limestone in the above locality, and remarked upon the very gentle way in which the limestone strata must have accumulated and consolidated around the organisms, so as to preserve the spines in their natural position without break or fracture.

The Rev. James Somerville exhibited a specimen of a species of Cuttle-fish, *Eledone octopodia*, which had been captured a few weeks ago in Brodick Bay, and made some remarks on its structure and habits, at the close of which he handed the specimen to Dr Young as a donation to the Hunterian Museum. Mr Somerville also mentioned that, in the month of June last, he had found a rare plant, *Trientalis europæa*, growing in Brodick Castle woods, near the side of the road leading to Goatfell.

PAPER READ.

On a specimen of the lower portion of the horn of the Reindeer (Cervus tarandus), now extinct in the British Islands.

By Mr JOHN YOUNG, F.G.S.

This interesting relic of an animal, which seems to have existed in Scotland from pre-glacial times down to a period as recent as the twelfth century, was found embedded in boulder-clay at Rae's-gill, near Carluke, Lanarkshire, about the year 1849, during the open cast working of the clayband ironstone at that place. Since that time it has been in the possession of Mr William Grossart, Surgeon, Salsburgh, in the parish of Shotts, and it was by him recently presented to the Hunterian Museum. This is only the fourth recorded occurrence of the remains of Reindeer in the West of Scotland, and it appears to be equally rare in other parts of the country. The other three localities in which it has been found are—1st, Kilmajors, near Kilmarnock, where its remains were discovered in beds under the boulder-clay, and associated with those of the Mammoth. The stratum in which it occurred at this place was overlaid by another bed containing marine shells of Arctic species. 2nd, The valley of the Endrick, near Kilmarnock, where it was found with Arctic shells underlying the till; and 3d, in the silt of the river Clyde, nearly opposite Jordanhill. The Rae's-gill horn bears evident marks of transportation, and was probably derived from the denudation of strata more ancient than the boulder clay. Its whole surface is smooth, and its extremities are rounded. The striations on its surface also bear out the evidence of its having been obtained out of the till. These are generally in the direction of the longest axis of the horn, and in appearance they exactly correspond with the scratched and ice-worn stones of the till.

The Librarian announced as a donation to the library, The Entomologist's Monthly Magazine, 3 Vols., from Dr Hugh Colquhoun.

NOVEMBER 30TH, 1869.

Mr David Robertson, F.G.S., Vice-President, in the chair.

Messrs John Young, jun., William MacEwan, C.M., and James Lothian, were elected resident members.

SPECIMENS EXHIBITED.

Mr John Gilmour exhibited a remarkably fine specimen of the King Crab (*Limulus polyphemus*), which had been captured by himself in Horn Island, Mississippi Sound, Gulf of Mexico. The unusual size and formidable aspect of this specimen attracted considerable attention.

Mr Gilmour also exhibited a beautiful specimen of Diard's Pheasant (*Phasianus versicolor*), which was shot in September last, near Kames, in the Kyles of Bute. Referring to this bird, Mr Gray stated, that it had now become established to some extent in various localities in the West of Scotland, and that there was a prospect of seeing other breeds of equal value and beauty introduced ere long into Ayrshire.

Mr William Haddin exhibited a collection of ferns from Dunedin, New Zealand, including a number of interesting forms.

Mr Robert Gray exhibited a very fine Goshawk, which was shot on the flanks of Schiehallion, Perthshire, in 1868, corresponding in every particular with the species found in North America, which, since the time of Audubon, has been re-named *Astur atricapillus*, by the late Prince C. L. Bonaparte. As the American bird is larger than the European, and has been catalogued under a separate name by all recent writers on ornithology, with apparently good reason, the occurrence of this Perthshire specimen is a somewhat important circumstance, being, in fact, an addition to the fauna of Europe.

Mr Gray also exhibited a specimen of the Black-throated Diver (*Colymbus arcticus*), in the brilliant plumage of the breeding season, which had been captured in a salmon net at Girvan; and an unusually fine specimen of the Bird's-foot Sea-star (*Palmipes membranaceus*), which had been forwarded from Girvan by Mr Thomas Anderson, corresponding member.

Mr James Coutts exhibited a live specimen of a Scorpion which had been captured in a timber yard in East Campbell Street, Glasgow.

The Librarian announced the following donations to the Library: Bell's British Quadrupeds, Travels on the Amazon and Rio Negro, and Records of a Naturalist on the river Amazon, from Mr Gavin Miller. Bell's British Reptiles, from a member of Council. Proceedings of the Philosophical Society of Glasgow, Vols. iii. and iv., and Part I. of Vol. vii., from the Society. Hooker's Travels in Lapland, from Mr J. A. Mahony.

DECEMBER 28TH, 1869.

Mr David Robertson, F.G.S., Vice-President, in the chair.

The following gentlemen were elected members:—Messrs John Cook and Thomas Charles Young, M.A., as resident members, and Mr George S. Brady, C.M.Z.S., Sunderland, as a corresponding member.

SPECIMENS EXHIBITED.

Mr Robert Gray exhibited a specimen of the Brown Snipe (*Macrorhamphus griseus*, Gmelin), and a specimen of the Green-rumped Tattler (*Totanus chloropygius*, Vieillot), and read a communication from Mr Francis M'Culloch, Taxidermist, Sauchiehall Street, giving satisfactory evidence of the birds having been shot in Lanarkshire. The Brown Snipe had occurred in Scotland before, but the Sandpiper had not previously been found in Europe. Mr Gray also exhibited a specimen of the Shoveler (*Anas clypeata*), a beautiful male, which was shot a few months ago, and forwarded by Mr William Lorrain; also an immature specimen of the Little Gull, which was shot in March last near Aberdeen, where a number of specimens of this rare bird have been obtained at various intervals. It would appear, indeed, that in its movements southwards this species passes along the coasts of Aberdeenshire almost every winter.

Mr James Coutts exhibited a very pure albino of the Sky-lark, from Ballantrae, in Ayrshire. The specimen was quite spotless, and without the faintest trace of any tint on its plumage.

The Rev. James Somerville, B.D., exhibited a skull of the Hog Deer (*Babyrussa alfurus*), and made some remarks on the geographical distribution of this curious animal.

PAPERS READ.

I.—*Notes on Cypris lævis and its habit of perforating the leaves of Victoria regia.* By MR DAVID ROBERTSON, F.G.S.

About the latter end of June last, Dr Colquhoun drew my attention to some small insects that were infesting the water in the tank containing the Lily, *Victoria regia*, in the Botanic Gardens, and which were thought might be connected with the destruction of some parts of the leaves of that plant.

On looking into the tank great numbers of small animals were

seen actively swimming in the water, but a few draws of a small net amongst the leaves revealed their enormous numbers, and proved them to be a little Ostracod, *Cypris laevis*, (Müller).

After a careful examination of the surface of one of the mutilated leaves, along with the contents of the net, no other animal was seen, with the exception of two minute insects, which left little doubt that if the plant was suffering from the attacks of animals in the water, they must be these Ostracoda that swarmed around it in such multitudes.

On holding the leaf up between me and the light, I perceived that it was pierced like a sieve with very small holes, not all straight through, but obliquely. This will be seen in the specimen I now hand round, by holding it against the light, and slightly turning it from one angle to another, when at each change of position an additional batch of perforations comes into view, and when held at arm's length a still greater increase of punctures is seen.

On a closer examination of these holes they were found to consist of different sizes, but the great majority were of the smallest size, and these appeared to be the most smooth, without any apparent change in the surrounding structure of the plant. The larger holes, on the other hand, had the tissues of the margins less or more altered, and, as they became larger, this change of texture became more visible.

That the innumerable holes in the leaves are first made by *Cypris laevis*, that swarms so abundantly in the water of the tank, is greatly strengthened by the fact that the newly made perforations correspond in size to the adult of that animal.

On further examination I found three or four egg-like bodies agglutinated in the top of the holes, and these were in every case in the small smooth holes that had the appearance of having been lately perforated. By freeing a few of these egg-like bodies from their glutinous nidus, and subjecting them to the microscope, they were seen to be young Ostracoda, and so far as likeness to parent could be trusted at that age, there could be little doubt they were that of *Cypris laevis*.

Another conclusive fact given by Mr Bullen, curator of the gardens, further confirms the statement that the plant suffered greatly from these insects. He says that shortly after I had been with him in the month of June, these animals increased

excessively, and at the same time the Lily appeared to suffer more and more.

Seeing that the plant was perishing, and that whatever experiments he might make to remove these pests in hope to give the plant a chance of life, he could not be chargeable with its destruction even should it die, he applied a little lime to the water in the tank, and in a very short time the insects had almost entirely disappeared.

The plant, thus freed of its enemies, began at once to improve and regain its usual health.

It may be asked upon what do these animals live? According to Müller and Straus, the greater number of Entomostraca, if not parasitical, live on vegetable matter. Dr Baird calls this in question, and asserts from observation that the Cyprididæ in particular seem to be most voraciously carnivorous, but this in no way affects the question, as these holes or burrows are obviously not made for food, but as a shelter and nidus to their young.

If the increasing size of the holes were made by being nibbled away mechanically, we might expect to find some part at least of the abrasion raw, which close inspection failed to detect, but, on the contrary, the enlarging holes were surrounded by gangrenous-looking edges, which appeared to go on spreading from the first injured point.

This little Crustacean, *Cypris lævis*, is not uncommon in ditches and small patches of water, but I never saw them in such abundance in exposed situations as in the warm tank, which no doubt tends greatly to increase their numbers.

In a hot-house at Millport, in a barrel kept with water for the plants, I found another Ostracod of the same genus in abundance, *Cypris incongruens* (Ramdohr). In another barrel outside the same building the same species was found, but not one for twenty that were in the barrel within the house, which was much warmer. Both these vessels were supplied with water from the same source, and that there were more Ostracoda of the same species in the one vessel than the other, I can only ascribe to the additional heat.

There can be little doubt, if any, that in this case and most others these animals get in with the supply of water through the pipes. This suggests a remedy to prevent their entrance, which is, to let the water pass into the tanks through a sieve sufficiently

fine to arrest the smallest of these animals; and as they do not leave the nidus till they are a considerable size, a wire sieve of from 80 to 100 wires to the inch would, I think, make sure work with the smallest of them, while open enough to allow a considerable run of water to pass through with ease; and in this way it might be better to go in with the old proverb, "prevention is better than cure."

The reading of this paper was followed by an interesting discussion, in which Mr John Young, Mr James Ramsay, and several other members took part; and at its close a cordial vote of thanks was tendered to Mr Robertson, for the care and painstaking with which he had conducted his researches.

II.—*On the present distribution of the Capercaillie in Scotland.*

By Mr ROBERT GRAY.

Various localities were enumerated in which this "chieftain of the grouse tribe" had of late years become established in Scottish woods and forests, Perthshire and Forfarshire being looked upon as its principal strongholds. Stragglers, however, had been recently met with as far south as Galloway and Dumfriesshire, and it had occurred also at Auchengray moor, near Airdrie. These birds were probably wanderers from the woods of Sanquhar, where this species is known to have been introduced from the island of Arran a few years ago.

The Librarian announced, as a donation to the Library, Dr T. Spencer Cobbold's work on Entozoa—An Introduction to the study of Helminthology, in two volumes, 1864, and Supplement, 1869, from Mr James Stewart.

JANUARY 25TH, 1870.

Professor John Young, M.D., F.G.S., President, in the chair.

Mr James Beaumont was elected a resident member.

SPECIMENS EXHIBITED.

Mr Robert Gray exhibited a specimen of the Shore Lark (*Alauda alpestris*), which was shot near St. Andrews, on the first of the present month, and forwarded by R. J. Wardlaw Ramsay, Jun., Esq., Lasswade. This species has hitherto been regarded as a very rare

British bird, and in all the published works on the ornithology of this country, not more than perhaps a dozen British specimens have been enumerated. Within the last six or eight years, however, Mr Gray had seen at least nine specimens that had been captured north of the Tweed, and he thought the Shore Lark would yet be found to be a tolerably regular winter visitant to the eastern shores of Scotland.

Although the head quarters of this species might be said to be North America, where it is widely distributed, from the table land of Mexico to the Fur Countries, extending its range as far as the shores of the Arctic Sea, it was doubtful if the small flocks which reached Scotland came from that part of the world. It had not indeed been satisfactorily settled whether the Shore Lark of North America and that of European countries are really identical.

Mr Thomas Chapman exhibited two cases containing a number of specimens of *Ceratocampa regalis* and eight other species of interest, which had been brought alive to this country from North America in February last.

PAPERS READ.

I.—*On the claims of Natural History as a branch of Education.*

By Mr JAMES W. ALLAN.

In this paper the author advocated the teaching of Zoology and other branches of Natural History in schools, and also that they should occupy a more important place in the curriculum of all universities. At its close Professor Young made some lengthened remarks bearing on the different aspects of the question.

II.—*On the introduction of the Wild Turkey (Meleagris gallipavo) into Argyllshire.* By Mr JOHN GILMOUR.

The subject of acclimatization is one which interests nearly every one, but more especially the members of a Society such as this, and all the more when the object of that acclimatizing is one likely to prove useful as well as ornamental. I shall therefore take the liberty of reading a few remarks concerning "The Wild Turkey of North America," as seen nearer home, namely, in Argyllshire.

In the summer of 1866, a friend sent us three Wild Turkeys, one

male and two females, caught in the woods near Sarnia, at the most southerly extremity of Lake Huron in Canada. They had been captured when quite young, and would be a little over two years old when they arrived in this country. They came home in one of our own ships and arrived in splendid order, having apparently thriven well on the sea-voyage.

The different characters of the sexes were very marked, for while the cock tried all in his power to get a dab at you with his beak, or a dig at you with his long spur, the hens were of the most timid, shy, and retiring disposition; and while the cock strutted up and down behind the wooden bars of their house with feathers all set up and evidently in very irascible mood, the hens kept in the back ground, and by low chucks seemed to try to quiet their lord's excitement. Finding the cock too dangerous to trust with his liberty, we enclosed a run for them with wire, with a house for shelter at one end supplied with a roosting pole.

That season the hens laid well, but being late in the year we did not set any eggs. The eggs are a shade smaller than the Common Turkey's eggs, and generally more distinctly marked, although the colouring varies greatly. We then, after the fall of the leaves, when we thought we could better keep our eye on them, let the birds out of confinement; the cock behaved very well for a short time, but fell into bad ways, and after he had decapitated several fowls of one kind and another, we were compelled to put him once more under lock and key.

Next summer the hens laid splendidly, and we had a fine flock of about twenty young birds, brought out under common hens, of which seventeen reached maturity. These young birds, though thus domesticated, showed their wild nature thoroughly, and never would go under a roof, always roosting on the trees. A pair of these young birds was given to a gentleman in Argyllshire, with whom they have done very well, as he had seventeen young Wild Turkeys the first year. Another pair was given to a friend in Mid-Lothian, with whom they were not quite so successful, the situation not being so suitable and the birds more disturbed, but still I am glad to say they have done well enough to allow of the hope of some of their progeny being turned out next season in suitable coverts in Kinross-shire. A young cock of this flock (that of 1867), which we still have, and which has never been in

confinement, rivals his parent in plumage, size, and almost in wildness; having a free run on the open, his magnificent bronzed feathers show in the sun to greater advantage even than those of the old bird.

With these exceptions the rest of these birds were used for table, for which purpose they had to be shot, that being the only way to get hold of them. On the table some hold them to be more delicate than the Common Turkey, though they do not differ much from it; this may be owing to some extent to their being fed on Indian corn and Indian meal, the same as the rest of the poultry, and not depending altogether on wild food as they do in their native woods, where their flesh naturally has a slightly gamey flavour.

A high precipitous rock, standing peculiarly on the level grounds beside the house, crowned on the summit with a dense growth of ivy and overshadowed by a tree, attracted the attention of one of the hens; and in the summer of 1868, the hens having been let out of confinement for a change, one of them nested in the very centre of this bunch of ivy. Her mode of getting upstairs was original, and displayed her wild cunning, for she first of all got into the tree, and going along a branch that overhung the rock, let herself drop on to her nest; when on her nest not a vestige of her could be seen, and it was some time before her hiding-place was discovered. When the young birds came out the difficulty was to get them on to "terra firma," so the keeper climbed up and brought the little things safely down, but the old hen would not then look near them, and took off to the thicket like a wild thing; fearing the young birds would perish, the keeper managed to capture the hen and put the young birds in beside her, but she was so violent that she trampled several to death, and the covey was becoming beautifully less before she condescended to care for her reduced family.

Our experience has been that during hatching time, since these birds are very wild, their nests should not be approached or disturbed in any way, otherwise the chances are they will forsake them. Besides the casualty above mentioned, the young birds seemed more difficult to rear, and our flock in 1868 was consequently a small one.

This last season (1869), the hens were also allowed to be at large, but their first eggs were taken from them and set under common

hens, and the result of these settings is about eight young birds reached maturity; but the Wild Turkey hens, their feelings evidently outraged, disappeared for a long time, when one was discovered on her nest, but nothing was seen of the other till both hens appeared with about a dozen chickens each. Though late birds, luckily our fine summer favoured them, and with only two or three deaths in each brood these careful mothers have brought them all up safely, proving how much better nature manages these things than man even with all his appliances.

These broods have been objects of great interest to us all the season, for though coming daily near the house to get their accustomed pick, the hens have kept them almost exclusively in the woods, bringing them on to the small grass paddocks at the edges of the coverts to enjoy the sunshine and feed on the insects, etc. While the young birds were thus busily engaged, the old hen would stand like a sentinel in the midst, her neck stretched to its full extent and her head turned sharply from side to side, while with her quick keen eye she watched, not only her brood, but also for any approaching danger. If you approached near, and there was not sufficient cover for her to hide in, she crouched almost level with the ground with her head and neck stretched out straight in front of her, and, at a warning chuck from her, the young ones disappeared as if by magic, and were by no means easy to discover in the tufts of grass, etc., in which they had taken refuge. We have, in shooting, several times come across these birds on the heather hill above the coverts, and several times beat them out of the woods; and though the joke is becoming a little old, it is no unusual thing for the beaters, after their usual cautionary cry of "mark," on any game rising, instead of the expected "woodcock," "hare," or "rabbit," to call out "wild turkey!" and it was only the other day that, in firing at a rabbit in the covert, it was found that I had shot a young Wild Turkey, so that if this goes on it will be necessary to get a new column added to the game-book.

Our coverts being chiefly natural wood, such as birch and hazel, and for the most part unenclosed, are not so well adapted for these birds; but in extensive enclosed woods I have no doubt they would do well, and I am happy to say that there is every chance of their being introduced into the fine old woods of Inveraray, where, if anywhere, they ought to succeed. I should consider that

with very much the same feeding as given to Pheasants they should thrive well, though I have been informed that Lord Ducie introduced them into his coverts in Gloucestershire, but found they drove off his Pheasants. If this be the case (and there is no doubt the cocks are very pugnacious) it will go greatly against their extensive introduction, more especially as, except as a mark for the pea-rifle, there can be but little sport got out of the Wild Turkey in our comparatively small woods.

In comparing this bird with our own breeds of Norfolk and Cambridgeshire Turkeys, we find it to be of much the same size as the average of these birds; it stands higher on its legs than the domesticated bird, and is of far finer, or, as we might call it, more "gamey" shape; especially is this noticeable in the head, which is most symmetrical and very small, with a wonderful, bright, sharp eye. The legs are a dull red, and those of the males are furnished with most formidable spurs. The plumage of the cock is of the most perfect bronze colour, and when the sun shines on the bird his feathers fairly gleam again like a splendid coat of mail. From his breast hangs a handsome tassel of "hair," or hair-like feathers. The only feathers in the bird approaching dulness are those of the wing and tail, which are of a mottled brown and white. The plumage of the female is duller than that of the male, but differs in no other respect. These birds lay sixteen to twenty eggs before sitting, and take thirty-one days to hatch their eggs. Formerly they were very plentiful in Canada, west of Toronto, but now are becoming extremely rare, and are met with in the greatest numbers in some of the least settled of the Western and Southern States.

Mr Gray mentioned, in reference to the Wild Turkey as catalogued by scientific ornithologists, that there are now supposed to be three different species of *Meleagris*, besides the *M. ocellata* of Honduras and other parts of Central America; namely, *M. americana*, which is probably peculiar to the eastern half of North America; *M. mexicana* of Gould, a species belonging to Mexico and extending along the table lands to the Rocky Mountains; and a third, the *M. galliparo* of Linnæus, our domesticated bird. This last species was perhaps originally indigenous to one or more of the West India islands, whence it was taken in a tamed state to various parts of North America, and thence to Europe about the year 1520. The domesticated

bird differs from the nearly allied wild species in having a largely developed dewlap extending from the base of the under mandible down the fore part of the neck to its base. It cannot yet be said to be a settled question as to the precise original stock from which the valuable barndoor breeds have descended.

III.—Notes on the genera of extinct fossil shells, *Bellerophon* and *Porcellia*; their classification amongst the Mollusca, and their distribution in the Silurian and Carboniferous strata of the West of Scotland. By Mr JOHN YOUNG, F.G.S.

Mr Young stated that at one time this interesting group of shells had been placed by palæontologists among the Cephalopoda, the highest division of the Mollusca, and regarded as fossil representatives of the recent *Argonautidae*, which possess a symmetrically coiled shell as in *Bellerophon* and *Porcellia*, but like them not chambered, as in the genus *Nautilus*. In the more recent classification of the Mollusca, *Bellerophon* and *Porcellia* are now placed among the Gasteropoda in that division termed the *Nucleobranchiata*, which consists of entirely pelagic animals, some having shells, others none, and, according to Woodward, swimming at the surface instead of creeping on the bed of the sea. Prof. Owen believes, however, that from the thickness of the shells in many of the species of *Bellerophon*, they may have been adapted to protect their owner while crawling over the sea bottom; for it can scarcely be insisted, he says, that all were necessarily floaters on account of their organisation. In recent seas the extinct genera are represented by the genus *Atlanta* and the sub-genus *Oxygyrus*. In palæozoic times, the genus *Bellerophon* commenced its existence, so far as is known, in the lower Silurian period, and became extinct in the Carboniferous; it is represented over the world by about seventy species, fourteen of which are found in Western Scotland, viz., four in the Silurian rocks of the Girvan valley, and ten in the Carboniferous limestone strata of the district around Glasgow: the most abundant and characteristic Carboniferous species being, *B. Urvii* and *B. decussatus*, and their varieties. The rarer genus *Porcellia* ranges from the Devonian to the Triassic period; ten species have been found, but only one of these, *P. armata*, has yet been discovered in the Glasgow district.

FEBRUARY 22D, 1870.

Mr David Robertson, F.G.S., Vice-President, in the chair.

Mr Henry E. Clark was elected a resident member.

SPECIMENS EXHIBITED.

Mr Thomas Chapman exhibited specimens of *Venilia macularia*, which he had captured in June last in the Pass of Leny, Perthshire; and the Rev. James E. Somerville stated that he had taken the species in some numbers in Argyllshire, both at Loch Awe and Oban.

Mr Robert Gray exhibited a small collection of Star-fishes which had been forwarded from Girvan by Mr Thomas Anderson, corresponding member. In this series, which showed the relative numbers found in deep water off that part of Ayrshire, there were specimens of *Goniaster Templetoni* and *Asterias aurantiaca* in equal numbers; *Solaster endeca*, which is a common species in some parts of the east coast, but is rather scarce in the west; and *Palmipes membranaceus*, three specimens of which had previously been forwarded for exhibition by Mr Anderson, being probably the rarest of the Girvan Star-fishes.

Mr Duncan McLellan exhibited monstrosities of the common Ash and Hawthorn, from the Queen's Park, the former shewing the twigs flattened like the horns of a reindeer; the latter having its branches tortuous like a cork-screw. Both specimens presented a very abnormal appearance.

Mr Alexander Donaldson exhibited an example of malformation in the bill of a Rook, regarding which Mr Gray observed that the specimen possessed additional interest from the fact that it showed only a partial abrasion at the base of the bill, and that its growth had been arrested probably in consequence of the malformation. Drawings of others were exhibited by Mr Gray, from which it was seen that, when the mandibles were crossed to any extent, the deformity effectually prevented the bird from digging into the ground, as it is habitually known to do, and that, as a result, the nostrils, forehead, and chin were fully clothed with feathers like those of a Carrion Crow. In examples, however, where the upper mandible projected over the lower, even twice its length, the abrasion was found to be perfect like that seen in an ordinary specimen. This he explained on the ground that the prolonga-

tion of the mandible had taken place after the feathers had been denuded, and that this bareness became permanent on account of the bulbs, from which the feathers arise, having been destroyed and thus rendered unproductive.

Mr John Gilmour exhibited an unusually dark specimen of the Hooded Crow (*Corvus cornix*), which had the light space on the breast and shoulders very much clouded, giving the bird the appearance of a variety of the Carrion Crow (*Corvus corone*). Mr Gray was of opinion that these two birds are identical; no real difference existed except in the markings, and as these were known to vary, they could hardly be entitled to specific value. The two birds were also known to breed freely together, so that in the middle districts of Scotland, at least where this habit was the rule, it was impossible, on examining specimens, to say from what parentage they had sprung.

Dr Stirton exhibited specimens of *Adelanthus Carringtoni*, a *Jungermannia* new to science, which he had found on Ben Lawers and in other places; this moss had formerly been confounded with *Alicularia compressa*, from which, however, it differs not only in the colour and aeration of the leaves, but also in their mode of attachment to the stem. It approaches much more closely *Alicularia oclusa* from Campbell's Island in the South Pacific; and as this last has been proved by Dr Carpenter to be an *Adelanthus*, it has been thought proper to refer this moss also to the same sub-genus.

PAPER READ.

On Danais chrysippus and its food plant Asclepias gigantea, with illustrative specimens from Upper Egypt. By the Rev. JAMES E. SOMERVILLE, B.D.

The author of this paper gave a very interesting account of this butterfly, from personal observations made during a three months' residence in Egypt, and also of the plants on which it is known to feed. He likewise described the peculiar properties of the *Calotropis procera*, or *Asclepias gigantea* of Linnæus, a plant better known as the apple of Sodom, a beautiful series of which, in its various stages of growth, was exhibited by Mr Somerville in illustration of his remarks.

MARCH 29TH, 1870.

Professor John Young, M.D., F.G.S., President, in the chair.

Mr James Lumsden and Mr David M. Lyle were elected resident members. Mr James A. Mahony, Librarian, who was leaving Glasgow to settle in Ireland, was elected a corresponding member.

SPECIMENS EXHIBITED.

Mr Robert Gray exhibited skulls of the male and female Gaur or Indian Bison (*Gavæus gaurus*, Jerd.), which had been forwarded by Capt. H. W. Feilden, 4th King's Own Royal Regiment, corresponding member. Mr Edward R. Alston, F.Z.S., read the subjoined remarks, prepared by Capt. Feilden.

In the introduction to Dr Jerdon's "Mammals of India," occurs the following:—"The magnificent Gaur, the Bison of sportsmen, abounds in the forests of Southern India, and extends more sparingly into Central India, as well as to Burmah and the Malay peninsula." This describes its habitat correctly and concisely. Sportsmen from the Bengal Presidency do not talk much of the Gaur; being a woodland species, it is not found on the great plains of Bengal, Oude, Rohilcund, and the Punjaub, though it is said by Hodgeson to occur in the Terai, the jungle-belt that skirts the base of the Himalayas. It must be rare there, however, for I have hunted in the Terai, and have never come across it. In the Bombay and Madras Presidencies, sportsmen are well acquainted with the Gaur, and from its exceeding shyness, esteem it highly as an object of chase. When wounded it is sometimes exceedingly fierce and dangerous, and requires all the skill and courage of the hunter to destroy it. The great Wynaad forest—the favourite elephant hunting-ground in the Madras Presidency—abounds with this species, and Col. W. Campbell's interesting book of sporting adventures in India contains most accurate descriptions of the appearance, habits, and chase of the Gaur.

I will quote Jerdon's description:—"The skull is massive, the frontal large, deeply concave, surmounted by a large semi-cylindric crest rising above the base of the horns. There are thirteen pairs of ribs. The head is square, proportionally shorter than in the Ox; the bony frontal ridge is five inches above the frontal plane. The muzzle is large and full; the eyes small, with a full pupil of a pale blue colour. The whole of the head in front of the eyes is covered with a coat of close short hair of a light greyish-brown

colour, which below the eye is darker, approaching almost to black. The muzzle is greyish, and the hair thick and short. The ears are broad and fan-shaped. The neck is sunk between the head and the back, and is short, thick, and heavy. Behind the neck, and immediately above the shoulder, rises a fleshy gibbosity or hump of the same height as the dorsal ridge. This ridge rises gradually as it goes backwards, and terminates suddenly about the middle of the back. The chest is broad, the shoulder deep and muscular, the fore-legs short, with the joints very short and strong, and the arm exceedingly large and muscular. The hair on the neck and breast and beneath, is longer than on the body, and the skin of the neck is somewhat loose, giving the appearance of a slight dewlap. The fore-legs have a rufous tint behind and laterally, above the white. Horns pale greenish, with black tips, curving outwards, upwards, and slightly backwards, and finally inwards. General colour, dark chesnut-brown or coffee-brown; legs from the knee downwards, white."

I will now briefly refer to the specimens exhibited this evening. They are the skulls of adult male and female, and were procured for me by a European employé in the department of woods and forests. The animals were shot by him near the Godavery River, in the territory of the Nizam, in May, 1868, and the following is the account he gave me:—"I was camped at a village, some hundred miles from Secunderabad, on the banks of the Godavery, felling and collecting rosewood. The inhabitants of a neighbouring village told me that a herd of Bison came nightly from the jungle and destroyed the young rice, and begged me to drive them off. I had a hole dug on the border of this rice-field and took up my position there the next night, my only weapon being an old Enfield carbine. Towards morning a herd of ten or fifteen Bison issued from the jungle and began grazing on the rice. I selected what I thought to be the finest, an old bull, and when he came within thirty paces I fired at him behind the shoulder,—he rushed off to the jungle snorting. The herd gave me time to load again before going off, and I shot at a cow that had a calf beside her. She fell dead in her tracks, and the wounded bull was followed up by the natives the next day, and found lying dead in the forest." These two heads were given me about a month after they had been killed, and though they were partially skinned, yet enough flesh remained on them to make them most offensive. The bull's

head with the skin on was a load for two coolies. I tried to preserve the skins, but the hair came off, so I was obliged to content myself with the skulls and horns. The hair along the frontal bone, between the bases of the horns of the bull, was about two inches long, greyish-brown, and in heavy curls.

Elliot gives the following measurements of a fine old bull's horns: circumference at base, $19\frac{1}{2}$ inches; distance between the points, 25 inches. The following are the dimensions of the present specimens, as taken by Mr Alston:—

	Bull.	Cow.
Skull, length from frontal-ridge, - -	21·75	18·25
“ breadth between bases of horns, -	11·50	9·00
“ breadth between orbits, - -	10·00	8·25
Horns, length along outside curve, - -	22·25	13·25
“ circumference at base, - - -	14·25	9·50
“ breadth between tips, - - -	22·50	9·00
“ breadth at widest curve, - - -	32·00	19·00

The wearing off of the bull's horns at the tips is a sign of old age and of many combats, and I fancy that this is the skull of a very ancient individual.

So many sportsmen have given descriptions of the hunting of these animals, as Col. Campbell, “The Old Shekarry,” and others, that it is not necessary to enlarge on the subject here. I do not think that complete skulls of *Gavæus gaurus* are often to be met with in collections, the size of the horns being so little in proportion to that of the skull, that the latter is generally left behind on account of the weight.

Mr Gray also drew the attention of the meeting to a fine head of the Cape Buffalo (*Bubalus caffer*), which had been lent for the occasion by the Messrs Yuile, taxidermists, 94 Sauchiehall Street.

Mr John Young, F.G.S., exhibited a small collection of fossil Brachiopoda, which had been collected last summer, in the neighbourhood of Girvan, by Mrs Robert Gray. The series contained examples of *Atrypa incerta*; *Rhynchonella anula*; *R. Thomsoni*; *R. Weaveri*, the first Scottish example; *Orthis Bouchardii*, or perhaps a new species, *O. vespertilio*; *O. calligramma*, var. *Scotica*; *O. elegantula*, and another species of *Orthis*, not yet named; also specimens of *Triplesia Grayi*; *Strophomena imbrex*; *Leptaena transversalis*, var. *Youngiana*; *L. sericea*; *L. tenuicincta* and *Strophomena Grayi*, a new and unpublished species. Mr Young stated that the

collection made by Mrs Gray was equally important as regarded other fossils, the Trilobites, Corals, Graptolites, etc., the whole consisting of several hundred well selected specimens, which would probably yield a number of new species when they came to be thoroughly examined.

Mr Robert Gray exhibited a specimen of the Crested Spizaëtus, (*Spizaëtus cristatellus*, Jardine and Selby), from Demerara, a rare bird in collections, which had been lent by Mr J. Whiteford, Wilson Street.

Dr John Grieve and Mr J. A. Mahony exhibited a series of fossils from the leaf beds of Mull, regarding which Dr Grieve made some interesting remarks.

After referring to the Duke of Argyll's paper in the Quarterly Journal, Geological Society, vol. vii., and describing the position of these beds in the headland of Ardtun, on the south-west side of the Island of Mull, as resting upon the amorphous and columnar basalt below, and separated from each other by beds of volcanic ashes or tuff, and finally covered by a layer of rudely columnar basalt, Dr Grieve went on to say that they had both carefully examined the layer of baked clay or fine mud, in which these leaves have been imbedded, and which now forms the matrix of the fossils, after being pounded and suspended in water, and also after boiling with acid, but had failed to find any trace either of Entomostraca or of Diatomaceæ, both of which might have been expected in such a situation as these leaves were probably deposited in. A few spicula of some sort were the only approach to any organic structure. A drawing of these was exhibited. The matrix had also been analysed by Mr Mahony, with the following results:—

ANALYSIS OF LEAF-BED MATRIX.

Sand,	-	-	-	-	-	66·10 p. cent.
Peroxide of iron and aluminum,	-	-	-	-	-	14·35 “
Protoxide of iron,	-	-	-	-	-	·19 “
Carbonate of lime,	-	-	-	-	-	16·06 “
Sulphate of lime,	-	-	-	-	-	1·10 “
Matter burnt off at 500°,	-	-	-	-	-	1·60 “
Water,	-	-	-	-	-	·60 “

100·00

This composition is very similar to that of many shales and beds of consolidated mud. The matter burnt off at 500° seems to be the organic particles of the leaves still remaining in the matrix.

After referring to the reasons for assigning these leaf beds to the Miocene period, the writer concluded with some remarks on the recent researches into the Miocene flora of the Polar regions, and their connection, in point of time, with the Mull flora.

A Plane tree, *Platanus aceroides*, probably identical with the *P. hebridicus* of Mull, appears to have spread over North Canada and Greenland, and extended to Iceland, and even to the ice-fiords of Spitzbergen, while Hazel and Alder seem to have been common trees all over the north, along with other species which have been found in these leaf beds. *Sequoia* would appear to have been the predominant genus, not less than seven species having been recognised; while only two have come down to the present day, both of which are living in California. *Sequoia Langsdorfii* was the chief tree in North Greenland, but grew also in Canada, Vancouver's Island, Switzerland, and Italy. It can only be distinguished from the existing *S. sempervirens* by the larger size of its cones. *Sequoia Sternbergii* again prevailed in Iceland, and approached very close to the existing *S. gigantea*, the Wellingtonia or mammoth tree of California. Such a flora as existed in this Miocene period, in regions now covered with snow and ice, clearly shows that a considerable diminution of temperature must have taken place, though it may not have been so much as has been imagined.

Dr Grieve also exhibited, with remarks, a specimen of a sponge, *Halychondria suberea*, completely investing a *Fusus* shell in which a *Pagurus lævis* had taken up its abode, also a specimen of an Entomostracan, *Nebalia bipes*, both from Rothesay, and a series of Amphipoda and Isopoda from Gourock, of which the following is a list:—

AMPHIPODA.

- Anonyx ampulla.*
- *denticulatus.*
- Dexamine spinosa.*
- Microdeutopus versiculatus.*
- Protomedeia Whitei.*
- Erystheus erythrophthalmus.*
- Gammarus marinus.*

Gammarus locusta.
Calliope læviuscula.
Podocerus pelagicus.
Nænia excavata.

ISOPODA.

1. *Anceus maxillaris*, - - - male.
2. ——— ——— - - - female.
3. ——— ——— - - - young.
4. *Anceus* (or *Praniza*), *Edwardsii*, female.

PAPERS READ.

- I.—*On Shell-mounds at the Machar Grogary, in the Island of South Uist.* By Mr JAMES A. MAHONY.

This paper was illustrated by a large collection of objects taken from these mounds, consisting of bones of various animals, some split, others drilled with holes, shells, pieces of rude pottery, stone knives or scrapers, and other articles, showing the remains to be of considerable antiquity. Professor Young spoke at some length in comparing the Hebridean mounds with those of Caithness and other parts of the Scottish mainland.

- II.—*On the Sea Anemones of the shores of the Cumbræes.*
 By Mr DAVID ROBERTSON, F.G.S.

The importance of local lists, whether of plants or animals, is daily becoming more widely recognised; but the difficulty, in many cases, of making these in some degree complete, can only be appreciated by those who are engaged in such inquiries. We cannot expect to find in every district, for example, an observer specially devoted to each of the many obscure groups of marine invertebrate fauna. And yet the time and labour required to make a tolerably complete list of these, for any portion of our sea-coast, would be very great.

It may not be thought out of place, or without interest at present, to offer a beginning of a list of the Sea Anemones incidentally picked up on my occasional explorations around the shores of the Cumbræes.

Large numbers of these animals are met with between high and

low water mark. The tide pools are the haunts of many of the species, and in these, they have to be looked for with considerable care, as they often so much assimilate the tints of the pebbles at the bottom, and the sea-weeds and sponges with which these are clothed, that they are difficult of discovery.

By clearing away the floating tangle off some of the smaller holes and fissures, the most charming little grottoes are frequently revealed, crowded with species of different hues; and where the ground-work is studded with the tiny *Corynactis viridis*, nothing can be more lovely. In such cases, our greatest difficulty is to get them dislodged without injury, as they mostly have their bases insinuated into holes and crevices of the rock, and the least violence causes them to contract and retreat deep into their strongholds; in which case, the best means is to be provided with a hammer and chisel, and carefully chip off the piece of rock to which they adhere. Specimens procured in this way are more likely to do well in the aquarium than those torn off by the base; but when they are attached to the plane surface of the rock or stone, they may be in most cases removed without much injury, by gently inserting the nail of the finger under the adhering base. When a little bit has been disengaged, the whole comes away without much difficulty. The greatest danger is in using too much violence.

Those among gravelly shingle and on stones may be secured in the same way. Others are met with in soft muddy sand, and frequently at low water; some of these sit loosely in the sand, and are easily removed with the fingers. There is another, however, not so easily captured, *Cerianthus Lloydii*, which exists not free in the sand but in a long leathery tube, running down to the depth of 18 or 20 inches or more. The animal itself, when contracted, may not exceed 2 or 3 inches, and when elongated, may reach from 5 to 7 inches. Those I have met with at Cumbrae were all at a little beyond low water to a depth of from 4 to 10 inches at spring tide. The summit of their tubes barely reaches the surface of the sand, and their long maroon tapering tentacles lie spread star-like over it; but upon the least concussion of the ground, they are down out of sight in a moment.

Gosse quotes the method taken by Mr Edwards of Menai Bridge to capture this interesting species. He says, "The operation of taking it is difficult, as on the least disturbing



of the ground it slips through the sac and is lost. The plan that I adopt is to surround it with two or three spades, and each to act at the same moment so as to undermine it in an instant, and pressing the ground causes its escape to be more difficult."

I have not found the use of more than one spade necessary; I think more would only increase the chance of giving the alarm, as all that is required to make sure of the animal is to cut off its means of retreat. To do this, it must be approached with the greatest caution, and a spade or other such implement placed in the gentlest manner 4 or 5 inches from the spot where it is, and when all is ready, drive the spade suddenly in beneath it, cutting off its escape by passing through the tube. If the animal takes the alarm before the thrust is made, I should say, speaking from my own experience, that it is almost hopeless to follow up the pursuit. Whether this arises from the creature retreating to a portion of the tube that had not been reached, or escaping through it, as Mr Edwards thinks, I have been unable to determine. The fine muddy sand closes in so quickly when dug under water, that I have never satisfactorily ascertained whether the termination of the tube (which is liable to sever at its lower end), had been reached or not. Where they can be met with between tide marks, as at Menai Strait, the question might be easily solved. I am inclined to think, in the meantime, that the animal never voluntarily leaves its own tube, as I doubt whether it could make progress so as to escape pursuit, beyond the limits of its own smooth cylinder.

Little more need be said of the means of capture or their haunts; the greater portion of our Anemones being met with within the tidal belt, and few belonging exclusively to deep water. To reach the latter, the use of the dredge is of course required. Many valuable specimens are obtained from trawl refuse, and others are brought up on the fisherman's long lines. A little beyond low water, good captures are made over the side of the row-boat from the fronds and stems of tangle, and under the ledges of deep overhanging rocks.

Mr Gosse in his "British Sea Anemones" gives a table of their geographical distribution, and divides them into ten provinces, which, as he says, are somewhat arbitrarily defined, and "The product of the divisions rather represent the state of our know-

ledge than the fact." They show what has been done, but faintly shadow what remains to do. As the following table gives some idea of the character of the ground on which these animals are found in the greatest numbers, and the extent searched, I give it in full, but in making any comparison it must be borne in mind that all the long tracts of shore given, have not been searched, but only in parts here and there, more or less fully.

1st. The Shetland, including the Orkneys, and Scotland as far as Kinnaird's Head, from which thirty species are recorded.

2d. The North Sea, including the coast from Kinnaird's Head to Spurn Head; fourteen species.

3d. The Eastern, from the Humber to the Thames, a flat low shore; seven species.

4th. The South-east, from the Foreland to St. Alban's Head, chiefly chalk cliffs; nine species.

5th. The Devonian, from St. Alban's to St. David's Head, a rugged rocky coast; fifty-one species.

6th. The Irish Sea to the Mull of Cantyre, including Man and the Irish shore; twenty species.

7th. The Hebridean, from Cantyre to the Orkneys; six species.

8th. The South Irish, from Carnsore point to Mizen Head; seven species.

9th. The Atlantic, from Mizen Head to Rathlin Island; twenty-one species.

10th. The Channel Islands; twenty-two species.

In all, seventy-five species; but as five of these are in some degree doubtful, there remain seventy good species.

It can easily be shown that some of these provinces or divisions have only yielded fragments of what they contain. The Clyde division, if included at all, comes under that of the Hebridean, which only represents six species. If we thus make the Frith of Clyde a sub-province of the Hebridean and give the Cumbræ as a small point of it, the subjoined list shows for that portion alone twenty-four species, and of these eight are new or not previously recorded from Scotland, viz.:—*Sagartia venusta*; *Sagartia nivea*; *Sagartia parasitica*; *Bunodes thallia*; *Peachia hastata*; *Peachia triphylla*; *Edwardsia callimorpha*; and *Edwardsia carnea*.

TRIBE ASTRÆACEA.

FAMILY SAGARTIADÆ.

Actinoloba dianthus (Ellis). This species is common round the shores of both Cumbraes, most frequently at very low water on the under sides of shelving rocks. For the aquarium, it is the Queen of our British Anemones, both in size and beauty, and thrives well in confinement. One, long in my possession, measured fully 6 inches high, and the fully expanded lobes were nearly as broad.

Sagartia bellis (Ellis and Solander). Found in tide pools and generally in the crevices of the rock. According to Gosse, it is abundant on the south and west coast of England, and Man, and Ireland, but almost unknown in Scotland. It is by no means common in Cumbrae; but in the pools where it is found, there are generally a few together.

Sagartia miniata, Gosse. Common in rock-pools and under stones near low water; very finely coloured.

Sagartia venusta, Gosse. In holes and crevices in rock pools near low water; rather rare.

Sagartia nivea, Gosse. In holes and crevices in rock pools near low water; rather rare.

Sagartia troglodytes (Johnston). Moderately common in holes and crevices in rock-pools between tide mark.

Sagartia troglodytes var. *Prasinopicta*; one only met with.

Sagartia viduata (Müller). Rare, on stones between tide mark.

Sagartia parasitica (Couch). Only one specimen of this was obtained; it was taken in deep water on a fisherman's line, off the south-west point of Cumbrae.

Adamsia palliata (Bohadsch). Moderately common in deep water, on a muddy gravelly bottom, and on scallop banks. This Anemone is mostly found on a univalve shell inhabited by a Hermit Crab, and the species, in all my experience, with few exceptions, has been *Pagurus Prideauxii*.

Phellia picta, Gosse. Rare, dredged on the valve of an old shell in 20 fathom water. The only other locality hitherto recorded is Banff.

FAMILY ANTHEADÆ.

Anthea cercus (Ellis and Solander). I find this species most frequently at Cumbrae, attached near the tips of tall *Zostera*. They are all same coloured, a light greyish-brown.

FAMILY ACTINIADÆ.

Actinia mesembryanthemum (Ellis and Solander). Common, all round the shores from low to near high water mark.

FAMILY BUNODIDÆ.

Bolocera Tuedicæ (Johnston). Brought up on the fisherman's long line, off the west-end of Cumbrae. Rare; this species was also obtained by the Rev. D. Landsborough, off Cumbrae.

Bolocera eques, Gosse. Rare; the only one I have seen was floated in-shore among sea-weed. It was in good condition, and survived a journey to Torquay to visit its admirer, Mr Gosse.

Bunodes thallia, Gosse. Rare, in a tide-pool in a hole of the rock after the manner of the *Troglodytes*; but the well marked vertical rows of warts, and the close agreement of column, disc, and tentacles, left no doubt of its identity.

Tealia crassicornis (Müller). Common, in tide-pools, in the crevices of rocks, and in the gravelly shingle, near and beyond low water.

Stomphia Churchicæ, Gosse. Moderately common off the south-west point of Cumbrae, in from 12 to 25 fathoms; brought up in the dredge adhering to stones.

FAMILY ILYANTHIDÆ.

Peachia hastata, Gosse. Rare, dredged in about two fathom water on a gravelly muddy bottom between "the Alands," and in 8 and 10 fathoms amongst mud and *Melobesia* near the "Tan Buoy."

Peachia triphylla, Gosse. Rare, in muddy sand at extreme low water. Gosse records it only from Guernsey.

Edwardsia callimorpha (Gosse). Moderately common; taken in the dredge in from 6 to 25 fathoms, in sandy and muddy gravel. At the first look, when the animal is contracted, it may be readily mistaken for one of the smaller *Holothuriidæ*.

Edwardsia carnea (Gosse). Locally common, on the under sides

of stones propped up between others, so that the water can pass freely between them, none of the specimens were in holes in the stones, but all projecting from the surface. I have only met with this beautiful little Anemone in one creek on the east side of Kames Bay, and then it appears only to be present periodically. Some seasons none could be found with the most diligent search.

Cerianthus Lloydii (Gosse). Rather rare. In muddy sand at and beyond extreme low water. Where one is met with, a few more may be expected close by.

TRIBE CARYOPHYLLIACEA.

FAMILY CAPNEADÆ.

Corynactis viridis, Allman. Locally common in small rock-pools shaded from the sun. All those I have seen at Cumbræ closely approach the white variety, *Coïna*.

FAMILY TURBINOLIADÆ.

Caryophyllia Smithii (Stokes). Rare, at low water, attached to the under sides of stones that are so lying as leave open spaces between.

The Librarian announced the following donations to the Library:—Notice of the remains of the Reindeer found in Scotland. By John Alexander Smith, M.D. Edinburgh, 1869. From the Author. The Geographical Distribution of Mammals. By Andrew Murray, 1866. From David Mackinlay, M.D. The Natural History of the Tineina. Vol. xi. By H. T. Stainton, 1870. From Hugh Colquhoun, M.D. Hortus Cliffortianus. Cum Tabulis Æneis. Auctore Crolo Linnæao. Amsterdam, 1737. From Mr Thomas Chapman.

APRIL 26TH, 1870.

Professor John Young, M.D., F.G.S., President, in the chair.

Messrs James Hardy, Old Cambus, Berwickshire, and James Thomson, Kelvingrove Museum, were elected corresponding members.

SPECIMENS EXHIBITED.

Dr Young exhibited a model illustrating the anatomy of the Polyzoa, recently prepared for the Hunterian Museum by Mr Fenwick, and made some remarks on the value of such models for teaching purposes.

Mr John Young, F.G.S., exhibited a series of specimens of a rare bivalve shell, first discovered by Mr James Thomson, F.G.S., a member of this Society, in Carboniferous limestone strata, in a locality near Dalry, Ayrshire, and which has since been named *Posidonomya corrugata*, sp.n., by Mr Etheridge of the Jermyn Street Museum, London; Mr Young stated that he had recently obtained specimens of this interesting shell, in a second and new locality, at a quarry near Boghead, south-west of Hamilton, and made some remarks on Mr Thomson's discovery, as the earliest recorded example of the genus *Posidonomya* found in this district.

PAPERS READ.

I.—*Note on the recent occurrence of the Crane (Grus cinerea), in Ross-shire.* By Mr ROBERT GRAY.

Mr Gray stated that he had examined a young male bird of this species in Dingwall ten days ago, which had been shot on the Dundonald estate, near the head of Loch Broom, on the West Coast, and that a second specimen had been seen by a keeper at Loch Torridon, in the last week of March. He also read a communication from Mr Wilson of Kirkaldy, on the occurrence of a male Golden Oriole (*Oriolus galbula*), which was shot on the estate of Raith, on the 23d of the present month.

II.—*Notes on recently discovered Foraminifera from the Lanarkshire Coal-field.* By Mr JOHN YOUNG, F.G.S.

The author of this paper stated that he had submitted the specimens with which his remarks were illustrated, to Mr Henry B. Brady, F.L.S., Newcastle-on-Tyne, and that they had been found to belong to species which he had named as follows:—*Climacammina antiqua*, (Brady, M.S.); *Endothyra Bowmanni*, (Phillips); *Valvulina palæotrochus*, (Ehrenberg); *Endothyra radiata*, (Brady, M.S.); several forms being left undetermined until further sections were made to enable him to make out their exact relationship to some of the other fossil genera. Mr Young stated

that previous to the recent researches made by himself and other members of the Natural History and Geological Societies of Glasgow, no Foraminifera had ever been recorded from the Carboniferous rocks of the West of Scotland, but in the washing of certain of the weathered limestones and shales, the above mentioned species along with others had been found. Mr Young next pointed out the vertical range and distribution of the species, the various localities, and nature of the strata in which he had found these minute organisms, and recommended a more careful search for other forms.

Note.—Since the above specimens were brought before the Society, Mr Brady has identified the following species from our limestone strata:—

<i>Endothyra radiata</i> ,	-	-	-	Brady, M.S.
———— <i>Bowmanni</i> ,	-	-	-	Phillips.
———— <i>Robertsoni</i> ,	-	-	-	Brady, M.S.
———— <i>ornata</i> ,	-	-	-	Brady, M.S.
———— <i>ammonoides</i> ,	-	-	-	Brady, M.S.
———— <i>globulus</i> ,	-	-	-	Eichwald.
———— <i>plicata</i> (?)	-	-	-	Brady, M.S.
<i>Trochammina centrifuga</i> ,	-	-	-	Brady, M.S.
———— <i>gordialis</i> ,	-	-	-	Parker I. Jones.
———— <i>incerta</i> ,	-	-	-	D'Orbigny.
<i>Valvulina palæotrochus</i> ,	-	-	-	Ehrenberg.
———— var. <i>compressa</i> ,	-	-	-	Brady, M.S.
———— <i>Youngi</i> ,	-	-	-	Brady, M.S.
———— var. <i>contraria</i> ,	-	-	-	Brady, M.S.
———— <i>decurrens</i> ,	-	-	-	Brady, M.S.
<i>Archoëdiscus Karreri</i> ,	-	-	-	Brady.
<i>Climacammina antiqua</i> ,	-	-	-	Brady, M.S.
<i>Textularia gibbosa</i> ,	-	-	-	D'Orbigny.
<i>Webbina acervalis</i> ,	-	-	-	Brady, M.S.
<i>Saccammina Carteri</i> ,	-	-	-	Brady.

III.—*Notes on Pleurobranchus plumula (Montagu), with illustrative specimens.* By MR DAVID ROBERTSON, F.G.S., Vice-President.

Mr Robertson remarked that during the present month he had procured three or four specimens of this animal from the fishermen of Cumbrae, who had found them adhering to their lines brought

up from deep water. Previously he had looked upon the species as rare in that locality, having obtained only two specimens in all his experience there.

The Librarian announced the following donations to the Library:—Transactions and Proceedings of the Botanical Society of Edinburgh, Vol. x., Part i., from the Society. Transactions of the Geological Society of Glasgow, Vol. iii., Part ii., from the Society. Transactions of the Wernerian Society of Edinburgh, Vols. vi., vii., and Vol. viii., Part i., from the Royal Physical Society of Edinburgh.

MAY 31ST, 1870.

Mr David Robertson, F.G.S., in the chair.

SPECIMENS EXHIBITED.

Dr James Stirton exhibited specimens of *Sphæromphale (Verrucaria) Henscheliana*, a lichen new to Britain, gathered by himself on Ben Voirlich.

The Chairman exhibited specimens, male and female, of *Pagurus Prideauxii*, remarking that he had found the species in pairs for some years past, first in the nets of the fishermen lifted from deep water, and subsequently in the dredge, and along the shores of Cumbrae at low spring tides. From these instances of apparent attachment, he was inclined to think that this Hermit Crab pairs for the season, and that the female, which is but half the size of the male, may by this arrangement share the protection of the powerful pincers of the stronger sex.

The Rev. James E. Somerville, B.D., exhibited a specimen of the Hooded Crow (*Corvus cornix*) and its eggs, from Egypt, regarding which Mr Gray observed that, when contrasted with Scottish specimens, both the bird and its eggs appeared to be much lighter in colour, a difference which might be owing to the nature of its food, or the result of climatic influences.

PAPERS READ.

I.—*On the Post-tertiary Clay-beds at Kilchattan Bay, Island of Bute.*
By Mr JAMES COUTTS.

The late Mr Smith of Jordanhill was the first to call attention to the boreal shells contained in the Clyde beds, and to every

scientific enquirer they have ever since been objects of much interest. They carry the mind back to a time when the whole of Northern Europe, and Asia, as well as the northern part of America, was under ice action, as is amply indicated by the groovings, striæ, and polished rock surfaces found throughout these countries. Nowhere are these evidences of ice action better marked than in the Island of Bute.

Lying on the hill-side at Glen Callum, near Kilchattan, are transported boulders of such gigantic size, that one is inclined to look under them to make sure that they are not an outcrop of the rock. Often have I stood on the hill side above St. Blane's Chapel, admiring the romantic landscape, the rounded outlines of the hillocks, the numerous boulders wide-spread on every side, the deep glens and lakes, all emphatically indicating severe and long-continued ice action.

Near St. Blane's Chapel there is a massive circular building called the "Devil's cauldron." The guide-book to Bute says "it is a wall nearly 30 feet in diameter, and about $4\frac{1}{2}$ feet in height, with a gateway 9 feet wide, externally narrowing to 3 feet inside. It is of great strength, many of the stones of which it is composed being of immense size. There is growing in the centre of this building a very lofty pine, called the dreaming tree." The tree and walls are now in ruins, and scattered all around are stones of such huge dimensions that one would imagine that only Fingal and his giant sons, with super-human strength, could have riven them from the neighbouring rocks, but it is evident at a glance that a greater power than theirs was at work, rending the rocks into fragments, and scattering them as boulders over hill and glen. That power seems to have been land-ice, or ice carried forward by water; it may, however, have been both combined. The ice appears to have moved from the south-west, directly over Kilchattan clay-field, which is evident from the immense number of large boulders laid down in Kilchattan Bay, exactly in the line of the clay-field.

In Scotland there are very few traces of the Tertiary period. What have been preserved to us are merely sufficient to prove that it was of a comparatively warm character, but the evidence is decisive that it was succeeded by another period of which the climate was so severely Arctic, that it is doubtful whether vegetable or animal life could exist, at least on land. This was

the time to which our oldest boulder clays are referred, and the utter want of fossils in them is therefore not to be marvelled at. How long this Arctic condition lasted we cannot even guess, but we know that at length its rigour was slackened, and over land and sea the frosty grip of a Polar winter loosened, and life began to multiply in, and enliven, both. This was the time to which the fine laminated clays of the Clyde valley are generally referred. During this probably lengthened period numerous colonies of Arctic shells migrated southwards, and filled our bays and firths with all the various genera and species whose remains we now find so plentifully in these clays. Kilchattan Bay was one of these localities, and in its clay-fields we have evidence that its waters teemed with life of every grade and character, proper to the conditions of the place and time. That these conditions were exceedingly tranquil is evident to any one minutely examining its deposits. In Kilchattan the shells are found lying where the animals lived and died, and, if lifted carefully, the shells of each bivalve will be found united; none of them exhibiting signs of travel or wear, showing that the deposit in which they are now entombed was quietly laid down around them.

The next great geological epoch, that of the Raised Beaches, is well represented in the neighbourhood of Kilchattan. I have closely examined the beach from Kerrylamont on the south-east, to Scalpsie Bay on the south-west, and have observed numerous high cut terraces, along with wide and deep old sea caves. Many of these are so large that cattle find shelter in them from the heat and storms, and people who gather cockles at Kilchattan Bay for the market, often make these caves their dwellings, living in gipsy fashion.

The section at Kilchattan clay-field is as follows :

First—The oldest till, or boulder clay, resting on the sandstone rock.

Second—The finely laminated clay, from 10 to 12 feet in thickness.

Third—Resting on this clay is a deposit of obscurely stratified clay, about 2 feet in thickness. In this deposit lies the shell-bed, which appears to be only a few inches in thickness.

Fourth—Above the shell bed is a layer of sandy clay, with neither shells nor stones, 12 to 22 inches in thickness.

Fifth—Resting on this clay is a mass of stratified gravel and shingle, forming a bank from 5 to 9 feet in depth.

Sixth—The vegetable, or surface soil.

In the second bed above referred to, there appear to be two kinds of laminated clay. The lower is of a reddish brown colour, and is a good workable clay with stones in it, some of them being from 7 to 10 pounds in weight, but the greater number are only from 1 to 2 pounds. Resting on this is a fine laminated blueish-grey clay, difficult to work, with fewer stones in it, these being also considerably smaller in size.

I have been particular in describing this clay, in consequence of a reference to it in a passage in the "Glacial Drift of Scotland,"* by Professor Geikie, which reads thus:—"It retains throughout the same colour, the same impalpable unctuous texture, and fine lamination. Its freedom from stones is remarkable. Nowhere have I seen a single pebble in it. Mr Macbride, who has been looking at it for years, has been equally unsuccessful, and the workmen at the Kilchattan tile-works assured me they had never seen a single stone in this lower or brick clay."

During repeated visits to Kilchattan, and close examination of this particular bed, I am satisfied that what I have above stated describes its true composition, and that stones are to be found in it by all who diligently search for them.

LIST OF FOSSILS FOUND IN KILCHATTAN CLAY-BEDS.

PISCES.

Small vertebrae and scales, - Not determined.

CONCHIFERA.

Anomia ephippium, Linn., - - Two good specimens.
Pecten Islandicus, Müll., - - Fragments.
Cyprina Islandica, Linn., - - Common and large.
Mya truncata, Linn., - - - Common.
Cardium edule, Linn., - - - One large valve.
 ——— *echinatum*, Linn., - - Two valves fry.
Pholas crispata, Linn., - - - Fragment.
Tellina calcarea, Chemn., - - Very Common.
Mastra subtruncata, Da Costa, Seven valves.
Axinus flexuosus, - - - - Common.

* Transactions of the Geol. Soc. of Glasgow. Vol. I., Part II., page 133.

<i>Mytilus modiolus</i> , Linn.,	- -	One valve $6\frac{1}{2}$ by $3\frac{1}{2}$, fry com.
—— <i>edulis</i> ? Linn.,	- - -	One young specimen.
<i>Nucula tenuis</i> , Mont.,	- - -	Five valves.
<i>Leda pernula</i> , var.,	- - - -	Common.
—— <i>pygmæa</i> , var.,	- - - -	Common.
<i>Scrobicularia prismatica</i> , Mont.,		Common.
<i>Astarte compressa</i> , Mont.,	- -	Common, all fry.
<i>Solen siliqua</i> ,	- - - - -	Fragments.

GASTEROPODA.

<i>Buccinum undatum</i> , Linn.,	- -	One full grown, fry com.
<i>Fusus antiquus</i> , Linn.,	- - -	One full grown, fry com.
<i>Lacuna divaricata</i> , Fabr.,	- -	Common.
<i>Littorina littorea</i> , Linn.,	- -	Common and full grown.
—— <i>obtusata</i> , Linn.,	- -	Common.
<i>Pleurotoma violacea</i> , Migh. and		
Ad.,	- - - - -	Three specimens.
—— <i>turriculu</i> , Mont.,	-	Common.
—— <i>Trevelyana</i> , Turt.,	-	One specimen.
—— <i>pyramidalis</i> , Ström.,		Seven specimens.
<i>Tectura virginea</i> , Müll.,	- - -	One specimen.
<i>Trochus cinerarius</i> , Linn.,	- -	Moderately common.
<i>Trophon clathratus</i> , F. and H.,		Three specimens.
—— <i>truncatus</i> , Ström.,	- -	Two specimens.
<i>Skenea planorbis</i> , Fabr.,	- - -	Moderately common.
<i>Homalogyra atomus</i> , Phil.,	- -	Common.
<i>Natica Grænelandica</i> , Beck,	- -	Common.
—— <i>affinis</i> , Gmel.,	- - -	Common.
<i>Aporrhais pes-pellicani</i> , Linn.,	-	One specimen.
<i>Velutina lævigata</i> ,	- - - -	One fry.
<i>Purpura lapillus</i> , Linn.,	- -	One specimen.
<i>Rissoa striata</i> , Adams,	- - -	Common.
—— <i>var. interrupta</i> ,	- - -	Common.
<i>Utriculus obtusus</i> , Mont.,	- -	Common.

POLYZOA.

<i>Cellularia</i> ,	- - - - -	Rare.
<i>Membranipora Flemingii</i> , Busk,		Rare.

CRUSTACEA.

Plates and Claws, - - - - - Undetermined.

OSTRACODA.

Cytheridea punctillata, Brady, - Common.

Cythere concinna, Jones, - - Common.

———— *dunelmensis*, Norman, Rare.

CIRRIPEDIA.

Balanus porcatus, Da Costa, - Common.

———— *crenatus*, Brug., - - Moderately common.

Verruca Strömia, Müll., - - Rare.

ANNELIDA.

Serpula vermicularis, Ellis, - - Common.

ECHINODERMATA.

Echinus Dröbachiensis, Müll.,

plates and spines, - - - Common.

———— *Spatangidæ*, - - - Common.

FORAMINIFERA.

Biloculina depressa, D'Orb., - Rare.

Quinqueloculina seminulum,

Linn., - - - - - Common.

Rotalia Beccarii, Linn., - - - Rare.

Polystomella striato-punctata, F.

and M., - - - - - Common.

———— *crispa*, Linn., - - One specimen.

Nonionina turgida, Will., - - Common.

SPONGE.

Cliona celata, Grant, - - - Moderately common.

Note.—In the preparation of the foregoing list of fossils, I have been kindly assisted in the determination of species by Mr David Robertson, F.G.S., who has given several excellent lists of Post-tertiary fossils from the Clyde beds, in the Transactions of the Geological Society of Glasgow.

II.—*On the natural history of the Wood Pigeon (Columba palumbus), with remarks on its extraordinary increase of late years throughout the Agricultural districts of Scotland.* By MR ROBERT GRAY.

The author of this paper in the course of his remarks showed that about eighty years ago the Wood Pigeon was almost unknown in East Lothian, a county which may now be said to be the head quarters of the bird in Britain. Within the limits of that district alone, upwards of 50,000 Wood Pigeons had been destroyed in the course of three years, a fact which almost proves that Haddingtonshire is yearly invaded by large migratory flocks from other countries. Mr Gray had himself seen prodigious flights of these birds arriving about daybreak on the coast near Dunbar; and other observers, favourably situated in coast localities south of the Tweed, had of late years published similar records. The Wood Pigeon is known to migrate southwards from the pine forests of Norway, Denmark, Sweden, and some parts of Russia, and, on settling in a purely agricultural district like East Lothian, these flocks would not return to their native forests like Fieldfares, Redwings, and other strictly migratory birds, but remain satisfied with their new quarters, and thus fill the place of home-bred birds which had been destroyed.

Mr Gray also read the following communication from Lord Binning, one of the Society's corresponding members:—

III.—*Notes on the food of the Wood Pigeon.*

By LORD BINNING.*

When I originally began to make observations on the habits and food of the Wood Pigeon, my intention was to note during each month of the year its prevailing food, but, having spent nearly the whole of the last three summers in Cheshire, where the Wood Pigeon is a comparatively rare bird, I have had no opportunity of making my observations during the summer months, and the notes that I now offer are therefore most incomplete, and hardly worthy of your acceptance. My object in making these notes was to ascertain the correctness of the opinion expressed by the Rev. F. O. Morris, that "It may safely be said

* Now Earl of Haddington.

that any damage it (the Wood Pigeon) does, is abundantly compensated by the good that it effects in the destruction of the seeds of injurious plants."

I am sorry to say that I cannot indorse this opinion, and my verdict must be against the bird. There can be no doubt,—as I will prove,—that the Wood Pigeon feeds on the leaves, seeds, and roots of various weeds; but, as I have examined the contents of the crops of some thousand or two of Pigeons, I am in a position to state positively that the amount of good done in this way by no means counterbalances the injury done by them to the farmer—especially in the newly-sown corn-fields, and on the young grass fields, where they devour bushels of the leaf of the white clover. Their voracity is most remarkable, and unfortunately their powers of digestion are also almost incredible. Meyer remarks that this bird is very regular in its habits, and my observations exactly coincide with his statements in regard to their hours of feeding. We had this winter, 1869–70, the most abundant crop of Beech-nuts (or Beech-mast) that I ever saw. The Cushats seemed to come from all parts to feed on this their favourite food, and there were sometimes thousands to be seen feeding under the Beech-trees. At 7-30 or 8 A.M. the ground was blue with them, but by about the time when I had breakfasted, 9-15 to 9-45, hardly a bird was to be seen on the ground,—all having breakfasted also,—and being now perched on the tops of the trees in an adjoining wood. About an hour afterwards they were all again feeding. At 12-30 or 1 P.M. I have seen them in a continuous stream going to the large fir-woods in the neighbourhood, where they have another siesta; and I have remarked that at this time they fly straight into the woods and alight at once, without the preliminary wheeling and circling over the wood in which they always indulge before finally settling down to roost. After another rest they again go out to feed, returning to roost in winter at 3 P.M., and in March and April at 5 to 6 or 7 P.M. When food is scarce, or when there is snow on the ground, I think they dispense with the mid-day rest, but in summer or autumn, or whenever food is abundant, you will find that what I have stated is the daily life of the Wood Pigeon. Now, there is one point which I have not been able yet to determine, which is,—Does the Pigeon during its morning and mid-day intervals of feeding digest all or the greater part of the contents of its crop?

I am inclined to think that it does; but, though I cannot positively prove this, I may mention the grounds on which I base my opinion, namely, that I have several times shot Wood Pigeons in the afternoon with nothing in their crops, (and this not in the breeding season, when the birds might have just come off their nests,) and that my brother, W. Baillie Hamilton, R.N., shot twelve Wood Pigeons in one afternoon last month, February, as they came to feed on a newly-sown field, in the crops of which twelve birds not one particle of food was to be found.

As examples of the voracity of the Wood Pigeon, I may state the result of four *post-mortem* examinations at different times:—

In the crop of one Wood Pigeon, 144 field peas and 7 large beans.

In another, 231 beech-nuts.

In another, 813 grains of barley.

In another, 874 grains of oats, and 55 of barley.

Now, presuming that I am right in my supposition that they have three meals *per diem*—under favourable circumstances, abundance of food, or long days—the amount consumed by one pigeon in a single day is almost incredible.

The Earl of Home informs me that he has seen great damage done to a field of Swede turnips by Wood Pigeons, and also states that a bird or birds (I forget which, not having a copy of his letter) were killed with turnip in the crop. Of course I do not for a moment dispute the fact stated by his lordship, but I do say that as a rule the Wood Pigeon feeds, not on the bulb, but on the leaf of the turnip. In the winter of 1860, which was one of great severity, the crops of nearly 700 Wood Pigeons were examined by Lord Haddington's keeper and myself, and I never found a single instance of the food consisting of the turnip bulb; true, I have found small pieces of turnip amongst the mass of leaf, and even larger pieces than one would imagine a pigeon could swallow; but these latter had all the appearance of having been cut with a knife, and had probably been picked up in the neighbourhood of a sheep-feeding trough. During the last four winters, 3526 Wood Pigeons have been killed at Tynninghame, and Mr Inglis, the head gamekeeper, assures me that he has never known an instance of the crop being filled with the bulb of turnip. Even a casual observer can hardly fail to notice in winter that whenever a

Swede turnip has been well broken into by Rooks or Partridges, it is surrounded by pieces broken out in the process: these fragments the Pigeon will readily pick up from the ground, but I have difficulty in believing that he can break into the turnip himself,—especially in frost, when the bulb becomes as hard as a stone. Examine the bill; does it look as if it were adapted for breaking into a hard bulb? Examine the lower mandible especially; it is almost as pliable as that of a singing bird. But there is an exception to every rule, and if a Wood Pigeon comes across a partially-decayed bulb, I believe that he would feed on it; as I watched one this winter, within twenty yards of me, vainly endeavouring to drive his bill into a turnip, which I afterwards examined, and found that he had not left his mark, though he would evidently have fed on it had it been in his power to do so.

Whilst speaking of exceptions to rules, I may here mention that in March I found, amongst a lot of white clover leaf in a Pigeon's crop, four large and perfect earth-worms, with part of a fifth. In the crop of another, in April, I found one small and two large caterpillars. These are the only instances of the kind that have come under my notice.

I will now endeavour to give a list of the prevailing articles of a Wood Pigeon's food during the months in which I have made observations, but having lost the notes that I made in 1861, and the two following years, it will not be so complete as I could have wished.

AUGUST.

Grain of various sorts, barley and unripe oats prevailing in the beginning, barley and wheat in the end, of the month.

SEPTEMBER.

Wheat, oats, and barley.

OCTOBER.

Wheat, oats, and barley; with peas, beans, and tares.

NOVEMBER.

Grain of various sorts; beech-nuts; leaf of Swedish turnip; oak spangle; seeds of the elm; acorns occasionally.

DECEMBER.

Beech-nuts; leaves of turnip, white clover, and cranes-bill; grain, wheat, oats, barley, and tares; decayed potatoes; seeds of wild mustard.

JANUARY.

Beech-nuts; leaves of turnip, white clover, common cabbage, and cranes-bill; decayed potatoes; seeds of wild oats, wild mustard, and Venus' comb; tubers of the lesser celandine; berries of the ivy, hawthorn, and holly,—the latter I only found during the snowstorm of 1860.

FEBRUARY.

Beech-nuts; leaves of Swedish turnip, white clover, cranes-bill, and cabbage; seeds of wild oats, Venus' comb, common knot-grass, spotted persicaria, broad-leaved dock, and wild mustard; tubers of the lesser celandine; grain of various sorts, especially towards the end of the month.

MARCH.

During this month, and to nearly the end of April, the food consists almost entirely of grain, wheat, oats, and barley, together with beans, peas, and tares. I have, however, found occasionally seeds of common knot grass, common dock, and wild mustard; leaves of white clover, cranes-bill, and ribwort plantain; tubers of lesser celandine.

APRIL.

Grain, oats, barley, and wheat,—barley being the favourite,—tares; occasional leaves of white clover, and cranes-bill; leaf and flower of ivy-leaved speedwell; and in the end of the month the leaf-bud of the beech-tree, of which they are very fond.

MAY.

I have had little opportunity of making observations in this month, but may mention the flower-bud and leaf of common chickweed, and the leaf-bud of the beech-tree, as two of their principal articles of diet.

Now, dividing under three heads the various seeds, etc., that I have found in the crops of Wood Pigeons, we have the following:—

GRAIN AND FARM PRODUCE.

Wheat, oats, barley, beans, peas, tares; leaf, and occasionally bulb of Swedish turnip; leaf of white clover; decayed potatoes.

SEEDS, ETC., OF TREES AND SHRUBS.

Beech-nuts; leaf-bud of beech; acorns (rarely); oak spangle, or galls from the leaf of oak; seed of elm; ivy and holly berries; fruit of hawthorn.

SEEDS, ETC., OF WILD PLANTS AND NOXIOUS WEEDS.

Seeds of wild mustard (*Sinapis arvensis*), wild oats (*Avena fatua*), broad-leaved dock (*Rumex obtusifolius*), common knot-grass (*Polygonum aviculare*), spotted persicaria (*Polygonum Persicaria*), Venus' comb (*Scandix Pecten*); leaves of round-leaved cranes-bill (*Geranium rotundifolium*), ribwort plantain (*Plantago lanceolata*), ivy-leaved speedwell (*Veronica hederifolia*), common chickweed (*Stellaria media*); tubers of the lesser celandine (*Ranunculus Ficaria*).

The seeds of *Polygonum* were sandy, and had evidently been picked up on ploughed land; the same applies to *Avena fatua*, *Sinapis arvensis*, and *Scandix Pecten*, whereas the seeds of *Rumex*, which were found during snow, were bright and clear from sand, and had apparently been taken from the plant.

In addition to this list, I have found two or three seeds which I have not been able to determine, but I have no doubt that Professor Balfour, who is always kind and ready to assist me, will be able to name them for me. The list of seeds, leaves, and roots appears a long one, but these things are, after all, but few and far between as compared with the quantities of grain consumed by the Wood Pigeon, especially during seed-time. I examined thirty-six Pigeons last Saturday, and their crops contained nothing but grain, principally barley. To-day I opened twelve with the same result, finding only two small seeds of an umbelliferous plant; as Prince Hal would say, but "One halfpenny worth of bread to this intolerable deal of sack."

I must therefore conclude my remarks as I commenced them, having come to the conclusion, from what I have seen, that the

damage done by the Wood Pigeon is not compensated by the good that it does in the destruction of noxious weeds. My verdict is against the bird, but let it be distinctly understood that I find that verdict on such evidence as is before me. And let it also be remembered that my observations have been made principally during the times of the year—harvest and seed-time—when grain was most easily procurable, whereas I know next to nothing of the food of the Wood Pigeon during the months of May, June, and July, when grain would be almost impossible to obtain, and when the birds must feed on the leaves, buds, roots, and seeds of many wild plants.

To prevent any doubt as to the seeds, etc., which I have named with the kind assistance of Professor Balfour, I enclose in separate boxes specimens of many of them as taken from the Pigeon's crop. Together with the boxes of seeds of wild plants (eleven in number), I have forwarded three boxes illustrative of the extraordinary quantity eaten by a Wood Pigeon. They are marked Nos. 1, 2, and 3, and each is as taken from the bird's crop.

I also send a box containing small fresh-water shells, and portions of shells, and a small bone, taken from two Wood Pigeons this month. I often find pieces of lime-stone, lime, and old mortar in their crops, and these shells have evidently not been picked up for the nutriment they contained, as they were all dead, colourless, and empty. I shall hope to supplement these remarks, if you consider them worthy of acceptance, by others at a future time, shewing the principal diet of the Wood Pigeon in the summer months.

At the close of the paper, Professor Alexander Dickson spoke of the importance of such contributions, both from a scientific and an economic point of view, as they enabled Naturalists to judge of the propriety of encouraging or destroying certain animals, just as they were found to be beneficial or the reverse. He then proposed that the thanks of the Society be transmitted to Lord Binning for his very interesting communication, which was cordially agreed to.

IV.—*Dredging Notes from the Bay of Rothesay.*

By JOHN GRIEVE, M.A., M.D.

During the months of August and September, in 1868 and 1869, I dredged a little in the Bay of Rothesay, and off its

adjacent shores; and, in now exhibiting some of the species of animals obtained, I propose to offer a few observations, illustrative of the fauna of this portion of our Firth.

A few years ago, I gave the Society some idea of what was generally to be found on the different sides of the Bay, so as to point out to some extent its leading and characteristic features. At present I lay before you some of the Hydroid Zoophytes, Sessile-eyed Crustaceans and Echinoderms, a few of which have not been previously met with in the locality.

I.—Hydroid Zoophytes.

Clytia Johnstoni (Alder). The long frond of *Chorda filum*, as it floats in the sea, is frequently covered with this beautiful little Zoophyte, which twines round it, and forms a thick mossy patch when the frond is lifted up; but when a piece is put into a glass of water, the long stems supporting the calyces stand out more or less at right angles, and the animals speedily unfold their tentacles, and project beyond the castellated rim of the crystalline calycle, which protects them. Some of the stalks are much longer than others, and all are more or less ringed at either extremity, with occasionally an odd ring or two in the middle. Now and then one may be met with ringed throughout. These all spring from a stouter creeping stem, which extends over the sea-weed, and forms a thick matted covering to it, being intertwined with other portions of what is probably the same stem, though it is hardly possible to prove the continuity with sufficient accuracy in so minute a Zoophyte. From this creeping stem the reproductive capsules spring, being attached by a short pedicle; usually the capsule is deeply ringed, but occasionally they are short and broad, with two flat shallow rings, so that the capsule appears to be only waved.

Sometimes the long straight stalk gives off one or two branches similar to itself, each terminating in a calycle, while from the side of the stalk a reproductive capsule, on a short-ringed pedicle, also projects. These capsules appear to differ from those on the creeping stem, in so far that they are narrower and more parallel-sided, and do not present the ringed appearance, but are straight, and the waved outline is hardly discernible, being limited at most to one faint wave near the mouth of the capsule. They have somewhat the appearance of the capsule of *Gonothyræa gracilis* (Sars), but the calyces are not so large, nor margined with pointed

denticles, as occurs in that species; the margin, so far as visible in most, being castellated. Their connection with, and occurrence along with, the ringed capsules, make it evident that it is the same Zoophyte. There may be a sexual difference between the two capsules, but this has not been determined.

From the ringed capsules, at all events, numbers of little medusæ are given off, and were seen swimming up and down the glass of water. They are furnished with four tentacles, eight lythocists, and the umbrella is bell-shaped, and appears to be rough over the surface, the little papulæ being thread cells. Not a few were swimming everted like little hand-bells, the manubrium of the medusa forming the handle. The power of swimming did not seem to be diminished by their being turned outside in, though the movements might not be so graceful as in the usual form.

Campanularia flexuosa (Hincks) is extremely common on all parts of the shore, and is also met with growing on *Chorda filum*. The medusæ of this Zoophyte are often everted, but none of this species appeared to be mixed with the *Clytia* on the piece of *Chorda filum* examined.

Among other Zoophytes brought up by the dredge were *Sertularia polyzonias* (Linn.) and *S. argentea* (Ellis and Solander), usually growing on old shells, stones, and cinders. *Antennularia Antennina* (Linn.), *Plumularia Catharina* (Johnston), and *P. pinnata* (Linn.) The latter appears to be a favourite resort with the *Caprellas*, numbers of these curious creatures being constantly found crawling from branch to branch, or standing on their hind legs waving their long antennæ, and bending backwards and forwards in their usual comical manner.

Campanularia verticillata (Linn.) was frequently covered with a curious Polyzoon, *Pedicellina echinata* (Sars), rising from a stem which creeps along one side for a short distance, and then twines round the stem or branches of the Zoophyte. From this stem a short stalk arises, with little spines projecting at right angles from its side, and terminates in a rounded head, which forms the Polypide. What strikes one at first sight on watching these minute animals is the power of bending this stem, and so curving it as to bring the head down to touch the Zoophyte to which it is attached, and then it is curved back to touch it again on the other side, and so for a few times this irregular action is maintained till

it recovers its equanimity, settles quiet, and projects erect. In bending from side to side, not unfrequently one comes against its neighbour, setting it in motion, and this striking a third, several may be observed at one time curving their heads about, and giving each other an occasional buffet. This stem is never twisted spirally, nor is its motion spasmodic, like a *Vorticella*, the longitudinal and transverse fibres of which it is composed being only able to bring the head to the same plane as the base of the stem, leaving an arch between the two. The tentacles were usually seen curved and rolled up, but not retracted. The passage of food revolving in the stomach to the intestine was also visible. Sometimes the entire Polypide, drops off the stem, which remains as a stump, and still preserves its capability of motion; after a time a new one is said to bud forth from this extremity.

Four of the Zoophytes most frequently found, and occurring in considerable profusion and good condition, are *Tubularia indivisa* (Linn.), in the mud, and *Obelia longissima* (Pallas), *Halecium halecinum* (Linn.), and *Eudendrium rameum* (Pallas), attached to stones in the mud as well as on the hard ground; upon a small branch of *Obelia* I detected a single *Campanularia*, which appears to agree with the description and plate of *C. raridentata* (Alder).

Two or three branches of these Zoophytes, and chiefly of *Eudendrium rameum*, are frequently matted together by the silken sheaths of *Nereis Dumerilii* (Aud. and M. Edw.) When one of these annelids is placed in a saucer of sea water, it speedily protects itself at the margin of the water with a transparent sheath, which it evacuates upon pressure, and soon forms another. When they attach themselves to the *Eudendrium*, the tube or sheath is strengthened by two or three stems being brought together, and made fast to it; the transparency is soon lost from mud and dirt. In these long black nests or tubes the *Nereis* dwells. From an empty one a *Phyllodoce bilineata* (Johnston) crawled out; it had probably taken up a temporary abode, as I am not aware that this genus ever forms a tube.

II.—Sessile-eyed Crustaceans.

In the branches of these Zoophytes we also find numbers of tube-like nests, inhabited by the domicolous Amphipods. In these the occupants may be observed on the look-out, leaning half over the side, and waving their antennæ to and fro, as they watch for

some passing pilgrim. Among these, *Cerapus abditus** is conspicuous from his powerful claws.

Dercotohœ (*Cerapus*) *punctatus*, now supposed to be the female of the preceding, will be seen in another such nest; a small one, from its spotted appearance and the form of the gnathopod, appears to agree with *C. difformis*, if it is not the young of the preceding. In similar situations *Podocerus pulchellus* and *P. pelagicus* also occur; sometimes the nest is formed on the old shell tenanted by a hermit-crab. There we find also his companions, *Nœnia rimapalmata* and *N. excavata*. From the shore I add also *Amphithœ littorina*, as another example of a nest-builder.

In the muddy refuse at the bottom of a bucket, into which some Ascidians, muddy shells, and other animals had been thrown in the course of dredging, there occurred a beautiful Amphipod, distinguished by "a blush of rose colour," with crimson spots on some of the limbs, particularly on the anterior portion of the body, *Ampelisca Gaimardii*. One striking peculiarity in this genus consists in the eyes being formed of only two simple lenses on each side of the head, with a small mass of pigment behind them. I am not certain whether they were brought up in some of the mud hauls, as they were not observed at the time, and only three specimens were got. [In the mud off Ashton I have taken *Anonyx ampulla* in considerable numbers, and a few of *A. denticulatus* along with them.]

