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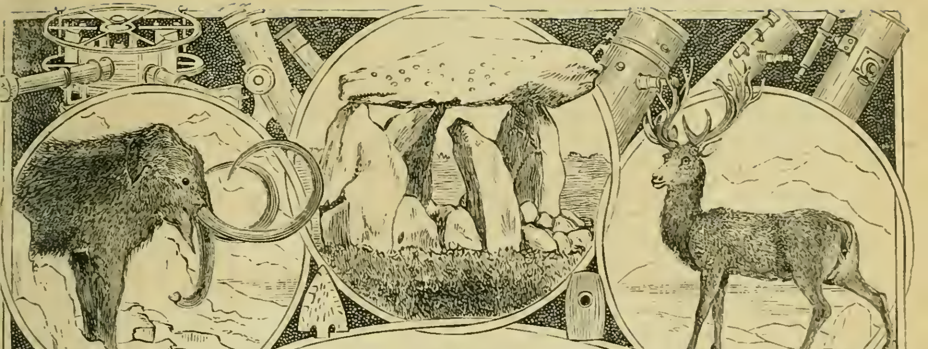

THE MIDLAND NATURALIST:

THE JOURNAL OF THE
ASSOCIATED NATURAL HISTORY, PHILOSOPHICAL,
AND ARCHÆOLOGICAL SOCIETIES AND FIELD CLUBS
OF THE MIDLAND COUNTIES.

EDITED BY

E. W. BADGER & W. J. HARRISON, F.G.S.

"Come forth into the light of things,
Let Nature be your teacher."
Wordsworth.

VOLUME V.

1882.

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PREFACE.

The undoubted merits of the very able Report on the Pennatulida which occupies something like one-fourth of the present Volume have been recognised by the award of the Darwin Medal to the authors, Professor A. Milnes Marshall, M.A., M.D., D.Sc., Professor of Zoology in Owens College, and Mr. W. P. Marshall, M.I.C.E. To the liberality of the Committee of the Birmingham Natural History and Microscopical Society the Editors are indebted for the excellent reproductions of the authors' exquisite drawings illustrating the Report, which have been done at the sole cost of the Society.

The Editors beg to thank their band of regular contributors for the valuable assistance they have rendered during the past year, and solicit a continuance of their help in the future. They will also gladly welcome contributions from other competent naturalists, to whom the pages of the Magazine will always be open.

Space will be set apart for questions from inquirers seeking information, and no pains will be spared to obtain replies from reliable authorities.

The Darwin prize in 1883 being limited to Archæology, the Editors will be glad to receive suitable papers not later than the 31st of March next.

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ILLUSTRATIONS IN VOLUME V.

PLATES.

CORRECTIONS.

Page 1, 25—The date of the Oban Marine Excursion should be July (not August) 1881.
,, 34—Transfer bottom line to page 35 and insert it above second line from bottom of page.
,, 36—Lines 9 to 11, read 0·014in. by 0.001in., 0·003in. by 0·002in.
,, 45—Delete heading "Review."
,, 77—Line 9, for $\frac{1}{100}$th read $\frac{1}{1000}$th.
, 97—Note at foot of page, for Plate III. read Plate IIa.

INDEX.

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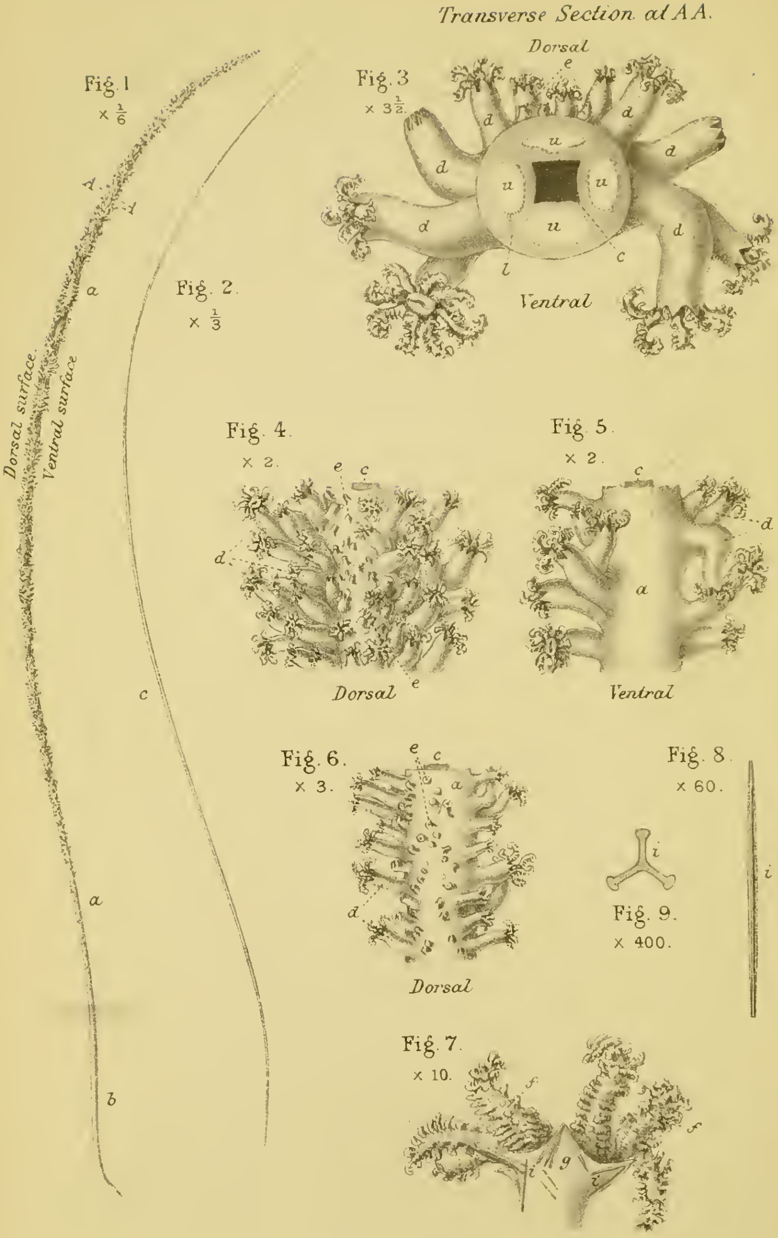
Plate I.