In the Bay I have also obtained *Gossea microdeutopa*, *Aora gracilis*, *Gammarus marinus*, *Urothœ elegans*, *Calliope læviuscula*, *Montagua monoculoides*. The three last were also obtained in 1859, and most probably with the towing net. They have been preserved in glycerine, and still retain their colouring—*Montagua* its red eye, and *Urothœ* its pink markings. At that time I also obtained another curious species, the pleon of which has a deep notch, and terminates abruptly with a straight outline, so that the telson seems as it were to be stuck on to the truncated pleon. The last pereopod has also a large coxa beautifully cancellated in honey-comb pattern, and the propoda are hairy on both sides. This species does not seem to have been known till after the publication of Spence Bate and Westwood's work, when it was

* The specific names of this and the following species are given from Spence Bate and Westwood's "Sessile-eyed Crustacea." Lon., 1863.

described and figured in the Annals and Mag. of Natural History for Dec., 1868, by Rev. A. M. Norman, as *Helleria coalita*, from specimens recently obtained by himself in Shetland, and by Mr Robertson in Cumbrae—in both cases with the towing net, as I believe mine to have been taken.

Passing on to the aberrant group, *Proto pedata* and *Protella phasma* are those most usually occurring on the Zoophytes, also *Caprella linearis*, while *C. acanthifera* is very abundant on seaweeds at low water as well as on the *Plumularia*. The females, both of this and *P. Phasma*, are frequently seen with the young clustered on the antennæ, to which they cling by their hind legs, and wave about their antennæ just as their parents do on the Zoophyte. In such a case the antennæ look like brushes.

In pools near high water mark I may add that *Tanais vittatus* is frequently found in the tufts of *Cladophora rupestris*. In the same situation the little nests of a minute annelid *Othonia Fabricii* (Johnston) is found. It is distinguished by what appear to be two eyes on its tail—a very useful arrangement in a house open at both ends, where there is hardly room for turning, but a gift not conceded to most annelids which occupy a similar position. *Idotea tricuspidata* occurs both on shore and in deep water.

A still more curious Isopod, *Arcturus longicornis*, was brought up from the hard ground off Huntly Place. Placed in a glass of sea water, it swims with a series of dancing movements. Standing on what are its hind legs, it springs up and rises swimming with the fore legs; the latter are fringed, and used also to clean and brush the long inferior antennæ, which are strong and stiff, with a sharp point at the extremity. Sometimes the creature threw itself on its back, and lay stretched out stiff and rigid, supported on the tip of its tail and the points of the long antennæ in a sort of tetanic spasm, or rather in a cataleptic state. Whether this is done to feign death on a surprise, or is a part of its gymnastic performances, it does not seem to have any injurious effects, as the animal speedily resumes its more lively movements.

III.—Echinoderms.

We pass now to the Echinodermata. In a former communication I stated that I had not then obtained *Comatula rosacea* (Link) in this Bay, and referred to what may be termed its erratic habits, its numbers varying much in different localities in our Frith, sometimes occurring almost like a shoal, and then disappearing,

not one being found for a long time. Though they have not occurred in any number in the Bay, yet on almost every excursion at this time one or two came up in the dredge, usually from the hard bottom off Craigmore and Huntly Place, and the nullipore bed at Ardbeg, but sometimes even from the mud their feathery rays would be seen trying to get free from such an uncongenial position, in which *Ophiocoma filiformis* (Müller) is so much more at home, always appearing clean even in such a dirty habitat, while the *Comatulas* seem to have been overtaken when creeping over the surface, and rolled into the netting over and over, till completely enveloped. Like other Star-fishes in the Bay, the *Comatulas* appear to attain to a good size, the length of a single ray, in a fine specimen, being $7\frac{1}{2}$ to 8 inches.

This species is now named *Antedon Milleri*, and has been separated from *A. rosaceus*. In the former the centrodorsal plate is entirely covered with dorsal cirrhi, while in the latter only the sides are so covered and the central portion is naked. It is a smaller species, Norman stating the size to be $4\frac{1}{2}$ inches from tip to tip of the arms or rays, while *A. Milleri* is 11 inches from tip to tip—our largest, however, will be 16 inches. *Solaster papposa* (Linn.) is not unfrequently met with also of large size, while *S. endeca* (Linn.) is more rare. *Goniaster Templetoni* (Thompson) was obtained at this time. *Amphidotus roseus* (Forbes) is not uncommon; and *Echinocyamus pusillus* (Müller) is occasionally detected.

Of the Holothuriadæ *Cucumaria pentactes* (Müller) may be considered as occurring everywhere. *C. fusiformis* (Forbes and Goodsir) was added to the list in 1869; and *C. Hyndmanni* (Thompson), in 1868. When first obtained the latter was covered with small stones, from which its head projected at an angle, and continued in this stiff position till night, when it became more lively, and, throwing off the stones, proceeded on a survey of its new quarters.

At the same dredging *Thyone papillosa* (Müller) was found. Most of these Holothuriæ seem to be nocturnal animals, and to get lively after dark, displaying their tentacles in all their beauty; on the second night, however, poor *Thyone* put an end to itself, somewhat after the Japanese fashion of the happy despatch, evacuating its interior, the whole of the dental apparatus and intestine. The long narrow form of this dental apparatus shows

the adaptation of what is so powerful an organ in the *Echinus* to a soft-skinned urchin like *Thyone*.

Syrinx nudus (Linnæus) is not uncommon. *Syrinx Harveii* (Forbes) was obtained this last autumn. Both extremities have minute suckers, and that part of the body appears to be reticulated, while the central portion is quite smooth, and the line of separation between these two portions is most distinctly defined. There is a small proboscis partly protruded in the specimen.

Synapta tenera (Norman). In 1868 several soft, white, transparent worms came up in one of the dredgings through the mud of the Bay. They were somewhat gelatinous in appearance, and were rather difficult to pick up, but were soon found to possess a remarkable power of adhesion to the finger, and did not readily drop off into the glass. The length was from one to one and a half inches. They were very transparent, the interior being visible through the integument. A whitish ring surrounds one end (the head), from which about a dozen (eleven) tentacles arise. These are rather stout and dumpy in form, thick below, and taper rapidly to a point, giving off two smaller ones at right angles, at about one-third of the length from the extremity, and all three from that point are about the same length. At the extremity they are usually curved up or down, bending towards the bottom like a finger. Small irregular calcareous spicula, something like a femur in shape, may be observed in them. At the base of each, in the angle from which they arise from the ring margin, is a patch of yellowish pigment, which may possibly represent an eye.

In the centre of this ring is the mouth. In the anterior third of the animal is the stomach and the intestine, which winds down the middle third, while the posterior third, and sometimes the middle also, are quite transparent and banded with longitudinal muscles. The whole surface of the integument is dotted with minute anchor-shaped spicula, which give it a rough appearance, and their probably projecting from the surface may possibly account for the adhesive powers displayed. When the integument is longitudinally corrugated, the rounded end of the anchor shaft with its flukes is that which projects. These flukes are sharp pointed, but it does not appear that either of them projects much more than the other, though it must be with one or other that adhesion takes place; it is rather the end of the shaft to which

they are united, and with which they form one solid piece, which is most prominent.

The other end of the shaft is not terminated by a ring, as one might expect, but by a small handle or cross-piece, which is not exactly in the same plane as the fluke end of the shaft, and yet not exactly at right angles, but apparently somewhat diagonal to that plane. By this little cross-piece it is attached to the anchor-plate which lies below it. Indeed, at first sight it is rather difficult to make out whether the anchor lies above or below the anchor-plate, or whether even the shaft does not pass through one of the holes in the anchor-plate; but on careful examination with the microscope it will be observed that the anchor comes first into the field of view, and that when the anchor-plate is most distinctly visible the anchor has sensibly faded. This plate then lies beneath the anchor, and is rather less in length, the fluke end of the anchor sometimes projecting clear of it. It is a somewhat hexagonal plate, characterised by seven holes, and by a small sort of handle or process, so to speak, projecting from one end of it. This process is about one-half of the diameter of the plate in length, and has two little holes in it; one at the end, an eyelet hole, into which one end of the little hammer-head-looking cross-piece of the shaft seems to fit and to be attached, though perhaps not very firmly, as the anchor is not unfrequently seen by itself on the integument, as is also the anchor-plate. The two holes are somewhat pyriform in shape, and a sort of streak may be observed between them, as if they had at one time been continuous, and, indeed, one long hole may sometimes be observed. The one at the extremity, so far as I can make out with a high power, seems also to be minutely toothed. The plate is rather larger in diameter than the length from point to point of the anchor flukes, and is not exactly circular, for the outline of the circle is waved, where each of the holes within it causes a bulging in the external ring or circumference. The form of the plate is rather hexagonal; four of the sides may be considered about equal, and the other two next the process are not so long, but the angles are all rounded off. There is one hole in the centre and six around it, seven in all; they are somewhat roundish rather than oval in form, with the exception of the one opposite to the process, and it is usually semilunar.

Minute teeth project from the margin of each of these holes, and appear to rise above the plane of the plate. Four teeth may be observed on one side of a hole and three on the other; at other times, and perhaps as often, there are five on one side and four on the other, nine in all; and, on some of the smaller ones, there are only five altogether. Occasionally, but rarely, two or three of these minute teeth or processes may be seen on the external margin of one of the sides of the plate, and similarly one of these may be incomplete, leaving a little opening into one of the holes, the calcareous matter terminating in two points, as if its development had been arrested before these points coalesced to complete the circle around the hole. Other malformations occasionally occur in the forms of the plate.

Upon this anchor-plate the anchor lies, folded down, as it were, at an acute angle, and projecting at the fluke end. The flukes are sharp-pointed, and are frequently serrated on the outer margin. In one example there was an open foramen at the fluke end of the shaft, so that the anchor had somewhat the appearance of a double-edged battle-axe. Near the other extremity the shaft bulges a little, and again contracts next the cross-piece. The breadth of the shaft is about the same as that of the process of the anchor-plate.

According to Mr Herapath (On the *Pedicellariæ* of the Echinodermata, Quart. Jour. Microscop. Soc., Vol. v.), "These perforated plates are the analogues of the pentagonal plates of an Echinus shell, while the anchors are merely modifications of the spines, and are used as organs for prehension and locomotion, and assist the animal in raising its vermiform body to the mouth of its tube, the anchors being withdrawn during the period of contraction of the *Synapta*, and contribute little or nothing to the powers of defending the animal from the attacks of its predatory enemies." I cannot say whether such is the case or not; it appeared to me that the anchor-flukes were sometimes covered by a thin membrane.

There is a very regular row of these anchors down each side of the longitudinal muscles, and they are placed at right angles to the muscle, the hinge-joint of attachment being nearest it, and the round end of the plate, with the fluke end of the anchor, pointing towards the space between the muscles. It is also that part which projects when the muscle is contracted. The animal

crawls along by the tentacles, and the posterior half of the body is often held upright, or nearly so. Like other species of this genus, it is very prone to break into pieces.

Mr Robertson informs me that this species is *Synapta tenera*, one of his numerous additions to the marine fauna, and was named by the Rev. A. M. Norman in a paper read before the British Association in 1863, although no description is given in the notice in the Report of that meeting.*

An examination of the anchor plates in the drawing sent round, as compared with Mr Herapath's plate of the known British species, will show how distinctly the anchor process of this species and the form of plate differ from those represented.

Messrs Woodward and Barrett, in their paper on *S. digitata* and *S. inhaerens*, (reported in the Annals and Mag. of Natural History, Vol. iii., 1859,) consider these plates as fully reliable for specific characters, and that opinion is borne out by the plates of this species. I have not yet met with *S. digitata* in Rothesay Bay, but Messrs W. and B. state it was obtained there by the late Mr Alder in 1844.

IV.—In conclusion, two *Serpulæ* are exhibited.

Serpula Berkeleyi (Johnston) usually occurs singly by itself on a stone, and does not form a cluster like many of the other species. It forms a hard, semi-transparent, porcellaneous looking tube, very different in apparent consistency from the others. It rises up and projects freely from the attached portion, and is terminated by three well-defined sharp mucros; one or other of the points, however, is often broken, probably the result of capture. The operculum is of a fine orange colour; the stem is corrugated and banded with orange red; the margin as well as the upper surface is smooth. There is a narrow black ring inside, which perhaps is caused by dirt. The branchial plumes are of a pale greenish yellow, with an orange band across the middle. This species is comparatively rare.

S. reversa (Montagu), on the other hand, appears to be very common. It has a double operculum; the upper one rises out of the centre of the lower, and has the margin armed with thorny spines; sometimes they are single, but usually have one or two

* It has since been described, with a plate, by Messrs Brady and Robertson, in the Proceedings of the Zoological Society of London, Nov. 21, 1871.

ramuli. The lower operculum has the margin serrated and the stalk grooved in continuation therewith.

V.—*Contributions towards a Moss and Lichen Flora of Cumbrae.*
By MR WALTER GALT.

VI.—*Notes of a Botanical Trip to Ben Lawers with Dr Stirton.*
By the same Author.

In this paper several rare plants were enumerated, including a number of interesting lichens.

The Librarian announced the following donation to the Library:—Transactions of the Natural History Society of Northumberland and Durham, Vols. i., ii., and Vol. iii., Part i., from the Society.

SESSION 1870-71.

THE NINETEENTH ANNUAL GENERAL MEETING, ANDERSON'S
UNIVERSITY BUILDINGS, SEPTEMBER 27TH, 1870.

Professor John Young, M.D., F.G.S., President, in the chair.

The Treasurer and Librarian submitted their Annual Reports, the statement of the former shewing a balance in favour of the Society of £77 10s. The following gentlemen were elected office-bearers for the session:—Professor John Young, M.D., F.G.S., President; Mr David Robertson, F.G.S., and Professor Alexander Dickson, M.D., Vice-Presidents; Robert Gray, Secretary; Thomas S. Hutcheson, Treasurer; Thomas Chapman, Librarian; Hugh Colquhoun, M.D., James Stirton, M.D., Donald Dewar, M.D., Edward R. Alston, F.Z.S., John Alexander, Robert Mason, James Coutts, and William Sinclair, Members of Council.

SPECIMENS EXHIBITED.

Mr Gray exhibited a specimen of the Green Sandpiper (*Totanus ochropus*), from the banks of the Carron, in Stirlingshire, and a specimen of the Little Stint (*Tringa minuta*), from Grangemouth, both got recently and forwarded by Mr John A. Harvie Brown, corresponding member.

Mr Gray also exhibited a specimen of the Tree Sparrow (*Passer montanus*), from Ardrossan, and read the following extracts from a letter written by Mr John Jameson, of 87 Princes Street, Ardrossan:—"The nest from which this specimen was obtained was under the cope-stone of a high wall, and contained four birds. It was found in the evening by a lad, who brought three birds to the writer, the fourth having flown away. The young birds were all marked with black on the cheek exactly alike, and were much less in size than the House Sparrow. It would seem that the Tree Sparrow does not always build in trees, but sometimes nests along with the Common Sparrow in houses." Mr Jameson also noticed a Blue Tit (*Parus cceruleus*), which he had observed during the summer. In 1864 a specimen of this bird was exhibited to the

Society, captured near Dunbar, where, it was stated at the time, it seemed to have established itself, though not previously recognised as a Scottish species.

Mr Chapman stated that he had in his possession at Buchanan Street a full-grown living larva of the Emperor Moth (*Ceratocampa imperialis*, Fab.), a native of the Middle and Southern States of North America.

PAPER READ.

Journal of a Tour through the Outer Hebrides in 1870.

By Captain H. W. FEILDEN, Corresponding Member.

This tour was made in company with Mr Harvie Brown, and the present communication takes up the narrative when the latter gentleman left for the South. Captain Feilden obtained in the Long Island the eggs of the Red-necked Phalarope, Dunlin, Black-throated Diver, Ring Plover, etc. He mentions that there is a belief throughout the Long Island, and in parts of Sutherlandshire, that if the eggs of the Hooded Crow are boiled and returned to the nest, the hen will sit on them till she dies of exhaustion. Visiting the island on which the Black-throated Diver nests, "we were surprised to find the nest composed of grass, and raised considerably, not unlike that of the Common Gull. We particularly asked our guide if he was sure about this being the nest, as we always supposed the Diver made no nest; but he corroborated his statement by pointing to the otter-like tracks from the nest to the water."

On the "Machirs," near Drumore, Captain Feilden saw shell mounds from which the winds had removed the lighter sand, leaving great masses of periwinkles, cockle-shells, and fragments of teeth and bones. From a large mound near Grogary a quantity of bones was obtained. "Among the remains we found many fragments of bone pins, one very perfect one made of deer's horn. We packed a considerable number of these bones for the examination of Professor Newton, being in hopes that some relic of the Great Auk (*Alca impennis*), however minute, might turn up among the remains of deer, swine, and seal, which form the largest part of the remains. In pre-historic times, when this mound was the home of man, it had evidently been surrounded with water, which the rise of the coast line has since drained off. This very interesting mound will in a few years blow away entirely,

and nothing will be left but a heap of bones and large quantities of shells to mark the spot.

“We were taken to a green hillock situated a little to the N.W. of Grogary, and between the “Machirs” and Drumore Loch. It has evidently at one time been surrounded by a shallow lake, now drained off by the elevation of the land. Our guide told us this was another shell mound, and if dug into would prove quite as rich in bones as the other.” Other shell mounds were visited, situated three miles from Nunton, Benbecula, and not far from the sea. The portions of these mounds exposed by the winds are rich in remains. “We picked up a considerable number of bone needles and pieces of animals’ bones. A large portion of a human skeleton was also exposed. It appeared to be the remains of a very tall man. The most interesting results were a well-carved bone spoon and half of an elegantly-made bronze brooch.

“Finding these vestiges of civilization *in situ*, side by side with the cleaver and hatchet, the splintered bones and horn needles of the pre-historic man, for a moment shook our faith in the antiquity of the kitchen-middens, as on reflection it occurred to the author, first, that the brooch and spoon might have been dropped in comparatively recent times, (a supposition negatived by the position in which they were found); second, that these articles, manufactured by a more highly-civilized people in Britain or the Continent, might have reached Long Island by accident or barter, just as centuries hence an Esquimaux heap might contain relics of Kane’s or other expeditions.” Captain Feilden, adverting to the friable nature of the remains, recommended that visits should be paid after storms, when the winds expose the interior of the mounds, and diminish the risk of breaking the bones in digging.

It was ascertained that Eagles had not been at Wiay for many years, the last female having been killed twenty years ago. Two large flocks of Whimbrel were noted, this being an unusually late date for them to linger on the coast of Britain.

A visit to the old castle of the Clanranalds, now a quarter of a mile from the shore, but once so near the water that seals were shot from the windows, suggested to the author the probability of a slow elevation being in progress over these islands.

In the discussion which followed the reading of this interesting paper, Dr Dewar, Mr Gray, Dr Young and others took part. The importance of the ornithological notes, and of the facts

regarding the shell mounds, was pointed out, but exception was taken to Captain Feilden's views regarding the elevation of the land.

The Librarian announced the following donations to the Library:—Transactions of the Glasgow Archæological Society, Vol. ii., Part i., from the Society. Ungedruckte, unbeachtete und wenig beachtete Quellen zur Geschichte des Taufsymbols und der Glaubensregel, Dr C. P. Caspari, Professor der Theologie an der Norwegischen Universität, Christiania, 1869. Mærker Efter en Iistid I Omegnen af Hardangerfjorden, af S. A. Sexe, Christiania, 1866. Om Siphonodentalium Vitreum, en ny Slægt og Art af Dentalidernes Familie, af Dr Michael Sars, Professor ved Christianias Universitet, Christiania, 1861. Etudes sur Les Affinités Chimiques, par C. M. Guldberg et P. Waage, Christiania, 1867. Le Glacier De Boium, en Juillet, 1868, par S. A. Sexe, Christiania, 1869. Ten Maps of North Norway, —from the University of Christiania. Natural History Transactions of Northumberland and Durham, Vol. iii., Part ii., 1870, from the Society.

OCTOBER 25TH, 1870.

Professor John Young, M.D., F.G.S., President, in the chair.

Messrs John M. Campbell, James Peebles, and David C. Glen, were elected resident members.

SPECIMENS EXHIBITED.

The Secretary exhibited a specimen of the Manx Shearwater (*Puffinus anglorum*) which had been taken alive last month at the railway station, Larbert, Stirlingshire, and was forwarded by Mr John A. Harvie Brown, corresponding member. Mr Gray made some remarks on the distribution of the species in Western Scotland.

Mr John Bell exhibited specimens of the Iceland Falcon (*Falco islandicus*), Greenland Falcon (*F. candicans*), and Norwegian Gyrfalcon (*F. gyr-falco norvegicus*), on which the Secretary and Dr Dewar offered some observations, showing the difficulty of distinguishing between the three species, especially in the case of immature specimens. Mr Bell also exhibited a specimen of the Swallow-tailed Kite (*Nauclerus furcatus*).

Mr John Young exhibited specimens of several species of Polyzoa recently obtained from an exceedingly interesting Arctic shell-bed at present exposed in the cutting of a new dock at Cartdyke, near Greenock. One Polyzoon he referred to the genus *Idmonea*, which, he said, had not been recorded from any of the other Arctic shell-beds in the West of Scotland. Mr Young stated, that from the disturbed condition of the larger shells observed in the deposit, and from other circumstances, considerable diversity of opinion existed as to whether the bed lay in its natural position, or had at some former period been dug out of some Arctic shell bed cropping out on the Greenock coast, and had been brought to the spot where it is now found to fill up a hollow in the boulder-clay. The shell-bed, as seen in the cutting, appears to be of a very limited extent; but Mr Young would not express any decided opinion as to how the disturbed condition of the shells had been produced (while there was the probability of their having been placed in their present position by man's agency) further than by stating that it could not be by water or ice, as the beautiful manner in which the Polyzoa, *Serpulæ*, *Spirobis*, etc., are preserved upon the larger shells and on the stones and boulders in the deposit, precludes the idea of their having drifted from other tracks into the hollow at Cartdyke since the time these delicate organisms became attached.

PAPER READ.

On Petromyzon fluviatilis, and its mode of preying on Coregonus clupeoides. By Mr DAVID ROBERTSON, F.G.S.

About a month ago I found on Loch Lomond a full-sized dead Powan (*Coregonus clupeoides*, Lacep.), having two abraded holes about the size of the point of the fore-finger, one on each side of the shoulder. My boatman said that these holes, or bites as he called them, were made by an eel, which he assured me he often found hanging to a Powan. Shortly afterwards we came upon another Powan of smaller size, floating on the water, belly up, with an eel hanging to it. I managed by means of a hand-net to get them both into the boat, where the eel at once let go its hold. The Powan was dead, but had all the appearance of being only newly so. This so-called eel was the Lampern (*Petromyzon fluviatilis*, Linn.) In looking over what books were accessible to

me, I find no mention made of this species hanging to its prey in the manner to which I have referred. If this habit is as common as it seems to me to be, both from my own observation and from the boatman's report, it is remarkable that no notice has been taken of it, particularly as this fish is as well known, and has had a great commercial interest in some places. It is said the Thames alone supplied from one million to twelve hundred thousand Lamperns annually. The only passage I find bearing directly on the point at issue is by Yarrell, when speaking of the food of the Sea Lamprey (*Petronryzon marinus*); he says, "it consists generally of soft animal matter, and in the sea it is known to attack other fishes of large size by fastening upon them, and by its numerous small rasp-like teeth, eating away the soft parts down to the bone." This suggests the inquiry whether the Lamprey occupies itself with the prey that it has taken till it entirely consumes it, or whether, like the Otter, it only takes the choice part, and again renews the hunt for another fresh and savoury repast.

That they do betake themselves to dead fish is favoured by a statement of Bloch's, where he says, "The food of the fresh water Lampern is insects, worms, small fish, and the flesh of dead fish."

It is not improbable, the assertion that its food is occasionally dead fish, may have arisen from the occurrence having been noticed of its holding on to the newly-killed prey. The facts that came under my own observation, so far as they go, appear to show that the Lampern does not feed on the dead bodies of fish till they are all consumed. The abrasions on both the Powans I found on the loch were only about the size of the sucking mouth of the Lampern, and to a small depth, with no visible deviation of encroachments of the holes either to one side or another. Even the statement that was made of the Sea-Lamprey, with "its small rasp-like teeth, eating away the soft parts down to the bone," gives no indication of the consumption of the whole fish, but rather that of tapping an opening from which the juices of the animal might be withdrawn. The whole mechanism of the mouth, with the rasp-like tubercles or teeth and suctorial lips, point in that direction.

I give these facts and suggestions in the meantime, in the hope that they will elicit something more bearing on the subject from some of our members.

Professor Young then delivered an opening address, after which the Librarian announced the following donations to the Library : Vargasia. Boletin de la Sociedad de Ciencias Fisicas y Naturales de Caracas, numero 7, 1870, from the Society. Proceedings of the Perthshire Society of Natural Science for 1869-70, Perth, 1870, from the Society. Seventh Annual Report of the Belfast Naturalists' Field Club, 1869-70. Opening Address of Professor Wyville Thomson, M.D., Nov., 1869, Belfast, 1870, from the Club.

NOVEMBER 29TH, 1870.

Mr Edward R. Alston, F.Z.S., in the chair.

The following gentlemen were elected members :—Messrs John Barr, David More, C.E., James Allen Harker, and John Hopkins, as resident members. Rev. H. Williamson, Mantchouria, and Mr W. A. Dixon, Newcastle, New South Wales, as corresponding members.

SPECIMENS EXHIBITED.

The Chairman exhibited a specimen of the Barbastelle Bat (*Barbastellus communis*) from Norfolk, and made some remarks on the distribution of this species in Britain and on the Continent; also a specimen of the Black Tern (*Sterna fassipes*), which had been shot near Grangemouth, on the Firth of Forth, on 8th September last, by Mr John A. Harvie Brown, corresponding member. This bird was alone when seen, and is in the plumage of the first autumn. Regarding its occurrence in Scotland, Mr Alston stated that he had been informed by Mr Gray that specimens had been obtained in the counties of Dumfries, Haddington, Berwick, Fife, and Aberdeen. In the last-named shire one was shot in the autumn of 1866, and another on the 30th April, 1867.

Mr Gray said that he had seen it on Loch Lomond in full breeding plumage in May, 1867, and again at Girvan in August, 1870. Five specimens were seen some years ago on Loch Fyne by the late Mr James Hamilton of Minard. Upon the whole, he was disposed to think that the species is a regular spring and autumn visitant to our shores.

The Secretary exhibited a specimen of the Red-necked Phalarope (*Phalaropus hyperboreus*), a young bird in the plumage of the first

year, which was shot on the 15th September last, near Aberdeen, by Mr Alexander Mitchell, and referred to that state of plumage as one which had been but imperfectly described by Yarrell and other writers. Another specimen was obtained by Mr Mitchell three days afterwards at the same place; and these two birds had probably belonged to a migratory flock from more northern latitudes.

Mr John A. Harvie Brown exhibited two specimens (females in breeding plumage) of the Purple Sandpiper (*Tringa maritima*), which were shot on 27th May last on the island of Mingulay, Outer Hebrides, by Captain H. W. Feilden. These birds had apparently been nesting in the district, as both showed abrasion of the under parts of the plumage, indicating that they had been sitting on eggs. Captain Feilden saw other specimens of this Sandpiper at the same place, and in Barra, and was inclined to think that small numbers bred in that part of the Long Island.

PAPERS READ.

I.—*Notes on the Shell Mounds of the Outer Hebrides.*

By Mr ROBERT GRAY.

The writer, who had visited these mounds in August, 1870, drew the attention of the meeting to several passages in a curious work published about 200 years ago, entitled "A Description of the Western Islands of Scotland," by M. Martin, which appeared to throw some light on the history of many of the objects that have been discovered in these mounds. At a previous meeting of the Society a paper on the subject had been read by Captain Feilden, who stated that he had found in one of the heaps a bone spoon, ornamented with carved work, and also bone needles and other objects, such as have hitherto had a considerable antiquity, if not pre-historic age, assigned to them. It was, however, a curious circumstance, to say the least of it, that Martin mentions in his account of the inhabitants of the Outer Hebrides in his day, that "some of the natives are very dexterous in engraving trees, birds, deer, dogs, etc., upon bone and horn, or wood, without any other tool than a sharp-pointed knife." Again, in speaking of their dress, he says,—“When they [the men] travel on foot, the *plad* is tied on the breast with a bodkin of bone,” etc.; and, in alluding to the dress of the women, he states that “the *plad*

being pleated all round was tied with a belt below the breast ; the belt was of leather, and several pieces of silver intermixed with the leather like a chain. The lower end of the belt has a piece of plate about eight inches long, and three in breadth, curiously engraved, the end of which was adorned with fine stones or pieces of red coral." Mr Gray exhibited a small piece of pink coral perforated, which he had found while digging into one of the mounds in the island of South Uist, and mentioned that this article of ornament, taken in connection with the bronze brooch found in one of the Benbecula heaps by Captain Feilden, or even with bone bodkins, or other articles of bone ornamented with carving, excited at least a suspicion that these Hebridean mounds might not be of a greater age than two or three hundred years.

II.—*Notes on the discovery of an Ancient Canoe on the farm of Littlehill, Cadder Moor, near Kirkintilloch, the property of Sir William Stirling Maxwell, Bart. Illustrated by drawings. By Mr JAMES S. DIXON.*

The position in which this curious relic of antiquity was lying, indicated that it had been stranded or hauled up on the beach, the stern being uppermost, and slightly protruding above the surface. The workpeople about the farm imagined it was the stump of a tree, and so it was rather damaged in the process of removal, until its real nature was discovered. The dimensions are—length, thirteen feet ; breadth, from one foot nine inches near the taper at the bow, to two feet five inches at the stern. There are two detached pieces of wood or ribs, formed of the bent branch of an oak ; these have circular holes drilled or burned through them, which appear to correspond with similar holes in the bottom of the canoe. At the stern there is a slight groove, into which a board or piece of wood had probably been inserted, and held in its place by similar grooves in the sides. The canoe has been hewn or burned from the trunk of an oak tree, with the bark adhering to the outside. Cadder Moor, where this canoe was found, is of considerable extent, and is a nearly level peat moss. Some time ago an attempt was made to bore there for minerals, which resulted in failure, as, after cutting through the peat to a depth of twenty feet, the workmen found it to be floating on the top of fluid mud

and water, reaching to a considerable depth. This, corroborated by the finding of the canoe, shows that the present situation of the Moor was formerly a loch, which has been silted up by vegetation, the uppermost stratum being now perfectly firm, and a portion of it drained and under cultivation.

The Librarian announced the following donations to the Library:—Notes of a Week's Dredging on the West of Ireland, and The Ostracoda and Foraminifera of Tidal Rivers, by G. S. Brady, C.M.Z.S., and David Robertson, F.G.S., from the authors. A List of Fresh Water Algæ, collected in Northumberland and Durham, and Notes on Entomostraca, taken chiefly in the Northumberland and Durham District, by G. S. Brady, from the author.

SPECIAL MEETING.

NATURAL HISTORY CLASS ROOM, GLASGOW UNIVERSITY.

DECEMBER 19TH, 1870.

Professor John Young, M.D., F.G.S., President, in the chair.

There was a good attendance of members, and Professors Allen Thomson, Blackburn, and Veitch, were also present. The more interesting among recent additions to the Hunterian Museum were exhibited, including a part of the collection of birds from Central India, given by Mr W. Ramsay, Bombay Civil Service; a part of the Mexican series collected by Dr Dugeès, and presented by Mr Lachlan M'Gown, Consul at Guanajuato; and a group of sea birds shot by a student of medicine on a voyage to Greenland. These specimens, together with an Emu purchased from a menagerie, had just come from the stuffer, M'Culloch, on whose dexterity they reflected credit.

Mr R. Gray, the Secretary of the Society, commented on several of the birds, especially those rarely found in Scotland, and concluded his remarks by presenting to Dr Young, for the Hunterian Museum, specimens of the *Aglàia striata*, and other birds.

SPECIMENS EXHIBITED.

Dr Young described a new species of Carboniferous fish (*Palaconiscus Wardi*), which he had found in the cabinet of Mr Ward of Longton; a new species of crustacean, belonging to the

genus *Solenocaris*, which had been collected by Mrs Robert Gray, from the Silurian strata near Girvan; a remarkable series of fragments, found in the same locality by Mrs Gray, and which the speaker was inclined to consider as appendages of a Trilobite or Limulid crustacean; and lastly, a specimen of the Tench (*Cyprinus tinca*), from Lochlomond. This specimen gave rise to some conversation, but no one could give information as to the introduction of Tench into the loch. Mr Hadaway some time ago informed Dr Young that one had been caught by two members of the Angling Club near Balmaha, and that an individual captured in the spring had been kept alive in the neighbourhood; the latter, forwarded by the Rev. W. Macintosh of Buchanan, being that shown to the Society. It was stated that the recently caught fish had been taken by the net, but that one had been taken with bait some years ago. Mr John Young, F.G.S., said that in a cut, near the Kelvin, in Cadder Park, Tench had been found living some years ago, having been introduced by a former Mr Stirling of Cadder. Yarrell does not mention its occurrence in the West of Scotland.

Mr John Young exhibited a further series of specimens of polyzoa, shells, etc., which he had collected from the glacial clays at Cartsdyke, a deposit in which he, Mr D. Robertson, F.G.S., and others, had found over eighty species, some of them identical with those from the English Crag. The carefully-selected series he showed was presented to the Hunterian Museum. An animated conversation ensued, in which Mr J. Thomson, F.G.S., Mr Coutts, and others took part, the natural or artificial disturbance of the beds being the chief points at issue.

Dr Young, in exhibiting the specimens purchased from menageries, stated the cause of death in each case, insufficient food and imperfect protection from cold being the chief causes; while in the case of the monkeys, neglect of the most obvious sanitary precautions had also to be considered. In connection with this subject he referred to the mortality of cats in autumn, and denounced the brutality too common of turning them adrift when families leave town for the holidays. He suggested the imposition of a tax on cats, if that would be found practicable, not for fiscal purposes, but to diminish the cruelty practised on these animals, and because vagrant cats were, he believed, agents in the spread of infectious diseases.

Dr Allen Thomson, the Chairman of the Museum Committee, expressed his gratification at being present at this, the first meeting of the Society within the University walls, where he hoped that many such meetings would be held; and concluded by presenting to the Museum a specimen of the *Didunculus strigirostris*, which had been given to him by the Rev. Dr Turner. This very rare bird, a native of Samoa, is the nearest living species to the extinct Dodo, and the value and importance of the gift may be guessed from the fact that there is only one other specimen in Britain, in the possession of Dr Rolleston, at Oxford. On the motion of Mr Gray, the Society returned thanks to the Senate for their permission to meet in the University.

ANDERSON'S UNIVERSITY BUILDINGS.

JANUARY 3D, 1871.

Mr Edward R. Alston, F.Z.S., in the chair.

Mr William Macgregor was elected a resident member.

SPECIMENS EXHIBITED.

The Chairman exhibited, with remarks, several curious varieties of the common Mole (*Talpa europaea*) from different parts of Britain. The most interesting of these was a specimen of a rich golden hue; and another of the specimens, which was killed at Dunipace, was of a uniform clear greyish white.

Mr A. H. Dennistoun, Jun., exhibited a specimen of the Ptarmigan from Dumbartonshire, the locality being perhaps the furthest south of any known haunt of the species in Great Britain. This bird, which was in full summer plumage, had been shot by Mr Crum Ewing on the hills between Glen Fruin and Luss Glen, a haunt invested with additional interest from the circumstance of its being at a much lower elevation than the mountain tracts usually frequented by Ptarmigan.

PAPER READ.

*On the Birds found breeding in Sutherlandshire.**

By Mr JOHN A. HARVIE BROWN, Corresponding Member.

Before entering upon my more immediate subject it may be well to lay before you a list of the various works by previous authors, as well as separate papers, treating more or less of the natural history of the County of Sutherland.

Of these the first that recommends itself to your notice is—

1. "A History of the Earldom of Sutherland," to the year 1630, by Sir Robert Gordon, Bart., first published in - 1813

As a certain passage in it serves in some measure to describe the general aspect of the then existing *ferae naturae*, I offer no apology for transcribing it, the more particularly as the work in question is not easy of access. After speaking of certain forked-tailed deer, said to inhabit the mountain 'called Arkill,' he goes on to say—

"All these forrests and schases are verie profitable for feiding of bestiall, and delectable for hunting. They are full of reid deir and roes, woulffs, foxes, wyld catts, brocks, skuyrrells, whit-trets, weasels, otters, martrixes, hares, and fumarts. In these forrests and in all this province, ther is great store of partridges, pluivers, capercalegs, blackwaks, murefowls, heth-hens, swanes, bewters, turtle-doves, herons, doves, steares or stirlings, lair-igigh or knag, (which is a foull lyk vnto a paroket, or parret, which maks place for her nest with her beck, in the oak trie), duke, draig, widgeon, teale, wildgouse, ringouse, routs, whaips, shot-whaips, woodcok, larkes, sparrowes, snyps, blakburds or osills, meweis, thrushes, and all other kinds of wildfoule and birds, which ar to be had in any pairt of this kingdome."

* When the greater part of this paper was written and read, some years ago, at a meeting of the Society, several of the rarer species were, if anything, not quite so rare as they are at the present time. On the other hand, many of our woodland species have increased in the county, and one or two have been added to the number found during the nesting season. That the latter are likely still further to increase, is extremely probable, owing to the extensive improvements being now carried on by the proprietor, who is annually bringing large areas of ground under wood and cultivation, and is reclaiming a considerable acreage from the barren moors, by converting them into flourishing turnip fields. Those who are specially interested in the subject of agricultural improvements would do well to read the account given in the *Inverness Courier* for August 6, 1874.

I am bound to confess my inability to identify some of the above-mentioned species, though most of them are easily recognisable. "Turtle-doves" are probably Wood Pigeons, as distinguished from "doves," which are doubtless Rock Pigeons. "Shot-whaips" are Whimbrels, and "bewters" Bitterns; but what "rouths" may be, or have been, I am at a loss to conjecture. As to the "lair-igh or knag," I may not be far wrong in supposing it to be the Common Crossbill, some idea of its making "place for her nest in the oak trie" having been simply suggested to the author's mind by the curious formation of the bill.

2. "A Tour in Scotland," by T. Pennant, contains notes on the birds and animals of Sutherland and Caithness, - 1769
3. "Tour in Scotland and Voyage to the Hebrides," also by Pennant, - - - - - 1774
4. "The Statistical Account of Scotland"—Sutherlandshire, - - - - - 1793
5. "On the Quadrupeds and Birds inhabiting the County of Sutherland, etc.," by P. L. Selby, Esq., and Sir W. Jardine, Bart. (contained in the *Edinr. New Phil. Journal*, Jan., April), 1836
6. "The New Statistical Account of Scotland"—Sutherlandshire, - - - - - 1841
7. "A Voyage round the Coasts of Scotland and the Isles," by James Wilson, - - - - - 1842
8. "Wild Sports of the Highlands," by Charles St. John, 1846
9. "The Birds of Sutherland and Ross-shire," by Milner, (contained in the *Zoologist*), - - - - - 1848
10. "Tour in Sutherland," by Charles St. John, in which a list of the Birds of Sutherland is given, - - - - - 1849
11. "Notes on the Ornithology of Caithness," by Messrs Shearer and Osborne (contained in *Proc. Roy. Physical Soc. of Edinburgh*, Vol. ii.), - - - - - 1861

A full list of all the species obtained in that county up to date is given; but it is founded principally on a collection formed by Dr Sinclair, of Wick, previous to 1840, which, as we are informed, contained 191 species. In Vol. iii. of the *Proceedings* also, mention is made of various rare species recorded as obtained in Sutherland and Caithness.

12. "On the Distribution of Birds in Great Britain during the nesting season," by A. G. More (contained in the *Ibis*), - - - - - 1865

A most valuable paper. Messrs Shearer and Osborne are quoted as authorities for Caithness, and Mr W. Dunbar for Sutherland.

13. "Sporting Days," by John Colquhoun, - - - 1866
Contains a chapter on the wilds of Sutherland, and a list of the Birds of the district. Pp. 235-55.

14, 15. Two Papers in *Zoologist*, on "Nesting Tours in Sutherland," by J. A. Harvie Brown, - - 1867 and 1868

Having thus, as I believe, given a somewhat full list of previous writings on the subject, my next duty, and a most pleasant one, is to express thanks to all those who have assisted directly or indirectly in the preparation of my paper.

To Mr John Crawford of Tongue, the Duke of Sutherland's factor for the northern districts, and to Mr Thomas Mackenzie of Dornoch, I have all along been greatly indebted, for the kind way in which they have ever rendered me ready assistance, not to speak of the pleasure I have derived from our correspondence. Special thanks are also due to Mr E. MacIver, the Duke of Sutherland's factor for the districts of Assynt and Edderachyllis. I shall never cease gratefully to remember his unvarying kindness, shown in many ways, and the trouble he so often took in all matters bearing upon the objects of my excursions.

To Mr John Sutherland, whose comfortable inn was my chief head-quarters, I am much indebted. His thorough knowledge of the haunts and habits of all the wild creatures, amongst which he passed so many years of his life, as the Duke of Sutherland's head gamekeeper, was of infinite service to me.

To many others, too numerous to name—but whom, though not now naming, I well remember—I desire to express sincere thanks, not only for help given in my pursuits, but also for their light-hearted, cheerful companionship in many a long ramble by the lochs and streams, and wild hills and valleys of their glorious county.

Professor Newton, Sir William Jardine,* Mr Robert Gray, and others with whom I have corresponded, I would thank for their

* Since the above was written, Sir William Jardine died at his residence, Jardine Hall, Dumfriesshire, at the age of 74, regretted by a wide circle of scientific and personal friends, on the 21st November, 1874.

assistance, and also my friend, Mr E. R. Alston, for his friendly and valuable criticism during almost the whole time I have been engaged in collecting and arranging my materials.*

ACCIPITRES (Diurni).

Fam. ii., FALCONIDAE.

THE GOLDEN EAGLE.

AQUILA CHRYSÆTOS (Linnaeus).

This fine species is still common, although not so abundant in the county as at the time of Sir William Jardine's and Mr Selby's expedition, in 1834. Mr Selby informs us that about that time no less than 171 full-grown eagles, besides 53 young birds and eggs, were destroyed in the course of three years; and that the proprietor paid to gamekeepers, shepherds, and others, the total sum of £205, as rewards for their destruction. Of late years Eagles have been protected; and, although the directions issued for their preservation have not, I fear, been carried out to the letter, nevertheless I am able to state with some degree of certainty, that both they and the Peregrine Falcon have increased in numbers considerably since such orders were given. It was, a few years ago, and indeed still is, a comparatively rare circumstance to obtain a glimpse of the Royal birds, unless their peculiar haunts are known beforehand, and the birds positively sought for. In May, 1869, however, I had a near view of a grand old Eagle. I was sitting in company with the gamekeeper of the district and some shepherds, under a rock, on the side of a deep narrow glen, when our conversation was interrupted by a rushing sound overhead; and, as we all looked up, the men said in suppressed voices, and it seemed with respect in *the presence*—"The Eagle." Down the narrow glen he rushed in the full impetus of his flight, his wings half-folded to his sides; a rich golden hue, proclaiming the adult bird, plainly discernible, as the sun shone

* It is only at somewhat short notice, owing partly to my absence from home, that I have been made aware of the intention of the Society to print this paper in the present Part of the Proceedings; and, not having paid so much attention to the birds of the county of late years, I am necessarily not so well prepared to bring it fully up to date as otherwise would have been the case.

full on his back and neck. He passed us within forty yards, and almost ere we had time to turn our heads he was at the foot of the glen, nearly half a mile distant. Then a pair of Peregrine Falcons, which had their eyrie on the cliff above our heads, swept after in pursuit, and were seen swooping and dashing at the Eagle, the one relieving the other, until they almost drove him to the ground. On seeing this I thought, "Can he be the king?"

"Fain would I know (if beasts have any reason),
If Falcons killing Eagles do commit a treason?"

—Cleland's "*Hallo my fancy.*"

As if struggling with his degradation, the Eagle again rose upwards in gradually widening circles, avoiding the oft-recurring swoops of his tormentors, much in the same undignified way that the Hooded Crow avoids those of the Kestrel—viz., by half-turning on his side in the air. At last, after reaching a considerable elevation, he disappeared round a shoulder of the hill, no doubt to retrace his flight to his eyrie, amid the crags of the cold grey stony mountain, which rises at the head of the glen. Though all this took place in an infinitely less space of time than the description of it has occupied, it was a sight never to be forgotten, and even now I seem to hear the great rush of his wings in that lonely Highland glen. Several times I had seen Eagles at tolerably close quarters, but never before had I witnessed the immense power, the irresistible rush, of an Eagle's flight when cleaving the air at full speed.

WHITE-TAILED EAGLE.

HALIAETUS ALBICILLA (Linnaeus).

This species, which was equally persecuted at one time with the last, is now likewise protected, but its numbers are not equal to those of the "Mountain Eagle." The north coast of the county is perhaps most frequented by them, though on certain cliffs on the west coast, as well as on inland lochs, they are also found breeding. The fact that they are a scarcer species in this part of Scotland may perhaps in part be accounted for by their disposition to wander, during the winter, far southward from their breeding haunts, and their consequent liability to be shot, trapped, poisoned, or otherwise destroyed. Doubtless this wandering habit,

which is in a great measure contrary to that of the Golden Eagle, is occasioned by the scarcity of their favourite food. Probably their journeyings southward are much influenced by the migrations of the fish along our coasts, as well as the fact that rabbits, of which they are specially fond, and which inhabit the islands on the north and west coasts, keep more to their burrows during the winter.

OSPREY.

PANDION HALIAETUS (Linnaeus).

Such a sight as that witnessed by Sir W. Jardine's party, in 1834, at the mouth of the river Laxford—viz., four Ospreys on the wing and in sight at the same time, hovering over the shoals of salmon as they ascended the stream, is seldom or never witnessed in the county now, though, when Ospreys are seen, I believe this locality is still a favourite haunt. The pair of birds so often alluded to in works on British Ornithology,* and which had their nest on the summit of the ruins of Aardvraak Castle, on Loch Assynt, used regularly, as I am informed by one who had often seen them, to frequent a shallow sandy bay at the south-east end of the loch, and might be seen on such occasions plunging after their finny prey, and bearing it off to their then undisturbed nesting place. I am not an antiquarian, nor given at all to archæological pursuits, so may be pardoned for saying that, with the disappearance of the Osprey, the glory has departed from the ruins of Aardvraak.†

PEREGRINE FALCON.

FALCO PEREGRINUS, Gmelin.

This noble bird, the "Game Hawk" of the natives, and which lowers not his proud head beneath the gaze of his so-called king,

* Amongst others, *vide* "A Voyage round the Coasts of Scotland and the Isles," by James Wilson, Vol. i., p. 334. He mentions that the Ospreys, in 1834, bred on a chimney of Calda House, another ruin contiguous to Aardvraak Castle. I have been assured, however, that it was always upon Aardvraak Castle that the nest was built, and the place has been pointed out by those who well remember its existence.

† The nest described by St. John, in his "Tour in Sutherland," Vol. i., p. 37, as belonging to this species, was really that of a White-tailed Eagle. *Vide Ootheca Wolleyana*, Part i., p. 45.

I am glad to say, is far from being a scarce species in Sutherland, and seems to be very generally distributed over all the more mountainous districts. Some authors assert, without much foundation on fact, that this species breeds by preference, and more frequently, on sea cliffs than on inland ones. When they do breed on the coast it is not generally from choice, but simply because the nature of the inland country does not supply suitable rocks for them to nest upon. I say "generally," because when the Peregrine places his eyrie close to some large colony of Guillemots and other rock-birds, I believe he has an eye to the stocking of his larder, and is more influenced by the prospects of good living, easily obtained, than by the extensive sea-view or other amenities of the situation. For one eyrie of the Peregrine found on the coasts of Sutherland, which are admirably adapted for the nesting habits of the species, there are at least three or four on the rocks of the more inland mountains and glens, and this I state, not only from information gleaned from different quarters, but from personal experience of at least one district of considerable dimensions. In some parts of England, and in other comparatively level districts, the Peregrine naturally seeks the coast line for suitable cliffs; but that it does so, as a rule, in Scotland, I feel much inclined to doubt.

This species varies considerably in size in both sexes. I obtained what I considered an exceedingly large female in 1869; but, on forwarding it to Mr Robert Gray, he assured me that it measured two inches less than another female in his possession. I also saw another female the same season, which was shot off her nest. She was a very small bird indeed, though the four eggs were uncommonly large and handsome. They are now in my cabinet, and measure in diametrical length 2.16 inches, and in breadth 1.6 inch. I have also seen an egg of the Peregrine, the length of which could not have exceeded the breadth of one of the above, and so was not above the size of an average Kestrel's egg. Others in my possession hold a medium place as regards size between these two extremes.

With regard to the fact repeatedly taken notice of by ornithologists, that if one of a pair of Peregrines or other birds of prey be shot or otherwise destroyed, the remaining bird easily and rapidly obtains another partner, I am inclined to believe that in no case does it do so without first having a severe battle with its

nearest neighbour of the same species. In the spring of 1869 I knew of an authentic instance, in which the tercel procured a second falcon within two days and a-half (it may have been a much shorter time) of that on which he was deprived of his first. About the same time the falcon of another pair, from an eyrie about five miles' distant, went amissing; and there is every reason to believe that it had not been shot or otherwise destroyed, but had supplied the place of the slain falcon in the above tercel's affections. In a country where there are few Peregrines a longer time would probably be taken to secure a second partner; but where there are, say, from eight to ten eyries not very far removed from one another, there is nothing so very remarkable in the rapid advent of a substitute, though of course, in order to obtain another partner, the Peregrine would have to conquer a rival in battle.

MERLIN.

HYPOTRIORCHIS AESALON (Gmelin).

This is a plentifully-distributed species in the county, especially in the west, though the late Mr John Wolley "was not sure that he ever saw this bird whilst he was in Sutherland," and adds, "it certainly was not common there," though he heard of its nesting, and afterwards obtained a laying of the unusual number of six eggs.* This was in the year 1852. I can hardly think that such a comparatively common bird, as the Merlin now is in Sutherland, could, if equally plentiful at that time, have escaped the notice of such an observer as Mr Wolley. I believe that it was, as he remarks, "certainly not common there" at that time, and that it has within the last twenty years or so spread northwards, as the Sparrow Hawk is now doing in the same county. It must now at least be considered as certainly one of the commonest birds of prey in Sutherland, and is well known to the inhabitants of the west. In the north, however, whence, I believe, Mr Wolley obtained his laying of six eggs, there exists in the minds of the inhabitants a certain amount of confusion between the Merlin and the Kestrel, as is proved by a correspondence I had with a person there, regarding six eggs which were sent to me as those of a Merlin, but which, as I had suspected, were a Kestrel's, and were taken from "the face of a green rock," a position never chosen by

* *Ootheca Wolleyana*, Part i., p. 105.

the Merlin for nesting purposes. I have obtained or taken many eggs of this species in Sutherland, and other parts of Scotland, and have never, in the north, got more than four eggs from the same nest, though, curiously enough, the only laying which Mr Wolley obtained consisted of six. Four eggs are the full number assigned to this bird by all the keepers and shepherds I have questioned on the subject; and I do not remember any one of these worthies ever having asserted that he had known of a single case in which more had been seen or obtained. That this species lays a larger number in some localities is certain, and that five eggs is a common number in the south of Scotland, I am fully aware. In the north I have several times received complete layings of three, which were much incubated. In one nest of four, from Sutherland, one egg contained no yolk, and the colour was most peculiar, being dark sepia, or almost black. Of this variety I have only heard of one or two other specimens.

KESTREL.

TINNUNCULUS ALAUDARIUS (Linnaeus).

As elsewhere in Great Britain this is an exceedingly abundant species. Almost every little rock contains a breeding place, and in the longer ranges of cliff several pairs may be found nesting.* They are, however, even more abundant in some districts than in others, and are especially partial to the rocky islands off the north shore of Stoir and Aardvaar, and at the entrance of Cairnbawn Loch; and this, notwithstanding the fact that they are much persecuted and shot down by the keepers, who receive for them, in common with all other species of "hawk," one shilling per head. I believe it only lies with the proprietor to forbid their destruction for the future to ensure peace to the species, as the keepers acknowledge that they do little harm to game. If the reward was transferred, and added, to that already given for the Hooded Crow, much service might be done both to the proprietor and to the lover of ornithology; for there is no species more

* An instance has come under the notice of Capt. H. W. Feilden, of the Kestrel breeding on the ground amongst heather, like the Merlin. I have now in my collection a laying of five eggs which he obtained in this situation in North Uist. The position was evidently chosen on account of the scarcity of either trees or rocks, its usual breeding places.

destructive to game than the Hooded Crow, and no bird more ornamental in the eyes of the naturalist than the poor, harmless, and persecuted Kestrel.

In answer to inquiries made concerning a supposed migration southward of this species in winter, Mr J. Crawford, the Duke of Sutherland's factor at Tongue, to whom I am greatly indebted for many useful notes on the birds found in his part of the county, writes, "Kestrels and Merlins remain with us all winter; but it has struck me that they are not so plentiful in winter, especially if the weather is severe, otherwise they are more reserved in their habits." This account agrees with others from many localities, and naturalists may therefore safely conclude that a partial migration does take place, but depends in its extent mainly, if not entirely, upon the food-supply.*

Five eggs are often laid by the Kestrel; indeed, in Sutherland I consider this to be the normal number, and I have several times received six from the same nest. The colouring does not vary so much as in some other localities where, doubtless, their food is more varied and more abundant. Amongst many which I have taken in, or received from the county, very few indeed have varied much from the type, though in one or two nests beautiful light-coloured specimens have been procured. Kestrel's eggs, generally, are easily distinguishable from those of Merlins, by their greater comparative thickness, though specimens do frequently occur which it would be almost impossible to identify.

SPARROW HAWK.

ACCIPITER NISUS (Linnaeus).

This species has not as yet appeared in the west of the county; but when the fir plantations around Loch Inver and elsewhere attain a greater height, I have no doubt the Sparrow Hawk will advance from the east. At present it is not uncommon at Rosehall, and in wooded districts in the east. In 1869, through the kindness of Mr J. Crawford, I obtained two eggs of this bird, taken near Tongue. He informed me that the birds had only bred on one previous occasion in the Tongue district—viz., in

* In the winter of 1869-70 I was much surprised at the unusual numbers of Kestrels which were present in Stirlingshire. There had been little or no snow in that county, while further north there had been an unusually heavy fall.

1867; and, so far as I am aware, these are the first recorded specimens of eggs taken so far north. Mr R. I. Shearer says that the bird is "occasional" in Caithness, but "only in autumn."* The Sparrow Hawk may therefore be considered at present as only a very local species in the north of Scotland, but likely to extend its northward and westward range, and become more generally spread over the county of Sutherland as wood becomes more abundant or attains a greater size.

Obs. Milvus icinus, Savigny.—The Common Kite does not now breed in Sutherland; and it is only upon Mr St. John's authority that I enter it here as once having been a resident. Even at the time of his residence at Rosehall, in Sutherland, or during his visit there, in 1849, it seems to have been far from common. He says,† "The Kite, being a large, greedy bird, and easily caught in traps, is very rare now, common as it was a few years ago. In the wooded districts it is still, though but seldom, seen soaring with graceful flight, high in air."

COMMON BUZZARD.

BUTEO VULGARIS (Leach).

A common species, though perhaps somewhat locally distributed, being comparatively scarce in the eastern and more level parts of the county.

This much despised bird, called "cowardly," "sneaking," as well as harder epithets relative to the sex, by which it is casually at times named by the natives, is, I think, far from meriting such general abuse. It cannot, it is true, lay claim to the designation "noble," as the Peregrine, or any true Falcon can; but in many points, we contest, it is equally entitled to that adjective, as is the so-called "King of Birds." Thus, the Buzzard's cry is described as "cat-like;" but why not with equal justice describe that of the Eagle as "wild-cat-like?" The Buzzard's habits are described as "carrion-feeding;" but in this he by no means excels his big brother the Eagle. The Buzzard's movements on wing are described as "clumsy" or "sluggish;" but why not apply the same terms to at least one phase of the Eagle's flight—not that I consider either "clumsy," or "sluggish," but would rather designate

* Proc. Royal Physical Soc. of Edin, Vol. ii., p. 337.

† "Tour in Sutherland," Vol. ii., p. 121.

them graceful; and, if slow, powerful? "Cowardly," or "sneaking," is applied to his mode of obtaining food, but to place such words before "Eagle" would be to insult majesty (?), though perhaps not always exempt from such failings either. It is true as regards the Buzzard, as with some of the "noble" birds of prey, that, where food is abundant and easily obtained, they will take the lazier, and perhaps surer way of securing it; but, on the other hand, where food is scarce, the birds are driven by hunger to search more diligently for it. In Sutherland, at all events, the Buzzard does not deserve such contemptuous epithets. Mr Yarrell says: "Mr Macgillivray gives the Buzzard a character for greater activity in Scotland, as observed by himself; but the nature of the country may be the cause of the difference in habits, and much greater exertion may perhaps be necessary to ensure a sufficient supply of food."*

There is great irregularity in the time of laying of this species, which is more observable in some seasons than in others. I have taken and obtained during the same season fresh, or nearly fresh eggs, as early as the 23d April, and others fresh, or nearly so, as late as the 17th May; these last being from a part of the country where I was certain no Buzzards' eggs had been taken before in the same season. One nest of three eggs, blown with small holes, was sent to me, which my correspondent took on the 28th May. In the same season I obtained eggs early in May, which were in a far-advanced stage of incubation. A similar irregularity as regards time of laying, independently of second broods, I observed in the Peregrine Falcon, one of the species that is usually most regular in its time for laying. The species I have found most regular in this respect are the Merlin and the Hen Harrier, and, with the above exception, the Peregrine Falcon.

Mr Hewitson, when speaking of the number of the eggs of the Common Buzzard, says—"Three or four in number." Sufficient stress has not been laid upon the undoubted fact, that in some districts, many species lay fewer eggs than in others, owing to the nature, or the scarcity, or abundance of their food. In Sutherland I have never upon any occasion taken, seen, or heard of, more than three eggs in the nest of a Buzzard, and two are nearly as common. On the other hand, four eggs are a common

* "British Birds, 1856," Vol. i., p. 77.

number on the Continent, where F. von Tschudi tells us it preys largely, in Switzerland, "on lizards, slow-worms, snakes, rats, mice, and moles, and even on large insects," etc. In the south and midland districts of Scotland, also, four eggs are not uncommonly obtained; and in 1869 I knew of two nests having been found, each containing four eggs; but in one of these instances two of the eggs were addled.

That the Buzzard is sometimes hard enough pressed for food, the following fact, related to me by an old and experienced gamekeeper, would seem partially to prove. On one occasion he shot a Common Buzzard, which had a newly-killed weasel in one of its feet. One of the Buzzard's sharp claws had entered the side of its victim's head, so that death had in all probability been instantaneous; had it been otherwise, the Buzzard might perhaps have discovered that he had caught a Tartar. Nor can I imagine that a weasel would prove a dainty morsel even to the "degraded" taste of *Buteo vulgaris*.

HEN HARRIER.

CIRCUS CYANEUS (Linnaeus).

Common in some parts of Sutherland, perhaps most so in the north-east. This species, like other raptorial birds, frequently returns to the same hillside, year after year, during the nesting season, generally breeding amongst tall old heather, but occasionally resorting to very bare open spots on the moors. Old white males are not unfrequently seen, though naturally not so common as the younger examples. The female is easily obtained during the breeding season, either as she rises off the nest, or when, having risen, she repeatedly returns and passes overhead, uttering her tremulous kestrel-like cry. The male, however, is a very shy bird, generally keeping at a distance from the nest, perched upon some grey stone or tussock of heather. He is seldom indeed observed near the nest at all, although upon occasions I have witnessed both male and female wheeling about in close proximity to it. The cry of the male upon such occasions seemed more prolonged than that of the female.

When the Hen Harrier hunts for prey, it skims over the surface of the moors, backwards and forwards, taking in every square-yard of ground, and when it discovers a Grouse on its nest, or a

mouse in the grass, it pounces suddenly down, without seeming to make any preparatory halt in its flight. It wheels rapidly to the right or left, and with the same beat of the wings dashes down upon the victim. It seldom ascends the hillsides above the line of heather, nevertheless I have found amongst the remains of a Hen Harrier's repast, on the top of a mound of stones and moss on the moor, the feathered legs and feet of a newly killed Ptarmigan. Occasionally the nest of a Hen Harrier is placed on a very bare hillside, almost destitute of heather. When so placed, as in the case of one I found in 1869, there is scarcely any foundation laid at all, and it merely consists of a few loosely-arranged heather stems, with a shallow depression in the centre, lined with wiry, dry grass, cut into small pieces about an inch or less in length. When placed in deep heather, however, it presents a totally different appearance. It is sometimes more than a foot in outside depth, and is composed of stout rank stems and roots of heather. Its height is generally such as to bring the bird's head, when sitting, slightly above the level of the surrounding heather.

Five eggs seems to be the number generally laid, but six is not an unusual number; and Mr Robert Gray records, in his "Birds of Loch Lomond,"* an instance in which no less than nine eggs were obtained in a "clutch."

It is generally supposed that spotted specimens of the Hen Harrier's eggs are comparatively rare, and form an exception to the rule. Such has certainly not been my experience in Sutherland, nor in Scotland generally, as out of numerous layings I have received, taken, or seen, only one laying of five—now in our† cabinet—can be said to be perfectly free from markings, and these eggs are so decidedly undersized as to present a most suspicious resemblance to those of the Montagu's Harrier; while their shape is more elliptical than any other Harrier's eggs in our collection.

That the Hen Harrier occasionally pursues its prey on the wing is proved by the following anecdote related to me by a shepherd, with whom I had just been visiting a nest of the species. As we

* Maclure & Macdonald's Illustrated Guide to the Western Highlands, sec. vii., 1864.

† Where the plural pronoun is used in the possessive sense, it refers to Capt. Feilden's and my own collections, which are united.

were returning with the eggs, he told me that about a fortnight previously, he was standing just inside the open door of his house, when a Grouse dashed in, and flew under his left arm. The next instant a large bird, evidently in close pursuit, swept past, and on going out, my informant recognised it to be a Hen Harrier, most likely one of the very birds from whose nest we had just taken the eggs. Mr Sterland, the author of a delightful little book, "The Birds of Sherwood Forest," writes concerning this species (p. 17): "If practicable, they pounce upon it (their prey) at once; or if it take the alarm, they chase it until it is seized."

A belief is prevalent in Sutherland that when the female Harrier is disturbed when sitting, she will afterwards remove her eggs to another place, and that in the same way she will remove the young birds. I tried to collect some authentic information on this point, but, though the statement was often repeated, no one seemed to be able to verify it from personal observation.

Obs. Montagu's Harrier, *C. cineraceus* (Mont.).—The occurrence of this as a breeding species in the county rests on very meagre and insufficient data. Sir William Milner relates that he "met with Montagu's Harrier and its nest;" and further, that "not a season passes but one nest at least is found near Bonar Bridge." I have utterly failed in obtaining any corroborative evidence, or in procuring either birds or eggs, so am unwillingly obliged to give the species a place only under "Observations." It seems so unlikely also that even one pair of these birds should breed so far north.

Obs. Scops-eared Owl, *Scops-giu* Scopoli.—It is of course almost unnecessary to point out that St. John was in error when he included this bird as a breeding species, but the persistence with which he has been quoted, and the mistake perpetuated, scarcely allows me to pass it over without remark.*

THE TAWNY OWL.

STRIX ALUCO, *Linnaeus*.

The only authority for this species breeding in the county is that of Mr A. G. More ("Ibis," 1865, p. 15). He says, "Scarce

* Since the above was written, Mr J. E. Harting has taken notice of the error, in his "Hand-Book of British Birds," page 94.

in the north of Scotland according to Macgillivray, but is reported by various correspondents as nesting regularly in the counties of Aberdeen, Sutherland, and even in Caithness." Since the above was first penned, I find that Mr J. Crawford also includes it as "breeding occasionally at Tongue," (*in epist.*) This is doubtless a species which will increase its northward range of distribution, as land becomes better wooded and more cultivated.

LONG-EARED OWL.

ASIO ACCIPITRINUS (Pall.).

Though Mr Selby met with no owls (Hewitson) in 1834 in the county, this species is known to breed now in the eastern districts, at Rosehall, and also in a large pine wood fringing the shores of Loch Migdale, near Bonar. I have never received the eggs nor seen the birds, but the fact of their breeding regularly, if not commonly, is well known to the inhabitants. In the north Mr J. Crawford reports it as "breeding in the woods at Tongue." In the west it is quite unknown at present.

SHORT-EARED OWL.

ASIO OTUS (Linnaeus).

Few nests, that I can hear of, have actually been obtained in the county. That recorded in "*Ootheca Wolleyana*" may have been taken either on the Ross-shire or Sutherlandshire side of the river Oykel, as Louberoy stands within a stonecast of the river on the Ross-shire side, although "*Ross-shire*" being printed with a (?) shows that there is some doubt as to the precise locality. Mr A. G. More includes it as breeding "regularly" in a number of counties, including Ross, Sutherland, and Caithness. I myself obtained one egg not far from the march of the county. Specimens are frequently shot in autumn on the hillsides, and those, I have little doubt, would prove on examination for the most part to be birds of the year, bred probably on or near the ground where they were killed, and not migratory birds from more northern localities. Though breeding in Orkney, that county could scarcely be considered to supply the whole of those which are shot in the autumn in Sutherland.

BARN OWL.

ALUCO FLAMMEUS (Linnaeus).

Mr A. G. More says, "nests only occasionally in Ross and Caithness," and the same remark perhaps may apply to Sutherland also. In the breeding season I have never observed this species in the birch woods of the west, but we know from reliable sources that it has occasionally bred on the south shore of Loch Assynt. In August I have seen the species in the birch woods near Loch Inver, and around the shores of Loch Letteressee,—a continuation or branch of Loch Assynt. That it breeds about Rosehall and in the east seems certain, but so rarely, or in such small numbers, that it would be difficult to say whether or not it does so regularly. It is known only to some of the natives, not to all. Mr J. Crawford marks it as breeding "occasionally" at Tongue.

*Order ii., PASSERES.**FISSIROSTRES (Nocturnae).**Fam. i., CAPRIMULGIDAE.*

EUROPEAN GOATSUCKER.

CAPRIMULGUS EUROPAEUS, Linnaeus.

I have been informed by a gamekeeper, who knows this bird well under the name of "Night-Hawk," that twenty years ago they were not uncommon at Dunrobin. Since that time they have increased in numbers, and have spread westward of late years, as far as the thickly-wooded slopes of Rosehall. Here, however, they seem to meet an effectual check to their further progress in the bleak, bare, undulating moors, which stretch between Rosehall and the mountainous district of Assynt. Hitherto this species has been totally unknown in the west, as far as I can discover. Northward from Dunrobin it may be found in wooded parts along the east coast, and it has also been observed at Tongue, but only very rarely.

*FISSIROSTRES (Diurnae).**Fam. ii., HIRUNDINIDAE.*

COMMON SWIFT.

CYPSELUS APUS, Linnaeus.

I never observed these birds in the west, nor do I believe that

they are often found there. Mr Selby says they breed at the great Smoo cave near Durness, and "in other caverns of the limestone rocks" on the north coast. Mr J. Crawford informs me that only on two occasions has he seen the Swift at Tongue, and that they did not remain to breed, but only stayed for two or three days. It is not easy to account for their numbers at Durness, which I am informed are considerable, when we ask the questions, "How did they come there?" and "Why should they not occupy the caves on the west coast, as well as those on the north?"

Perhaps the following hypothesis may account for this somewhat curious local distribution. First, I would be inclined to suppose that the line of migration lies between Bonar Bridge in the south-east, and Durness in the north-west, and midway between the north and west coasts; or, in other words, the said line of migration, after reaching Bonar, runs in a north-westerly direction; and this would seem to receive probability from the fact that occasional specimens are observed along the shores of Loch Shin, and again about Loch More. That more are not seen at these intermediate stations may possibly be owing to the migration taking place either at a great height, or during the late evening. Second, the reason that Swifts do not visit the west coast may be owing to either of two causes, or partly to both, viz.:—that, as their migration follows the course of the great dividing valley formed by the rising grounds on either side of the chain of lochs—including Loch Shin, Loch Gream, and Loch More—it would lead them out of this course to surmount the high ranges of mountains which lie between these lochs and the Atlantic; again, another reason may be found in the fact that the caves of the west coast being principally in granite rocks, fewer crevices suitable for nesting purposes are to be found than in the limestone rocks of the north coast. In the range of cliffs above Inchnadamph they might find perfectly suitable nesting places, but this being only an isolated cropping-out of the limestone, it may not offer sufficient inducement to them to diverge from their above mentioned north-westerly course.

CHIMNEY SWALLOW.

HIRUNDO RUSTICA, Linnaeus.

I have not observed this species to be abundant, except at Bonar, in the east. In the west and north they arrive much later than almost anywhere else in Scotland. At Tongue, where they breed almost every year, they arrive, Mr J. Crawford informs me, about 28th April; but, in the west, we would consider this a very early date for their appearance; indeed, in cold backward springs, few are visible there at all, and half-a-dozen Swallows in that district may almost be considered to constitute a summer. Such at least have been the results of my personal observations during five years. At Scowrie they seem to be more regular in their visits, but scarcely more abundant.

Since the above was first written, Mr J. Crawford has informed me that he did not observe the Swallows nesting in their old haunts near Tongue during the years 1867 and 1868, but that they reappeared in 1869.

HOUSE MARTIN.

HIRUNDO URBICA, Linnaeus.

A considerable number breed on the limestone rocks in Assynt, as Mr Selby informs us, and on one part of these rocks I have frequently seen the remains of old nests; but, during three years, I have not seen above a dozen House Martins altogether, and so late are these birds of appearing, that I have never succeeded in obtaining a single egg, though generally present there between the 1st May and the 10th June. Our landlord at Inchnadamph always said, "They have not come yet," and at the same time assured me that their numbers have of late years much decreased. I have also observed this decrease in several other localities in Scotland. The House Martin is much earlier in its arrival, and much more abundant, at Bonar, and in the east of the county generally. At Tongue, Mr Crawford gives the date of its arrival "at the end of April;" and as a rule, I have found that many birds breed at Tongue, though further north, considerably earlier than in the west, this being noticeable amongst both migrants and residents. This species was also found breeding in the caves close to Durness, in some numbers, by Mr St. John ("Tour in Sutherland," Vol. i., p. 85).

SAND MARTIN.

HIRUNDO RIPARIA, *Linnaeus*.

This bird arrives in small numbers at Tongue about the end of April. Like the last named species, they are much later of arrival in the west, where I know of no large colonies, but only of a few scattered pairs, breeding up and down the banks of a single burn, in the extreme south-west of the county.

*TENUIROSTRES.**Fam. ii., CERTHIADAE.*

COMMON CREEPER.

CERTHIA FAMILIARIS, *Linnaeus*.

Plentiful as a species at Rosehall, and in the east, though none are found in the birch-woods of the west. It is found at Tongue.

COMMON WREN.

TROGLODYTES PARVULUS, *Koch*.

Common, and very generally distributed, even in the wilder portions of the country, but commoner, without doubt, at Dunrobin, Rosehall, and in other wooded or cultivated districts.

*DENTIROSTRES.**Fam. i., LUSCINIIDAE.*

SEDGE WARBLER.

ACROCEPHALUS SCHOENOBAENUS (*Linnaeus*).

This species was traced to the very north of Sutherland by Mr Selby. It is a common species in some suitable localities, but comparatively rare in others. Mr R. I. Shearer includes the Reed Warbler in his "List of Birds of Caithness," evidently a *lapsus pennae*, as the Sedge Warbler is omitted.

COMMON WHITETHROAT.

*SYLVIA RUPA** (*Bodd*).

I have never met with the Whitethroat, though doubtless present in limited numbers in suitable localities. Mr Selby considered it of rare occurrence in 1834, when it was observed

* Newton's "Yarrell's British Birds," Vol. i., 1871-4.

only on two occasions, once at Tongue and once at Bonar. "Mr Dunbar describes it as nesting, only occasionally, in Ross, Sutherland, and Caithness" (A. G. More in "Ibis," 1865, p. 25). It is one of those species which, however, will probably extend its northern distribution.

WILLOW WARBLER.

PHYLLOSCOPUS TROCHILUS (Linnæus).

Mr J. Crawford, in describing the habits of this species, writes to me as follows:—"We have the Willow Wren here too, for a short time in summer. They utter a few sweet notes during the very early morning by the brooks and mountain streams. One seldom hears their voice during the day, unless in some very solitary glade, or where water-falls exist, the murmuring of which seems to excite their muse. Water-rills through meadows are their favourite resort when fringed with scrub."

To the above vividly truthful account of this delicate little species, I have nothing to add, save that it is very abundant in every wood: often to be seen too where only a single stunted willow or alder, or birch bush grows on a bare hillside, or by the margin of a mountain torrent. A bit of green, however small, seems necessary to its existence. I once found a nest of this species on an island where there was also a large colony of the Lesser Black-backed Gull (*Larus fuscus*). This nest was almost entirely composed of the feathers of the latter species.

GOLDEN-CRESTED REGULUS.

REGULUS CRISTATUS (Koch).

This is a well-known species in all parts of the county where fir-wood abounds. An immense flight of these tiny little gold-crowned wanderers was driven on the Caithness coasts by a south-east gale in October, 1868, and one of the number (as Mr Osborne, Jun., informs us in one of his many interesting communications to the "Field") took shelter during the wild weather in a hole in the inside wall of a house near Wick, choosing for itself a warm place near the fire, apparently not being annoyed either by the presence of the inhabitants, or by the "peat-reek."

WHEATEAR.

SAXICOLA OENANTHE (Linnaeus).

Sir W. Milner considered this the commonest bird in Sutherland, and though, on the whole, agreeing with the remark, I would more especially agree with Mr Selby when he says, "generally distributed over the county, but, I think, most abundant in the limestone districts." Certainly the numbers to be seen in the immediate vicinity of Inchnadamph, in Assynt, where the rocks are for the most part limestone, are very great indeed; and here it is worthy of remark, that the Wheatear seldom goes higher up the hills than to where the limestone ends, and the granite rocks begin. On one occasion, and on one only, I observed a pair, evidently having a nest on the very summit of Ben Chaorin (spelt in maps, erroneously I believe, *Ben Harran*), and Mr Robert Gray informs me that they have occasionally been found before in similar situations. Ben Chaorin (Hill of the Cloudberry) is about 2700 feet in height.

Six eggs are usually laid, but often in Sutherland only five; I have taken their nests also with seven eggs, and I once received a laying of eight.

WHINCHAT.

SAXICOLA RUBETRA (Linnaeus).

So far as my own observation goes, not nearly so plentiful as the next species, though I have seen it in one locality in considerable numbers.

STONECHAT.

SAXICOLA RUBICOLA (Linnaeus).

More abundant than the last, but locally distributed. I observed them in the west, principally on the northern whin-clad slope of the sea-lochs at Kylesku—Lochs Dhu and Coul.

REDSTART.

RUTICILLA PHOENICURA (Linnaeus).

Not plentiful. I have observed it on two occasions only, once at Loch Awe in the west, and once at Rosehall. It was twice

observed also by Mr Selby's party, "first at Oykel Bridge, and again at Ron-Stall."* Mr A. G. More, in his paper on the "Distribution of Birds in Great Britain during the nesting season," says, "the nest has been found as far north as Sutherland and Caithness," ("Ibis," 1865, p. 21).

The arrival of this species on more than one occasion on the east coast of Caithness, very late in autumn, is worthy of remark. It is there a rare species, though recorded as breeding. Mr Osborne twice instances the arrival of the Redstart on the Caithness coast, on or about the dates of 8th, 9th, or 10th October (*vide* "Field," Jan. 9th, 1864). In the last instance, "a good many Redstarts, a rare bird in this district," appeared during a furious south-east gale, which commenced on the 8th or 9th October, 1863, "but after a few days proceeded on their journey southward." In all probability these birds had not come direct from a more northern country, but had been blown out of their course, after attaining a considerable southing during their autumn migration across the German Ocean. Mr Osborne gives instances of other migratory species appearing at the same time.

REDBREAST.

ERYTHACUS RUBECULA (Linnaeus).

Found distributed all over the country, but nowhere plentiful, except at Dunrobin, Rosehall, or in wooded parts of the east.

HEDGE ACCENTOR.

ACCENTOR MODULARIS (Linnaeus).

This species has much the same distribution as the last. I once observed a Hedge Sparrow very high up among the heather, and a similar instance is recorded by Mr Selby.

GREAT TIT.

PARUS MAJOR, Linnaeus.

The family of Titmice is not well represented by number of individuals in the west, though common enough in more wooded districts. I have observed this species in the west at Loch Inver.

* (Rosehall ?)

BLUE TIT.

PARUS CAERULEUS, Linnæus.

Common but local, as the last. This is another species which will probably increase in numbers.

COLE TIT.

PARUS ATER, Linnæus.

Commoner than either of the two last named species. "Found at Tongue" (Mr J. Crawford).

This species would appear to be rare in Caithness, as Mr Osborne records that the first specimen and the second were obtained a mile from Wick, subsequent to 1840. Thus it would seem that there were no specimens in Dr Sinclair's collection.

LONG-TAILED TIT.

ACREDULA ROSEA (Blyth).

Seems to be a known species in the east, as a trustworthy informant, now living in Assynt, assured me he himself remembers seeing them on various occasions round Dunrobin, sometimes in pairs, but more frequently in small flocks, probably family parties. Sir W. Jardine "considers that it does not reach nearly so far north as the Cole Titmouse," though Mr Dunbar describes it as "nesting regularly in Ross, Sutherland, and Caithness."—(A. G. More, in "Ibis," 1865, p. 121).

PIED WAGTAIL.

MOTACILLA LUGUBRIS, Temm.

Abundant.

GREY WAGTAIL.

MOTACILLA SULPHUREA, Bechstein.

Common. I knew of two pairs breeding close together on the side of a mountain burn. Pennant states that at the time of his visit in 1769, the Grey Wagtail quitted the east of the county in winter. At the present time, however, it is resident there all the year, and, in proof of this, a correspondent sent me a specimen in the flesh, shot near Bonar, in December, 1869.

Obs. Ray's Wagtail, *Motacilla rayi*, Bonaparte.—Mr A. G. More

includes this species in sub-province 35, but with a mark of interrogation. He says "this bird has been seen as far north as Sutherland by Mr St. John and Sir W. Jardine, etc."

MEADOW PIPIT.

ANTHUS PRATENSIS (Linnaeus).

Exceedingly abundant. Mr Selby says that "it is met with on the summits of the highest hills." Perhaps this remark was meant by Mr Selby only to apply to green-topped mountains, as for instance, Ben Clibrich, the highest mountain in Sutherland. That it is but very rarely, if at all, seen amongst the stony barrens and cairns "confusedly hurled" of the Ben More range or other stony-topped mountains, is nearly certain. I have never observed it, so far as I can recollect, above the heather line, which in West Sutherland and the North West of Scotland generally is a long way below the summits of the mountains.

Obs. I once saw a specimen of *Anthus trivialis* (Linnaeus), the Tree Pipit, sitting on an ash-tree close to the Inn at Inchnadamph, but, as it was the only specimen seen, I do not include it in this list, though it is probably found breeding at Rosehall and in the east.

ROCK PIPIT.

ANTHUS OBSCURUS (Latham).

Common all along the coast, breeding in numbers on Handa, and even on the furthest-out islands of the Badcall group. The nest is exceedingly difficult to find, being often far underneath a loose turf or large stone. On one occasion, on Handa, I accidentally kicked over a piece of loose turf, and found underneath a nest and young of *Anthus obscurus*. Mr E. R. Alston, in 1869, found another nest on the Badcall Islands, containing four eggs. Though present, I did not take note of the site or materials of the nest, but he afterwards informed me, "The nest I found on Mhael Beg was neatly but loosely built of fine dry grass, and was placed in a hole about six inches deep, in the face of a low 'hag' or perpendicular bank of peat." On rockier parts of the coast the nest is frequently placed on the face of a cliff, advantage being taken of the support offered by a tuft of wiry grass or sea-pink.

Ord. PASSERES.
DENTIROSTRES.

Fam. ii., TURDIDAE.

DIPPER.

CINCLUS AQUATICUS, Bechstein.

This ornithologist's favourite was at one time sadly persecuted in Sutherland, the sum of sixpence having been, until very lately, paid for each head brought in by the keepers; consequently few were observed in 1834 by Mr Selby, or by members of that expedition. It is now plentiful, having been removed from the list of "vermin;" and on every rocky burn two or three pairs, and sometimes more, may be found breeding. I do not think that the most bigoted of its accusers can affirm that salmon or trout have suffered in consequence of its increase. In this county it is called the "King's Fisher:" the true *Alcedo ispida* being unknown. So much has already been written in praise of this really interesting little bird, that I need not say more than to hope that it may still increase and multiply, no less in the wilds of Sutherland, which are essentially its habitat, than in more southerly and better cultivated districts.

MISSEL THRUSH.

TURDUS VISCIVORUS, Linnaeus.

This still remains a comparatively rare species so far north, though spreading steadily through both Sutherland and Caithness, with the advance of wood and cultivation. In 1834 Mr Selby writes that it was observed about the banks of Loch Naver; but in 1869, a correspondent in that neighbourhood failed to obtain the eggs for me. Mr J. Crawford, however, is confident that the Missel Thrush breeds about Tongue, as the birds are constantly observed in summer. I obtained one egg in 1869 from a much more northern locality—in Caithness. Even in 1865 Mr A. G. More records it as breeding and "increasing" as far north as Caithness. Since the above was first penned, I have seen eggs which were taken close to Cape Wrath.

SONG THRUSH.

TURDUS MUSICUS, Linnaeus.

Common about Scowrie, and especially at Badcall and Loch

Inver. I have also received its eggs from near Tongue, where, Mr Crawford writes, it is a common species. Mr Selby says, that at Tongue he was informed, "they do not migrate, but remain during winter upon the margins of the Firth (Kyle of Tongue?), and other low situations, etc." It is somewhat curious, as I have repeatedly been assured, that this species resorts in winter to the stony tops or high parts of the mountains, where, in company with, or at the same time with flocks of Rooks, they feed upon the numerous berries to be found even in mid-winter. It has, however, been suggested to me as possible that both Mr Selby's and my own informants may have mistaken Redwings for Song Thrushes.

BLACKBIRD.

TURDUS MERULA, *Linnaeus*.

Like the last, and inhabiting the same localities, but not sufficiently known in the more hilly parts for the natives to distinguish it from the next species, to which they erroneously apply the English name of "Blackbird."

RING OUZEL.

TURDUS TORQUATUS, *Linnaeus*.

This is an abundant species. The nest is generally considered difficult to find. Coming out one day in 1869, expressly to search the burn-sides and low rocks for their nests, in a short time I was fortunate in discovering no less than three, each containing three eggs. Out of six or seven nests obtained in Sutherland that season, only two contained four eggs. I am inclined, therefore, to consider three eggs to be the usual number laid, at least in this district, though further south four is quite as common.

Ord. PASSERES.
DENTIROSTRES.

Fam. iii., MUSCICAPIDAE.

SPOTTED FLYCATCHER.

MUSCICAPA GRISOLA, *Linnaeus*.

The Spotted Flycatcher, like many other insect-feeding species, is confined to the more wooded portions of the county, nor does

it seem to find a home, as far as I have been able to observe, where birch-wood only abounds. Numbers may be seen in the season at Rosehall, and between that place and Bonar.

PASSERES.

CONIROSTRES.

Fam i., CORVIDAE.

MAGPIE.

PICA RUSTICA, Linnæus.

Common in the east, but utterly unknown, save by name, in the west. When it does migrate westward, it will doubtless receive a "warm reception," as its name and character have preceded it.

THE RAVEN.

CORVUS CORAX, Linnæus.

Still common, though killed down at every opportunity. I received several layings of eggs in 1869, both while staying in the county, and, after returning home. Ravens frequently dispute with the Buzzards for the ownership of some favourite nesting place. A "Buzzard-rock" may almost be considered synonymous with a "Raven-rock," as one or other of these species is sure to occupy it. The Raven has the advantage of being a much earlier breeder, and thus is able to verify the truth of the saying, "First come, first served." The Peregrine Falcon, however, often steps in and takes possession of the last year's nest, to the utter disgust, no doubt, of both Ravens and Buzzards. "Might is right."

HOODED CROW.

CORVUS CORNIX, Linnæus.

Only too plentiful, and really a destructive bird, not only to eggs and young of other birds, but also to the interests of the sheep-farmers. On one occasion I actually shot a Hooded Crow, as he rose from the body of a *half-born* lamb. To give a list of the Grey Crow's misdeeds would only be to occupy space unnecessarily, but I may mention two instances of his oophilous (to coin a word) propensities. Two Hooded Crows once robbed both the parent birds and myself of a fine pair of Black-throated Diver's eggs, and

another "did me out" of some Red-breasted Merganser's eggs.* I only saved one of the nest, and it had a perforation in the side, almost as neatly formed as if done with an egg-drill. Such insults offered by the tribe can only be wiped out in blood.

Obs. A gamekeeper told me that he once shot a Carrion Crow (*C. corone*), in the west of the county, which for some two or three years had frequented a certain rock in that district. It is possible that he may have made some mistake, as, had it remained so long, it would in all probability have paired with the Grey Crow, and reared others of its own colour.†

THE ROOK.

CORVUS FRUGILEGUS, Linnæus.

The only rookery in the west, that I am aware of, is that on an island of Loch Cama, near Knockan and Elphin. This colony has been established very lately, and I can quite well remember when only some eight or ten pairs of Rooks built their nests on the low birch trees which cover the island. In 1869 there were about forty pairs breeding at this place. The nests are in most cases not more than eight or ten feet from the ground, and some are still lower. Not many years ago there was a Heronry here, but it succumbed to the advance of the black invaders. There are, as yet, no Rooks found breeding north of Loch Cama, or in other words, between that and Cape Wrath, but eastwards it is a common species. In winter, large assemblages of Rooks gather on the hills, when clear of snow, to feed on the mountain berries, as also, (Mr Selby informs us) on the larvae of certain insects. The next station on the west coast that the Rooks will advance to, will probably be either in the neighbourhood of Loch Inver, or at Loch Beannoch, Stoir, at which latter place there is a

* As will be seen under "Red-breasted Merganser," the nests of this species are often quite exposed, and not invariably concealed amongst stones, or under roots of trees, as has been stated.

† If we accept Mr Wallace's definition of the term "species," and it certainly seems the most perfect, where can a more complete instance of "dimorphism" be found in ornithology than in the interbreeding of the Black and Grey Crows, which, as now well known, is of common occurrence in the midland districts of Scotland, the progeny being, half of the young like one parent, and half like the other? "Intercrossing," says Mr Wallace, "without producing an intermediate race is a test of dimorphism."

Heronry at present. They may settle also on the south shore of Loch Assynt, which is well-wooded; but, as the Rook seems to prefer the proximity of houses, or to find ready-made nests, it is on the whole more likely that they will choose either one or the other of the two first-mentioned localities.

JACKDAW.

CORVUS MONEDULA, *Linnaeus*.

The "pert Jackdaw" has not yet found suitable breeding places in the west, and is for the most part only known to the natives by name. It is, however, common in the east, and, from what I can gather, is an "old residenter" in the parishes of Bonar and Golspie. It is also present in the north, at Tongue.

Obs. Chough, *Pyrhocorax graculus* (Linnaeus).—Mr Dunbar says that "The Chough inhabits only a few localities in Sutherland" (A. G. More in "Ibis," 1865, p. 132). Mr St. John, in his "Tour in Sutherland" (Vol. i., p. 86), writes as follows of one locality: "Whilst looking for Rock Pigeons, I saw a few of the Red-legged Crow or Cornish Chough, passing from rock to rock, and busily employed about the broken stones, searching for food." Mr Dunbar probably refers to the same occasion, as he accompanied Mr St. John during that excursion. As I have utterly failed in obtaining any further evidence of the presence of the species, even in this very locality, I am at present inclined to think that the specimens seen by Mr St. John were accidental visitors, and not birds breeding in the neighbourhood, and so I meanwhile exclude it from this list.*

Order ii., PASSERES.
CONIROSTRES.

Fam. ii., STURNIDAE.

COMMON STARLING.

STURNUS VULGARIS (*Linnaeus*).

This is a very abundant species at Scowrie, Handa, and on the Badcall islands, as elsewhere in the county. On the islands they

* But as the Chough is a species which has decreased in numbers throughout Scotland, it is quite possible that it did breed at the locality named by Mr St. John, at that time. Mr Gray ("Birds of Scotland," p. 162) seems to consider that Skye is now its northern limit.

build in holes in the turf,* and also in niches of the rocks. A colony of Starlings, and another of Black Guillemots, in one locality live in perfect harmony, the former feeding their young, whilst the latter are sitting on their eggs. On the Badcall islands, on one occasion, Mr W. Jesse and myself started an immense number of these birds from under a projecting rock. On examining the spot, we found the loose stones sprinkled with blood, but to this day I have been quite at a loss to understand what could be the meaning of these fresh blood stains upon the stones. Doubtless we would have concluded that the large assemblage of Starlings had simply sought shelter there from the scorching sun, but finding the blood scattered about, we were led to believe that these birds were in some way or other connected with it.

Order ii., PASSERES.
CONIROSTRES.

Fam. iii., FRINGILLIDAE.

CHAFFINCH.

FRINGILLA COELEBS, Linnaeus.

The Chaffinch is abundant in wooded districts, and not rare in suitable localities in the west. A pair of Chaffinches bred two years consecutively in a stunted elder-tree, growing at the door of the byre at Inchnadamph Inn. The nest was composed of the usual materials, though not so neatly arranged as those which may be seen in orchards further south.

GOLDFINCH.

FRINGILLA CARDUELIS, Linnaeus.

The Goldfinch is rare. "A pair were seen in a birch-wood on the banks of Loch Laoghal by Mr James Wilson"—one of Mr Selby's party—in 1834, and Mr St. John likewise observed it in the county. Mr J. Crawford has not seen it near Tongue.

* I am under the impression that these nesting holes, occupied by the Starlings in spring, are in July tenanted by Petrels (*Thalassidroma*). In one of the islands, at least, where these holes in the turf are quite abundant, there are certainly no rats.

SISKIN.

FRINGILLA SPINUS, Linnæus.

This interesting bird breeds in the east of the county, where, though not plentiful, it is not an uncommon species.

GREENFINCH.

COCCOTHRAUSTES CHLORIS (Linnæus).

The Greenfinch is common in the east of the county, and in wooded districts, but is absent or rare in the west.

COMMON LINNET.

LINOTA CANNABINA (Linnæus).

Mr Selby says, "Seemingly a rare species in Sutherland: a single pair was seen at Keoldale." I have met with them on several occasions in the west, and have shot about half-a-dozen specimens. It is not by any means a common species.

TWITE.

LINOTA FLAVIROSTRIS (Linnæus).

This is a common species in many parts of the county. It avoids, as a rule, the wooded or cultivated parts, though exceptions may be found. For instance, it breeds in small numbers close to Inchnadamph Inn, on Loch Assynt, within a stone-cast of the house. Nor is it partial to the level inland moors, but prefers the neighbourhood of the sea-shore, or sheltered localities near the long arms of the sea so numerous on the west coast. This species is said by the natives to remove its eggs if the nest be disturbed. One nest containing eggs, which I examined, was certainly empty the following morning, but I cannot feel positive that the eggs were removed by the parent birds. In the Long Island, Capt. Feilden and myself examined several nests of this bird, but in no case did removal of the eggs by the birds take place.*

* These nests were placed in red-currant bushes, three or four feet from the ground, a somewhat unusual position (see "Gray's Birds of the West of Scotland," p. 151).

LESSER REDPOLE.

LINOTA RUFESCENS (Vieillot).

I can find no record of this species occurring in the breeding season, except in Mr More's paper, where it is included in sub-province 35. I have not myself met with it.

HOUSE SPARROW.

PASSER DOMESTICUS (Linnaeus).

Common in cultivated districts, though absent at Inchnadamph.

TREE SPARROW.

PASSER MONTANUS (Linnaeus).

This is an interesting addition to the list of birds found breeding in the county, since the first draft of this paper was written. It is first recorded by Mr Thomas Mackenzie of Dornoch Castle, near which place he himself observed the birds in 1872, and took the eggs in some numbers, though he had not previously seen the species in the county. I add the principal part of the observations made by him, and which he kindly communicated to me:—

March 28th, 1872.—“A flock of a dozen observed in the neighbourhood of Dornoch.”

May 11th, 1872.—“Six eggs just at hatching.”

May 24th, 1872.—“Two young birds in nest, also one egg just at hatching and two addled eggs. Captured bird on nest—a male.”

June 8th, 1872.—“Got two nests with five and six eggs, fresh.”

June 27th, 1872.—“From the two nests referred to on the 8th, other ten eggs were obtained to-day.”

July 25th, 1872.—“Obtained four fresh eggs from the same nesting place.”

August 9th, 1872.—“Another nest with four fresh eggs.”

I have to thank Mr Mackenzie further for kindly forwarding for our collection one of the layings taken on the 27th June, and the skin of the male bird, captured on the nest of the 24th May.

COMMON BUNTING.

EMBERIZA MILIARIA, Linnaeus.

In the west I observed this species at Knockan, and at Elphin; also at Scowrie, but never at Inchnadamph. It is abundant about

Rosehall, and the level lands bordering the Oykel river. It is not uncommon in cultivated districts generally, and was traced to the northern coast by Mr Selby in 1834.

BLACK HEADED BUNTING.

EMBERIZA SCHOENICLUS, *Linnaeus*.

Common on the banks of lochs and streams.

YELLOW BUNTING.

EMBERIZA CITRINELLA, *Linnaeus*.

Common in suitable localities.

SKY LARK.

ALAUDA ARVENSIS, *Linnaeus*.

Found plentifully in cultivated districts, but not frequenting the wilder moors, as is its habit in the Outer Hebrides. It is specially abundant around Scowrie. Mr Selby heard of its occurrence "within a few hundred yards of Cape Wrath."

BULLFINCH.

PYRRHULA VULGARIS, *Temminck*.

Not seen in the west: plentiful in the east. "Observed at Tongue" (Mr J. Crawford). Mr Dunbar says it breeds regularly in Sutherland and Caithness ("Ibis," 1865, p. 130).

COMMON CROSSBILL.

LOXIA CURVIROSTRA (*Linnaeus*).

Mr St. John, in 1849, says: "The Crossbill has of late years become numerous in the fir-woods, and will probably become more so when the magnificent plantations of the Duke of Sutherland grow to a height suited to these amusing birds" ("Tour in Sutherland," Vol. i., 128). Whether they have increased since St. John's time or not I cannot positively affirm, but they are certainly abundant at Dunrobin, and they breed sparingly in another locality. Mr A. G. More includes them in sub-province 35, and says, "it breeds probably in Sutherland." I have not

met with its eggs taken in the county, but my information scarcely leaves a doubt of the fact.*

Order iii., SCANSORES.

Fam. ii., CUCULIDAE.

CUCKOO.

CUCULUS CANORUS, *Linnaeus*.

This is a very abundant species. Its eggs, however, do not seem to be recognised by the natives, though they are aware of the fact that it lays in the nest of the Titlark (*Anthus pratensis*). Often several Cuckoos may be seen chasing one another along the burn-sides, or crossing the open, and coming quite close to the houses. A Titlark used regularly to feed a young full-fledged Cuckoo on a wall close to Inchnadamph Inn in 1869, whilst I was there. Regularly as June came in, I have noticed the treble-syllabled note of the Cuckoo, hearing it as early as two o'clock in the morning, and once at night, when it was quite dark—a cloudy, windy night.

Order iv., COLUMBAE.

Fam. i., COLUMBIDAE.

WOOD PIGEON.

COLUMBA PALUMBUS, *Linnaeus*.

The Wood Pigeon is plentiful, like other sylvan species, at Rosehall, between that and Bonar Bridge, and in the east generally. In 1834, Mr Selby observed it as far north as Tongue, where it breeds in the “plantations and birch-woods about the base of Ben Laoghal,” but he adds, that “a few pairs only were seen during our excursion.” Now, it is more plentiful at Tongue, but in the west only occasional pairs are seen at rare intervals, spying out, no doubt, the nakedness of the land. In the spring of 1869 one pair frequented a small patch of birch-wood close to Loch Assynt, and I observed them feeding in the fields around for a few days, but they soon took their departure, probably to return to the better wooded slopes of the Kyle at Rosehall.

* Since the above was written, I have been informed by Mr T. Mackenzie of a nest taken near Dornoch, which came into his possession in the spring of 1874.

ROCK DOVE.

COLUMBA LIVIA, Temminck.

Abundant all round the north coast, and in certain localities in the west. As far as my own experience goes, the Rock Dove prefers the caves of the mainland for breeding purposes, to those of the small islands lying off the coast. In 1869 I saw two pairs on one of the Badcall islands, which probably were breeding, but I never observed any there before. Mr St. John considered this bird to be very generally distributed along the north coast; but it is more local on the west coast. It is abundant at Stoir Head. Mr St. John speaks of having met with "sandy-coloured Rock Doves in the sea caves of Ross-shire and Cromarty (east), but no other varieties," but does not state whether he considered these as partial albinos, or as varieties caused by interbreeding with Dovecot Pigeons. This last, however, appears unlikely, as only the sandy-coloured varieties were seen. I have searched in other localities, where there could be no intermixing with Dovecot Pigeons, for these sandy-coloured birds, but have never succeeded in observing them. I may here remark that in Orkney, where Rock Pigeons have abundant opportunity of mixing with Dovecot Pigeons, they seem to keep very much apart from them, though feeding in the same fields. Amongst the many met with along the rocky shores of these islands, I do not remember observing a single departure from the Wild Blue-rock.

*Order v., GALLINAE.**Fam. ii., PHASIANIDAE.*

COMMON PHEASANT.

PHASIANUS COLCHICUS, Linnæus.

In 1841 the minister of Dornoch wrote: "As a proof of the mildness of our climate, Pheasants have been recently introduced at Skibo. They are doing well, and are likely to increase." ("Old Statistical Account of Scotland," parish of Dornoch). Skibo, as Mr Mackenzie informs me, is the only place where Pheasants are numerous at the present day.

In the west the lessee of the Loch Inver shootings introduced them in 1869, by hatching the eggs under hens, and I heard lately that they were promising very well. It remains to be seen how they will breed in future years, the only cover

being birch-wood, with the exception of a small fir plantation near Loch Inver. They have been known to do well, however, in similar situations.

Order v., GALLINAE.

Fam. iii., TETRAONIDAE.

COMMON PARTRIDGE.

PERDIX CINEREA, Latham.

Common about Rosehall and Lairg. Seen at Tongue by Sir W. Milner, and common also in the west at Loch Inver, and along the cultivated districts of the west of Stoir. One pair was seen at Inchnadamph, in 1834, by Mr Selby's party. Since then they do not seem to have much increased in numbers there, as in 1869 there were only two pairs to be found. Of one of these pairs I knew the nest, which contained fifteen eggs, an unusual number so far north. The severe weather at Inchnadamph, as well as the almost total absence of any kind of cover or shelter, is doubtless much against their increase.

COMMON QUAIL.

COTURNIX VULGARIS, Fleming.

Mr A. G. More includes the Quail as breeding in sub-province 35, and says "it is thinly scattered to the very north of Scotland." Amongst other records of its nesting in Caithness and Sutherland I may instance the following. In the former county, Mr R. I. Shearer records that the Quail bred in 1860 near Ulbster, and that "twelve eggs were laid and hatched: I shot two of the young, and the old cock, in autumn." In Sutherland the Quail has nested in the east of the county several times, and Mr T. Mackenzie of Dornoch Castle writes to me, that he himself "found the nest, but unfortunately after the young had been hatched. The fragments of egg-shells enabled me to identify them as Quail's eggs, and the young birds were seen in September following."* There are specimens also in the Dunrobin Museum.

* He writes to me also under date of 21st July, 1874 :—"I was fortunate last September in securing a deserted nest of the Quail with ten eggs, and a notice of the fact in the 'Field' elicited a statement that young Quails had been shot at Brora, some dozen of miles north of this, the same season."

BLACK GROUSE.

TETRAO TETRIX, Linnaeus.

Common about the birch-woods of Loch Inver, and abundant in the interior of the county, in suitable localities.

Obs. The Capercaillie, (*Tetrao urogallus*, Linnaeus) is extinct in the county, though at one time abundant, as may be seen in Sir Robert Gordon's "Earldom of Sutherland" and in later records.

RED GROUSE.

TETRAO SCOTICUS, Linnaeus.

Very scarce in many localities, and tolerably abundant in others. Very few birds are to be seen in the county lying near the west coast, and I have walked, for the greater part of two days, consecutively, over that portion lying to the west of the mountain called Quinaig, and between it and Stoir point, without seeing more than one or two pairs of old birds in the breeding season. They are scarce also in the parish of Durness, as mentioned in the old "Statistical Account," 1793. Further inland they become more numerous; but in Assynt generally, from eight or ten, up to twenty brace, are considered a good bag for one or two guns. This comparative scarcity of the Red Grouse, is, however, amply atoned for, in my opinion, by the great numbers of the next species, though many sportsmen who take shootings in the west of Sutherland scarcely ever go in pursuit of the Ptarmigan. In these wild parts Grouse do not "pack" as they do in Perthshire, or where there is a heavy stock of birds; and in September, and even on certain days in October, almost as good shooting may be had, as earlier in the season.

PTARMIGAN.

TETRAO LAGOPUS, Linnaeus.

Perhaps nowhere in Scotland are Ptarmigan more abundant than on the mountains of Assynt. The ridge of Ben Chaorin, with the heights and corries of Glashven, Ben More, and Braebag, are especially famous for the numbers there found. Other hills again are not so well stocked; for instance, isolated mountains such as Quinaig, Canispe, Soulbhein, Coul More, and Coul Beg, which lie nearer to the sea.

The nest of the Ptarmigan is extremely difficult to find. Many a day I have spent "in the region of stones," searching diligently, and during the years I visited Assynt in the breeding season I, unaided, found only one nest with eggs. In 1869, at the end of a long day, during most of which there was a close, "driving" mist, I at last found one containing nine eggs, putting the female off. These eggs were lighter-coloured than those of Grouse, and considerably smaller. On the day this nest was found I had two men assisting. We flushed at least a dozen old cocks, and heard many more crowing in the mist, and must have passed as many hens at no great distance. I know of no nest more difficult to find without a dog. There is a ventriloquistic sound in the crow of the Ptarmigan, especially when heard on a misty day, which, with the difficulty of observing the bird at rest, or sitting on the nest, adds greatly to its safety. To ensure success in shooting these birds in the season, a certain knowledge of the ground is required, and note should be taken of the direction of the wind, as they are almost as much influenced, in the choice of their ground for the day, by the currents of air, as deer are; and where on one day a good bag of Ptarmigan may be obtained, scarcely a bird can be found on another.

Ptarmigans are scarcer on the extreme tops, as far as my experience goes, than at a lower elevation, and those which are shot on the "barrens," or level deserts of stones in the higher situations, are found to be considerably smaller-sized birds. I know this to be the case, not only from information obtained from gamekeepers, shepherds, and others who are continually amid their haunts, but likewise from personal observation, and from specimens which I possess. So remarkable sometimes is this difference in size, that, when on wing, the smaller birds appear as pigmies beside the lower-ranging ones. Moreover, these higher-ranging and smaller birds assume the full-winter dress sooner than do those which are found lower down, and in less bleak and exposed situations. During a short correspondence I had with Professor Newton of Cambridge on the subject of our Scotch Ptarmigan, he informed me that the above facts fully bear out similar observations made by him on the Ptarmigan in Norway.

Obs. In 1834, Mr Selby was under the impression that *Lagopus rupestris*, the North American species, had been obtained on the "Ben More ridge above Inchnadamph;" and Dr Richardson, when a

specimen was shown to him, obtained there by Sir W. Jardine, "thought it to be the *Lagopus rupestris* of the Faun. Bor. Am." Mr Selby states that the specimen was "smaller than the usual average size of the common Ptarmigan." Upon this subject I consulted Professor Newton, and he considers there can be no doubt that the mistake arose from the fact, that the orange-yellow summer dress of the female *L. mutus* was not then generally known to naturalists, but was supposed by them to be peculiar to the North American species, *L. rupestris*. Therefore, when this specimen was obtained, and the orange-yellow plumage detected, being doubtless one of the higher-ranging and smaller birds, it was erroneously referred to the latter species.

Order vii., GRALLAE.

Fam. i., CHARADRIADAE.

GOLDEN PLOVER.

CHARADRIUS PLUVIALIS, Linnæus.

Sutherland has been named by Mr Selby "the great breeding station of this species." He also says of it: "Plentiful throughout the county, but particularly abundant in the district between Lairg and Tongue, the parish of Durness, Scowrie, etc." To this there is nothing to add, save that I have received eggs from all parts of the county. Whilst the females are sitting on their nests, the males go together in small flocks, and in autumn these flocks increase in size, when the young join them, but break up again into smaller flocks as they take their departure for the coast.

Perhaps no bird's eggs vary so much in ground colour as do those of the Golden Plover, and yet they can seldom be mistaken for those of any other species.

Obs. Mr St. John mentions the Dotterell, (*C. morinellus*), as breeding on Ben Clibrich, "but by no means numerously." There are specimens in the Dunrobin museum. Mr Crawford, landlord of Lairg Inn, and once a gamekeeper in that district (Ben Clibrich and eastward), writes to me that "they are seen on Ben Clibrich," but his informant could never find the nests. The shepherd used to tell him of getting the nests frequently twenty years ago, but he never preserved the eggs.

Now, though the above may be held as pretty good evidence of the Dotterell nesting in Sutherland, and though Ben

Clibrich is assuredly the most likely looking hill in the county for its nesting habits, I would wish to see more conclusive evidence before admitting it permanently to a place in this list.

THE RINGED PLOVER.

ÆGIALITIS HIATICULA (Linnæus).

Abundant on the east and north coasts, but almost absent in Assynt, where I only knew of one place at which two pairs, at most, breed every year. It is there found in company with the Dunlins, which are also only found in Assynt in this single locality. Mr Selby remarks that this species is found "very numerous on the margins of all the lochs and larger streams," but this must only be held as applicable to those lochs in the north and east of the county. I have never obtained the eggs from any part of Sutherland, and I doubt if they are so abundant now. Is it not possible that Mr Selby only saw them on migration?

THE LAPWING.

VANELLUS CRISTATUS, Meyer.

Very abundant in the east and central districts, and this is perhaps specially observable about Lairg and Bonar. In the west it is also abundant in one locality, but elsewhere is comparatively scarce, there being few moors and mosses sufficiently level for its habits.

OYSTER CATCHER.

HAEMATOPUS OSTRALEGUS (Linnæus).

Very numerous. On the west coast it never comes inland to breed, but frequents all the sea-lochs, and especially the Badcall islands. On Loch Shin it breeds, and also in the north. I have observed an occasional pair upon Loch Assynt, but the men who were with me on such occasions seemed invariably surprised at their presence, and all agreed that they were only rarely seen there, and I never heard of their nest having been found. In other counties, as is well known, they breed numerously on the larger rivers, for instance, the Tay, Tummel, Spey, Dee, and Don.

It is somewhat curious to find that the closely-allied American species (*Haematopus palliatus*), according to Audubon, never comes up the St. Lawrence, nor leaves the salt water, for breeding purposes.

In Sutherland they seldom place their nests in such places as Mr Hewitson describes, viz. :—on “a piece of gravel or stony ground,” but generally, and by preference, on the grassy tops of the islands, often amongst patches of sea pink. The nests often contain numerous pieces of crab’s shells.

Order vii., GRALLAE.

Fam. ii., ARDEIDAE.

COMMON HERON.

ARDEA CINEREA, *Linnaeus*.

There are various Heronries in the county. Those two with which I am best acquainted are both in the west, and occupy the low birch-trees on the islands of two different lochs. At Balblair, another locality, they breed on high fir-trees, but I cannot learn that they were ever known at any locality to breed on the ground, as stated by Mr St. John. In the localities which I have visited, the nests are often not more than six feet from the ground, and are generally formed by heather stalks, twigs of alder-tree or willow, lined with heather tops and dry grass; and, where it grows, a few blades of wild garlic (*Allium ursinum*), are often introduced, by no means detracting from the already offensive odour which arises from their filthy nests.

I have frequently taken their eggs in May, and even as late as June; in the latter case from a locality where the nests could scarcely have been robbed without the aid of a boat, except by Hooded Crows. Herons used to breed at Loch Cama, but, as already noticed, have of late years been driven away by the Rooks.

I have often been struck by observing the small size of eggs of certain species of birds obtained in the north and west, as compared with those of the same species from localities further south and east, and I am inclined to consider the difference constant, at least in eggs of the Common Heron.

Order vii., GRALLAE.

Fam. iii., SCOLOPACIDAE.

CURLEW.

NUMENIUS ARQUATUS (Linnaeus).

Abundant, but very much restricted in its distribution in the west. In 1868 I received five Curlew's eggs from a shepherd boy, who assured me that he found them in one nest. I have since heard of another nest of five eggs, obtained near Langwell, and now in the Messrs Paterson's collection, in Glasgow. Four is the usual number in Sutherland.

WHIMBREL.

NUMENIUS PHAEOPUS (Linnaeus).

This is a species whose numbers in Scotland in the breeding season have been very often over-estimated. I have tried hard, and repeatedly, to obtain the eggs taken in Sutherland, but have never received them. Nevertheless, we are informed that the Whimbrel "is plentiful during the nesting season all along the coast of Sutherland and Caithness, and breeds on open moors near the sea" (Mr Dunbar—"Ibis," 1865, p. 435). Mr Crawford writes to me that it "breeds along the north coast in much less numbers than the Curlew;" and again, under date of 21st March, 1870, "Whimbrels were common on the shore last month, but all the tribe are now leaving, or have left, for the interior." The great numbers of the Whimbrel seen in the Long Island in the month of May (and known there as "May-fowl") do not breed in the islands, but depart towards the end of the month. They arrive in Iceland for breeding purposes "at the end of April" (see Appendix A. to Mr Baring-Gould's "Iceland," by Professor Newton). I am inclined to believe, therefore, that the birds seen by Mr Crawford are the earlier migrants *en route* for Iceland, or still further north, whilst those seen in the Long Island are probably on their way to Faroe, and that very few indeed remain to rear their young in the north of Scotland. The island of Handa is another locality described as the breeding place of the Whimbrel (Rev. F. O. Morris' "British Birds"), but I am confident the statement has arisen and has been perpetuated in error. I have always failed to see any of the species at any season I have visited the place, and I invariably kept a sharp look out for them.

That it may breed in limited numbers along the north coast I do not deny, but the matter requires more careful attention before anything positive can be affirmed. Personally I would not be surprised if the Whimbrel were proved to be entirely absent during the nesting season.

THE REDSHANK.

TOTANUS CALIDRIS (Linnaeus).

This is another species which is confined to a single locality in the west, so far as I have found: there it breeds in considerable numbers. It is common in the east of the county, about Lairg and elsewhere. I have also obtained eggs from the extreme north-east. Mr Crawford describes it as less plentiful around Tongue than the Greenshank. The same remark is applicable to the district of Assynt; because, though the Redshank is plentiful in one locality there, it is absent from almost all others, whereas the Greenshank is much more generally distributed, though rarely more than two pairs breed in the same locality.

COMMON SANDPIPER.

TRINGOIDES HYPOLEUCUS (Linnaeus).

This chaste-looking little bird is exceedingly abundant; generally found on the lochs which lie at no great altitude, or on the banks of small burns. It arrives in Sutherland, as nearly as I can ascertain, in the last week of April, which is a little later than in more southern counties. Upon the summit of Ben Chaorin, which is about 2,700 feet above the sea, in two successive seasons I have met with one pair of these birds, evidently breeding. This, however, is the only instance I know of its being found at such an altitude in this county, though I understand it is occasionally met with, at an even higher elevation, in one or two other localities in Scotland. I have found the nest of this species sometimes protected above by a projecting rock or boulder, but it is generally placed on the open ground amongst grass. It breeds on the islands and shores of both inland and sea lochs.

Obs. The Purple Sandpiper, *Tringa maritima*, Brunnich, has frequently been observed on our coasts in summer. On the Badcall islands, on May 26th, 1868, I distinctly saw one specimen. It rose from the rocks on the shore of the outermost island, Mhael

More, and flew out to sea against a gale of wind, but shortly turned, and alighted on the grassy top of the island. On landing and going up to search for it, I failed in seeing it again. It appeared to be in very fine summer plumage.

On the 26th and 27th May, 1870, Captain H. W. Feilden and I saw Purple Sandpipers on the shores of Barra Head and Mingalay, in the Hebrides; and on the 27th, Capt. Feilden shot two specimens in beautiful summer plumage. These specimens, both females on dissection, were exhibited by Mr Robert Gray, at a meeting of this Society in November following. In Faroe, Mr John Wolley informs us, this species breeds "on the summits of the mountains in small numbers: young just fledged in the end of June" (*vide* Sir W. Jardine's "Contributions to Ornithology" for 1850). Now, if young Purple Sandpipers are just fledged in the end of June, the question naturally arises, as Captain Feilden pointed out: What were those, that we saw in the Hebrides, doing there at so late a date? We feel inclined to answer the question, either by the supposition that, as many male birds of different species, especially among the Waders, are known to sit upon the eggs, and assist in the labours of incubation, it is possible that, whilst these females were feeding on the shore or resting there, the males may have been engaged in incubation on the top of the hill of Mingalay. Or, again, we might answer it with another supposition, viz., that these late migrants were barren birds, and therefore had no call in particular to hurry northward to Faroe or elsewhere, with the body of the migrating flocks.

GREENSHANK.

TOTANUS GLOTTIS (Pallas).

This species is very generally distributed over the whole of Sutherland, extending into Caithness, and southward into west Ross-shire, west Cromarty, west of Inverness-shire, Argyleshire, and Perthshire, and is present in the Hebrides. I consider it far from an uncommon species in Sutherland. They are wild and wary, much more so than the Redshank, in the breeding season, and the male is wilder and shyer than the female.

The cry of the Greenshank, from which it gets its local Gaelic name in West Sutherland—*Teochvingh* (the accent on the last syllable)—is somewhat like that of the Redshank, but slower,

louder, and differently modulated. Those who have heard both species should easily recognise either bird by the note alone. When flying overhead, or at some distance from the ground, the note is slow and clear; but when in the act of alighting, with the wings raised over its head, it repeats the note with great rapidity, the syllables running into one another. This is accompanied by a tremulous motion of the wings, very similar to what may be observed in the Common Sandpipers, or in the Curlews soon after their arrival in spring. The flight is rapid, though the strokes of the pinions are in slow, strong, regular beats, which appear to keep time with each syllable of the note. The mark by which a Greenshank is most easily recognisable, independent of its note, and mode of flight, and size, when rising from a loch-side or marsh, is the conspicuous white patch of feathers on the rump. It has, moreover, some resemblance, on the wing, to the Bar-tailed Godwit, though smaller, and is midway in size between that species and the Redshank.

The eggs are difficult to find, and often the bird has to be watched to the nest. I have obtained a good many of their eggs from different localities, and am inclined to think that those having a pale-green ground, with small distinct blotches, represent the type; though others, some of which I possess, have a darker ground-colour, with bold rich-brown and purplish blotches, confluent at the larger end. The Greenshank begins to lay about the 10th May in Sutherland, though in other counties some observers consider it amongst the earliest breeders of the *Grallae*. I have one laying taken on the 10th May, but of many others received, very few complete sets have been taken so early in the season.

THE DUNLIN.

TRINGA ALPINA, *Linnaeus*.

As already mentioned under the Ringed Plover, the Dunlin is found breeding only in one locality in Assynt. Mr Selby considered it a common species, but I think it is local in its distribution. It breeds near Tongue, Mr Crawford informs me, but I have failed hitherto in receiving the eggs from any of my correspondents. Sir W. Milner does not mention it in his "List of Birds observed in Sutherland in 1847" ("Zoologist," 1848, p. 216).

Any specimens of the Dunlin which I have obtained in the west have, I think without exception, proved to be of the short-billed northern race. Out of the immense flocks which frequent the muddy estuaries of the east coast, and those of other parts of Scotland, very few indeed have the longer and more slender bill. The medium-sized bill or the short bill is predominant.*

THE COMMON SNIPE.

SCOLOPAX GALLINAGO, *Linnæus*.

Very abundant and generally distributed.

Obs. Jack Snipe, *S. gallinula*.—Mr Selby writes: "The game-keeper of the Tongue district assured us that the Jack Snipe breeds in Sutherland almost every year, and that he had obtained the eggs, as well as young, in some boggy ground, about two miles from Tongue. He shewed such an intimate knowledge of the bird, as to do away with any impression upon our minds of a mistake as to the species" (Edin. New Phil. Journal, Vol. xx., 1836, p. 292). Mr St. John, evidently referring to the same locality, says that he "was never satisfied with the authenticity of these accounts . . . for the very man whom I was referred to † as having seen this bird breeding, distinctly assured me that it never had been seen in that county during the breeding season." ("Tour in Sutherland," Vol. i.)

To the above I may add that on different occasions I have been assured that the Jack Snipe has bred or does breed, and that the young have been shot in August; and these accounts were frequently from persons who must have been perfectly well acquainted with the bird. In vain, however, have I attempted to obtain a nest of eggs, along with the old bird, by offering a large reward. The fact still remains, I believe, that there is no collection containing thoroughly well-identified and well-authenticated British specimens.

* On the Firth of Forth, one day in autumn, when all the great flocks of Dunlins had taken shelter on the lee shore from a stormy wind, I found and fired into a small flock of some twenty on the windward shore, and killed seven or eight. All these birds proved to be long-billed birds, and seemed to be strangers on the coast. These long-billed birds are always larger and stouter, and stronger-built birds than such as are found in the west in the breeding season. I believe none of these long-billed birds breed in Scotland, though they may do so in Orkney and Shetland.

† The same man whom Mr Selby quoted as his authority.

WOODCOCK.

SCOLOPAX RUSTICOLA, *Linnaeus*.

The Woodcock breeds very generally all over the county wherever sufficient cover is to be found, but perhaps is most abundant along the banks of the river Shin, and at Rosehall. I have never had the good fortune to see this bird carrying its young, though I have heard various accounts of its doing so from game-keepers and others. Mr J. Crawford writes that it breeds every year close to his house at Tongue, and that he has found the newly-hatched young "crouching amongst the fallen beech leaves." He further remarks, that the old bird gathers its young together "by flying about and uttering a peculiar 'croak.'" It breeds also now around Loch Inver, and on the wooded banks of Loch Letteressee, in the west. Mr Anthony Hamond is quoted by Mr Stevenson, in his "Birds of Norfolk" (Vol. ii., p. 286), as having seen Woodcocks sitting on their eggs, in the end of March, in the north-west of Scotland. I have myself taken the eggs in the midland counties of Scotland, containing fully-developed chicks, on the 25th of April.

Obs. Red-necked Phalarope, *Phalaropus hyperboreus* (Linnaeus).—As there is only one record of this species having been seen in the breeding season in Sutherland, I prefer entering it under this heading, all endeavours to hear of its actually breeding having failed. The only record with which I am acquainted is given in Mr St. John's "Natural History and Sport in Moray." At page 136, under the date of June 10th, 1848, he says, ". But the birds which were most interesting (and to me new) were two Red-necked Phalaropes, which I watched for half an hour, while they fed, sometimes within a yard of my feet, where I was sitting, close to a corner of the swamp. They were swimming about in the weedy water, and sometimes running on the broader leaves,* feeding on the small insects and shells." Mr A. G. More also cites Mr W. Dunbar as an authority for its breeding in Sutherland, but I believe that Mr Dunbar, in giving this information, only quoted the above passage on the authority of Mr St. John, who saw the above single pair. They were possibly migrating to Shetland, where they breed about that date.

* Probably the leaves of the water-lily, which is exceedingly abundant on many of the Sutherland lochs.

Order vii., GRALLAE.

Fam. vi., RALLIDAE.

Obs. Water Rail, *Rallus aquaticus*, Linnaeus.—Mr A. G. More includes it in sub-province 35, but gives no authority. He says: "Throughout the mainland: and Messrs Baikie and Heddle describe it as found in Orkney all the year." There is little doubt that these notes are correct, but as I cannot verify them from my own experience, I prefer to enter this species under this heading. It may be added that all whom I have questioned, or corresponded with, regarding it, say that Water Rails are often shot in autumn and winter; but none have instanced the occurrence of its breeding.

LAND RAIL.

CREX PRATENSIS, *Bechstein.*

Common in all cultivated parts. Wherever a small patch of corn or hay is grown a pair at least are sure to be found during the season, arriving generally in the beginning of June. On several occasions I have found the Corncrake far from cultivation, in the middle of a barren moor, but this is of course the exception to the rule. It is amusing to see with what eagerness and rapidity, and with what total want of suspicion, the Corncrake will approach to the notes of a supposed rival. I have called them, both with and without the aid of the usual Corncrake call, and it seemed to me that in Sutherland, where small patches of corn hereditarily belong, say, to one pair of birds, they hurried with even greater rapidity to the call than elsewhere.

WATER-HEN.

GALLINULA CHLOROPUS (*Linnaeus*).

Common as this species is generally throughout Great Britain, it cannot be called abundant in most parts of Sutherland, and is certainly rare in all the wilder portions. In Assynt, nearly every loch and burn of which district are familiar to me, I only know of one locality where a single pair of birds breed every year. Why it does not increase in numbers, any more than do the Partridges at Inchnadamph, before alluded to, I cannot tell. Perhaps, as in their case, the severe winters destroy the young before they reach maturity. Mr J. Crawford speaks of their being present in one

small pond near Tongue. From one locality in the north-east, a correspondent sent me some of their eggs, telling me he had never seen such before. They are common about Dunrobin, where they are known to the keepers.

COMMON COOT.

FULICA ATRA, *Linnaeus*.

The distribution of this species is very similar to that of the last named. Mr Crawford has observed them, though not regularly, on the same pond as that on which he found the Water-hens, and remarks: "I have not seen the Bald Coot anywhere else throughout the district."

Order viii., *ANSERES*.

Fam. i., *ANATIDAE*.

GREY-LAG GOOSE.

ANSER FERUS (*Gmelin*).

As is now well known to ornithologists, this is the only species of Wild Goose found breeding in Scotland. "As in Sutherland the Grey-lag Goose has been mistaken for the Bean Goose, and the more recent observations of the late Mr J. Wolley have conclusively proved that only one species at present breeds in the north of Scotland" (Mr A. G. More, in "Ibis," 1865, p. 441); and the same remarks apply as regards the Hebrides, as ascertained since Macgillivray's time.

The Grey-lag Goose is still a plentiful species, but I am sadly afraid it will before very long, unless stringent measures be taken, become extinct as a breeding species in Sutherland, as the nests are constantly pillaged, and the birds shot by keepers and others at every opportunity. I plead guilty, in one instance only, of having shot a female from her nest, in order to obtain a specimen. On one loch, a person told me that he killed no less than ten old Geese, shooting them on the same day, as they rose from their nests—thus destroying altogether about sixty birds, young and old, allowing five eggs to each sitting bird. In this particular locality they seem again to have increased in numbers, whereas, in most places, only an occasionally solitary nest is found. On the islands of this loch I believe more geese breed annually than anywhere else in Scotland, at least in proportion to the area.

The average number of eggs is five or less, though I have found six in the same nest. Young birds are easily reared from the eggs, but I believe that these never interbreed with the tame or domestic Geese, along with which they will feed in the same yard, though almost invariably keeping at a little distance from them. If they were more strictly confined along with the domestic birds, possibly they might interbreed; indeed, an instance did occur in 1849, in the Zoological Gardens in London, as related, if I remember correctly, by Darwin.

These semi-domesticated birds occasionally take short flights to the nearest loch, but never go far from the farm-yard; and, more curious still, do not seem to be influenced by any migratory impulse, except that they answer the calls of wild birds passing high overhead. Their movements on land are dignified, yet graceful, showing a vast contrast to the clumsy waddle of the domestic birds. I have eggs laid by these half-wild geese; the texture of the shell being finer and thinner, probably owing to the nature of their food. They are also smaller in size, though this may probably be exceptional.

COMMON SHIELDRAKE.

TADORNA VULPANSER, Fleming.

Common in certain suitable localities in the east and north, but absent, so far as I know, in the west. The sandy shore of Handa next the mainland should afford good breeding ground, riddled as it is with innumerable rabbit-burrows, but I have never observed the species there.

COMMON WILD DUCK.

ANAS BOSCHAS, Linnæus.

Very abundant, and found breeding both on the shores and on the islands of nearly all the numerous lochs of Assynt, salt as well as fresh water, but more rarely in the district of Stoir and Aardvaar, west and north of Quinaig. Indeed, that tract of country, though dotted with innumerable lochs, is singularly devoid of bird-life.

WIDGEON.

ANAS PENELOPE, Linnæus.

This species is distributed over the central and northern portions

of the county, being perhaps more common north and east of Loch Shin than elsewhere. In the west it is extremely rare, if not altogether absent. I have not met with it there, nor are the natives well acquainted with it. Sir W. Milner seems to have observed a considerable number in 1847, and to have considered it quite a common species in both Sutherland and Ross. It was first discovered breeding in Great Britain by Mr Selby and his party, who observed "various pairs" in different parts of the county. An excellent description of the nest of the Widgeon will be found, from the pen of Mr Selby, in Hewitson's "Eggs of British Birds," 1856, Vol. ii., p. 412. Mr J. Crawford writes that they are frequently observed on some marshy ground between Tongue and Loch Eriboll, and these birds doubtless breed in that neighbourhood.

The eggs of the Widgeon are recognizable from most duck's eggs. They are midway in size between those of the Teal and those of the Wild Duck, and bear a close resemblance, save in size, to the type of the former, being of glossy texture, and of a fine creamy white colour. No tinge of green is discernible, except perhaps in very abnormal layings, as in the case of the Teal's eggs mentioned below. Peculiar lines are often to be seen in the texture of the shell, like those sometimes observable in polished slabs of white marble, giving to the eggs the appearance of being cracked.*

TEAL.

QUERQUEDULA CRECCA (Linnaeus).

Tolerably abundant, and returning more regularly to the same locality to breed year after year than the Widgeon does. I could always make sure of a nest of eggs on an island in a certain small tarn about ten yards square. There is one laying in my cabinet taken at this locality, the eggs of which are of a decided, though very delicate green colour, without any trace whatsoever of a creamy tint, as is usual in eggs of this species.

Obs. Scaup Duck, *Fuligula marila* (Linnaeus).—Mr Selby writes as follows:—"A single female was shot by Sir W. Jardine on a small loch between Lochs Hope and Eriboll; she was attended by

* Since the above was first written, Mr Thomas Mackenzie has informed me that Widgeons have become much more numerous in the breeding season, of late years, and that in 1874 great numbers of nests were found.

a young one, which unfortunately escaped among the reeds." Sir W. Jardine has kindly informed me that "The old bird certainly had a young one with it, but whether a young Scaup or not, it would be difficult to say." Thus, then, the matter still remains uncertain, as no authentic nest or eggs have since been obtained. I have, however, obtained strong presumptive evidence of its having bred. In June, 1868, I shot an adult male Scaup, which had been frequenting the same small loch for some days; and from its unwillingness to leave the locality, though repeatedly disturbed and fired at, I am fully persuaded that the female was sitting on her eggs at no great distance. With my friend, Mr W. Jesse, I also, in June, 1867, obtained a laying of duck's eggs, and though failing to identify them, they closely resembled eggs of this species from Lapland. I shall not be surprised to hear of the young or eggs of the Scaup being found in either one or other of four different localities. A correspondent from one of these, described a duck very minutely—which could hardly have belonged to any other species—as having bred in the county, to his certain knowledge, in 1865.

*Obs. No. 2. Golden Eye, Clangula glaucion (Linnaeus).—*Sir W. Milner includes the Golden Eye in his "List" as observed on two occasions. First—"On one of the numerous lochs between Thurso and Tongue, we fell in with a male Golden Eye (May 17th), and from what we observed in Sutherland afterwards, we had no doubt that the female was upon her eggs." And again: "Near Loch Maddy (or Maldie), on the 21st May, on another small loch, we flushed a female Golden Eye." Mr St. John also observed this species in summer, on Loch Laoghal. Mr A. G. More says ("Ibis," 1865, p. 447): "Mr W. Dunbar informs me that the Golden Eye has once been known to breed in Sutherland, a nest with young birds having been found by a shepherd in the hollow of an old larch-tree on Loch Assynt, and he suggests that one of the birds must have been disabled and unable to migrate." At present there are no larch-trees on the banks of Loch Assynt, nor have I been able to ascertain from any of the older inhabitants that the larch ever grew there. But if the nest was found in the trunk of a fir or birch, it may possibly have been that of a Goosander.

Obs. No. 3. Black Scoter, OEdemia nigra (Linnaeus), according to Mr Dunbar, breeds regularly in Caithness; and Mr J. Watson says ("Zoologist," 2nd series, p. 1867), that it did so in 1868.

Possibly, also, it may yet be found in some part of Sutherland, especially as the locality in Caithness is not far removed from the boundary line between the two counties. Mr Dunbar "has known the eggs taken more than once."

RED-BREASTED MERGANSER.

MERGUS SERRATOR, *Linnaeus*.

Common, and found breeding on many of the larger lochs, as well as on the islands of the numberless arms of the sea which indent the western coast. When found inland, seldom more than one or two pairs frequent the same loch, but on one small island of a sea loch, I have found as many as three nests, and I was told by a person in the neighbourhood that there were generally three pairs there every year.

Any nests of the Red-breasted Merganser I have examined in Sutherland have not been concealed from view amongst loose stones, or in turf holes, as is the case in the Hebrides and elsewhere, but have invariably been placed amongst long heather on a sloping bank, and not hidden, except from the most inexperienced eye. The Hooded Crows, at all events, soon find them out, and no sooner does the female quit the nest than one or both of the black vermin, probably breeding on some neighbouring rock, repair to the unguarded nest. On the island above mentioned, I have seen a pair of "Hoodies" hunting the ground as systematically as any good pointer or setter dog.

Order viii., ANSERES.

Fam. ii., COLYMBIDAE.

BLACK-THROATED DIVER.

COLYMBUS ARCTICUS (*Linnaeus*).

This handsome species was first discovered as resident and breeding in Great Britain by Mr Selby's party in 1834. It is now well known as far from uncommon on the inland lochs, always choosing a green island for its nest. The Black-throated Diver is perhaps more plentiful in the south-western portion of Sutherland than elsewhere in the county, becoming very scarce northward in Edderachyllis, and north-eastward through the rest of the county. In both these directions it gives place to the Red-throated Diver. I consider that in the west the proportion of

C. arcticus is about three to one of *C. septentrionalis*, and in the north-east this is as nearly as possible reversed. Taking the county as a whole, the two species are about equal in number.

On each of the smaller lochs frequented by this species, only one pair is to be found breeding, but on some of the larger lochs two pairs are occasionally observed. The nest is simply a hollow in the ground, rarely, if ever, having any lining, and chosen close to the water edge, or at least within a yard of it. On several occasions with a good glass I have watched the female as she sat on her eggs, whilst the male swam up and down at no great distance, and often close beside the island. As he did so, all unsuspecting of my presence, he would gracefully dip his bill in the water, or lie over on his side, stretching back his leg the better to preserve his balance, and then preen the feathers of his breast and side with his long dagger-shaped bill. When alarmed, he would raise his head sharply, and gradually sink his body, till his back became level with the water, or entirely disappeared beneath it, leaving only the long snake-like neck and head exposed to view. If the danger then became more imminent, he would dive without leaving a ripple on the surface, and reappear far out upon the loch.

The cry of the Black-throated Diver, when alarmed, is a guttural "quack," repeated at intervals, which seems to be a cry of warning to the female. I have never seen the male bird quit the water and rest upon land, though he not unfrequently rises off the surface and flies once or twice round the loch, nor have I seen the female on land save when she has been sitting on her eggs. On leaving the nest, when undisturbed, she floats gently off on the surface, but if alarmed, almost instantaneously dives, or should the water close to shore be too shallow to admit of this, she half flies, half swims, until she finds sufficient depth, splashing up the water, and making sufficient noise to be heard 250 yards off on a calm day.

The Black-throated Diver seldom breeds on the shores of a loch, although I have heard of well authenticated instances of its doing so. It usually chooses a green, grass-grown island, and should a loch be found not to possess such an island, it is almost needless to search there for a Diver's nest. On one loch with which I am acquainted, a pair of these birds breed upon a long narrow point of gravel and sand, which runs out from a grassy

island, on which also is a colony of the Common Gull (*Larus canus*). This situation, however, is exceptional, as usually they are solitary birds. The males of different pairs, when the females are sitting, often join company, and may be seen fishing together on another loch.

This beautiful bird, so graceful in its every action whilst in the water, progresses but clumsily on land. The female, when going to or from her nest, rests her breast upon the ground, and uses her feet behind as propellers, much in the same way as she would do if swimming. Thus a beaten path, and often a deepish groove in the turf or gravel, is always found between the nest and the water. An old gamekeeper informed me that he has in vain attempted to trap an old Diver, invariably finding his trap sprung, with a few of the breast feathers in its grasp.

If a pair of Divers be pursued by a boat, comparatively rarely will either bird take wing, but almost always they will endeavour to escape by swimming and diving. I have, however, seen them, when hard pressed, rise and quit the loch, but only to return again in a short time. If danger is at hand when the female is sitting, the male will try to lead her off the nest by uttering his guttural cry. If the danger becomes imminent (as, for instance, if a man enter the water preparatory to swimming out to the island), the male will swim rapidly close up to his mate, and then both will dive and reappear at a distance.

The Black-throated Diver is very tenacious of its old breeding haunts, and, unless systematically persecuted from year to year, repeatedly fired at, or otherwise annoyed, will not easily change to a new locality; but, once a loch is deserted by these birds, it may be many years before they will again be seen upon it.

RED-THROATED DIVER.

COLYMBUS SEPTENTRIONALIS, Linnæus.

Mention is made of this species as inhabiting Sutherland so long ago as 1793, in the "Old Statistical Account" of the parish of Realf, where, under the name of "Rain-Goose," it is included in a somewhat long and tolerably full list of the birds found in that district.

The Red-throated Diver is about as abundant as the last-mentioned species, but, as already noticed, its distribution is

different, being most plentiful where the Black-throated Diver is scarcest, and *vice versa*. It frequents more retired and out-of-the-way spots than the Black-throated Diver, and often breeds at a much higher elevation. It also differs somewhat in its nesting habits, preferring the shore of a small peaty tarn to the islands of a larger loch. The eggs are considerably smaller; and on comparing a small series with a larger one of the eggs of the other species, they are found to vary more, both in the ground colour and in the markings.

The cry of the Red-throated Diver is perhaps one of the most extraordinary and startling sounds a person can well listen to, especially when heard for the first time. On one occasion a friend and myself were rowing on Loch Assynt, when the wild, half cat-like, half infant-scream-like cry came loudly and distinctly across the water. We were both startled, not even excepting our steady old highland boatman, who had often heard it before; whilst my friend, who had never heard it until that occasion, could hardly be convinced that it was not a cry of distress from some drowning person. So human-like was the strange shriek, that even after we had seen the birds we could hardly divest ourselves of a disagreeable feeling that it might have been a child drowning after all.

Obs. Great Northern Diver, *Colymbus glacialis* (Linnaeus).—Mr Selby records that “A single pair was seen in the Bay of Balnakill, mouth of the Durness Firth, both adult birds, and in full adult plumage.” He suggests that “It is probable that they had their nest upon one of the numerous islets that abound in the bay.” Sir William Milner also observed the species; and there are numerous other records of these birds having been seen late in summer on various parts of our coasts.

On June 5th, 1868, I identified a pair of these birds upon a wild inland loch in Sutherland, and soon afterwards sent an account of my discovery to a natural history periodical (“Zoologist,” 2nd series, p. 1309). I am quite positive as to the correctness of my observation, and, from various scraps of information that have since reached me, I am also decidedly of opinion that the Great Northern Diver has bred in Sutherland.

Mr Dunbar reports that he saw Great Northern Divers, with “one young one,” on Loch Endorb, where there were also at the same time two or three pairs of the Black-throated Diver; “so that the two species were easily distinguished by the great disparity

of size" (A. G. More in "The Ibis"). Dr Saxby reports having received eggs "from Yell, in Shetland, which he considers to belong to the Great Northern Diver;" and his belief is strengthened by the fact that the Black-throated Diver does not breed in Shetland ("Ibis," 1865, p. 449).*

LITTLE GREBE.

PODICEPS MINOR (Gmelin).

This is a rather rare species in Sutherland. Mr Selby observes that it was met with "occasionally upon the smaller lochs during the excursion" in 1834. Sir W. Milner also includes it in his "List" in 1847. It breeds regularly in the neighbourhood of Tongue, but is rare in the west, so far as I know. I have neither taken or received its eggs from there.

Order viii., *ANSERES*.

Fam. iii., *ALCIDAE*.

COMMON GUILLEMOT.

URIA TROILE (Linnaeus).

On Handa there is an immense colony of this species, far surpassing in numbers those on the Bass Rock, on Ailsa Craig, or on the Hoy Head. That portion of Handa which is most crowded with these birds, if any part be more thickly populated than another, is "The Stack." Thousands crowd its ledges, and swarm on the outward-sloping face at the top. The Guillemot is decidedly the most abundant species at Handa. I have been much disappointed in finding the eggs of the Guillemot at this locality not, as a rule, nearly so richly coloured as those from other nurseries of sea-fowl. Out of a lot of about 400, I picked out a dozen or so of the finest, but found even those to be poorly marked as compared with others I have seen, and since possessed, from other places.

In the "Old Statistical Account" of the Parish of Edderachyllis mention is made of the fact that the inhabitants, at the time of its publication—1793—"set great store by the birds of Handa, both as food, and for sake of the feathers." Now such is not so much the case, though the birds are occasionally made use of for food.

Of the race *U. ringvia* I may state that it is abundant on

* Also see Dr Saxby's "Birds of Shetland," 1874.

Handa as compared with some other bird-stations on our coasts. I have on many occasions counted the Guillemots occupying a ledge, and generally found that the average of bridled birds on Handa was one to ten, or twelve, of the common race. The estimate of their numbers on this island, as given by Mr J. Wolley, also agrees with my estimate. He writes ("Zoologist," 1852, p. 3478) that he spent four days there, and went down on a rope "in every part of the rocks," and, after careful examination, sums up by saying, "and in every row of ten or twenty Guillemots, one or two were seen to have the white above the eyes."

Mr Wolley did not consider *U. troile* and *U. ringvia* as separate species, nor did he recognise any difference in their eggs. Capt. H. J. Elwes procured eggs of *U. ringvia* in the Hebrides, taken from under the birds in 1868, and says of them, "more were marked with streaks than blotches." My own experience of them, in the same locality in 1870, is that they are quite undistinguishable from typical eggs of *U. troile*.

In the Hebrides in 1870 Capt. H. W. Feilden and myself saw bridled and common birds *in copulá*, thus putting their identity beyond a doubt. We also very carefully came to the conclusion that the average of the bridled birds there was one to five of the commoner race.*

In his "Birds of the West of Scotland" (p. 426), Mr Robert Gray gives the numbers of the bridled birds amongst the Guillemot population of Handa as one in a hundred; but this is such a very low estimate indeed, that it is probably a printer's error. My estimate of the numbers there has always been as above stated.

BLACK GUILLEMOT.

URIA GRYLLE (Linnaeus).

This bird is now very rare in Handa, though at one time, as we were assured by the cragsmen, it was plentiful. The reason

* I am not aware that any Guillemots have ever been found to partake of the characteristics of both *U. ringvia* and *U. troile*, as would be the case in a true cross formed by the interbreeding of species. All specimens hitherto obtained have been either purely the one or purely the other, thus, as I understand, proving their identity as a species, and giving an instance of Darwin's dimorphism.

assigned for its decrease in numbers there is, that rats have managed to dislodge them. This can, however, hardly be the case, because the places, in which doubtless, Black Guillemots bred when there, seem to me to be inaccessible even to a rat.

On other islands of the west coast, however, it is not so uncommon. At one locality where I have taken their eggs, some twenty pairs or more were breeding in a colony. At this place few of the eggs were placed in crevices in the perpendicular face of the cliff, but mostly at the bottom of deep cracks or fissures in the surface of the island, never far removed from the sea. Some of these fissures were from six to ten feet deep, and it was only by using a stick with a ring at the end of it, and a piece of netting attached, that I could get out the eggs. On this occasion I caught three of the birds on the eggs. Two of these birds proved upon dissection to be males, as was noted by Mr MacLeay of Inverness. The bare breast-spots were equally visible in them as in the females, and in one specimen there were two such spots. These facts prove that both sexes share in the duties of incubation, as Thomson has remarked in his "Birds of Ireland."

One of these same three birds was curiously mottled with white all over the lower breast and belly, being part of the winter plumage not yet changed into the pure black of summer. Such specimens are not common in summer, but Mr MacLeay informed me that he has on several occasions received them for preservation.

The number of eggs laid by this species seems to be almost invariably two, but occasionally only one. I never found more than two. Most of those obtained at the above place were far advanced in incubation. It is somewhat singular, therefore, to find that Mr Anderson states most strongly that in Labrador *Uria grylle* invariably lays three eggs. No doubt this singular disparity in numbers is caused by a greater or less supply of their favourite food in different localities, and the fact that the Black Guillemot is infinitely more abundant in the Arctic regions than with us, goes to prove that food is there most plentiful.

The Black Guillemot cannot be considered an abundant species in the west of Sutherland; indeed, I know of only two or three localities where it breeds, though doubtless there are others between Scowrie and Cape Wrath. On the north coast they are more abundant, though a correspondent writes that there are none breeding near Armadale.

PUFFIN.

FRATERCULA ARCTICA (Linnaeus).

The Puffin is still a very abundant species on Handa, and especially on "The Stack," where they lay their eggs on the top, amongst some loose stones and rubble. They also breed numerously in the gap in the opposite cliff, and are plentiful on all parts of the rocks where there are green slopes of grass, and cairns of loose stones and other debris; often, as in other localities, disputing for possession with the rabbits. The cragsmen assured me that not many years ago the Puffin was almost the most numerous species on Handa, and at that time the eggs could be taken from holes on the flat tops of the rocks, but of late that, as in the case of the Black Guillemot, rats have driven them to search for securer situations. Puffins were then much less abundant on the sloping top of "The Stack," their present numbers there being attributed to their desertion of these formerly inhabited places. But I have observed that Puffins are very much more numerous on "The Stack" in some years than in others, and I incline more to the belief that their choice for the season may be considerably influenced by the direction of the prevailing winds, when they "come up" from the sea. Thus, the gap in the cliff opposite "The Stack" is always well populated, as it is sheltered by "The Stack" from the north-west winds and waves.

RAZORBILL.

ALCA TORDA, Linnaeus.

The Razorbill is plentiful. It seldom breeds low down on the cliffs. I do not think that the arrangement, so to speak, of the different species on the cliffs of Handa in tiers, one above the other, is so observable for its regularity as in many other nurseries of sea fowl. The Kittiwakes are always low down: the Puffins seem to occupy the whole face of the cliffs, wherever suitable cracks or crevices are to be found, or cairns, or patches of green: the present species seldom descends below half way: the Guillemots crowd on all the ledges, save those occupied by the Kittiwakes, and on "The Stack" they breed likewise on the sloping summit. In such places, indeed, where the ledges are at regular, or nearly regular, distances from one another, the different species

keep each their own legitimate level; but where the rocks are rent and cracked, where landslips have occurred, and there are mounds of earth and stones, such regularity is not so observable.

Order viii., *ANSERES*.

Fam. iv., *PROCELLARIIDAE*.

Obs. I have not been able to discover any breeding place of either the Manx Shear-water, *Puffinus anglorum* (Temminck), or the Fulmar Petrel, *Procellaria pelagica* (Linnaeus), but would suggest that, as the former breeds in Orkney, it may be found also on the north coast of Sutherland, and that the latter, if searched for in July, may be found in at least one locality on the west coast.

Order viii., *ANSERES*.

Fam. v., *LARIDAE*.

Obs. Richardson's Skua, *Lestris parasiticus* (Linnaeus).—Mr A. G. More says ("Ibis," 1865, p. 456): "The bird still breeds in Sutherland and Caithness," but he gives no authority. I can hear from no other source of their nesting in the county, nor have I received eggs from any locality there. In June I have received a specimen of the bird, in the flesh, from Handa, where it is considered rare, and is not known to breed. It is seen much more numerous on the east coast of Caithness and Sutherland than elsewhere, these birds being probably those which breed on an inland moor in the former county, and in Hoy, and which follow the flights of other Gulls preying on the passing shoals of fish.

GREAT BLACK-BACKED GULL.

LARUS MARINUS, Linnaeus.

The only place on the west coast, that I have visited, where this fine bird breeds in any numbers, is at Handa, where a colony of about fifteen pairs have their breeding station, which is perfectly inaccessible to man, on the grassy summit of "The Stack." Apparently knowing the security of their nesting place, they allow a close approach to the opposite edge of the chasm which separates them from the main island, without showing any symptoms of alarm.

Scattered pairs breed up and down the coast, generally returning to the same locality year after year. A few pairs breed also in

company with the Lesser Black-backed Gulls, from which birds they are easily distinguishable, not only by their greater size, but also by their much louder, and, if I may use the expression, much more defiant voice. I received a laying of their eggs on one occasion, which was taken on the shore of an inland loch, a most unusual situation, as they generally choose the very highest part of an island whereon to make their nest.*

LESSER BLACK-BACKED GULL.

LARUS FUSCUS, *Linnaeus*.

This is perhaps the most abundant species of Gull in Sutherland, and is found breeding, in large colonies, on the islands of both inland and sea lochs. The largest colony with which I am personally acquainted is on two islands of a loch in West Cromarty, where I have estimated their numbers at about two hundred pairs. Here they breed entirely by themselves; with no other species of Gull, except one pair of Great Black-backed Gulls. They are more plentiful in the west than in the north or east. Their numbers on the Badcall islands, where they breed along with the Herring Gull, fluctuate considerably in different years, owing, doubtless, to their nests being robbed perpetually by the inhabitants of Stoir and Aardvaar. There are numbers of rats also on the islands, which are not favourable to their increase.

Few objects present a more beautiful sight to the eye of the ornithologist, than an island of some inland loch colonized by these handsome birds. Everywhere their pure white breasts and black backs are to be seen, in striking contrast to the deep-green colour of the grass, which is sure to be found on every island which they frequent, or in time past have frequented. The air, too, is full of them, as they sail round and round, uttering their loud, defiant laugh. The calm, unruffled surface of the loch, too, bears its share of them upon its bosom, as parties of from two or three to a dozen float lightly upon it. In one locality I found this

* An interesting account is given in Wilson's "Voyage round the Coasts of Scotland and the Isles" (Vol. i., p. 237), of a battle between a flock of Sea-Gulls protecting their young and a troop of goats (in which the former succeeded in beating off the latter, and saving their offspring from their hoofs), on an island of Loch Laxford. They were probably of this or the following species.

species breeding not only on the open grassy parts of the islands, but also amongst some thick birch-wood, and I have flushed them in this situation direct from their nests.

HERRING GULL.

LARUS ARGENTATUS, Gmelin.

Not nearly so numerous as the last, but tolerably abundant, especially on the Badcall islands. Like the *L. fuscus*, I have found their numbers at this locality to differ very much in different years. In one season, for instance, I found great difficulty in obtaining properly identified eggs of the Lesser Black-backed Gull, from the much larger numbers of this species breeding with them; whilst another season I found equal difficulty in identifying the eggs of the present species, on account of the superabundance of the Lesser Black-backed Gulls.

COMMON GULL.

LARUS CANUS, Linnaeus.

Very abundant; breeding numerous on the inland lochs of the west, as well as on the islands of the various arms of the sea, and on the Badcall islands. A long spell of dry weather in spring and summer seems to retard these and other Gulls from laying. They were unusually late of breeding in 1869.

BLACK-HEADED GULL.

LARUS RIDIBUNDUS, Linnaeus.

Plentiful in the east; entirely absent, as far as my experience goes, in the west. Having been told that they bred on a small loch at the base of Canispe, I visited the locality, but found no other species besides *Larus canus*.

KITTIWAKE.

LARUS TRIDACTYLUS, Linnaeus.

Occupies the lower ranges of ledges on Handa, where I have seen the waves cast their spray over the sitting birds. They are partial to "The Stack," seeking out the landward and more sheltered sides, where they build their large warm nests close to one another. The number of their eggs is three; never, I believe, more.

ARCTIC TERN.

STERNA HIRUNDO, Linnæus.

The Arctic Tern is of more frequent occurrence than the Common Tern.

COMMON TERN.

STERNA FLUVIATILIS, Naumann.

These two species are both abundant in the east, but rare in the west. The Common Tern is found breeding on a small detached island close to Handa, but only in very limited numbers; and the Arctic Tern is abundant on a loch in the east intermixing with the latter. On Loch Migdale, near Bonar, the latter breed, and, as far as I could observe, are the only species there.

Obs. Mr A. G. More ("Ibis," 1865, p. 453) includes the Lesser Tern (*Sterna minuta*), in sub-province 35, but gives no authority; nor can I hear of a breeding place.

Obs. No. 2. Mr A. G. More does not include the Sandwich Tern (*Sterna cantiaca*), but remarks that the birds have been seen in summer on the Firths of Tongue and Eriboll, "but the nest was not discovered," evidently quoting Mr Selby. Mr J. Crawford informs me that the Sandwich Tern is frequently seen on the island of the Kyle of Tongue, and considers that it breeds there, though he has not obtained the eggs. He further states that "both species (*i.e.*, Sandwich and Arctic Terns), arrive at nearly the same time."

*Order viii., ANSERES.**Fam. vi., PELECANIDÆ.*

CORMORANT.

PHALACROCORAX CARBO (Linnaeus).

Not numerous on Handa; and such as breed there invariably choose the highest parts of the cliffs for nesting purposes. There are no large settlements, perhaps half a-dozen pairs breeding together in the same place. On the Badcall islands, however, there is a large colony, and the nests are placed in the simplest places, where even a child might take the eggs. They seldom, however, occupy the same island two years running. Thus one season they crowd the rocks of one island, and the next entirely desert it for the adjacent one. Their numbers are on the decrease;

and the persecution to which they are subjected on these islands, is doubtless the cause, both of their numbers diminishing, and of their so frequently shifting their place of abode.

We have not unfrequently found four eggs in a nest, and on one occasion five were found, though Mr Shearer, with all the long experience he has had in the east of Caithness, nevertheless states that "it never lays more than three" ("Field," 29th Nov., 1862). This only proves, to my mind, how greatly circumstances and locality influence birds in the number of eggs laid. Whether this is owing to comparative plenty or comparative scarcity of food in general, or of their favourite food in particular, or to some other cause not yet accurately determined by naturalists, I cannot take it upon me to say; but the fact stands, I believe, beyond disproof, not only as regards Cormorants, but as regards numberless other species, as, for instance, the Merlin, Buzzard, etc.

GREEN CORMORANT.

PHALACROCORAX CRISTATUS (Faber).

More plentiful on Handa than the Cormorant, breeding as usual low down on the rocks, and, when possible, choosing such ledges as are found to hang immediately over the water. On the Badcall islands they are comparatively scarce, though the caves there seem to be fully as well adapted to their habits as those of Handa are.

The Librarian announced the following donations to the Library:—Transactions and Proceedings of the Botanical Society of Edinburgh, Vol. x., Part ii., 1870; from the Society. Henedy's Clydesdale Flora, 1865, and Salisbury's Botanist's Companion, 1816; from Mr Walter Galt. Skandinavisk Herpetologi, af S. Nilsson, Lund., 1842; from Mr Thomas Chapman. Jahresbericht der Gesellschaft für Natur und Heilkunde in Dresden, 1870; from the Society. Stainton's Natural History of the Tineina, Vol. xii., London, 1870; from Dr Hugh Colquhoun.

JANUARY 31ST, 1871.

Professor John Young, M.D., F.G.S., President, in the chair.

Messrs George Martin, Jun., and James M'Kerrow, were elected resident members.

The Chairman exhibited the lower jaw-bones and some of the vertebrae of a ruminant—probably a deer—from a moss near Cambusnethan. These, with a quantity of decayed flesh and coarse black hair, had been found embedded in the peat at a depth of about seven feet, and had first come into the possession of Mr George Thomson, a member of the Society.

Mr John Bell exhibited a specimen of the Grey Phalarope (*Phalaropus lobatus*), which was shot some time ago near Helensburgh. Mr John Young laid on the table a peculiar monstrosity of the Scotch Fir, which had been cut in a plantation near Mugdock, and on which Mr M'Lellan and Mr Ramsay made some remarks.

PAPERS READ.

I.—*Remarks on the Parallelism of the Scottish and North Irish Carboniferous strata.* By Mr JOHN YOUNG, F.G.S.

The author founded his remarks chiefly on the geological age of the Ballycastle coalfield, and its relation to the Carboniferous rocks of the West of Scotland, from a paper read this month by Mr Edward Hull before the Geological Society of Ireland, and after some preliminary observations proceeded as follows:—During the short period Mr Hull was with us in Glasgow, engaged in the survey of the coalfields of the West of Scotland, he became acquainted with the peculiar stratigraphical and lithological characters of the Carboniferous limestone series of the Glasgow district, so different from the typical strata of the same age observed in most of the coalfields of England and Ireland, and he has since been enabled to trace an approach to the same conditions of deposit in the Ballycastle coalfield as those seen in the West of Scotland. Mr Hull does not found his conclusions solely upon the similarity of lithological character of the strata observed in the two districts, but also upon the palaeontological evidence of the various organisms obtained from the two series of beds. He says that, amongst thirty-three species of shells, corals, and crinoids, from the Ballycastle strata, Mr Baillie, palaeontologist to the Irish Geological Survey, finds fifty per cent. are related to those from the West of Scotland.

Mr Hull divides the Carboniferous strata of the Ballycastle or

Antrim coalfield into three groups, which, in a descending series, consist of—

1st, Coalbeds and blackband ironstone alternating with other strata;

2d, Limestone and impure earthy shales, with shells, crinoids, and corals;

3d, Beds of reddish sandstone, conglomerates, and shales.

The first group corresponds closely to the Possil and Govan coal and blackband ironstone series; the second to the lower limestone series of the West of Scotland; and the third to the sandstones, conglomerates, and shales that underlie our limestones, some of which are of a reddish colour, as in Arran and in various tracts along the south-western base of the Ayrshire coalfield.

Mr Hull states that he is not sure if the millstone grit series is represented in the Ballycastle coalfield, and I think there is also evidence from the three divisions of the strata which he gives us, that the upper limestone series of the West of Scotland is not there found. With us this upper limestone series consists of three or four beds alternating with other strata of sandstone and shale, which lie over the Possil coal and ironstone series—the supposed representatives of the upper strata of the Ballycastle coalfield. But as many tracts of the Irish coalfield have suffered extensive denudation, it may probably be concluded that these upper beds have been all swept away.

One other point of similarity which Mr Hull notices in connection with the coalfield of the West of Scotland and that of Ballycastle, is the occurrence of a brachiopod shell—*Lingula squamiformis*. In the coalfields of Lanarkshire, Renfrewshire, and Ayrshire, this shell occurs in such abundance in certain strata on the horizon of the Possil and Govan ironstone series, that it strongly characterises this division of our beds. Years ago Dr Rankin of Carlisle, in his section of the strata of that district, named certain beds on this horizon as “*Lingula* ironstone,” “*Lingula* limestone and shale,” from the abundance of this one shell in the beds. This shell, though ranging from the lower to the upper limestone series in the West of Scotland, is nowhere else met with in such numbers.

It is worthy of being noted that Mr Hull in this paper does not claim to be the first to recognise the difference that exists in the beds of the Ballycastle coalfield from those composing the

typical Carboniferous limestone series of other tracts of Ireland. This feature, he says, was pointed out long ago by Dr Griffith. The late Professor Jukes, in his "Manual of Geology," also says, that in tracing the Carboniferous series from the central districts of Ireland northwards, the beds become more complicated and sub-divided as we proceed from south to north. The Calp limestone becomes more purely an earthy deposit, and in its middle portion the shales are split up by a considerable group of sandstone beds, sometimes containing traces and thin seams of coal. This sandstone group, I may also point out, is a feature in the Possil coal series in this district, being the repository of the best quarries of this rock in the neighbourhood of Glasgow.

What Mr Hull means to indicate, and, indeed, has been the first to point out, is the close relationship of this coalfield in the North of Ireland to that of the West of Scotland; and I think he has established this clearly, both by lithological and palaeontological evidence. In the West of Scotland the great bed, or series of beds, a thousand feet or more in thickness, forming the typical Carboniferous limestone of many tracts in England and Ireland, no longer prevails. With us the limestone series is split up into a dozen or twenty beds, parted by strata of coal, ironstone, sandstone, and shale, and forming a lower and upper series. Few of the limestone beds, even in the district around Beith, in Ayrshire, where they attain their greatest development, reach 40 feet in thickness; while in many parts of our coalfield they do not average more than from one to five or six feet, many of the beds being of an earthy or impure character.

Those interested in the physical causes which have brought about this unequal distribution of the limestone strata in the coalfields of Great Britain and Ireland will find an able and interesting paper on the subject by Mr Hull, in the Proceedings of the Geological Society of Glasgow, vol. iii. It is of geological interest also to note that as the Carboniferous strata are traced northwards through the various counties of England, they, like those of Ireland, begin to take on the Scottish types of deposition. Professor Jukes says that the limestone series in the North of England eventually begin to contain beds of sandstone and coal, and that, finally, farther north the whole group becomes a great series of coal measures, containing interstratified limestones in its lower part only.

Professor Young then made some remarks corroborative of Mr Hull's views, and expressed a hope that the subject would be still further investigated, as, judging from what had been already indicated, the results were likely to prove both interesting and instructive to geologists generally.

II.—*On the Mammals and Reptiles of Sutherlandshire.* By MESSRS EDWARD R. ALSTON, F.Z.S., and JOHN A. HARVIE BROWN, M.B.O.U.

The first account of the Mammals of Sutherlandshire with which we are acquainted is to be found in Sir Robert Gordon's "Earldom of Sutherland" (1630), where the following species are enumerated—"Reid-deir and Roes, Woulffs, Foxes, Wyld Catts, Brocks, Skuyrells, Whittrets, Weasels, Otters, Martrixes, Hares, and Foumarts." In 1836 Mr Selby published an excellent paper "On the Quadrupeds and Birds of Sutherland," in vol. v. of the Edinburgh New Philosophical Journal; and scattered notices are to be found in the works of the late Mr St. John; in Scrope's "Days of Deer-Stalking;" in Wilson's "Voyage Round Scotland;" and in the "Statistical Account of Scotland," by the Parish Ministers.

The number of Mammals found in Sutherlandshire is not great, but several of them are interesting as being now rare or extinct in the more cultivated regions of Britain. The noble Stag still wanders over glen and corrie; the fierce Wild Cat and the beautiful Marten lurk in the birch-woods; the Fox and Badger find safe retreats in the cairns and rocks of the bare hill-sides, and the lithsome Otter pursues its prey alike in the sea, lochs, and rivers.

But if the existing fauna of the county is of interest to the naturalist, that which has passed away is of still greater importance. From pre-historic times we have traces of the Reindeer (*Cervus tarandus*), and the Beaver (*Castor fiber*), remains of which have been found in various parts of Sutherlandshire and Caithness. In Gaelic tradition legends of the Wild Boar (*Sus scrofa*) still survive and have given name to several localities in the county, as Aultnatorre—"the Burn of the Boar"—near Ben Loyal. But the Wolf (*Canis lupus*), lingered very much longer than any of these others, and it appears to be certain that the species existed in

Scotland at a much later date than is usually believed.* According to tradition they were once so numerous that the natives of the west coast buried their dead on the island of Handa to avoid the ghoul-like ravages of the Wolves (Voyage Round Scotl., p. 347), and as we have already mentioned, Sir R. Gordon speaks of them as still existing in 1630. Mr Scrope collected traditional accounts of four old Wolves and several whelps, which were all killed about the same time, but at different places, between the year 1690 and 1700. The localities named are at Achumore, Assynt, Halladale, and Glen-Loth, the last-mentioned individual having been the veritable "last Wolf" of the county. The story goes that a man named Polson and his son discovered the den and were destroying the cubs, when the dam returned and came to the rescue, but after a desperate struggle, in the description of which there appear to be some touches of the mythical, they dispatched her with their dirks. "These," concludes Mr Scrope, "were the last Wolves killed in Sutherlandshire, and the den was between Craig-Rhadich and Craig-Voakie, by the narrow Glen of Loth." (Days of Deer-Stalking, pp. 374-7).

The Reptiles of Sutherlandshire are more numerous than might have been expected, almost all the well-ascertained Scotch species having been observed in the county.

PART I.—MAMMALS.

COMMON BAT.

VESPERUGO PIPISTRELLUS (*Geoffroy*).

Although abundant in many parts of the Highlands, this is far from being a common species in Sutherlandshire. In the west of the county, a careful observer assured us that he had seen only

* We may observe that there is little doubt that the story of the "last Wolf in Scotland" having been killed in 1680 by Locheil is an error which originated in a mistake of Pennant's; Locheil's Wolf was the last in Lochaber, but the brutes lingered much later in other districts. The Brothers Stuart, in their "Lays of the Deer-forest," have collected many Gaelic traditions on the subject, and have shown that probably the real "last Wolf" was one killed so late as about the year 1743, by M'Queen of Pall-a-chrocaïn, between that place and Fi-Gintha, in Strathdearn. M'Queen lived till 1796, so that the tradition has not passed through many hands.

two Bats within the last twenty years; in the east we have observed one or two at Bonar and Loch Migdale. As far as we are aware, no other species has been recorded from the county.

MOLE.

TALPA EUROPAEA, Linnaeus.

As in other parts of the north of Scotland, the Mole appears to be increasing in Sutherlandshire. In 1843 it was very rare in the parish of Durness, and only to be met with on the western side of Loch Hope (Old Statistical Acct., p. 88). In Assynt it is now quite plentiful in low-lying ground and valleys, where the surface is cultivated; in some of the pastures great numbers of old mole-hills may be seen overgrown with grass, making the whole surface of the fields rough and uneven. In Sutherlandshire this animal is never found at any considerable elevation, a fact which must be attributed to the nature of the soil, or rather to the want of soil on the hill sides, for in other localities the Mole ascends mountains to a great height.

Obs. The Hedgehog (*Erinaceus europaeus*) is certainly unknown in the west, and we have been unable to procure positive evidence of its occurrence in any part of the county.

COMMON SHREW.

SOREX VULGARIS, Linnaeus.

Common. It is included in Mr Selby's list under the name of *S. araneus*.

WATER SHREW.

CROSSOPUS FODIENS (Pallas).

Is not uncommon in Sutherlandshire and Caithness. It extends to Orkney. The dark variety, formerly separated as *C. remifer*, does not appear to be found within our limits, although common in many parts of Scotland.

BADGER.

MELES TAXUS (Schreber).

Mr Selby says that in 1834 the Badger was "pretty generally dispersed throughout the midland mountainous part of the county."

Being much persecuted by the gamekeepers, it is now extinct in many districts, but, like other species of so-called "vermin," it finds a safe retreat in the deer-forests, in some of which it is still very abundant.

OTTER.

LUTRA VULGARIS (*Erxleben*).

Found on the inland lochs and rivers, but now much reduced in numbers by the gamekeepers. In the years 1831-4 rewards were paid for no less than 263 head, killed on the Sutherland estates. On streams Otters have favourite stations, where they always halt; these are generally on some little islet or promontory, and are easily recognised by the short bright green grass which soon covers them, caused by the dung of the animal. On the sea-coast Otters are still very plentiful, especially on the north side of Stoir, and at Oederney Island. At the latter place no less than twelve were killed by one man in the winter of 1868-9, one of which had a large white mark on its throat. Mr Selby observes that the Otters found on the coast are said to be smaller in size and lighter in colour than those which frequent fresh water, but this must surely be an error, as the very reverse has been observed both in Shetland and Ireland (Bell, *British Quadrupeds*, 2d ed., pp. 158-9).

POLECAT OR FOUMART.

MUSTELLA PUTORIUS, *Linnaeus*.

Mr Selby notices the Polecat as being "common upon the banks of the rivers, margins of lakes, etc.;" it is still not unfrequent throughout the county, in spite of constant persecution, and is especially plentiful on the west coast at Stoir.

STOAT OR ERMINE.

MUSTELA ERMINEA, *Linnaeus*.

Very plentiful, and ascends the hills to a considerable elevation.

COMMON WEASEL.

MUSTELA VULGARIS, *Linnaeus*.

As is usually the case throughout Scotland, this species is not

so abundant in Sutherlandshire as the last. It frequents peat-stacks, out-houses, etc., and does not go so far up the hills as the Stoat.

YELLOW-BREASTED MARTIN.

MARTES ABIETUM, Fleming.

This very beautiful animal is still far from uncommon in the birch woods which adorn the shores of some of the Sutherlandshire lochs, and the late Mr St. John mentions his having frequently shot it with a rifle on tall pine trees—probably at Rosehall. We examined the skins of twelve, all killed by one keeper in the Assynt district in the winter of 1868-9. The keepers receive a reward of 2s 6d per head, and the skins are worth from seven to ten shillings.

Obs. Mr Selby appears to have been doubtful as to the identity of the Sutherlandshire Marten, entering it in his list as "*M. fagorum* aut *abietum*." We have not only never met with the white-breasted species (*M. foinea*) in Sutherlandshire, but have never ourselves seen a single authentic British-killed specimen.

WILD CAT.

FELIS CATUS, Linnaeus.