W. P. Marshall del. F. Huth, Lith^r Edin^r

FUNICULINA QUADRANGULARIS.

THE MIDLAND NATURALIST.

"Come forth into the light of things,
Let Nature be your teacher."

REPORT ON THE PENNATULIDA

COLLECTED IN THE OBAN DREDGING EXCURSION OF THE BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY, AUGUST, 1881.

BY A. MILNES MARSHALL, M.A., D.SC., PROFESSOR OF ZOOLOGY IN OWENS COLLEGE, AND W. P. MARSHALL, M.I.C.E.

The specimens of Pennatulida or Sea-pens obtained in the Oban dredging expedition, and placed in our hands for description, include examples of three species, *Pennatula phosphorea*, *Virgularia mirabilis*, and *Funiculina quadrangularis*, belonging to three distinct genera and even families. The following table, abridged from the scheme of classification proposed by Kölliker in his Report on the Pennatulida

DESCRIPTION OF THE FIGURES IN PLATE I.

Figures 1 and 2 are reduced from full-sized drawings made by tracing the outline direct from the original objects. Figs. 4–9 are drawn direct with the camera from the objects themselves. Fig. 3 is constructed from separate camera drawings of the dorsal, ventral, and lateral surfaces; the four main canals, indicated by the dotted lines, are filled in from one of Kölliker's figures (*op. cit.* Pl. xvii., Fig. 151). The magnifying power is indicated in diameters for each figure. Figs. 1, 3, 4, 5, 7, 8, 9 are from the largest living specimen.

Alphabetical List of References.

a. Rachis.	*f.* Tentacle.
b. Stalk.	*g.* Calyx.
c. Stem.	*i.* Spicule.
d. Polype.	*l.* Cœnenchym, or fleshy body-substance.
e. Zooid.	*u.* Main canals of rachis.

Fig. 1.—Lateral view (right side) of the largest specimen, 39 ins. long, dredged living, shown in its supposed natural position with the stalk planted in the mud of the sea bottom, × 1-6th.

Fig. 2.—Similar view of perfect bare stem, 24ins. long × 1-3rd.

Fig. 3.—Transverse section of rachis at its widest part, showing zooids on dorsal surface, and polypes gradually increasing in size from the dorsal towards the ventral surface, leaving the actual ventral surface bare; also the quadrangular stem, and the four main canals of the cœnenchym, × 3½.

Fig. 4.—Portion of dorsal surface of largest living specimen at the widest part of the rachis, about 6ins. from top, showing arrangement of zooids and polypes, × 2.

Fig. 5.—Ventral surface of the same portion, as in Fig. 4, × 2.

Fig. 6.—Portion of dorsal surface of younger specimen (20 ins. long) at widest part of rachis, showing arrangement of zooids and polypes, × 3.

Fig. 7.—Head of a polype, showing calcareous spicules in the calyx and its processes, × 10.

Fig. 8—.One of the calcareous spicules from the calyx, × 60.

Fig. 9.—Transverse section of calcareous spicule at the middle of its length × 400.

collected by H. M. S. Challenger,* shows the relative positions and affinities of the three genera:—

ORDER.—PENNATULIDA.

SECTION I.—*Pennatuleæ:* polypes on leaves.

Family 1. *Pteroeididæ.*

Family 2. *Pennatulidæ.*

Genus, *Pennatula.*

Family 3. *Virgularidæ.*

Genus, *Virgularia.*

Family 4. *Stylatulidæ.*

SECTION II.—*Spicatæ:* polypes sessile.

Family 1. *Funiculinidæ.*

Genus, *Funiculina.*

SECTION III.—*Renilleæ:* rachis expanded in form of a leaf.

SECTION IV.—*Veretilleæ:* polypes arranged radially, not bilaterally.

Of the three genera with which we are concerned *Funiculina* is the rarest, and in many ways the most interesting, and we therefore propose to deal with it first, reserving *Pennatula* and *Virgularia* for subsequent papers. An additional reason for adopting this course is afforded by the fact that while the internal structure of *Pennatula* and *Virgularia* has been described and figured by various writers, that of *Funiculina* is known to us only through the very careful and elaborate description given by Kölliker in his monograph on the Pennatulida;† and this description, though very full, is yet incomplete in some points on which the opportunity of examining perfect specimens, either living or recently preserved, has enabled us to throw some light.

We have devoted special attention to the figures illustrating this paper, all of which have either been drawn direct from the object with the aid of a camera, or else, where—as in Plate I. fig. 3—it was impossible to obtain a direct view in the required position, have been compiled from several camera drawings of the individual parts concerned. We desire to lay some stress on this point, inasmuch as the figures of *Funiculina* hitherto published‡ are either very inaccurate, or if correct, as is the case with Kölliker's figures, are taken from specimens with the tentacles completely retracted, and consequently fail to express accurately the appearance of the living animal.

PART I.—FUNICULINA QUADRANGULARIS. Pallas.

Of this rare and interesting species the following specimens were obtained:—

a. Four living specimens: one a remarkably large and perfect example, thirty-nine inches in length; a second, smaller and less mature specimen, twenty inches long; and two much smaller ones of ten and eight inches length respectively.

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* Kölliker: Zoology of Challenger Expedition, Part II., 1880, pp., 33–35.

† Kölliker: Anatomisch—systematische Beschreibung der Alcyonarien. Erste Abtheilung: Die Pennatuliden, 1872, pp. 250–261.

‡ A full list of all the figures of *Funiculina* hitherto published is given at the end of this paper in connection with the literature of our subject.

b. Three complete skeletons of calcareous stems, of twenty-four, twenty, and sixteen inches length respectively; and sixteen fragments of stems, varying in length from four to twenty inches. Some of these are still encrusted with portions of the cœnenchym, or fleshy body-substance, and must, therefore, have belonged to specimens only recently dead; the majority, however, are quite clean and white, and appear, therefore, to have been dead for some time.