The formidable-looking Wild Cat is not unfrequent in Sutherlandshire in suitable places. In its choice of a home it much resembles the Marten, principally frequenting the birch woods, but sometimes it takes up its abode in cairns of stones, or amongst loose rocks on the open hill side. Now and then it is driven by hunger to approach human dwellings, where it works sad havoc among the poultry, etc.; a few winters ago two were caught in the garden of a farm-house in Assynt, but such occurrences are very uncommon. Usually the Wild Cat will not turn on a man or dog, unless when disturbed with its young, or when hard pressed at a distance from any safe retreat. In such a case, however, it is by no means a contemptible enemy. Mr St. John, in his "Wild Sports," relates that when fishing in Sutherlandshire, accompanied by three terriers, he started a Wild Cat, which the dogs brought to bay amongst some rocks; having cut a stout cudgel, he was proceeding to dislodge her, when she sprang full

at his face over the dogs' heads, and had he not succeeded in striking her down in mid air, she would probably have inflicted severe wounds.

FOX.

VULPES VULGARIS, Fleming.

Very plentiful, and, as in other parts of the Highlands, attains a large size. Mr Selby observes that in Sutherlandshire Foxes, the "tag" or tip of the brush is black, and not white as usual; this, however, is a very variable character, and a cub from this county in our collection has the "tag" pure white. The Fox frequents the open hills, his "den" (as it is locally called) being often at a great elevation. Many are killed by the gamekeepers, who receive £1 for an old dog, £2 for a vixen, and 10s each for cubs. Between March 1831 and March 1834 rewards were paid for 239 Foxes killed on the Sutherland estates. The keepers usually place their traps in a soft marshy spot; this is done, they say, to prevent the Fox biting off the imprisoned limb, for in his struggles he at once lairs himself in the marsh and sticks firm and fast. Besides the keepers, there are professional "Fox-hunters," who are joined by the shepherds and ghillies, and conduct the chase in the same manner as Sir Walter Scott has so well described in "Guy Mannering." More than one Sutherlandshire keeper has assured us that if a "den" be disturbed, the vixen will take away her cubs, carrying them off one by one, and depositing each in a separate place of safety. One very trustworthy observer states that early one morning he observed a Fox coming towards him carrying a young one in her mouth; when she noticed him she dropt the cub and uttered a most wild and startling cry. He fired, but the distance was too great, and the vixen, picking up her burden and bounding down the hill side, was soon out of sight.

COMMON SEAL.

PHOCA VITULINA, Linnaeus.

Seals are abundant on many parts of the coast, particularly in the great caves of the north, and at Ealan-nan-Roan ("The island of Seals"), near Tongue. Another great resort of the species is Souliskerry, north of Cape Wrath, which is annually visited by

parties of fishermen from Durness and the Lews, who kill great numbers; there is a small pool or loch among the rocks which the Seals frequent, and by cutting off their retreat to the sea the fishermen are able to despatch them with heavy clubs.

Obs. A very large Seal, which has been reported to us as sometimes occurring on the west coast of Sutherlandshire, is in all probability the Grey Seal (*Halicherus gryphus*), which is very abundant in some parts of the Hebrides. Other species probably visit the Scotch coasts, but the subject has not hitherto received the attention it deserves.

CETACEANS.

We regret that we have not materials for a list of this order. The Porpoise (*Phocoena communis*) and the Pilot Whale (*Globicephalus melas*) certainly visit the coast, but many other species must have been overlooked. From the adjoining counties of Ross and Caithness several rare Cetaceans have been recorded, as the Sperm Whale (*Physeter macrocephalus*), the White Whale (*Delphinapterus leucas*), etc., etc. (*Cf.*, Bell, British Quadrupeds, 2d ed., pp. 381-474).

SQUIRREL.

SCIURUS VULGARIS, *Linnaeus*.

As already noted, "Skuyrells" are included in Sir R. Gordon's list of Sutherlandshire animals in the seventeenth century. Subsequently they appear to have become extinct, owing doubtless to the destruction of the remains of the ancient pine woods. Of late years, however, Squirrels have been spreading fast throughout the North Highlands, and we are informed by Thomas Mackenzie, Esq., Dornoch Castle, that they re-established themselves in the south-east of the country about the year 1869, and are rapidly becoming numerous. They are still quite unknown in the north and west.

WOOD MOUSE.

MUS SYLVATICUS, *Linnaeus*.

We have not noticed this species ourselves, but it is mentioned by Mr Selby as being common.

HOUSE MOUSE.

MUS MUSCULUS, *Linnaeus*.

“Ye lyttel vulgar Mouse” is of course common about houses and farm-yards.

BROWN RAT.

MUS DECUMANUS, *Pallas*.

Rats are rather rare in inland districts, while nearer the coast they are very plentiful. Of late years they have become exceedingly abundant on Handa and the Badcall islands, off the west coast, where they feed much on the eggs of the sea-birds; at Handa they have almost banished the Puffins from the island.

Obs. We have not been able to hear anything of the Black Rat (*M. rattus*), in Sutherlandshire, nor does Mr Selby mention it. Probably it was formerly found near the coast, but is now either extinct or almost so.

WATER-VOLE.

ARVICOLA AMPHIBIUS (*Linnaeus*).

Of the “Water Rat” Mr Selby observes that it is “common upon many of the slower-running streams and on the islands of the various lochs. The black variety (at first supposed to be a distinct species), is met with about the head of Loch Naver, and a large colony of the same inhabits a low sandy island on Loch Laighal.” This black race is also abundant in Assynt, and, we believe, in various other parts of the county.

COMMON FIELD-VOLE.

ARVICOLA AGRESTIS (*Linnaeus*).

Common; we have observed it in the caverns of the limestone rocks of Assynt.

Obs. The Red Field-Vole (*A. glareolus*), has not hitherto been recorded from Sutherlandshire, but from what we have observed of its distribution in other parts of Scotland, we think that it will probably be found in some districts. It seems to be a widely-spread but rather local species.



MOUNTAIN HARE.

LEPUS VARIABILIS, Pallas.

Both the "Blue Hare" and the next species appear to be decreasing in numbers throughout west Sutherlandshire, a fact which we cannot explain in any way. In Assynt the Mountain Hare is now too scarce to be valued or preserved as game, but is often killed by the gamekeepers to bait their traps with. Mr Selby observes that it descends to the low grounds on the borders of Loch Shin, and elsewhere.

COMMON HARE.

LEPUS EUROPAEUS, Pallas.

Mr Selby says that in 1834 this species was "common in the lower lands and the limestone district about Inchnadamph." It is now extremely rare, not only at Inchnadamph, but throughout west Sutherlandshire. We have only seen two examples in Assynt, and these on the same day. It is locally known as the "Red Hare."

RABBIT.

LEPUS CUNICULUS, Linnaeus.

Although very common in the east of the county, Rabbits are scarce in the west and north, except on some of the islands and in other suitable places. On Ealan-nan-Gaeil ("The Island of Strangers,") at the entrance of Tongue Bay, they abound, whence its English name of "Rabbit Island." They have recently been introduced into Handa, and are now very numerous there.

RED-DEER.

CERVUS ELAPHUS, Linnaeus.

As is well-known, Sutherlandshire is a stronghold of this princely species, for whose special behoof wide tracts of country have been set apart from the earliest times. Of these the principal are the Dirrie-chatt, extending from the centre of the county to the borders of Caithness, and the Dirrie-more or Reay Forest in the west. Of the latter Sir Robert Gordon says "In the *Dirimore* ther is a hill called *Arkill*; all the deir that ar bred therein or hant within the

bounds of that hill, have forked tails, thrie inches long, whereby they are easilie known and decerned from all other deir." We have never ourselves heard of these forked-tailed Deer, nor are they mentioned in Mr Scrope's work. Before the introduction of fire-arms Deer were killed in various ways; sometimes they were entrapped in enclosures called *Garru-na-bhin* or "deer-dykes," at others whole herds were driven over the cliffs into the sea. Thirty or forty years ago the number of Red-deer in the Sutherlandshire forests was estimated at about fifteen hundred head, and they are probably much more numerous now. They seldom, however, carry very fine heads, a fact which is attributed, in some of the forests at least, to over-stocking and to inter-breeding. To remedy this last defect, it has been proposed to introduce fresh blood from a distance, an experiment which has been tried with the best effect in the Long Island. Like the rest of the family, the Stag is a strong swimmer, and often visits the islands on the larger lochs, especially when about to cast its antlers, a season at which instinct prompts it to seek solitude and retirement.

ROE-DEER.

CAPREOLUS CAPREA, Gray.

Of late years Roe-deer have been much increased in numbers by preservation and the extension of plantations; they now abound in suitable localities, as at Dunrobin, Rosehall, Lochinver, Tongue, etc. Sometimes they will cross great tracts of open moorland country on their way from one favoured resort to another. An experienced gamekeeper told us, that once on the bare slopes of Canispe he saw three Roe-deer, two Red-deer, and a pair of Golden Eagles all in sight at the same time.

PART II.—REPTILES AND AMPHIBIANS.

COMMON LIZARD.

ZOOTACA VIVIPARA (Jacquin).

Not uncommon, especially on the moors between Aultnacealgach and Loch Urigil.

SLOW-WORM.

ANGUIS FRAGILIS, Linnæus.

In the west, the Slow-worm is not uncommon, especially about

Scowrie, where we have more than once seen it on the public road; we have also observed it near Loch Cairnbawn. This appears to be an extremely local species in Scotland.

ADDER OR VIPER.

PELIAS BERUS (Linnaeus).

The Adder is abundant in some parts of Sutherlandshire, and very rare in others; in Assynt, for example, it is almost unknown. The natives assert that this species has a particular dislike to limestone districts, but this is certainly not observed in other parts of Scotland. Adders are said to be especially plentiful on Coul-more and Coul-beg, and in west Cromarty generally.

FROG.

RANA TEMPORARIA, Linnaeus.

Very common; we have found both this and the next species in clear stony streams at a very considerable elevation.

TOAD.

BUFO VULGARIS, Laurent.

As already observed, the Toad goes far up the clear mountain burns, where it usually appears to be small in size and very brightly coloured.

ROUGH NEWT.

TRITON CRISTATUS, Laurent.

Not uncommon; we have noticed it near Loch Assynt, and the late Mr John Wolley says, that a large "Lizard" which was reported to him as inhabiting Mondale, in Sutherlandshire, seemed on further investigation to belong to this species. ("Zoologist," 1850, p. 2709).

SMOOTH NEWT.

TRITON TAENIATUS (Schneider).

Not uncommon.

PALMATED NEWT.

TRITON PALMIPES (Latreille).

This species, which occurs in various parts of Scotland, was

found in this county by the late Mr Wolley, who writes in the "Zoologist" (1848, p. 2265):—"I have to report the existence of our recently ascertained Newt in the extreme north of the island. On the 1st of August I found several females and one male in a little fresh-water peaty pool, a few hundred yards from the high-water mark, on the side of the hills which rise from Loch Eriboll, and on the west side of the loch. It is an inlet of the sea, about sixteen miles to the east of Cape Wrath, on the north coast of Sutherlandshire." We are not aware of the species having been found in any other part of the North Highlands.

The Librarian announced the following donations to the Library:—The Practical Naturalist's Guide, by James Boyd Davies, 1858; Hand-Book of Field Botany, by William F. Steele, A.B., M.B., 1851; from Mr Walter Galt.

SPECIAL MEETING.

NATURAL HISTORY CLASS ROOM, GLASGOW UNIVERSITY.

FEBRUARY 21ST, 1871.

Professor John Young, M.D., F.G.S., President, in the chair.

SPECIMENS EXHIBITED.

Dr Young exhibited a number of recent additions to the Hunterian Museum, including I. A collection of shells from Hong Kong; II. Specimens of the Wart Hog, *Phacochaerus aethiopicus*; III. The Common Wolf, and other skins, recently mounted by Mr Francis M'Culloch, Taxidermist, Sauchiehall Street; and IV. A collection of Kiltorechan fossils. Dr Young remarked that the manipulation of the skins showed more than ordinary skill, as every bone had been extracted from the specimens for the purpose of making skeletons.

Mr Edward R. Alston, F.Z.S., exhibited the skull of the Pilot Whale (*Globicephalus melas*), from the Frith of Forth, and made some observations on the occurrence of the species on the coasts of Scotland.

Mr Robert Gray exhibited specimens of the common Wild

Swan (*Cygnus ferus*), and Bewick's Swan (*C. bewickii*), got last month, the former in Renfrewshire, and the latter in Argyllshire, and lent by Mr Francis M'Culloch. Mr Gray said that a number of Bewick's Swans had occurred this winter in various parts of Scotland, and that he now inclined to the belief that the species was the commonest of all the wild Swans to be found in this country.

Mr John Young, F.G.S., exhibited photographs of ripple-marked sandstone, and unusually large stems of *Lepidodendron* and *Sigillaria*, which had been taken from the adjoining quarries during the progress of the building of the new University.

FEBRUARY 28TH, 1871.

Professor John Young, M.D., F.G.S., President, in the chair.

Messrs Alexander Watson, C.A., and Archibald Robertson, were elected resident members.

SPECIMEN EXHIBITED.

Dr Dewar exhibited an egg of the Brush Turkey (*Talegalla lathami*), which was laid in the Zoological Society's Gardens, London, and made some remarks on the habits of the bird, and the extraordinary manner in which its eggs are hatched. The Brush Turkey is a large rasorial bird of gregarious habits, and is found in Australia. It does not incubate its eggs, but deposits them in mounds of decaying vegetable matter, the further decomposition of which raises sufficient heat to hatch the young ones. These mounds, which are formed by the united efforts of two or three pairs of birds, are sometimes of great size, three or four cartloads being heaped up in the form of a pyramid. The eggs are buried to a depth of an arm's length, and are invariably placed with the large end upwards. The young birds are said to be able to use their wings on the day they are hatched.

PAPERS READ.

I.—*On an Ancient River Course at Auchinlea, Parish of Shotts. With a Plate.* By Mr JAMES S. DIXON.

My attention was first directed to the ancient river course which forms the subject of these remarks about the end of the year 1865.

In the course of working the main coal seam of the Lanarkshire coal series by the Midhill Pit, the workings were interrupted by what the miners thought a rather novel dislocation, as it was composed of water-worn stones and sand, which indicated a slip of an unusual type. As the workings were then within a short distance of the boundary of the property, nothing was done to prove its actual nature or extent for upwards of a year, when a short exploring drift was driven into it at a point eastward of where it was first touched. This clearly showed it to be the bed of an ancient river, which had washed away the coal and adjoining strata, leaving in their place a deposit of sand, gravel, and stones. I exhibit a plan of the district, on which the river course, as far as explored, is laid down. At the time I have spoken of, the coal had not been begun to be worked to the south, between the supposed line of the river course and the two large upthrow slips which bound the field to the south and west. Two pits have since then been sunk, the workings of which have laid bare the south side of the channel, and two drifts have been driven through it at different points, which throw considerable light on the subject.

Fig. 1 is a cross section, shewing the manner in which the channel intersected the strata at point D, where it was cut through by drift No. 1, which was similar to that seen in the short drift first mentioned. In these cases the floor of the drifts were still in the channel, so that nothing could be said as to its probable depth. This was clearly defined by drift No. 2, which passes immediately under the bed of the ancient river, as shewn in section by Fig. No. 2, as well as by a bore recently put down, at point A on plan. The depth of the bottom of the bed from the surface, at point B, where drift No. 2 intersects it, is about 130 feet, and at point A 114 feet. This latter depth, I think, cannot be in the centre of the channel. The reason of the different manner in which the channel intersects the coal at

points D and B is that the strata dip from D towards B, and the river course is apparently nearly level; the coal, therefore, gradually dips under it, till, at a short distance below B, the channel will be altogether lost sight of in the main coal seam. This is proved to be the case by the bore at A, where there are $25\frac{1}{2}$ feet of undisturbed strata on the top of the coal; of course the reverse of this takes place towards the rise, as in that direction the channel cuts deeper and deeper into the strata. That it continues at about the same depth and manner in that direction is shewn by the water-worn pieces of trap which are abundantly distributed, some having been washed from the district to the rise, where the river crossed the position of the splint coal, about 12 fathoms below the main seam, and which is occupied by an intrusive mass of trap.

I exhibit specimens of these, taken from the channel in the drifts, and from the outcrop of the bed of trap referred to, and some of them seem to be identical, others appear to be different, and of an amygdaloidal structure; I also show other specimens got in the drifts, to indicate the composition of the bed, all water-worn, and consisting of various kinds of rock, such as sandstone, quartz, ironstone, etc. From the worn appearance of the harder stones, some of which are of considerable size, and from the comparative scarcity of large boulders of sandstone, shales, and the softer rocks, and from the great quantities of fine sand which is often deposited in circles, as if by eddies, the conclusion, I think, can be drawn, that the stream at the bottom level of the channel, where cut by the drifts, ran with considerable velocity, and that its existence as a river must have been of long duration, from the depth, about 83 feet, which it had penetrated into the solid rock, which, in a bore, at C on plan, is within 48 feet of the surface, although this bore seems still to be within the confines of the river bed.

During the formation of a deep cutting on the Cleland and Midcalder Railway, and in the adjoining coal workings, a similar channel was met with, which there can be no doubt is a continuation of, or branch from the one described. The direction in which the trap has been carried by the current shows that the river flowed from east to west. This corresponds to the contour of the present surface, which falls rapidly in that direction. At the points where it has been cut and bared on both sides, the channel varies from 160 feet to 300 feet wide, so that

the volume of the river, if filled from bank to bank, must have been considerable; the average width, about 200 feet, being as wide as the Clyde at Glasgow Green. On the surface there is no appearance whatever to indicate that such a channel exists, as it is all uniformly covered by the boulder clay, which is cut into to the depth of about 20 feet by the railway to Landridge, almost immediately over where the channel is intersected by the drifts alluded to. In the section of the bore at A on plan, this clay occupies the first 60 feet, and in that at C the first 37 feet.

From all these circumstances conclusions may be drawn as to the age and history of this river. The composition of the lowest layer as cut through in the drift, and the depth to which the water had worn away the rocks, point to a long continuation of a rapid current, which ultimately flowed through a gorge with sloping sides, about 80 or 100 feet below the level of the surrounding country. Taking the bore at A for our data, the correctness of which I before explained is fully borne out by what is seen in the coal workings which strip the channel to the rise; this rapid current is indicated by 3 feet of sand and gravel 110 feet from the surface. At this period the land appears to have begun to sink, and a turbid stream with slower current has been the result; from this the finely stratified, somewhat siliceous, mud has been deposited to a thickness of 17 feet, which shows a still gradual sinking. This is succeeded by 33 feet of sand and gravel, during the deposition of which the water has been comparatively clear, although not necessarily of quicker current, and from its great thickness the subsidence still seems to have continued. When this had been finished, the point at which the changes which ushered in the boulder clay had arrived. During its deposition the whole surrounding country assumed a somewhat uniform undulating surface, and the gorge, in which the river had flowed, was filled up, having received 23 feet greater depth of clay at A than at C.

The bottom of the channel, where cut through, is about 300 feet above the present bed of the Clyde, at the point where it would intersect it if continued in the same course as it seems to be keeping; and the distance is about $3\frac{1}{2}$ miles. To gain that level it must have flowed at an inclination of about 1 in 50, which would give a current of great rapidity, or it may have gone over one or more falls. A stream of such magnitude flowing so near

the present position of the Clyde, and at such a height above it, shews that the configuration of the valley was then very different from that which it at present assumes.

II.—*Sketch of the Coalfields in the Neighbourhood of Irvine.*

By Mr ADAM SUTHERLAND, Corresponding Member.

Mr Sutherland described the peculiarities of the Bogside parrot coal, presently used for the manufacture of paraffin, its oily character diminishing towards the east. He also dwelt on the burning of the coal seams by floating whin, and applied Tyndall's spectrum experiments to show that the blind coal of Irvine, "which produces an intense white, dissipates in obscure heat-giving rays an energy at least double that of ordinary household coal."

The Librarian announced the following donation to the Library:—Proceedings of the Berwickshire Naturalists' Club, 1870; from the Society.

MARCH 28TH, 1871.

Professor Alexander Dickson, M.D., in the chair.

SPECIMENS EXHIBITED.

Mr Thomas Chapman exhibited a small collection of insects recently brought from Port Natal by Mr William Dale. This collection embraced a few interesting forms, including a male and female of *Charaxes ethalion*—a somewhat rare species not often met with in even well-furnished cabinets; also the well-known Death's-head Moth (*Acherontia atropos*) and Painted lady Butterfly (*Pyrameis cardui*), the latter possessing additional interest from the fact of its having now been detected in almost every quarter of the globe. It has been found throughout Europe, Asia, Africa, Australia, and New Zealand; also in America, from Hudson's Bay to Venezuela. Specimens have been likewise brought from the following islands, which are very far apart:—Teneriffe, St Helena, Madagascar, and the Sandwich Islands.

Mr John Young, F.G.S., exhibited a specimen of Carboniferous shale from the roof of one of the upper coal seams in Springhill Pit, near Baillieston, showing a portion of the stem of a Calamite with attached slender branches of a plant with numerous whorled

leaves, formerly regarded by botanists as belonging to *Asterophyllites* or *Annularia*. Mr Young stated that the remains of Calamites were abundant in the roof shales of many localities in the Lanarkshire coalfield, but that it rarely happened that any of the foliage of the plant was found attached to the stems; the specimen exhibited being the only example he had ever met with, although examples had been found elsewhere in British Carboniferous strata. Mr Young next referred to the class of plants to which the extinct family of the Calamites were most nearly related, viz., the recent *Equisetaceae*, or Horse-tails, found in our marshes, of which the fossil Calamites were the gigantic progenitors. Recent discoveries of the stems of Calamites in the coal measures, with portions of the foliage attached, have proved that the plants with whorled leaves, formerly referred to the genera *Asterophyllites*, *Annularia*, and *Sphenophyllum*, were the foliage of various species of Calamites, and that the genera *Volkmania* and *Pinnularia* of which he exhibited specimens, were their fruits and roots—these facts being established on the evidence of the more perfect specimens found, and the better knowledge now obtained of the relation and affinities of the plants of our coal measures.

Professor Dickson exhibited specimens illustrating some of the principal spirals found in Fir Cones. He stated that in these, as in the higher plants generally, the spiral arrangements fall under one or other of the terms of the series of fractions $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{5}$, $\frac{3}{8}$, etc. Exceptional cases, however, are met with not very unfrequently, where, either what are termed conjugate spirals (*i.e.*, two or more parallel spirals resulting from opposite or whorled leaves or scales) occur, or where there is a single spiral not belonging to the normal series. For example, in the common Spruce Fir about 95 per cent. of the cones exhibit an $\frac{8}{21}$ arrangement—a spiral belonging to the ordinary system: the remaining 5 per cent. being exceptional, and consisting sometimes of a bijugate spiral, where the angular divergence in each of the two parallel spirals is $\frac{8}{21 \times 2}$, ($=\frac{4}{21}$) of the circumference; sometimes of a $\frac{5}{18}$ spiral, a term of the series $\frac{1}{3}$, $\frac{1}{4}$, $\frac{2}{7}$, $\frac{3}{11}$, $\frac{5}{18}$, etc.; and more rarely of a trijugate spiral, where the divergences of each of the three parallel spirals $=\frac{5}{13 \times 3}$, $=\frac{5}{39}$. The per centage of abnormalities seems to vary to some extent with the individual tree,—and is higher in some species than in others—thus, in *Pinus pinaster* at any

rate, 8 per cent. are exceptional, while out of 200 cones of *Abies Douglasii*, Dr Dickson only obtained one abnormality, namely, a cone with a bijugate arrangement, $= \frac{2}{5 \times 2} = \frac{1}{5}$. Spirals belonging to other and rarer series occasionally occur in Fir Cones, but those above mentioned are the commonest.

The Librarian announced the following donation to the Library:—Transactions and Journal of the Proceedings of the Dumfriesshire and Galloway Natural History and Antiquarian Society, 1867–68; from the Society.

APRIL 25TH, 1871.

Professor John Young, M.D., F.G.S., President, in the chair.

Mr James Graham, Girvan, was elected a resident member, and Mr George Thomson, West Africa, a corresponding member.

Before proceeding with the other business of the meeting, the Chairman adverted to the resignation of the secretaryship by Mr Robert Gray, who had filled that office for a long period of years, and remarked that in electing a successor the Society could not expect to secure the services of a gentleman better qualified to discharge the duties of the office than Mr Gray. He could only hope that the new secretary would maintain the Society's widespread connection which had of late years been opened up. After some remarks by Mr Hutcheson, the meeting resolved to appoint Mr Robert Mason as secretary, and, on the motion of Professor Young, it was unanimously agreed to record in the Society's minutes a cordial vote of thanks to Mr Gray, and an expression of general regret that he had found it necessary to discontinue his valuable services.

SPECIMENS EXHIBITED.

The Chairman then exhibited and made some remarks on the uterus of a species of *Hyrax*, which had been presented to the Hunterian Museum by Mr William Dale; also a species of Cuttlefish, and the lower jaw of a small Shark—both from South Australia—which had been forwarded for exhibition by Mr John Kirsop, Queen's Crescent.

Mr Chapman exhibited and made some remarks upon a fine specimen of a very rare butterfly, *Papilio zalmoxis*—from Central Africa—a species which was figured for the first time by Mr Hewitson in 1864; also a series of specimens of *Melanippe hastata*, bred last month from caterpillars found in August near Gareloch-head. Mr Chapman remarked that though entomological authors had recorded that the caterpillar of this moth is gregarious and feeds on the common birch, he had taken it while feeding on *Myrica Gale*, and always found it singly, not in groups.

PAPERS READ.

I.—*Remarks on the Great Grey Shrike (Lanius excubitor), and Northern Shrike (L. borealis), with illustrative specimens.*

By MR ROBERT GRAY.

The author of this paper remarked that out of nearly thirty Grey Shrikes killed in Scotland that had come under his observation, only one could be regarded, when subjected to the test of recent descriptions published by Messrs Sharpe and Dresser, in the Proceedings of the Zoological Society of London, as a perfect adult bird. It possessed a double bar on the wing, and was totally free from vermicular markings on the under surface—two of the alleged characteristic distinctions of the true *Lanius excubitor*. The others, however, had but one wing spot, and were more or less marked with transverse vermiculations, one in particular, killed in Ayrshire, bearing so strong a general resemblance to the adult female of the true *L. borealis* of North America, as to be almost identical.

Looking, therefore, to the fact that nearly all the Shrikes which visit Scotland are strongly marked on the under surface, it would appear that either the descriptions of Messrs Sharpe and Dresser are defective, or these Scottish migrants must be referred to a race or variety between the two species in question, existing somewhere to the east and north-east of Britain. Mr Gray further remarked that in the distribution of markings of the tail feathers scarcely two of his specimens were alike, and that even in apparently old birds no outward trace of a second bar on the wing could be found, showing that this feature is not the result of age.

II.—*Remarks on the simpler Spirals in the Phyllotaxy of Vegetables.*
By Mr JAMES RAMSAY.

This paper was illustrated by a highly ingenious though simple model, constructed by Mr Ramsay, and showing the arrangement of the spirals in a manner at once intelligible and interesting.

SPECIAL MEETING.

NATURAL HISTORY CLASS ROOM, GLASGOW UNIVERSITY.

MAY 15TH, 1871.

Professor John Young, M.D., F.G.S., President, in the chair.

Several recent additions to the Museum were placed in the room, including a suite of North American shells, the gift of the Natural History Society of Portland, U.S.

SPECIMENS EXHIBITED.

Mr David Robertson, F.G.S., shewed a large series of slides containing Foraminifera and Ostracoda obtained from dredgings in the Chinese Seas, presented by Mr Henry Dunbar.

The Chairman exhibited a series of about fifty rock specimens lately presented to the Museum by Mr James Thomson, F.G.S., illustrating the composition of the conglomerate beds which he had found in the schists of Islay.

Dr Young also showed and commented on a suite of specimens which had been kindly lent him for the occasion by Mr Thomas Gray. The collection was intended to illustrate the parallel forms which are found in genera of shells of various degrees of affinity, and in particular the very close similarity of form presented by pulmonate and branchiate families of Gasteropods. Thus among the Snails, *Trochus*, *Solarium*, etc., are closely simulated; and it was farther noticed that this simulation was especially observed in species inhabiting the Eastern Archipelago. The genus *Melania* was also shown to contain forms characteristic of seven distinct genera, chiefly of marine Gasteropods, and this furnished an analogous case to that of the Marsupials of Australia, which embraced representatives in four of the great groups of Mammals found in other parts of the world.

Mr John Young, F.G.S., exhibited some microscopic preparations of the shell of *Estheria punctatella* (Jones), a new species of a large Phyllopod Crustacean, found by him in the upper shales of Arden quarry, Thornliebank, and which has since been discovered by Mr James Thomson, F.G.S., at the Linn Spout, near Dalry, where they crowd the surfaces of certain shell beds on the same geological horizon as those in the Thornliebank district. Preparations of the shell of this Crustacean, as seen under the microscope, show a beautiful punctate or minute honeycomb style of ornamentation, by which this species is distinguished from other forms of Carboniferous *Estheria*, as well as from the shells of certain bivalve molluscs which it resembles, and with which it is liable to be confounded.

MAY 30TH, 1871.

Mr Thomas Chapman in the chair.

The following gentlemen were elected members:—Mr John Kirsop and Mr James Park as resident members; Mr Alexander Gray, Banker, Batavia, as a corresponding member.

SPECIMENS EXHIBITED.

Mr James Coutts exhibited, with remarks, two moths, *Bunoea alcinoe* and *Gynanasa isis*, both from Natal.

Mr Charles Eadie exhibited two fine specimens of a fossil fish, the Little Capelin, *Mallotus villosus* (?), from Canada. These specimens, which Mr Eadie had presented to the Hunterian Museum, were described by Mr John Young, F.G.S., who stated that the fishes are found enclosed in nodules of clay, and are interesting as belonging to a species that is supposed to be still living in northern seas. They have also been found embedded in clay deposits in Greenland, the nodules in which they are enclosed being formed by the decay of the soft parts of the fish hardening the surrounding clay.

Mr Young exhibited, with remarks, a very finely-preserved fin spine of a fossil Carboniferous fish, *Leptacanthus Jenkinsoni* (M'Coy), which was obtained from the clayband ironstone in the Carboniferous limestone series at High Blantyre. Mr Young stated that, so

far as he was aware, this was the first instance in which the genus *Leptacanthus* had been recorded from Scottish Carboniferous strata, and afterwards pointed out the characters by which it is distinguished from the nearly allied genera *Ctenacanthus* and *Homocanthus*. In this specimen a portion of the base of the spine was wanting, but when perfect it probably measures about eight inches in length. Mr Young expressed himself indebted for the specimen to the Rev. Dr Gloag, one of the Society's corresponding members, who had obtained it from a workman in one of the pits at High Blantyre.

PAPERS READ.

I.—*The Birds Frequenting Possil Marsh.* By Mr JAMES S. DIXON.

Possil marsh, situated about $2\frac{1}{2}$ miles north of this city, has always been a favourite resort of many species of birds, but from the encroachments that are yearly made upon its area, and still more from the increasing population in its vicinity, through the establishment of numerous public works, it is being gradually deserted by the more shy species, and I am afraid the more pertinacious ones will also soon be driven off. In these circumstances, it is well to put on record the species now frequenting this locality, and also to mention those rarer birds which have within the last few years been known to pay it a passing visit, the attractions of the place proving strong for every wading or marsh-loving bird.

I have been in the habit of making oological expeditions to Possil marsh during each spring and summer for the last seven or eight years, and during the rest of the year I have paid occasional visits, in the hopes of seeing some of the rarer stragglers.

Of the birds of prey the Kestrel (*Falco tinnunculus*) may be seen daily hovering over the drier parts of the marsh, and I have occasionally noticed the Merlin (*F. aesalon*). The Sparrow-hawk (*Accipiter nisus*) is also a constant visitor. These birds seem to be attracted by the large number of Jack and Common Snipes, and smaller birds, on which they prey.

Of the Swallows great numbers of the two common species, *Hirundo rustica* and *H. urbica*, roost during the autumn on the branches of the willows and other shrubs which grow in parts of the marsh. They, together with numerous other land birds to

be hereafter mentioned, probably from a sense of security through being surrounded by water, resort there in flocks of hundreds to pass the night. The Sand Martin (*H. riparia*) breeds in the banks of the canal, a short distance from the marsh, and hawks for flies over it. The Cuckoo (*Cuculus canorus*) is a constant summer resident, and, I have no doubt, makes use of the numerous Titlarks, which breed in the drier parts, to rear its young.

During the winter of 1864 I several times saw the Kingfisher (*Alcedo ispida*) fishing for Stickle-backs, and darting along the surface of the ditches which intersect and flow from both Possil marsh and the neighbouring Loch Burnie. The Magpie (*Pica caudata*) frequents the marsh, and breeds in the immediate vicinity. The Starling (*Sturnus vulgaris*) is a nightly lodger in the bushes throughout most of the year, but may be seen in hundreds, at dusk, during the autumn, darting from every direction to this common centre of attraction. These birds, having remained quiet for some time, as if by a preconcerted signal, but without apparent cause, will rise in a cloud, and, after a few wheels in the air, will again alight. After spending a short time in a low sort of congratulatory whistling and chattering, they will then settle for the night. The Blackbird (*Turdus merula*), the Song Thrush (*T. musicus*), and the Missel Thrush (*T. viscivorus*), breed in the hedges and plantations on the banks of the marsh; the Fieldfare (*T. pilaris*) and the Redwing (*T. iliacus*) are constant winter habitants. The Stonechat (*Saxicola rubicota*) breeds on the margin of the marsh, and the Wheatear (*S. oenanthe*) is a regular visitor.

The Whitethroat (*Curruca cinerea*) breeds plentifully amongst the rank grass and bushes; the Wood Wren (*Sylvia sylvicola*), the Willow Wren (*S. trochilus*), and the Chiff Chaff (*S. hypotaïs*), are all found breeding in the neighbourhood, or on the banks of the marsh. The Sedge Warbler (*Salicaria phragmitis*) breeds very abundantly, and its merry song is constantly to be heard both during the day and after dark. It frequently repeats the cry of the Coot, Water-hen, Lapwing, or that of any other bird with which it is associated. The Pied Wagtail (*Motacilla yarrellii*), the Grey Wagtail (*M. boarula*), and the Yellow Wagtail (*M. rayi*), resort to the bushes for night quarters, and breed in the immediate vicinity. The Meadow Pipit (*Anthus pratensis*) breeds plentifully in the drier parts, and the Tree Pipit (*A. arboreus*) in the surrounding fields. The Skylark (*Alauda arvensis*) breeds in the drier

parts. The Longtailed Tit (*Parus caudatus*), together with its congeners, the Blue Tit (*P. coeruleus*), and the Cole Tit (*P. ater*), are common, especially during winter. The Yellow Hammer (*Emberiza citrinella*) breeds in the drier parts of the marsh. The Black-headed Bunting (*E. schoeniclus*) is very abundant, the rank rushes and other vegetation proving particularly attractive to it. The Goldfinch (*Carduelis elegans*) is occasionally caught on the banks of the marsh during winter. The Partridge (*Perdix cinerea*) is still to be constantly seen and heard about its margin.

Besides the foregoing there are many other land birds which are common in the neighbourhood, but which cannot be said to frequent the marsh, although they may be seen there by accident, and, therefore, I need not more particularly allude to them. Many sea birds also occasionally alight.

The Golden Plover (*Charadrius pluvialis*) is a winter visitor. The Dotterel (*C. morinellus*) was observed here some few winters since. The Lapwing (*Vanellus cristatus*) breeds regularly on the drier parts. The Black-winged Stilt (*Himantopus melanopterus*) was observed here in 1867, and was vainly run after by all the collectors in the neighbourhood. Mr Gray informs me that Sir William Jardine, in Dumfriesshire, and Mr Angus, in Aberdeenshire, about the same time saw specimens of this rare bird; probably they were all members of a flock which had become scattered. The Greenshank (*Totanus glottis*), in winter plumage, has been shot here within a few years. The Redshank (*T. calidris*) is a regular summer frequenter; but I have never been so fortunate as to find its nest, although, from the clamour the birds make on any one approaching the drier parts of the marsh, there can be little doubt that they breed. The Common Sandpiper (*T. hypoleucus*), although not breeding, is a constant visitor. The Common Snipe (*Scolopax gallinago*) is a constant resident and breeding species. The Jack Snipe (*S. gallinula*) is plentiful during autumn and winter. The Water Rail (*Rallus aquaticus*) bred here to my knowledge in the summer of 1863, and I believe is to be found regularly every season. The Water Hen (*Gallinula chloropus*) is very abundant. I have seen as many as twenty nests in a day. The Coot (*Fulica atra*) is also plentiful. Of the Bittern (*Botaurus stellaris*), a fine specimen was shot in the marsh five or six years ago; it is now, I believe, in Dr Dewar's collection. The Heron (*Ardea cinerea*) is an almost daily visitor during most of the year.

The Wild Duck (*Anas boschas*) is plentiful during the autumn and winter months; and, I understand, bred abundantly here thirty years ago. The Teal (*A. crecca*) is also to be found in small flocks. The Widgeon (*A. penelope*) is an occasional visitor. A specimen of the Shoveller (*A. clypeatu*) was shot here a few winters since, and was stuffed by Mr F. M'Culloch, taxidermist, Glasgow. Mr Gray informs me that a Tufted Duck (*Fuligula cristata*) was obtained at Possil within a few years. The Little Grebe or Dabchick (*Podiceps minor*) is a regular breeding species; its shrill whistle-like cry being quite associated with my visits to the marsh. The nest is composed of the *Anacharis canadensis*, which, introduced about twenty years ago from America, is now a great pest in canals and ponds. The Swan is said to feed freely upon it; so that where these birds are, it may be kept within bounds. A large portion of the bottom of Possil marsh, where solid or firm, is overgrown with this plant. The Little Grebe piles it up among the *Equisetae*, until a sufficient basis is obtained, on which the four white eggs are laid. Some few years ago I found about a dozen nests in one day. That so many escaped the numerous searchers is probably owing to the fact that the bird, however hurriedly it leaves the nest, covers its eggs with the plant referred to. This covering and the nest being very little above the water, and therefore always quite wet, account for the stained appearance of the eggs, when the least incubated. The Little Grebe has also a practice of deeply scratching its eggs with its horny feet. These birds on the approach of danger sink themselves into the water, leaving nothing but their bills exposed; and, should the water not be of sufficient depth for diving, they will not rise till actually kicked by the wader. The Red-Throated Diver (*Colymbus septentrionalis*) has been shot here within a few years.

In conclusion, I have to warn any person who is desirous of investigating this interesting locality to be exceedingly cautious, as in many places the surface is very soft and treacherous, being nothing more than a tangled mass of roots, under which there is a stratum of soft mud of considerable depth, so that should the roots give way it would be exceedingly difficult to extricate oneself.

SESSION 1871-72.

THE TWENTIETH ANNUAL GENERAL MEETING, ANDERSON'S
UNIVERSITY BUILDINGS, SEPTEMBER 26TH, 1871.

Professor John Young, M.D., F.G.S., President, in the chair.

Reports were received from the Treasurer and Librarian; the statement of the former showing a balance in favour of the Society of £41 1s. 2d. The following gentlemen were elected office-bearers for the session:—Professor John Young, M.D., President; Professor Alexander Dickson, M.D., and James Ramsay, Vice-Presidents; Robert Mason, Secretary; Thomas S. Hutcheson, Treasurer; Thomas Chapman, Librarian; Donald Dewar, M.D., James Coutts, William Sinclair, John Alexander, James B. Murdoch, Gavin Miller, Robert Gray, and James S. Dixon, Members of Council.

Mr William Kirkwood was elected a resident member.

SPECIMENS EXHIBITED.

Mr Robert Gray exhibited a specimen of Temminck's Stint, (*Tringa temminckii*), which had been shot near Aberdeen on 4th September, and forwarded by Mr Alexander Mitchell of that city. Another specimen of this rare bird had been obtained about a week previously by Mr Mitchell at the same place, and it seemed probable it would annually be found recurring in limited numbers in Aberdeenshire, where so many rare species have of late years been obtained during the autumn migrations.

Mr Henry A. Rannie exhibited an Albino variety of the Sand Martin, (*Hirundo riparia*), which he had shot at Mill of Boyndie, Banffshire; and Mr Gray laid on the table a pair of Willow Wrens (*Sylvia trochilus*), yellow variety, procured in Aberdeenshire, and forwarded by Mr William C. Angus, corresponding member. These were of a pure canary yellow, with the quills and tail feathers pure white.



ANCIENT RIVER COURSE.



Mr John Young, F.G.S., exhibited several large specimens of *Limnaea stagnalis*, obtained during the summer of the present year at Possil marsh, and stated that, so far as he was aware, this shell had not hitherto been recorded from any locality in the West of Scotland. He believed it must have been introduced into the marsh from some English or Irish locality since the summer of 1867, in which year a diligent search had been made at Possil for fresh-water shells, without leading to the discovery of this species. In the present year, however, it had been found over a great area of the marsh, and Possil is likely therefore to become a station for this fine shell so long as it remains undrained. The specimens exhibited, which were of a considerable size, had spawned freely in an aquarium where they had been placed, and the young shells had attained the length of quarter of an inch.

Mr Young also exhibited some white transparent specimens of *Ancylus lacustris*, which had been bred in the aquarium from the incrustated and dark-coloured specimens found in Possil marsh, and stated his belief that the variety of this shell named *albida*, as well as other colourless and transparent varieties, is produced by the condition of the water in which the molluscs are reared; all shells being more or less covered with a black incrustation where decaying vegetable matter is abundant.

Professor Young then made some remarks on the structure of the wing-bones of birds in relation to their use in flight.

OCTOBER 31ST, 1871.

Professor Young, M.D., F.G.S., President, in the chair.

Messrs Donald W. Dickson and Arthur Okell were elected resident members.

Before proceeding with the business of the meeting, Dr Young adverted to the appearance during the past month of two important contributions to the scientific literature of the West of Scotland by members of the Society, viz.:—Messrs Young and Armstrong's work on Carboniferous fossils, and Mr Robert Gray's volume on the "Birds of the West of Scotland, including the Outer Hebrides," both of which reflected much credit upon the authors, and also upon the Society as a body.

SPECIMENS EXHIBITED.

Mr John Young, F.G.S., laid upon the table a series of fossils from the Silurian rocks of the Girvan valley, and remarked that while looking over the large collection of specimens contained in the cabinet of Mrs Robert Gray, he had observed several interesting fossils which had been collected during the past summer, and which from their rarity and state of preservation, deserved to be placed on record in the Society's Proceedings. The specimens exhibited consisted, first, of a series of shells belonging to the genus *Bellerophon*, of which there were six species, including a large example of *B. dilatatus*, a rare shell in the Girvan strata; second, several well-preserved specimens of *Murchisonia obscura*, *Holopella obsoleta*, and *Scalites angulatus*, genera of shells of which these several species are rare in the above mentioned strata; third, specimens of *Lingula quadrata* (Eichwald), a large species, which Mr Davidson, in his recent work on the Silurian brachiopoda, has identified with that found in Russia, and which Mrs Gray was the first to discover in the Girvan beds; also, specimens of three other brachiopods, *Orthis biforata*, *Rhynchonella salteri*, and *Orthis girvaniensis*; fourth, two species of trilobites, new to her collection, *Acidaspis brightii*, and another identified as belonging to the genus *Eccoptochile*. Mr Young, in concluding his remarks, stated that the cabinet of Silurian fossils at present being formed by Mrs Gray, and which she was enriching from year to year, testified to her great ability, perseverance, and powers of discrimination, and promised ere long to become the most complete collection with which he was acquainted of the early records of past life entombed in the Silurian strata of Western Scotland.

Mr James Thomson, of the Kelvingrove Museum, exhibited two specimens, male and female, of the Hen-Harrier (*Circus cyaneus*), shot last summer in Sutherlandshire, and showing an immature state of plumage while the birds were breeding; also a specimen of the Little Bittern (*Botaurus minutus*), which had been captured in Aberdeenshire in October, 1866. Mr Gray remarked, regarding the last mentioned bird, that it was the second specimen exhibited before the Society, the first having been forwarded about three years ago by the Earl of Haddington, who procured it in East Lothian.

Mr Gray exhibited a specimen of Diard's Pheasant (*Phasianus*

versicolor), which had been shot about a fortnight ago by Mr Gibson, in Dumbartonshire, and kindly lent by that gentleman. This beautiful pheasant has of late years been introduced into various Scottish counties,—Argyllshire, Ayrshire, Stirlingshire, amongst others—and there is reason to believe that its numbers are increasing.

Dr Young made some remarks on a miscellaneous collection of objects from Australia, which had been placed on the table by Mr John Kirsop. It included the jaws of a large shark, in fine condition; the tail of a species of ray, several spiders, centipedes, etc., that had belonged to the late Mr David Russell of Sydney.

The President, Professor Young, proceeded to give his annual address, in the first part of which he drew attention to the geographical distribution of the perennibranchiate amphibians of the present day, of which one genus is European, and five are North American; while of these five one species is also found in Japan, a distribution which suggested comparison and contrast with that of the ganoid fishes. He enumerated the points of relationship to the palaeozoic labyrinthodonts; and, after stating the order of appearance in the geological series of the amphibian and reptilian orders, pointed out the parallelism of the two series, of perennibranchs with cylindrical bodies, *Siren*, *Amphiuma*, *Proteus*; and with depressed bodies, *Menobranthus*, *Axolotl*, *Cryptobranthus*. After pointing out a possible explanation of these facts by successive divergence from common ancestral forms, Dr Young proceeded to the second part of his address, which was mainly an urgent appeal to the Society to agitate as a Society for the improvement and extension of science teaching in the country. While it is evident that a large number find scientific pursuits interesting, few of those who are not naturalists by profession can realise the value of these sciences as educational instruments. After repeating what he had stated on previous occasions—namely, that an attempt to establish, two years ago, physiological demonstrations for teachers and their advanced pupils in the Hunterian Museum had failed, because a large number were too much hampered and exhausted by Government restrictions, Dr Young went on to say, that if these restraints were removed to-morrow, a serious difficulty would still remain, which would prevent the rapid spread of physiological instruction, namely, the deficiency of capable teachers. It is true that in some schools, as the Normal Institutions, the

High School, and Western Academy, special science teachers exist; but the number is small, though the examples are striking, where a teacher has qualified himself to give accurate lessons in geology or biology. To remedy this state of things, a splendid scheme had been organised and carried out at South Kensington, with brilliant success: a scheme of teaching teachers, not cramming them, but forcing them to learn "off their own bat." Every lesson by Professor Huxley, in the use of the microscope, or the dissection of some plant or animal, was repeated by each person at a later hour of the day, under the care and with the assistance of gentlemen admirably qualified for the task. Such a scheme would necessarily involve a considerable expenditure from the public purse. But great as might be its success in London, its benefits would be practically *nil* to the great body of Scottish teachers. To multiply rapidly the class of qualified science teachers would require the establishment of similar schools in Glasgow, Edinburgh, and Aberdeen. How the expense is to be met is another consideration; but the grand fact is, that till such courses are established, no general cultivation of science in our schools can be looked for. Supposing, however, that the expense difficulty were met, there still remains a serious difficulty, at least in the cases of Glasgow and Aberdeen. In Edinburgh the teaching of geology and zoology had been entrusted to separate teachers. In the other Universities the absurd union of the two subjects persisted, a combination which savoured rather of medieval omniscience, that is, ignorance, than of the notions of the nineteenth century. The number of those qualified by special knowledge, or the possession of sufficient leisure to undertake the courses spoken of, is necessarily small; but at present the Professors of Natural History in Aberdeen and Glasgow would be justified in refusing to undertake the additional duty, so long as they were compelled to discharge two incongruous, in some respects incompatible, offices. Dr Young related to the Society the effort he had made to enlist public opinion in favour of the division of the Natural History Chair, after the example set in Edinburgh, and concluded by asking the support of the Natural History Society in the endeavour to bring about this result.

The following resolution was proposed by Mr John Alexander, and unanimously adopted:—"The Natural History Society of Glasgow desires to draw the attention of the Senatus and General

Council of Glasgow University to the anomalous position in which the University stands relatively to the teaching of the sciences of geology and zoology; these two subjects being still taught by one professor, though either is more than sufficient to occupy the whole time of the teacher. The Natural History Society of Glasgow recognises with satisfaction the essential service rendered to science by the separation of the two subjects in the University of Edinburgh, and would urge upon the Senatus and the General Council the necessity of adopting such steps as may be required to procure a similar readjustment of the duties of the Chair of Natural History, so that the University of Glasgow may maintain its place among the schools of the country."

PAPER READ.

Notes on the Injury done to Vegetation by the severe Frost of the 17th May, 1871. By Mr JAMES RAMSAY, V.P.

Most, if not all of you, will recollect that last winter was both a severe and a protracted one: perhaps more protracted than severe; for, although prolonged far into the spring, yet the thermometer never fell remarkably low. The season was on the whole very backward, ungenial weather prevailing till the year was well advanced.

The cold disagreeable weather was accompanied by certain phenomena, difficult to reconcile with the actual meteorological conditions existing at the time. There is a proverb that "one swallow does not make a summer;" neither does a dozen it would appear. Saturday, the 22d April, was about as ungenial a day as ever I recollect, considering the time of year; cold and blustering, with constantly recurring sleety showers; yet on that Saturday afternoon I saw as many as a dozen Swallows (*Hirundo rustica*) skimming over the surface of the Clyde, just above the new Albert Bridge. The following day was no great improvement on its predecessor, as regards the weather; but on that day also, I saw a perfect little flock of Sand Martins (*H. riparia*), with two or three Swallows amongst them, sporting over the Langside dam on the Cart. I do not remember having seen swallows much earlier, even in the most favourable seasons; and their appearance so soon last April is all the more remarkable, from being accompanied, as well as preceded and followed, by very ungenial weather.

For several weeks after this there was little or no improvement in the weather; it may even be said to have got worse, considering the advanced time of the year, till it culminated in a severe frost between the night of Tuesday, the 16th, and the morning of Wednesday, the 17th May, when the thermometer in the Queen's Park registered fully 7° of frost. Mr Graham, gardener to Sir George Campbell, informed me that it indicated nearly 8° at Garscube. The effect of so severe a frost at such a season, accompanied as it was by a keen cutting wind, was very disastrous to vegetation.

The following remarks are the result of observations noted at the time, and are confined entirely to the effect the frost had on the various trees and shrubs in the neighbourhood of Glasgow, particularly towards the south, as it is in that direction my steps most frequently turn when I take a walk. I never before gave so much attention to the wonderful power that some trees more than others apparently possess of resisting frost, and those not always the species that one would naturally think the hardiest, and best fitted for enduring the cold; for native trees in many cases suffered far more than exotics. The scarcity of fruit of all kinds during the past season tells its own tale as to the effect produced on the orchards and gardens around Glasgow.

The first thing that attracted my attention was the great amount of injury sustained by some of the commonest, and what I had always looked upon as the hardiest of our wild plants. Common Comfrey (*Symphytum officinale*), and the Butter-Burr (*Petasites vulgaris*), two of the largest and coarsest of our native weeds, were both much hurt. The leaves of the Comfrey, in particular, were rendered so brown that they might have passed for tobacco, to which they bear a considerable resemblance, both in size and shape. I was likewise much astonished at the effect that had been produced on our two commonest species of dock, both of which are abundant by every wayside. The Broad-leaved Dock (*Rumex obtusifolius*) was a good deal injured in places where much exposed; while the Curled-leaved Dock (*R. crispus*), growing side by side with it, had passed through the ordeal, to all appearance, scatheless. What can be in the nature of these two docks that they should differ thus in their capacity of enduring cold, is more than I can tell, or even imagine.

The Common Hawthorn (*Crataegus oxyacantha*) had its leaves a

good deal withered where much exposed ; while its near relatives, the Sweet-scented Hawthorn (*C. odoratissima*), from the shores of the Euxine; the Cockspur Thorn (*C. crus-galli*), a native of the United States ; and the Evergreen Thorn (*C. pyracanthus*), a native, I believe, of southern Europe, were, as far as I could observe, wholly uninjured. The Common Elder (*Sambucus nigra*), a native of Britain ; the Red-berried Elder (*S. racemosa*), a native of central Europe; and *S. canadensis*, a native of Canada, as indicated by its specific name, suffered all three about equally in their foliage, and that was not much ; but the *S. racemosa*, being a much earlier flowerer than either of the other two species, and being in full bloom at the time, had its blossoms all destroyed. In the previous season it had a very fine effect in the Queen's Park, during the months of August and September, with its clusters of red coral-like berries; but during the past autumn not a berry was to be seen. The Walnut (*Juglans regia*), a native of Persia, was a good deal hurt, and would no doubt have suffered much more had its leaves been farther expanded. The wonder is that it stood the ordeal so well, considering the climate of its native country ; it also recovered wonderfully, and by the month of July one would scarcely have known that it had suffered any disaster in the spring.

Our own native Beech (*Fagus sylvatica*) was stripped of almost every leaf; the purple and copper-coloured varieties being, if possible, more unfortunate than those of the normal type. Its near relative, the Chestnut (*Castanea vesca*), was thoroughly blasted; and, although it does not flower before the month of July, it appeared to have got such a scourging that when the blooming season came round, trees that in ordinary seasons are loaded with flowers, did not put forth a single blossom.

The Plane (*Platanus orientalis*), a native of Western Asia, suffered only where much exposed ; but, where it had a fair amount of shelter, it stood the ordeal wonderfully well. Our native Sycamore, or Great Maple (*Acer pseudo-platanus*), fared worse than did the Striped-bark Maple (*A. striatum*), which is a native of North America; while *A. campestre*, a native of Britain, *A. platanoides*, the Norway Maple, and *A. sacharrinum*, the Sugar Maple, a native of Canada, were not visibly affected. The Common Lime (*Tilia europaea*) suffered but slightly; the Large-leaved Lime (*T. grandifolia*) was affected a good deal more; while the Small-leaved

Lime (*T. parvifolia*), as far as I could see, wholly escaped, at least its injuries were so slight as not to obtrude themselves.

The Portugal Laurel (*Prunus lusitanica*), and the Cherry Laurel (*P. laura-cerasus*), both evergreens, had their young leaves browned in exposed situations. The Gean (*P. avium*) was in full bloom at the time, and had its blossom much injured, but its foliage did not seem affected. The same may be said of the Bird Cherry (*P. padus*), and the Scented Cherry (*P. mahaleb*). The Japan Blotched-leaved Laurel (*Aucuba japonica*) had its young tender leaves slightly blackened. The two Manna Ashes, from the south of Europe (*Ornus europaea*, and *O. rotundifolia*) were rendered quite leafless; but later in the season they recovered astonishingly, as regards their foliage, but showed no flowers all summer, although both are free flowerers in ordinary seasons.

Our own native Ash (*Fraxinus excelsior*), very nearly allied to the two last-mentioned trees, escaped only on account of its late habit. It is the latest of all British trees in putting forth its leaves; and last season it was exceptionally late. The same remark will apply to the Oak. It was saved, also, in a great measure by its lateness; for both Ash and Oak suffered wherever, owing to their being favourably situated, they had put forth their leaves. The Common Horse-chestnut (*AEsculus hippocastaneum*), a native of Western Asia, and the Red-flowered Horse-chestnut (*AE. pavia*), a native of the States of America, both stood the ordeal with comparatively little injury to their foliage; but the earlier inflorescence of the Common Horse-chestnut, which was far advanced at the time, was in most cases utterly destroyed; while the *AE. pavia*, owing to its later flowering, put forth as fine a display of blossoms as in ordinary seasons, except in a few instances, where much exposed. Perhaps owing to the two or three specimens of the Yellow-flowered Horse-chestnut (*AE. flava*) being situated in well-sheltered places of the Park, it did not suffer any apparent injury. It also, I believe, is a native of the United States of North America.

All the species and varieties of rhododendron, being evergreens, suffered but little in their foliage; but the early-flowering varieties had their bloom destroyed. The reverse was the case with the nearly allied *Azalea pontica*; its leaves were much blackened, but its flowers, although nearly fully expanded at the time, were little if at all injured. All the poplars, the White, the Black, the Lom-

bardy, and even the Laurel-leaved Poplar, stood the ordeal well. Only one species of the genus, *Populus balsamifera*, the *Tacamahac* of the North American Indians, one of the earliest of all trees, had its young delicate leaves thoroughly blackened, but recovered its verdure astonishingly during the season. The three lilacs usually cultivated in shrubberies (*Syringa vulgaris*, *S. persica*, and *S. chinensis*), ordinarily known as the Common, the Persian, and the Chinese Lilacs, natives, as their specific names imply, of much warmer latitudes than ours, passed through the trying ordeal all but scatheless, the flowers of all three being slightly injured when growing in exposed situations. The Scotch Laburnum (*Cytisus alpinus*), although a hardier and far more self-reliant looking tree than its English sister (the *Cytisus laburnum*), suffered more in foliage than its more delicate relative, while both had their inflorescence so much injured that the shrubberies of the Queen's Park in June last were almost wholly devoid of the golden tassels that form so conspicuous a feature at that time of year in ordinary seasons.

The Siberian Crab (*Pyrus prunifolius*) had its blossoms so destroyed that there was no need for the Park-keeper to go round and pluck all the crabs to prevent the boys from injuring the trees, but the Rowan (*P. aucuparia*), and the Beam-tree (*P. aria*), seemed none the worse, neither in flower nor foliage. The Snow-berry (*Symphoricarpos racemosus*), a native of Canada, was blasted even where well protected, as if a scathing fire had passed over it, yet it recovered its normal healthy appearance most wonderfully under the influence of more genial weather. The various species and varieties of elms and willows all passed through the chilling process most satisfactorily.

I might go on multiplying instances and examples, if not *ad infinitum*, at least *ad nauseam*, as I fear I may have done already, but what I have brought forward is, I think, sufficient to show, what perhaps nobody will be prepared to deny, that certain genera and species of trees and shrubs are better adapted than others for resisting the baneful influences of our uncertain climate, the worst feature of which, undoubtedly, is the generally cold backward character of our springs. This is, no doubt, the grand meteorological defect of Scotland. We frequently pass through winter with but little frost or snow, and we as frequently see summer glide away without enjoying any great amount of heat or sunshine,

but I cannot recollect a spring without its cold east winds. In fact, the only weather that can be predicted with any degree of certainty in this country, proverbial for the uncertainty of its climate, is the cold blighting east wind that visits us so regularly in the months of March, April, and May. And although fortunately it is only now and again that it reaches a point so injurious as it did last spring, yet every season its baneful influence on vegetation is felt more or less.

The practical deduction, if any, to be derived from this inductive rigmarole of facts is that, in such places as the neighbourhood of Glasgow, where trees are planted for ornament and shelter only, their economic value being a quantity so infinitesimally small, as never, I believe, to enter into the calculation of any one, the trees most likely to give some measure of satisfaction, are, in my opinion, the various species and varieties of elms, willows, and poplars. The common-place character of some of those trees may be objected to, but I think it will be pretty generally admitted, from an aesthetic point of view, that the commonest tree or shrub, if growing in a healthy condition, is a more pleasing and attractive object than the rarest exotic struggling for a bare existence in a miserable, shrivelled, half-dead condition.

SPECIAL MEETING.

NATURAL HISTORY CLASS ROOM, GLASGOW UNIVERSITY.

NOVEMBER 14TH, 1871.

Professor John Young, M.D., F.G.S., President, in the chair.

SPECIMENS EXHIBITED.

The President and Mr John Young, F.G.S., had placed in the room a very large number of specimens of fossil and recent oxen and antelopes; also, of a series of deer, including the *Megaceros*, or Irish Elk. Dr Young gave a brief sketch of the history of the domestic races of oxen, the specimens in the room illustrating the character from which their relationship had been inferred. He then pointed out the variations presented by the horns of cervine animals, such as Fallow, Red, and Roe-deer. An interesting con-

versation followed, in which Dr Dewar, Mr Thomson, Mr Gilmour, and Mr Young took part.

Professor Young exhibited a fine series of insects and reptiles, sent home from Batavia, by Mr William Lorrain, whose father (the late Dr Lorrain) had done so much good work in the natural history of the same area.

Mr James Thomson, of the Kelvingrove Museum, exhibited specimens of several rare Scottish birds; these included a pair of Pallas's Sand Grouse (*Syrrhaptes paradoxus*), and a Roller (*Coracias garrula*), from Aberdeenshire; also a beautiful specimen of a hybrid between the Capercaillie and Black Grouse, from Clackmannanshire.

NOVEMBER 25TH, 1871.

Professor John Young, M.D., F.G.S., President, in the chair.

Mr Robert Yylie was elected a resident member.

As this was the first meeting of the Society since the death of Dr John Scouler, the President, in moving that the Society should record its regret for the loss it had thereby sustained, said that Dr Scouler's active interest in its proceedings commenced in 1851, when he read a paper on the "Symmetrical Differences of Plants and Animals." He was at that time in office in Dublin, but was unanimously elected Honorary President in 1853, having resigned his Dublin lectureship and settled in Glasgow; he began his regular attendance with a lecture on the "Natural History of the Cephalopods." From that time until May, 1865, he had taken an active part in all the business of the Society, exhibiting specimens, demonstrating structural peculiarities, and discussing the general questions which arose from time to time. Many, in fact, acquired their first notions of comparative anatomy from him, and to his influence was largely owing the scientific spirit in all the work done. Dr Young said that though there was no one to whom the formal expression of the Society's feelings would be matter of perfect comfort or consolation, it was still the duty of every earnest student to render acknowledgment to his benefactor. Dr Scouler had survived wife and child, and the solitude of his latter years and sad remembrances were doubtless not without effect in hastening declining health.

SPECIMENS EXHIBITED.

Mr James Lumsden exhibited a young male specimen of the Great Spotted Woodpecker (*Picus major*), shot by himself on the 9th November at Arden House, Loch Lomond. Mr Gray remarked that this bird was of somewhat rare occurrence in the West of Scotland, though it had of late years appeared in considerable migratory flocks in the eastern counties, ranging from Berwickshire to the Orkney and Shetland Islands.

Dr Dewar exhibited a live specimen of the Snowy Owl (*Nyctea scandiaca*), which had been lent by Mr Martin, Buchanan Street. This beautiful bird, which excited considerable interest by the lively way in which it scanned the audience on being introduced to the meeting, had been captured at sea on board the S.S. "St Andrew." It was in beautiful plumage.

Mr David Robertson, F.G.S., exhibited some recent nodules of Post-pliocene Clay, from Norway, enclosing various species of mollusca, the clay having evidently been hardened by the presence of animal matter. These were shown in illustration of a specimen of clay taken out of a skull of the Great Irish Deer in which the clay was found to contain a considerable portion of animal matter, rendering it insoluble in water.

PAPERS READ.

I.—*Abstract of a paper on the Existence of the Elk (Alces malchis, Gray) in Scotland.* By Professor JOHN YOUNG, M.D., F.G.S.

Dr Young described, and gave the measurements of, the head and antlers of an Elk found in a marl pit in Perthshire, and referred to by Mr Smith of Jordanhill as being deposited in the Hunterian Museum. As Mr J. Young had pointed out, this example had been entirely overlooked by subsequent writers. Dr J. A. Smith of Edinburgh, in his paper "On the Reindeer in Scotland," has doubted the existence of the Elk, and, without seeing the specimens, it is impossible to rely on statements not made by naturalists, more especially as there is still some confusion in the use of the word Elk, which is used indiscriminately for the Caribou and the Wapiti. Mr H. Woodward has spoken of an Elk as having been found at "Chirdon Burn," a locality which he (Dr Young) had failed to identify. In the course of his remarks

Dr Young had occasion to refer to the fossil oxen of Britain, and mentioned that Dr Scouler had identified his name with the discovery of these and of the Irish Elk. He had, moreover, suggested that the Moose was referred to in the old Welsh traditions, an opinion which, if proved to be correct, would approximate the date of its extinction more closely to that of its disappearance from central Europe.

II.—*On the Nesting of the Fieldfare (Turdus pilaris), in Great Britain.*
By Mr W. C. ANGUS, corresponding member.

In this paper the author stated that a pair of Fieldfares had built a nest and successfully reared a brood of young ones within the boundaries of the city of Aberdeen in May of the present year. Some of the members present held that the fact was not sufficiently proved to warrant the addition of the Fieldfare to the list of birds breeding in Scotland.

DECEMBER 26TH, 1871.

Professor John Young, M.D., F.G.S., President, in the chair.

The following gentlemen were elected resident members:— Messrs Peter Cameron, jun., Archibald Gilchrist, and John M'Laren, M.D. Mr Edwin Lees, F.L.S., F.G.S., Greenhill Summit, Worcester, was elected a corresponding member.

SPECIMENS EXHIBITED.

Mr Thomas Chapman exhibited a series of lepidopterous insects, showing sexual differences, and remarked on the specific identity of two African butterflies, *Papilio merope* and *Papilio hippocoon*.

PAPER READ.

Notes on the Occurrence of the Waxwing (Ampelis garrulus) in Scotland during the present year. By Mr ROBERT GRAY.

JANUARY 30TH, 1872.

Mr James Ramsay, Vice-President, in the chair.

The following gentlemen were elected resident members:—
Messrs John Fleming, Archibald T. Arrol, William Johnston,
Donald T. Martin, and David Aitken.

SPECIMENS EXHIBITED.

Mr Gray exhibited the following birds, which have occurred in the West of Scotland during the last six months:—

I. A specimen of the Balearic Crane (*Grus pavonina*), shot near Dalry, Ayrshire, on 17th September. This large and beautiful bird had made its appearance in the neighbourhood about a week previously, and was repeatedly seen soaring with a strong and vigorous flight at a considerable height in the air. It then became a marked object, and when it alighted it was heard giving utterance to loud and discordant cries, the only effect of which was to draw the closer attention of those who had designs on its life. On being approached it ran with great swiftness before taking wing, and after being hunted from one farm to another, it was at last shot while perched on a hay-rick towards the close of a quiet Sabbath.

The Balearic Crane is found generally in the north-east of Africa. Dr Bree has admitted it with hesitation into his "Birds of Europe." Brisson, however, has mentioned that in 1760 it was a common bird in the Balearic Islands (Majorca and Minorca). Twenty years later Dr Latham, in his "General History of Birds," denied the accuracy of that statement; but the late Mr Swainson, in his work on the "Classification of Birds," says that specimens were brought to him in Malta from the little island of Lampedusa, where they are by no means scarce. To these localities Degland adds Sicily; and the late Prince Bonaparte has recorded that the species "is found in the islands of the Mediterranean." Mr Tristram informed Dr Bree that one had been killed in the island of Pantellaria, between Tunis and Sicily.

Mr Gray concluded by saying, that though Keyserling, Blasius, and Schlegel refuse to admit the bird into the European list, and though another well-known ornithologist—M. De Selys Longchamps—has also doubted its claims as a European species, there could be no reason for rejecting it now, as an allied species—the Demoiselle Crane (*Anthropoides virgo*)—had been unhesitatingly

received as British since the occurrence of two specimens in the Shetland Islands some years ago. Mr Gray further stated that the greatest care had been taken to ascertain that the specimen was in reality a wild bird, both by himself and his friend Mr James Stirrat, banker, Dalry, to whom he expressed his obligations for the fullest information regarding its occurrence and capture.

II. A specimen of the Wryneck (*Yunx torquilla*), shot near Garunkirk, in the first week of October. Very few examples of this bird have occurred in the western counties, the only one recorded for many years being that mentioned by the late Mr Yarrell in his "British Birds," as having been shot near Hamilton in 1835. Of late years, however, it has been found breeding in the district of Nether Lochaber, Inverness-shire, by the Rev. Alex. Stewart, Ballachulish.

III. A Little Auk (*Mergulus alle*), shot at Ardentinny on the 16th of the present month. Specimens have occurred from time to time, chiefly in inland situations, at some distance from the sea; and the presence of the Little Auk seems more or less associated with heavy gales and tempestuous weather, by which the bird is sometimes blown many miles into the country. For the two last-mentioned birds Mr Gray expressed himself indebted to Mr Martin, taxidermist, Buchanan Street.

Mr John Kirsop exhibited a collection of birds from Java, including about forty species, the property of Mrs Peter Hall, of Campbelton. Mr George Martin, jun., exhibited three specimens of the tailless Trout from Islay; also a female Pheasant in the plumage of the male, recently shot in the same island. A conversation ensued among the members regarding the Trout, without, however, eliciting any definite theory to account for the absence of the caudal rays. From what Mr Martin stated, it appears that the particular breed has been known for many years, though confined to a single loch in the island.

Mr John Young, F.G.S, exhibited a series of trilobites of Caradoc age from the Silurian strata of the Girvan valley. These were from the collection of Mrs Robert Gray, and comprised specimens of *Iliaenus boumanni*, *I. thomsoni*, *I. barriensis*, *Cybele verrucosa*, *Stau-rocephalus unicus*, *Proteus latifrons*, *Cheirurus clavifrons*, *Zethus rugosus*, *Odontopleura ovata* (?), and specimens of a large *Trinucleus*, which, so far as yet examined, does not correspond with any of the described species. Mr Young, in pointing out the characters of

these trilobites, referred to the interest attached to many of the species in Mrs Gray's collection, several of these being new to science and others new to the Girvan beds, while the whole group clearly established the age of the deposits and the relation which the strata bore to the Silurian rocks of other parts of the world.

The Librarian announced the following donations to the library:—Transactions of the Malvern Naturalists' Field Club, 1870; Proceedings of the Literary and Philosophical Society of Manchester, nos. 6 and 7; from the respective Societies.

SPECIAL MEETING.

NATURAL HISTORY CLASS ROOM, GLASGOW UNIVERSITY.

FEBRUARY 13TH, 1872.

Professor John Young, M.D., F.G.S., President, in the chair.

SPECIMENS EXHIBITED.

Mr James Thomson exhibited a valuable series of bones of the Moa from New Zealand, and several flint knives and scrapers which had been discovered in the mound from which the bones had been taken. These excited considerable interest, and the Chairman remarked that the series formed a valuable addition to the Kelvingrove Museum.

Mr Gray drew the attention of the meeting to several British birds that had recently been presented to the Hunterian collection by Mr James Lumsden, and afterwards read a communication from Mr John A. Harvie Brown of Dunipace, one of the Society's corresponding members, relating to the extraordinary abundance of gulls and Garvies during the present winter in the estuary of the Forth.

A conversation then ensued respecting the results of the Sea-Birds Preservation Act, in the course of which Mr Gray maintained, with some degree of probability, that the present swarms of gulls found in the Forth were due, not to the increase of British breeding stations, but to migratory flocks from other countries which had followed the shoals of fishes as they travelled southwards. Forty years ago flocks of gulls equally large had been observed in the Forth, and their presence was then attributed to the same cause.

ANDERSON'S UNIVERSITY BUILDINGS.

FEBRUARY 27TH, 1872.

Mr James Ramsay, Vice-President, in the chair.

Messrs Henry Young and James J. King were elected resident members.

SPECIMENS EXHIBITED.

Mr Chapman exhibited a large collection of butterflies, beetles, bats, and reptiles from Batavia. These had been forwarded by Mr William Lorrain, one of the Society's corresponding members, and excited considerable interest. Among the beetles were several specimens of *Mormolyce phyllodes*—a species remarkable for the peculiar leaf-like expansion of the elytra.

Mr James Lumsden exhibited a specimen of the Marsh Tit (*Parus palustris*), from near Loch Lomond, a species somewhat local in its habits, and probably restricted in its distribution in Scotland to localities south of Perthshire. Mr Lumsden also drew the attention of the meeting to the circumstance of numbers of Razor-bills (*Alca torda*) having of late been cast on shore, either dead or in an exhausted condition, both on the English and Scottish coasts. He had even heard of specimens having been driven inland to considerable distances, and he exhibited one which he had found in the River Fruin, about three and a-half miles in a strait line from the sea. This gave rise to a discussion among the members as to the probable cause of the exhaustion and mortality affecting a single species, as in the present case. In 1859 large numbers of sea-fowl of various species had been discovered dead on the water—the mortality, however, having been much greater in the Frith of Clyde than elsewhere. Various theories had been put forward to account for the visitation, such as loss of food and consequent starvation, poisoning from substances floating on the sea, as would happen after the shipwreck of a vessel laden with paraffin oil, etc.; but during the present winter, the disease having been confined exclusively to one species, it was not easy to account for its existence. Several gales had no doubt been experienced on various parts of the coast, but these would naturally have affected Guillemots and other birds as well as Razorbills; and as for the loss of food, it was remarked by Mr Gray that the shoals of

migratory fishes, on which these birds feed, had this year been unprecedentedly great.

Mr Gray read a communication from Mr John Bateson of Shieldag, Gairloch, containing some ornithological notes from Ross-shire. These embraced various facts of interest, such as the breeding of the Dotterel (*Charadrius morinellus*) on two separate hills in the west, and also on Ben Wyvis, in the east of the county; the nesting of the Snow Bunting on a range of precipitous hills near Shieldag; the breeding haunts of two or three pairs of Golden Eagles (which are strictly preserved); the permanent residence of such birds as the Greenshank and Black-throated Diver; the former eyries of the Osprey; and a description of the full breeding plumage of the Ptarmigan. Mr Bateson also mentioned the occurrence of the Spotted Woodpecker, Golden Oriole, Redstart, Rose-coloured Pastor, Spotted Crake, Nightjar (very common), Turnstone (shot in the breeding season), Pintail Duck, Smew, and Pomarine Skua. The Widgeon and Pochard have both been found nesting in Ross-shire, and the eggs obtained. Among birds lately introduced there, the Red-legged Partridge had become established, and was likely to thrive. During the reading of the communication Mr Gray illustrated some of the more interesting facts from his own notes, and exhibited a series of Ptarmigan in various stages of plumage, from the Kelvingrove Museum, which had been obtained by Mr James Thomson, the curator, from Inverness-shire and the Outer Hebrides.

MARCH 26TH, 1872.

Donald Dewar, M.D., in the chair.

Mr Alfred Blackie was elected a resident member, and the Rev. Alexander Stewart, Ballachulish, a corresponding member.

SPECIMENS EXHIBITED.

Mr John Young, F.G.S., exhibited a series of graptolites from the Silurian strata of the Girvan valley, the specimens having been collected by Mrs Robert Gray, from whose cabinet several groups of fossils have already been brought before the Society. Mr Young pointed out some of the principal characters of the extinct family of graptolites, and the position they were supposed to hold in the

animal kingdom, and stated that their nearest living allies were believed to be the sertularian group of hydrozoons or sea pens. The specimens exhibited were from a bed of Silurian grey sandy shale exposed in the banks of Penwhapple Glen, where these graptolites are not uncommon, and where they exist in a less compressed condition than those found in the Moffat beds. The species obtained by Mrs Gray are *Graptolites priodon* (common); *G. sedgwickii* (rather rare); *G. colonus* (rare); *Cyrtograpsus graxianus* (Lapworth, M.S.), a rare and interesting new species first found by Mr Lapworth of Galashiels, in the Gala group of that district, and which he proposes to name after Mrs Gray. *Dicranograpsus tardiusculus* (Lapworth, M.S.), another new and rare species from Balclatchie, this being, according to Mr Lapworth, the first time the genus has been found in Silurian rocks of Caradoc age. No specimens belonging to the group of double graptolites (*Diplograpsus*), have yet been discovered by Mrs Gray; but as the beds have not hitherto been thoroughly searched, it is to be hoped that examples in this interesting group will reward her future labours.

Mr Peter Cameron, jun., exhibited the egg-bag of a spider, *Agelena brunnea*, which had been found in the Black Wood of Rannoch in Perthshire, attached to sprigs of growing heather. It was somewhat well shaped, and was composed of a very beautiful silk, white and glossy, forming a very elegant and interesting object. Mr Cameron had found a few of these egg-purses powdered all over with a fine dust; but from the positions in which these were placed, it was evidently not blown dust, but had been put on by the spiders themselves.

PAPER READ.

On the Coleoptera of Rannoch. By Mr PETER CAMERON, jun.

The author, in his opening remarks, referred to the extreme productiveness of that district in coleopterous insects, and assigned as a reason that the Black Wood there, which is a remnant of the old Caledonian Forest, was composed almost entirely of the Scotch Fir (*Pinus sylvestris*), a tree that had upwards of forty species exclusively attached to it, besides many others that are common to it and other trees. The paper was illustrated by a fine collection of specimens, and was accompanied by a full list of the insects found.

SPECIAL MEETING.

NATURAL HISTORY CLASS ROOM, GLASGOW UNIVERSITY.

FEBRUARY 15TH, 1872.

Professor John Young, M.D., F.G.S., President, in the chair.

Professor Alexander Dickson, M.D., exhibited a series of preparations of monocotyledonous embryos, the subject being further illustrated by numerous beautiful diagrams. Dr Dickson had also on the table a number of specimens illustrating dichogamy.

Mr Gray exhibited a collection of birds' eggs from Iceland. This collection, which had been made in the north-eastern portion of that country, and chiefly in the neighbourhood of Seidesfiord, embraced at least half-a-dozen species not included by Professor Newton of Cambridge, in his account of the ornithology of Iceland, published in 1863. Among these may be mentioned the Rock Pipit (*Anthus rupestris*), the Rock Dove (*Columba livia*), the Starling (*Sturnus vulgaris*), the Herring Gull (*Larus argentatus*), and the Lesser Black-backed Gull (*L. fuscus*).

Mr Gray likewise exhibited a specimen of the common Francolin (*Francolinus vulgaris*), and its egg, from Tricomo, in the island of Cyprus, and read some remarks on the extinction of that bird as a European species. The Francolin appears to have had at one time a somewhat extensive distribution in the south of Europe, having been commonly met with in Spain, Sicily, Malta, Cyprus, Sardinia, Naples, the islands of the Grecian Archipelago, and Turkey. After giving the authorities for its former existence in these localities, Mr Gray stated that, with the exception of Cyprus, where a few birds might still be lingering, every European haunt had been entirely deserted. He expressed himself indebted to the Rev. John Pagan of Bothwell, for the opportunity of exhibiting the specimen, and also for some interesting notes on the habits of the species in connection with the last of its European habitats.

Ten years ago, Lord Lilford, in a contribution to the "Ibis," had drawn the attention of ornithologists to the fact of its gradual extinction over a wide area, and maintained that, though doubts might exist as to the propriety of including the island of Cyprus within European range, the Francolin had become a thing

of the past in every other haunt. At that time flocks of this fine game bird were said to be lingering in one part of Cyprus, viz., in the Vale of Maratassa, near Baffa, the ancient Paphos; but from the information communicated by Mr Pagan it was evident that the great scarcity of recent years was but the precursor of extinction there also.

Mr Gray concluded his remarks as follows:—From all the published accounts of the bird, it would appear that the scarcity and subsequent disappearance of the Francolin from Europe, have wholly resulted from its being a favourite table luxury. Year by year its haunts, which have in every respect remained unaltered, have been gradually deserted, or, rather, the birds themselves have been extirpated through a persistent demand for them and their eggs. In other countries certain birds have yielded to the destructive influences of man's encroachment through inability to protect themselves. The Dodo and Dinornis are familiar examples, and the Great Auk may now be added as a victim to the law which is slowly but surely swelling the list of extinct species. In the case of the Francolin, however, no immediate dread of total extinction need be entertained, as it is still a well-known bird in many parts of India, and is, in fact, a somewhat common Asiatic species. No other reason can be given for its utter extirpation from an area so extensive as the range of its former habitats in Europe than its marketable value; no alteration of the ground frequented, no inertness on the part of the bird, no introduction of undue protection to other species which might adversely affect its well-being, no appearance of natural decay—nothing, in short, to induce a comparison between its fate and that of the flightless birds I have named. While, therefore, the ornithologist laments the disappearance of species within his own recollection, and is warned to prepare for the exit of others whose powers of self-preservation are but feeble, he has no theory to offer for the extinction of the Francolin as a European bird but the exceedingly unromantic statement that it has literally been eaten up!

Dr Dewar exhibited two unblown eggs of the Golden Eagle (*Aquila chrysaetos*), taken from an eyrie on the confines of Argyllshire and Dumbartonshire on the 11th of the present month. The specimens (one darkly spotted, the other very light in colour) were large, heavy, and handsome; and having been procured in a district which, in

clear weather, is visible from the top of the college tower, the eggs, lying as they were on part of the lining of the nest, excited unusual interest and attention.

ANDERSON'S UNIVERSITY BUILDINGS.

APRIL 27TH, 1872.

Professor Alexander Dickson, M.D., Vice-President, in the chair.
Mr David Kidston was elected a resident member.

SPECIMENS EXHIBITED.

Mr Gray exhibited two eggs of the Water Rail (*Rallus aquaticus*), taken from a nest of seven found last month in Possil marsh, and remarked on the singular fact that the principal writers on British birds had been unable to describe either the nest or eggs of that bird from personal observation. This may have arisen from the circumstance that Montagu had mistaken the eggs of the Little Grebe for those of the Water Rail, and that his description had been handed down from one author to another in the belief that it was correct. Sir William Jardine, Mr Selby, Professor Macgillivray, and Mr Yarrell had all admitted, in their published writings, that they had never met with the nest. It was, therefore, a fact of more than usual interest that one should have been discovered in a situation like Possil marsh, which may now be said to be in the very centre of a large mining and manufacturing population. Mr J. S. Dixon remarked that a few years ago he had found a nest in the same place, but had been unable to identify it. He had no doubt, however, on looking at the eggs exhibited by Mr Gray, that he was right in his recollection of the species.

Mr John Kirsop exhibited an Ermine in the pure winter fur, from Loch Ascog, in Bute. It had been sent to him by Mr Henry Stevenson, who informed him that another, of a browner shade, had been seen in its company. As the white and spotless winter fur is supposed to characterise only those Ermines frequenting mountain ranges at a considerable altitude, it was suggested that these examples found in Bute might have crossed at the narrowest part of the Kyles by swimming, these animals being known to travel long distances in quest of prey.

Mr James Lumsden exhibited a monstrosity of the domestic Duck, with three legs. It had lived upwards of a week. A similar specimen of the common Dorking Fowl was exhibited by Mr John Gilmour, the chairman remarking that in both cases the extra limb looked like a union of two of imperfect development.

Dr Stirton exhibited a series of mosses from New Zealand, collected by Mr John Buchanan of the Government Geological Survey, Wellington, N.Z., a corresponding member of the Society. Dr Stirton stated that the natural history of New Zealand had been very thoroughly investigated, but although many of the species now exhibited were well known, many of them were rare, and three if not four of them were not included in any Antarctic flora, and were still undescribed. The most interesting one of these, which he proposed to name after his correspondent, was thus described:—

I. *Grimmia buchanani* (Stirton, M.S.). Stems loosely tufted, leaves oblong amplexicaule, plane margined, laxly areolated, terminating abruptly in very long green nearly entire subulae, which are composed almost entirely of the prolonged nerves, perichaetial leaves longer and narrower at the sheathing bases, otherwise identical, fruit stalk curved, capsule ovate, regular, furrowed when dry, pale, lid conico-rostrate, oblique, more than half the length of the capsule, calyptra dimidiate covering half the capsule, teeth deep-red at base, curved, bifid into long pale subulate points, inflorescence in all likelihood dioicous, antheridia not detected.

II. *Tortula incurvidens* (Stirton, M.S.). Stems gregarious, short, leaves lanceolate with plane entire margins, crisped when dry, texture dense, opaque above, pellucid and quadrangular at base, nerve strong, indistinct near apex, which is somewhat cucullate, capsule red, erect on a thick red seta arising from a basilar membrane, broad and prominent above the mouth of the capsule, irregular, rough with minute papillae, and crossed by two or three septa, incurved when dry, converging into a cone when moistened, lid obliquely rostrate, subulate, nearly as long as the capsule, calyptra dimidiate, extending more than half way down. Approaches in several of its characters to *Tortula ambigua*, but diverges widely in others.

III. *Bryum contortum* (Stirton, M.S.). Dioicous, densely caespitose, stems radiculose, lower leaves small, scattered, upper suddenly enlarged, closely imbricated in a moist state, contorted

when dry, ovate oblong, terminating in long smooth reflexed points formed by the excurrent nerves, which are red in the substance of the leaves, margin slightly reflexed, not thickened, but composed of two or three rows of narrower cells than those of the rest of the pagina, seta long, stout, red, capsule red, pendulous narrowly obconical, lid sharply conical, apiculate, deep red, shining, allied to *Bryum obconicum*.

IV. *Bryum bulbiliosum* (Montague). Description of this moss in Miller's Synopsis agrees pretty well with the character of the New Zealand moss, and in the absence of any more definite indications it has not been thought advisable to separate them.

MAY 28TH, 1872.

Professor John Young, M.D., F.G.S., President, in the chair.

SPECIMENS EXHIBITED.

Mr James Thomson, of the Kelvingrove Museum, exhibited an unusually small specimen of the Glaucous Gull (*Larus glaucus*), which was shot on Gourock Moor on 20th March last, and regarding which Mr Gray stated that it appeared to be a bird of the second year's plumage. The keeper who shot it had seen others in its company, and though the Glaucous Gull had hitherto been regarded as a rare British bird, it would in all probability be found to be a regular winter visitant to the Firth of Clyde. Specimens had already occurred in the island of Arran and on the coast of Ayrshire. The birds were seen to be remarkably tame, but being in the inconspicuous plumage of the first or second year, they were generally passed over as the young of some other species. They could, however, be easily distinguished at any age by the absence of the black tips to the wings and the bar across the tail. Mr Thomson also exhibited a beautiful specimen of the Slavonian Grebe (*Podiceps cornutus*), from the island of Harris. This bird was in full breeding plumage, and had been shot in the second week in April. Mr Gray also exhibited a specimen of the same Grebe in a similar state of plumage, from the island of North Uist, where it had been shot about the end of April.

Mr James Lumsden exhibited two young Woodcocks (*Scolopax*

rusticola) in the down, and communicated the following interesting particulars on the nesting habits of that bird in the neighbourhood of Loch Lomond:—

This season I have found two Woodcock's nests. The one I first saw on the 8th of April, but the nest had been known to the gamekeeper for about a week previous. When I saw it the bird was sitting on four eggs. The nest was placed in an open field, about ten or a dozen yards from the edge of a young larch plantation. It was quite bare, but the bird was not easily seen, from its colour resembling so closely the dead leaves and withered grass which were lying about it, and from the manner in which it sits with its long beak thrust down into the fog in front of it. It sat quite still until I went up to it and touched it with the end of my stick. About a fortnight after my first seeing the nest, it was discovered to be "run." Three birds had come out, leaving one rotten egg. The ground all round was carefully searched, but no trace of the chicks could be found. Most likely the old bird had carried them away as soon as hatched.

The second nest was hatched on the 9th of May. It also contained four eggs. I had known of it for about a week, when on the 9th of May the gamekeeper brought me word that the nest was "run," and that he had seen the old bird sitting within a few feet of the nest, and, on putting her up, had seen the four young ones, all the eggs having come out. I went up to the place at once, but only to find the old bird and two of the young ones gone, and the other two lying dead at the place where the keeper had seen them a couple of hours before. Something must have disturbed them, and the old one had carried away the first two, leaving the others, which had perished from the cold and wet in her absence, as the day was very cold, and heavy hail showers falling. This nest was in an oak wood, on a bare spot at the foot of a small tree.

Upon the 13th of May some men who were cutting timber came upon an old bird with four young ones, within a few hundred yards of the places where the two nests were, which must have been a third brood hatched in the same neighbourhood.

Mr Gray then read some notes from Mr John Gilmour on the nesting of the Woodcock and of the Wild Turkey (*Meleagris gallipavo*) at Ardlamont.

Though we had during the winter fewer Woodcocks on our ground than for several years past, which we consider the mild wet weather fully accounted for, strange to say we have far more birds remaining than we have ever had; in fact, in one cover they are quite numerous. Whether these birds are all or most of them breeding, I do not know, but I should expect so. Robert Patrick, our head keeper, has already seen two young broods of these birds, one on the 25th of April, and the other about five days later, and had a good opportunity on both occasions of watching them. They were about the size of large snipe, and each time the old bird picked up one of the young ones and flew off with it, she seemed to catch it in between her legs and feet, and almost held it under her tail, and flew with a very peculiar sort of side motion of the wings. Following it once, he saw the young one dropped, and as soon as he came near it picked it up and flew away again. There must be a considerable difference in the time of hatching of these birds, for the nest we found a few years ago with four eggs was on the 21st of April, and it was not hatched for some time after that, while these young birds were well grown on the 25th of same month. I am glad to say that if we have dry weather now for a time there is a prospect of having better luck with our Wild Turkeys than last year. On Sunday, when walking along the road to church, I heard the "chuck, chuck" of a Turkey hen, and just fancying from her call that she had chicks with her, I went quietly through the bush, and, though I saw her quite well, I had to wait quietly for some minutes before seeing any of the little ones; but she began to walk slowly away, giving a call as she went, and then one by one the wee things followed her, till I counted seven, and I think there were more, but they are so cunning in lying hid that they are not easy to see. It was a pretty sight; they were, I should think, four or five days old, and seemed strong and active. Coming home, Robert Patrick showed us one of the hens on her nest on the top of a dry bank, in among the old dry brackens, and this nest will probably be hatched in a day or two. There are also two other hens that must have nests somewhere in the woods, but he has not been able to find them yet, and, as the woods are now getting thick, until they appear with their families, we do not expect to see them. Surely we will manage to bring some of these to maturity, but we are not going to

interfere with the hens' management at all, and our chief hope is dry and warm weather, with lots of insect food.

The Librarian announced the following donations to the Library:—Transactions and Proceedings of the Botanical Society of Edinburgh, Vol. xi., Part i., 1871; Proceedings of the Literary and Philosophic Society of Manchester, nos. 11, 12, 13, session 1871-72; Proceedings of the Berwickshire Naturalists' Club, Vol. vi., No. 3; from the respective Societies.

SESSION 1872-73.

TWENTY-FIRST ANNUAL GENERAL MEETING, ANDERSON'S
UNIVERSITY BUILDINGS, SEPTEMBER 24TH, 1872.

Mr James Ramsay, Vice-President, in the chair.

Reports were received from the Treasurer and Librarian; the statement of the former shewing a balance in favour of the Society of £51 14s. 10d.

The following gentlemen were elected office-bearers for the session :—Professor John Young, M.D., F.G.S., President ; Professor Alexander Dickson, M.D., and Mr James Ramsay, Vice-Presidents ; Robert Mason, Secretary ; Thomas S. Hutcheson, Treasurer ; Thomas Chapman, Librarian ; James Coutts, William Sinclair, John Alexander, Robert Gray, Donald Dewar, M.D., James S. Dixon, James B. Murdoch, and Gavin Miller, Members of Council.

Mr George E. Paterson was elected a resident member.

SPECIMENS EXHIBITED.

Mr Gray exhibited a specimen of the Blue throated Warbler (*Cyanecula suecica*), which had been captured near Aberdeen on 16th May last, and forwarded by Mr George Sim, of that city, and made some remarks on the three different forms of that bird—viz., the *Motacilla suecica* of Linnaeus, the *C. cyanecula* of Brehm, and the *Sylvia wolfi* of Meyer—the first having a red spot in the centre of the blue patch on the throat, the second a white spot, and the third none at all. The bird exhibited had a red spot, and was, therefore, a true *suecica*; but Mr Gray remarked, with regard to the bird possessing the white spot, that it was necessary in some cases to examine the plumage carefully, as that feature could only be seen on pushing aside the blue feathers. Might not these spots, therefore, in both instances be the results of age.

Mr James Lumsden exhibited a specimen of the Pied Flycatcher (*Muscicapa atricapilla*), which was shot at North Berwick on 23d

May, and forwarded by Mr Wm. Paterson, Abbey Farm. This bird occurs but sparingly in the east of Scotland, where it made its first appearance a few years ago, but it has not yet been detected in any of the western counties.

PAPER READ.

The Secretary read a communication from Mr Alexander Gray of Batavia, one of the Society's corresponding members, on some of the natural history features of that country, in illustration of which he exhibited specimens of the Rebton shell-fish (*Turbo petholatus*), from the Cocos Islands, and also a collection of snakes of various species.

OCTOBER 29TH, 1872.

Professor John Young, M.D., F.G.S., President, in the chair.

The following gentlemen were elected resident members:— Messrs James Beckett, James Scott, John G. Scott, David N. Knox, M.A., M.B., Thomas S. Hadaway, and Henry Leck.

SPECIMENS EXHIBITED.

Mr James Lumsden exhibited, I. A specimen of the Wood Sandpiper (*Totanus glareola*), shot by Sir George H. Leith, Bart., near Loch Lomond, in August last. II. A specimen of the common Hedgehog, found dead near Arden in the month of September. As this specimen was very young, the eyes not being yet open, it was either one of a second brood, or the breeding season is later than stated in text books.

Mr George E. Paterson exhibited an albino variety of the Mallard (*Anas boschas*), and Dr Dewar showed a variety of the same bird in which the male and female plumage were combined.

Mr James Coutts made some remarks on a section in Calderwood Glen, of which he exhibited a diagram, illustrating the denudation of the district.

The President, Dr Young, gave a brief address, in which he sketched the general plan according to which the Hunterian Museum collections were to be arranged.

NOVEMBER 26TH, 1872.

Mr James Ramsay, Vice-President, in the chair.

SPECIMENS EXHIBITED.

Mr William Johnston exhibited a living specimen of the Four-horned Sheep of St Kilda, a very curious breed, about which little appears to be known. It is mentioned by Martin in his work on St Kilda, published in 1698, and also by Dr Walker in his "Economical History of the Hebrides," 1809. The last named author says that the original breed had come from Norway, between the eighth and twelfth centuries, and states that the colour of the animals varied from a bluish-grey to russet, and in some cases deep black, which is the prevailing hue at the present day. From its goat-like aspect it is evidently fitted for living in such a place as St Kilda, where herbage is scanty, and in some parts of the cliffs only to be reached by sure-footed animals of a slender make. Its body is much compressed, and does not appear to accumulate flesh in the same way as other breeds, a fact probably due to the want of feeding in its isolated haunts; yet such is the force of habit in these animals, that when placed in spots where they can obtain abundance of good grass, they almost reject it, and instinctively search for particular wild plants which our southern sheep turn from with aversion.

Mr John Kirsop exhibited, I. Some specimens of Tertiary shells from the Waipara River, Canterbury, New Zealand, which had been forwarded by Mr John Stewart of Kilmarnock. Mr John Young, F.G.S., said that some of the shells had been enclosed in a sandy mud, others in a coarse gravelly conglomerate, and as they were found at a considerable height above the sea-level, they indicated a rise of the land in that district since the Tertiary period. II. A specimen of a cryptogamic plant from New Zealand, parasitic on the caterpillar of a moth which feeds under ground. This plant, as was explained, grows from the back of the grub, and gradually deprives it of life. III. A fine pair of horns of the Great Rusa (*Rusa hippelaphus*), from Bengal, which, with the shells, were presented by Mr Kirsop to the Hunterian Museum.

Mr Chapman exhibited several specimens of the Japanese Silkworm (*Bombyx yama mai*) and cocoons, which had been bred in England, and stated that this species was subject to great

variety in colouring, two specimens being rarely found of the same shade.

Mr James Lumsden exhibited a most beautiful hybrid between the Black Grouse and Capercaillie, which had been shot, in the beginning of November, near Campbelton, and obligingly lent by Mr Martin, Exchange Square. This bird, which was the finest any of the members had ever seen, had evidently sprung from the male of *Tetrao tetrix* and a female of *Tetrao urogallus*, the latter having probably wandered from the island of Arran, where the Capercaillie has now become naturalized. Mr Lumsden also exhibited an albino Starling (*Sturnus vulgaris*), which had been killed in Arran in May last.

The Librarian announced the following donation to the Library :—The Birds of the Faroe Islands, by Capt. H. W. Feilden, 1872; from the Author.

SPECIAL MEETING.

NATURAL HISTORY CLASS ROOM, GLASGOW UNIVERSITY.

DECEMBER 16TH, 1872.

Professor John Young, M.D., F.G.S., President, in the chair.

SPECIMENS EXHIBITED.

Dr Young called attention, 1st, to a small fossil lent by Mrs. Robert Gray, which proved to be a portion of a star-fish, and which appears to be entirely new to Scottish Silurian strata; 2d, to a large collection of crustaceans from the East Indies, for which the Museum was indebted to Mr James Thomson, F.G.S.; and, 3d, to a series of nearly eighty iron spears from the Gaboon, presented by Mr Wales.

Mr George E. Paterson exhibited a large series of bird-skins, obtained by him during a residence of some months in Normandy. These were in fine condition, and admirably illustrated the bird fauna of the district. Mr Paterson read an excellent paper, in which he gave the results of his observations and inquiries regarding the habits and plumage of the various species exhibited, including the Goshawk, Honey Buzzard, Hobby, Montagu's Harrier, Marsh Harrier, and the continental form of our Kestrel (*Falco tinnunculus*).

Mr Alexander Dennistoun, jun., exhibited a Peregrine Falcon (*Falco peregrinus*) in the first year's plumage, which had been artistically grouped in the act of feeding on a Ptarmigan. This specimen was intended for the Kelvingrove Museum.

Mr Robert Gray exhibited specimens of the Buff-breasted Sandpiper (*Tringa rufescens*), and Pectoral Sandpiper (*T. pectoralis*), and read an interesting communication on the habits and migrations of these two birds, which had been forwarded by Mr Thomas M'Ilwraith, a well-known ornithologist resident in Hamilton, Ontario. Mr M'Ilwraith referred to the difficulty of defining the geographical range of certain wading birds, some of this species appearing but for an hour or two on their northward journey. He had observed the Buff-breasted Sandpiper only on the land-locked shores of Burlington Bay, a portion of Lake Ontario which is crossed by a sand bar, leaving an area of six miles, broadly edged in many places with flags and bullrushes, and likewise an expanse of mud which is attractive to wading birds. Here also he had met with the Pectoral Sandpiper in considerable numbers, though, in the time of Audubon, it was believed to be wholly confined to the sea coast. Mr M'Ilwraith concluded his communication with some remarks on the habits of the Solitary Sandpiper (*Totanus chloropygius*), and the Spotted Sandpiper (*T. macularius*), both of which are found on the margin of the same bay.

Mr John Young, F.G.S., exhibited a number of fossil plant remains, in which the woody structure is finely preserved in a calcified condition. These had been obtained by Professor Alexander Dickson and himself, from the Lower Carboniferous deposits that lie among the traps of the Kilpatrick hills, at Glenbarbuck, near Bowling. They belong chiefly to *Stigmaria*—a genus of plants forming the underground stems of *Sigillaria* and *Lepidodendron*, and which with other lycopods flourished during the Carboniferous period, their remains form one or two beds of impure coal, which alternate with the strata containing the stigmarian stems at Bowling. Mr Young referred to the evidence which these coal-beds and plant remains afford of former forests of vegetation that had grown upon these tracts during the long periods of repose that had taken place between the various outflows of trap and other igneous rock matter of which this section of the Kilpatrick hills is principally built up. The stigmarian stems

from this locality show the vascular structure of the internal woody cylinder of the plant in a finer state of preservation than any that have previously been obtained from the Carboniferous strata of the West of Scotland.

Mr Young also exhibited a series of specimens of Carboniferous limestone fossils from a quarry at present being worked on the lands of Trearne, near Beith, in Ayrshire. The limestone of this quarry is literally composed of organisms belonging to various genera and species, some of which are in a measure restricted to distinct horizons of the limestone stratum, which, in that locality, is of considerable thickness. One portion of the bed is loaded with the remains of large crinoids of various species, forming a fine encrinal limestone; another part is charged with various corals; while another, a fine light coloured layer, contain, in great abundance the shells of various Brachiopods and the lace-like and feathery fronds of various Polyzoons, which present a very beautiful appearance on the stone. Mr Young stated that a visit to this highly interesting quarry would afford a clear idea of the manner in which many of our Carboniferous limestone strata had been built up, and of the very great profusion of life that flourished during this period over certain tracts of the sea bottom within the Western Scottish coalfield.

Mr James Thomson, of the Kelvingrove Museum, exhibited a specimen of the Opah or King Fish (*Lampris luna*), which was taken last summer in the West of Scotland, and presented by Mr M'Allister; and one of the members exhibited a collection of four lizards, several insects, and several entire land shells, all obtained in a bundle of esparto grass. Dr Young said that Mr Taylor in John Street had sent him grubs and beetles, found in the lignumvitae logs which he obtained for the purposes of his business.

In the course of the evening, Dr Grierson of Thornhill, at the request of the President, made some remarks on the subject of local museums, and referring to that at Thornhill, said that he was already able to trace to that institution important benefits. Young men had been led to take an interest in Natural History studies, and had found the benefit in the knowledge they obtained being directly applicable to their pursuits. Thus the careful study of the vine had led the gardeners of the district to a thorough knowledge of the habits of the *Phylloxera*, whose devastating

powers had been so widely experienced. He urged natural history as an important educational instrument supplemental to the three R's, which are, after all, only the handles of the tools. Dr Young explained that the collection of the Museum, the building in which it is lodged, and its maintenance, were at the expense of Dr Grierson himself, and that in addition to this great but unobtrusive gift to the district, a gift which the money spent only feebly represented, Dr Grierson gave personal attendance for the purpose of helping young students, and conducted a small society of naturalists. Dr Young, in name of the Society, thanked Dr Grierson for his remarks, and expressed a hope that the Thornhill and the Glasgow workers might be more closely associated.

ANDERSON'S UNIVERSITY BUILDINGS.

JANUARY 7TH, 1873.

Mr John Alexander in the chair.

Mr John Lyle and Mr Walter Gibson were elected resident members.

SPECIMENS EXHIBITED.

Mr Robert Gray, F.R.S.E., exhibited a very handsome pair of Greenland Falcons (*Falco candicans*), from Davis' Straits; also a specimen of the Kingfisher (*Alcedo ispida*), which had been captured alive about a fortnight ago at Ibrox Terrace, Govan Road, a locality interesting from its close proximity to the city.

PAPER READ.

On the Sea-gulls at present frequenting the Estuary of the Forth. By Mr ROBERT GRAY, F.R.S.E.

It will be in the recollection of some of the members, that about a year ago I read a communication from one of our corresponding members, Mr Harvie Brown of Dunipace, in which mention was made of the extraordinary flocks of sea-gulls which were then found frequenting the Firth of Forth, near Grangemouth. Besides referring to the Kittiwake and some of the larger gulls, Mr Harvie Brown stated that the two species which were most

abundant were the Common Gull (*Larus canus*) and the Black-headed Gull (*L. ridibundus*), and that the waters of the Forth were literally covered with birds.

Since that time I have had no information leading me to suppose that these birds had returned to the estuary, at least in any numbers; indeed, during the past autumn, it was remarked that there were but few birds of any kind to be seen, and my own observations, on two occasions, fully corroborated the apparent scarcity. I was therefore gratified, as well as surprised, on learning from Mr Thomson of the Kelvingrove Museum, about a fortnight ago, that between the towns of Alloa and Kincardine the gulls were flying about in thousands. He had just been there, and wished my opinion on some of the birds he had brought home. On visiting Mr Thomson I was hardly prepared for the sight which awaited me, as he had on his table no less than six Glaucous Gulls (*L. glaucus*) in various stages of plumage, and a number of Kittiwakes (*L. tridactylus*), a bird which has hitherto been recognised as rather a scarce species during the winter season. Mr Thomson told me that he was indebted to his friend Mr Gibson for having induced him to visit Kincardine; and as, from the accounts submitted to me, it was evident that the invasion of sea-gulls was no ordinary one, another visit was at once arranged.

We therefore met on the morning of the 27th December, and took train for Alloa. Our party consisted of Dr Dewar, Mr Gibson, Mr Thomson, and myself. On reaching Kincardine, we found the estuary perfectly packed with birds. The tide being full and a strong gale prevailing at the time, we made up for the disappointment of not having a boat by waylaying the gulls from the embankments, and also from the ferry pier which juts some distance into the water. It was impossible, in fact, to use a boat on account of the storm; indeed, the best proof I can give of its severity, is to mention that one of the Newhaven fishing-boats was lost not far from where we stood, and a crew of four persons drowned.

Taking up our stations, in the first place, on the pier, Mr Gibson had the good fortune to bring down the first Glaucous Gull—an immature bird. As it fell into the water, four of the bystanders—either ferrymen or fishermen—volunteered to retrieve it, but I must say I never saw so many experienced rowers have their strength put to so severe a test. The distance could

not be more than thirty yards, yet such was the force of the wind, that the task of picking up the gull was heavier than a mile's rowing in ordinary weather.

From this post Dr Dewar proceeded southwards about two miles along the shore, while Mr Thomson and myself took an opposite direction, leaving Mr Gibson and one of the Tulliallan keepers in sole possession of the pier. We soon found that many of the larger gulls might be obtained by screening ourselves behind the grassy embankment, and we therefore lay down at a point we selected in full view of a small bay, which the storm-baffled birds were scanning for stranded Garvies, and, as we ultimately found, the bodies of the shot Kittiwakes which were drifting up from our two friends on the pier. We had not been long on the ground when three or four Glaucous Gulls came in sight, soaring quietly with arched wings, and eagerly searching the verge of the mud-banks just beginning to appear. Two of these Mr Thomson secured—one of them at a very long range, with a charge of No. 1, the only really serviceable shot in such weather. This bird, though we heard the charge strike its feathers, showed no signs of being hit; but we had the satisfaction, after watching its flight a few minutes, of seeing it alight in the water and then drop its head. The wind very soon drifted it to the muddy shore, about fifty yards from the embankment, and we induced a Kincardine arab to wade in for it, which he did to our entire satisfaction, though once or twice we felt anxious about his safety. We saw altogether, while at this post of observation, upwards of fifty Glaucous Gulls, all in flight, and easily recognised by their size, the absence of black tips to their wings, and, I may add, their mode of flying, for it was impossible to mistake them for the Great Black-backed Gull (*L. marinus*), whose wing is, as a rule, of much greater length and curvature. We secured three specimens of the last mentioned bird—the measurements of which varied extremely, whether as regards length and thickness of bill, extent of wing from flexure, or total expanse from tip to tip.

Looking northwards and westwards, we observed the Kittiwakes following the shoals of Garvies (*Clupea sprattus*), and hovering over the water in impenetrable clouds, appearing, when seen against the opposite woods of Dunmore, like a heavy fall of snow. There must have been many thousands in the estuary at the time,

for it was occasionally impossible to see the other side of the firth through the main body.

Rejoining our friends on the quay we found that they had nearly filled a boat with Kittiwakes, all of which had been killed while crossing the pier. I counted over one hundred and ten birds—a task which enabled me to note the per centage of those in adult plumage. I found only four adult birds in that number, and judging from the flocks that flew past me, as I stood upwards of an hour watching their movements, I should say that the birds in the hand were a very fair criterion of those in the air. While here, as was noticed by Mr Thomson and myself when along the banks, we saw comparatively few species, the bulk of the birds being Kittiwakes. Occasionally a full plumaged Great Black-backed Gull swept past, and there was a sprinkling of immature birds of that species also visible during our stay; but these were nothing when compared with the clouds of Kittiwakes that rose and fell, while feeding on the shoals of Garvies.

On examining the contents of our hamper, we found Mr Gibson had shot another Glaucous Gull; and Dr Dewar having come in from his shore ramble, shewed us other four, a beautiful adult and three in immature plumage, making eight in all of that important species. Dr Dewar reported that he had seen an Iceland Gull (*Larus leucopterus*), in full adult dress, and on comparing notes with him as to the numbers of the Glaucous Gull seen by him and ourselves, we agreed that, on a moderate computation, there must have been from one hundred and fifty to two hundred in the firth between Alloa and Kincardine alone. I may here remark that Mr Thomson was told of Mr Singer of Kincardine having last month killed fifteen of these gulls at a single shot; and on questioning some of the older seafaring people of the town about the birds, I was informed that they are recognised in the estuary every winter, and in the young state are called *Golden Maws*. During Mr Thomson's first visit, and that of which I am now giving an account, the total number of specimens taken to Glasgow was fourteen. At least other eight were shot, but lost on account of the difficulty of retrieving them.

On the 2d of January Messrs Harvie Brown and George Paterson, both members of this Society, visited the estuary, and procured two Glaucous Gulls and a beautiful adult specimen of the Great Black-backed Gull. Mr Harvie Brown informed me

that he had on the same day shot an immature Iceland Gull, somewhat smaller than one which he had killed on the 31st December. The two birds measured as follows:—

I. Specimen in last stage of immaturity :

Length, 21 ; wing, from flexure, $15\frac{1}{2}$ inches.

II. Specimen in plumage of first winter :

Length, $21\frac{1}{2}$; wing, from flexure, 16 inches.

At our next meeting I hope to exhibit these and others which may be obtained during the interval.

On Saturday last, the 4th inst., I joined Mr Harvie Brown and Mr Robert Paterson in another excursion to the same place, and immediately on reaching the ferry we were pleased to find several Glaucous Gulls hovering lazily in the vicinity. One of these, a splendid adult male, now on the table, alighted on the mud within fifty yards, and, on going cautiously forward, Mr Harvie Brown at once secured it. This was the great catch of the day; but the excursion was not without other important fruits, as we were fortunate enough to see and fairly recognize, five, if not six, adult specimens of the Iceland Gull, which is a much rarer species on the British coasts. Of the identification of these I have not the least doubt. We had a boat at our service, and were rowed across to the opposite banks, where, however, we procured nothing but an adult Kittiwake. It is worth noticing here that on returning to the spot some hours afterwards, my two friends shot six adult Kittiwakes from a flock of certainly not more than 150 birds, and saw many more, shewing that my previous estimate would not apply to the present gull population of the firth. It shews, moreover, the advantage of repeated visits to such a locality for the purposes of observation; indeed, to form a correct idea of both numbers and species, it is absolutely necessary to be there at various states of the tide and in all kinds of weather, besides waiting occasionally until the fishermen begin to draw their nets.

During this excursion I can safely say that I did not see one fiftieth part of the numbers of sea-gulls I saw on the 27th December; but before we left, Mr Harvie Brown suggested that we should proceed along the banks in the direction of Dunmore, and I was glad we did so, as we had an opportunity of observing by far the largest congregation of Black-backed and Glaucous Gulls I had yet seen. The birds were all sitting on the mud, far out of range of

our guns, but, with a powerful glass, we readily made out the species. We gave them a parting salute, and the rising of that large flock on wing, was one of the best bird-sights I have enjoyed I may say for many years.

So much, then, for the excursions, so far as they have gone. Let me now, in a few words, advert to the birds we obtained, and which you have submitted to your inspection.

To begin with the Glaucous Gull or Burgomaster:—I may state that the earliest account of the bird (which is accompanied by a roughly executed figure) appears to be that given by Fred. Martens, in his “Voyage to Spitzbergen,” published in 1671. “The Burgermeister,” says this quaint writer, “is the biggest of all the birds of Spitzbergen; wherefore his name is given him, as being the chief of them. His bill is crooked, of a yellow colour, narrow and thick; his under-bill is somewhat rising or knobby at the point or end, a great deal more than the Kutge-chefs, which looketh very pretty, as if he had a cherry in his mouth; he hath longish nostrils, and a red ring about his eyes; he hath but three claws, of a grey colour; his legs are grey, and not quite so long as those of a stork, yet he is almost equally big with him. His tail is broad like a fan, and white, which is chiefly to be understood of these birds when they fly. His wings are of a pale colour, and so is all the back, but *his wings are white at the tip*, and so is the whole body.” In later times, though the Glaucous Gull was well known to Brunnich in 1764, and subsequently to Gmelin and Fabricius, it was only first recognised as a British bird by the late Dr Edmondston of Shetland, who sent a specimen to Mr Bullock in 1814, and afterwards described its habits, as observed by himself, in the memoirs of the Wernerian Society of Edinburgh. Since that time it has occurred sparingly on our coasts as a winter visitant, though it is still regarded by English collectors as a somewhat rare bird. I have for some years, however, entertained the idea that it is a regular migrant as far as the estuary of the Forth. On the Aberdeenshire coast it was observed two years ago in considerable numbers, and a correspondent there informed me that he never visited the shore during the winter without seeing a number. I had myself killed stray examples thirty years ago on the coast of East Lothian; and in the Outer Hebrides small flocks have of late years been seen frequenting the sounds which separate the islands of Benbecula and the two Uists.

To show the variation in size to which this species is subject, I shall give the dimensions of those obtained in the Forth, and then quote what different authors state on the subject.

The eight specimens shot at Kincardine were all females except one; they averaged 27 inches in length,—the largest being 29 inches, and the smallest $25\frac{1}{2}$ inches. These, I may mention, were all in immature plumage. An adult male, killed by Mr Thomson on the same day on the Forth, measured 30 inches in length; and another, also a beautiful adult bird, shot by Dr Dewar, had the wings, when closed, extending fully an inch beyond the tail. This is contrary to what is said of the specific characters given by most authors, who state that the wings when closed are of the same length as to the tip of the tail. The average measurement of wing from flexure of the specimens here referred to was 19 inches.

Mr George Paterson's specimen, killed on 2d January, measured as follows:—

Length, 29; wing, $18\frac{1}{2}$; breadth, $62\frac{1}{2}$ inches.

Mr Harvie Brown's adult male, shot on the 4th January, measured—

Length, $29\frac{1}{2}$; wing, $19\frac{1}{2}$; breadth, 64 inches.

Two others, in immature plumage, measured as follows:

I. Length, $27\frac{1}{2}$; wing, $17\frac{1}{2}$; breadth, $60\frac{1}{2}$ inches.

II. „ 26 „ $17\frac{1}{2}$ inches.

No. II. showed the same length of wing from flexure, while it varied an inch and a half in total length.

Capt. Sabine, in his "Memoir of the Birds of Greenland," gives the measurements of one—a young bird—shot in Davis' Straits on 6th June:—Length, 26; breadth, 58 inches; and another—a full adult male:—Length, $29\frac{1}{2}$; extent, 63 inches; showing a difference of $3\frac{1}{2}$ inches in the length, and 5 inches in the total expanse. The smaller bird referred to by this author differed strongly from the larger in being nearly white all over; and, being so very much smaller in size, he conjectured it might have been caused by sickness, or by scarcity of food.

Dr Edmondston, in the "Wernerian Society's Memoirs" (Vol. v., p. 176), states the dimensions of one to have been:—Length, 33; breadth, 64 inches; while another specimen, shot in Balta Sound, in November, 1821, measured in length only 29 inches.

Macgillivray's measurements are :

Male,.....	Length, 30 ;	wing, $19\frac{1}{2}$;	breadth, 62 inches.
Female,.....	„ 28	—	„ 60 „
Young bird,	„ 26 ;	wing, $18\frac{1}{2}$ inches.	
2d Winter,	„ 27	„ $18\frac{1}{2}$ „	
3d Winter,	„ 29	„ $19\frac{1}{2}$ „	

—a result showing greater dimensions as the bird gets older. As variations, he mentions that the largest he examined was 30 inches in length, and the smallest 27 inches.

Fleming's figures are :

Length, 30 ; breadth, 63 inches.

Selby gives no measurements but those of the bill, which I find to be even more inconstant than those of the body.

Yarrell gives the length as 32 or 33 ; wing, 19 inches.

II. Length, $27\frac{1}{2}$; wing, $17\frac{3}{4}$ inches.

III. „ $26\frac{1}{2}$ „ $17\frac{1}{2}$ „

Richardson and Swainson, in "Faun. Bor. Amer.":

Length, 29 ; wing, from flexure, 19 inches.

Audubon, "Orn. Biog.," Vol. v., p. 61 :

Length, 30 ; wing, from flexure, $19\frac{1}{2}$ inches.

Baird, Cassin, and Lawrence. Birds of North Amer.:

Length, 30 ; wing, $19\frac{1}{2}$; alar extent, 60 inches.

The flight of this gull is soft, sedate, and owl-like, and easily distinguished from that of the Great Black-backed Gull or the Iceland Gull. The birds we saw were chiefly flying along the muddy shores, and not over the water like the Kittiwakes. One which passed Mr Thomson and myself, twice over stooped in its flight and lifted a dead Kittiwake, which it carried to a considerable height in the air and then dropped. I have no doubt but that for our presence it would have taken it to the embankment and devoured it bodily. The whole of the specimens—thirteen in number—were extremely fat, but nothing was found in any of their stomachs, except a few remains of fish bones and scales. The same remark applies to other four skinned at the same time. I am inclined to think they live largely on carrion. On the other hand, every Kittiwake we shot was crammed full of Garvies.

When satisfied, and during the time the Kittiwakes and other smaller gulls are following the Garvies back to Queensferry at low tide, the Glaucous, Great Black-backed, and, I am inclined to think, the Iceland Gulls, remain roosting on the mud-flats or in

the adjoining fields. I regard the Glaucous Gull as a much less shy bird than its congener the Great Black-backed Gull.

It may be added that Messrs Harvie Brown and Thomson, and Dr Dewar, procured a number of Herring Gulls (*L. argentatus*), Lesser Black-backed, and Great Black-backed Gulls, in various stages of plumage, from the young of the first year to the end of the fourth. Many of these birds were of great interest, some shewing but the faintest trace of immaturity, and others being beautifully marled all over. Great diversity existed also in their measurements. I particularly notice the specimens of *L. marinus*, belonging to Mr George Paterson: one, an adult bird, was in length, 27; wing, $19\frac{1}{2}$; total expanse, $62\frac{1}{2}$ inches; while the other, a bird of the first winter, measured in length, 30; wing, 21; total expanse, $69\frac{1}{4}$ inches.

With regard to the Iceland Gull, it appears to have been first made known as a distinct species in the Wernerian Memoirs (Vol. iv., p. 507) by Dr Edmondston, who describes one shot by himself in Balta Sound, Shetland, in April, 1821, as being smaller than a Herring Gull, and also refers to another which was shot in the Clyde in December, 1822. The length of this specimen was 22, the breadth, 52 inches. Faber, however, in his account of the Birds of Iceland, published in 1820, had the honour of first distinguishing the species, which he named *L. leucopterus*.

Great differences have been observed in the size of individuals of this species. According to Macgillivray, the largest that had come under his notice measured 26 inches in length, and the smallest 20 inches. Of one adult male he gives the length, 24; wing, from flexure, $17\frac{1}{2}$; breadth, 50 inches. Females smaller, as in the case of the Glaucous Gull. Young measured from 20 to 23 inches.

Capt. Sabine, in his "Memoirs of the Birds of Greenland," has evidently described his Arctic variety of the Herring Gull from a bird of this species. He says he should have been disposed to consider the bird as a new and undescribed species, but that Mons. Temminck had in a personal interview influenced his judgment. Capt. Sabine's measurements are for males—average, 24 inches in length; females rather less: alar extent, 53 to 54 inches.

Fleming's measurements are :

Length, 24; breadth, 53 inches.

Yarrell gives 22 inches in length for one, and for another 18 inches; wing, $15\frac{1}{2}$ inches. The wings, he says, reached two inches beyond the tail.

Richardson and Swainson, F.B.A. 418:

Length, 26; extent, 50 inches,

—these measurements being copied from Macgillivray, who probably had his specimens from Audubon.

Audubon, "Ornith. Biog.," Vol. iii., p. 553:

Length, 26; wing, $17\frac{1}{2}$; extent, 50 inches.

This author describes the angle of the mouth and edges of eyelids as being of an orange red; irides, pale yellow.

Baird, Cassin, and Lawrence. Birds of North Amer. 843:

Length, 26; wing, $17\frac{1}{2}$ inches,

—measurements which, when taken in connection with the fact that they give little or no information about this gull, would almost indicate that they had been borrowed, without acknowledgment, from the same source.

The flight of the Iceland Gull, so far as I have observed, resembles that of a large tern—the flapping motion being similar to that of the Common or Arctic Terns, owing, no doubt, to the length of the quill feathers in proportion to the size of the body of the bird. It appears to be a much shyer bird than either the Glaucous or Black-backed Gulls. It is well known in Arctic waters; and, according to Professor Newton, is a winter visitant only to Iceland, while the Glaucous Gull is resident there.

As in the case of the bird last named, another species closely resembling the Iceland Gull has been discovered on the coasts of North America (Behring's Straits and Greenland), and been named by Bruch *L. chalcophterus*. This species, which is the Grey-winged Gull of Lawrence, appears to be a small edition of *L. glaucescens*, the offshoot from the Glaucous Gull, and is only to be recognised by the ashy grey wing feathers, terminating in white spots at the points. This circumstance is highly curious, though not without suspicion, as the same deviation happening in both forms is apt to create a doubt in the specific value of the eastern bird. *Glaucescens* is a good species, and appears to be confined to the coasts of North-western America. As, however, the smaller variety has been recognised by Professor Baird and the late Mr Cassin, it would be well to scrutinize carefully all specimens of British killed Iceland Gulls. The unusually large flocks of gulls of all kinds,

indeed, which are at this moment in the estuary, suggest the probability of some of the nearly allied North American forms being present.

There can be no doubt that the immense numbers of these birds at present frequenting the Forth have been attracted by the shoals of Sprats or Garvies which at full tide are swarming near the surface of the water. These fish are taken in prodigious quantities in nets by the fishermen, who dispose of them in cart-loads. The selling price being about 10s a ton, the farmers in the neighbourhood use them as manure. We saw entire fields spread over with Sprats, and men busily employed in ploughing them in.

No doubt need be entertained, I think, as to the origin of these immense flocks of sea gulls. They cannot be looked upon as offshoots from British nurseries, but are strictly of Arctic parentage. The presence of so many Glaucous and Iceland Gulls I think clearly shows this.

In conclusion, I may add a word of summary. The experience of the past fortnight has shewn me that the Glaucous Gull has occurred in very large numbers during the present winter, and that the Iceland Gull—a still rarer bird—has also been seen in much greater numbers than we have any previous record of. We have likewise seen that the Kittiwake, usually accounted a migratory bird, and entirely absent, or nearly so, in winter, is moving about at present in thousands in the firth, and that their presence is wholly due to the abundance of food. Whether they have travelled southwards from Arctic seas in the immediate train of the fish I am not able to say, though, from their extraordinary numbers, it may be presumed so. I can only further recommend the field to the notice of ornithologists as furnishing a rare opportunity for studying the flight and habits of several of the rarer species, and I must cordially thank Mr Thomson for having drawn my attention to such an unprecedented influx of Arctic gulls into our Scottish waters.

JANUARY 28TH, 1873.

Professor John Young, M.D., F.G.S., President, in the chair.

Mr Robert Paterson was elected a resident member, and Sir George Hector Leith, Bart., Ross Priory, Dumbartonshire, a corresponding member.

SPECIMENS EXHIBITED.

Mr Peter Cameron, jun., exhibited an interesting collection of insects, chiefly from the neighbourhood of Glasgow, and including the following:—Sawflies—*Pachyprotasis variegata*, *Lophyrus virens*, *L. pallipes*, *Taxonus glottianus*, Cam., a new species found in Kenmuir woods; and *Tenthredo obsoleta*, a species not hitherto recorded as British. Bees—*Bombus fragrans*, together with its nest, found in Possil marsh; and *Nomada xanthostica*, a very rare species, which had been taken on the Tollcross sand-hills. Cynipidae—*Cynips lignicola*, *C. radicis*, *Trigonaspis megaptera*, and *Spathogaster baccarum*, along with their galls. Beetles—*Donacia crassipes*, found on the water-lilies at Bardowie Loch; *Dyschirius impunctipennis*, found on the sands at Troon; and *Bembidium paludosum*, from Possil. Mr Cameron likewise exhibited a curious neuropterous insect, *Raphidia maculicollis*, and a grasshopper, *Tetrix bipunctata*, both taken in the West of Scotland.

Mr John Kirsop exhibited a small collection of birds from Berbice, and Mr James Watson laid on the table a singularly-formed bird's nest from Jamaica.

Mr Robert Gray, F.R.S.E., exhibited a very perfect specimen of the Ivory Gull (*Larus eburneus*), which was shot at Campbelton on the 21st January last. The bird was remarkable for the purity of its plumage, being wholly of a spotless white. Mr Gray remarked that it agreed precisely with the published description of the variety known among ornithologists as the Short-legged Ivory Gull (*Pagophila brachytarsus*, Holböll), a variety which the late Prince Bonaparte had shown to be identical with the *Larus neveus* of Brehm. Compared with the ordinary form, it is whiter and more handsome, being larger and having the bill shorter, with the tip orange-coloured. This variety had previously occurred once in Scotland, a specimen, now in the collection of Sir William Jardine, having been obtained in the county of Caithness some years ago.

PAPER READ.

On the Occurrence of the Iceland Gull (Larus leucopterus) in the Estuary of the Forth during the present Winter, with notes on the habits of the species, from personal observation. By Mr JOHN A. HARVIE BROWN, M.B.O.U., corresponding member.

Mr R. Gray, in his paper "On the Sea-gulls at present frequenting the Estuary of the Forth," has already drawn the attention of the members of this Society to the extraordinary invasion of Arctic gulls. When first observed and commented upon, a few specimens of the rarer species of White-winged Gull (*Larus leucopterus*) had been observed by Dr Dewar, and afterwards they were seen in some numbers by Mr Gray and myself on the 4th January. As Mr Gray mentioned in his paper, we identified at least six adult birds of this species on that day. Since then I have met with them abundantly; on some days they were much more numerous than the Glaucous Gull (*L. glaucus*). But it was only at sunrise on the 13th of this month that I realised in my mind the vast numbers which are frequenting the firth. Whether those I saw on this day had only lately arrived, or had merely remained out of sight, it is difficult of course to determine, but I think, from what I have observed of late, that the latter is the more probable supposition. On the above mentioned date, I counted in a few seconds no less than twelve adult Iceland Gulls as they flew low against the wind, showing the white primaries distinctly, and as I afterwards slowly drifted in a boat along the side of the mud-banks, Iceland Gulls were constantly in sight, two, three, or even more at a time. These birds were all flying away inland; and, in company with Glaucous and other gulls, were alighting on a ploughed field on Dunmore estate. Towards the afternoon scarcely a single Iceland Gull was visible over the water. As a large body of gulls have for some time past frequented this particular field, I am in the belief that the Iceland Gulls have been generally associating with them, and, in fact, that they are not so exclusively maritime in their habits as has been described. Moreover, it is seldom that I have observed the Iceland Gull following the shoals of Garvies (*Clupea sprattus*), or fishing for them in the manner of the Kittiwake (*Rissa tridactyla*), or even to the same extent as the Glaucous or other large gulls. They seem rather to hold

aloof from the other species when the latter are fishing, and fly often in pairs far inland over the mud-flats. Upon other occasions, on firing a shot in early morning, when the crowd of gulls was resting on the edge of the mud, I have observed that they almost invariably wing their way to the above-mentioned field; and, when the tide rises, and the fishermen begin drawing their nets, do not, like the other species, flock down to feed on the fish which escape through the meshes, and which struggle for a time near the surface.

Upon the 15th of January I again paid an early visit to the coast, and took up a position on the pier. Thousands of great gulls—*Larus marinus*, *L. fuscus*, *L. glaucus*, and *L. argentatus*—were massed together on the mud-edge, and on examining them carefully with my glass, I could distinguish many of the more slender-built Iceland Gulls amongst them. At length one adult Iceland Gull flew past me, and I fired, but ineffectually. With the rushing noise of many wings, the great body of gulls rose, at the report of the gun, and, along with other flocks lower down the firth, winged their way, as before, inland, and the air became filled as by a snow-drift.

Before they all took wing, however, I had a good opportunity of comparing the Glaucous and Iceland Gulls when at rest, and the experiences of this, and of another trip combined, have led me to the following conclusions:—Apart from the inferior size of *L. leucopterus*, which in itself alone cannot be accepted as a criterion for distinction, this species can be separated by the field naturalist from the Glaucous Gull, by its neater, more slender appearance, standing higher on its legs, having a more cuneate shape posteriorly, and the wings more tapering when closed. Further, it appeared to me that the Glaucous Gulls when resting on the mud, and with the wings closed, carried the tips of the wings higher than the end of the tail, but that the Iceland Gulls carried their wings on the same, or nearly the same level as the tail; thus imparting to these birds a more tidy, trim appearance than their big brothers possessed. Those who have watched the tame goose of our farm-yards, and have had opportunities of comparing with it the lighter, handsomer form of the tamed Grey-lag Goose (*Anser ferus*), will more easily understand some of the comparisons I have above drawn.

When flying, the action of the Iceland Gull is more airy and

buoyant—less owl-like—than that of the Glaucous Gull. The adults, when flying low or against a dark cloud, show the white primaries, like a narrow strip of silver, along the wing. (The wings of the Black-headed Gull (*Chroicocephalus ridibundus*) have this appearance also in certain effects of light, but the very diminutive size, and still more the tern-like flight of the latter, serve at once to distinguish them).

The Iceland Gull is by far the most wary species of gull at present in the Firth. The adults are especially shy. Indeed, had they proved anything like so tame as the Glaucous Gull, many more specimens, I am certain, would have appeared this evening on the Society's table.

It now only remains for me to direct your attention to the specimens before you. Mr Gray has described to you how the birds can be distinguished in the hand, and I have endeavoured to describe how they can be distinguished on the mud and in the air. I need not say, that should any of the members of this Society have opportunities of judging for themselves, I shall be glad to hear of the results of their observations. I do not consider the subject exhausted by any means; and such an opportunity as the present offers of studying the habits, postures, flight, etc., of these rare Arctic strangers, should not be neglected by those who have time to devote to the subject, and who feel sufficiently interested in it.

Mr Gray, in referring to the importance of Mr Harvie Brown's observations, called attention to the specimens which had been sent for illustrative purposes. These included four beautiful examples of the Iceland Gull, and six Glaucous Gulls, two of the latter being from the coast of Forfarshire.

There were also on the table some interesting skins of the Herring Gull and Great Black-backed Gull, some of them being in the last stage of immaturity, and others beautifully marked with blue and grey on the dorsal plumage.

FEBRUARY 25TH, 1873.

Mr John Alexander in the chair.

SPECIMENS EXHIBITED.

Mr James Lumsden exhibited a specimen of the Pine Marten (*Martes abietum*), which had been lent for the occasion by Mr Alexander Martin, Exchange Square. This species, now a very rare British quadruped, is readily distinguishable from the Common Marten by the patch under the chin, and throat being of an orange yellow in place of white. The present example was killed in Glencoe, Argyllshire, a few weeks ago.

Mr James Thomson, of the Kelvingrove Museum, exhibited a specimen of the Little Gull (*Larus minutus*), in the breeding plumage; a pair of Bernicle Geese (*Anser leucopsis*), from Islay, one of which had the facial and chin markings of a strong rufous tint; and a pair of Great Northern Divers (*Colymbas glacialis*), from Campbelton. These two last-named birds completed the interesting series now in the Museum, and showed the transition from the plumage of the first year to the adult bird, as also the seasonal changes.

Mr John Kirsop exhibited a large and interesting photograph of various perfect skeletons of the Moa and its allies, the original having been taken from the valuable series in the museum at Christchurch, New Zealand.

Mr Thomas Chapman exhibited specimens of a new butterfly, *Euploea Lorraini*, sent from Java by Mr William Lorrain, corresponding member.

Mr Robert Gray, F.R.S.E., exhibited a specimen of the Glaucous Gull, which had been killed at Craignish, in the Sound of Jura, on 15th January, and remarked that it had probably wandered across the country from the Forth, where so many of these birds had been seen and procured during the present winter.

PAPERS READ.

Note on the Velocity of the Flight of the Common Pheasant
(*Phasianus colchicus*). By Mr JAMES LUMSDEN.

In this communication it was stated that last month a hen Pheasant had, while in full flight, dashed through a pane of strong plate glass, upwards of a quarter of an inch in thickness, in one of

the windows of Arden House, Dumbartonshire, and that large pieces of the glass, which were exhibited, had been violently thrown to a distance of twenty feet inside the room.

Notes on various Lepidoptera collected at Rannoch.

By MR JAMES KING.

Several interesting moths were included in the list furnished by the writer of this paper.

Note on the occurrence of the Eagle Owl (Bubo maximus) in Perthshire.

From Mr M'LAY, Inverness; communicated by Mr GRAY, F.R.S.E.

This rare bird, of which only two or three examples have occurred in Great Britain, was shot on 17th January last, in a birch-wood on the banks of the Tummel, six miles above Pitlochry. It measured five feet from tip to tip of its wings; the length, from beak to extremity of tail feathers, being two feet. Mr Gray took the opportunity of laying on the table, for the inspection of the members, a specimen of this bird, the history of which possessed unusual interest, having belonged originally to the famous Audubon, and presented by him to the late Professor Macgillivray, who mentions in his work "On the Rapacious Birds of Great Britain," that it served him as a subject for description and measurements. Having been kept alive for some time, it was at length killed and skinned, as a cabinet specimen; and, after passing into more than one collection, it had ultimately found a resting-place in Mr Gray's own cabinet.

SPECIAL MEETING.

NATURAL HISTORY CLASS ROOM, GLASGOW UNIVERSITY.

MARCH 11TH, 1873.

Professor John Young, M.D., F.G.S, President, in the chair.

SPECIMENS EXHIBITED.

Dr Young called attention to a series of specimens containing the remains of *Cladodus mirabilis*, a large sauroid fish, from Langside quarry, Beith, and entered into an explanation of the different

portions which had been preserved, after which Mr John Young, F.G.S., pointed out the horizon of the limestone in which they occurred.

Dr Young also exhibited a number of objects from the Hunterian Museum, including a collection of specimens showing reptilian remains from the Lanarkshire coalfield.

Mr James Thomson of the Kelvingrove Museum exhibited a portion of the carapace of the Glyptodon, a gigantic edentate animal from the Upper Tertiaries of South America, allied to the armadilloes of the present day, a specimen of which was on the table, and on which the chairman made some remarks.

ANDERSON'S UNIVERSITY BUILDINGS.

MARCH 25TH, 1873.

Professor Alexander Dickson, M.D., Vice-President, in the chair.
Mr David Gemmell was elected a resident member.

SPECIMENS EXHIBITED.

Mr George E. Paterson exhibited a specimen of the Pink-footed Goose (*Anser brachyrhynchus*), from Kincardine-on-Forth. It was remarked that in reality this bird was one of the rarest of the British wild geese in Scotland, and that but little had been recorded of its habits by recent writers from personal observation. Mr Robert Gray, F.R.S.E., observed that, until within the last eight or ten years, ornithologists had accepted Macgillivray's statement, that the Pink-footed Goose was a native of the Hebridean islands; an evident mistake, as subsequent observers have proved. He believed that in the eastern counties of Scotland it might be found to be a regular winter visitant in small numbers, but that records of its appearance were still much wanted.

Mr John Kirsop exhibited a large leg bone, which he had obtained from Captain Aiken, Bowling, and which had been dredged from the Clyde, near Erskine Ferry; also several red-deers' horns, from a sandy deposit in the Clyde, near Dalmuir. Mr John Young, F.G.S., stated that, in his opinion, the bone belonged to a large example of the horse.

Mr Robert Gray, F.R.S.E., exhibited two specimens in the flesh,

male and female, of the Marsh Tit, *Parus palustris*, from Dunipace, in Stirlingshire, and which had been forwarded by Mr J. A. Harvie Brown, corresponding member. Mr Gray said that this bird would appear to be restricted to only a few localities north of the Tweed, but not confined to marshy places, as its name would indicate. At the same time he admitted that, from its close resemblance to the Cole Tit, it had been possibly overlooked, and he therefore invited closer attention to the subject of its distribution.

The Librarian announced the following donation to the Library :—The Transactions and Proceedings of the New Zealand Institute, Vols. i., ii., 1868–70 ; from Mr Gavin Miller.

APRIL 29TH, 1873.

Mr James Ramsay, Vice-President, in the chair.

SPECIMENS EXHIBITED.

Mr John Young, F.G.S., exhibited, from the collection of Mrs Robert Gray, a number of crinoid remains from the Silurian strata of the Girvan district. Mr Young stated that the crinoids exhibited were the oldest organisms of their class yet found in the Silurian strata of Scotland. They consisted of the heads and portions of the stems of several species, in a very fair state of preservation, and were from two different localities, viz., Craighhead and Balclatchie. One of the crinoids, which appears to be not uncommon, seems to be very closely related to the Carboniferous genus *Rhodocrinus*, a specimen of which, from the Ayrshire coalfield, was exhibited for comparison with the older Silurian form.

Mr Young also exhibited a quantity of black magnetic iron sand, found as a small deposit, extending for a considerable distance along the south-east shore of the island of Bute. He stated that, although this black sand may have been formerly noticed by persons traversing that portion of the shore, no one seems to have examined or made any record, so far as he was aware, of this interesting deposit. Its discovery, in this instance, was due to his young friend, Mr Archibald Gray, who was struck by its peculiar appearance, and brought to Glasgow, lately, a quantity for examination. This sand, when gathered, was mixed up to a considerable extent with light brown quartz sand ; but on drying the

material, and passing a magnet through it, plenty of the magnetic iron sand could be collected free from the other matter. After all the magnetic sand is extracted by the magnet, there still remains in the deposit a quantity of black iron sand not magnetic, probably Illmenite or Iserite. It is found on analysis to contain arsenic in its composition. Mr Young stated that this magnetic iron sand from Bute resembled very much, in appearance and colour, similar magnetic iron sands obtained from the gold washings of Sutherlandshire and Australia, which he had seen. It was not known from what class of the Bute rocks this sand was derived; but he thought its derivation would likely be found in the trap rocks of the island, although metamorphic rocks in some districts yielded magnetic iron sand in their disintegration. Mr Gray informed him that it was to be found principally as a narrow band mixed with the ordinary shore sand, a little above high-tide level, but he had detected it likewise in small patches on lower levels of the shore.

Mr James J. King exhibited seven species of coleoptera, not previously reported from the Clyde district, viz.:—*Anchomenus gracilis*, *Notiophilus palustris*, *Pelophila borealis*, *Amara lunicollis*, *Bradycellus harpalinus*, *B. collaris*, and *Trechus obtusus*. Mr King also exhibited specimens of the following tortrices, taken near Glasgow:—*Dicrorampha herbosana* and *Cochylis smeathmanniana*.

PAPERS READ.

I.—*On the Reproduction of the Spines of Echinus sphaera (Müller).*

By Mr DAVID ROBERTSON, F.G.S.

Amongst the echinoderms there are many well-known instances of the reproduction of parts, as, for example, of the rays of star-fishes, but I am not aware that this has hitherto been recorded as having occurred with the spines of any of the sea-urchins. As the one I refer to is a species exceedingly common, and of which the characteristics have been frequently and minutely described in works on this department of marine zoology, without any allusion to this important circumstance, I am constrained to make the statement of reproduction of the spines with reserve; more especially as it is only on a single example that I have based my observations. Yet, in this case, there appear to be so many points of confirmation in favour of the view I hold, that I venture to bring it forward.

Looking at the specimen in its present condition, there can be no doubt that the greater part of the surface has had the spines rubbed off, and at other places broken off at different lengths from the base. To all appearance it has also had a new set growing on. This is obvious from what we shall call the "new spines" being all very small, and out of all proportion to the size of the shell or "test," while the portions of the old broken spines that remain are of the normal size. This forces on us the conviction that the two sets are not of the same age; the new spines being so feeble and small, that we cannot believe that they grew from the beginning in connection with the large tubercles on which they stand. Many of the denuded tubercles bear no new spines; but on close inspection it is seen that the convexity of such tubercles has been rubbed off, and it appears that the new spines are only reproduced when the tubercle and membrane have not suffered from abrasion.

In regard to the growth of the "tests" of the *echinidae*, it has been long known that the common membrane of the "test," by dipping between the edges of each plate, supplies calcareous material for the uniform enlargement of the whole. But the great variety of the contours that may be noticed amongst specimens of *Echinus sphaera*, shows that the law of enlargement does not keep strictly to uniformity. In the taller examples the supply to the edges of the plates must be greater to the vertical or polar edges than to the lateral, and the reverse must be the case with the flatter forms.

The principle, however, cannot apply in the same way to the growth of the spines; and I am not aware that any other explanation has been given.

The mutilated specimen of *Echinus sphaera* in my possession strengthens an opinion which I have entertained for some years past, that the spines grow or enlarge by concentric layers, as well as by their longer axis. I was first led to this belief by observing that in many of the glacial fossil spines, where all the soft animal matter had been removed, parts of the different layers came off, in some cases appearing like the drawn-out slides of a telescope. Sometimes the core comes out, leaving the external walls as an empty tube, as is well shown by the specimens exhibited.

In the recent example, many of the spines that have been broken have the inner layers produced beyond the outer ones, showing

a tendency in some cases to taper into a point. It is evident that this did not take place at the time of the fracture, but that they have thus grown since the accident occurred.

II.—*On a Section of Lower Carboniferous Limestone Strata, exposed at Sculliongour, on the North Hill of Campsie.* By Mr JOHN YOUNG, F.G.S.

Mr Young stated that during the working of the main limestone by the lessee, Mr Kirk, a new tract of rock had been opened up, lying on the hill-side, between the old quarries on the east, and the "Craw Road." After removing the overlying boulder-clay and shale from the top of the limestone stratum, the rock was found to contain many vertical fissures, some of which were completely filled up with a very fine vegetable pulp, in which were embedded considerable numbers of well-preserved hazel nuts. As these could not have passed into the fissures of the limestone from the present surface (the shale and boulder-clay being over fourteen feet in thickness), it became a point of interest to determine how they got there. The conclusions at which he had arrived, led him to believe that the higher rocky front of the hill had, in some remote period of time, been covered by hazel and other trees, which now no longer exist on the above tract. Streams descending from the hills would carry the nuts and vegetable matter, in the first place, into the numerous fissures of the trap; and with the descending water, they would be carried forward into those which traversed the limestone strata, where they ultimately found a lodgement. On a late visit, he had observed that a considerable stream of water was still pouring out of one of the fissures of the limestone, which water must have entered the strata at a higher point of the hill.

Mr Young concluded by observing, that many of the nuts had their kernels extracted by squirrels, a neat round hole being gnawed through the shell. The nuts were also larger than those which now grow in the Campsie glens, implying some slight changes in the climatal condition of the district.

MAY 27TH, 1873.

Mr John Alexander in the chair.

At this meeting a revised constitution was discussed and adopted, with enlarged and extended rules, embracing points where the former were defective, and increasing the number of Vice-Presidents to three, and of Members of Council to nine; the session to commence in September and close in April of each year.

The full text of the Constitution and Rules will be found at the end of this Volume.

SESSION 1873-74.

TWENTY-SECOND ANNUAL GENERAL MEETING, ANDERSON'S
UNIVERSITY BUILDINGS, SEPTEMBER 30TH, 1873.

Mr James Ramsay, Vice-President, in the chair.

Reports were received from the Treasurer and Librarian; the statement of the former showing a balance in favour of the Society of £67 16s.

The following gentlemen were elected office-bearers for the session:—Professor John Young, M.D., F.G.S., President; Mr James Ramsay, Professor Alexander Dickson, M.D., and James Stirton, M.D., Vice-Presidents; Robert Mason, Secretary; Thomas S. Hutcheson, Treasurer; Thomas Chapman, Librarian; James Coutts, William Sinclair, John Alexander, Gavin Miller, Donald Dewar, M.D., James S. Dixon, James Barclay Murdoch, Archibald Gilchrist, and David Corse Glen, C.E., Members of Council.

Messrs Robert Smith, James Cameron, and Thomas D. Buchanan, M.D., were elected ordinary members.

SPECIMENS EXHIBITED.

Mr James Coutts exhibited specimens of columnar sandstone, from the island of Bute, and explained its character and the situation in which it was found.

Mr Robert Gray, F.R.S.E., exhibited a specimen of the Nuthatch (*Sitta caesia*, Wolf), killed in East Lothian, and pointed out, that of late years it had been ascertained that the true *Sitta europaea* of Linnaeus had not yet occurred in this country. He, therefore, explained that it was of some consequence to identify correctly all specimens of the Nuthatch killed in Scotland, as the bird originally described by Linnaeus might yet be found in the Orkney and Shetland islands, where straggling birds were known to occur at uncertain intervals.

Mr Gray also exhibited a specimen of the Stormy Petrel (*Thalassidroma pelagica*), captured last week near Gourock.

Mr D. C. Brown exhibited several nut galls, from Rothesay ; illustrating the usefulness of insectivorous birds.

Mr John Kirsop exhibited several objects of interest, from India, including a perfect specimen of a saw-fish, caught in the Bay of Bengal, and a series of birds' skins, from the Carnatic.

The Librarian announced the following donations to the Library:—The Natural History of the Tineina; from Dr Colquhoun; Transactions of the Geological Society of Glasgow, Vol. iv., Part ii.; from the Society.

OCTOBER 28TH, 1873.

Mr John Alexander in the chair.

Mr Edward R. Alston, F.L.S., was elected a corresponding member, and Messrs John Chalmers and Hugh M'Bean ordinary members.

Mr Thomas Chapman exhibited specimens of *Urania ripheus*, from Madagascar, and two other species of the same genus, and remarked that these day-flying moths, which are often called emerald butterflies, compose the genus *Urania*, of which they form the only authentic known species. *Urania leilus* has been known in Europe for more than 200 years, and was named by Linnaeus. It is by far the most abundant species, and inhabits the northern half of South America and the West Indian islands. *Urania Sloanus* was first named by Cramer, and figured in his great work in 1779; it is not known to inhabit any other place than Jamaica, and is, therefore, not common in collections. *Urania ripheus* was first made known to the world by Drury, in the second volume of his work published in London in 1773; but his figure was made from a defective specimen, wanting the tails of the hind wings, and with the head of a butterfly substituted for the original. Drury states that the specimen from which his drawing was made was brought from China. The next specimen we read of was figured by Cramer, in 1782, with the statement that it came from the coast of Bengal; he refers to Drury's figure, and suggests that it was defective. Esper published a superior drawing of this species in 1801, and mentions that only three specimens were known to exist, and that he did not know from whence his came. Up to

1831, we do not find any farther notice of this insect; in that year Swainson published, in his "Zoological Illustrations," copies of both Drury's and Cramer's figures, stating that he had never seen the insect. In 1837, James Duncan, in his "Natural History of Foreign Butterflies," copies the same figures as Swainson, and quotes his remarks in extenso; although in 1833, *i.e.*, four years previously, Dr Boisduval published his natural history of the insect, with beautiful figures. He states that it inhabits Madagascar, and that a single specimen had been taken in Bourbon, whither a caterpillar had probably been transmitted accidentally. The larva feeds on the *Mangifera indica*. With respect to the geographical distribution of this genus, a problem arises for evolutionists to solve. We have two species located in the West Indies, and one in Madagascar; the shortest distance between these countries is across Africa and the Atlantic, but in Africa no closely allied species is found, and we may therefore conclude that extinct allied species connecting the two forms existed rather across the Pacific than over Africa and the Atlantic.

Professor Young, F.G.S., who was prevented from attending the meeting, sent for exhibition, through Mr John Young, F.G.S., specimens of a Silurian fossil, from the Girvan district. Regarding this organism, Dr Young stated that his attention was called to it by Mrs Robert Gray, and for some time he thought it represented some phyllopod crustacean. It belongs to a genus created some years ago by the late Mr Salter, who named it *Stenotheca*, believing that it belonged to the pteropods. Whatever the determination may be worth, it is interesting to find this same form in the Silurians of Scotland and North Wales; but its pteropod character is doubtful, for this reason, among others, that the valves are found in pairs, and in many cases the similar margins are turned towards each other, just as happens with *Dictyocaris*, *Estheria* and other bivalve forms. Dr Young said he was not in a position to affirm its crustacean character as more than a probability; and that we must therefore, meanwhile, accept the genus already established, and chronicle it *Stenotheca* (Salter).

Mr John Young, F.G.S., exhibited specimens of a small Carboniferous tubicolor annelid, which he discovered in the marine limestone shales of the Lanarkshire coal-fields, and which he had described in the London Geological Magazine for this year, under the name of *Ortonia carbonaria*. The genus *Ortonia*, he stated, had been

recently established by Professor Alleyne Nicholson, to embrace one or two similar forms of tubicolor annelids found in the Silurian strata of America. The species which he described consists of small conical cylindrical tubes, generally found attached by their whole length to the slender spines of *Productae* and stems of crinoids. They are ornamented with numerous sharp transverse ridges or annulations, and fine longitudinal striae. None of the specimens seemed to have attained a greater length than one-fourth of an inch, their greatest diameter being about one-twentieth of an inch. They have been found in the shales of several localities, in both the upper and lower limestone series; but nowhere do they seem abundant, nor has any more than this species been discovered in our strata.

Mr James Lumsden exhibited, I. A nest of the Red-throated Diver (*Colymbus septentrionalis*), from the island of Arran. The eggs were unusually dark and handsome; and it was remarked that the locality in which they were found was perhaps the most southern breeding haunt of the species in Scotland. II. Two young Choughs (*Fregilus graculus*), from Cantyre and Islay, shewing the gradation in colour of the legs and bill. One was taken from the nest, and showed a strong orange tint on the legs, though the scutellae in front appeared nearly black in colour; the other, which had left the nest, though unable to fly, had the legs of a still deeper orange, mixed with vermilion; showing that as the birds grow older the colour deepens. III. A specimen of the Rook, from Alyth, in Forfarshire, and of the Common Snipe, from Renfrewshire; the former being a singular variety, of a light brown or rust colour; the latter of a dirty white, which might ultimately have become an albino.

The Secretary read the following communication from the President:—There appears in the newspapers of this week notice of an unusual darkness over some places in the south of England; the intense gloom lasting for a short time, and being succeeded by brilliant sunshine. I have observed similar phenomena more than once, but find meteorological literature deficient on the subject. My belief is, that as these glooms come in autumn and winter, and are not accompanied by fog or cloud, they are due to the presence of much vapour in the crystalline form of ice, which, drifting as a cloud, obscures the sun-light, as a snow shower sometimes does; internal reflection of the crystals being the mode of such interrup-

tion of light. But the phenomenon is worthy of note; and the Society would do well to receive records of such meteorological events, which too often escape notice.

I may mention that the recent hail storm showed peculiar forms, the drop resembling a cone upside down, the lamellae being horizontal, like the petals of a rose, and similar in form.

NOVEMBER 25TH, 1873.

Mr James Ramsay, Vice-President, in the chair.

Mr James Nicol Fleming of Keil, Argyllshire, was elected a life member, and Mr W. Craibe Angus an ordinary member.

SPECIMENS EXHIBITED.

Mr J. A. Harvie Brown exhibited a rock specimen, from New Zealand, containing a number of shells of recent or existing species. Mr John Young, F.G.S., remarked, that the specimen was undoubtedly of recent origin, although consolidated into a hard compound rock by the infusion of some silicious matter in solution; and he further pointed out that, from the absence of any such solidifying agency in certain strata of Post-tertiary and other formations, shells of a very much earlier date than those seen in this specimen were still found embedded in material of a soft and yielding nature.

Mr James J. King exhibited a collection of specimens of lepidoptera, from Rannoch, including *Erebia epiphron*; *Coenonympha typhon*, three varieties; *Psodos trepidaria*; *Geometra papilionaria*; *Acidalia fumata*, very common in the Black Wood; *Fidonia pinetaria*, very local, only occurring in one small locality; *Emmlesia ericetata* and *E. blandiata*; *Coremia munitata*; a beautiful variety of *Cidaria corylata*, in which the ground colour was white and the markings almost black; and a very fine variety of *Eubolia palumbaria*, the colour of which was a dark slate with a chocolate tinge.

PAPERS READ.

I.—*Notes on Archæocidaris, a Carboniferous Echinoderm, with overlapping plates.* By Mr JOHN YOUNG, F.G.S.

My attention was recently directed to a review of Professor Wyville Thomson's "Depths of the Sea," in the May number of

the London Geological Magazine for this year (1873), in which a figure and short description are given of a new living Echinoderm, dredged during the cruise of the Porcupine in the Atlantic, off the Faroe islands, and which Professor Thomson has named *Calveria hystrix*; its peculiar feature lying in its possessing a flexible shell or test with overlapping plates.

In a short note, in the July number of the Geological Magazine, I called attention to the interesting fact that, besides the few other species of Echinoderms with overlapping plates noticed in the above review, there were Echinoderms, having their plates arranged on the same plan, as far back in time as the Lower Carboniferous limestone period. Those to which I specially referred, belong to the genus *Archæocidaris*, one of our oldest known Sea-urchins.

I may here be allowed to state, that previous to the time when my observations were recorded in the Geological Magazine, no palæontologist who has described the remains of *Archæocidaris* had, so far as I am aware, noticed that its ambulacral and interambulacral plates were arranged in the test in overlapping series. It is therefore with the view of more fully recording this fact in the Proceedings of this Society, that I now bring this paper on *Archæocidaris* before you this evening.

For many years past I have carefully preserved all the remains of *Archæocidaris* that came under my observation, and had long ago noticed the peculiar character of the bevelled edges of both the ambulacral and interambulacral plates, but I never fully understood their significance until I saw the figures, and read the description of the arrangement of the plates, of *Calveria hystrix*. I have no doubt that those of *Archæocidaris* were arranged on a somewhat similar plan; and I am now in a position to show, from numerous well-preserved plates in my collection, that their edges did not abut or join square, end to end, like the plates of other normal species of Echini or Cidaridæ, but must have overlapped or imbricated each other to a certain extent—a feature easily recognizable upon the edges of many plates, especially those belonging to the ambulacral series, which, from their smaller size, are often found in much better preservation than the larger interambulacral plates.

The interambulacral plates in *Archæocidaris* which bore the long primary spines are of two kinds—a pentagonal and hexagonal

series—as was first pointed out by Professor McCoy, and must have been arranged in the test in three or more rows. In this they differ from all mesozoic and recent forms of *Cidaridæ*, which have only two rows. The pentagonal plates are somewhat oblong, and seldom measure, in the largest specimens, more than $\frac{5}{8}$ inch in length in their greatest diameter; the hexagonal plates are generally smaller. Both series of plates have carried a long primary denticulated spine upon the central tubercle, some of which measure fully 4 inches in length. The plates are also bordered by a series of smaller secondary tubercles, varying in number from 40 to 100, on the larger plates. These, as first pointed out by Mr David Robertson, F.G.S., from specimens which he collected from the limestone shales of Dunbar, have likewise small slender striated spines, that seldom measure more than $\frac{1}{4}$ inch in length. These small spines are well seen in position along with the larger muricated spines, in a crushed and weathered test of *Archæocidaris* from the limestone shale of Sculliongour, Campsie.

The ambulacral plates are small, scale-like, and thinning from the middle on their under surface towards their edges. They are of irregular form, and vary from $\frac{1}{8}$ to $\frac{1}{12}$ inch in diameter. Each plate is perforated by a central pair of small pores, which, on the upper surface, are situated in the middle of a slight oval depression. Most of them are ornamented with two or three small tubercles, which probably bore minute spines. Along with the perforated ambulacral plates are found numerous other small plates that cannot be distinguished from the former, either in size or shape. These, however, contain no pores; but whether they were arranged alternately with the poriferous plates, or formed part of the base or summit of the test, I would not venture an opinion in the present disjointed condition in which the plates are met with: I may here state that, with the exception of the larger spines, which are only found preserved to their full length in the harder shales, all the best preserved fragments of *Archæocidaris* I have found were obtained from the washing of the weathered limestone shales. By this method I have obtained nearly all the plates and spines that compose the test, as well as all the portions of the lantern or dental apparatus, and these in a state of preservation that often permits of the examination of all their articulating surfaces.

I shall now shortly describe the overlapping character of the

plates, which forms one of the chief points of interest in this organism. The large oblong pentagonal plates have two of their shorter edges bevelled from above, and were overlapped by the lower edges of the hexagonal plates at this point, their edges being bevelled from below. The other opposite edges of the pentagonal plates are bevelled or thinned off from below, and overlapped in their turn the edges of the smaller plates in the ambulacral areas. I have also observed, in one or two of my best preserved pentagonal plates, that either the lower or upper horizontal edge—according to the way the position of the plate may be viewed in the test—has a small groove along that side, into which the edge of the next plate was received. Probably this was an arrangement to retain the plates in proper position during elevation and depression of the test, while, at the same time, it would allow of a certain amount of vertical movement along their edges, as well as amongst the overlapping plates in the ambulacral areas.

The plates of *Archæocidaris* are somewhat thinner than similar plates in other species of Cidaridæ constructed upon the normal plan. This feature, when taken along with the overlapping characteristics of the plates, may have given a greater flexibility to the test, like that observed in *Calveria hystrix*. If this were the case, and the plates held loosely together in the living animal, it may help to explain how very seldom it is that we find a specimen preserved with all the parts in position. This latter circumstance is all the more to be wondered at, when we consider the abundance and wide distribution of the organism throughout our limestone strata. Over many of the Carboniferous old sea bottoms thousands of specimens must have lived and died, yet not a single example, so far as I am aware, beyond the specimen from Campsie formerly mentioned, shows the arrangement and position of the various kinds of plates in the test.

The Campsie specimen, in the Hunterian Museum of the University of Glasgow, consists of a crushed test, with the spines in position, lying in a piece of limestone shale. The whole organism, however, is so much crushed and weathered, that nothing can be made clear from it as to the arrangement of the plates in the test. The long muricated spines are seen lying in the shale around the test in nearly their natural position, while the numerous smaller secondary spines give a brush-like aspect to many of the larger plates.

At Thorn, near Carluke, there is a thin stratum of limestone shale, overlying the main limestone of that locality, which is almost exclusively made up of the remains of *Archæocidaris*; yet, abundant as the organism is, no specimens have turned up showing the plates or spines in position. Dr Rankin, of Carluke, has sent me many fine slabs of the limestone shale from this bed, which I have examined very minutely. These show how very readily the organism must have fallen to pieces after death, the plates, spines, and other portions of the dental apparatus being completely disunited, and now, in many instances, lie assorted in the stratum according to their size and density; this arrangement of the parts having, no doubt, been produced by the action of the sea currents. Some of the thin layers are seen to consist almost exclusively of the smaller ambulacral plates and secondary spines, while other layers are made up of only the larger plates, spines, and heavier portions of the dental apparatus.

Sections of the larger spines of *Archæocidaris* that I have prepared for microscopic examination show that they were tubular, the hollow interior, now filled with calcite, being one quarter the diameter of the spine. In this other characteristic, *Archæocidaris* agrees with the other Sea-urchins possessing overlapping plates, and with the family of the Diadematidæ. The intimate structure of a longitudinal section of a spine consists of a series of parallel rows of elongated oval cells, bounded by calcareous walls. The rows of cells are about twenty in number, and are arranged on each side of the tubular space in quincuncial order. A cross section shows the cells within concentric lines in radiating series. They form beautiful and interesting objects for microscopic investigation. Other portions of the organism that I have examined are also composed of somewhat similar cellular structure, this being well seen in weathered portions of the test and dental apparatus.

Only one species of *Archæocidaris* has as yet been described from our Scottish Carboniferous limestone strata, viz., *A. Uriei* (Fleming), an interambulacral plate and lower portion of a spine of which were first figured by the Rev. David Ure, in his "History of Rutherglen and East Kilbride," 1793, where he states (page 318), "that good specimens of both are found at Craigen-glen, Campsie." It is from the washing of the weathered shales of this same locality that I have obtained my best plates and other portions of the dental apparatus. I am, however, satisfied,

from specimens of the teeth that have been found, that there are at least two well marked species of *Archæocidaris* in our beds. The teeth that are generally referred to as belonging to that of *A. Urii* are broad, slightly rounded, and have serrated points. They are further marked along their whole length by a central rounded keel, bounded on each side by a narrow groove; the inside of the teeth are also slightly grooved. Some of these teeth measure fully $\frac{3}{4}$ inch in length, by $\frac{3}{16}$ inch in breadth, but in general they are of smaller size. The other form of teeth is found in the same strata as those of *A. Urii*, but does not seem to be quite so abundant. They are narrow, acutely ridged, and acutely pointed, but not serrated. Their outer surface is smooth, but marked with two faint lines or grooves that run along their whole length; the inner surface, by numerous transverse scale-like ridges. The largest examples seldom exceed $\frac{1}{2}$ inch in length, and are rather less than $\frac{1}{8}$ inch in breadth. I showed specimens of this latter tooth to Dr Wright of Cheltenham, who is one of our best authorities on fossil Echinoderms, and he was satisfied that it belonged to quite a distinct species from that referred to *A. Urii*. For this form of tooth I would propose the provisional name of *A. Scotica*, to distinguish it from that of *A. Urii*. I have not yet, however, been able to make out any very decided differences amongst the plates and spines with which these two forms of teeth are associated, although probably differences do exist. Plates, doubtfully referred to the genus *Palæechinus* or *Melonites*, are sometimes found in the same strata with *Archæocidaris*, but their rarity forbids the idea that any of these teeth, which are moderately numerous, could belong to either of these genera; besides, we are still ignorant of the nature of their dental apparatus. In the lower limestones of the Beith district, in Ayrshire, one or two examples of a spine, which I have identified as belonging to *A. Munsteriana* (De Koninck), have been found. This species is distinguished from that of *A. Urii* by its more robust form and numerous close set muricated ribs. It does not, however, occur in the beds in which the above two forms of teeth are most plentiful, so that none of them can belong to it.

Five species of *Archæocidaris* have been described from British Carboniferous strata, viz. :—*A. Urii* (Fleming), *A. Munsteriana* (De Koninck), *A. triserialis* (McCoy), *A. vetusta* (Phillips), and *A. glabrispina* (Phillips). With the exception of the two first

mentioned species, it is questionable how far the three other species may hold good, as their specific characters have been established upon the character of the spines. M'Coy states—"It is very possible that the spines of *A. vetusta* may really belong to the upper part of *A. Urvii*;" also, that the spines of *A. Urvii* have about five or six longitudinal rows of short strong spines, and that *A. triserialis* has only "three longitudinal rows of spines or denticulations," while *A. glabrispina* has a smooth spine, without denticulations. In Scottish Carboniferous strata spines are not uncommon having only two rows of denticles; they occur along with spines that have three or more rows with the same external form. It therefore becomes a question whether these spines all belonged to distinct species, or may not have varied in the number of rows of denticulations on different portions of the same test, or on different individuals of the same species.

If it can ever be satisfactorily shown that the number of rows of denticles did not vary in the spines of the same species, then we would have a character that may yet be of use in the discrimination of our specimens. If, on the other hand, the spines varied, then the number of rows of denticles would be a point of no value in their identification, and we should then have to look for other characters, either in the plates or dental apparatus. We have already shortly pointed out the characters of the two kinds of teeth met with in our strata, and have only to refer to the plates. These do not seem to present any very well marked features by which the different species can be identified; the only slight variations I have noticed are in the number of secondary tubercles that border the plates—some having nearly twice as many as others of the same size. Whether specific characters can be established on the number of secondary tubercles, is a point which I leave for future investigation. In the meantime, I hope that specimens will yet turn up somewhere, that will show the relation of the various disarticulated parts to one another more clearly than any yet found. The principal point, however, to which I wished to direct your attention in this paper, is the interesting fact, that *Archæocidaris*, like the recent *Calveria hystrix*, is characterized by the possession of a movable test, made up of a series of overlapping plates; a feature which must always remain the most distinctive of this genus of Echinoderms.

II.—*Remarks on the Eggs of some New Zealand Birds, collected by Mr J. R. Cook in Canterbury Province in 1872; including Notes by the Collector.* By Mr JOHN A. HARVIE-BROWN, M.B.O.U., corresponding member.

Casarca variegata (Gmel.)—Paradise Duck. Native name, “Putangi.”

“Nest of eight eggs in schist rock on Upper Waiko; nearly inaccessible, in a horizontal fissure some 50 feet from the ground; 30 miles inland; on December 23d, 1872.”

Mr Cook describes this as a very handsome duck. A beautiful plate representing the species will be found in “A History of the Birds of New Zealand,” by Mr Walter Lawry Buller, plate xi., page 241.

Mr Buller writes of this species:—“Its habits resemble in many respects those of the Common Shieldrake of Europe (*Tadorna vulpanser*, Flem.). . . . It is easily domesticated, and has been successfully introduced into England, and is to be seen in all its beauty on the artificial lake at Kew Gardens, and elsewhere in this country, and it breeds in the Zoological Society’s Gardens, in Regent’s Park.”

Three eggs of the above nest measure exactly the same, viz., $2\frac{2}{40}$ inches by 2 inches. These measurements, and all others in this paper, are taken by means of an öometer, and are therefore fully to be relied on.*

Porphyrio melanotus (Temminck)—Swamp Hen. Native name, “Pukeko.”

“Five eggs. Nests in rushes, or sedge, or tussac, in or very near water. Like water-hen’s (*Gallinula chloropus*, Lin.). Bird very like a magnified water-hen, but purple, with scarlet bare patch on forehead. Handsome bird. Five or six eggs in nests. December, 1872.”

Mr Buller does not figure this species in his work, but a description and account of its habits will be found at page 185, *et seq.* He informs us that this species is widely distributed over Tasmania, Australia, New Zealand, and the Chatham islands, and

* Öometers, to Mr H. E. Dressers’s pattern, and as supplied to him and myself, are made by Mr J. Buck, 124 Newgate Street, and Waterloo Road, Lambeth, London.

also occurs in New Caledonia. Further, that it has increased in numbers in many of the settled districts, owing no doubt to the greater abundance of food afforded by the farms and plantations of the colonists.

In size, the eggs vary from $1\frac{3}{4}\frac{8}{0}$ inches to $2\frac{3}{10}$ inches in length, by $1\frac{1}{4}\frac{4}{0}$ inches to $1\frac{1}{4}\frac{6}{0}$ inches in breadth.

Haematopus longirostris (Vieill.) — Pied Oystercatcher. Native name, "Torea."

"Two eggs. Nest on bare shingle of Otaio river-bed; hard to find. Bird very like English Oystercatcher (*H. ostralegus*, Lin.). A small black variety breeds, I fancy, on sea beech."

The small black variety alluded to in the above note of Mr Cook's is doubtless *H. unicolor*, Wagler, and is described by Mr Buller as "glossy brownish-black, with faint metallic reflections on the back and wings."

A specimen of *H. longirostris*, forwarded by Mr Cook along with the above eggs, closely resembles our British species, but is considerably smaller.

For account of habits, etc., see "Birds of New Zealand," p. 223, *et seq.*

Two of the above eggs retained in our collection measure, respectively, $2\frac{1}{4}\frac{1}{0}$ inches by $1\frac{2}{4}\frac{2}{0}$ inches, and $2\frac{7}{4}\frac{0}{0}$ inches by $1\frac{2}{4}\frac{2}{0}$ inches.

Himantopus leucocephalus (Gould.).

"Six eggs sent. Nest on shingle of Otaio river-bed; easy to find. Birds bold and noisy. Nest of drift-weeds fairly built. A black variety, I believe to be the immature of this. Will be sure next year. Four eggs in nests; three eggs on 14th October, 1872."