Specimens of *Funiculina* were dredged at two spots about a mile apart; one of these about three miles N.W. of Oban, and midway between the mainland and Lismore Point, the southern extremity of Lismore Island; the other about half-a-mile S.E. of Lismore Point.* The depth of water in both cases was about twenty-two fathoms, and the bottom mud.

The living specimens were kept in sea water for one to three days, and then transferred to spirit. In order to study the anatomy of the polypes a few have been removed from different portions of the colony; and of these sections, either transverse or longitudinal, were made, which, when cleared with a mixture of creosote and turpentine and mounted in balsam, made very satisfactory preparations. The specimens proved to be in better histological condition than was anticipated from the method of preparation, but cannot be relied on to determine doubtful points of microscopic structure. It is highly desirable that in future expeditions more attention should be paid to this very important point.

The following description, which has been drawn up from the preparations obtained in the above manner, applies, except when otherwise specified, to the largest of the specimens obtained alive.

General Account.

Funiculina is a compound or colonial Actinozoon, whose general appearance is shown in Plate I., Fig. 1. It consists of a cylindrical, fleshy axial portion, the lower $\frac{1}{5}$th of which is bare, forming the *stalk* (Fig. 1. *b*), which in the natural condition is planted in the mud of the sea bottom, while the upper $\frac{4}{5}$ths, forming the *rachis* (Fig. 1, *a*) are thickly studded with the individual animals or *polypes*, each of which is similar in structure to an ordinary sea-anemone.

The axial portion, which is gracefully curved as shown in the figure, is traversed throughout its whole length by a solid calcareous *stem*, quadrangular in section, and shown in Fig. 2 free from the investing fleshy substance or *cœnenchym*.

At the bottom of the rachis the polypes are few and small; passing upwards they gradually increase in both number and size, attaining a maximum in the upper third. They are not placed all round the rachis, but on three sides only, leaving the fourth bare. This,

* *Vide* "General Report on the Dredging Expedition," by J. F. Goode and W. P. Marshall, in which the first locality is marked Station III., the second, Station VI.

which is the inner or concave side of the curve formed by the whole rachis, is referred to as the *ventral surface* (Figs. 3 and 5); the opposite or convex face (Figs. 1, 3, and 4) is the *dorsal surface*, while the sides are referred to as *right* and *left lateral surfaces* respectively.

The whole pen is of an ivory-white colour* except the stalk, which is yellowish brown. The surface is covered with a slimy mucus, and is in the living animal, according to both Forbes and Thomson,† brilliantly phosphorescent.

The term *feather*, which is often used to designate the rachis and polypes together, calls to mind the fanciful name *Penna del pesce pavone* (feather of the peacock fish) given to *Funiculina* by the Neapolitan fishermen, under which name it was described in 1757 by Bohadsch, the discoverer of this very curious Sea-pen.

Anatomical Description.

1.—*The Stalk and Rachis*—

The stalk in the large specimen measures six inches in length. Along its greater part it is cylindrical, with a diameter of 0·15 inch; toward the lower end it enlarges to 0·21 inch. The last ¾-in. is bent rather sharply, nearly at right angles to the main axis (Fig. 1), and ends in a blunt point. The upper part of the stalk diminishes gradually in size, loses its cylindrical form and becomes quadrangular, the lateral diameter slightly exceeding the dorso-ventral one. At the junction of stalk and rachis the actual measurements are—lateral diameter, 0·13in.; dorso-ventral diameter, 0·10in.

The rachis gradually increases in thickness in passing upwards from its junction with the stalk; it also loses its quadrangular form and becomes cylindrical. At about six inches from the top (Fig. 3), at which point it attains its greatest size, the diameters are—lateral, 0·18in.; dorso-ventral, 0·17in.; above this point it tapers rapidly to the top.

We have been unable to examine the internal structure of the stalk and rachis, as the specimens were destined for museum purposes. Kölliker ‡ has shown that they are traversed along their whole length by four main longitudinal canals (Fig. 3, *u*.), one dorsal, one ventral, and two lateral, from which smaller canals arise forming a rich network of nutrient vessels traversing the cœnenchym, and communicating, as we shall see shortly, with the body-cavities of the polypes. We have been able to confirm the existence of these main canals, though we have not had an opportunity of tracing them along their whole length. The smaller canals, with their openings into the cavities of the polypes are shown in Plate II., Figs. 10 and 15, *v*.

* Both Forbes ("Johnston's British Zoophytes." 2nd ed., 1847, p. 165) and Thomson ("Depths of the Sea," 1873, p. 149) describe the living *Funiculina* as rose-coloured.

† Forbes, *loc. cit.* Thomson, *op. cit.*

‡ *Op. cit.*, pp. 253-254.

The integument of both stalk and rachis is, according to Kölliker, thick, and closely studded with minute fusiform calcareous spicules.*

In stating that the stalk is, in the natural condition, inserted in the mud of the sea bottom, we rely mainly on the very definite statement of Forbes, who says :† "It lives erect, its lower extremity, as it were, rooted in slimy mud." Additional evidence on the point is yielded by the anatomical arrangement of the parts, especially of the stem (as will be noticed immediately) ; and by the fact that the allied genus *Virgularia* is known to live erect.‡ Sir Wyville Thomson§ also speaks of "passing over a forest" of *Funiculina*, clearly implying that they live erect.

2.—*The Stem*—

The Stem (Fig. 2) extends from the top of the rachis to within a short distance of the lower end of the stalk. As shown in Fig. 3 *c*, it is quadrangular in section, but the sides are not perfectly flat. The dorsal surface is slightly convex (flat in some specimens) along the greater part of its length, but becomes concave in the stalk : the ventral surface is slightly concave ; while the lateral surfaces, which are rather narrower than the dorsal and ventral ones, are decidedly concave.

The stem is thickest at the junction of the rachis and stalk, where its transverse diameter is 0·10 in., its dorso-ventral diameter 0·08 in. From this point it tapers towards the upper end, at first very gradually, then more rapidly; its upper part being very slender and flexible: towards the lower end it tapers gradually for a short distance, and then rapidly, ending in a fine flexible and imperfectly calcified point which enters the bent portion of the stalk, and ends a very short distance from its extremity.