In Mr Cook's notes, *H. Nov-Zaelandiae* (Gould)—another species of Stilt—is stated as the parent of these eggs; but, as he has talked of a *black* variety (*i.e.*, blacker, I presume, than the species of which he obtained the eggs), I have little hesitation in assigning these eggs to the other species, *viz.*, *H. leucocephalus*, because, of these two species, *H. Nov-Zaelandiae* is the darker. The "black variety" is in truth, I believe, *H. Nov-Zaelandiae*, and *H. leucocephalus* is the species of which he has sent the eggs; and in this belief I am borne out by Mr J. E. Harting, to whom I forwarded

specimens. Indeed, the mistake may be ascribed simply to a slip of the pen, as Mr Cook is too good an ornithologist to have actually mistaken the two species. *H. leucocephalus* being *black and white*; and, being "bold and noisy," must have afforded a narrow inspection. The native name applied by Mr Cook is "Poaka;" but Mr Buller assigns the native name "Kaki" to *H. Nov-Zaelandiae*, and "Tutumati" to *H. leucocephalus*, without mention of the name "Poaka" at all.

Mr Buller gives only these two species of New Zealand Stilts; but Mr Potts, in the Transactions of the N. Z. Institute (as Mr J. E. Harting informs me), has described a third species, under the name of *H. varius*, nov. sp., in which the fore-neck and part of the breast and abdomen are white. There is, however, some doubt existing amongst naturalists, whether this may not turn out to be only a specimen, in one of the many stages of plumage which *H. Nov-Zaelandiae* undergoes. This question can only be set at rest by an examination of a larger series of specimens than is at present available.

The measurements of four of the above eggs vary from $1\frac{2}{40}$ inches to $1\frac{5}{40}$ inches in length, and from $1\frac{8}{40}$ inches to $1\frac{10}{40}$ inches in breadth.

Anarhynchus frontalis (Quoy. and Gaim.)—Crook-billed Plover.

Three eggs sent. "Nest on sand, amongst shingle, in Otaio river-bed; very hard to find, though birds were bold. Eggs almost covered with lichens, chopped small, and placed *point down*. Nest with three eggs, on October 20th, 1872."

As these eggs are desiderata in most English or European collections, and as comparatively little is known of the nesting habits of this extremely interesting species, I look upon the above notes and specimens as very valuable, especially that portion which relates to the position of the eggs in the nest, as it exhibits a departure from the habit of such of the closely allied species as naturalists are acquainted with. The words "point down" being underlined in Mr Cook's MS., and he being a careful observer, I attach more importance to the note than if the underlining had been omitted. Mr Cook is well aware of the position in the nests of the eggs of most of the *Scolopacidae*, and would not, I feel certain, have underlined these words had he not intended that they should be read literally.

The appearance of these eggs of *Anarhynchus frontalis* indicate an approach to those of the pratincoles (*Glareolidae*), both in texture and markings, and are intermediate in shape between eggs of *Glareolidae* and those of some of the smaller *Totaniidae*.

The peculiar form of the bill of this bird, the remarkable coloring on one side of the breast in contradistinction to that on the other, and the interesting deductions drawn therefrom by authors, together with its unique method of searching for its food, make it one of the most extraordinary forms of New Zealand birds. I would recommend those interested in this species to read the following papers, articles, and notes on the subject:—

“On rare or little-known *Limicolae*,” by Mr J. E. Harting, F.L.S., F.Z.S. ‘Ibis,’ 1869, p. 304.

“Letter to the Editor of the ‘Ibis’ from Sir Wm. Jardine, Bart.” ‘Ibis,’ 1869, p. 461.

‘Ibis,’ 1871, p. 455. At the foot of the page.

“On the Birds of New Zealand,” by T. H. Potts. ‘Trans. N. Z. Institute,’ 1870, pp. 59–109.

“A History of the Birds of New Zealand,” by Mr W. L. Buller, etc., p. 216; where a very complete and careful account is given of its habits and peculiarities.

One egg in our collection measures $1\frac{6}{40}$ inches by $1\frac{2}{40}$ inches.*

Ochydromus australis (Sparrm.)—Maori Hen. Native name, “Weka.”

Two eggs sent. “Nests under snow-grass, tussac, and common tussac; dogs find them. Found about seven or eight nests on Upper Waiko, on December 13th, 1872; all with very hard-set eggs. From three to four in nests. Nest of grass.”

This species, being a brevi-pennate bird, unable to fly, is subjected to great persecution, and may be expected to become extinct in course of time, unless protected. The eggs may, therefore, be

* Since the above was written, my friend, Mr J. E. Harting, has read a paper on the eggs of some new or little-known *Limicolae*, before a meeting of the Zoological Society of London, on June 2d, 1874; and in a letter lately received from him, he informs me that an egg of *Anarhynchus frontalis*, which I had the pleasure of forwarding to him, will be figured in a forthcoming paper in the Proceedings of the Zoological Society. For further information on this interesting species, vide ‘Ibis,’ Oct., 1875—by the present writer.

looked upon as valuable, and likely to become more so. They are at present desiderata in many European collections.

Two eggs sent measure $2\frac{11}{40}$ inches by $1\frac{24}{40}$ inches, and $2\frac{6}{40}$ inches by $1\frac{25}{40}$ inches, respectively.

Sterna antarctica (Wagler)—Common (New Zealand) Tern.

“Nests, with two eggs, on Otaio river-bed shingle. Like Common (English) Terns. October 20th, 1872.”

The various stages of plumage of this species are next to unknown, though a common enough species in New Zealand. The young birds migrate northwards, probably to the south of India, Ceylon, etc., and are not recognised in their various phases of plumage.

The native name of this bird, as given by Mr Buller, is “Tara.” (B. of N. Z., p. 283).

Two eggs measure 2 inches by $1\frac{6}{40}$ inches, and $2\frac{2}{40}$ inches by $1\frac{6}{40}$ inches respectively.

Anthornis melanura (Sparrrn.)—Bell-Bird, or Mocking-Bird.

Native name, “Korimoko,” or “Moko-moko.”

“Three eggs. Nest of grass and turfs, in front of Broad-leaf tree, on Otaio river. Birds very bold, but nest well concealed. Nest with four eggs. January 26th, 1873.”

Mr Buller says:—“This species, formerly very plentiful in every part of the country, appears to be rapidly dying out. From some districts, where a few years ago it was the commonest bird, it has now entirely vanished.” The reasons for the disappearance of various species from New Zealand, other than brevi-pennate birds, are not yet clearly understood. Some interesting particulars on this head will be found, under the present species, in Mr Buller’s work (p. 93), to which I would direct your attention.

The three eggs measure as nearly as possible alike, viz., about $\frac{35}{40}$ inch by $\frac{27}{40}$ inch.

In concluding this paper, I may inform the Society that I am in expectation of receiving further and larger collections from the careful hands of my friend, Mr J. R. Cook; and I hope to be able to lay before the Society, from time to time, a few more specimens and to read a few more notes such as the above. The observations made by Mr Cook on the spot, cannot fail, I think, to have considerable interest for students of New Zealand ornithology.

The paper was illustrated by a beautiful series of the eggs referred to, which were collected by Mr Cook in the province of Canterbury, N.Z., in 1872.

III.—*On the Nesting of the Dotterell (Charadrius morinellus) in Scotland.*

By Mr JOHN A. HARVIE-BROWN.

Some years ago my friend Captain H. W. Feilden and myself obtained the kind permission of the lessee of a shooting, in a certain wild district of Scotland, to obtain the eggs of the Dotterell (*Charadrius morinellus*), which rare species was known to breed upon a mountain on the property. The gamekeeper, however, during three successive seasons, failed to obtain them for us, and assured us that none had frequented their accustomed haunts during these years; further, that a young English gentleman, who was shooting there, had killed in one day the two old birds and the three young; and that, since that time, none had been seen upon the mountain, though, upon an adjoining property, two pairs had bred undisturbed the year previous to our visit.

It was, therefore, with but the very faintest expectations of success that Captain Feilden and myself, accompanied by the gamekeeper, started to ascend the mountain on the morning of the 16th June of the present year (1873). Indeed, we already consoled ourselves with the thought that we would, at all events, see the ground which was known at one time to have been occupied by this now rare British bird, and have a good walk and a view from the top. We reached the top of the mountain, some 3000 feet above the sea, at nine o'clock A.M., and found a broad, almost level, moss-covered plateau stretching before us to a distance of about three-quarters of a mile. Scattered over this level mossy ground were numberless small pieces of grey rock, partially embedded in the yielding moss, and the moss itself rose in ridges or hummocks, giving an irregular outline to the surface, or, as it were, forming the latter into innumerable miniature hills and valleys. We at once saw how admirably suited to the habits of the species we were in search of, this kind of ground was, and, moreover, that we would have no little difficulty to contend with, in the event of our having to watch the bird to the nest, as the upper plumage of the Dotterell harmonizes in color with the yellowish-brown carpeting of moss. First, however, we had to find the birds; and, accordingly, with this object in view, we

slowly walked over the deep yielding moss, towards the far, or west end of the ridge.

About half-past ten o'clock, as we were walking along in line, I first discovered a Dotterell, running swiftly, about twenty yards in front of the gamekeeper. It shortly afterwards rose and flew close past, and across our line of march, uttering a low, plaintive, plover-like call—once heard, not easily to be forgotten. Feilden and I agreed that it was the female bird, from the brightness of the chestnut coloring, which was distinctly visible as it passed us.* We now marked the place where I had first seen it, by laying one small grey stone on the top of a larger, and after a short search for the other bird, in which we were not successful, we went away again to the east end of the range. After an hour or so we returned again to the west end; Feilden walking in the centre, and the keeper and myself on each side, lower down the hill and a little in advance. On arriving near the place, Feilden detected the female running a considerable way off in front of him, and I saw the male bird, which ran from the vicinity of the nest, or at least from where we supposed it to be, in a diametrically opposite direction from that chosen by the female. We now made sure that the eggs or young were not far distant; while, at the same time, we learned that we had two most cunning parents to circumvent. Far, indeed, were they from being the "little fools" (*morinelli*), which Linnaeus named them.

After a consultation, it was agreed to leave me to watch, whilst Feilden and the keeper again went off to a distance. Accordingly, I lay down, partially concealed by a hummocky piece of mossy ground, about fifty yards from the place whence Feilden had seen the female run. The keeper afterwards told me that I was absolutely invisible from a distance, the color of my clothes harmonizing admirably with that of the yellowish-brown moss. For an hour I remained almost, if not quite, immovable, and, at the end of that time, was rewarded by seeing the female run rapidly up over the crest of the nearest ridge. It became a difficult matter to watch her movements after she came down amongst the hummocky ground, all the more so, as she took advantage of every grey stone or inequality of the ground to

* The females of several species of Waders are brighter in color than the males. The Dotterell and Red-necked Phalarope are perhaps the most striking instances of this amongst British birds.

dodge behind, and stooping low, with head pushed out in front, when she crossed the higher places, just as I have seen a Corn-crake do when crossing open ground between two places of shelter. She must have seen me, or suspected my presence, as she soon ran rapidly away in another direction, over the sky-line, and was lost to view. I waited again, and in about ten minutes she returned from the same direction in which she had last disappeared, and repeated the manoeuvres above described, also picking up flies, and endeavouring to put on an appearance of supreme indifference. As if not quite certain of my presence, she sometimes perched on the top of a mossy hummock and looked round, jerking up her head; but, finally, she again ran swiftly over the sky-line. From these movements I, somewhat too hastily, concluded that the nest must have been in that direction, and I accordingly left my place of concealment, and carefully stalked, on hands and knees, after her. I peeped over the crest just to see her take wing from the succeeding sky-line.

Feilden and the keeper then joined me, and we searched carefully around, beating up every foot of a large square which we had first marked out. We found a *false nest*, which gave us hopes. Had the real nest been within that square, we feel convinced it could not have escaped us, and the sequel will show how closely we must have passed it. Once more we went to the east end of the range. Here, amongst some loose stones on the side of the hill, we found a Ptarmigan sitting on her nest. Feilden put down his hand, and the poor bird did not move off her eggs until his forefinger was within three inches of her bill. When at last she scuttled off, we found that she had been sitting hard on only three eggs.

After an hour or so, Feilden started, this time alone, and we lay still. In about half an hour from the time he left us we heard him shout, and we sprang to our feet and ran. The keeper said, "Can he have found it?" and I answered, as we ran, "Not a doubt of it." Sure enough, Feilden had the nest safely and surely marked with a red pocket-handkerchief, and had come away to meet us. As we now approached we again saw the bird run, this time directly off the nest. It was not fifteen yards from the side of the big square we had before so carefully searched. We sat down beside the nest and feasted our eyes upon the contents; and the poor bird, still exercising her cunning, ran

round and round us, here and there picking at the flies, or pretending to do so, or watching us from a hummock of moss.

There were the three eggs, lying in a shallow saucer-like depression in the deep moss, close to a small grey stone, behind which Feilden had seen her lie down. There was no lining to the nest whatever; it was simply a shallow hollow, *pressed down* (not scraped) by the bird, and the eggs lay points inwards.

Feilden had seen the bird run from the nest, or from its vicinity, and had remained and watched. At my suggestion he had come up over the crest of the ridge instead of going down from the top. The bird came running from one direction, and then, as she had done when I watched, ran down the hill in another. The second time, she came from a different direction, repeating the manoeuvres I have endeavoured to describe; but the third time, Feilden marked her sneak on to the nest, head down, and saw her gradually settle. He gave her five minutes, to make certain, and then walked straight for the little grey stone, keeping his eyes firmly fixed upon it. When he was within six feet of the bird she was still indistinguishable from the surrounding moss, and it was only when she was at last forced to rise that he discovered her. It was six o'clock when the nest was discovered, and seven o'clock when we left the mountain. Feilden carefully packed the eggs in his hat, which he carried in his hand, and I brought away a square of the moss containing the nest, having cut it carefully out with my knife.

I heard the Dotterell's cry, well and repeatedly, to-day, and recognised it as the same that I had heard the day previously on another mountain, which I now feel convinced holds another pair.

I have, in this paper, confined myself to giving a statement of the day's proceedings and search for the eggs, which I have now the pleasure of exhibiting to the Society; and I have dwelt at considerable length on the habits of the bird, as observed by us. I would have had some hesitation in taking up so much of your time in this way, had the nesting habits of this rare bird been as generally known as those of others of our rarer species; but when I state that no published account of its nesting habits in Great Britain has appeared since 1835, I hope you will kindly overlook the length of my remarks. I might easily add to the paper, by giving a short sketch of the present distribution of the Dotterell in Scotland, together with some account of the autumn

migration and shooting of the birds in certain districts in the south of Scotland and north of England, from persons who have witnessed the flight and participated in the slaughter, but I have already exceeded the space originally intended. I will not, therefore, trespass further on your time, except to say that my friend, Captain Feilden, has written an account of our search for Mr H. E. Dresser's "Birds of Europe," which will, doubtless, appear in due time. To those who are sufficiently interested in the subject of these remarks, I may recommend, also, a perusal of the account, written in 1835 by Mr Heysham, and published in the "Magazine of Natural History" (Vol. ii., page 295), of the habits of this species, as observed by him amongst the Cumberland hills; or of Macgillivray's "British Birds" (Vol. iv., page 108, *et seq.*), where the same account is partially reproduced.

On the table were placed fine specimens of the male and female Dotterell; the former exhibited by Dr Dewar, and the latter by Mr James Thomson of the Kelvingrove Museum. These gentlemen having made a few remarks, Mr Robert Gray said the Society was much indebted to Mr Harvie-Brown for bringing this valuable communication before them, instead of taking it elsewhere; and, on the motion of the chairman, it was unanimously resolved to record a vote of thanks to Mr Harvie-Brown for his interesting paper.

KELVINGROVE PARK MUSEUM.

DECEMBER 23D, 1873.

Dr Dewar in the chair.

SPECIMENS EXHIBITED.

Mr John A. Harvie-Brown, corresponding member, exhibited a specimen of the Little Bustard (*Otis tetrax*), obtained near Old Meldrum, Aberdeenshire, on the 13th November last. Mr Harvie-Brown stated that he was indebted to Mr George Sim, naturalist, Aberdeen, for being able to exhibit this fine specimen of the Little Bustard, which proved on dissection to be a female. Mr

Sim had also transmitted careful notes and measurements, which he was sure would prove interesting to the ornithological members of the Society. The mere acquisition of skins of such rare species should not be the sole aim of collectors. By accumulating these, without keeping notes of habits and measurements, etc., in many cases they are depriving science of interesting observations, instead of, as they suppose, furthering the cause. He hoped that, in future, as careful notes would be taken of any rare and interesting species which might come into the hands of local naturalists.

The measurements given by Mr Sim are as follows:—

- Weight, 1 lb. $7\frac{1}{4}$ oz.; length, $16\frac{1}{2}$ inches; expanse of wings, $34\frac{3}{4}$ inches.

Dissection :

Rectum— $6\frac{1}{2}$ inches ; breadth when pressed flat, $\frac{1}{2}$ inch.

Cæcum— $14\frac{1}{2}$ inches ; breadth in middle, 1 inch.

Gizzard—Length, $2\frac{1}{2}$ inches ; breadth in middle, $\frac{3}{8}$ inch.

Alimentary canal in toto, 4 feet.

Proventriculus—Length, 1 inch ; breadth in middle, $\frac{7}{8}$ inch ; thickness of walls, $\frac{1}{4}$ inch ; coated with a thick mucous membrane internally.

Gizzard— $\frac{1}{8}$ inch in thickness ; the inner lining hard and rough ; posterior half formed into longitudinal furrows ; anterior, into confused wrinkles.

Tail—Composed of 18 feathers ; not 16, as stated by Macgillivray.

Mr James Lumsden exhibited a specimen of the Snowy Owl (*Surnia nyctea*), got on the island of Tyree, in the last week of November this year. A conversation ensued, in which Mr Robert Gray, Dr Dewar, and Mr Harvie-Brown, took part, the general opinion being that the Snowy Owl would be found breeding in the Outer Hebrides.

Mr Robert Gray, F.R.S.E., exhibited a specimen of the Egyptian Goose (*Anser egyptiacus*), forwarded by Mr John Jaffray of Dunbar, corresponding member. Mr Gray said this specimen of the Egyptian Goose was obtained near Dunbar, on the 8th of December ; the bird was a male, and had been seen in company with a female of the same species flying along shore and coming from the south. They alighted in a salt-water creek, and having been watched by two wild-fowl shooters,

were both shot. Mr Jaffray had kindly procured the male for Mr Gray, and the female, a much smaller bird, and less bright in colour, had found its way into the hands of a Dunbar bird-stuffer. Previous occurrences of this rare goose may be briefly stated. In 1832 numerous specimens were obtained in the south of Scotland, and several flocks having been seen on the wing during that year, in districts ranging from the Tweed to the Forth, we are led to conclude that, if these flocks as some have conjectured, were escaped birds, the weather, which was stormy, must have induced unusual restlessness. All the specimens Mr Gray had seen killed in Scotland, were obtained in winter time, and chiefly in rough weather. A considerable number occurred in East Lothian. In November, 1832, one was killed out of a flock of nineteen; another out of a dozen in 1846; and the Earl of Haddington shot a fine male in the winter of 1862. Five were observed in Montrose Basin in Forfarshire in 1865, and two years later a similar flock appeared there. In January, 1867, one was shot on the Forth, and is now in the collection of Dr Dewar. In the Western Counties, the Egyptian Goose has occurred several times. One or two were observed on Loch Lomond in 1832, and three were shot near Campsie in Stirlingshire, in the same year; also three out of a flock of five on Loch Lomond in 1861, one of which was exhibited at a meeting of this Society by Dr Dewar, in January, 1867. Other two were killed from a small flock which had been observed on the same loch some time previously. So far as Mr Gray knew, the two specimens exhibited this evening made up a total of fourteen, killed north of the Tweed. The Egyptian Goose has been unhesitatingly admitted into the British fauna by all ornithological writers for the last forty years, and Mr Harting, in his recently published "Hand-book of British Birds," admits it as a regular winter visitant. A flock of eighty occurred many years ago in Hampshire.

Mr John Young, F.G.S., exhibited a living specimen of the King Crab (*Limulus polyphemus*), from the American coast, which had been presented to the Hunterian Museum by Mr James Paton, Laurence Place, and made a few remarks, pointing out its affinity to certain species of extinct crustaceans found in the coal measures.

NATURAL HISTORY CLASS ROOM, GLASGOW UNIVERSITY.

JANUARY 27TH, 1874.

Professor John Young, M.D., F.G.S., President, in the chair.

SPECIMENS EXHIBITED.

Mr John Young, F.G.S., exhibited a number of drawers containing a valuable series of minerals, chiefly from the Kilpatrick hills and Leadhills, and forming part of the large collection lately presented to the Hunterian Museum by Miss Brown of Lanfine, Ayrshire. Mr Young made some remarks on the specimens, and the districts of country from which they were obtained, and referred to the present scarcity of many of these minerals in the tracts from which they were collected, owing to the veins having been worked out. The magnificent specimens of red Stilbite and Heuhlandite from the Kilpatrick hills were much admired, as were also the very fine series of vanadiates of lead and other ores from Leadhills, among which were examples of that beautiful mineral named Caledonite, a cupreous sulphato carbonate of lead.

Mr Robert Gray, F.R.S.E., exhibited a series of birds from Australia and New Zealand, including *Apteryx owenii*, of which three specimens were on the table, *Strigops habroptilus*, and *Trichoglossus versicolor*, the latter being a rare species, from the northern territory. Mr Gray expressed himself indebted for these specimens to Dr Godfrey Howitt of Melbourne, and Mr Robert Anderson of Cape Schanck.

Mr Peter Cameron, jun., exhibited specimens of Cynipidae and Tenthredinidae, including the following species: *Andricus noduli*, bred from swollen oak twigs found at Kenmuir; *A. amenti*, bred from small brown galls on male catkins of the oak; *A. ramuli*, the maker of the cotton-gall of the oak; *Croesus varus*, from Rannoch; *Eriocampa adumbrata*, bred from slimy larvae found feeding on the hawthorn; and *Taxonus covalis*, from Rannoch, recorded lately for the first time as British.

Dr Young called the attention of the Society to the young King-Crab (*Limulus polyphemus*), which was still living and seemingly healthy. He also described two new star-pored polyzoa from the Carboniferous limestone shales. Mr John Young had observed the peculiarities which distinguish these specimens in the course of last summer, and he and Dr Young were preparing for

publication a detailed account of the specimens which they considered to be the types of two new genera, as well as the first example of cheilostomatous polyzoa which had been recognised in Carboniferous strata. These specimens, the *Limulus* and *Cephalaspis Lyelli*, some fine examples of which were in the Lanfine collection, Dr Young made the text of an address on "Intermediate or Annectant Forms." He referred to what he had said in former addresses regarding independent resemblance, and pointed out the clear distinction drawn by Sir John Lubbock in the "Origin of Insects" between hereditary and adaptive modifications, the distinction between anatomical and physiological change being one not always regarded by English zoologists.

ANDERSON'S UNIVERSITY BUILDINGS.

FEBRUARY 24TH, 1874.

Dr Dewar in the chair.

Before proceeding with the business on the card, Mr Robert Gray called attention to the death of Mr Henry Davenport Graham, one of the earliest corresponding members of the Society. Mr Graham joined the Society in 1852, and since that time many contributions from him had been read at the meetings, and these were much appreciated for their accuracy and freshness. Mr Graham was one of the few writers on birds who combined the strictest correctness with a strong poetic feeling, all his communications showing a high admiration for nature in her various moods, and a deep insight into bird life, as observed by him within the limits of his Hebridean rambles. Mr Graham's chief contributions to the Proceedings of the Society were forwarded from Iona, where he lived for many years. He had, during his residence in that island, made drawings of all the birds he had obtained there and in Mull, and from these and materials in his own possession, Mr Gray intimated his intention of bringing out a memorial volume, containing all that Mr Graham had written on the birds of Iona and Mull for the last twenty years. On the motion of the chairman, it was unanimously agreed to record in the minutes an expression of the regret with which the members have heard of the death of Mr Graham, of whose in-

teresting contributions to the Society's Proceedings many of them retain a pleasing and vivid remembrance.

SPECIMENS EXHIBITED.

Mr James Lumsden exhibited a specimen of the Little Auk (*Mergulus melanoleucos*), shot on 7th January last by one of the Duke of Hamilton's keepers in a turnip field about three miles from the sea, near Shisken, on the south-west of Arran. This bird, which proved to be a male, was, like others obtained on the West Coast, in very poor condition when contrasted with the state of those found on the East Coast. Mr Lumsden also exhibited a specimen of the Common Bittern (*Botaurus stellaris*), obligingly lent by Mr Alexander Martin, Exchange Square. This bird was shot on 14th January last by a keeper at Newholm, Lanarkshire. When observed it was standing at the edge of a small pond, and at first sight was supposed to be an owl, but on a nearer approach it was seen with its head raised and the bill pointing upwards. Upon noticing the keeper, it quickly rose and flew among the bushes, but was stopped by a long shot at about 50 yards. Its measurements were—length, $30\frac{1}{2}$ inches; expanse of wings, 52 inches. The stomach contained black water-beetles. This species, which was very common in Britain many years ago, is now of rare occurrence, especially in Scotland, the draining of bogs and marshes where it found a home, and it being esteemed a delicacy for the table, having tended to reduce its numbers materially. So much was it prized in olden times that a heavy fine was imposed on any one found guilty of taking its eggs. The Bittern is somewhat owl-like in its habits, lying close during the day and beginning at twilight its search for food, which consists of beetles, frogs, or even small birds, which its large throat enables it to swallow entire.

Mr Peter Cameron, jun., exhibited living specimens of *Formica nigra* and *Aphis radicis*, taken from one nest on 14th February. The plant lice were very numerous; and on the nest being disturbed, the ants took them up carefully in their jaws and carried them to a place of safety. Mr Cameron remarked that it is very unusual to find these insects in a state of activity so early in the year.

Mr Duncan McLellan, as evidence of the mildness of the present season and of its effects on vegetation, read a list of plants in flower in the Queen's Park on 1st February. The list comprised

55 species, 30 of which had anticipated their ordinary time of flowering from one to three months. The forest trees, as a rule, were about eight weeks earlier than usual.

Mr Edward A. Wünsch exhibited very large and finely preserved specimens of *Pecten maximus*, from the glacial clay-beds at Fairlie. These shells were found at a depth of about two feet from the surface, and were disposed so regularly that it seemed evident they must have lived and died in the position in which they lay. Mr David Robertson, F.G.S., and Mr John Young, F.G.S., made some remarks regarding the Fairlie beds.

PAPER READ.

On a Visit to the Marine Fish-pond at Port Logan, Wigtonshire.

By Mr E. A. WÜNSCH.

This pond, which is situated on the property of James M'Douall, Esq., of Logan House, a distance of fourteen miles from Stranraer, has acquired a certain celebrity for its tame cod-fish. Finding myself recently in the neighbourhood, with a day to spare, I visited the pond; and I thought that an account of my visit, from the geological, as well as from the natural history and economic point of view, might not prove uninteresting to the members of this Society.

After holding on in a south-westerly direction, leaving the bay of Luce on your left, and emerging from a drive through the beautiful private grounds of Logan House, you suddenly come upon one of the roughest and wildest spots on the shores of the Mull of Galloway. The schistose rocks of the district, tilted up all but vertically, with very distinctly stratified beds of various degrees of hardness, present their upturned edges to the action of the sea, giving rise to an endless variety of small bays, narrow gorges, gullies, and fissures, into which the waters rush furiously in stormy weather. One of these openings into the solid rock, naturally excavated by the tides and waves, and afterwards artificially enlarged and improved, has been converted into the pond now tenanted by the tame fish.

The pond is about 20 feet in diameter, and 12 feet deep, well enclosed on all sides by the natural rock, to the height of about 10 feet, and further built round with a circular wall about 7 feet in height. There is also a shelf, about 2 feet wide, at the water-level, enabling you to walk all round the pond. The channel by

which the pond communicates with the sea is a curiously arched tunnel, excavated naturally no doubt, but, curiously enough, almost at a right angle to the stratification of the beds. It is about large enough for a person to walk upright in, wider at the bottom and narrowing towards the top, with daylight coming in for the greater part of its length. Formerly there was an iron grating in the upper part of the tunnel, but now there is simply a wall of loose stones built up across it, close to where it communicates with the pond; and this is found sufficient to prevent the egress of the fish, and to admit of the ebb and flow of the tide.

The level of the water in the pond is of course dependent upon that of the bottom of this aqueduct, and this level is practically 3 feet below the level of the highest tide, so that at every average tide a fresh supply of salt water flows into the pond; but in very calm weather, and at very low tides, the salt water does not reach the level of the pond, sometimes for several days in succession. A small cottage, affording accommodation to the old woman in charge, adjoins the outer wall, and a door close to the cottage admits us through the wall down a number of steps. Your first impression on entering is, that you are going to walk into a well of rather large dimensions; but your attention is immediately monopolised by the inhabitants of the pond, plainly visible in its clear green waters.

The first thing that strikes you is the intelligent "expectant attitude" of the creatures. It is evident that they can look up out of the water, and at you; and by the time we have reached the water level, in company with the old woman, they are all assembled in a shoal, like a flock of poultry, each eager for a share of the good things coming. The bowl of limpets with which the woman is provided is no doubt a familiar object to them, and as soon as she stoops down with a limpet, divested of its shell and held in her fingers, there is an eager crowding forward, and the successful candidate takes it out of her hand with a great suck, first with an opening of his upper and lower jaws, and then with a supplementary opening of his side-jaws, forming a sort of square abyss into which the tiny morsel disappears.

To enable the fish to take up their food comfortably, the morsel has to be held an inch or two below the water level. The mouth of the fish closes upon all your fingers, and by a gentle sucking motion the morsel of food is withdrawn from between them. If the hand is held gently, and without offering the

least resistance, nothing but a soft touch is experienced; but if, from nervousness, as was the case in my first attempt, it is in any degree jerked back, then a rasping action takes place, sufficient to abrade the skin, and even to draw blood. If the limpets are thrown into the water from above, a regular rush takes place, and after having snatched the morsel, the winner of the prize dives downwards with a jerk of his tail. If an empty shell is thrown into the water, it is eagerly taken up, but is again immediately ejected from the mouth, and allowed to sink to the bottom.

Having exhausted our stock of food, the old woman now went through the "patting" process. Whenever she put her hand close to the surface of the water, the fish came up readily, balancing themselves at a sharp angle in a slanting position, and allowing themselves to be patted on the head, and stroked down their sides, freely; and some individual fish, probably the older inmates, allowed me to do the same, though others started away frightened, before I could touch them.

The weight of the fish is from 4 to 5 lbs., and their number from 25 to 30. It is necessary to have them all pretty much of the same size, because, if unequal to any considerable extent, the big ones would soon swallow the smaller ones; indeed, the woman told me that on one occasion she had noticed one of the big ones swimming about, for a day or two, with the tail of one of its smaller companions, which it had swallowed, just sticking out of its mouth.

A bowl of limpets every second day seems to be sufficient food for them; but the number of fish is limited by the dimensions of the pond. If crowded, they soon sicken and die. They suffer most in the heat of the summer, and when deprived for several days in succession of a fresh supply of sea water, from the tides not being high enough to reach to the level of the pond.

Indeed, the great drawback to the pond seems to be that the channel leading to it is at too high a level relative to the average height of the tides, and after many experiments cod have been found to be the only fish hardy enough to live and thrive in it. A number of other fish, including salmon, have been tried, but all, sooner or later, sickened and died.

The whole arrangements are entirely simple and natural, and when you are told, as is stated in the last edition of

the "Guide to the Brighton Aquarium," that this pond has acquired a world-wide celebrity, you are tempted to exclaim: why, anybody could have done that! From Columbus downwards, however, there is nothing so simple as to make an egg stand on end, provided you have been once shown how to do it, but the merit of originality certainly belongs to the first projector of the Logan fish-pond!

Thus far the natural history view—and the whole subject is so simple and in itself of such little importance, that I should hardly have felt justified in troubling the Society with it, were it not that, as stated at the beginning, we may look at it from the economic as well as from the natural history point of view—and apply to our locality and our circumstances the lessons to be derived from this solitary experiment in an out-of-the-way place.

There are so many spots on the estuary of the Clyde and along our western shores favourable to the construction of similar ponds, and the luxury of fresh fish is so widely appreciated by our townsmen spending their summer season at the coast, while, on the other hand, the misery of stale fish is so often experienced during the remaining months in town, that the attempt might well be made to secure fresh supplies every day in the week and at all times of the day, as could be done if the fish were ready to be lifted out of a pond at any given moment, and forwarded by steamer or train in time for the dinner or supper table. On the principle that a superior article fetches a superior price, a fish-pond on a large scale might even be made to pay commercially; but at all events, there are many proprietors of houses and lands adjoining the shore, who, at a comparatively small outlay, might afford themselves and their friends the luxury of fresh fish at any hour, irrespective of tide or weather. If I can give any further information to any one having the command of a sea-shore for such a purpose, I shall only be too happy to do so.

The Librarian announced the following donations to the Library:—Scottish Arboricultural Society's Twentieth Report, 1873; Manchester Scientific Students' Annual Report, 1873; Tenth Annual Report of the Belfast Naturalists' Club, 1873; from the respective Societies. Transactions and Proceedings of the New Zealand Institute, Vols. iv. and v., 1872-73; from Mr Gavin Miller.

MARCH 31ST, 1874.

Professor John Young, M.D., F.G.S., President, in the chair.

Mr James Duncan was elected an ordinary member.

SPECIMENS EXHIBITED.

Mr James Thomson, Kelvingrove Museum, exhibited an albino variety of the Water Vole (*Arvicola amphibius*). He also placed on the table specimens of the brown and black varieties.

Mr James Lumsden remarked that albinos of this species are not uncommon; but the one exhibited was of considerable interest, from the albino condition being only partially developed. Macgillivray mentions having seen one with yellowish-white hair and pink eyes; but the specimen before us was unfortunately so much damaged about the head when received, that the colour of the eyes could not be noted. The black variety, which was first described in the "Transactions of the Wernerian Society," Vol. vi., is much more frequently met with in many parts of Scotland than the brown one, and is also to be obtained in certain districts of England; but there it is somewhat local in its distribution.

Mr George E. Paterson exhibited a large series of the Sparrow Hawk (*Accipiter nisus*), illustrating some of the differences of plumage, which are very great in this species. Amongst those shown there was a female, which when in the flesh measured 19 inches in length, the usual measurement of these birds being about 16 inches.

Mr Paterson also exhibited two examples of the Hen Harrier (*Circus cyaneus*), one an old female, and the other a young male, from Sutherland; also, two of Montagu's Harrier (*Circus cineraceus*) from Normandy, France, upon which the Chairman and Mr W. C. Angus made some remarks.

Mr Peter Cameron, jun., exhibited and described a small collection of saw-flies, including *Lyda betulae*, *L. flaviceps*, *L. erythrocephala*, *Poecilostoma pulveratum*, and *Emphytus perla*.

Mr James B. Murdoch submitted a list of plants exhibited before the Helensburgh Horticultural Society in January last, and kindly forwarded by the Secretary of that Society, Mr George Galloway. The plants all had been grown in the open air, in Helensburgh and neighbourhood, and the extraordinary number of

106 genera, and 244 species and varieties, testified to the wonderful mildness of the past winter.

Mr David Robertson, F.G.S., and Mr John Young, F.G.S., exhibited a series of small recent land and fresh-water shells, from Hairmyres, East Kilbride, which they had obtained last month in the washings of some of the weathered fossiliferous limestone shales from that district. Mr Young stated that their object in bringing these shells before the Society, was for the purpose of indicating a locality which gave promise of yielding a considerable number of Scottish land and fresh-water mollusca. The spot where they were obtained is at the Curling Pond, near the Railway Station, and although the object of search was not this class of organisms, yet it was interesting to state that, in the small quantity of material which had been examined, and which was only collected over a few feet of surface, there should occur some fifteen species of recent shells, one of which had not formerly been recorded as found in the Glasgow district, viz., *Vertigo pygmæa*. This shell, however, had been found on the coast at Largs, and at Bute, by the late Mr William Haddin, a member of the Society. Mr Young had no doubt that if a careful search was made in the above locality during the summer and autumn months, an enlarged collection of these interesting shells could easily be formed.

The President exhibited a number of specimens of finely preserved Carboniferous polyzoa, from the collection of Mr John Young, F.G.S., and made some observations on the structure of their new genus, *Rhabdomeson*, of which they had discovered two species; the genus being founded upon the organisms formerly known as *Ceriopora gracilis* and *C. rhombifera* of Phillips. He also explained the structure of the star-mouthed cells in the newly discovered genus *Actinostoma fenestratum*, and in a new species of *Glaucanome*, which had been provisionally named *G. stellipora*, the specimens being all from the limestone strata of the West of Scotland. A number of large and beautiful photographs of slabs of polyzoa, crinoidea, and shells, executed by Mr Thomas Annan, Sauchiehall Street, were exhibited by the President as illustrative of what could be done by photography in producing faithful pictures of the numerous and varied organisms that crowd many of our limestone shales.

APRIL 28TH, 1874.

Mr James Ramsay, Vice-President, in the chair.

SPECIMENS EXHIBITED.

Dr Dewar exhibited—I. The nest and eggs of the Common Crossbill (*Loria curvirostra*), from Aberdeenshire, and remarked that this species occurred more frequently in the North of Scotland than in the southern counties. The nest is difficult to find, and, although he had been endeavouring to meet with one for some years, this was the first he had got, and for it he was indebted to the kindness of Mr John A. Harvie-Brown of Dunipace, one of the Society's corresponding members. The Crossbill breeds early, pairing in January and building in February; the present example, which was found on the 13th of April, may therefore be considered later than usual.

II. Eggs of the Woodcock (*Scolopax rusticola*), from a district on the Frith of Clyde. It was thought at one time that Woodcocks did not breed in Scotland, but of late years their nests have been frequently met with, and the number seems to be on the increase. The bird is protected, although the eggs are not.

III. Eggs of the Water Rail (*Rallus aquaticus*), from Possil marsh, in the vicinity of Glasgow. The Water Rail is not common in this district, and was not known to breed here until three years ago, when its eggs were found for the first time, as they have been each season since. The ordinary time of breeding is in May or June, and it would appear in this instance the birds have considerably anticipated the usual period.

A conversation ensued as to the desirableness of a more thorough protection for this unique spot, which is the refuge of some of our rarer birds and plants, from the depredations of amateur sportsmen and nest-hunters, in the course of which it was stated that the proprietors of the marsh had put a stop to the practice of the miners of the surrounding districts, who for a long time had made it a field for Saturday afternoon shooting. It was thought, however, that something more might be done to stay the raids of boys in search of eggs.

IV. A specimen of the Sea Eagle (*Haliaetus albicilla*), with a singular malformation of the foot. This bird, which was in its second year, had only one leg, and the talons on its remaining

foot were so singularly contorted that it seemed impossible it could have used them in feeding; it must, therefore, have been dependent solely on what fish it could find cast ashore by the tides. Dr Dewar was inclined to think it had not been trapped, as in that case the remaining leg might have been expected to be strengthened and fitted for doing double duty. It seemed to him that the malformation extended to both legs, one of which was undeveloped, and the talons of the existing foot so curiously twisted that it could be of little use to the bird.

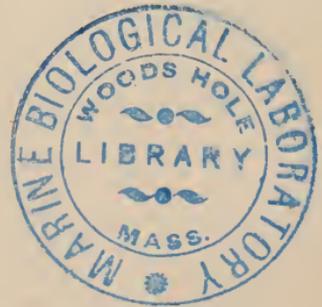
Mr George E. Paterson exhibited a specimen of the Oystercatcher (*Hoematopus ostralegus*), with an abnormal bill, forwarded by Mr Thomas Struthers, Larkhall. This bird, which was obtained some time ago near Motherwell, had the upper mandible so far turned to one side as to make it impossible it could have found its own food, and it is difficult to conceive how it could have existed at all unless fed by some other bird. The specimen being a young one had probably been bred in the district where it was found.

Mr James J. King exhibited a collection of coleoptera from different localities, including examples of *Placusa infima* taken at Cadder in June of last year, under the bark of felled trees. *Tachinus elongatus*, at Tollerross; *T. flavipes* and *T. laticollis*, common in cow-dung at Rannoch; *Philonthus cephalotes* and *P. puella*, both sparingly taken at Rannoch; *Lathrobium atripalpe*, only one specimen of this Scottish rarity occurred, at Rannoch; *Lema erichsoni*, from the neighbourhood of Belfast.

Mr John Young, F.G.S., exhibited an interesting series of Carboniferous mollusca, recently obtained from the weathered fissures in the limestone at Hairmyres old quarry, near East Kilbride, by Mr David Robertson, F.G.S., Mr James Armstrong, and himself. The most of the specimens are found weathered into relief on the face of the limestone fissures, many of them being but slightly attached to the rock, while all possessed their original sculpturing in a wonderful state of preservation. A short examination of the limestone strata had yielded the following species, not hitherto recorded in that locality, while one or two are rare shells in the limestone strata of the West of Scotland:—*Bellerophon Uriei*, *B. decussatus*, *B. Dumontii*, *Elenchus antiquus*, *Macrocheilus acutus*, *M. imbricatus*, *Naticopsis plicistria*, *N. variata*, *Pleurotomaria Galleottiana*, *P. Yvani*, *P. monilifera*, *P. contraria*,

Murchisonia quadricarinata, *M. striatula*, *Loxonema rugifera*, *Axinus orbicularis*, *Cypricardia rhombea*. Mr Robertson also exhibited a valve of *Chonetes Buchiana*, and the basal portions of the heads of several small crinoids that he had obtained from the limestone shales at Hairmyres.

The Librarian announced the following donations to the Library:—Proceedings of the Literary and Philosophical Society of Manchester, Vols. viii., ix., x.; and Memoirs, Vol. iv., Third Series; from the Society.



SESSION 1874-75.

TWENTY-THIRD ANNUAL GENERAL MEETING, ANDERSON'S
UNIVERSITY BUILDINGS, SEPTEMBER 29TH, 1874.

Mr James Ramsay, Vice-President, in the chair.

Reports were received from the Treasurer and Librarian; the statement of the former, audited by two members, shewing a balance in favour of the Society of £85 5s. 9d.

The Secretary read the Report of the Council on the business of last session, which was considered satisfactory.

The following gentlemen were declared office-bearers for the session:—President, Professor John Young, M.D., F.G.S.; Vice-Presidents, Professor Alexander Dickson, M.D., James Stirton, M.D., and James Ramsay; Secretary, Robert Mason; Treasurer, Thomas S. Hutcheson; Librarian, Thomas Chapman; Members of Council, Gavin Miller, Donald Dewar, M.D., James S. Dixon, Archibald Gilchrist, James B. Murdoch, David C. Glen, C.E., James Coutts, Hugh M'Bean, and John Kirsop.

SPECIMENS EXHIBITED.

Mr James Coutts exhibited a specimen of an exogenous shrub of the genus *Napoleona*, order Belvisiaceae, a native of the west coast of Africa, which had been forwarded by Mr George Thomson, corresponding member. Mr Coutts gave a detailed description of this curious genus of shrubs, with large oval leaves, acuminate, entire, and coriaceous. The flowers are one to three in the axils of the leaves, but in the specimen exhibited there were the remains of several flowers in the axil of the portion without leaves. The structure of the flower causes it to be in appearance related to Passifloraceae, though Dr Lindley pointed out its true relation to Myrtaceae and Rhizophoraceae. The structure of the corolla is remarkable, being a triple concentric row; the outer one is five lobed, consisting of stiff ribs connected by a membrane. The second row consists of an in-

definite number of fleshy filaments, not so long as either of the other rows, reminding us of the same in Passifloraceae; while the next row is membranous, in the form of a cup with the edge incurved and fringed. The stamens are monadelphous, incurved, and the filaments of the same breadth as the other. The stigma is in the form of a star five lobed, and, surrounding the style is a fleshy cup or disk. The fruit is a soft berry, as large as a pomegranate, containing a mucilaginous pulp, which is edible. The rind is so full of tannin, that the natives make an ink from it.

The first species, *Napoleona imperialis*, was discovered by Palisot de Beauvois in 1786, in the neighbourhood of Benin. Other three travellers have since met with it, viz., Vogel, on the banks of the Niger; Heudelot, in High Senegambia; and Mr Whitfield, at Sierra Leone; these three have received the names of the respective travellers, but only one is considered a good species, that of the last mentioned. Two species are now admitted, one having the exterior corolla of the colour of an apricot, the other having the same part a fine blue or violet. *N. imperialis* has produced flowers in Kew Gardens.

Mr Coutts likewise brought forward a number of objects from Africa, consisting of specimens of fresh-water molluscs, eggs of reptiles of various species, and lizards; and Mr John A. Craigie showed a fine specimen of the egg of the Emu from Australia.

Mr James Thomson, Kelvingrove Museum, exhibited a collection of crocodile's eggs, from the banks of the river Quanza, south-west coast of Africa, also a specimen of the reptile of the age of seven days.

Mr John Young, F.G.S., referred to the varied collection of eggs on the table, and made some observations on the affinity which the Emu and other wingless birds have to the higher class of existing reptiles, as well as to the Pterodactyle and other extinct species.

Mr John Young, F.G.S., in the absence of the President, exhibited a large and carefully prepared series of drawings, illustrated by specimens, of the genus *Glauconome* and other Carboniferous polyzoons, from the limestone strata of the Lanarkshire coalfield. The drawings, he stated, were prepared by Dr Young, to illustrate several new and undescribed species of these organisms which it is their intention to figure and describe

jointly in the Proceedings of the Society. Mr Young stated that in their investigation of these Carboniferous polyzoa they had found, after close research, that many of the forms were undescribed. In the genus *Glaucanome* the following species were new, and they had provisionally named them *G. stellipora*, *G. marginalis*, *G. aspera*, *G. flexicarinata*, *G. retroflexa*, and *G. laxa*. From the limestone strata of the East Kilbride district they had also found the following new species belonging to other genera:—*Actinostoma fenestratum*, a polyzoon with star-mouthed cells, and *Sulcoretipora porosa*. Dr Rankin, of Carluke, had also sent them a new and interesting species of *Thamniscus*, a genus of polyzoons, hitherto met with only in Permian strata. This species they propose to name *T. Rankini*, in honour of this able investigator, who has so long and so carefully worked at the Palaeontology of the Carluke district. There are other forms of Carboniferous polyzoa that still await investigation, and which they hope to take up at some other time. They were indebted to Mr James Thomson, F.G.S., and Mr David Robertson, F.G.S., both members of this Society, for the examination of many interesting specimens in their collections, and they hoped that these gentlemen, as well as other members, would continue their researches amongst this interesting group, which is perhaps more abundant, and in better preservation, in our strata, than in any other Carboniferous district in the British Isles.

NOVEMBER 3D, 1874.

Mr James Ramsay, Vice-President, in the chair.

Mr John Crosby was elected an ordinary member.

SPECIMENS EXHIBITED.

Mr George E. Paterson exhibited and described a fine collection of birds and eggs, which he had obtained in Shetland last summer. It embraced specimens of Richardson's Skua (*Lestris richardsonii*), showing a considerable variety of plumage; the Black Guillemot (*Uria grylle*), the Green Cormorant (*Carbo cormoranus*), and the Eider Duck (*Somateria mollissima*).

Mr J. A. Harvie-Brown, corresponding member, made some

remarks on the collection, and pointed out certain marks which distinguished some of the more remarkable specimens.

Mr Peter Cameron, jun., exhibited specimens of the social wasps found in the vicinity of Glasgow, viz.: *Vespa norvegica*, *V. sylvestris*, *V. rufa*, *V. germanica*, *V. vulgaris*, and *V. arborea*, Smith. With the exception of the latter these are all commonly distributed in Britain; but *V. arborea* is an insect of great rarity, and is an interesting addition to the Clydesdale hymenoptera. He also showed the following saw-flies:—*Strongylogaster femoralis*, Cameron, Ent. Mo. Mag., xi. 250, a species nearly related to *S. mixtus*, Kl., but differing in having the femora and mouth black, and the abdomen more broadly red in the middle. There is also a difference in the neuration of the wings, but this is an unstable character. It was taken on the Gleniffer Braes, and in Cadder Wilderness. *Nematus pallidiventris*, Fallén, Acta Holm (1808), 120, 63; Thomson, Hymen. Scand., i., 110, 35. Specimens probably of this species have been taken in Cadder, but they differ from the description in having the antennae brown underneath, and one example wants the black colour on the abdomen. There was also shown a variety or race of the common species, *Nematus luteus*, which varied from the normal form in being marked with three broad black lines on the mesonotum. It has been bred from the ordinary larvae on alder, and has been found in various parts of Scotland. As it seems to be a tolerably constant variety, it might with advantage be called var. *trimaculatus*.

Mr John Kirsop exhibited stuffed specimens of a sword-fish, *Histiophorus indicus*, from the Bay of Bengal, measuring seven feet two inches in length, and a fine example of a *Naia*, one of the vipers of India, which has a beautiful spectacle-like mark on its broadly extended disc. Mr Kirsop also exhibited a number of shells and corals from the Indian Ocean. Among the shells there were examples of the genus *Conus*, *Strombus*, *Mitra*, *Turbo*, *Chama*, etc., and among the corals some fine specimens of *Meandrina*, *Astrea*, *Euphyllia*, and *Herpetolithus*. Mr Kirsop presented the sword-fish and spectacled viper to the Hunterian Museum, along with two of the species of corals. Mr John Young, F.G.S., made some remarks on the interesting specimens exhibited by Mr Kirsop, and in the absence of the President, Dr Young, returned thanks in his name to Mr Kirsop for this additional donation he had made to the museum.

The Secretary exhibited a specimen of *Plantago lanceolata*, which showed a remarkable deviation from the normal form, combining the characters of several recorded varieties of the plant. The top of the scape is surrounded by a circle of leaves three inches in length, and from the centre of these there proceed in a horizontal direction six medium-sized spikes, all more or less pedunculated; while above these there extend perpendicularly four additional scapes, each bearing a small spike of a globose form. The specimen was found at Bowling in July last.

Mr James S. Dixon exhibited specimens of alum shale in its normal, and also in its decomposed form, describing the position it occupies in the coal formation, and the manner in which it is converted into the alum of commerce.

PAPERS READ.

I.—*On the Development of Insects.* By Professor JOHN YOUNG, M.D., F.G.S.

In this paper, which Dr Young intended as the first of a series, he gave an outline of the development of the egg, and pointed out a difficulty in the way of accepting the views of Haeckel and Ray Lankester regarding the primitive form of the embryo. The paper was illustrated by diagrams showing the position of the yolk relative to the embryo, in various groups of animals. From these it would appear, according to Dr Young, that, as has been indicated by Sallusky, the gastrula stage is not so universal in the animal kingdom as has been asserted. The mode of development of the crustaceans was referred to as a crucial instance, and this Dr Young promised to discuss in his next communication.

II.—*Description of a new species of Nematus from Scotland.*

By Mr PETER CAMERON, jun.

Nematus interstitialis, sp. n.

N. niger, nitidus, pedibus, pronoti limbo, tegulis, ventreque testaceis; tarsis posticis fuscis; ore, antennisque subtus brunneis; alis lenissime fumatis; nervo 2°, recurrente interstitiali; costa stigmatique fuscis. Long, 2½ lin.

Female. Antennae, a little longer than the abdomen, rather stout, covered with a microscopic down; the third joint a little longer than the fourth, the remaining joints becoming gradually

shorter and thinner; the colour black above, beneath brown, except with the three basal joints, which are entirely black. Head, black, shining; the vertex, faintly punctured; the clypeus, labrum, and palpi, brown; the mandibles, black. Thorax, black above and beneath, shining; the pronotum, edged laterally with testaceous; tegulae, testaceous; cenchri, obscure white. The head and thorax are covered sparingly with down. Abdomen, black, the ventral surface testaceous; the apex is somewhat acuminate, pilose, cerci very short; terebra, slightly projecting, hairy. Feet, testaceous; coxae and trochanters paler, the former black at the extreme base; posterior tarsi and tibiae, at the apex black, or rather fuscous; anterior tarsi, faintly marked with fuscous; posterior tibiae, slightly channelled on the inner side. Wings, iridescent, faintly smoky (as in *Nematus quercus*); costa and stigma, fuscous, the latter paler at the base; the third submarginal cellule almost square; the first submarginal nervure very distinct; the second submarginal is united to the second recurrent.

This species belongs to the *Abietum* group. I can find no description in the works of St Fargeau, Stephens, Hartig, Foerster, and Thomson, with which it will quadrate. The alar cell structure, unicolorous femora, and somewhat pointed abdomen, will serve to distinguish it. Taken in Scotland; the exact locality I have not noted, but I do not think that it was taken in the Glasgow districts.

The Librarian announced the following donations to the Library:—Transactions of the Manchester Geological Society, Vol. xiii., Part v., 1874; Reports of the Bristol Naturalists' Society, two Parts, 1874; from the respective Societies.

DECEMBER 1ST, 1874.

Mr James Ramsay, Vice-President, in the chair.

Messrs Richard A. Marshall, James R. Watson, and Francis G. Binnie, were elected ordinary members.

SPECIMENS EXHIBITED.

Mr Peter Cameron, jun., exhibited specimens of several Tenthredinidae, hitherto unrecorded as natives of Britain, viz. :—

Nematus puncticeps, Thomson Hymen. Scand., i., 92, 14,—taken in Scotland with the next two species, by Dr Sharp, the well known Coleopterist. It will probably prove to be merely a variety of *N. ruficornis*, Ol. = *N. appendiculatus* and *N. fraxini*, Htg. *N. albipennis* (Klug.), Hartig, Blatt. und Holzwespen, 196, 22; Thomson, Hymen. Scand., i., 88, 8. *N. hyperboreus*, Thomson, l. c., 127, 54. *N. Zetterstedti*, Dahlbom, Clavis, fig. 5, Thomson, l. c., 147, 78 = *N. miniatus*, Hartig, l. c., 189, 12,—taken at Braemar, by Dr Buchanan White. *Poecilosoma guttatum*, Thomson, l. c., 231, 5, and *P. excisum*, Thomson, l. c., 233, 8,—the former taken by Mr J. E. Fletcher, at Worcester, and the latter in various parts of Scotland.

There were also shown specimens of a new species, *N. Marshalli*, Cameron, obtained in the island of Corsica by the Rev. T. A. Marshall, F.L.S., after whom Mr Cameron had much pleasure in naming it. There was also exhibited specimens of the recently-described *Eriocampa testaceipes*, Cam., from the neighbourhood of Beaulieu, and a minute hymenopterous insect *Meraporus graminicola*, Walker, which has its wings very imperfectly developed. It was found near a barn in Possil Road, in the flower of chickweed. Notwithstanding its minuteness, it is a useful friend to the farmer, as it destroys the larva of the weevil (*Calandra*), which is so injurious to stored corn.

Mr John Young, F.G.S., exhibited from his own collection and that of Mr James Coutts, some fine large slabs of encrinital limestone, from Trearne Quarry, near Beith, Ayrshire, and remarked that nowhere in the West of Scotland had he seen such an assemblage of large crinoids as are to be met with in this particular bed of limestone, which at present is being extensively worked for the ironstone smelting in the furnaces of that district. The crinoids belong to the genera *Poteriocrinus*, *Actinocrinus*, *Platycrinus*, and *Cyathocrinus*. Some of these must have attained a large size, portions of the columns being met with on the weathered surface of the limestone that measure three and a-quarter inches in circumference, and from two to three feet in length. Complete heads of the crinoids, and fragments of the cup or upper portion of the animal, to which the arms were attached, are occasionally found; but the instances are rare. The encrinital limestone is several feet in thickness, and is almost exclusively made up of the remains of large crinoids. One tract has been finely glaciated, or

polished by ice, while other portions have been deeply corroded into gullies by atmospheric action. These surfaces present the crinoids either weathered into high relief on the surface of the stone, or cut into so as to present sections of the column in every imaginable position. Mr Young recommended members visiting the Beith district to pay a visit to the quarry before the whole of this interesting section of limestone is quarried away.

Dr William Macewen exhibited an elephant's tooth, found in Glenmoidart, near Strontian, West Highlands, which proved to be a recent tooth of an Asiatic elephant, however its occurrence in that locality may be accounted for. In illustration of this specimen, Dr Young sent a series of rubbings from teeth of the elephant and mammoth in the Lanfine and Hunterian collections, and in the cabinet of Dr Allen Thomson. The last-named cabinet also contains the mammoth tooth obtained some years ago by Dr Beveridge from the drift near Bishopbridge. This is the only perfect mammoth grinding tooth known to be found in Scotland.

Mr James Lumsden exhibited a fine specimen of a hybrid between the Common Grouse (*Lagopus scoticus*) and the Black Grouse (*Tetrao tetrix*), and remarked that the Black Grouse is found breeding with allied species to perhaps a greater extent than most other birds. Three distinct hybrids of this kind have been described—I. That between the Black Grouse and Capercaillie (*Tetrao urogallus*), several specimens of which have been exhibited before this Society at various times. This variety is, perhaps, the most common, and is frequently met with in Norway and Sweden. II. The cross between the Black Grouse and Willow Grouse (*Lagopus albus*), the Scandinavian *dal ripa*, which is a very closely allied species to our common Red Grouse. This form is only occasionally met with in Northern Europe. III. That between the Blackcock and the female of the common Red Grouse, of which this specimen is an example. This bird was killed in South Ayrshire in the beginning of last month, and is a variety still less common than any of the others; but it must be remembered that the Red Grouse is met with only in the British Islands, while the Capercaillie and Willow Grouse have a much larger geographical distribution.

PAPERS READ.

I.—*On the Blind Fauna inhabiting the Mammoth Cave, Kentucky, U.S.*
By Mr ARCHIBALD ROBERTSON.

The paper was illustrated by a number of views of the interior of the cave, and by a collection of specimens of the various objects found in it, including examples of the blind fishes, *Amblyopsis spelaeus*, and *Typhlichthys subterraneus*, three specimens of a crustacean, *Orconectes pellucidus*, a number of insects, including *Anophthalmus Mendricii* and *A. Jelikampgii*; also several small carnivorous beetles.

Mr Robertson also showed several specimens of stalactites from the cave, on which Mr John Young, F.G.S., made a few remarks, pointing out some of the geological features of these wonderful caverns, and the probable causes which led to their formation. He also described the composition of the stalactites, and the manner in which they are formed by the percolation of water through the limestone strata forming the roof from which they hang.

Mr Robertson expressed himself indebted for the opportunity of exhibiting the specimens to Mr Charles Malloch, who had obtained them on a recent visit to the cave.

II.—*On a Collection of North American Birds' Eggs and Skins, formed principally by the Rev. C. M. Jones, Conn., U.S. America, and forwarded by the same gentleman.* By Mr JOHN A. HARVIE-BROWN, M.B.O.U., corresponding member.

The following notes are extracted, for the most part, from the correspondence of the Rev. C. M. Jones, Connecticut, to whom I am indebted for nearly the whole collection of bird skins now laid before this meeting, as well as for a considerable collection of eggs sent from time to time, by far the largest portion of which was formed by himself, and to which latter these notes principally refer. I would also have exhibited the eggs this evening, but living at a distance from Glasgow as I do, the difficulties of carriage and risk of breakage prevent me from bringing such fragile things as birds' eggs, at least in any numbers. These notes, however, give some idea of the nidification of the different species, and their habits during the nesting season, and therefore ought to be considered of some value, even when

unaccompanied by the eggs themselves. In order to make the paper of more general interest, I have added to each species mentioned, an account of its geographical distribution, as supplied by Baird in his excellent quarto Catalogue of North American Birds,* and have given in some cases references to Brewer's work on North American Oology.†

1.‡ *Cathartes aura* (Lin.)—Turkey-Buzzard.

A nest of 2 eggs sent, concerning which Mr Jones writes:—"Collected in Harford county, Maryland, 8/5/70. It builds on the ground, and in caverns of rocks, in which latter situation these eggs were taken. They never lay more than 2 eggs, as far as my information goes."

The measurements of these eggs are as follows:—Spn. 1 is 2·07 in. by 2 in; Spn. 2 is 2·8 in. by 2 in. The shape of Spn. 1 is nearly elliptical, the greatest breadth being at the centre, and the ends equally rounded; and in Spn. 2, the greatest breadth is towards one end. (*V. Egg-Book Mus. Feilden and Harvie-Brown*, p. 186).

The Geog. Range of this species is very extensive, including the "whole of N. America, except the Arctic regions" (Baird).

Vide also 'N. Am. Oology,' Part i., p. 1 and pl. 1, figs. 1 and 2.

14. *Astur atricapillus* (Wils.)—American Goshawk.

1 egg. "Collected at Lapwai Creek, Idaho territory, 25/5/71, by Capt. Chas. Bendire, 1st U.S. Cavalry. Nest in a cottonwood tree. I obtained 2 eggs, and send you 1. They are the only eggs of this species I have ever obtained." Capt. Bendire is a well-known collector, who was stationed in Arizona, and made a large collection of rare eggs there. (*V. Egg Bk. Mus. F. and H.-B.*, p. 270).

The Geog. Range—"N. America: chiefly in the N. Western portions" (Baird). It has also occurred in Great Britain, and a

* 'Catalogue of North American Birds, chiefly in the Museum of the Smithsonian Institution,' by Spencer F. Baird, Assistant Sec. of the Smithsonian Inst. Washington, 1858.

† 'North American Oology,' by Brewer. Part i. Raptores.

‡ The numbers prefixed to the name of each species are those used in Baird's Catalogue.

specimen was exhibited by Mr R. Gray at a former meeting of the Society. (*V. Proc. Nat. Hist. Soc. Glas., Vol. ii., p. 6.*)

V. 'N. Am. Oology,' Part i.

17. *Accipiter fuscus*, Bon.—Sharp-shinned Hawk.

2 eggs. "These eggs were collected in Hampton, Conn., by myself. Nest in a cedar tree, in a swamp, and about 30 feet from the ground. On the 22/5/71, I took 3 eggs from the same nest, which were all it contained. I did not like to leave them, as I was going to Virginia on a collecting tour, and knew they would be spoiled by the time I returned. A few days after I came home I went to the nest, and I found the bird had laid 4 more, and was incubating them. This was on the 14th June. I think they generally lay 5, if left undisturbed. Nest made of smooth sticks, without any lining." I also possess the 4 eggs above referred to by Mr Jones, along with the following note:—"This species builds a nest of sticks, without any lining, selecting for a site an evergreen tree. I have known them to use pine, cedar, and hemlock, and no other, though they probably use other kinds where these do not occur."

2 of these eggs measure—1·6 in. by 1·2 in., and 2·03 in. by 1·01 in. (*V. Egg Bk. Mus. F. and H.-B., p. 186.*)

The Geog. Range—"Throughout N. America and Mexico."

23. *Buteo borealis* (Vieill.)—Red-tailed Hawk.

Of these Mr Jones has sent me several sets, with the following notes:—One nest "was a new one, quite large, and built in a tall oak tree, constructed of sticks, and lined with moss. . . . Breeds early." Dates of nest and eggs are—22/4/70, 1/4/70, 29/4/70. One egg measures 2·03 in. by 1·8 in., and another, 2·05 in. by 1·9 in.

The Geog. Range—"Eastern N. America; Fur countries; Jamaica; Cuba" (Baird).

(*V. Egg Bk. Mus. F. and H.-B., pp. 187 and 269.*)

25. *Buteo lineatus*, Jardine—Red-shouldered Hawk.

Two sets of 4 and 3 sent, with the note—besides dates and localities, viz.:—"This bird usually lays 3 eggs; sometimes only 2." The dates are 1/5/72 and 23/4/73.

The Geog. Range—"Eastern and Northern N. America" (Baird).

38. *Circus hudsonicus*, Vieill.—Marsh Hawk.

Nest of 6 eggs. "Taken 16/5/70, in Madison, Conn., by myself. I first discovered their haunt about the beginning of May. They were flying about in an erratic manner, which led me to think that they were nesting in the vicinity. . . . I succeeded in finding a bog suited to their purpose, and revisited the place a few days after: on this latter occasion I started the female off the nest. The nest was situated near the edge of the bog, on the ground, and composed of a quantity of sticks, upon which was piled a lot of coarse grass, such as was growing in abundance all about the nest. There was but little skill or taste displayed in the construction. From the fact that the materials at the bottom of the nest were quite rotten, I concluded that it was an old nest repaired, by simply placing on more grass. The nest then contained 1 egg. . . . Both hawks were circling overhead. On the 14th May the nest contained 5 eggs; but not feeling satisfied with that, I left it two days longer, when I found 6 eggs, which I think is the number usually laid. On rising from the nest, the female would circle round overhead, and the male would soon afterwards join her; showing that he must have been in the immediate vicinity." Mr Jones describes another nest "in a bog, not over 30 rods from the public highway, and in full view, and composed of sticks, without any lining." Mr Jones further notes, that—"This hawk is generally seen flying very near the ground, searching for food, which consists principally of field mice." He also relates how, upon one occasion, he saw one settle upon a tree; which he considers unusual.

This species is closely related to our well-known Hen Harrier (*Circus cyaneus*, Lin.). On comparing these 6 eggs of *C. hudsonicus* with a series of 22 Scotch-taken eggs of *C. cyaneus*, I find them smaller than 20 of the latter—by actual measurements—and larger than only 2. These two are Hebridean specimens, and measure respectively, $1\frac{6}{8}$ in. by $1\frac{3}{8}$ in., and $1\frac{6}{8}$ in. by rather less than $1\frac{3}{8}$ in.; and the average measurement of the largest set of 6 eggs of *C. cyaneus* are $1\frac{15}{16}$ in., or nearly 2 inches by $1\frac{7}{16}$ in. (*V. Egg Bk. Mus. F. and H.-B.*, p. 67 d.).

The Geog. Range of *C. hudsonicus*—"All of N. America, and Cuba" (Baird).

(*V. Egg Bk. Mus. F. and H.-B.*, p. 150, *et seq.*).

44. *Pandion carolinensis*—Fish Hawk.

= *P. haliaetus* (Lin.)—Osprey;

but separated by some authors.

3 eggs sent are from different nests. "Taken on Hogg Island, Virginia, 31/5/71, by myself. I think I saw more than 30 nests on the islands. They were built in pine trees, some pretty high, others quite low. Some of the trees were dead, and so rotten that it was not safe to climb them; others alive, and showing no signs of decay. This hawk does not build a very large nest the first year, but adds to it each season, and I saw some that were fully 3 feet deep. It was late when I visited their breeding station, and most of the eggs were nearly ready to hatch." In a former letter, Mr Jones tells me that, on the same tree with the nest of the Fish Hawk, he found 3 or 4 nests of the Great Blue Heron (*Ardea herodias*).

These eggs measure—2.5 in. by 1.8 in., 2.4 in. by 1.03 in., and 2.04 in. by 1.8 in. They are in every respect similar to the eggs of the European bird.

Mr Jones has since sent me several sets of these eggs. (*V. Egg Bk. Mus. F. and H.-B.*, p. 187).

The Geog. Range—"Throughout temperate N. America" (Baird).

48. *Bubo virginianus*—Great-horned Owl.

The representative in N. America of our *Bubo ignavus*, or Eagle Owl.

"Nest of two eggs sent. Taken in Portland, Conn., by a boy in the employment of W. W. Coe. Mr Coe obtained a nest of 2 eggs from the same bird in March; consequently, this was a second laying. One of these eggs is more elongated than the other, and the same was the case with the other set. I consider this a fine set of eggs, and they are amongst our most valuable eggs, being rarely obtained in this part of the country. They usually occupy an old hawk's nest; and the one from which these eggs were taken, was built and occupied by a Red-tailed Hawk in 1870."

The Geog. Range—"The whole of N. America: runs into varieties" (Baird).

49. *Scops asio*—Mottled Owl.

2 eggs sent. Mr Jones writes:—"I have never been fortunate enough to find the nest of this species, though they breed in this

State. They nest in hollow trees, both in the forests and orchards. I am informed that they make only a very slight nest, and lay from 3 to 6 eggs; 4 and 5 being the common number. In June, 1867, while I was living at Madison, a female of this species, with three young, came around my house on two successive evenings at dusk. She was very busy collecting beetles for their supper; and when she came with food, they made a noise which sounded like a person strangling."

These eggs measure—1.5 in. by 1.2 in., and 1.03 in. by 1.2 in.

The Geog. Range—"The whole of temperate America; Greenland" (Baird); and it is reported as having occurred in Great Britain.

59. *Athene cunicularia*, Bon.—Burrowing Owl.

N.B.—Mr Jones merely sends me 1 egg of this species, to compare with those of the same species from South America. He writes:—"I send you a cracked specimen of No. 59, to give you an idea of the egg. I have only 1 other." (*V. Egg Bk. Mus. F. and H.-B.*, p. 204).

The Geog. Range—"N. Am., W. of the Rocky Mountains; S. America" (Baird).

97. *Colaptes auratus*, Sw.—Flicker.

"Nest of 8 eggs sent. Taken 4/6/70, in Madison, Conn., by myself. The nest-hole was picked out by the bird in the old decayed stock of a tree. They carry in no materials for a nest, but leave a few chips in the bottom. They nest anywhere in the deep woods, in an orchard, or in a tree standing alone in open ground."

These eggs measure nearly $1\frac{1}{16}$ in. by $\frac{7}{8}$ in., or thereby.

The Geog. Range—"Eastern N. Am., to the eastern slopes of the Rocky Mountains; Greenland" (Baird).

76. *Picus pubescens*—Downy Woodpecker.

"Nest of 5 eggs, taken by myself, 22/5/71, in Hampton, Conn. I discovered the birds while engaged in building their nest (picking the hole) in a willow tree growing on a little island in a mill-pond. This species lays from 3 to 6 eggs, but so far as my observation goes, 5 is the usual number. Nest in the woods, or in open country."

The Geog. Range—"Eastern U.S., towards the eastern slope of the Rocky Mountains.

109. *Chaetura pelagica*, Steph.—Chimney Swallow.

Nest of 4 eggs sent. "Taken by myself, 28 / 6 / 69, in Madison, Conn., from the chimney of a house in which I lived. The nest was attached to the inside of the chimney, constructed entirely of sticks, fastened together by a glutinous secretion with which nature has provided the birds. It contained no lining, and was just large enough to hold the eggs. 4 is the usual number, sometimes only 3." (*V. Egg Bk. Mus. F. and H.-B.*, p. 188).

The Geog. Range—"Eastern N. America to slopes of the Rocky Mountains" (Baird).

V. 'N. Am. Oology,' Part i., p. 108, plate iv., fig. 31.

130. *Myarchus crinitus* (Cab.)—Great-crested Flycatcher.

"Nest of 6 eggs, taken by myself in Madison, Conn., 15 / 6 / 69. The nest was in a hollow chestnut tree, and about 30 feet from the ground. This species nests in the hollow of a tree, either in the trunk or branch, as the case may be. I once found one in an old woodpecker's nest-hole. They frequently breed in apple trees. The nest is composed of dry leaves and grass, and in every instance which has come under my observation, there has been a cast-off skin of a snake-worm among the other materials. This I believe to be an invariable practice. I am unable to appreciate their taste. They are very noisy when constructing their nest: I have observed them a number of times, and whenever the female deposited any material in her nest, she would come out of the hole and utter a triumphant scream. The usual number of eggs is 6." (*V. Egg Bk. Mus. F. and H.-B.*, p. 201).

The Geog. Range—"Eastern N. America to the Missouri, and south to Eastern Texas" (Baird).

124. *Tyrannus carolinensis* (Lin.)—King Bird.

Nest of 3, and others. Mr Jones says:—"Taken by myself in Madison, Conn., 10 / 6 / 70. The nest, built of grass, sticks, and moss, is placed in a tree, more commonly in an apple tree. I have never found more than 3 in a nest."

These eggs measure close upon 1 in. by $\frac{1}{8}$ in. They are of a creamy, glossy white ground-color, with dark reddish brown large

blotches in a zone round the large end, and resemble the eggs of the Shrikes. (*V. Egg Bk. Mus. F. and H.-B.*, p. 154).

The Geog. Range—"Eastern N. Am. to Rocky Mountains" (Baird).

117. *Ceryle alcyon* (Lin.)—Great Belted Kingfisher.

"7 eggs, taken by myself in Eastford, Conn., 27/5/73. Female captured on the nest, and the skin sent in the box. The nest was in a sand-bank by the side of a road, and the tunnel was about 5 feet in length. While engaged in digging out the eggs, I discovered a nest of Screech Owls (*Scops asio*, No. 49) flying about, and killed 3 of the young with sticks, 1 of which I send you." (*V. Egg Bk. Mus. F. and H.-B.*, p. 270).

The Geog. Range—"Entire continent of N. America" (Baird).

139. *Contopus virens* (Cab.)—Wood Pewee.

"Nest of 3 eggs. Taken 18/6/69, in Madison, Conn. Nest in a chestnut tree, on a horizontal branch, about 12 feet from the ground; constructed of moss, fine grass, and pine leaves (? needles); the outside plastered over with pieces of lichen, giving it the appearance of an old knot, and rendering it somewhat difficult to discover. It is rarely that the nest is found. I have never known of more than 3 eggs in a nest." (*V. Egg Bk. Mus. F. and H.-B.*, p. 106).

The Geog. Range—"Eastern N. America, to the borders of the high central plains; south to New Grenada" (Baird).

135. *Sayornis fuscus*, Baird—Pewee.

"Nest of 5 eggs, taken 28/5/70, by myself, in Madison, Conn. The nest was in a saw-mill, built on one of the corner braces; was composed of mud and moss, lined with fine moss. This species builds in mills, barns, outhouses, under shelving rocks, and banks of streams."

The eggs are white, and closely resemble those of our Bank Martin (*Cotyle riparia*), or those of the Black Redstart (*Sylvia titys*). (*V. Egg Bk. Mus. F. and H.-B.*, p. 155).

The Geog. Range—"Eastern N. America" (Baird).

142. *Empidonax minimus*, Baird—Least Flycatcher.

"3 eggs, collected by Milo T. Crum, in Holyoke, Mass.,

28/5/71. There were 4 eggs in the nest, but I broke one." (*V. Egg Bk. Mus. F. and H.-B.*, p. 201).

The Geog. Range—"Eastern U.S. to Fort Bridger" (Baird).

148. *Turdus mustelinus*, Gmel.—Wood Thrush.

"Nest of 4 eggs, taken 26/5/70, in Madison, Conn., by myself. Was built on the limb of a beech tree, in deep woods; composed of, first, a layer of beech leaves, and then the nest proper built of mud and leaves, and lined with fine roots. Number of eggs, 3 or 4, rarely 5. This is one of our sweetest songsters."

These eggs, dark glossy blue in colour, and unspotted, measure $1\frac{1}{8}$ in. by nearly $\frac{6}{8}$ in.

The Geog. Range—"Eastern U.S. to Missouri river; south to Guatemala" (Baird).

151. *Turdus fusescens*, Steph.—Wilson's Thrush.

"4 eggs, collected on an island of the Connecticut river at Portland, Conn., by W. W. Coe." No date. (*V. Egg Bk. Mus. F. and H.-B.*, p. 275).

"This species builds a nest of sticks and grass near the ground, but not on it, in a low bush or on a pile of dead sticks, and seems to prefer the river banks." (*V. Egg Bk. Mus. F. and H.-B.*, p. 233).

The Geog. Range—"Eastern N. Am., to the Missouri; N. to the Fur countries" (Baird).

155. *Turdus migratorius*, Lin.—Robin.

"Nest of 4 eggs, taken 26/5/70, in Madison, Conn., by myself. The nest was in an apple tree. It builds in houses, trees, bushes, on fences or on old stumps, just as fancy leads; anywhere but on the ground. Number of eggs, 2 to 5, commonly 4." (*V. Egg Bk. Mus. F. and H.-B.*, p. 155).

Eggs, dark glossy blue, larger than those of *T. mustelinus*; measure $1\frac{1}{8}$ in. by $\frac{7}{8}$ in.

The Geog. Range—"Continent of N. Am. to Mexico" (Baird).

158. *Sialia sialis*, Baird—Blue Bird.

"Nest of 5 eggs, which is the usual number. Taken 23/4/70. Nest was built of grass, in a box which I placed in a peach tree

near my house. This bird usually builds its nest in a hole in a tree or post, sometimes in an old woodpecker's nest-hole, but will readily appropriate a box placed for the purpose. It is one of the earliest of our small birds to nest, and one of the first to arrive in spring." (*V. Egg. Bk. Mus. F. and H.-B.*, p. A. 104).

The Geog. Range—"Eastern N. Am. to west of Missouri river; Fort Laramie" (Baird).

177. *Icteria longicauda*, Lawr.—Long-tailed Chat.

"1 egg. Taken at Fort Lapwai, Idaho, by Capt. C. Bendire. Received by me 9/12/73." (*V. Egg Bk. Mus. F. and H.-B.*, p. 289).

The Geog. Range—"High central plains of U. States to the Pacific, south into Mexico" (Baird).

186. *Sciurus aurocapillus*, Sw.—Golden-crowned Thrush.

"Nest of 4 eggs, taken 26/5/70, in Madison, Conn., by myself. This bird breeds on the ground, selecting a spot where the leaves of the previous year are abundant. It scratches a hollow in the ground and places a layer of leaves at the bottom, on which it builds its nest of grass and leaves, and arches it over with leaves, leaving only a hole for egress and ingress, so that one might pass directly over the nest without discovering it, were it not betrayed by the birds darting from under the feet, and fluttering along on the ground as if hurt."

Eggs, 3 to 5; pinky-white ground-color; blotched and spotted, principally at the large end, with delicate red. In some a tinge of lilac is visible. (*V. Egg. Bk. Mus. F. and H.-B.*, p. 155).

The Geog. Range—"Eastern N. America to the Missouri" (Baird).

170. *Geothlypis trichas*, Cab.—Maryland Yellow-throat.

"Nest of 4, taken by myself in Madison, Conn., in June, 1870. This species builds its nest sometimes on the ground and sometimes in a bush. In this case it was built in a small scrubby bush, and about two feet from the ground. The nest is a very bulky affair for the size of the bird. When on the ground it is usually very difficult to find, being skilfully covered over and concealed. I shot the parent bird for identification." (*V. Egg Bk. Mus. F. and H.-B.*, p. 232).

The Geog. Range—"North America, from Atlantic to Pacific" (Baird).

200. *Dendroeca pennsylvanica*, Baird—Chestnut-sided Warbler.

"4, a nest. Collected by myself, 10/6/73, in Eastford, near Chrystal Pond. Nest in a small bush, near the ground." (*V. Egg Bk. Mus. F. and H.-B.*, p. 271).

The Geog. Range—"Eastern U.S. to Missouri" (Baird).

203. *Dendroeca aestiva*, Baird—Yellow Warbler.

"Nest of 4 eggs, taken 6/6/70, in Madison, by myself. This species builds in low, thick bushes, often in briars, and in the forks of trees. The nest is neatly built of fine grass, and the woolly part of plants; is thick and warm, and firmly attached to its supports. Eggs, usually 4, sometimes only 3." (*V. Egg Bk. Mus. F. and H.-B.*, p. 156).

Eggs—Ground-color, delicate green, or greenish-white; marbled, and minutely spotted with two shades of purple.

(*V. also Egg Bk. Mus. F. and H.-B.*, p. 275^A).

220. *Pyrranga rubra*, Vieill.—Scarlet Tanager.

"2 eggs from different nests. This species often builds in an orchard, but more commonly in the woods, placing the nest on a horizontal branch at some distance from the tree, which is commonly an oak when in the woods. The nest is built of coarse grasses, and is a very frail affair; so thin that the eggs can often be seen through it. Eggs, 3 or 4. The male is one of our richest plumaged birds." (*V. Egg Bk. Mus. F. and H.-B.*, p. 156).

Eggs—Green ground-color, thickly spotted with reddish-brown all over; confluent in patches at larger end, forming an indistinct zone.

The Geog. Range—"Eastern U.S. to Missouri" (Baird).

225. *Hirundo horroreum*, Barton—Barn Swallow.

"Nest of 5 eggs, taken 7/6/70, in Madison, by myself. This bird builds in barns and sheds, attaching its nest of mud to a rafter, and lining it with feathers. Sometimes only a single pair builds in a barn, while in another barn there may be a dozen or twenty pairs. They are very sociable birds, and general

favourites with the people." (*Vide* 'Ibis,' 1864, p. 127). (*V. Egg Bk. Mus. F. and H.-B.*, p. 157).

The eggs are like those of our Chimney Swallow, *H. rustica*, white, spotted with red, but are of a more regular oval.

The Geog. Range—"N. Am., from Atlantic to Pacific" (Baird).

226. *Hirundo lunifrons*, Say—Cliff Swallow.

"Nest of 4 eggs, taken 6/6/70, in Madison, by myself. This bird nests under the eaves of barns. Sometimes a row of their nests extends the whole length of the barn, placed as closely together as possible. Nest of mud, lined slightly with straws and feathers. Eggs usually 4, sometimes 5." (*V. 'Ibis,'* 1864, p. 127). (*V. Egg Bk. Mus. F. and H.-B.*, p. 157).

The Geog. Range—"N. Am., from Atlantic to Pacific" (Baird).

227. *Hirundo bicolor* (Vieill.)—White-bellied Swallow.

"5 a nest, taken 12/6/73, by myself in Eastford. Nest in a hollow stump, just on the edge of Chrystal Pond. I was obliged to wade out a little distance to get the eggs. These birds, like Martens, will breed in boxes put up for them near or on houses." (*V. Egg Bk. Mus. F. and H.-B.*, p. 271).

The Geog. Range—"N. Am., from Atlantic to Pacific" (Baird).

217. *Setophaga ruticilla*, Sw.—Redstart.

"3 a nest, taken in Portland, Conn., by W. W. Coe, 5/6/72." (*V. Egg Bk. Mus. F. and H.-B.*, p. 273).

The Geog. Range—"Eastern United States to Fort Bridger" (Baird).

231. *Progne purpurea*, Boie.—Purple Martin.

"Nest of 5 eggs, taken 11/6/70, in Madison, by myself. This nest was built in a box which I put up for the purpose on the house where I lived. This is their usual method of nesting at the present day. They build a large nest of straws and sticks, and line it with green leaves plucked from the trees. In Madison peach trees are plentiful, and there, so far as my observations went, they invariably used the leaves of these trees. Eggs, 4 to 6, commonly 5." (*V. Egg Bk. Mus. F. and H.-B.*, p. 157).

The Geog. Range—"N. Am., generally" (Baird), and it has occurred in the British Isles.

229. *Cotyle riparia*, Boic.—Bank Swallow.

"Nest of 5 eggs, taken 30/5/70, by myself, in S. Windsor, Conn., in the bank of the Conn. River. This bird burrows a hole, from 15 to 30 inches deep, in steep banks, enlarging it at the end, and builds a loose nest of grass, straw, and feathers. Eggs, 4 or 5." (*V. Egg Bk. Mus. F. and H.-B.*, p. 157).

The Geog. Range—"N. America generally" (Baird). Not distinguishable from our European bird.

240. *Vireo olivaceus*, Vieill.—Red-eyed Flycatcher.