It is thus seen that the thickest part of the stem is at the point where the fleshy cœnenchym is thinnest; indeed, as is seen from the measurements given above, the total thickness at this point—the junction of rachis and stalk—is due almost entirely to the stem, which is here covered by a layer of cœnenchym so thin that the quadrangular shape of the stem is very evident on mere inspection.

A point of much greater interest, and one on which we think some stress should be laid, is that the proportions of the stem at various points of its length are such as, mechanically considered, to adapt it most perfectly to what we regard, for the reasons stated above, as its normal position, *i.e.*, planted erect with the stalk buried in muds and the rachis projecting freely above it into the water. In this position the thickest and strongest portion of the stem is at the point where most strength is needed, *i.e.*, at the surface of the mud. The gradual tapering downwards in the first part of the stalk gives a firm, rigid support, while the gradual and steady tapering towards the upper end of the rachis provides the requisite strength in the lower part with

* Kölliker, *op. cit.*, p. 253, and Plate XVIII., Fig. 154.

† "Johnston's British Zoophytes," 2nd edition, 1847, Vol. i., p. 165. Cf. also Richiardi, "Monografia della Famiglia dei Pennatularii," p. 91.

‡ Darwin, "Naturalists' Voyage Round the World," 1860, p. 99.

§ Thomson, "Depths of the Sea," 1873, p. 149.

increasing flexibility in the upper. So marked, indeed, is this adaptation of the shape of the stem to the form of the whole Pen that it would alone be an argument of no inconsiderable weight in favour of the erect position being the natural one.

The lower part of the stem is very stiff, rigid, and brittle; the upper part is highly flexible, so that the two ends of the stem may be brought together without the slightest danger of breaking.

The stem itself, when freed from the cœnenchym, preserves the very graceful curve already referred to, and well shown in Fig. 2., which is drawn from the largest of the three perfect specimens of stems dredged up.

Of the sixteen fragments of stems obtained, one 12 ins. in length and with scarcely any curvature, must, from its size, have belonged to a specimen at least as large as, and probably larger than, the big living specimen. The other fragments belonged, so far as we can judge, to specimens averaging from 18 ins. to 36 ins. in length. In the curvature and relative proportions of its parts the stem of *Funiculina* offers a marked contrast to that of *Virgularia*, which we shall describe in a subsequent paper. The differences are important, as they appear to be directly connected with certain very marked differences in the habits of the two genera.

Transverse sections through the stem show that it consists of a central core which is chitinous and only very imperfectly calcified, and an outer very hard, and firmly calcified rind, with a smooth outer surface, and made up of parallel lamellæ. As the stem grows in thickness by the addition of successive lamellæ on its exterior, and as the proportions between the hard outer rind and the soft core are much the same in both young and old specimens, it is clear that the process of deposition of calcareous lamellæ on the outside must be accompanied by absorption of the calcareous matter previously deposited in the more central portion.

3.—*The Polypes and Zooids*—

As among Pennatulida generally* the individual animals composing the colony are of two kinds, distinguished as *polypes* and *zooids*: the polypes (Figs. 3 and 4, *d*) being distinguished by their greater size, and by possessing tentacles and reproductive organs, while the zooids, (Figs. 3 and 4 *e*), are smaller, and have neither tentacles nor reproductive organs.

In *Funiculina*, the zooids form an irregular row on the mid-dorsal surface (Figs. 3 and 4), on either side of which the polypes are placed; but the distinction between polypes and zooids is far less marked than in the majority of Pennatulida, and it is very doubtful whether any sharp line can be drawn between the two forms. In young specimens especially the transition is a perfectly gradual one, and a complete series of intermediate forms can be obtained between the largest polypes and the smallest zooids.

* Kolliker, *op. cit.*, p. 6.

Confining the term zooid to the small individuals destitute of tentacles, the arrangement of the polypes and zooids on the rachis is as follows:—At the lower end of the rachis there are no polypes at all, and merely a single longitudinal row of small zooids, situated along the ventro-lateral angle of the quandrangular rachis. Passing upwards, the zooids increase in both size and number, and pass obliquely across the side of the rachis to the dorso-lateral angle, which they reach about 2 ins. above its commencement. Above this point they gradually shift on to the dorsal surface, where they form an interrupted and irregular longitudinal median row from three to five zooids wide, extending to the extreme top of the rachis.

The first polypes are found about 2 ins. above the commencement of the rachis, and on the middle of the lateral surfaces. They lie on the ventral side of the zooid rows, and are at first in a single row on either side, and at rather wide intervals apart. About an inch higher up the rows become double, and beyond this point the polypes increase rapidly in number and size. For a short distance they are clearly arranged in oblique rows, ascending from the ventral side below to the dorsal side above; but along the greater part of the rachis they are clustered so closely together that it is difficult to make out any definite arrangement in rows, though a closer examination shows, as Kölliker has already pointed out,* that they are really arranged in ill-defined, somewhat triangular groups, the apices of the triangles being situated on the ventro-lateral angles of the rachis and about ¼ in. apart, while the bases are on the dorsal surface in contact with the median zooid tract.

The polypes cover the whole of the lateral surface of the rachis and the marginal portion of the dorsal surface, but do not extend on to the ventral face (Figs. 3, 4, 5). Throughout the whole length of the rachis the polypes on the dorsal surface are the smallest, those on the lateral surface gradually increase in size, and those along the ventro-lateral angle are the largest of all (Fig. 3). These latter may, as shown in Fig. 5, encroach somewhat on the ventral surface.

The polypes are largest and most closely placed in the uppermost 12 ins. of the rachis, where they form a thick heavy mass, completely weighing down the top when taken out of water. The greatest width of the rachis, at 6 ins. from the top, is ¾ in.