"Nest of 3, taken by myself, 24/6/72, in a piece of wood on the shore of Chrystal Pond, Eastford, Conn. This species builds a pensile nest, and in this case it was attached to the extremity of a branch of a yellow birch-trée, and about 10 feet from the ground. Also, 1 egg taken in Madison in June, 1870, by myself. This species lays 3 or 4 eggs." (*V. Egg Bk. Mus. F. and H.-B.*, p. 233).

The Geog. Range—"Eastern U.S. to Fort Bridger, Utah; in Texas to Devil's River; South to Guatemala; Greenland" (Baird).

254. *Mimus carolinensis*, Gray—Cat Bird.

"Nest of 4 eggs, taken in Madison, Conn., 15/6/70, by myself. This bird generally builds in low bushes, preferring the shores of ponds and streams and swampy thickets. Nest constructed of leaves, grass, inner bark of trees, and lined with roots. Eggs, 3 or 4." (*V. Egg Bk. Mus. F. and H.-B.*, p. 189).

The Geog. Range—"Eastern U.S. to Fort Bridger" (Baird).

261. *Harporhynchus rufus*, Cab.—Brown Thrush.

"Nest of 4 eggs, taken 24/5/70, in Madison, by O. D. Redfield. This species nests on the ground or in low bushes; builds a bulky structure of sticks and moss, lining it with fine roots. Seems to prefer pasture grounds, partly grown over with bushes."

Eggs—greenish-white ground color, but almost hidden by minute freckles of russet, confluent and darker at larger end, forming a broad zone. In shape a handsome oval, very slightly smaller at small end. Measure—nearly $1\frac{1}{8}$ in. by $\frac{6}{8}$ in.

The Geog. Range—"Eastern N. Am. to Missouri River, and perhaps to high central plains, unless replaced by a long tailed variety, *H. longicauda*" (Baird).

257^A. *Harporhynchus bendirei*—Bendire's Thrush.

"2 eggs. A new species discovered in Arizona, in 1872, by Capt. Chas. Bendire, 1st U.S. Cavalry."

Eggs—Greyish-white, with spots and larger blotches, principally about the larger end, of two shades of pale reddish-brown, with some lilac and lavender; measure only .96 in. by .70 in. (Coues, in 'American Naturalist,' vol. vii., June, 1873, No. 6. "Some U.S. Birds new to Science, and other things Ornithological"). (*V. Egg Bk. Mus. F. and H.-B.*, p. 287).

259^B. *Harporhynchus curvirostris*, var. *palmeri*—Palmer's Thrush.
1 egg. "Reillete Creek, Arizona, 2/8/72, by Capt. Bendire."

268. *Cistothorus palustris*, Cab.—Long-billed Marsh Wren.

"Eggs from different nests. Collected by M. Coe, in Middleton, Conn., 3/6/72. This species breeds in marshes, weaving a nest of grass in the rushes (a very bulky affair for so small a bird), having a small hole in the side for ingress and egress."

The Geog. Range—"North America, from Atlantic to Pacific; N. to Greenland" (Baird).

270. *Troglodytes aedon*, Vieill.—House Wren.

"Nest of 7 eggs, taken 28/5/70, in Madison, by myself. The nest was built in a box which I fastened up in a tree: they will always appropriate such a convenience. They will build also in a hollow stump or tree, or in some mortice in the frame of a building, and they generally fill up the cavity, however large, with sticks, leaving just room for the nest, which they line very warmly with feathers. Eggs, usually 7. The eggs I send you are the first of three sets of 7 each, which I took from the same bird on 25/5/70, 9/6/70, and 21/6/70. She afterwards laid another set, which I allowed her to hatch." (*V. Egg Bk. Mus. F. and H.-B.*, p. 158).

Eggs—Rich pink; minutely, and almost invisibly freckled with a slightly darker shade.

The Geog. Range—"Eastern U.S. to the Missouri, or to the high central plains" (Baird).

277. *Sitta carolinensis*, Gmel.—White-bellied Nuthatch.

"Eggs from different nests. Dates—2/5/70, 18/5/70, and
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20/5/72. Nests in hollow oak, maple, and chestnut trees in Eastford and Madison. By myself." (*V. Egg Bk. Mus. F. and H.-B.*, p. 274).

The Geog. Range—"Eastern N. Am. to the high central plains; west of this, replaced by *S. aculeata*" (Baird).

290. *Parus atricapillus*, Lin.—Black-cap Titmouse.

"Nest of 7 eggs, taken 17/5/70, Madison, Conn., by myself. The nest was in a decayed birch stub, and about 2½ feet from the ground. Nest-hole picked out by the birds after the manner of the woodpecker's, and was thickly lined with rabbit's fur (? *Lepus americanus*, Ersel.—*J. A. H.-B.*) The usual number of eggs is 7, but I once found 8, and have frequently found but 6." (*V. Egg Bk. Mus. F. and H.-B.*, p. 159).

The Geog. Range—"Eastern N. Am., along the Atlantic border" (Baird).

341. *Ammodromus caudacutus*, Sw.—Sharp-tailed Finch.

"Nest of 4 eggs, collected in Madison, Conn., 17/6/69, by myself. This species is confined to the salt marshes, and weaves a nest of grass, usually attaching it to the grass in which it is built. Sometimes it is open at the top, and sometimes it has a round hole in the side for ingress and egress. Eggs, 4." (*V. Egg Bk. Mus. F. and H.-B.*, p. 189).

The Geog. Range—"Atlantic coast of the U.S." (Baird).

342. *Ammodromus maritimus*, Sw.—Sea-side Finch.

"Nest of 4 eggs, collected by myself in Madison, Conn., 21/6/70. The habits and habitat of this species are the same as of No. 341. They breed together in the marshes in Madison on Long Island Sound. The birds resemble each other so closely, that a person not acquainted with them, on seeing them in the marshes, might not suspect that they were different species." (*V. Egg Bk. Mus. F. and H.-B.*, p. 189).

The Geog. Range—"Atlantic coast, as far at least as Long Island" (Baird).

355. *Poospiza bilineata*, Sclat.—Black-throated Sparrow.

"2 eggs, taken near Reillito Creek, 14/9/72, by Capt. Chas. Bendire." (*V. Egg Bk. Mus. F. and H.-B.*, p. 288).

The Geog. Range—"Valley of the Rio Grande and of Gila; Big Cañon of Colorado" (Baird).

358. *Spizella pusilla*, Bon.—Field Sparrow.

"Nest of 4 eggs, taken 23/5/70, in Madison, by myself. The nest was built in a small running juniper, in a position somewhat grown up with bushes such as this species usually resorts to. They lay 4 eggs, sometimes only 3. The nest is built of grass, with a lining of a finer quality, and is rather loose in structure." (*V. Egg Bk. Mus. F. and H.-B.*, p. 159).

The Geog. Range—"Eastern N. America to the Missouri River" (Baird).

359. *Spizella socialis*, Bon.—Chipping Sparrow.

"4 eggs. Dates on eggs; one marked 6/6/70, taken in Madison; the other 3, 30/5/73 and 12/7/73, in Eastford." (*V. Egg Bk. Mus. F. and H.-B.*, p. 286).

The Geog. Range—"N. Am., from Atlantic to Pacific" (Baird).

363. *Melospiza melodia* (Baird)—Song Sparrow.

"Nest of 5 eggs, taken 30/5/70, by myself, at East Windsor hill, Conn., on the banks of the Connecticut river. Nest—a hole scratched in the ground, and neatly lined with fine grass. They usually lay 4 eggs, very rarely 5." (*V. Egg Bk. Mus. F. and H.-B.*, p. 159).

The Geog. Range—"Eastern U.S. to high central plains" (Baird).

391. *Pipilo erythrophthalmus*, Vieill.—Ground Robin.

"Nest of 4 eggs, taken 19/5/70, in Madison, by myself. Nest on the ground, and is generally placed under a bush; a slight cavity lined with grass." (*V. Egg Bk. Mus. F. and H.-B.*, p. 159).

The Geog. Range—"Eastern U.S. to Missouri River" (Baird).

395. *Pipilo alberti* (Baird).

"1 egg. Reillito Creek, 27/8/72, by Capt. Chas. Bendire." (*V. Egg Bk. Mus. F. and H.-B.*, p. 289).

The Geog. Range—"Base of Rocky Mountains in New Mexico; Valley of Gila and Colorado" (Baird).

397. *Pipilo mesoleucus* (Baird).

"1 egg. Reillito Creek, 8/9/72 (?), by Capt. Chas. Bendire." (V. Egg Bk. Mus. F. and H.-B., p. 288).

The Geog. Range—"Valley of Upper Rio Grande, and across to the Gila River; east to Santa Catarina; New Leon" (Baird).

399. *Dolichonyx oryzivorus* (Sw.)—Boblink.

"Nest of 5 eggs collected by myself, 7/6/66, East Windsor Hill, Conn. This species builds its nest on the ground in 'mowing' fields, a somewhat slight structure of grass, and lays from 4 to 6 eggs, usually 5. In the meadows along the Connecticut River they breed in great numbers, but there is great difficulty in finding their nests. When one approaches to where the female is sitting, the male will hover overhead and keep up an incessant noise, and I think the female leaves the nest and runs some distance through the grass before flying, as I have many times searched for the nest about the place where I flushed her, but almost always unsuccessfully. I found this set of eggs by flushing the female from the nest just at dusk of evening, after the males had retired for the night. The males are exceedingly musical during the breeding season, making the meadows ring with their melody." (V. Egg Bk. Mus. F. and H.-B., p. 202).

The Geog. Range—"Eastern U.S. to Fort Bridger, Utah" (Baird).

400. *Molothrus pecoris*, Sw.—Cow Bird.

"2 eggs. One taken 6/6/70, in Madison, by O. D. Redfield; the other was taken in Madison, 8/6/70, by myself, from the nest of the Golden-crowned Thrush (No. 186, Baird). This species never builds a nest of its own, but drops its egg in the nest of some other bird to be taken care of. How many eggs it lays during the season I have no means of knowing." (V. Egg Bk. Mus. F. and H.-B., p. 160).

"1 egg. Collected by myself in Hampton, Conn., 12/5/71. The egg was deposited in the nest of a Phoebe (No. 135, Baird), which was built in an old barn. The Phoebe had not commenced laying, and seemed to be very much disturbed by the intrusion of the strange egg." (V. Egg Bk. Mus. F. and H.-B., p. 275).

The Geog. Range—"U.S., from the Atlantic to California; Fort Bridger" (Baird).

401. *Agelaius phoeniceus*, Vieill.—Swamp Blackbird (or, English name, Red-winged Starling).

“Nest of 4 eggs, taken 24/5/70, in Madison, by O. D. Redfield, and brought to me, with others, 6/6/70. This species breeds in swampy districts, placing its nest usually in a tussock of grass, sometimes in a low bush, and constructs it of grasses. Number of eggs, 3 or 4.” (*V. Egg Bk. Mus. F. and H.-B.*, p. 160).

The Geog. Range—“United States, from Atlantic to Pacific” (Baird).

415. *Icterus baltimore*, Daudin.—Baltimore Oriole.

“Nest of 5 eggs, collected in Madison, 7/6/70, by myself. This beautiful bird weaves a prehensile nest, attaching it to the ends of the branches of trees, often inaccessible to man, though it prefers to build near dwellings. Materials—grass, tow, and, if it can find them, strings of any kind, as cotton, twine, and yarn. Eggs, usually 4 or 5, rarely only 3.” (*V. Egg Bk. Mus. F. and H.-B.*, p. 190).

The Geog. Range—“From Atlantic coast to the high central plains; probably throughout Texas; south to Guatemala” (Baird).

406. *Sturnella magna*, Sw.—Meadow Lark.

“Nest of 5 eggs, taken in Hampton, Conn., 15/5/71, by a boy in the employment of Lucius Holt, farmer, and brought to me unblown, 17/5/71. The Meadow Lark breeds on the ground in ‘mowing lots,’ building an arched nest of dry grass and weaving the growing grass over it; with this often forming a tunnel or passage-way from one to two feet in length. They sit very close on the nest, and will allow a person to almost step on them before flying.”

The Geog. Range—“Eastern U.S. to the high central plains; south to Mexico; Cuba” (Baird).

421. *Quiscalus versicolor*, Vieill.—Crow Blackbird.

“Nest of 5 eggs, taken in Clinton, Conn., 27/5/67, by C. M. Jones, *ipse*. Incubation was then far advanced. These birds usually breed in communities, building their nests in evergreens, though I have found them in apple trees, and in one case the nest was in a hollow tree. The present nest was in a red cedar, some 12 feet from the ground, near the sea-shore, by the edge of a salt

marsh; and was composed of mud and coarse grass, forming a somewhat bulky and heavy structure." (*V. Egg Bk. Mus. F. and H.-B.*, p. 106).

The Geog. Range—"Atlantic to high central plains; Fort Bridger" (Baird).

426. *Corvus americanus*, Aud.—Common Crow.

"3 eggs to show varieties. One nest was taken in an oak tree, and contained 4 eggs, in Madison, Conn., 3/5/70. Another was in a red cedar, and contained 5 eggs, taken same day by Henry Pocker; and a third was taken by myself in Madison, 16/5/70, in a chestnut tree, and contained 4 eggs." (*V. Egg Bk. Mus. F. and H.-B.*, p. 204).

The Geog. Range—"N. Am. to the Missouri region; also, on the coast of California (?); (not found on the high central plains?)" (Baird).

434. *Cyanura cristata*, Sw.—Blue Jay.

"Nest of 5 eggs, taken 9/5/70, in Madison, by myself. Nest constructed of twigs and stalks of weeds, and lined with fibrous roots, and placed in a small red cedar. I have seldom seen a nest more than 8 or 10 feet from the ground, more frequently not over 5 or 6 feet. Commonly in a small-sized tree or bush. Number of eggs—4 or 5, sometimes only 3. My experience has been that the birds which nest early in the season lay 5 eggs, and those nesting later only 4." (*V. Egg Bk. Mus. F. and H.-B.*, p. 160).

The Geog. Range—"Eastern N. Am.; W. to the Missouri" (Baird).

464. *Cupidonia cupido* (Baird)—Prairie Hen.

"3 eggs, taken 15/5/70, in the State of Illinois. I do not know the exact locality. I received them from my correspondent, W. K. Kedzie of Lausing, Michigan, for whom they were collected by a friend in Illinois. This species lays a dozen or 14 eggs." (*V. Egg Bk. Mus. F. and H.-B.*, p. 160).

The Geog. Range—"Western prairies and plains, within the limits of the U.S. east of the Rocky Mountains; south-east to Calcasieu, Louisiana; east to Pocono Mountains, Pennsylvania, Long Island, and eastern coast" (Baird).

465. *Bonasa umbellus*, Steph.—Ruffed Grouse.

“13 eggs, collected in Madison, Conn., 12/5/73, by Henry Watsons, farmer’s son, whom I employ to collect for me, and received by me unblown, 22/5/73. A nest; and this is the most usual number laid by this bird.” (*V. Egg Bk. Mus. F. and H.-B.*, p. 269).

The Geog. Range—“Wooded portions of Eastern U.S. towards the Rocky Mountains” (Baird).

479. *Grus canadensis*, Temm.—Sand-hill Crane.

“I obtained this egg from H. S. Hollingsworth, of New York, 16/1/71. He told me it was collected in Okley, Iowa.” (*V. Egg Bk. Mus. F. and H.-B.*, p. 286).

The Geog. Range—“Whole of western regions of United States; Florida” (Baird).

451. *Zenaidura carolinensis*, Bon.—Common Dove.

“2—a nest taken in Reillito Creek, 3/6/72, by Capt. Bendire; received by me 9/12/72. Nest in a hock-berry bush.” (*V. Egg Bk. Mus. F. and H.-B.*, p. 289).

The Geog. Range—“Throughout U.S., from Atlantic to Pacific; Cuba” (Baird).

367. *Melospiza fallax* (Baird).

“2, taken at Reillito Creek, Arizona, by Capt. Bendire. Dates on eggs, viz.:—23/7/72 and 8/5/72.” (*V. Egg Bk. Mus. F. and H.-B.*, p. 289).

The Geog. Range—“Rocky Mountain region, from Fort Thorn to the Colorado” (Baird).

485. *Garzetta candidissima*, Bon.—Snowy Heron.

“4 eggs. These eggs were taken at the same time and place as those of No. 487; breeding along with them in large numbers; placing their nests in bushes, six or seven feet from the ground. Their nests were merely a few sticks, placed together without much skill.” (*V. Egg Bk. Mus. F. and H.-B.*, p. 105).

The Geog. Range—“Coast of Middle and Gulf States, and across to California” (Baird).

487. *Ardea herodias*, Lin.—Great Blue Heron.

“Nest of 4 eggs taken by myself on Mockhorn island, off the coast of Cape Charles, Virginia, 29/5/68. These birds breed in communities, nesting in the red cedars which grow abundantly on that island. Frequently a tree would contain 5 or 6 nests, which are large, loose, composed of sticks, and without lining. These, as well as the trees, are rendered filthy by the droppings of the birds. Myself and a man whom I had employed to assist me, gathered nearly a bushel of eggs in about an hour. When we commenced operations the birds retired, and settled in the marsh at some distance, to watch the proceedings.” (*V. Egg Bk. Mus. F. and H.-B.*, p. 105).

The Geog. Range—“Throughout the entire territory of the U.S.; West Indies” (Baird).

495. *Nycteardea gardeni* (Baird)—Night Heron.

“Nest of 4 eggs, taken by myself 29/5/66, in the town of Rocky Hill, Conn. This species, like the other herons, breeds in communities. There has been a heronry in Rocky Hill for many years, but the birds have been so much disturbed that the greater part of them have left. It was a swamp near the Connecticut river. The trees were mostly maples, and very tall, and the nests were mostly placed at the very top. They are of very frail structure, built of sticks, without lining. I know of no other place where they breed.” (*V. Egg Bk. Mus. F. and H.-B.*, p. 104).

The Geog. Range—“United States generally” (Baird).

493. *Butoroides virescens*, Bon.—Green Heron.

“3 eggs taken from same nest. It contained 4, but I broke 1. This species lays from 3 to 5. I think the latter number is very common in Virginia. The nest is a very rude affair, built of sticks, and placed in a bush. The species is somewhat rare in this State. The eggs which I send you, I collected on Mockhorn island, Virginia, 5/6/71. I expected to find an abundance of eggs there, but this nest was all I could find.” (*V. Egg Bk. Mus. F. and H.-B.*, p. 191).

The Geog. Range—“U.S. generally” (Baird).

499. *Ibis alba*, Vicill.—White Ibis.

“1. I received this egg on 11/2/69, from Dr J. M. Brown of Boston, Mass. He did not give the date or precise locality, only

said that it was collected in Florida." (V. Egg Bk. Mus. F. and H.-B., p. 270).

The Geog. Range—"South Atlantic and Gulf States, straggling occasionally northward" (Baird).

506. *Aegialites wilsonius*, Cassin.—Wilson's Plover.

"Nest of 3 eggs, collected on Cobbs island, Virginia, 1/6/71. Nest, a mere hollow scratched in the sand. These birds breed somewhat plentifully along the coast of Virginia, though it is somewhat difficult to see the eggs, since they so closely resemble the sand on which they are laid. Eggs, 3." (V. Egg Bk. Mus. F. and H.-B., p. 190).

The Geog. Range—"Middle and Southern States on the Atlantic, and the Atlantic coast of South America" (Baird).

518. *Himantopus nigricollis*, Vieill.—Black-necked Stilt.

"3, collected in Florida, spring of 1872. I received them from Mr J. H. Batty of New York, 7/1/73." (V. Egg Bk. Mus. F. and H.-B., p. 274).

The Geog. Range—"U.S. generally" (Baird).

512. *Haematopus palliatus*, Temm.—Oyster Catcher.

"3 eggs, a nest, taken by myself on Cobbs Island, off the coast of Virginia, near Cape Charles, 30/5/68. Nest a mere hollow scratched in the sand above high water mark; can hardly be said to breed in communities, yet they nest near enough to be neighbours." (V. Egg Bk. Mus. F. and H.-B., p. 105).

The Geog. Range—"Coast of Atlantic Ocean; States on the Pacific (?); Florida" (Baird).

537. *Symphemia semipalmata*, Hartlaub—Willet.

"4, a nest, taken on Cobbs Island, 30/5/71, by C. M. Jones. Nest on ground among the tall grass, a hole scratched in the ground, slightly lined with grass." (V. Egg Bk. Mus. F. and H.-B., pp. 204, 233, 285).

The Geog. Range—"Entire temperate regions of N. Am.; South Am." (Baird).

543. *Tringoides macularius*, Gray—Spotted Sandpiper.

"Nest of 4 eggs, taken 25/5/70, in Madison, by myself. This species generally nests on the borders of streams and ponds, but

I have found its nest in a corn field at some distance from water. A slight hollow scratched in the ground, and loosely lined with coarse grass, or whatever happens to be most convenient. The eggs are almost invariably placed with the small ends together in the middle of the nest, but I found a nest last summer in which no regard was paid to this order. One had the large end inwards, and the others lay sideways." (*V. Egg Bk. Mus. F. and H.-B.*, p. 161).

The Geog. Range—"Entire temperate N. Am., Oregon; accidental in Europe" (Baird). Mr R. Gray, formerly Secretary to this Society, exhibited two Scotch-killed specimens of this bird at meetings here. (*V. Proc. Nat. Hist. Soc. Glas.*, Vol. i., p. 256, and Vol. ii., p. 2.)

553. *Rallus crepitans*, Gm.—Clapper Rail.

"9 eggs. A nest collected by myself on Cobbs island, Virginia, 30/5/71. Nest, a pile of grass slightly hollowed; sometimes in the marsh, and arched over with the growing grass, woven together, and sometimes under grass, lodged in the sand, just at the edge of the marsh. Eggs, from 6 to 11; from 7 to 10 is the usual number." (*V. Egg Bk. Mus. F. and H.-B.*, p. 190).

The Geog. Range—"Middle and southern coasts of the States on the Atlantic Ocean; South America" (Baird).

554. *Rallus virginianus*, Lin.—Virginia Rail.

"3 eggs, collected by Milo T. Crum, in Holyoke, Mass., 22/5/71. Mr Crum writes me that the nest was in a deep swamp, in a tussock of grass, about 15 inches above the water, built of dry grass, and contained 9 eggs, of which he sent me 3, 12/8/71. I have never seen a nest of this species." (*V. Egg Bk. Mus. F. and H.-B.*, p. 203).

The Geog. Range—"The entire temperate regions of N. Am.; New Mexico; California; Oregon" (Baird).

642. *Thalassidroma leachii*, Temm.—Leach's Petrel.

"4. 3 of these eggs, marked 12/6/72, were collected in Eastern Green Island, Bay of Fundy, near Grand Manan, by J. H. Batty of New York city, who went there last summer on a collecting trip. The other, marked 25/6/72, was taken on White Horse Island, also near Grand Manan, by the same person." (*V. Egg Bk. Mus. F. and H.-B.*, p. 232).

The Geog. Range—"Atlantic coast, from Massachusetts to Baffin's Bay" (Baird.)

667. *Chroicocephalus atricilla*, Lin.—Laughing Gull.

25 eggs. "Collected by myself on a salt marsh, inside of Cobbs Island, Virginia, 31/5/71. This gull nests on drift grass in the marshes, simply hollowing out a nest in which to deposit its eggs. They breed in large numbers along the coast of Virginia, but are incessantly persecuted by the people, who take the eggs for culinary purposes. I was informed by the men that, if undisturbed, they lay 4 eggs, but I never succeeded in finding this number except in two instances. One of these sets of 4 I have sent you in the box." (*V. Egg Bk. Mus. F. and H.-B.*, p. 203).

NOTE.—As 4 is quite an abnormal number of eggs to be laid by any species of gull—3 being the usual number laid by birds of that family—I am inclined to think that in all cases where more than 3 are found, they are laid by more than one female. Many parallel instances might be recorded, such as 5 eggs being found in a Curlew's nest (I obtained one nest of 5, and I believe my friend, Mr Paterson, got another, both from the county of Sutherland), 4 being the normal number; or, a set of Merganser's and a set of Shielduck's eggs being found in the same nest, as is, I believe, not infrequent in the Long Island. J. A. H.-B.

681. *Sterna aranea*, Wils.—The Marsh Tern.

"3 eggs. Cobbs Island, 2/6/68. Nests scratched out on the sand." (*V. Egg Bk. Mus. F. and H.-B.*, p. 105).

The Geog. Range—"Coast of the United States as far north as Connecticut" (Baird).

688. *Sterna fuliginosa*, Gmel.—The Sooty Tern.

"3, collected in Florida, spring of 1872. I received them from Mr J. H. Batty, of New York, 7/1/73." (*V. Egg Bk. Mus. F. and H.-B.*, p. 274).

The Geog. Range—"Texas to Florida" (Baird).

692. *Sterna paradisea*, Brünn.—The Roseate Tern.

"3 eggs. Cobbs Island, Virginia, 2/6/68. Nests on the marshes, on the drift grass." (*V. Egg Bk. Mus. F. and H.-B.*, p. 105).

The Geog. Range—"Florida to New York" (Baird).

694. *Sterna frenata*, Gambel—The Least Tern.

"3 eggs. Cobbs Island, Virginia, 2/6/68. Nest in a hole scratched in the sand." (*V. Egg Bk. Mus. F. and H.-B.*, p. 104).

The Geog. Range—"Texas to Labrador; western rivers" (Baird).

697. *Rhynchops nigra*, Lin.—Black Skimmer.

"3 eggs, taken by myself on Cobbs Island, Virginia, 6/6/71. The two marked "8" are from the same nest. The birds were just beginning to lay when I started for home, so that I did not succeed in getting a single full set of 3 eggs. They merely scratch a hole in the sand, without any lining, and so close together, that I could often have walked some distance stepping on a nest each time." (*V. Egg Bk. Mus. F. and H.-B.*, p. 191).

The Geog. Range—"From Texas to New Jersey" (Baird).

I hope occasionally to be able to give you some further notes similar to the above. I believe they would prove useful to any person going out from this country to collect, and serve as a guide to locality, time of year when the different species are found nesting, materials of nests, and other matters of interest.

JANUARY 5TH, 1875.

Mr James Ramsay, Vice-President, in the chair.

Mr David D. McLellan was elected an ordinary member.

SPECIMENS EXHIBITED.

The Chairman exhibited a number of large galls found on a small foreign oak growing in Queen's Park, and which he was of opinion is *Quercus infectoria*, a native of Asia Minor and Northern Africa, on which the galls of commerce are found. The specimens exhibited are equal in size to those brought from the Levant, but are of a less firm texture, being internally of the consistence of cork, and containing very little gallic acid; they would seem to

be produced by a different species of *Cynips* from that which forms the Syrian galls.

Mr Peter Cameron, jun., stated that the insect which produces these galls is *Cynips lignicola*, a Continental species which was introduced into this country about sixty years ago. It does not confine itself to any particular species of oak, the galls having been found on our native tree *Quercus robur*.

Mr Donald T. Martin exhibited a small collection of Lepidoptera from Manilla, on which Mr Thomas Chapman made some remarks. He stated that some of the moths were peculiar to the Philippine Islands, but others of them, and a considerable number of the butterflies, were generally distributed in the Eastern Archipelago.

Mr James Lumsden exhibited a pair of Hen Harriers (*Circus cyaneus*), found breeding in the island of Arran in June last, and observed that instances are recorded of these birds breeding in immature plumage; but it was singular to find the pair now shown mated, the female being in adult plumage, while the male was in that of the first year, without any trace of the grey feathers of the adult bird. Dr Dewar, who had examined the specimens, confirmed Mr Lumsden's remarks.

Dr Dewar exhibited a specimen of the Glaucous Gull (*Larus glaucus*), which had been forwarded to him in the flesh by Captain Macdonald, a corresponding member of the Society. This specimen was obtained on the west coast of the Isle of Skye, where they are not frequently met with, being oftener seen on the eastern coast, from the Shetlands as far south as Northumberland, and frequenting the various firths from Cromarty to the Forth, in search of food.

Mr David Robertson, F.G.S., exhibited specimens of *Melobesia agariciformis* (Harvey), a rare alga, of which the geographical distribution is the Atlantic and Mediterranean shores of Europe. These specimens were dredged in company with the Rev. A. M. Norman, in Roundstone Bay, on the coast of Ireland, in one place only, on a soft, muddy, weedy bottom, in from two to three fathoms of water, where it was found in some abundance, but no vestige of it was seen anywhere else, three or four large well-formed plants coming up in the dredger at a time. Roundstone Bay is the habitat given by Dr Harvey for this alga in his "Phycologia Britannica," more than

twenty years ago, where he says it is got in one or two places abundantly, but locally; and that it seems to maintain its hold there, neither spreading nor diminishing.

PAPER READ.

Notes on Hymenoptera observed in Inverness-shire. By
MR PETER CAMERON, jun.

In Scotland the study of the Hymenoptera has been so much neglected that our knowledge of the distribution of the species inhabiting the country is very limited. There are, indeed, some notices scattered throughout the works of Smith and Stephens, as well as in the various magazines; but unfortunately in most cases the writers do not give the particular localities for the species they mention, so that such records are of no use for local faunistic purposes; while any districts that are specially mentioned are mainly situated south of Perthshire, the districts north of that being totally unworked. This is the more to be regretted, as it is precisely in the north of Scotland where most novelties are likely to occur; indeed, there seems no reason why the great majority of the boreal and alpine species of Scandinavia should not be met with there; and no doubt they will eventually be found, if they are only sought after.

The following small contribution to the Hymenopterous fauna of the north of Scotland is principally of interest as recording the occurrence of insects in districts hitherto unworked, as well as some species not previously mentioned as natives of Scotland; and the list of species may be at some time or other of use in furnishing materials for illustrating that highly interesting subject, the distribution of species—a branch of Natural History that is now attracting the attention which it undoubtedly deserves.

The districts that I explored were Strath Glass and Strath Affaric, Glen Urquhart, Glen Moriston, and Kintail, and also Glenelg; but as I have in another place (*Scot. Nat.*, April, 1873) given a list of the species found in the latter locality, I shall not mention it here. All the first-mentioned places are well wooded, especially Straths Glass and Affaric, where the hills are covered to their summits with birch, intermixed with pines, a covering which, with the varied outlines of the mountains, forms a scene indescribably charming. From the end of Glen Moriston to

Kintail again, we have quite another form of scenery—for the country is free from trees; the hills being, as a rule, bare and rugged, but covered with grass even to the tops. The weather, however, when I was there, was by no means favourable for collecting, and thus my list is smaller than it would have been if the weather had been better.

Of the Tenthredinidae *Cimbex sylvarum* was found in Strath Affaric; *Trichiosoma vitellinæ* and *lucorum* were not rare in most of the birch woods; and *T. sorbi* rare in Strath Glass. *Abia sericea* not uncommon wherever its food-plant, *Scabiosa succisa*, abounded. A variety of *Hylotoma ustulata*, having the tarsi black, occurred at Strath Glass. *Cladius difformis* and *C. padi*, in the same place, and also in Kintail, on *Rosa canina*, which is the food-plant for both species. *Hemichroa rufa*, one specimen near Beaully; *H. luridiventris*, found everywhere on alder. *Nematus Degeeri*, abundant in the birch woods in Straths Glass and Affaric; *N. stilatus*, one or two examples on rowan in Glen Moriston; *N. testaceipes*—the variety with the abdomen beneath testaceous—in Kintail; *N. septentrionalis* and *N. varus*, a specimen of each, beaten out of the same alder bush in Kintail; *N. ruficornis*, Ol. (*var. fraxini*, Hart.), and *N. alnivorus* (see Ent. Mo. Mag., xi., 107), in Glen Moriston; *N. conductus*, Ruthe; *N. obductus*, Htg.; *N. Kirbyi*, Dbm., common among grass in all the places visited; *N. histrio*, Lep., bred from larvae found feeding on *Salix aurita*, in Kintail. These Kintail specimens are only about half the size of the form I have bred from larvae got near Glasgow; they agree, however, in coloration, except in being darker, and the apex of the abdomen is, if anything, more acute. *N. abdominalis*, Fall., in Glen Moriston; *N. luteus* and (‡) *N. acuminatus*, Thoms., in Glen Moriston and Kintail. I am not sure about the last-mentioned form; it agrees tolerably well with Thomson's description of his *acuminatus*, but it has not the breast black; from the normal Scotch form of *luteus* it differs, in its smaller size, in the dorsal surface of the abdomen being black, and in the apex being much more acute. From its occurring in company with the type, it is obvious that it is not a local race; and, if it be a variety of *luteus*, it is certainly very interesting to find such a well-marked sub-species (‡) subsisting in close proximity with what must be regarded as the parent form. As it scarcely agrees with any of Thomson's varieties of *acuminatus*, I propose to call the present

race *dorsatus*.* *N. ribesii*, the gooseberry pest, was noticed near Beauly; *N. papillosus*, common; *N. croceus*, rare in Kintail; *N. miliaris*, abundant everywhere; *N. pallescens*, Htg., several specimens found near the end of Glen Moriston. The latter species might pass for a small immaculate specimen of *N. croceus*, but it is undoubtedly distinct from it.† *N. cinerea*, Retz. (including several varieties, one or two of which may rank as species); *N. vallisnerii*, and *N. (Cryptocampus) saliceti*, Fall., were all common on willows in Glen Moriston and Kintail.

Poecilosoma pulveratum, on alder; *P. excisum*, Thoms., and *P. submuticum*, Thoms., were common throughout. The species of *Blennocampa* met with were: *nana*, *luteiventris*, *cinereipes*, *betuleti*, *albipes*, *aethiops*, Kl., and *pusilla*; of *Eriocampa*: *ovata*, in Strath Glass; *annulipes*, in Kintail; and a new species, *E. testaceipes*, Cameron (Ent. Mo. Mag., xi., 128), near Beauly. *Athalia rosae* was very common everywhere. *Fenusa pumila* was captured in Kintail. The only species of *Emphytus* met with were *cinctus* and *tener*, Fall. *Taxonus equiseti* was found in Kintail—not the typical form, but the variety which I described in the Ent. Mo. Mag. for Nov., 1874, xi., p. 129. *Selandria morio*, *S. stramineipes*, and *S. serva*, were common everywhere; *S. grandis*, Zaddach, rare in Kintail. *Strongylogaster cingulatus*, *S. mixtus*, and *S. delicatulus*, among ferns, in Kintail. *Pachyprotasis rapae* and *simulans*, common throughout; and a single example of *P. variegata* was found in Glen Urquhart and Kintail. The only *Allantus* noticed was the

* Having reared this insect since the above was written, I have been able to prove that it is a distinct species = *N. dorsatus*, *mihi*. This shows very clearly how necessary it is, for the proper understanding of species, that we should know them in their early life—not merely contenting ourselves with an examination of the natural form.

† As the larva of *Nematus pallescens* has not been described, I give here a description of it.

Head roundish, of a translucent whitish grey colour, and covered with longish white hair; the eyes black, mouth brown, tips of the mandibles black. Feet white, with the claws faintly brownish; claspers white; a line of black dots over the feet and claspers. Upper part of the body whitish, assuming a greenish tinge when the food canal is filled; the lower half of the body is whiter than the upper; and the skin is covered with tubercles, each ending in a hair. The body is rather flat. The larva feeds on *Salix cinerea*, and in confinement pupates between the leaves.

N. pallescens is probably identical with *N. testaceus*, Dbm., and perhaps also with *N. testaceus*, Ste., and *N. flavescens*, Ste.

common *A. nothus*. *Perineura nassata*, Thoms.; *P. sordida*, Thoms.; and *P. excisa*, Thoms., were all more or less common. Of *Tenthredo* I captured *lateralis*, *aucupariæ*, *scalaris*, *punctulata*, *mesomela*, *atra*, *L.* (var. *dispar*, Klug), *olivacea*, *livida*, *balteata*, and *rufiventris*, in all the glens; and *T. velox* in Kintail. A variety of *T. olivacea* occurred, which wanted entirely the black dorsal stripe. *Dolerus* was represented by *niger*, *anticus*, *eglanteriæ*, *gonager*, *vestigialis*, *palustris*, *aeneus*, and *gibbosus*. On Scur Ouran, in Kintail, I observed *D. gibbosus* flying about at an elevation of about 3000 feet. The only *Lyda* noticed was *L. depressa*, which was met with at the entrance of Strath Glass.

Of the Gall-making Cynipidæ I noticed that the galls of *Spathogaster biccarum*, *Andricus curvator*, *A. inflator*, and *Dryoteras terminale*, were not uncommon wherever oaks abounded. *Andricus amenti* and *A. quadrilineatus*, on oak-catkins in Strath Glass; and in the same locality *A. ramuli* was very common in some quarters. All these are well known as Scotch species; but I also got at Inver-Moriston, on the banks of Loch Ness, the very peculiar pedunculated galls of *Aphilothrix callidoma*, Htg., which is an interesting addition to the Scotch list. Unfortunately all were too young, so that I could not rear the upheavers. They were got about the middle of June; on the Continent they are found from July to the end of October.

I was rather too early in the season for the Figitidæ, or parasitic Cynipidæ, and my captures of these were very few. They are: *Ægilips*, two species apparently undescribed; but one may be *Ægilips armatus*, Giraud (Énumération des Figitides de l'Autriche, p. 173); *Anacharis eucharoides*, Dalm.; and *A. typica*, Walker; *Melanips opacus*, Htg.; and several species of *Eucoila*, all from the neighbourhood of Beauly.

The *Aculeata* were very scarce, probably owing to the stormy east wind which prevailed, keeping them well under shelter.

The commonest ant was undoubtedly *Formica rufa*. It was very abundant in Strath Glass and Strath Affaric; was my constant companion through Glen Urquhart, and along the shores of Loch Ness to the end of Glen Moriston, where wood ceasing, the country became unfit for its way of life. It reappeared again in the woods on the banks of Loch Hourn. *Formica fusca* and *Lasius niger* were found in Strath Glass and Kintail; *Formica flava*, seemingly rare in Kintail; *Myrmica ruginodis* was common every-

where ; and *Leptothorax acervorum* occurred under bark in Strath Glass and Kintail. In the latter locality an almost black variety of the worker of the last-mentioned species was found. The *Vespidæ* observed were: *Vespa vulgaris*, *V. rufa*, and *V. germanica*. Of the Sand wasps, *Crabro varius*, *C. dimidiatus*, and *Nysson spinosus* were obtained in Kintail ; and a male of *Pompilus niger* was taken on a moor at Loch Duich.

The following Bees were captured at and about Glen Shiel : *Bombus muscorum*, *B. lucorum*, *B. hortorum*, and *B. schrimshiranus* ; *Nomada ruficornis*, *N. flavo-guttata* ; *Andrena xanthura*, common, *A. minutula*, *A. albicrux*, *A. fulvicrux*, *A. albicans* ; *Halictus abdominalis*, *H. rubicundus*, and *H. morio*.

Probably my best captures will be in the Ichneumonidæ and Chalcididæ ; but the species have not as yet been examined.

23D JANUARY, 1875.

Mr James Ramsay, Vice-President, in the chair.

Messrs John Robb and John H. M'Farlane were elected ordinary members.

SPECIMENS EXHIBITED.

Mr James Coutts exhibited, with remarks, a small collection of Carboniferous fossils from the limestone shales at Brankumhall quarries, East Kilbride. The collection embraced various genera, some of the species corresponding with those figured by the Rev. David Ure, in his History of Rutherglen and East Kilbride. This is the same locality from which he obtained his specimens, and which is called by him Laurieston.

Mr John Young, F.G.S., in a few remarks, explained the position of the limestone strata at East Kilbride, and pointed out the geographical range of the beds in the West of Scotland.

Mr Coutts also exhibited specimens of plant remains from Glenarbuck, near Bowling, where they occur in beds of impure coal interstratified among the traps of the Kilpatrick hills. Apparently they are portions of *Sigillaria* and *Stigmaria*, and, being in a fine state of preservation, show the woody structure very distinctly, carbonate of lime having been infiltrated into the cells.

Mr Thomas Chapman exhibited the compound cocoon of *Anaphe reticulata* from Old Calabar, and remarked that this cocoon is formed by a family of moths that are gregarious, and that feed and spin in common, the specimen now shown being the result of their united efforts. In external appearance it resembles a brown sponge, and is about the size of a cocoa-nut compressed. It differs from any compound cocoons found in this country in having under the outward silky covering a tough envelope of the consistency of parchment, which encloses the interior cocoons, and being impervious to wet, must furnish a complete protection to the inmates. Mr Chapman also showed a number of moths from the same cocoon, which had emerged in Glasgow. It had unfortunately been cut open after its arrival in this country, or many more specimens might have been obtained, a considerable number of the insects having died in consequence of the exposure.

PAPERS READ.

I.—*On the habits of Nematus femoralis* (Zaddach). By
Mr PETER CAMERON, jun.

If we compare the larvæ of the gall-making Saw-flies with each other, we will find that they divide themselves into two groups: those composing the first group remaining of a white colour during all their larval life; while those belonging to the second division are only white till they cease feeding, when they moult, and the white colour gives place to slate or orange. The galls, again, are divisible into three classes. First, those formed of enlarged twigs—*e.g.*, *Nematus saliceti*, Fall.; second, of round, pea-shaped galls, attached only by a small point to the under side of the leaf, and usually of a green colour, with reddish cheeks—*e.g.*, *Nematus cinereæ*; and, third, of flat, bean-shaped galls, attached by their whole surface to the leaf-blades—*e.g.*, *Nematus Vallisnieri*.

A good number of gall-making Tenthredinidæ have been described; but the subject is still involved in considerable obscurity, and the proper discrimination of the species is very difficult. It is not easy to fix upon characters that do not vary; and the difficulty is increased by the fact that the larvæ of even every different and distinct species closely resemble one another, so that comparatively little confidence can be placed in this usually good means of separating closely allied forms. Nor do the galls afford very reliable specific characters; for the same insect does

not always affect the same species of willow; and it is obvious that a gall on a hairy-leaved willow, like *Salix aurita*, must be different from one on a plant like *Salix purpurea*; in the former case it will be white and hairy; in the latter, smooth, bright green, and mottled with red. Such being the case, it is apparent that before the species can be satisfactorily elucidated, we must have full information regarding the galls and larvæ, as well as the perfect insects, from all parts of the country.

I am now able to add a well-marked gall-making Saw-fly to the British list. I found the galls while at Rannoch, in June, 1872; and in the following spring succeeded in rearing a good series of the imagines. I could not identify it with any of the described species; but, to make certain, I forwarded some specimens to Dr van Vollenhoven, who, with his usual kindness, informed me that the insect was perhaps *Nematus proximus*, Lep. (Mon. Tenth., 67, 201); but as the description was rather ambiguous, he could not be certain regarding it. Stephens having described *N. proximus* (Brit. Ent., vii., 36, 40), I then sent the Rannoch species to Mr Fred. Smith, to be compared with the Stephensian types in the British Museum. This Mr Smith did, with the result that Stephens' insect proved to be quite another species. The description of *N. proximus* being so vague, I thought it better to consider the present species as undescribed, and accordingly attached a name to it. Last month, however, I wrote to Professor Zaddach of Königsberg, concerning it; and he tells me that it has been long known to him, and in his collection is placed under the name of *Nematus femoralis*, but is not as yet described. In these circumstances I have adopted the name of the German Professor; and have drawn up the following description of the Saw-fly and its habits, so as to enable the British student to recognise it.

The larvæ live solitary in galls, on a species of *Salix*. What is the species of willow upon which I found them, is a little uncertain; but my friend Mr Richard M'Kay thinks that it is probably *Salix laurina*. Near Danzig Herr Brischke finds them on *S. purpurea* (teste Zaddach, *in lit.*) The galls are usually in pairs on the leaf, placed opposite to and nearly always touching each other. They project to some extent above the upper, but not at all from the lower side of the leaf. In form they are usually

roundish or oval ; and the colour is dark purple, or very dark pink above, and green underneath. When very young they are of a uniform green colour. I had no means of observing how or when the eggs are deposited ; but from analogy it seems probable that the female lays them when the leaves are bursting out ; and this conclusion is also justified by my finding, on very young leaves, galls in progress of development.

The habits of the larva are identical with those of the familiar *N. Vallisnieri* ; but, unlike the larva of that insect, it does not make a hole on the underside of the gall at one end, for the expulsion of the "frass." It devours the gall very closely ; and when it has become full fed, its habitation is reduced to a mere thin bladder, all but the skin having been devoured. I noticed on some of the leaves galls which had every appearance of being composed of two galls amalgamated, but only one larva could be found. It was also interesting to notice that often on the same leaf two galls would be found, in one of which the larva would be far more advanced in its development than its neighbour ; yet the eggs must have been laid at the same time. In one instance a larva was still in the egg, whilst the other was in the commencement of the second moult.

When full fed the larva has the head of a white colour, more or less marked with fuscous above ; the eyes are placed in brown spots ; the mouth brown. The feet are greenish white ; and over the first six there is a black band over each ; and they have also their claws black. When the creature is feeding the dorsal vessel is green ; the rest of the body is of a dirty white colour, slightly tinged with green, and covered with a few hairs. The body tapers toward the end ; the segments project much at the sides. The abdominal feet are invisible from above, and, to a certain extent, laterally, by being hid by the overhanging folds of the body. The colour of the head is subject to some variation in the amount of fuscous with which it is marked.

From the above description it is at once evident that the similarity of the larva of *femoralis* with that of *Vallisnieri* is very close indeed.

As already remarked the galls were found in June ; and by the middle of July all the specimens I brought home had spun their cocoons ; and this appears to be the usual habit, for I visited the locality in which they were first discovered last year, on the 18th

July, and not one larva could be seen. It has, however, yet to be observed whether there may not be two broods in a year, though certainly with me the flies did not make their appearance till the following March; and this fact rather militates against the supposition of the species producing a double brood in a year.

The cocoons are somewhat larger than those of *N. Vallisnieri*, and the colour is rather darker.

The larvæ changed to pupæ in March; and in about fourteen days after the flies emerged. The pupa is greenish-white, with the antennæ, feet, and wings, white.

In February I noticed in the bottle where the cocoons were kept, a number of small white grubs, which at the time I did not examine particularly, believing them to pertain to the Ichneumonidæ or Chalcididæ. In a short time they changed to pupæ, and it was then observed that they were not Hymenopterous, but Dipterous insects. Their history seems to be as follows:—

The Dipterous is an internal parasite of the Saw-fly larva; the latter retains sufficient vitality to spin its cocoon, inside of which the fly-larva completes the destruction of its victim. In February it quits the cocoon, a proceeding rendered necessary by the mouth organs of the fly not being sufficiently strong to cut through the cocoon. In the earth it changes to a pupa. When I described one of these it had the thorax fuscous and shining; the abdomen white, but with a tinge of green; the antennæ, wings, and feet, black; but probably at an earlier stage their colour was white. The limbs are laid along the sides of the breast, the feet crossing over the abdomen. The pupa is enveloped in a thin pellicle, which retains its shape after the fly has left it.

The larva quits the cocoon by a rough, irregular hole, made in the side; and, from finding more than one hole in some of the cocoons, it seems probable that two or three of the Diptera are sometimes parasitic on one Saw-fly larva. Nearly a third of my cocoons were infested with these parasites.

Mr G. H. Verrall tells me that the fly is a *Sciara*, probably *S. humeralis*, Zett.; or *confinis*, Winn. I am also indebted to Mr Verrall for the information that no species of the genus has been noted as a parasite hitherto; but one species (*S. pulicaria*, Mg.) has been reared from rotten galls on *Salix pentandra*; and another species (*S. tilicola*, Lw.) is a true gall-maker.

The female Saw-fly has the antennæ a little shorter than the

thorax and abdomen; the third and fourth joints are nearly, if not quite equal in length; and the third joint is slightly curved. The head is very shining, slightly punctured, and black; the clypeus partly, and the labrum very dark testaceous—in some specimens almost black. The thorax is black and shining; the tegulæ and the apical angles of the pronotum white testaceous; the cenchri large, dull-white. The head and thorax are covered with a very short down; the abdomen is deep black; the apex being almost mucronate and pilose; the cerci long and pall testaceous; in some individuals the ventral surface of the abdomen is testaceous in the middle, in others quite black. The feet are pale testaceous; the femora, except at the base and apex, and the posterior tarsi, black; the anterior tarsi are also a little fuscous. The wings are hyaline; the costa and stigma, white testaceous; the latter having the apical half fuscous. The third sub-marginal cell is square, or nearly so.

The male differs from the female in having the antennæ longer, thicker, and more pilose, and they are also paler beneath. Moreover, it appears to have the coxæ and trochanters black; the anal segment is testaceous. I have not noticed any varieties beyond slight differences in the colour of the mouth and legs. Length, $1\frac{3}{4}$ to 2 lines.

Nematus femoralis comes nearest to *N. Vallisnieri*, Htg., and may be known from it by having the femora almost entirely black, and by the somewhat longer and thinner antennæ. *Nematus crassispinus*, Thoms.; and *N. dolichurus*, Thoms., are also closely allied species; but both may be known from *femoralis* by their totally white stigmas.

NOTE.—Since writing the above I have again visited Rannoch (17th July, 1875), and found the galls pretty commonly; but they contained very few larvæ. Many were tenanted by *Tortrix* larvæ, which fed upon the substance of the galls; and I likewise observed in them the larva of a beetle (? *Balaninus*); I also bred a *Pimpla* from the galls of *femoralis* which Mr Binnie brought me from Braemar.

On the same willow bushes on which I found *N. femoralis*, I got another and very different gall, of a pale-green colour. It was of about the size of a hazel nut, oval, or irregularly roundish in shape, the walls very thin, and the space inside consequently rather large.

What may be the name of the Saw-fly which produces it I cannot say for certain till the fly appears. The larva becomes slate-coloured when it has reached its third moult.

II.—*On the British species of the genus Cræsus.* By the same Author.

The genus *Cræsus* was founded by Leach in volume iii., p. 129, of his Zoological Miscellany, on the *Tenthredo septentrionalis* of Linné. The principal mark of distinction between it and *Nematus* lies in the hinder tibiæ and the first tarsal joint being greatly enlarged and compressed. Otherwise it agrees perfectly with *Nematus*; and even some typical species of the latter genus have the hinder tibiæ dilated, though perhaps not to so great an extent. The majority of systematists have therefore considered it to be merely a section of *Nematus*. The species composing it are very like in coloration, the abdomen broadly banded with red, and the feet variegated with red, black, and white. Further, the larvæ exhibit a striking peculiarity, namely, in possessing seven glands on the under side of the abdomen, between the claspers, and which glands they are able to protrude at will. Their use is clearly to frighten away ichneumons and other enemies. The larva feeds quite exposed and conspicuously on the edge of the leaf; and whenever anything approaches the body is flung about in all directions, often over the head, thus exposing the abdominal ducts, which are freely protruded. But even with this protection they do not escape from parasites.

Four species have been described, namely; *C. septentrionalis*, by Linné; and *latipes*, *laticrux*, and *varus*, by Folques de Villaret. Of these Stephens describes, in his "Illustrations of British Entomology," vol. vii., pp. 38 and 39, *septentrionalis*, *varus*, and *laticrux*; but he seems to have been in doubt regarding *varus*; and Mr F. Smith, in his "Nomenclator of Hymenoptera," only records the first mentioned; so that it looks either that Stephens had not the proper insects, or, if he had, that Mr Smith himself regards them all as varieties of *septentrionalis*. For my own part, I can only look upon *laticrux* as a variety of *septentrionalis*; and I have a specimen that agrees very closely with its description; but we now know from the discovery of the larvæ of *varus* and *latipes* that those two are good species; and I have, moreover, good evidence that *latipes*, which Stephens does not mention, is a British insect.

Nematus septentrionalis having been described in English works (see *Zoologist*, s.s. 8175, 1862, for van Vollenhoven's life history; and *Ent. Mag.*, i., pl. 1, f. 5, for figure of larva), I need not enter into its history here, beyond remarking that it is the commonest species, and that the larva feeds on alder, birch, hazel, poplar, and, according to Stephens (*loc. cit.*), gooseberry. The larvæ frequently occur in such numbers as to strip the trees almost completely of their leaves.

Nematus varus is not uncommon both in England and Scotland. It may be known from *septentrionalis* by its smaller size, the red femora, and by the wings wanting the smoky blotch. As the larva has not been described in any English work, I now give a description of it here.

The head is rather small, and covered with microscopic hairs; the colour is pale grayish-green, a brownish spot is on the face, and above this splash is a small black dot; the vertex is dotted with minute fuscous points; the eyes black. The feet are longish, green, with brown claws—a somewhat triangular mark is over each; the claspers are glassy green. The body is long and cylindrical, tapering a little towards the anal end, the colour bright green throughout; the last segment a little paler, and with a faint brown mark over the top. On the middle of the sides there is a row of black dots, placed rather wide apart, and ending on the twelfth segment. Below this row there is another line of smaller black dots; and directly over each of the feet there are two or three little black marks. Near the head the superior row is placed higher up. So far as I am aware the larva feeds only on alder; the pupa I have not observed.

In the autumn of 1872 I received from a correspondent in Lancashire a *Cræsus* larva which was new to me. Unfortunately it died; but I still possess, preserved in spirits, the only specimen I received. However, on comparing it with van Vollenhoven's fig. and description of *Nematus latipes* (*Tidj. voor Ent.*, 2^e serie, Deel. ii., Bl. 174-7, pl. 8), I at once recognised it as identical with the one I got from Lancashire: the black colour of the body, the yellowish legs, and the abdominal glands, leaving no room for doubt. I have never seen a specimen of the imago, nor am I aware of its having been reported for Britain; but still I think that it may now be added with safety to our lists.

The following is a description of the larva:—

Head and body deep black, the former covered with short down. Feet and claspers shining yellow; the claws are brown, and the feet are a little spotted with the same colour. The length is about 10 lines; the food-plant birch.

III.—*On Niptus hololeucus* (Fald). By the same Author.

In looking over my duplicate insect boxes not long ago, I found that in one of them considerable damage had been done to the specimens by some insect; and a search soon showed that the culprit was a beetle larva, which I determined to breed, in order to find out to what species it belonged. In this I was successful; and the insect turned out to be *Niptus hololeucus*, a beetle which appears to be only found in houses, and that often does considerable damage. In the *Zoologist* for 1862, p. 8218, it is recorded to have occurred in great numbers in a grocer's shop, infesting the beds and furniture, and devouring the clothes of the residents; and in the *Ent. Mo. Mag.* for October, 1872, there is a note stating that it over-ran a house to such an extent as to be a perfect pest. It, according to the inhabitants, ate flannel, cloth, etc., and they frequently swept it from the floor in hundreds.

The larva is a soft, fleshy, cylindrical grub, with a hairy body. The mandibles are black, or brownish-black, and above them is a large brown spot, of a lighter tint. It walks very slowly, with the body curled; and it seems to use the large anal segment in walking; and it can also hold on by it. In the two notes I have mentioned above there is nothing said about the larva, and the damage done is attributed to the perfect beetle.

2D MARCH, 1875.

Professor John Young, M.D., F.G.S., President, in the chair.

The Chairman called attention to the appointment of Captain H. W. Feilden, a corresponding member of the Society, as one of the naturalists to the new Arctic expedition, and stated that Capt. Feilden's high recommendations from eminent scientific men, and his knowledge of Zoology and other branches of natural history, thoroughly fitted him for this honourable and important post. Captain Feilden had frequently contributed papers to the Society's

Proceedings, and it must be highly gratifying to the members to find one of their correspondents selected to fill such an eminent position.

SPECIMENS EXHIBITED.

Mr Thomas Chapman exhibited specimens of several rare Lepidoptera from north-east Australia, on which he made the following remarks:—*Papilio Ulysses*, the most brilliant of these, has been long known, and was first named by Linnaeus. Most of the specimens in European collections have been sent from Amboyna by the Dutch, but that now shown was taken at Cape York, the most northern part of Queensland. The several specimens of *Mynes Geoffroyi* (which is very rare) and *Delias mysus* show sexual differences, and neither of them has been received before. Both species are from North Queensland. *Heteronympha mirifica*, of which only one specimen has been received, is the rarest species of all. It was first mentioned in the "Annals of Natural History" in 1867, and the last notice of it states that the British Museum possesses only half a specimen. *Nyctabenion orontes* is a day-flying moth, also from Cape York, which has hitherto only been received from Amboyna.

Mr James Lumsden exhibited a partial albino of the Common Woodcock (*Scolopax rusticola*), which had been shot at Ardlamont, Argyllshire, last month, and forwarded by Mr Allan Gilmour.

Mr Peter Cameron, jun., exhibited *Trichiosoma sorbi*, Htg., a saw-fly new to the British lists. It was described by Hartig in the Stett. Ent. Zeits., i., 20, 1840; and subsequently its transformations were described by Ratzburg (Forst-insekten, iii., 136), and by Zaddach (Blatt. u. Holzwespen, p. 263, pl. ii., figs. 8, 9, 10). The larva feeds, as the specific name denotes, on *Sorbus aucuparia*. It is of a yellowish-green colour, with the skin beset with white warts; the head is ochre-yellow, with a reddish-brown mark on each side of the vertex; and the spiracles are clear red. Although the rarest of the European *Trichiosomæ*, it seems to be widely distributed in the Highlands, having been taken by Mr Cameron in Strath Glass and Glen Lyon; and the larvæ had been forwarded to him from Braemar, by Dr Buchanan White.

Mr Cameron at the same time described the transformations of the other British species of *Trichiosoma*. These are:—*T. betuleti*, Kl., the larva of which feeds on hawthorn; *T. lucorum*, L., which

is attached to birch; and *T. vitellinae*, which feeds on willows and birch. The species very closely resemble one another, and it is only by breeding them that a proper knowledge of their distinctive characters can be obtained. Mr Cameron then exhibited:

Nomada mistura, Smith.—Four females of this bee have been taken at Cadder wilderness and at Strathblane. Previously, the male only had been recorded, and the capture of the female renders it clear that it cannot be *Nomada xanthosticta*, as was suspected by some who had only met with the male.

Pterocormus means, Gr.—A large series of this ichneumon was shown, having the wings in various stages of development, a few having the wings almost obliterated, while others had them completely developed, and the latter agreed perfectly with the description of *Ichneumon crassipes*, Lin.; so it is evident that *P. means* is merely a form of *I. crassipes* with abbreviated wings.

Dineura selandriiformis, Cameron.—A new species, taken by the Rev. T. A. Marshall, at St. Albans. (See Ent. Mo. Mag., xi., 252).

Dineura fuscula, Klug.—This species has been recorded as British by Stephens, but in error; and it having been taken in Cadder wilderness, it may now be added with certainty to our lists.

Nematus striatus, Hart.—An account of the life-history of this species was given. It is met with at Possil marsh, the larva feeding on *Salix fusca*. In connection with it there was shown the *Nematus humeralis* of Zetterstedt, which Mr Cameron had received from Mr Fletcher of Worcester; and it appears certain that it can only be an almost black variety of *striatus*.

And lastly, there was shown a variety of *Tenthredo moniliata*, from Aberlady, with 4 of the abdominal segments red, instead of 3 as is usual; and another specimen was exhibited, from Rannoch, without any red on the abdomen.

PAPERS READ.

I.—*On some new or little known British Hymenoptera.*

By Mr PETER CAMERON, jun.

On a more careful examination of the saw fly bred from galls on the leaves of *Salix herbacea*, which I exhibited at the last meeting of the Society, and having now both sexes before me, I have been enabled to come to the conclusion that the species cannot be referred with certainty to any of the described *Nemati*.

The galls have been found before in Britain. By the late Mr Armstead, they are stated to occur commonly at Allonby, Cumberland, on willows growing among the cranberries; and by Mr Inchbald they were got in the same county, as well as on Ben Ledi; but neither the larva nor the imago has been described by the discoverers. The species has been referred by Mr Edward Newman to his *Euura cynips*; a statement which is disproved by the fact, that the insect is not an *Euura* (which is, I suppose, identical with *Cryptocampus*, Hartig); and, besides, the description of *E. cynips* is so vague that it will apply to more than one species, and therefore must be simply ignored.

By myself the galls have been found on Ben Lawers and on "Garyvel," Rannoch. Dr Buchanan White told me that he had noticed them on the Braemar mountains; and Mr James R. Watson got them on Ben Laoghal, Sutherlandshire. It is thus seen to be widely distributed throughout the country; but it is very local in its habits, showing a partiality for particular spots on a mountain, and not spread generally over it. Probably, also, it varies in numbers during particular years; for this year I could find none in places where on previous years the galls were very common. The lowest elevation at which I have found them would be about 2000 feet; and from that height they extend to near 3800 feet, if not higher. Very young galls, containing eggs, I have noticed at the end of June; but they are most abundant from the middle of July to the middle of August.

The gall might readily be mistaken for a berry of some kind, being shaped like one: roundish, sometimes oval or oblong, of a green colour, often more or less marked with red. Each contains one larva; and, as a rule, there is but one gall on a leaf. Many of the galls will be observed studded over with small yellowish tubercle-like bodies; these are fungi, which are found on most of the smooth, hairless, pea-shaped saw-fly galls, no matter at what elevation they may be situated.

The larva has the head fuscous, somewhat darker in front; the eyes are deep black; the mouth is also black. The feet are dark greenish-white, with darker claws; the fourteen claspers are of the same colour. Over each claw there is a small black mark; there is a large (comparatively), irregular mark over each foot and clasper, except the first pair. The body is of a fuscous-white colour throughout; the contents of the food-canal give to the

back a darker tint; and the skin is covered with numerous small black or fuscous-black dots, arranged in rows. In all there are five rows of these dots, arranged as follows:—One row on the centre of the back, the dots composing it being of a nearly uniform size, as well as more numerous; in the second row the dots are fewer, there being about three to each segment of the body; the following row has two dots to a segment, one large, the other small; the next is composed of one long dot; and the last row is made up of the above-mentioned small marks over the feet. On the second segment the two first dots are of an irregular shape, and larger than any of the others; and a little below and in front of them are two smaller dots. The last segment is clear from marks. The length of the larva is about five lines.

This is the only gall-making saw-fly larva that I have seen bearing marks of any kind on the body; all the larvæ of the other known species being of a uniform colour. Unfortunately, all my specimens spun up before I could notice whether they changed colour at the last moult or not. I have a very vague remembrance that they then became of a slate colour, like those of *N. cinereæ*; but further observation is necessary to decide this point.

In their general habits the larvæ do not differ from the other species. The cocoon was spun in the earth, or inside the gall itself. It is of the same size as that of *N. Vallisneri*, and of a like colour. The majority of the larvæ I had spun up by the middle of August; and from these the flies were developed in the following February.

The pupa is white.

The imago may be characterised thus:—

NEMATUS HERBACEÆ, *sp. n.*

N. niger, nitidis, ore, genubus late, tibiis, tarsisque sordide testaceis; ano, costa, stigmatè, tegulisque pallidis; alis hyalinis; cercis breviusculis.

Long. $1\frac{1}{2}$ — $1\frac{3}{4}$ *lin.*

Female: Antennæ shorter than the body, moderately stout, with a lens seen to be covered with a close microscopic pile; two basal joints prominent; the third and fourth joints almost equal in length. Head black, shining; the vertex faintly punctured; the frontal sutures distinct; the surface covered with a short pile;

mouth obscure testaceous, covered with a longer pile than the rest of the head; tips of mandibles black. Thorax black, shining; mesonotum obscurely punctured, and covered with a microscopic pile; breast smooth and shining. Tegulæ whitish; abdomen black; the surface covered with a microscopic brown; apex angustate, pilose; anus pale white, pilose; sheath of the saw largely projecting and pilose. Feet stout; femora stout, for the greater part black; their apical third, knees, tibiæ, and tarsi, sordid testaceous; coxæ and trochanters paler than the femora; tips of tarsi fuscous; posterior tarsi apparently equal in length to the tibiæ. Wings clear hyaline; costa and stigma sordid white; nervures black; second recurrent nervure received a short distance in front of the second submarginal.

The male has the antennæ thicker and longer than in the other sex, with the stigma slightly darker; the anus pale; otherwise it agrees with the female, *mutatis mutandis*.

Judging from the descriptions, this species comes nearest to *N. dolichurus* and *N. crassispinus*, Thoms., both of which are only known to me from the descriptions. It cannot be the former, as the cerci are not long; and from the latter species it differs in having the anus pale-white; for the rest it agrees well enough with the description of *N. crassispinus* (except that the posterior calcaria can scarcely be called "subcurvatis"); yet, as we have no information regarding the early stages of the last mentioned species, nor authentic types for comparison, I think it better to regard *N. herbaceæ* as distinct from it.

It may be easily known from *N. femoralis* (*ante*, p. 295), by its black pronotum and unicolorous stigma; and the latter peculiarity serves also to distinguish it from *N. Vallisneri*.

The Rev. A. E. Eaton sent me for examination a number of a saw-fly which he took on stunted willows in Spitsbergen. All the specimens are males, and have a very close resemblance to *N. herbaceæ*, but the colour of the legs and of the mouth is much darker, and the posterior tibiæ are longer than the tarsi. The difference in coloration is not, of course, of much importance, but the other difference, combined with darker coloured wings, and a dissimilarity in the alar neuration, seems to show that they pertain to another species. They may be either *N. dolichurus* or *N. crassispinus*. Without types of these two species, I do not see how the Spitzbergen insects are to be identified.



NEMATUS LEUCOSTIGMUS, *sp. n.*

N. niger, nitidus, fronte punctatula, facie inferne orbitaque oculorum pallide testaceis; tegulis, pronoti lateribus, costu, stigmatē, pedibusque albidis; femoribus fere totis, tarsis posticis tibiārumque apice nigris; alis hyalinis; nervo 2° recurrente fere interstitiali; terebra longa.

Long. 2 lin.

Female—Head black; vertex punctured; the face (including the portion between the antennæ) and the orbits of the eyes broadly testaceous, the face being paler, almost white; antennæ black, almost bare, a little shorter than the body. Thorax black, shining, pronotum edged with white; tegulæ white. Abdomen a very little shorter than the head and thorax, black, the apex blunt, sub-truncated, terebra projecting considerably; cerci pale. Wings clear hyaline; costa and stigma white; 1st sub-marginal nervure very faint; 2d almost (if not quite) joined to the 2d recurrent; 2d sub-marginal cellule large; 3d small, a little less than a quarter of its length longer than broad; its apex slightly widened. Legs thickish, white; the coxæ at base, the femora, except at the base and apex, the posterior tarsi and the apex of posterior tibiæ, largely black; anterior tarsi fuscous; posterior calcaria white.

The male I do not know.

The above described species belongs apparently to the *Abietum* group. I have carefully compared it with all the descriptions I can find, and with none of them can I make it quadrate, so am obliged to consider it undescribed. It was taken by myself at Rannoch, in June.

It is very like *N. Sharpi*, Cameron, but that species has a thicker body; more sharply pointed abdomen; feet testaceous rather than white, and quite devoid of black (but from analogy I should think that specimens of *N. Sharpi* will yet be found with the femora marked with black); and the antennæ are undoubtedly brown underneath.

NEMATUS FURVESCENS, *sp. n.*

N. nididus, niger, fronte punctatula, antennis breviusculis, filiformibus; facie inferne, pronoto, pedibusque albo testaceis; femoribus linea supra, vel infra; tarsis posticis tibiārumque apice nigris; alis apice lenissime fumatis; stigmatē testaceo. Sic femina. Long. 2-2¼ lin.

Female—Head much narrower than the thorax, shining,

punctured, black; the face from below the antennæ whitish-testaceous; orbits of the eyes slightly surrounded with testaceous. Antennæ bare, black, thin, decreasing very perceptibly in breadth towards the apex; the 3d joint apparently longer than the 4th; in length they are decidedly longer than half of the body, if not longer than the abdomen. Thorax black, shining; mesonotum very finely punctured, half shining; cenchri scarcely visible; pronotum pale testaceous. Abdomen black, broader at the base than the thorax; the apex bluntly pointed, pilose; saw scarcely projecting; the external part surrounding it testaceous, and the posterior part of the ventral surface of the same colour. Feet white, with a testaceous tinge; femora marked with a broad black line above, beneath with a black or fuscous line; posterior tarsi and apex of tibiæ dark fuscous, almost black, the base of the tarsi being palest; posterior tarsi equal to, if not a little longer than, the tibiæ. Wings scarcely hyaline, having a fuscous yellowish tinge, especially at the apex; costa and stigma testaceous; 1st sub-marginal nervure very faint; 2d recurrent nervure received a little bit in front of the 2d sub-marginal; 2d sub-costal cellule with a dot in the centre; 3d small, nearly square.

The male is smaller, with the antennæ slightly thicker; the orbits of the eyes are broader marked with testaceous, and there is a broad testaceous splash on the side of the breast; the anal segment above, and the posterior half of the ventral surface beneath, are of the same colour. Further, the posterior tibiæ have more than the apical half black; the antennæ are quite black.

I have noticed that in some specimens the legs are more marked with black than in others, and some males want the testaceous splash on the side of the thorax.

I took about a dozen of this species on 17th May, on some spruce trees growing in a wood by the side of the old road between Milngavie and Strathblane. Subsequently I made several efforts to discover the larva, but so far without success.

When I first examined this insect, I put it down as *Nematus ambiguus*, Fallén = *parvus*, Hartig; but on a more minute examination, I have no hesitation in saying that it cannot be that species; and in this opinion I am glad to have the concurrence of Dr van Vollenhoven. Thomson (Hymen, Scand, i., 109), describes the antennæ of *ambiguus* as “dimidio corpore parum brevioribus;”

while in the species under consideration they are decidedly longer than that; nor can I think that Hartig's terms, "so lang wie der Hinterleib," can apply. But there are other differences; thus Thomson (*loc. cit.*) calls the terebra, "longa," and "terebra valvulis femorum longitudine, apice postabdomen longius superante;" and he says also of the male, "antennis subtus brunneis;" and "ventre nigro," words which show conclusively that the Strathblane saw-fly must be distinct; and I have not been able to identify it with any of the other described *Nemati*.

Snellen van Vollenhoven has described a small species which he bred from the spruce, under the name of *N. solea*;* but it has no likeness with *furvescens*, which can scarcely be even the *laricis* of Hartig; for, according to that author's description, *laricis* has the antennæ "dick, kaum borstenförmig;" whilst the exact opposite is the case with my insect; and Hartig also says, "Der behaarte Thorax mit kleinem blassem Fleck in der Hinterecken, der Halskragens, Rückenkörnchen rein weiß; Hinterleib einfarbig schwarz;" while in *furvescens* the whole of the pronotum is white, the cenchri are scarcely (if at all) visible, the anal segment and ventral more or less pale; and it is only with a strong lens, and sideways, that I can see any hairs on the thorax.

With regard to the affinities of this species, I thought first that it was allied to the *Abietum* group; but the alar cell structure and colour would seem to show that it is related to *N. fulvipes*, Fall.; and *appendiculatus*, Htg. (or rather with *N. ruficornis*, Oliver; for that seems to me to be the proper name for *appendiculatus*, Hartig; of which *fraxini* and *crassicornis* of the same author, are only varieties, as I know, from having bred them. I can see no difference between the birch and willow-feeding larva of *fraxini*, and the currant-feeding larva of *appendiculatus*, as figured and described by van Vollenhoven; while with the imagos, I can find no satisfactory marks of distinction, beyond colour; and it is easily seen that the various so-called species are mainly differentiated by the greater or lesser amount of black and white with which they are adorned; and even in structure and form I think that they vary *inter se*. Probably, also, one or two of Thomson's species may be referred to *ruficornis*).

* Van Vollenhoven himself suspects that *solea*, of which he only knows the male, may be merely the undescribed male of *laricis*.

As I have mentioned the *Abietum* group, I may state here that *Nematus abietum*, Hartig, is British, although it has not been previously recorded. I captured it in the Black Wood of Rannoch, in June. It is a very variable species; not one of the few specimens I have examined being exactly alike in colour. *N. abietinus*, *hospes*, and *limbatus* of Dahlbom (1835), *N. Saxeseni* and *compressus* of Hartig (1837), are merely aberrations of it. Dahlbom described it two years before Hartig; and his name of *abietinus* ought therefore to be adopted in preference to that of Hartig, in accordance with the law of priority, unless, indeed, the prior name of *pini*, given to it by Retzius (De Geer, Mém. iii., 266, pl. 38, f. 5-7) be inadmissible, through it being, when Retzius applied it to the present species, already in use for another, namely, for the *Tenthredo pini* of Linné.

NEMATUS DIMIDIATUS.

In the first volume of the Entomological Magazine, pl. 1, f. 1, Messrs Doubleday and Newman described and figured an orange larva, with black lateral spots, found by them feeding on the poplar, and which they referred to the *Nematus dimidiatus*, Saint Fargeau (Mon. Tenth., 68, 265). This figure has, until lately, greatly puzzled me, not being able to refer it to any true *Nematus* species, whose earlier stages had been described; nor could I make out what the *N. dimidiatus* might be, as the description is very ambiguous. Knowing that the Rev. T. A. Marshall had a number of saw-flies named by the late J. F. Stephens (by whom, no doubt, Mr Doubleday's insect had been named), I asked him to favour me with a look at a specimen of *dimidiatus*. This he very kindly did; but it did not throw very much light on the subject, as it seemed to be merely a variety of the common goose-berry pest, *Nematus ribesii*. However, the other day, on again examining the figure, it assumed a more familiar aspect, and I soon recognised it as that of *Cladius viminalis*, Fallén.

Nematus pallipes, Fallén.

I have two specimens of what appear to be this species, taken by Drs Sharp and White, at Braemar, which differ from the usual form in having the collar devoid of testaceous, and quite black, but otherwise resembling the type closely enough.

Nematus carinatus, Htg., is clearly different from *pallipes*, as may be easily seen by comparing the lengths given of their respective

antennæ. In *N. pallipes*, Thomson describes the antennæ in the male as "corporis fere longitudine;" while, according to Hartig, in the same sex in *carinatus*, they are scarcely longer than the abdomen. Saxesen also records that the larva of *carinatus* feeds on pine; while *pallipes* I have taken 3000 feet up on the mountains, far away from any pines.

NEMATUS LATIVENTRIS, Thoms.

A male insect, taken by Dr White, at Braemar, may, I think, be identified with this species; but determinations from males alone, are very unsatisfactory in *Nematus*. The species comes very near to *pallipes*.

Nematus crassus, Fallén.

The synonymy of this large species is not quite clear to me. Hartig describes two species, viz.: *N. sulcipes* and *N. cœreulocarpus*, either of which, if not both, must be identical with the *N. crassus*, Fallén. Thomson describes *crassus*, giving *sulcipes* as a synonym of it, but *cœreulocarpus* he does not mention at all. He, however, characterises a new species, which he calls *brachyacanthus*, with which, according to him, *N. propinquus*, Dbm., is identical; but he gives no reason for not adopting this long prior name, which would certainly be more natural to do than to coin a new one.

Both species (if they be really species) may be added to our lists. *Crassus* I have taken in the Highlands, on aspens, and of *brachyacanthus* I have received English specimens from the Rev. T. A. Marshall of Lasingham, and Mr J. E. Fletcher of Worcester. It is this latter form which Dr van Vollenhoven describes as *coereulocarpus*, and I think, also, that Mr Fletcher has bred it from poplar; and it is thus seen that both are attached to the same food plant. Whether Hartig's *cœreulocarpus* be identical or not with *brachyacanthus* cannot now be decided, as he does not mention those characters upon which Thomson founds his species. *Crassus*, Thoms., is slightly larger than it, and may be easily known by having the posterior calcaria black, instead of red, as in the other species. Whether the small differences between them are sufficient to warrant their specific separation, is a point about which I am in some doubt, and it cannot be definitely settled until both forms have had their earlier stages thoroughly elucidated. *N. vicinus*, Lep., is either a synonym of *crassus* or *brachyacanthus*.

I have seen an example of what, no doubt, pertains to the latter

species, taken in Spitzbergen by the Rev. A. E. Eaton, which is much smaller than the usual form, more hairy, and with the posterior tibiæ and tarsi devoid of black. It was, I believe, taken on willows, and the thorax was dusted over with pollen. This variety I propose to call *palliditarsus*.

NEMATUS CRASSULUS, Dahlbom.

Nematus crassulus, Dahlbom, Conspectus, No. 96; Thomson, Hymen. Scand., i., 157, 90; *N. leucostictus*, Hartig, Blatt. und Holzw., 202, 33 (*forte*); *N. xanthogaster*, Foerster, Verh. pr. Rheinl., 1854, p. 315 (*forte*); Kaltenbach, Die Pflanzenfeinde, 580 (*forte*).

As the account of the habits of this insect given by Kaltenbach (the only author who has described the larva), is not very minute, I think that a description of its life-history may be of interest, more especially as the species has never been mentioned in any works relating to British entomology.

If we go out to Possil marsh about the beginning of July, and examine the leaves of *Salix viminalis* and other willows growing there, we shall find that some of them have the edges neatly turned down on the underside, indifferently on the right or left, and (as a rule) extending down the whole length, just in the same way as we ourselves turn down the edges of the leaves of a book. Usually there is only one side turned down, but occasionally both are treated in this fashion. If we open the fold and examine it carefully, at one end there will be observed a minute oval egg, embedded in the epidermis. This is the egg of *N. crassulus*.

It may be asked—How, and by what is the leaf folded down? Certainly not by the insect during its larval life, as is usually the case with leaf-rollers, for with this species the leaf is folded down before the larva makes its appearance; so it is clear that the work must be done by the perfect insect. But how the fly manages to perform the operation, is a question that I cannot at present answer, not having yet been fortunate enough to observe the creatures ovipositing; and in confinement they will not lay—at least that is my experience. The leaf, in its early growth, seems to have its edge glued down, for if we inspect it with a lens, there will be seen a number of small glutinous points, separated by a small space from each other. I fancy, also, that the insect uses its mandibles to bend it down at first, and then applies the

glutinous substance; but where it gets this I cannot conjecture. When young, the two surfaces of the fold touch one another, but as the larva grows it gets more open, and it then very often becomes tenanted by plant lice. I have also found a small lepidopterous larva in these folds.

When young the larva is whiteish, with the markings not very distinct. At the third moult the head is flattish, sloping towards the mouth; in breadth, about the same as the second segment; the colour blackish, fuscous, yellow, or brownish-yellow, with the eyes and mouth black. The feet are greenish-white, with brown claws; over each is a broad black band; the fourteen claspers are whiteish. The body is greenish-white; the food-canal giving it a darker tint. The skin is beset with many small tubercles, each ending in a short hair; at the sides the segments project in ridges. Over the last segment are two—often only one—broad black bands, of a variable size and distinctness; the anal cerci black.

Previous to spinning the head is, as a rule, of a lighter colour, and often there is a distinct black splash on the face; the anal marks are very faint; and the body yellowish-white. The length is from 5–7 lines.

The larva carries the body in a somewhat arched position posteriorly, the anus touching the leaf.* In the autumn, when it becomes full fed, it drops to the ground, and spins a light, brown cocoon, in which it remains unchanged till May, when it becomes a pupa, in which state it remains ten or twelve days.

The pupa is green.

I believe I have correctly identified this species with the *N. crassulus*, Thoms.; but with regard to the other names I have quoted above, I am not sure whether they are synonymous, or if they refer to distinct species. My Possil specimens differ from a type of *leucostictus* that I got from Herr Brischke, of Danzig, in having the legs yellowish, instead of white; the femora are (apparently) thicker; and the stigma, at the apex, is darker than at the base; the stigma being, in my specimen of *leucostictus*, of a uniform white colour. Kaltenbach's description of the larva of *xanthogaster*, is not quite in accordance with mine (but this may be owing to his not having described it in full); while Foerster's description (of

* It commences feeding by eating the epidermis, near where the egg was placed; then in scattered places all under the fold, and ultimately over the whole leaf. It never devours the leaf quite through.

the male insect—the only sex known to him) would certainly give one the impression that *xanthogaster* was distinct from our insect, more particularly as he states that the abdomen is of a yellow colour.

A Monographic revision of the British species of *Phyllotoma*.

A good deal of confusion having been introduced into the nomenclature of the British *Phyllotomæ*, I have thought that a monographic revision of our species might be useful, more especially as they have never been properly described in this country.

Phyllotoma is distinguished by having the antennæ 10–15 jointed; the eyes not touching the base of the mandibles; the anterior wings with 2 marginal and 3 sub-marginal cellules, the first and second of the latter receiving each a recurrent nervure; and the tarsi devoid of patellæ. With *Phænusa*, *Fenella*, and *Cænoneura*,* it forms a very natural group, not so much remarkable for similarity of structure, as for the close agreement they evince in the habits, form, and coloration of their larvæ. The following table will differentiate these four genera:—

Section i.—Antennæ 10-15 jointed:

Eyes not touching the base of the mandibles; lanceolate cellule open—*Phyllotoma*.

Eyes touching the base of the mandibles; lanceolate cellule petiolate—*Fenella*.

Section ii.—Antennæ 7-9 jointed:

Antennæ 7-8 jointed; lanceolate cellule open—*Cænoneura*.

Antennæ 9 jointed (? sometimes 10 jointed); lanceolate cellule petiolate—*Phænusa*.

I have not yet been able to discover any characters whereby the larvæ of the various species of *Phyllotoma* may be recognised from each other, so alike are they in form and coloration, and the difficulty of doing so is increased by the fact that the markings on the same species vary more or less.† The following description will therefore apply to all the species:—

The form of the larva is depressed, flattish, broader before than behind; the head small, sharply-pointed in front, triangular, and

* We do not yet know the habits of *Cænoneura*, but it is highly possible that it is also a leaf miner.

† All, however, affect different food-plants, and this is the best way to distinguish them.

capable of being to a certain extent withdrawn into the folds of the second segment. The feet are very short, squat, and knob-like. The abdominal feet are scarcely developed, but 16 may be easily counted, viz., 14 ventral and 2 anal. The colour is white, assuming a greenish hue when the food-canal is filled. The head is brown, darker at the sides, and around the mouth it is reddish-brown, the eyes black, and the mandibles brown. On the back of the second segment is a dark-brown plate, rounded at the ends, and divided in the middle into two parts. On the same segment, beneath, is a horse-shoe or dumb-bell shaped black plate, narrow at the base, spreading out at both sides at the apex. On the next two or three segments, also on the underside, there is on each, in the centre, a round brown dot. At the last moult these markings disappear; the head is then very pale brown, with darker mandibles.

The larvæ are leaf-miners, like those of *Fenella* and *Phænusa*. The female fly lays her eggs on the tip or sides of a leaf, and whenever the larva escapes from the egg, it eats its way in between the parenchyma, and devours a roundish irregular blotch between the upper and lower epidermis, which becomes so transparent that the creature inside can be easily seen by holding the leaf against the light. There may be only one larva in a leaf, or there may be three or four. In the latter case the several mines are in their early stages distinct, but in course of time they become united into one common blotch. The larvæ are cleanly in their habits, inasmuch as they open the sides of the leaf and expel the "frass" through the opening made, while with *Phænusa* the "frass" is left in the blotch. When they become full-fed they spin, attached to the sides of the mine, a round, dark brown, flat cocoon,* where they pass to pupæ, and with the autumnal brood remain as unchanged larvæ over the winter until the spring. Most of the species produce two broods in a year.