The ventral surface has an average width of 0·14 in. It is not perfectly straight throughout, but becomes curiously twisted at one or more points, the most marked of which is 10½ ins. from the upper end, and is indicated in Fig. 1. These twists are apparently due to some irregularity in growth, though it is quite possible that the fleshy cœnenchym, as shown by Sir J. Dalyell, to occur in *Virgularia*,† may be able during life to twist itself round the calcareous stem, and so cause the distortion in question.

* Kölliker, *op. cit.*, p. 257.
† Sir John Graham Dalyell, "Rare and Remarkable Animals of Scotland," 1848, Vol. ii., p. 185

The largest polypes measure 0·30 in. in length, by 0·08 in. in width; the larger zooids are 0·05 in. long, and the smallest ones are minute warts. As already mentioned, it is impossible, in many cases, to distinguish between the larger zooids and the smaller polypes, and we are strongly disposed to view the former as being, at any rate in many cases, only polypes that have not yet reached maturity. At the most crowded part there are about fourteen rows of polypes per inch length of the rachis, with nine polypes in each row. The total number of polypes may be estimated at about 3,000.*

The smaller specimens obtained living differ from the larger one above described in the following points (Fig. 6):—The general proportions are very similar, but the actual size of the largest polypes is less than those of the large specimen; the polypes are also far less closely packed, considerable portions of the dorsal and lateral surfaces being left bare between the bases of the polypes and zooids: the polypes instead of being closely massed together in dense clusters are distinctly arranged in oblique rows along the whole length of the rachis. Furthermore the gradual transition from zooids to polypes is far more evident than in the larger specimen.

These differences between the larger and smaller specimens of *Funiculina* are of some zoological interest. Verrill,† from a comparison of several Scotch specimens with ones from the Mediterranean, concluded that they belonged to distinct species, and proposed the name *Funiculina Forbesii* for the Scotch one. Concerning it he says: "It is much more slender than the latter (*F. quadrangularis*, the Mediterranean form) with far less numerous and crowded polypes; these are arranged in oblique series of two or three, instead of five; the outer ones are the largest, those occupying the central region being rudimentary and papilliform, but all are disproportionately smaller than those of *F. quadrangularis*." Dr. Gray‡ adopts this division, and assigns the name *F. quadrangularis* to the Scandinavian forms as well as to the Mediterranean ones, distinguishing the Scotch ones, like Verrill, as *F. Forbesii.*

The validity of the distinction has been called in question by Richiardi,§ and by Kölliker,‖ both of whom distinctly state that *F. Forbesii* is merely the young form of *F. quadrangularis*, and that they have seen specimens from the Mediterranean forming a complete gradational series between the two forms.

The Oban specimens set this question completely at rest, showing that the Scotch forms are not, as Verrill and Gray supposed, all

* The above description of the largest of the Oban specimens will be found to agree very closely with that given by Kölliker. (*op. cit.*, pp. 257–258) of a very fine specimen 53 ins. in length, obtained from the Danish coast, and now the Museum of Copenhagen.

† A. E. Verrill: List of the Polypes and Corals sent by the Museum of Comparative Zoology to other Institutions in exchange, with annotations. Bulletin of the Museum of Comparative Zoology of Harvard College, 1864, p. 30.

‡ J. E. Gray: Catalogue of the Sea-pens or Pennatularidæ in the collection of the British Museum, 1870, pp., 12-13.

§ Richiardi: Monografia della Famiglia dei Pennatularii, Bologna, 1869, p. 96.

‖ Kölliker: *op. cit.*, p. 257.

F. Forbesii, but that perfectly typical *F. quadrangularis* occur side by side with them. The description given by Verrill applies perfectly to the three smaller living specimens obtained by the Society at Oban, but is contradicted on every point by the large specimen, which is in all respects a perfectly typical specimen of the form *Funiculina quadrangularis*, erroneously supposed by Verrill and Gray to be confined to the Mediterranean and Scandinavian seas. The point is, perhaps, one of no very great importance, but, inasmuch as unnecessary multiplication of species is a very definite evil, the Birmingham Natural History Society may certainly be congratulated on having established the fact that the Scotch *Funiculina* is identical with the Mediterranean and Scandinavian forms, and is not a distinct species.

The large specimen from Oban thus acquires some historical importance, as having been the means of proving this identity. Larger specimens even than that dredged by the Society have indeed been previously obtained from Oban, and there can be little doubt that these fully agreed with the Society's specimen; but of these no complete description has ever appeared, nor are the specimens themselves preserved for reference, so that the Birmingham specimen, which is now permanently deposited in the Zoological Museum of the Mason College, may undoubtedly claim the honour of being *the* typical British example of *Funiculina quadrangularis*.

(*To be continued.*)

THE BIRDS OF LEICESTERSHIRE.

PART II.—OUR WINTER MIGRANTS.

BY THOMAS MACAULAY, M.R.C.S.L., ETC.

This class is much smaller than the former one. The true Winter Migrants, by which I mean only those birds which approach our shores in winter and leave us again for distant breeding grounds, are not numerous, and I am only able to enumerate seventeen species as having been observed in the county of Leicester.

1.—The Merlin *(Falco Æsalon)*. If my notes were not meant to be purely local it would be open to question whether this bird should be classed amongst the "constant residents" or "winter migrants." It undoubtedly breeds in the northern parts of England, and (Morris says) in Lincolnshire. I cannot hear of any instance of its breeding in Leicestershire, and it only appears in this part of the country during the winter months. It is not a common bird by any means with us, though scarcely a winter passes by without one or two being seen.

2.—The Short-eared Owl *(Otus brachyotus)*. Not common. I have never met with it myself, but Rev. A. Matthews has done so on several occasions, as also has my friend Mr. H. Davenport.

3.—The Fieldfare *(Turdus pilaris).* Abundant every winter. They begin to arrive about the third week in October, from the 15th to the 25th, though I have known them to be as late as the first week in November. There is not one of our migrants, either summer or winter, which makes so long a visit as these birds: it is no uncommon thing to see them on their return journey as late as the end of April, or even in May. In 1877 I saw fieldfares for the last time on 10th May, and Mr. H. Davenport tells me that in 1879 he noticed a small party of them on May 12th.

4.—The Redwing *(Turdus iliacus).* The same remark will apply to this bird as to the Fieldfare. They arrive about the same date, but take their departure somewhat earlier. I have never seen Redwings later than the third week in April.

5.—The Grey Wagtail *(Motacilla boarula).* My friend, Rev. A. Matthews, has seen this bird on many occasions. I have not myself been so fortunate as to secure frequent notes of it, but I have no doubt if carefully looked for, it would be found every winter. Potter also mentions it as frequenting Charnwood Forest.

6.—The Snow Bunting, *(Plectrophanes nivalis.)* Although by no means uncommon on some parts of our coast, this bird is a *rara avis* in Leicestershire. I have two notes of its occurrence. One was killed at Laughton some years ago, and is now in the collection of the Rev. A. Matthews. In February last, during severe frost, four were shot out of a flock of about thirty, at Burton Overy. These also have been preserved by a local taxidermist.

7.—The Mountain Finch *(Fringilla montifringilla.)* It is not every winter that the Brambling is seen so far south as this. The harder the weather the more likely are you to see them, and in a very mild, open winter they may not appear at all. They are always found in small parties, never solitary.

8.—The Gray Phalarope *(Phalaropus lobatus.)* I have only one record. One was killed at Foxton, in the winter of 1860-1, and is now in the possession of the Rev. A. Matthews.

9.—The Woodcock *(Scolopax rusticola).* Although it is now a well-known fact that the Woodcock breeds regularly in many parts of England, it would be out of place in any other list than that of the winter migrants. The dearth of woodland in this part of Leicestershire renders them very scarce; but a few are met with every winter. A nest was found in Owston Wood a few years ago, and they have been known to breed in Charnwood Forest.

10.—The Great Snipe *(Scolopax major).* Four occurrences of this bird in Leicestershire have come to my knowledge. One was killed near Lutterworth some years ago by Mr. Sansome, of that town, and is now in his possession. Another was obtained at Noseley a few years since. A third was killed in 1879 near Smeeton, by Mr. Elliott, and was *eaten* by him; and the fourth was picked up dead last winter at Billesdon, and has been preserved. This last bird appeared to have died from want, as it was quite uninjured.

11.—The Common Snipe *(Scolopax gallinago.)* Before this county was so largely drained Snipe used to be fairly abundant (I have killed fifty couple in a winter); but they are decreasing every year. Still, our brooks and reservoir afford us a few every year.

12.—The Jack Snipe *(Scolopax gallinula)*. The above remarks apply also to the Jack. I do not now get three couple where I could formerly get ten. They are, however, still found every winter, and I have killed four during the past month.

13.—The Wild Goose. In very severe weather an occasional flock of Geese is seen; but they are so rarely obtained that the species is uncertain. Most probably they would be either *Anser segetum* or *A. albifrons*, these being the commonest varieties. Two white-fronted Geese were killed on December 18th, 1879, by Mr. West at Langton.

14.—The Teal *(Anas crecca)*. Not very common. A few are met with every winter. I have shot them on Saddington Reservoir and out of the River Welland.

15.—The Wigeon *(Anas Penelope)*. The large Reservoir at Saddington, so often mentioned in these notes, attracts many wild fowl in winter, and amongst them Wigeon may often be seen and sometimes obtained.

16.—The Pintail *(Anas acuta)*. The Rev. A. Matthews tells me that he has occasionally seen this duck; but I have not been fortunate enough to meet with it myself.

17.—The Hooper *(Cygnus ferus)*. Very rarely seen. It has, however, according to Mr. Potter, author of "The History of Charnwood Forest," been killed several times in that locality.

There is one other winter migrant, namely, the Great Grey Shrike *(Lanius excubitor)*, which, I have no doubt, must have occurred in this county; but I have not been able to obtain any authentic record of it, and must, therefore, omit it from my list for the present.

In my next I propose to give a list of the "constant residents," which will require very few remarks, after which I have a *grand* list of "occasional visitors" to wind up with.

THE MINERALS OF THE MIDLANDS.

BY C. J. WOODWARD, B.SC.

NORTHAMPTONSHIRE—*(continued from Vol. IV., p. 260)*.

Mr. B. Thompson, F.C.S., F.G.S., has sent me the following list, for which he says he is mainly indebted to Mr. Sharp, F.G.S., F.S.A.:—

Ironstone is largely quarried in Northamptonshire. It is obtained from the Northampton Sand, a division of the Inferior Oolite formation, and consists, in the deep, unweathered portions, chiefly of *carbonate of iron*, but grains of quartz and siliceous oolitic concretions, and other ferrous compounds, etc., are met with in it. The iron which is quarried nearer the surface is mainly the *hydrated peroxide of iron*.

Very much of the ironstone is cellular, the cells being of all shapes and sizes, and they contain ochreous, sandy, or argillaceous cores.

Iron Pyrites is commonly met with in the clays of the Upper Lias, but is always associated with fossils. I have many large ammonites converted into iron pyrites. Organic matter in a state of decomposition seems to have the power of reducing the sulphates of sea water, and, in the presence of a ferruginous mud, to give rise to sulphide of iron. No good crystals are found.

Vivianite (Phosphate of Iron) is met with in very small quantities in the alluvial beds of the Nene, near to Northampton, in the form of small nodules ; also the remains of the horse, deer, ox, wild boar, etc., found there were some of them stained blue by the same material.

Calcite is commonly met with in the oolitic rocks of Northamptonshire. It occurs in cracks or cavities of any kind in these rocks, and is often associated with coral.

Gypsum or Selenite is of very common occurrence in the clays of the Upper Lias, and the crystals are generally well shaped.

Mica.—In some few places the Northampton Sand is micaceous.

Allophane.—Specimens of a mineral described as Allophane were found near St. Andrew's Hospital, Northampton, by Dr. Berrill, and in an ironstone quarry on the Billing road, near to the above, by Mr. Sharp, F.G.S., F.S.A. After the decease of Dr. Berrill the whole of the material that had been collected was handed over to Mr. Sharp, as well as the following analyses (in Dr. Berrill's writing) :—

1.—Al_2Si_2 + 10Aq. Allophane.
2.—Al_2Si_5 + 7Aq. (Dr. Berrill's mineral.)
3.—Al_2Si_6 + 4Aq. Kaolin.