Obs. Besides those of the *Phyllotoma* group, the only other leaf-miner among the saw-flies is *Dineura despecta*, Klug. (*cf.* Kaltenbach, *Pflanzenfeinde*, 9). It forms a blotch on the leaves of *Ranunculus repens*, and from Kaltenbach's description, the larva seems to resemble very closely, in habits and form, the larvæ of the group we have been discussing. It is a pity that Kaltenbach

* *Phænusa* and *Fenella* pupate in the earth, not in the mines.

has not stated the number of abdominal feet, as that is a very important point, considering the uncertainty that exists regarding the systematic position of the smaller species of *Dineura*. Mr Charles Healy has found a saw-fly leaf-miner on the *Ranunculus*, but, unfortunately, he has never succeeded in rearing the fly; nor has *despecta* been recorded as a native of Britain. Perhaps this note may induce some one to try the breeding of the larvæ from the buttercup mines.

A. Antennæ 10-11 jointed; body oblong half depressed, black above and beneath; pronotum and tegulæ white. Feet white. Wings scarcely smoky.

Wings with a smoky fascia in the middle; sides of abdomen with white marks—*nemorata*.

Wings without a smoky fascia—*aceris*.

PHYLLOTOMA NEMORATA.

Tenthredo nemorata, Fallén, Acta Holm., 1808, 47, 23. *Druida parviceps*, Newman, Ent. Mag., iv., 261; v., 484; Healy, Ent. No. 62, p. 208. *Phyllotoma tenella*, Zaddach, Beschr. neuer oder wenig bekant. Blattw., 28, pl. 1, f. 17; van Vollenhoven, Tidjs. Ent. xviii., 39-42, pl. 4. *P. nemorata*, Thomson, Hymen. Scand., i., 176, 1.

Black, shining; antennæ shorter than the abdomen, 10-11 jointed, beneath fuscous testaceous; inner orbits of the eyes and face yellowish white; a black line above the epistoma; mandibles piceous; palpi white. Pronotum and tegulæ white; cenchri large, dull white. Abdomen with the sides marked with white dots, usually oblong. Feet white; base of coxæ and femora black. Wings hyaline at the apex, a little smoky at the base, with a large smoke-coloured fascia, extending from the stigma to the bottom. Length 2-2½ lines.

From the next species *nemorata* is distinguished by the fascia on the wings, the white spots on the abdomen, and larger size. The male is unknown.

P. leucomela, Klug. is probably identical with this species; but the description is not very good, and no mention is made of any markings on the abdomen.

The egg is deposited near the tip or edge of a birch leaf, in which the larva afterwards lives solitary. There are two broods in a year: the first, in June and July; the other later on in the autumn, the larvæ being found as late as October.

It is a very common species, although rather local. In our own neighbourhood it may be got in abundance (especially the larvæ) in Cadder Wilderness, and at Bishopton, and the country around there.

PHYLLOTOMA ACERIS.

Phyllotoma aceris, Kaltenbach, Die Pflanzenfeinde, 91; McLachlan, Ent. M. M., iv., 104; Healy, l. c., 107.

Black, shining, smaller than *nemorata*; antennæ 10–12 jointed; fuscous testaceous at the apex. The wings half-smoky, unclouded; the face above has more black on it, there being no white above the antennæ. Pronotum lined with white; tegulæ obscure white; abdomen quite black, except that the edges of the segments are sometimes faint white, but there are never distinct white markings. Feet white; femora for the greater part black. The male I do not know. Length $1\frac{1}{2}$ – $1\frac{3}{4}$ lines.

Easily known from *nemorata* by the absence of a distinct fascia in the anterior wings.

The larva mines the leaves of the maple in June and July. It is common in the London districts, but has not yet been met with in Scotland.

B. Antennæ 12–13 jointed. Abdomen black entirely, or white underneath. Feet pale yellow, black at the base. Wings smoky, clear at the apex. Only one species—*ochropoda*.

PHYLLOTOMA OCHROPODA.

Emphytus ochropodus, Klug.; Blattw., No. 182; Hartig, Blattw., u., Holzw., 255, 1. *Heterarthrus ochropodus*, Stephens, Ill. vii., 94. *Phyllotoma ochropoda*, Thomson, Hymen. Scand., i., 177, 2.

Black, shining; inner orbits of the eyes, labrum; clypeus, partly; palpi and trochanters white. Feet pale yellow, verging to testaceous; coxæ and base of femora black. Wings dark, smoky; apex hyaline. Length $2\frac{1}{2}$ lines.

The male has not been described, unless it be that which Thomson doubtfully describes as the male of *nemorata*. It has the antennæ 13 jointed—thicker and longer than in the female—the two basal joints white, the rest dull brown; the face with a greater amount of white; pronotum, sides of the breast and tegulæ, clear yellow-white; base of coxæ, trochanters, extreme base of femora, and abdomen beneath, white. Wings almost hyaline, with a slightly darker cloud in the middle.

From *nemorata* and *aceris*, *ochropoda* may be known by the colour of the feet, the black tegulæ, and pronotum (in the female), and the greater number of joints in the antennæ. From the following species it may be known by the absence of luteous colour on the abdomen.

For this species I am indebted to Mr J. E. Fletcher, of Worcester, who discovered the larvæ mining the leaves of the black poplar in the autumn. They do not differ in any noticeable particulars from the other larvæ. This is the first time that the habits of the species have been described.

P. ochropoda I have never met with in Scotland, and in England it appears to be rare.

C. Abdomen luteous; wings nearly smoky throughout; feet yellow luteous; body not depressed.

Antennæ 10-12 jointed, not pale at the base; pronotum and tegulæ black—*vagans*.

Antennæ 14-15 jointed, pale at the base; pronotum and tegulæ pale—*microcephala*.

PHYLLOTOMA VAGANS.

Hylotoma vagans, Fallén, Acta Holm., 1808, 47, 24. *Emphytus melanopygus*, Klug., Blattw., No. 185; Hartig, Blattw. u. Holz., 256, 4. *E. amaurus*, Klug., *l. c.*, No. 186; Hartig, *l. c.*, 256, 5. *Phyllotoma melanopyga*, Kaltenbach, Pflanzenfeinde, 620; van Vollenhoven, Tijds. Ent., 2d ser., i., 196-201, pl. 8; Ent., No. 102, 70-74. *P. microcephala*, Healy, Ent., No. 60, 177. *P. vagans*, Thomson, Hymen., Scand., i., 178, 3.

Antennæ about the length of the abdomen, 10-12 jointed, black, pilose, the two basal joints of nearly equal size, the 1st having a short joint at the base; the 3d double the length of the 4th; the 4th longer than the two basal; the remaining joints to penultimate becoming a little shorter, the last conical, thinner and longer than the preceding. Head not much narrower than the thorax, much broader than long; eyes projecting, front depressed, triangular; frontal and vertical sutures distinct; clypeus notched; labrum semi-circular, shining, slightly pubescent, the colour black; clypeus and labrum sometimes, a line on the inner orbits of the eyes, and between the antennæ, sordid yellow. Thorax black; tegulæ black; cenchri pale. Feet yellow luteous; tarsi darker. Abdomen luteous, the apex black above. Wings smoky.

The male has one more joint in the antennæ than the female; they are also testaceous beneath, and the abdomen has the dorsal surface of the abdomen black. Length $1\frac{3}{4}$ - $2\frac{1}{2}$ lines.

This species is very variable in coloration, some specimens having the head and abdomen almost all black. I have one male, from Kenmuir bank on the Clyde, which is half the usual size; the wings are scarcely smoky, and the basal half of the femora and the posterior tarsi black. I am in doubts whether it pertains to *vagans* or to a new species.

The larva mines the leaves of the common alder, in which it lives alone, or a leaf may be inhabited by two or three larvæ. Two broods are met with, the autumnal one being the most numerous. The mines appear to be met with almost wherever the food plant abounds.

PHYLLOTOMA MICROCEPHALA.

Emphytus microcephalus, Blattw., No. 184; Hartig, Blattw. u. Holzw., 255, 3. *Phyllotoma microcephala*, Kaltenbach, Pflanzenfiende, 581; Thomson, Hymen., Scand., i., 179, 4. *P. melanopyga*, Healy, Ent., iv., 176-178.

Black, shining; antennæ 14 jointed, two basal joints dull white; a line round the inner orbits of the eye, labrum, clypeus, sometimes the epistoma, mandibles at the base, and palpi, white or yellowish-white. Thorax black; pronotum and tegulæ white. Abdomen yellow luteous, apex more or less black; sheath of saw hairy, more or less projecting. Feet yellow luteous. Wings smoky, apex almost hyaline.

Male—Antennæ 15 jointed, beneath testaceous; sides of thorax more or less yellowish-white; face with more of the white colour than in the female, and dorsal surface of abdomen more or less black. Length $2-2\frac{3}{4}$ lines.

Microcephalus is easily known from *vagans*, by having the antennæ 14 jointed, with the base pale; the pronotum and tegulæ white; the wings clearer at the apex than at the base; and the apex of the sheaths of the saw hairy, instead of bare as in the other species.

The larva mines the leaves of various willows, and is double-brooded. It is generally distributed, and very common.

I have had ready for some time a monograph of the British species of *Phænusa*, but have delayed the publication of it until

I get some types from Germany, the nomenclature being in a very obscure condition. I may, however, take this occasion of saying a word or two upon three species.

Ph. nigricans, Kl.—It will, I think, be quite evident from the analysis given here, that Klug and Thomson have described two very distinct species, under the name of *nigricans*—

Thomson (Hymen. Scand. i., 184).	Hartig (Blattw., 259).
Mouth piceous.	Mouth pale brown.
All the knees, anterior tibiæ, and tarsi sordid yellowish white.	Feet pale brown.
Antennæ as long as the head.	Antennæ as long as the ab- domen.
Body black.	Body brownish black.

Thomson's *nigricans* must therefore be re-named.

The rasp and bramble leaf mining *Phænusa* is *pumilio*, Htg. = *rubi*; Boie—not *Ph. pumila*, as stated by several British authors. *Pumila*, according to Brischke, is an alder leaf-miner.

Lastly, *Ph. ulmi*, Sundeval; Healy (the Elm leaf-miner) = *intermedia*, Thomson, *lib. cit.*, p. 186.

One day last February, when looking for any insects that might be out, in a field near Partick, in company with Mr J. R. Watson, one of our members, my attention was directed to the roots of a grass (either *Triticum repens* or *Arrhenatherum avenaceum*, I am not sure which, having seen only the roots and young leaves), and on cutting one of them open, I was greatly interested to find it tenanted by a number of Hymenopterous larvæ. My first conjecture was that they pertained to some species of *Isosoma*, the only Hymenopterous genus known to form gall-like swellings on grasses. In the following month, however, the perfect insects made their appearance; and it was then seen that they belonged not to the Chalcididæ, but to the Cynipidæ; and further examination, with the aid of the works of Hartig, Giraud, and Schenck, convinced me that the insects were not only undescribed, but also, that their habits exemplified a new and interesting phase of gall-existence.

With the eggs and early life of the larvæ I am unacquainted. In the roots which I obtained tenanted with mature larvæ, from

10 to 12 larvæ would be in a single root, each being enclosed in a cell formed of the hardened vegetable matter, and of a size just sufficient to contain the inhabitant. In some cases the cells were situated so close together as to be in actual contact, as in the gall of *Aphilothrix radices*; but in others they were separated widely from each other. I could not find that the roots were outwardly malformed or enlarged in any way; they appeared not to differ in the least from normal specimens. They were not buried in the earth, but projected out from it.

The systematic position of the insect is to me not quite clear, but I think that it may be regarded as an *Aulax*, *sensu str.* Foerster, in his generic revision of the Cynipidæ (Verh. zool.-bot., Gesell., Wien, xix., pp. 327-370), formed three new genera out of species formerly included in the *Aulax* of Hartig. These new genera (viz., *Liposthenes*, *Perichlistus*, and *Xestophanes*) he describes in full; and to none of them can the present insect be referred. Unfortunately, Foerster neither describes *Aulax* in the restricted sense, nor does he mention a type for it; but in the generic synopsis it is stated to have the "mesonotum nicht glatt," in opposition to the "mesonotum ganz glatt" of *Xestophanes*. In this meaning it may be included in *Aulax*, which will also contain, I suppose, *Aulax sabaudi*.

The present insect may be described as

AULAX GRAMINIS, *sp. n.*

Thoracis dorso aciculatis. Niger, abdomine proparte pedibusque rufis; abdominis dorso, coxis, trochanteribus, femoribusque vel supra nigris; antennis 14-15 articulatis.

Long. $\frac{2}{3}$ -1 lin.

Black; the feet (coxæ, trochanters, and sometimes a line on the femora, excepted) and abdomen, at base and beneath, ferruginous-red. Antennæ black; in female 14, in male 15 jointed. Mesonotum aciculated; sutures only visible near the scutellum; scutellum strongly aciculated, with 2 deep impressions at the base. Abdomen very smooth and shining; terebra exerted; tips of tarsi black. Wings as in *Xestophanes*, but with the costal cellule shorter, more resembling that of *Synergus*.

The amount of black on the femora and abdomen varies a good deal. The 3d, 4th, and 5th basal joints of the antennæ are occasionally obscure red. In coloration, the species very closely

resembles *Nestophanes potentillæ*, but the aciculated mesothorax forms a ready mark of separation.

In the form of the thorax and abdomen it resembles *Ceroptres*, but then the antennæ are not thickened at the apex. I have compared my species with the descriptions of all the species of *Ceroptres*, but have not been able to find one with which it will agree.*

From the *Aulax* I bred two species of Chalcididæ, viz., a species of *Eurytoma* and a *Decatoma*. Of the former I bred only a male and female; and the species seems to me to be undescribed, but further investigation is necessary to confirm this. The *Decatoma* was more numerous, and both sexes were represented. It is, I believe, *D. biguttata*, Swed.,—not, certainly, agreeing with the type of that species; but, if the descriptions of *D. Cooperi*, Curt., *obscura*, and *immaculata*, Wlk., and *signata*, Nees (which are merely varieties of *biguttata*), be combined with that of *biguttata*, then our species will fit in with the united descriptions.

According to Foerster (Beiträge zur Monder. Pteromalinen, p. 6), the typical *biguttata* is a parasite in oak galls, viz., in those of *Aphilothrix gemmæ*, *Dryoteras terminale*, and a *Neuroterus*.

I likewise got in the centre of a root tenanted by the *Aulax*, the full-fed larva of a beetle, *Tachinus rufipes*. Whether it actually fed on the root or on the *Aulax* larvæ, or had merely retired there for the purpose of passing into the pupa state, I cannot say.

The Rev. T. A. Marshall, in his excellent article in the "Entomologist's Annual" for 1874, by giving a list of thirty-nine British species of parasitic Cynipidæ, has furnished us with a stand-point from which to record further discoveries. On working up my captures in this family, made during the last two years, I find that I can add the following species to our British list; and I am persuaded that this by no means closes my number of novelties. I appear to have several new species, notably a very small species of *Eucoila*, taken at an elevation of about 3500 feet, on one of the Breadalbane mountains.

Sapholytus apicalis. *Synergus apicalis*, Hartig, Germs. Zeits., iii.,

* I may take this opportunity of adding the genus *Ceroptres* to the British fauna, having bred *C. arator*, Hartig (Germ. Zeits., 1841, p. 343), from galls of *Andricus noduli*, found at Kenmuir bank, and also on the Cambuslang side of the Clyde.

349, 27; *Sapholytus apicalis*, Foerster, Verh., z. b., Ges. Wien, 1872, 337. Bred from galls of *Andricus noduli*, found in Cadder Wilderness.

Tetrarhoptera 4-toma—*Kleidotoma 4-toma*, Thomson, Öfv., 1861, 399, 8. Single specimens taken at Milngavie, Cadder, and Paisley.

Pentacrita 5-toma—*Kleidotoma 5-toma*, Thomson, *l. c.*, 398, 6. One example, taken near Paisley.

Pentacrita albipennis—*Kleid. albipennis*, Thomson, *l. c.*, 399, 7.

Ægilips subulifera, Thomson, *l. c.*, 412, 1. Taken in Strath Glass.

Ægilips abietina, Thomson, *l. c.*, 412, 2. Taken in same locality as the last. This species may be *Æ. armata*, Giraud.

I am a little dubious about my determination of the two last species, yet I cannot make them out to be anything else, nor can the Rev. T. A. Marshall. The species are in a rather confused state.

II.—On the Anatomical Structure of the Wings of Birds.

By Dr DAVID N. KNOX.

This interesting and instructive paper was illustrated by drawings, anatomical preparations, and dissections of the wing of the Woodcock. At its close the Chairman said that the Society was indebted to Dr Knox for the care he had bestowed in the preparation of his paper, and for the excellent way in which he had treated a very difficult subject. He was glad to learn that this was the first of a series of papers to be followed up by Dr Knox at subsequent meetings of the Society.

III.—Notes on the state of Vegetation in the Public Parks during January, 1875, as compared with the corresponding month in 1874.

By Mr DUNCAN M'LELLAN, Superintendent of Parks.

He stated that in the early part of this winter very severe weather was experienced; but, as the fibre and wood of the shrubs and plants had been fully ripened last season, vegetation did not suffer so severely as might have been expected. At the same time, such plants as *Escallonia maerantha*, *Euonymus japonicus*, *Viburnum tinus*, and *Ligustrum ovalifolium*, suffered more or less in the foliage. All plants covered by the snow were found perfectly safe after the severe frost. It is worthy of remark that in January of this year there were only five species of plants in flower in the

Queen's Park; while there were forty-two species, and many varieties, in bloom in the same month of last year. This striking contrast may be accounted for by the continuance of severe frost during the whole of December last, while the corresponding month of 1873 was exceptionally mild, thus promoting the flow of sap and stimulating what may be termed premature growth. During February the weather was very cold and dry, consequently few plants flowered. Snowdrops appeared about the 6th, Primulas, Hepaticas, Daphnes, and *Saxifraga oppositifolia*, about the 20th. Evergreen shrubs and grass had suffered more during the previous ten days than during the severe weather of December, when 21° of frost were registered.

The mean temperature in the Queen's Park in

December was—Maximum,	34.....	Minimum,	25
January,.....	do.,	44.....	do., 35
February,.....	do.,	41.....	do., 32

The rainfall in December was 1·77 inches; January, 5·60 inches; and February, 1·42 inches.

IV.—*New Species of Glauconome from Carboniferous Limestone Strata of the West of Scotland.* By Professor J. YOUNG, M.D., and Mr JOHN YOUNG, F.G.S.

PLATES II., III., IV.

The genus *Glauconome*, established by Goldfuss, and revised by Lonsdale, is thus characterised by M'Coy (Carb. Foss. Ireland, p. 198):—

“Stem elongate, oval, laterally branched; obverse bearing longitudinal rows of pores; reverse striated.”

The oval form is not universal; and the omission of any reference to the form of the cells has led to the inclusion, under one generic designation, of forms which should at least rank as sub-genera. We have described (Q. J. G. S., vol. xxx., p. 682, pl. 40, figs. 5-11) one species, *Glauconome stellipora*, characterised by the remarkable regularity of the eight radial spines, which guard the opening of the cells; in a second group there is invariably a minute orifice beneath each cell aperture, while both spines and accessory orifice are wanting in a third group. Before proceeding to the discussion of these forms, we would remark that our comments, in so far as they alter the determinations of our predecessors, are not so much corrections, as in reality

fresh investigations, which are only possible because the specimens are now more numerous, and the opportunities are greater of obtaining well-preserved examples. Further, most of the Polyzoa defined by Goldfuss, Lonsdale, and M'Coy, were referred to the Corals. Their systematic position has since been altered, but we are not prepared to say that the change has been in all cases correct. We have only the hard parts to study; and the Actinozoa and Polyzoa have several points of resemblance in the structure of their calcareous skeletons. We do not offer any systematic redistribution of the fossils, not wishing to add to the confusion in which these zoophytes are still involved; but we merely wish to guard ourselves against misconception, if we continue to speak of all these forms as Polyzoa. We have been careful to provide data, by means of transparent sections, by which we, or others having better opportunities, may in the future follow out the investigation.

The rich Limestone shales and Limestones of the Lanarkshire Coalfield have yielded a large number of species, the following of which seem to be new—namely, *Glaucanome stellipora*, *G. aspera*, *G. lava*, *G. retroflexa*, *G. marginalis*, *G. flexicarinata*, *G. elegans*.

GLAUCONOME (DIPLOPORA) MARGINALIS, *sp. nov.*

Plate iii., Figs. 14–21.

Polyzoary erect, slender, branching at intervals; cells of the stem (twenty-six, in one-fourth inch on each side), alternate, and marginal, giving a serrated outline, which is rendered more pronounced by the prominence of the upper margin of the circular aperture. Beneath the cell, in perfect specimens, is a small orifice, the septum between the two being very narrow and easily broken down, giving the large opening a pyriform shape. A mesial ridge bears a tubercle between each pair of cells. A narrow ridge runs parallel to this, on either side of it; but in the slenderest specimens the margins of the cells encroach on these lateral ridges, and interrupt them. The reverse is traversed with finely tuberculate, parallel, longitudinal ridges. There are no pinnules, and the branches come off at irregular distances, forming an angle of 40° with the stem; opposite the base of each branch is a cell about twice the size of the others. The cells and ridges of the branches are of similar character with those of the stem.

Localities:—Upper Limestone shales at Boghead, near Hamilton,

Hairmyres, East Kilbride; and Gillfoot, near Carluke: Crinoid shales, Hook Point, Ireland.

This species is readily distinguished by the graptolithic aspect which it owes to the lateral position, prominence, and triangular profile of its cells. The figures show some variations of this ornament: thus, in figure 16, the lateral ridges are not simple, but composed of a series, each of which starts opposite a cell, runs upwards, expanding till it terminates at the second cell, which is, as it were, pierced in its expanded extremity. Again, the secondary ridges are obsolete, or represented by the raised inner margins of the cells.

This species, in possessing the second orifice, differs from all the species hitherto described. We would therefore propose the sub-generic name *Diplopora*, for it and for such other species as may yet be found to present the same peculiarity. It may be found necessary to erect this into a distinct genus; but, having in view the remarkable resemblance presented by all the fossils which may be included under the general definition of *Glauconome*, quoted above from M'Coy, we do not feel justified in proposing the separation. For the same reason we would suggest *Acanthopora* as the sub-generic designation of *G. stellipora*, the character of which we quote below. (Q. J. G. S., xxx., p. 682).

GLAUCONOME (ACANTHOPORA) STELLIPORA, *novis*.

Plate iv., Figs. 25, 26.

Stems nearly cylindrical, branching irregularly, bearing two rows of alternate cells, with prominent circular orifices, over which eight radial denticles converge as in *Actinostoma*, a smaller orifice being placed at one end of the cell, on the side of the prominence, and separated from the larger aperture by an interval, which never exceeds one-third the diameter of the larger cell. The stem is ornamented with a sinuous mesial ridge; and sinuous ridges likewise pass from cell to cell. All these ridges are finely tuberculated; or, more correctly, beaded. The non-poriferous face is traversed by longitudinal parallel ridges, which are also finely tuberculated. Occasionally a larger cell occurs in the angle of the branches; but the small size of the fragments, hitherto obtained showing the poriferous face, renders it impossible to say whether they are of frequent occurrence. They are possibly ovicells.

Variety a: *spinosa*. Figs. 9, 10, pl. xl. *op. cit.* show strong tuberculation, the intervals being smooth; and fig. 11 shows these tubercles as almost spines. Where they are abraded, a central pit is suggested by the unequal wearing of the denser outer and softer central tissue.

The branches present three modifications: they are short and poriferous, they bear cells on the sides, and terminate with blunt ends; or they have (fig. 5 *op. cit.*) two terminal cells close together, the branch being probably continued past the cells by outgrowth of the axis between them.

Localities: Limestone shales at Hairmyres, Robroyston, Gare, and Boghead.

GLAUCONOME ELEGANS, *sp. nov.*

Plate iv., Figs. 27-32.

Polyzoary erect, slender, bipinnately branching. Stem rounded, mesial ridge broad, low; the poriferous and non-poriferous faces unequal, the cells and branches being turned towards the former. Cells alternate, equidistant; upper margin more prominent than the lateral, which sink away into the general surface below. The orifice is circular when entire, or pyriform. The middle line bears nearly equidistant small tubercles—one for every three cells. The reverse is flattened and striated longitudinally, the striæ being covered with close-set fine tubercles. The branches are opposite, or sub-alternate; the average angle of divergence is 35°. The cells are similar, as to size, distance, form, and alternation, to those of the stem; but two or three lines of approximately parallel ridges give a carinate aspect to the obverse, while the tuberculate ridges of the reverse are bolder and more regular than those of the stem. Seven branches and twenty-one cells in one quarter of an inch on either side. The intercellular space is ornamented with four or five finely granulated ridges.

Locality: Upper Limestone shales, Hairmyres, East Kilbride.

The striate condition of the intercellular area on the stem, and the inequality of the two surfaces, are the most distinctive characters of this species, which is further separated from *G. gracilis*, M'Coy, by having two pores, not one, in the intervals of the branches. The plane of the apertures being parallel to that of the poriferous face, and the bending of the branches towards that face, are points of contrast to *G. retroflexa*, *nobis*, hereafter to be

described. It is also distinguished from *G. pluma*, Phillips, by having the pores of the stem twice their own diameter apart, those of Phillips' species "occupying the entire of the poriferous surface." (M'Coy, Carb. Foss. Ireland, p. 199).

GLAUCONOME ASPERA, *sp. nov.*

Plate iii., Figs. 22-24.

Polyzoary erect, branching. Stem and branches round, bearing two rows of alternate cells. Cells round or oval, with raised tubercular lips, which are continued, though less prominent, from cell to cell, and include between them two or three parallel smaller tubercular ridges. Surface covered with short sinuous tubercular ridges, of irregular lengths, so that no mesial ridge can be recognised, the stems being, moreover, slightly twisted, so that the cells do not appear in the same plane. Branches similar to stem. Reverse more regularly striated longitudinally, the striæ being closely tubercular. About ten cells in one-eighth of an inch.

Locality: Hairmyres, East Kilbride.

This species is very distinct, and much resembles *G. (Diplopora) marginalis*, in the absence of secondary pinnules between the cells. The ornamentation of the surface is very distinctive.

GLAUCONOME FLEXICARINATA, *sp. nov.*

Plate ii., Figs. 1-7.

Polyzoary erect, branching bipinnate, the bipinnate branches being given off at intervals. Branches form, on the average, an angle of 40° with stem, and turned slightly towards the non-poriferous aspect.

Cells alternate, lanceolate oval, rather more than their own length apart; one cell between each pair of pinnules, and one in line with the upper row of cells on the pinnule. Each cell of the stem equals one-third of the transverse measurement of the stem. Those of the branches are smaller, and regularly alternate, as on the stem. The secondary branchlets are several cells apart. The ornaments of the surface are ridges and tubercles of various sizes. The broad prominent mesial ridge undulates regularly from side to side, following the alternations of the cells. This ridge bears small, close-set tubercles, a large one occurring as the centre of each alternate curve. Two tubercular ridges run parallel to the keel on each side. They form prominent lips on each side

of the cells, in the intervals of which they come together, or are sometimes separated by one to three finer series of tubercles. The tubercles on the lips of the cells are, when fully preserved, prominent and erect. Scattered tubercles occupy the space between the cells and the margin of the stem. The mesial ridge of the branches is usually derived from the outer tubercular ridge bordering a cell. The reverse is coarsely striated longitudinally, the striae being tuberculate.

Branches, nine; and cells eighteen, in one quarter inch on either side.

Localities: Hairmyres, E. Kilbride; Gillfoot, Carluke; Dykehead Pit, Blantyre.

The stem is somewhat flattened on the reverse, but it is doubtful whether this is not due to pressure. In its extreme degree it certainly results from crushing. The ridges vary in arrangement; and the figures show some of these irregularities. Thus (fig. 1) the lip of a cell is formed by a short ridge, an additional one running outside of it, while in the angle (fig. 6), several short ridges replace the simpler arrangement seen in other specimens.

The only described species with which this one might be compared is *G. gracilis*, M'Coy (Carb. Foss. Ireland, p. 199, pl. 28, f. 5). But though in that species, also, one cell intervenes between the branches, the cells are only "half their own length apart;" they "indent the margin strongly," and the branches have no keel: strong points of contrast, even if small importance is attached to the insistence on the "circular" form of the cells. The figures in M'Coy are unfortunately so artificial that they cannot be depended on, since the indented margin which the text asserts to be (p. 199) diagnostic from the other species, is not even suggested. *G. gracilis* and *G. flexicarinata* are allied but obviously distinct species, occurring in the Carboniferous Limestone series of Ireland and Scotland respectively.

GLAUCONOME RETROFLEXA, *sp. nov.*

Plate ii., Figs. 8-10. Plate iii., Figs. 11-13.

Polyzoary erect, branches short, subalternate; bipinnate branches at wide intervals. Cells on stem longer than broad, regularly alternate, their own length apart; one at the base of each branch, and one in the intervals; partly hidden on the inner side by the keel,

and bounded on the outer side by a prominent lip. Cells on bipinnate branches as on stem; those on branchlets alternate, smaller, and barely their own length apart. Branches at an angle of 40° with stem, and strongly bent back towards the reverse face. The obverse is covered with fine granules; and the keel, which is gently rounded, and about one-third the diameter of the stem, bears numerous small tubercles, at irregular distances, and set near one or other side. The keel of the branches is formed by a series of sharp tubercles, one corresponding to each pair of cells. The outer lip of the cell is sometimes projected in a blunt tubercle. The reverse face of the stem and bipinnate branches is evenly rounded and finely granulo-striate; a regular row of small tubercles marking the middle line. The reverse of the branches is distinctly striate, and the granules are larger than on the stem. Cells, eighteen; branches, nine on each side in one quarter inch.

Localities: Lower Limestone, Hairmyres, E. Kilbride, and Beith, Ayrshire.

The backward flexure of the short branches is the most distinctive character of this species; the deeply buried appearance of the cells being second in importance. From *G. laxa*, which likewise has buried cells, the flexure of the branches, and the regularity of the intervals at which they are given off, serve as diagnostic characters.

GLAUCONOME LAXA, *sp. nov.*

Plate iv., Figs 33, 34.

Polyzoary erect, pinnate, at intervals bipinnate. Stem rounded, slightly curved from side to side; the convexities corresponding to the branches on the alternate equidistant pinnule; cells oval, alternate, their own length apart; bounded on the inner side by the keel, and on the outer by a slight lip—two between the pinnules, and one at the base of each pinnule. Keel broader than one-third the transverse measurement of the stem; rounded, finely granular, and bearing gently swelling, rounded tubercles: one for nearly every cell. Pinnules tapering, narrower than the stem; keel sharper. Branches as broad as stem; their base as broad as two cells and three intercellular spaces; arrangement of cells and tubercles as on stem. Obverse covered with finely granular striæ, which are more distinct and parallel on branches and pinnules.

Cells, eighteen; pinnules, six in one-quarter inch on either side.

Locality: Hairmyres, East Kilbride.

This is a very well marked species; the regular alternation of the pinnules, and the number of cells (two) in the intervals being easily recognisable, even in small fragments. *G. grandis*, M'Coy, has one cell at the base of each pinnule, and three in the intervals; but they do not alternate, and they strongly indent the margins. They are, moreover, only half their own length apart; and there are no bipinnate branches. The cells are prominent, and keel indistinct. In *G. laxa* the cells are elongate, and partly buried by the prominent keel.

The following table sums up the principal points of distinction between the species:—

NAME OF SPECIES.	Pinnate, or bi-pinnate.	Number in $\frac{1}{4}$ inch, of		Number of cells in intervals.	Cells.		Pinnules.	Curve of Pinnules towards
		Cells.	Pinnules.		Distance apart.	Alternation.		
<i>G. bipinnata</i> , Phil.,.....	Bipin.	..	..	..	.....	.....	.....	.....
<i>G. gracilis</i> , M'Coy,.....	Pin.	..	..	1	$\frac{1}{2}$ length.	alternate.	opposite.	.....
<i>G. grandis</i> , M'Coy,.....	Pin.	..	..	3	.....	sub-alter.	alternate.	.....
<i>G. pulcherima</i> , M'Coy,....	Bipin.	..	..	1	.....	.....	.....	.....
<i>G. (Diplopora) marginalis</i> ,	Pin.	26	..	..	$1\frac{1}{2}$ lengths.	alternate.	.....	.....
<i>G. elegans</i> ,.....	Bipin.	21	7	2	2 lengths.	alternate.	{ opposite, or sub-altern.	obverse.
<i>G. aspera</i> ,.....	Bipin.	20	..	..	2 lengths.	alternate.	{ irregular, distant.	.....
<i>G. flexicarinata</i> ,	Bipin.	18	9	1	{ more than length.	alternate.	sub-altern.	obverse.
<i>G. retroflexa</i> ,.....	Bipin.	18	9	1	{ more than length.	alternate.	sub-altern.	reverse.
<i>G. laxa</i> ,	Bipin.	18	6	2	length.	alternate.	alternate.	obverse.
<i>G. (Acanthopora) stellipora</i> ,	Bipin.	24	12	1	2 lengths.	alternate.	sub-altern.	.....

All of the above species of *Glauconome* were obtained from a band of limestone shale that lies over the limestone at Hairmyres old quarries, East Kilbride, Lanarkshire. This shale is highly fossiliferous, and, besides numerous other organisms, it contains several genera of Polyzoa, all of which are in an excellent state of preservation. These organisms crowd the surface of the various layers of shale, the fronds of the Polyzoa being in a more or less broken up condition. Where the shale is weathered into a soft clay, numerous fragments of these Polyzoa can easily be obtained for microscopic examination, by washing the weathered shale.

The following remarks illustrate the conditions in which the several species are found in the strata in which they occur:—

G. marginalis. This slender species is very abundant in the shale at Hairmyres. It, however, is seldom found in greater lengths than $\frac{3}{4}$ of an inch. Some of these fragments show its mode of branching at intervals. In the shale at Gillfoot and Boghead this species is more sparingly found.

G. stellipora. Moderately common in the shale at Hairmyres, in fragments rarely exceeding $\frac{3}{4}$ of an inch in length. The fragments which show the star-pores in the best state of preservation are those obtained by washing the weathered shale. In the other localities noted in the text this form is rare. Recently, we have obtained a portion of a fine frond of this species from the polyzoa shale at Dikehead pit, High Blantyre, measuring $2\frac{1}{2}$ inches in length, and 2 inches in breadth. This specimen shows the branching habit of the Polyzoon very distinctly.

G. elegans. Moderately common in the shale at Hairmyres, in fragments rarely exceeding $1\frac{1}{4}$ inches in length. This species is also found at the following localities, in the shales of which, however, it is less common than at Hairmyres:—viz., Craigenglen and Corrieburn, Campsie; Boghead, near Hamilton; Capelrig, East Kilbride; Newfield quarry and Dikehead pit, High Blantyre. At Dikehead we have found fronds of this species measuring $3\frac{1}{2}$ inches in length and 2 inches in breadth.

G. aspera. We have only, as yet, obtained this species from the shale at Hairmyres, where it is rare. It is found in the form of small branching fronds, rarely exceeding $\frac{1}{2}$ inch in length. In the weathered shale it is found in smaller fragments.

G. flexicarinata. This species is somewhat rare. In the shale at Hairmyres it is found in fragments of fronds rarely exceeding $\frac{3}{4}$ inch in length. At Dikehead pit, High Blantyre, it is found in fragments of branching fronds that measure about 2 inches in length. It also occurs in the limestone shales at Boghead and Capelrig, in small fragments.

G. retroflexa. This form is abundant in the shale at Hairmyres, in fragments of fronds about 2 inches in length, also in smaller fragments in the shale. It is also a common species in the shale of the lower limestone series of the Beith and Dalry districts, in Ayrshire, where we have found it in fragments of fronds $2\frac{1}{2}$ inches in length. It is also found at Boghead, near Hamilton.

G. laxa. This species we only know from the Hairmyres shale, where it is somewhat rare. It is found in fragments of fronds, rarely exceeding $1\frac{1}{2}$ inches in length, which show very distinctly the bipinnate mode of branching at wide intervals.

EXPLANATION OF PLATES.

All the Figures were drawn with the Camera lucida, from specimens in the Cabinet of Mr J. Young, F.G.S.

PLATE II.

Figs. 1-7.—*Glaucanome flexicarinata*, nobis.

Fig. 1 shows ridge on stem distinct from that forming lip of cell on branch. Figs. 2 and 6 show irregularity in number of ridges which in figs. 6 and 4 are reduced to isolated tubercles. In fig. 5 the ridges of stem are not continuous with those on branch. In fig. 4 the branching is nearly bifurcate. Fig. 3 (drawn upside down) shows this, as seen on the polished face of a vertical section through the middle line of stem and branches. Fig. 7 shows ornament of non-celluliferous face.

Figs. 8-10.—*G. retroflexa*, nobis.

Fig. 8—Front view of somewhat worn specimen. Fig. 10—Transverse horizontal section showing backward flexure. Fig. 9—Polished section in middle plane of stem.

PLATE III.

Figs. 11-13.—*G. retroflexa*, nobis.

Fig. 11—Unworn specimen, showing granulation of obverse. Fig. 12 shows the striation and tubercles of reverse of same specimen. Fig. 13 illustrates irregularity of ornament of reverse.

Figs. 14-21.—*G. (Diplopora) marginalis*, nobis.

Figs. 14 and 15 show the pyriform apertures due to the abrasion of the septum between the two orifices (figs. 17 and 21). Fig. 16 shows irregularity of the secondary ridges, which are obsolete in figs. 15 and 18. Fig. 19 shows the reverse face with its ornament, which is enlarged in fig. 20.

Figs. 22-24.—*G. aspera*, nobis.

Fig. 22 shows the habit of the species, natural size. Fig. 23 illustrates the character of the ornament and the twist of the stem. Fig. 24 shows the tuberculate striate ornament of the reverse.

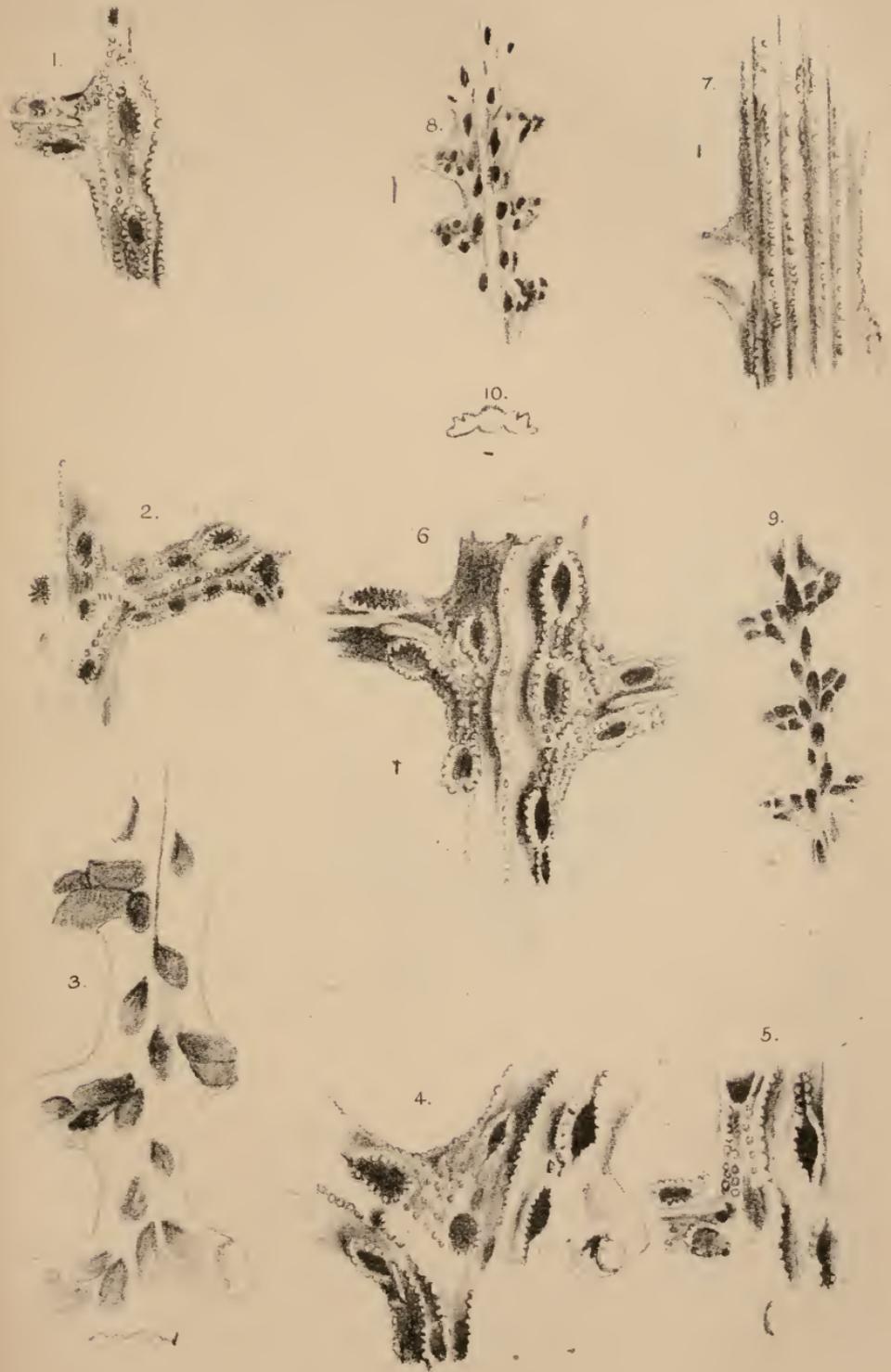
PLATE IV.

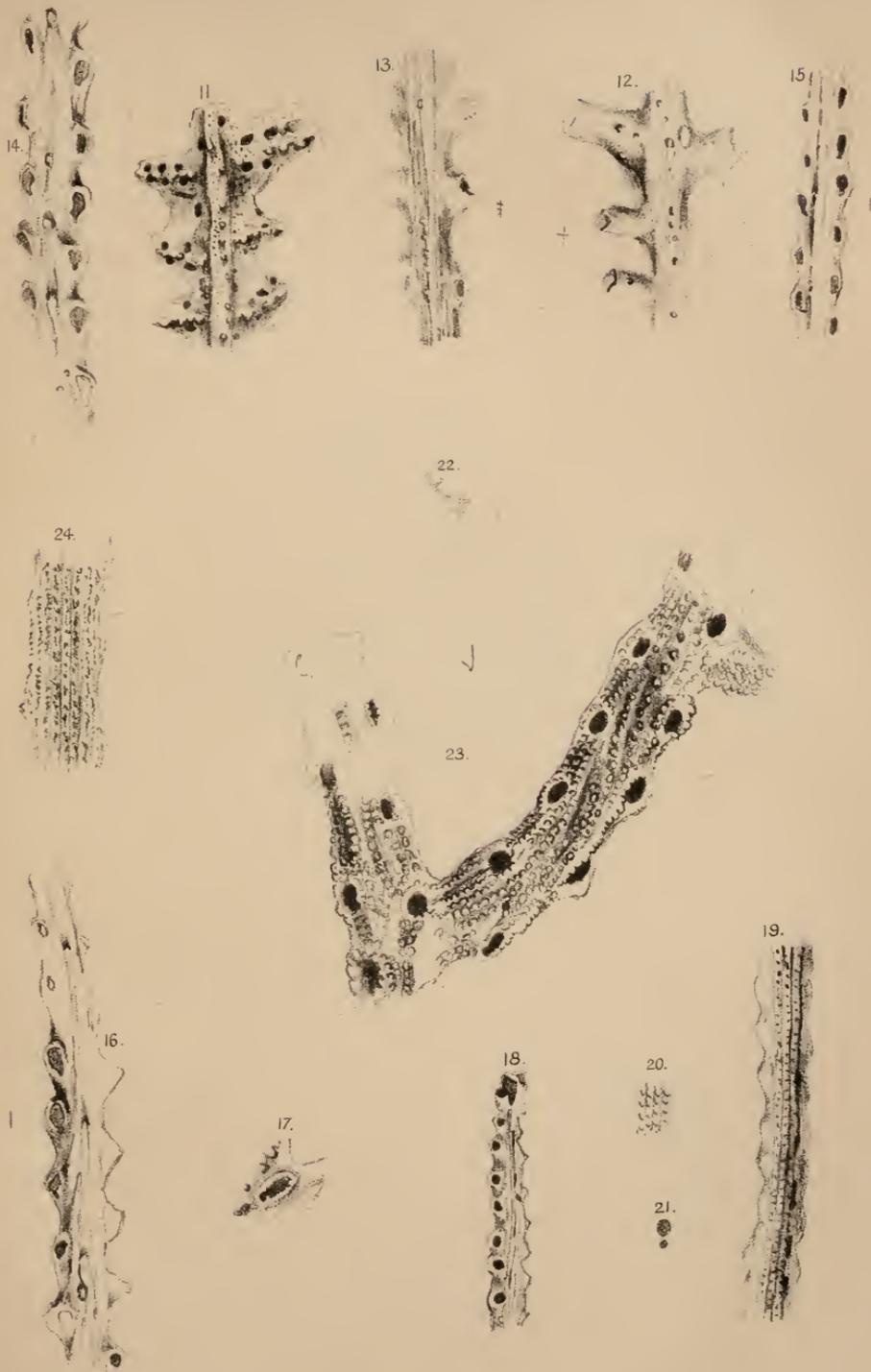
Figs. 25, 26.—*G. stellipora*, nobis.

Figs. 25, 26.—Obverse faces of different specimens.

Figs. 27-32.—*G. elegans*, nobis.

Fig. 27 is from a slightly worn specimen. Fig. 28 shows more distinctly the prominence of the upper margin of the cell aperture. Fig. 29 is an enlarge-





ment view of the ornament. Fig. 30 illustrates the habit of the species, and the diagram cross section below it shows the greater relative size of the reverse face. Fig. 32 shows the ornament of the reverse.

Figs. 33, 34.—*G. laxa, nobis.*

Fig. 33 is from a worn, fig. 34 from a better preserved specimen. The cell aperture beside the latter figure shows perhaps the proper ornament of the orifice when fully preserved.

Figs. 25 and 26 are from specimens found at Capelrig, East Kilbride; fig. 30 is from one found at Corrieburn, Campsie; all the rest are from specimens found at Hairmyres, East Kilbride.



NATURAL HISTORY CLASS ROOM, GLASGOW UNIVERSITY.

30TH MARCH, 1875.

Professor John Young, M.D., F.G.S., President, in the chair.

SPECIMENS EXHIBITED.

Professor John Young exhibited a collection of birds from the Society Islands, forwarded by the Rev. Dr Nisbet, and another from the Cape of Good Hope, presented by Mr John Ross, student of medicine. The intestines of a Wolf fish, recently purchased, was found to contain a mass of dry macerated matter, which turned out to be the plates and spines of star-fishes, sea urchins, and crabs, on which the fish had lived. Mr John Young, F.G.S., had mounted slides of these plates and spines, and showed them under the microscope. The Kelvingrove Museum lent for exhibition a stone-hammer from Stobcross, and one which had been found at New Kilpatrick; one was shown from the Hunterian Museum, found at Cadder. Dr Young spoke of the great age of these specimens, and referred to the way in which these hammers had been pierced. Some stone net-sinkers were also shown, and an iron axe head—also from the Clyde bed—the wooden shaft of which had disappeared, while the oxidation of the head had bound together a mass of sand and gravel, which had the exact shape of the metal.

Dr Knox exhibited and described an abnormal specimen of a human foetus, in which the limbs were almost sessile on the trunk, and took occasion to explain the relation of the limbs to the axis of the body, in illustration of the remarks which he made at a former

meeting on the wing of the bird. Dr Whitaker and the Chairman made some remarks on this specimen.

Mr Duncan M'Lellan, Superintendent of Parks, forwarded a vessel, filled from a ditch in Cathcart Parish, which so swarmed with red worms that it contained more worms than mud. Dr Young expressed his belief that they were one stage of development of some higher form, these worms appearing and disappearing from a district several times during a season.

Mr James Lumsden exhibited a very fine specimen of a fossil Nautilus (*N. ingens*), from the Carboniferous strata of North Ayrshire, upon which Mr John Young made some remarks, and pointed out the range of the genus throughout the various fossiliferous strata.

Mr Peter Cameron, jun., exhibited specimens of *Nematus conso-brinus*, a saw-fly, bred from the gooseberry, and found often in company with *N. ribessi*, the common gooseberry pest, which it very closely resembles. This species is an addition to the British fauna, as hitherto it has only been found in Holland. Mr Cameron also exhibited specimens of another species of *Nematus*, bred from pea-shaped green galls found on *Salix herbacea* on the Breadalbane mountains, at an elevation of from 3000 to 4000 feet, and referred to the difficulty of determining species in this extensive genus. The larva differs from its congeners in having the skin beset with small dots or tubercles. The specific name is still uncertain.

PAPER READ.

On the Post-tertiary Clay-beds at Houston. By MR JAMES COUTTS.

The Clyde post-tertiary beds have long been famous for the variety and abundance of the Arctic shells found in them. It was in these deposits that the evidence of a glacial fauna was first traced by the late Mr Smith of Jordanhill. At Dalmuir, Kyles of Bute, and other places, he found many shells, which he could not find by dredging to be living at the present time in the Firth of Clyde, and which he therefore concluded to be extinct. After many dredging cruises, in which he was assisted by the late G. B. Sowerby and others, he found that the molluscs which he thought extinct still lived in northern seas; and the idea was therefore suggested that they represented a time when the climate of Scotland was as severe as that which now prevails in Greenland or Spitzbergen. Since these facts were clearly established by Mr

Smith, many observers have interested themselves in the shelly clays, and a rich harvest of facts and observations has been reaped. Many able papers, containing lists of the organisms found in the clay-beds, have been published in the Proceedings of this Society, and those of the Geological Society of Glasgow. I hope I may be allowed to glean over the field that has been so ably worked by previous observers, and to gather after them a few stray facts.

The shell-beds of the Clyde district may be roughly grouped according to the matrix or material of which they are composed, viz., clay or sand. In the beds where sand predominates, the shells are generally closely packed together, and are often somewhat worn or abraded, while their colours have faded. In the beds formed chiefly of clay, the shells are thinly distributed, and are generally well preserved, even to their colouring. At Dalmuir and at Old Mains the sandy character prevails. At Cartdyke the molluscs are found in clay, and are encrusted with many kinds of marine organisms. Though in great abundance, the shells are found in the most confused condition possible; the causes of which led to much discussion amongst those who investigated its abnormal state some years ago. The shells in the clay beds being sparsely scattered, a collection is more difficult to make than from the sandy deposits; frequent visits are therefore necessary, and after all, unless fortune befriends the collector, his list may long remain incomplete.

My attention has been for a number of years directed to the Houston clay-field, and the collection exhibited is the result of many visits. These shell-beds are situated about two and a half miles north-west of Paisley, and are more in the centre of the plain, and further away from the boulder hillocks, from which the boulders and stones so frequently found in the laminated clay may have been derived. It is therefore comparatively free from extraneous stones or boulders, and it is only at very rare intervals that they occur, though they do turn up occasionally. I examined one large block of stone covered with *Balani*, and could only account for its presence there by its being lifted from the shore by ice and dropped into the laminated clay.

The depth of the clay worked at Houston is about 20 feet. The clay crops out at the surface, and 10 feet down is the shell-bed proper; 10 feet under this, or 20 feet from the surface, there is the appearance of another shell-bed, but whether it is as continuous

as the upper one, would require further investigation. The organisms got in the lower shell-bed are all of a dwarfed character. The same species appear in the upper bed, but a great many of those got here do not appear in the lower shell-bed. What may be the entire depth of this clay-field I am unable to say, but from the journal of bores taken in the neighbourhood of Houston and Johnstone, there appears to be a great depth of laminated and boulder clay; one bore gave more than 90 feet of soft muddy clay, with about 3 feet of till and stones on the rock head. At Walkinshaw, within a mile or so, numerous bores prove a great depth of surface, sometimes as much as 160 feet, and 90 to 100 feet is common. The most of these bores have muddy clay extending the whole depth. Some few have 30 or 40 feet of boulder clay at the bottom, capped by double that thickness of muddy clay. In two or three bores boulder clay extends from top to bottom, being more than 100 feet. From these facts it is clear that the muddy clay lies in hollows in the boulder clay, which is evidently an older formation. It is not likely, considering the circumstances of its formation, that this boulder clay was formerly uniform in thickness, still I believe that it extended more generally over the rock surface than is now the case, and that it must have suffered much denudation ere the deep hollows were formed in which the muddy clay is deposited. But however these hollows may have been formed, there can be little doubt that the beds of muddy clay, now lying in and over them to a depth of 100 to 130 feet, were formed in the sea.

It may be interesting here to consider how some of these changes were effected, and to endeavour to trace out what may have been the course of events. It is clear that the greater part of the glacial period had passed ere the clays containing Arctic shells were laid down. The great mass of boulder clay lying below them proves this, and it is probable that even the severest cold had given place to a comparatively milder temperature. The land and sea had changed places, or rather a moderate submergence had brought the sea over all the lower parts of Clydesdale, and land ice had given place to sea water. This comparatively shallow sea extended from the Gleniffer braes on the south, to the Lennox hills on the north, and from Bowling to Bothwell, receiving directly the drainage of the country surrounding, on the north and south, and that from the east was doubtless poured into it by a

stream of shorter length, but ampler volume, than that of the present Clyde. The amount and character of that drainage, and the quantity of sediment or mud it brought with it, can be only roughly guessed at from the condition of the land. The ice sheet had lifted from the lowlands, but still lay in patches upon the higher grounds, and from it local glaciers descended by the minor valleys to the sea. The higher parts of the Kilmalcolm, the Eaglesham, the Kilpatrick, and the Campsie hills were probably still shrouded in snow and ice, and down their glens the drainage flowed, first as ice, but gradually changing into water. The upper parts of Clydesdale, surrounded by even higher hill ranges than the lower, were also in like manner doubtless covered with ice, and yielded much glacial water. All glacier streams are full of mud—the finer waste of the land. This mud would begin to sink as soon as it came into still water, precipitation being quickened where the saltness was sufficient to make the water brackish, as shown by the experiments of Mr David Robertson. Thus were the great beds of muddy clay formed. The occasional boulders, and numerous smaller stones often found with them, would be brought by ice from the shore—by icebergs and ice-floes, and dropped as they melted or foundered. At first, immediately after the submergence, the deposition of the mud was probably rapid, and the lower portion of the muddy clay was formed in much less time than the upper, perhaps even before the marine fauna of the great sea outside the land had time to enter in and possess this little inland sea. But however that may be, the whole time occupied in the deposition of the muddy clay was doubtless a long one, and the conditions, though varying at times, were in the main similar throughout. In the very thickest of the shell-beds boulders occur, and striated stones are frequent; showing that much ice was abroad in the sea in which the Arctic shells lived. The grouping of the shells, also, in some of the beds—and notably in that of Houston—indicates also, I think, the action of ice as a carrying agent. Many of the shells belong to littoral species, and are found living only between tide-marks, on stony or rocky shores; yet here we have them deposited among mud, alongside of shells which inhabit deep water. How does this happen? I suppose it to be by the shore shells becoming frozen into shore ice, and lifted by it and carried seawards. From this, or other causes, so large a proportion of the shells found at

Houston are littoral—that I have often supposed that the shore could not be far distant, probably not more than a mile. The same prevalence of littoral shells has been observed in many of the other shell-beds of the Clyde district, and the same conclusion has been drawn therefrom—that they were all, more or less, situated near the shore.

LIST OF FOSSILS FOUND IN HOUSTON CLAY-FIELD.

PISCES.

A few small vertebræ, - - - - Not determined.

CONCHIFERA.

Anomia ephippium, Linn., - - - Common.
Mytilus edulis, Linn., - - - - Common.
 ——— *modiolus*, Linn., - - - - Common.
Pecten Islandicus, Müll., - - - - Common, but small.
Tellina calcarea, Chemn., - - - - Common.
Saxicava rugosa, Linn., - - - - Common.
Astarte compressa, Mont., - - - - Common.
 ——— *sulcata*, Da Costa, - - - - Common.
Cyprina Islandica, Linn., - - - - Common, but small.
Mya truncata, Linn., - - - - - Common.
Leda pernula, Müll., - - - - - Common.
 ——— *pygmæa*, Münster, - - - - - Common.
Axinus flexuosus, Mont., - - - - - Common.
Nucula tenuis, Mont., - - - - - Common.
Pholas crispata, Linn., - - - - - Rare, one specimen.
Cardium fasciatum, Mont., - - - - - Common.

GASTEROPODA.

Buccinum undatum, Linn., - - - - Common and large.
Fusus antiquus, Linn., - - - - - Common and large.
Littorina littorea, Linn., - - - - - Common and large.
 ——— *obtusata*, Linn., - - - - - Common.
Trophon clathratus, F. and H., - - - - - Rare, one specimen.
 ——— var. *Gunnerie*, - - - - - Rare.
Rissoa striata, Adams, - - - - - Common.
 ——— *parva*, Adams, - - - - - Common.
 ——— var. *interrupta*, - - - - - Rare.

<i>Puncturella noachina</i> , Linn.,	- -	Rare, two specimens.
<i>Utriculus obtusus</i> , Mont.,	- - -	Common.
<i>Patella vulgata</i> ,	- - - - -	Two specimens, large.
<i>Homalogyra atomus</i> , Phil.,	- - -	Common.
<i>Trochus grœnlandicus</i> , Chemn.,	-	Rare.
<i>Natica affinis</i> , Gmel.,	- - - -	Rare.
——— <i>grœnlandica</i> , Beck,	- - -	Moderately rare.
<i>Skenea planorbis</i> , Fabr.,	- - - -	Moderately rare.
<i>Tectura virginica</i> , Müll.,	- - - -	One specimen.
<i>Velutina lævigata</i> , Linn.,	- - -	One fry.
<i>Aporrhais pes-pellicani</i> , Linn.,	- -	One fry.
<i>Lacuna divaricata</i> , Fabr.,	- - -	Moderately common.

POLYZOA.

<i>Membranipora Flemingii</i> , Busk,	-	Rare.
<i>Discorporella Grignonensis</i> , Busk,	-	Rare.
<i>Canda reptans</i> , Linn.,	- - - -	Common.

CRUSTACEA.

<i>Plates</i> ,	- - - - -	Undetermined.
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OSTRACODA.

<i>Cytheridea punctillata</i> , Brady,	- -	Common.
<i>Cythere concinna</i> , Jones,	- - - -	Common.

CIRRIPEDIA.

<i>Balanus porcatus</i> , Da Costa,	- -	Common.
——— <i>crenatus</i> , Brug.,	- - - -	Rare.
<i>Verruca Strömia</i> Müll.,	- - - -	Common.

ANNELIDA.

<i>Serpula vermicularis</i> , Ellis,	- - -	Common.
<i>Spirorbis carinatus</i> , Flem.,	- - -	Common.

ECHINODERMATA.

<i>Echinus sphaera</i> , Müll.,	- - - -	Common.
——— <i>spatungidæ</i> ,	- - - -	One spine.

FORAMINIFERA.

<i>Polystomella striato-punctata</i> , F. and	
M., - - - - -	Common.
<i>Nonionina turgida</i> , Will., - - -	Common.
<i>Quinqueloculina seminulum</i> , Linn., -	Common.

SPONGIA.

<i>Cliona celata</i> , Grant, - - - - -	Common.
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ALGA.

<i>Melobesia polymorpha</i> Linn., - -	Common.
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The Librarian announced the following donations to the Library :—Proceedings of the Literary and Philosophical Society of Manchester, Vol. xiv., Parts i. to ix., 1874–75; Transactions of the Geological Society of Glasgow, Vol. v., Part i.; Transactions of the Manchester Geological Society, session 1875; from the respective Societies. Geology of the Clyde Valley, by John Young, M.D., F.G.S.; On a new genus of Carboniferous Polyzoa, by John Young, M.D., F.G.S., and John Young, F.G.S.; Notice of *Salix Sadleri* and of *Carex frigida*, both recently discovered in the Highlands of Scotland, by John Sadler, F.R.P.S.; from the respective authors.

ANDERSON'S UNIVERSITY BUILDINGS.

27TH APRIL, 1875.

Mr James Ramsay, Vice-President, in the chair.

The Rev. Francis P. Flemyng, LL.D., was elected a life member, and Mr John A. McLean an ordinary member.

- SPECIMENS EXHIBITED.

Mr David Robertson, F.G.S., exhibited a specimen of an annelid, *Phyllodoce lamellingera* (Turton), taken this season at Fintry Bay, Cumbrae, near low-water mark. Mr Robertson said this beautiful annelid has been found in the Firth of Forth, Berwick Bay, Falmouth, and South Devon, but it has not hitherto been recorded as met with on the West Coast of Scotland. He had once or twice

found it in the dredge among the roots of *Laminaria*, but always of small dimensions (6 or 7 inches), while the specimen exhibited is fully 16 inches in length. It was first noticed with 3 or 4 inches of its body wriggling out of the sand, and this it continued to do until the whole of it had gained the surface, when it moved slowly along with an undulating motion. Another was found close by, on the soft sand, travelling seaward. From the trail, it was noticed to have burrowed through a sand ripple in preference to moving over it, although the obstructive ridge did not exceed 2 inches in height. About 4 inches of the anterior end of another was found at a little distance, still in life, and to all appearance as full of vivacity as its unmutilated neighbours. Fourteen days later, at the next spring tide, which was exceedingly low, the sands were traversed from end to end without finding another specimen; nor had he met with these worms before, although for the last dozen years he had been a regular visitor to these sands at low water. Whether some exceptional state of the weather, or mere accident, was the cause of the turn-out of this species at the time may be hard to determine. There is no doubt, however, that some animals appear in far greater abundance at a particular time than they do again throughout the season.

Mr Peter Cameron, jun., exhibited a head of Indian corn, brought to this city from the United States, and which had the interior of a considerable number of the grains consumed by the larvæ of a moth (*Gelechia cerealella*), an American species, which has done great injury to the crops in that country. It was first heard of in 1750, and about that time began to spread over France, causing much damage to wheat, barley, and maize. A number of the moths had emerged in Glasgow, and it seems not unlikely they may spread in this country, and produce damage among the cereals.

Dr James Stirton, V.P., exhibited a number of new Lichens, collected by Mr George Thomson at Fernando Po, and by Mr Grant at Bonny River, and remarked that the flora of South-Western Africa is a typical one, and corresponds very closely with that on the opposite side of the Atlantic. He then described the specimens in detail, and stated that he had named one of them in honour of Mr Thomson, who had obtained it at a considerable elevation on Clarence Peak, a mountain which reaches an altitude of over 10,000 feet.

Mr Thomas Chapman exhibited several specimens of the Colorado beetle (*Doryphora decemlineata*), which had been received from Canada by Mr D. C. Glen, and remarked that this insect had caused great destruction to the potato crops in the Western States on this side of the Rocky Mountains, but does not seem to have extended to the further side, in consequence, it is thought, of the moister climate which prevails there. Great fears have been entertained that it might invade this country, but from what he had seen written on the subject, and from the report of Professor Westwood, who informed him that the insect is only found between 38° and 43° north latitude, he did not think there was any danger of it appearing here.

Mr Glen stated that the specimens were obtained at the southern boundary of Lake Huron, in the spring of 1874, but had not been brought to this country until the present year; and on two occasions, one of which was recent, upon being put for some time in the heat of the sun, they had shown evident signs of vitality. Mr Glen gave information, supplied by his correspondents, regarding the history and habits of the beetle, and quoted statistics showing the extent of its ravages among the potato crops, in some instances one-third of the plants having been destroyed, the leaves and stalks being eaten away down to the soil.

Mr John Young, F.G.S., exhibited a series of specimens of finely preserved Carboniferous Polyzoa from Dykehead pit, High Blantyre. He stated that in the working of the two posts of limestone in the above pit, the fossiliferous shale that lies between them is brought to the pithead, and from it he had recently obtained more perfect fronds of various Polyzoa than he had yet met with in that district. Some of these belong to the beautiful genus *Glaucanome*, and measure $3\frac{1}{2}$ inches in length by 2 inches in breadth. They show the branching form of the organism in a condition that is seldom met with in the other polyzoa shales of the West of Scotland. The species he had found belong to *G. elegans*, *G. flexicarinata*, *G. stellipora*, and *G. marginalis*. He exhibited some fronds, from the same shale, of *Actinostoma fenestratum* (a beautiful star-pored Polyzoon), measuring 4 by 3 inches, being of a greater size than any he had hitherto obtained; also, some species of *Fenestella*, which he believed to be undescribed. Mr Young stated that as the shale in which these delicate organisms are embedded readily falls to pieces under the influence of the weather,

there is some difficulty in preserving specimens for the cabinet. He therefore explained the method he adopted, and by which the largest fronds may safely be secured.

The following donations to the Library were announced by the Librarian :—Transactions and Proceedings of the Botanical Society of Edinburgh, Vol. xii., Part i., 1875 ; Eighth Annual Report of the Perthshire Society of Natural Science, 1875 ; Catalogue of the Library of the Manchester Geological Society, 1875 ; from the respective Societies. Loudon's Magazine of Natural History, 5 Vols. ; from Mr William Sinclair.

CONSTITUTION
OF THE
NATURAL HISTORY SOCIETY
OF GLASGOW.

[Unanimously adopted at a Meeting of the Society,
on 27th May, 1873.]

I.

Name of the Society.

The Society shall be called the "NATURAL HISTORY SOCIETY OF GLASGOW."

II.

Objects of the Society.

The Objects of the Society shall be to encourage the pursuit of Natural History in all its branches, and to foster a love of the science amongst the members by—

- (1.) Meetings for the reading of Papers and Communications, and the exhibition of Specimens.
- (2.) Excursions for practical study and mutual help.
- (3.) The formation of a Library for the use of members.
- (4.) Printing of the Society's Proceedings.

III.

Members of the Society.

The Society shall consist of Ordinary Members, of Corresponding Members, and of Honorary Members.

IV.

Ordinary Members.

Every candidate for Membership shall be recommended by at least three members, to one of whom he must be personally known.

Such applications shall be read by the Secretary at an Ordinary Meeting, and shall be printed in the circular calling the ensuing Ordinary Meeting; at which they shall be balloted for.

Upon election each Ordinary Member shall sign a minute of agreement to the Rules, thereupon receiving the Diploma of the Society.

All members leaving Glasgow for a year or longer, shall, upon written request to the Secretary, become entitled to suspend membership, and to resume its privileges, on their return, upon payment of the current year's subscription. Should they wish to become Corresponding Members, they shall be proposed and balloted for as provided for in Rule V.

V.

Corresponding Members.

Persons from whom information upon Natural History subjects may be expected shall be eligible as Corresponding Members. Having been recommended by three members at an Ordinary Meeting, their names shall be printed in the circular calling the ensuing Ordinary Meeting; at which they shall be balloted for.

Corresponding Members shall be entitled to attend all Meetings and Excursions of the Society. They shall not be entitled to vote at any Meetings, nor to use the Library, nor to receive the printed Proceedings. They shall not be liable for Entry-money nor Annual Subscriptions.

The Council, however, shall have power to grant all the privileges of Ordinary Members to Corresponding Members, in such cases as it may think fit.

VI.

Honorary Members.

Naturalists of known reputation shall be eligible as Honorary Members. Having been recommended by a quorum of the

Council, their names shall be printed in the circular calling the ensuing Ordinary Meeting; at which they shall be balloted for.

Ordinary Members shall be entitled to the same privileges as Corresponding Members.

VII.

Council—Office-Bearers.

The business of the Society shall be managed by a Council of sixteen, consisting of a President, three Vice-Presidents, nine Councillors, a Secretary, a Treasurer, and a Librarian, who shall take office for three years. One of the Vice-Presidents, and three Councillors, shall retire annually by rotation.

The election of Office-Bearers shall take place at the General Meeting in September of each year. Those retiring shall be eligible for re-election.

The Council shall have power to reject applications for membership; to settle all disputes arising from the business of the Society; to enact Bye-laws on points not provided for by the Rules; to fill up vacancies in the Council occurring during the Session, until the following General Meeting; and generally to superintend and govern the whole affairs of the Society.

Five Members of Council shall form a quorum.

VIII.

President and Vice-Presidents.

The President shall be Chairman of the Council, and of all meetings at which he may be present.

When he is absent, one of the Vice-Presidents shall take the Chair, and, failing them, any Member of Council may be voted into the Chair.

IX.

Secretary.

The Secretary shall act both for the Society and the Council. He shall record the Proceedings in the Minute Book, and shall also prepare Abstracts of them for newspaper publication.

He shall conduct the correspondence of the Society.

X.

Treasurer.

The Treasurer shall take measures to collect, and shall receive all subscriptions and moneys due to the Society, and shall make such payments as the Council may direct. He shall keep an account of his intromissions in the cash-book of the Society, which he shall balance at the end of August in each year.

The Balance Sheet shall be audited by two members, not being Members of Council, who shall have been chosen by the Council; and shall be printed in the circular calling the General Meeting in the following September.

The Treasurer shall open an account, in his own name and those of two Office-Bearers jointly, with one of the Glasgow Banks, and shall pay into it all funds of the Society whenever these accumulate in his hands to £2 or upwards.

The Treasurer shall also keep a register of the names and addresses of members, which shall be printed in the circular calling the General Meeting in September of each year.

XI.

Librarian.

The Librarian shall take charge of the books belonging to the Society, and shall keep a catalogue of them in a book provided for the purpose.

He shall give out books on each Ordinary Meeting night of the Session, and shall register the names of members who take them.

He shall also take charge of the distribution of the Society's printed Proceedings, both to members, to the public, and in exchange for those of kindred Societies. Such sums of money as may be received from the sale he shall pay to the Treasurer.

XII.

Meetings, Ordinary and Special.

The Session of the Society shall extend from September of each year to the following April.

The Ordinary Meetings shall be held on the last Tuesday of

each month during the Session, at 8 o'clock P.M., having been previously intimated by circular.

Special Meetings may be held during the Session, and Excursions during the year, on such days and at such hours as may be fixed by the Council. They shall be intimated by circular, and advertised once in the Glasgow Daily Newspapers.

At any meeting seven members shall form a quorum.

XIII.

Order of Business.

The Order of Business at the Ordinary Meetings of the Society shall be as follows:—

The Minutes of the previous meeting shall be read, amended if required, and approved of.

New members shall be admitted.

Proposed members shall be balloted for.

Applications for membership shall be announced.

Miscellaneous business shall be brought up.

Specimens shall be exhibited, with remarks.

Papers and communications shall be read and discussed.

XIV.

Annual General Meeting.

The Annual General Meeting of the Society shall be held on the last Tuesday of September in each year, being the first meeting of the Session.

The order of business at this meeting shall be as follows:—

The Treasurer shall read a statement of the financial affairs of the Society.

The Secretary shall read the report of the Council on the business of the past year.

The Librarian shall give a report on the state of the Library, the circulation of books, &c.

The Society shall proceed to the election of Office-Bearers, so far as there may be vacancies.

XV.

Circulars.

The business of each meeting of the Society shall be announced by circular issued at least three clear days previously. The names of proposed Members, Ordinary, Corresponding, or Honorary, shall be printed in the circular calling the meeting at which they are to be balloted for.

The circulars shall not be sent to Corresponding nor Honorary Members, unless such members make a written application to the Secretary, requesting the circulars to be sent them for the Session.

The circular issued in September of each year, containing the financial statement and the List of Members, shall be sent to every member on the roll, whether Ordinary, Corresponding, or Honorary.

XVI.

Removal of Members from the Roll.

If a written notice of motion for the removal of the name of any member from the roll of the Society, and signed by five or more members, shall be received by the Secretary, such notice shall be read at the first Ordinary Meeting thereafter, and shall be printed in the circular calling the ensuing Ordinary Meeting. The motion shall at that meeting be put to the vote, and if supported by three-fourths of the members present, it shall be declared carried.

XVII.

Voting.

All votes of the Society, when not unanimous, shall be taken by ballot. The election of members shall in all cases be made by ballot, one black ball in five excluding. Corresponding and Honorary Members shall not be entitled to vote, nor shall Ordinary Members who are in arrear of their subscriptions.

XVIII.

Subscriptions.

The Entry-Money shall be 10s, and the Annual Subscription, 5s. Should the sum in the Treasurer's hands be insufficient to meet

the current expenses of the Society, the Ordinary Members shall be liable to make up the deficit in equal proportions, and it shall be competent for the Treasurer to levy and collect such sums.

Members shall be liable for their subscriptions up to the date at which they shall give written notice to the Secretary of their resignation or suspension (Rule IV.)

Members whose subscriptions are in arrear shall not be entitled to vote, nor to use the Library, nor to receive the printed Proceedings of the Society.

Life Membership may be compounded for by a single payment of £5 5s.

XIX.

Proceedings of the Society.

The Proceedings of the Society shall be printed and issued as soon as practicable after the close of each Session. They shall be edited by a Printing Committee, to be elected annually by the Council, and this Committee shall decide which Papers or Abstracts of Papers shall be printed, and to what extent they shall be illustrated.

Ordinary Members shall be entitled to receive, free of charge, one copy of each part of the Society's Proceedings issued after the date of their election. But should sufficient funds not be available for the purpose, the Council shall have power to fix a charge for each Part, not exceeding the cost price thereof. Duplicate and back Parts shall in all cases be charged for.

The Proceedings shall be on sale to the public at 20 per cent. above members' prices.

Authors of Papers printed in the Proceedings shall be entitled to receive 20 copies of their Papers free.

XX.

Motions affecting the Constitution.

Notices of Motions affecting the Constitution of the Society shall be read at an Ordinary Meeting. They shall be printed in the circular calling the ensuing Ordinary Meeting; at which they shall be brought up for discussion. If voted for by three-fourths of the members present they shall be declared carried.

XXI.

The Library.

The Council shall have power to add to the Library suitable books. A motion made and seconded at an Ordinary Meeting for the addition of any book to the Library shall be remitted to the Council, whose decision shall be final. The Council shall have power to reject books presented to the Library if they are found unsuitable.

XXII.

Donations to the Society.

Any donations to the Society, except Books and MSS., may, if approved by the Council, be presented to one of the local museums. In the event of the Society deciding to form a collection in any special branches of Natural History, suitable donations will of course be retained for that purpose. All donations accepted shall be acknowledged in the Society's circular.

List of Societies to which copies of the Proceedings of the Natural History Society of Glasgow are sent, and with most of which exchanges are made:—

Bath Natural History and Antiquarian Society.
Belfast Naturalists' Field Club.
Berwickshire Naturalists' Field Club.
Brighton and Sussex Natural History Society.
Bristol Naturalists' Society.
Chester Society of Natural Science.
Dublin Natural History Society.
Dumfries and Galloway Natural History Society.
Eastbourne Natural History Society.
Edinburgh Botanical Society.
Edinburgh Geological Society.
Entomological Society of London.
Glasgow Archaeological Society.
Glasgow Philosophical Society.
London Geologists' Association.
Malvern Naturalists' Field Club.
Manchester Geological Society.
Manchester Literary and Philosophical Society.
Manchester Scientific Students' Association.
Norfolk and Norwich Naturalists' Society.
North Staffordshire Naturalists' Field Club.
Paisley Philosophical Society.
Perthshire Society of Natural History.
Quekett Microscopical Club.
Royal Geographical Society.
Royal Geological Society of Ireland.
Royal Physical Society of Edinburgh.
Société Royale des Sciences de Liège.
Watford Natural History Society.

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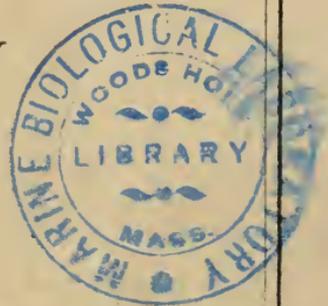
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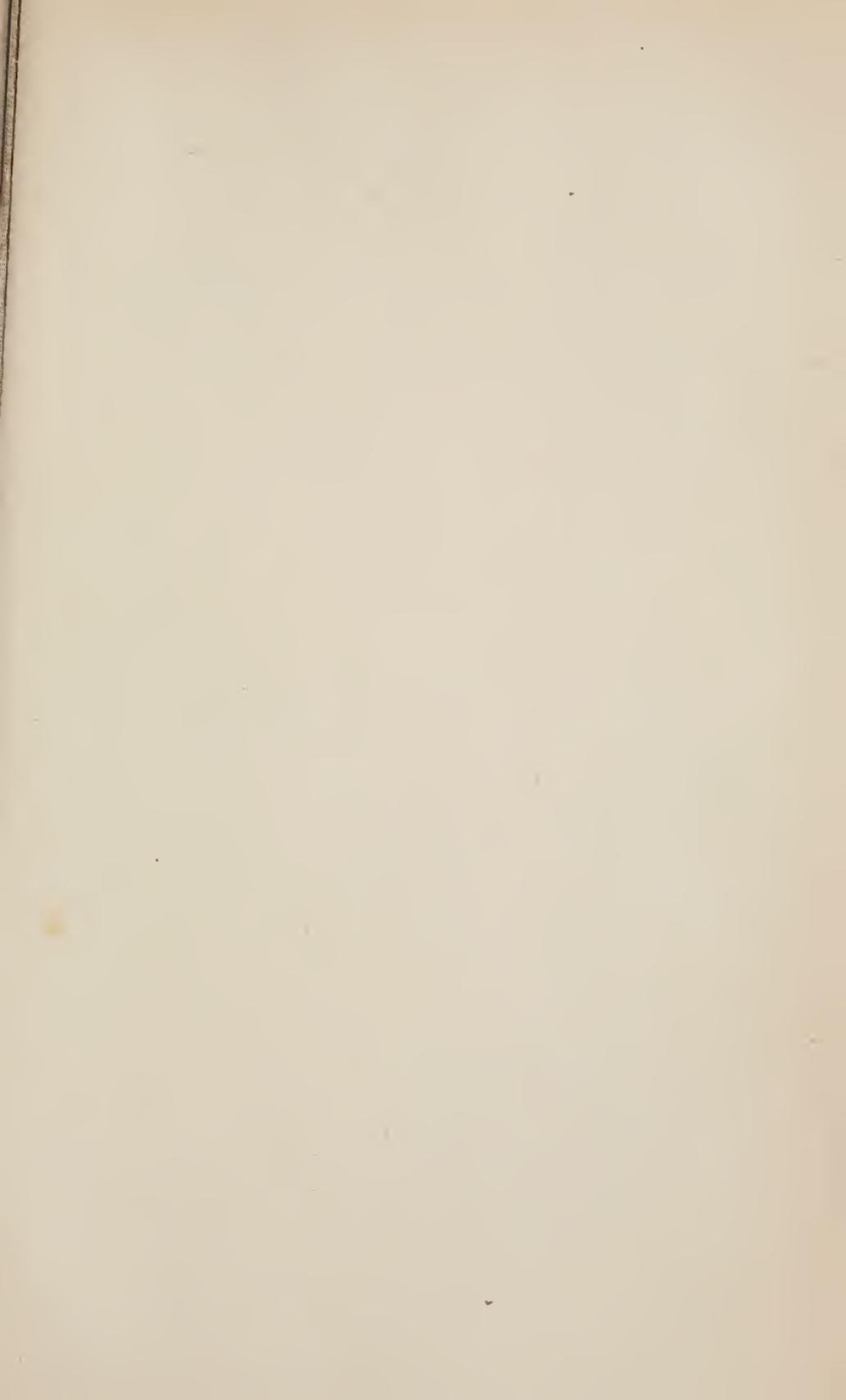
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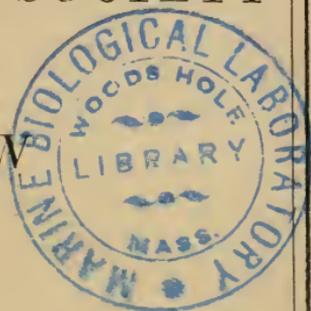
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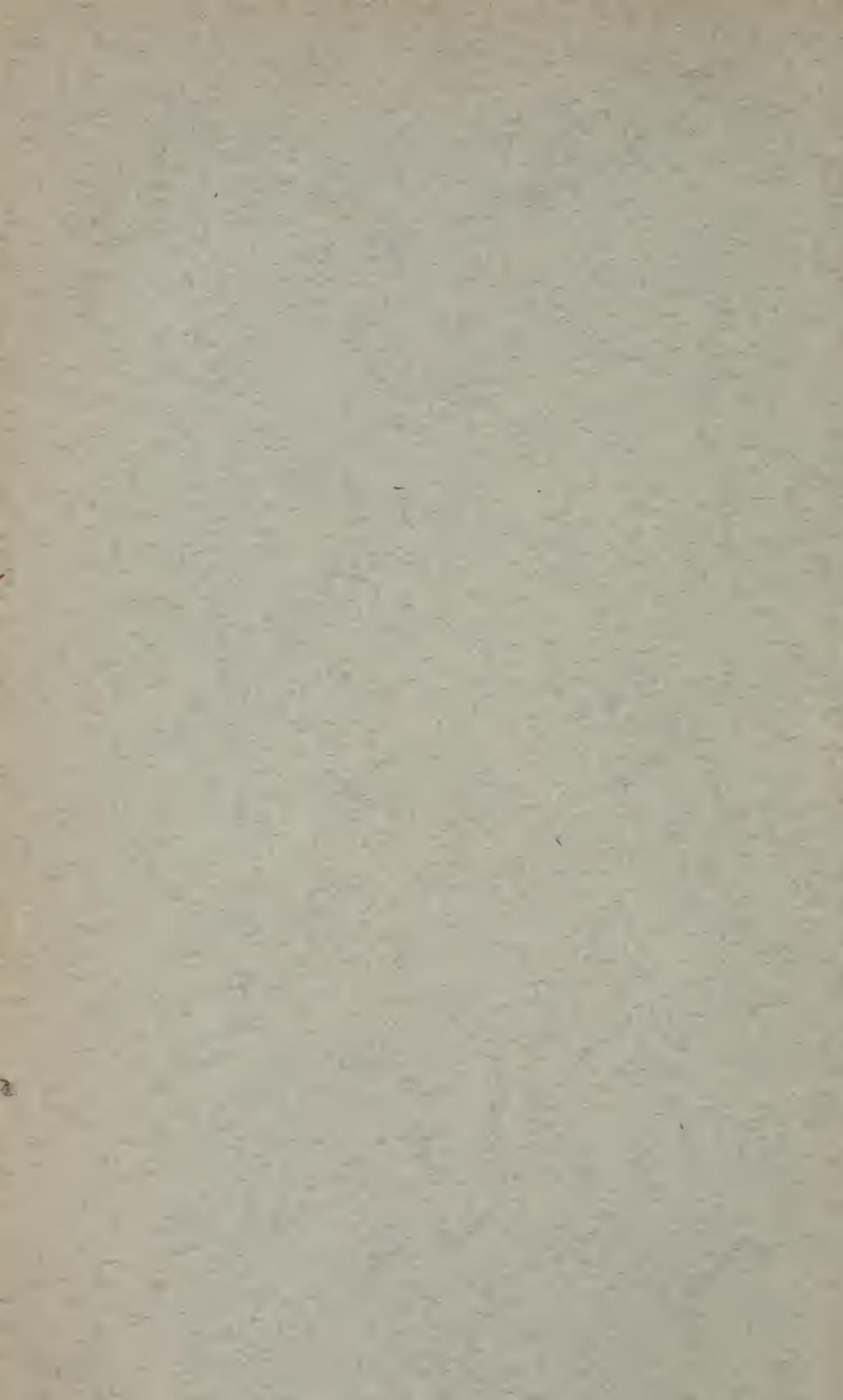
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