Taking No. 1 as the typical formula of Allophane, and No. 3 of Kaolin, it will be seen that the mineral is more nearly allied to Kaolin than Allophane.

NOTTINGHAMSHIRE.

I am indebted to Mr. A. T. Metcalfe and Mr. John N. Dufty, both Fellows of the Geological Society, for information concerning Gypsum, which appears from their reports to be the only mineral of this county. It occurs at Retford in veins, and is used for garden rock-work. At Southwell thinner veins occur. The mineral occurs, too, at Tuxford, and was formerly used for making plaster floors. "The Geology of the Nottingham District," by the Rev. Alexander Irving, F.G.S., is referred to as bearing slightly on the minerals of the county.

SHROPSHIRE.

Professor Prestwich, M.A., F.R.S., refers me to his work, "The Geology of Coalbrook Dale," Trans. Geological Society, 2nd Series, Vol. V., p. 487, and mentions that the following among other minerals are found at Coalbrook Dale :—*Barytes* (crystals in ironstone), *Blende*, *Iron Phosphate*, *Lead Sulphide*, *Calcite*, *Petroleum*.

Dr. Callaway, M.A., F.G.S., sends the following list :—

Barytes	Wrekin	In Archæan rocks.
Epidote	Caer Caradoc	In Radiated Amygdaloids in Dolomite.
Chalcedony, Agate	Lea Rocks	In Archæan rocks.
Quartz, Calcite, Galena, Blende, Chalcopyrite	White Grit Mine	In Ordovician (Lower Silurian) rocks.

Mr. G. H. Morton, F.G.S., sends the following list as occurring in the veins around Shelve :—

Quartz	Gravels and other Mines.
Chalcedony	White Grit Mine.
Calcite (Carbonate of Lime)	All the Mines.
Pseudomorphs of Fluor Spar	Gravels Mine.
Baryte	Cefn Gwyulle.
Witherite	White Grit Mine.
Petroleum	Oven Pipe Mine.
Pyrite	White Grit Mine.
Malachite	Gravels Mine.
Redruthite	Westcott.
Wad	White Grit.
Galena	All the Mines.
Minium	Snailbeach and White Grit Mines.
Cerussite	Snailbeach and White Grit Mines.
Blende	All the Mines.

WARWICKSHIRE.

The Rev. P. B. Brodie, M.A., F.G.S., mentions that Gypsum occurs in a railway cutting near Henley-in-Arden; Selenite at Fenny Compton, in Lias clays; and that in the Drift Pebbles he has met with Agate, Schorl, Jasper, and Quartz.

Mr. A. H. Atkins, B.Sc., states that Gypsum has been met with in sinking the artesian well at Small Heath Park, near Birmingham. He also mentions the occurrence of Green Cupric Carbonate, at Vaughton's Hole, near Birmingham.

WORCESTERSHIRE.

Dr. Harvey B. Holl, F.G.S., gives the following list from the Malvern Hills, and refers to papers in the "Quarterly Journal of Geological Society," Vol. XXI., p. 72, 1865, and June, 1867 :—Quartz, Orthoclase, Labradorite, Andesine, Potash Mica, Ferruginous Mica (Biotite), Augite Hornblende, Epidote, Chlorite, Hæmatite, Calc Spar, Graphite, Zeolites (Herefordshire Beacon), Garnet (North Hill).

THE FLORA OF WARWICKSHIRE.

AN ACCOUNT OF THE FLOWERING PLANTS AND FERNS OF THE COUNTY OF WARWICK.

BY JAMES E. BAGNALL.

(Continued from page 263.)

SAPINDACEÆ.

ACER.

A. Pseudo-platanus, *Linn.* *Sycamore.*
Alien: Hedges and woods. Common. April, May.
Throughout the county; possibly in most cases planted.

A. campestre, *Linn.* *Maple.*
Native: In hedges and woods. Common. May.
Throughout the county, but frequently planted.

LEGUMINIFERÆ.

ULEX.

U. europæus, *Linn.* *Furze or Gorse.*
Native: On heaths, banks, &c. Locally common. January to June.
Although found throughout the county, often absent over large areas.

U. Gallii, *Planchon.* *Planchon's Furze.*
Native: On heaths and heathy roadsides. Locally common. July to December.

I. Sutton Coldfield, abundant; Middleton Heath; Coleshill Heath; lanes near Solihull; Bentley Heath; Arley Wood.

II. Coughton Park, Dunnington Heath, Studley, *Purt.*, iii., 59; Between Wroxall and Honily, *Kirk*; Pinley! Beausdale! *Y. and B.*: Corley Moor! Shrewley Common, *Bree.*, *N.B.G.S.*; near Tardebigg.

GENISTA.

G. anglica, *Linn.* *Needle Furze.* *Petty Whin.*
Native: On sandy heaths and heathy waysides. Rather rare. June to July.

I. Coleshill Heath! *Bree.*, *Purt.*, i., 333. Brought to me from Bradnock's Marsh, *Perry Fl.*; Heathy waysides between Coleshill Pool and Stonebridge; Arley Wood.

II. Barby Road, near Rugby, *Rev. A. Blox.*; Honily, *Y. and B.*; Stivichall Common, *Cox.*

It not unfrequently blooms twice in the same year.

G. tinctoria, *Linn.* *Dyer's Green Weed.*
Native: On marly banks and in fields. Locally common. July, August.

I. A lane at Elmdon! near the Hall, *Ick. Anal.*, 1837; field path from Sheldon to Olton; Shelly Lane, near Shelly Coppice; Packwood; Ansley Heath.

II. Coughton Fields, near Beauchamp's Court, *Purt.*, i., 133; Green's Grove, Hatton; between Leamington and Emscote, *Perry*, 1817; Whitnash, Chesterton, *Y. and B.*; Lighthorne, *Bolton King*; Salford Lodge Wood, *Rev. J. C.*; Bridle Road, Billesley to Wilmcote; Yarningale Common; fields by Oversley Wood; near Oakley Wood.

SAROTHAMNUS.

S. scoparius, *Koch.* *Common Broom.*
Native: In woods and fields and on banks and waysides. Common. May, June. Throughout the county. In some districts rather local.

ONONIS.

O. spinosa, *Linn.* *Rest-harrow.*
Native: On sandy and marly banks, and waysides. Local. June, July.
I. Elmdon, near Bickenhill.
II. Near Coventry Wood, Arbury Hall. *Kirk, Phyt.*, ii., 970: Morton Morrell, Southam, *Y. and B.*; between Stratford and Binton; near Rose Hall, Oversley; Marl Cliff; Exhall: bridle road from Billesley to Wilmcote, Henley-in-Arden.

O. arvensis, *Auct.* *Field Rest harrow.*
Native: In fields, and on banks and waysides. Locally common. June, July.
I. Powell's Pool, Sutton Park; Langley: Wylde Green; Elmdon; &c.
II. With white flowers, in Rectory Farm, Harboro' Magna, *Rev. A. Blox.*; roadsides near Prince Thorpe! *R.S.R.*, 1874; Tachbrook, *Y. and B.*; Honington Park, *Newb.*; between Billesley and Wilmcote, &c.

ANTHYLLIS.

A. vulneraria, *Linn.* *Kidney Vetch.*
Native: On lias and marly banks. Local. May, July.
II. Kinwarton; Coughton Fields, Shottery, *Purt.*, i., 332; Harbury! *Y. and B.*; Harboro' Magna, *Rev. A. Blox.*: Whatcote, *Rev. J. Gorle*; Tredington, Honington, *Newb.*; Gaydon: Burton Dasset, *Bolton King*; Marl Cliff; Bearley Canal bank; Rowington Canal bank; fields near Wilmcote.

MEDICAGO.

M. sativa, *Linn.* *Common Lucerne.*
Casual: In cultivated fields and on banks. Rather rare.
I. Sutton railway bank, near Erdington.
II. Grafton, *Purt*, i., 347; Rugby, *R.S.R.*, 1871! Myton, *Y. and B.*; on railway banks, near Budbrook, and Emscote, *H.B.*: Blackwell, *Newb.*

M. lupulina, *Linn.* *Black Medick or Nonsuch.*
Native: On banks, waysides, fields, &c. Common. May, June. Area general.

M. denticulata, *Willd.* *Reticulated Medick.*
Denizen: In cultivated fields and waste places. Rare. July to August.
II. Established in lanes about Kenilworth; brought probably with foreign skins, *H. B.*: rick yard, near Kenilworth.
This cannot be considered as more than a casual in this county.

M. maculata, *Sibth.* *Spotted Medick.*
II. Sherbourne, *Y. and B.*; Myton! *H. B.*; rickyard, at Kenilworth! *H. B.*; roadside from Stratford-on-Avon to Eatington, abundant 1875.

MELILOTUS.

M. officinalis, *Willd.* *Common Melilot.*
Denizen: In woods, copses, and on marly banks, &c. Local. June, July.
I. In Aston Park, before it was broken up; railway banks, at Stechford; on all the sidings of new line from Castle Bromwich to Sutton Park, abundantly, 1878-80.

II. (*Trifolium melilotus officinalis.*) Spernal, Kinwarton, Grafton, *Purt.*, i., 346; between Warwick and Tachbrook, *Perry*; Whitnash, Harbury, *Y. and B.*; Rugby district, *R. S. R.*, 1869; Tredington; Tysoe; Honington; Shipston-on-Stour; Whatcote, *Newb.*; Bidford; Drayton Bushes; Little Alne; Bearley Canal bank.

M. alba, *Lam.* *White Melilot.*

Alien: On railway banks. Rare. July, August.

I. Stechford Railway bank; on the sidings of new line from Castle Bromwich to Sutton Park, 1878-80, becoming quite shrubby here; a few plants at Four Oaks in 1874.

II. Near Emscote Mill, *H. B.*

M. arvensis, *Wallr.* *Field Melilot.*

Casual: On waste places and waysides, &c. Rare. June, July.

I. Waste stony places in a lane near Bodmir, 1875, abundant; in Sutton Park on waste spots, near the new railway banks.

II. Warwick Stone Quarry, and Castle walls, *H.B.*; a few plants by the side of a field near to the allotments, Honington, *Newb.*; a few plants on waysides, near Wixford, 1872.

[*M. parviflora*, Lam., has occurred as a casual on the canal bank near Olton, and in potato fields and waste places, Kenilworth.]

(*To be continued.*)

METEOROLOGY OF THE MIDLANDS.

THE WEATHER OF NOVEMBER, 1881.

BY CLEMENT L. WRAGGE, F.R.G.S., F.M.S., ETC.

The meteorological conditions of this month were very remarkable; the abnormally high temperature and barometric depressions and gales calling for special notice. So unusually mild was the weather, that the violets forget-me-nots, daisies, etc., were in full bloom—lowering November seemed running its length, joined hand in hand with blushing May. At Orleton no temperature so high was recorded within the last twenty-five years, and the mean temperature was more than 6° above the average of the last twenty years. That the atmosphere of northern latitudes was generally in an extraordinarily unsettled condition, and that a remarkable *main* disturbance covered a wide area of the earth's surface, is sufficiently proved by the depressions and consequent gales of the last part of the month, with the low crests of pressure intervening. Over the moorlands of North Staffordshire the south-west wind accompanying the great depression of the 27th travelled with a velocity of fully 70 miles per hour, Beaufort scale, as recorded by two practised and experienced observers. The rainfall was much about the average. Duration of sunshine at Hodsock, 62 hours, and at Aspley Guise, Woburn, 74 hours. Mean sea temperature at Scarborough, 47·5.

NOTES BY OBSERVERS.—*Cheltenham.*—Roses, stocks, violets, and wallflowers in full bloom, and *Clematis Jackmanii* putting forth spring shoots. *More Rectory.*—Blossom of gooseberry, raspberry, &c., forming. No winter birds seen. *Dudley.*—Spring flowers blooming. *Dennis.*—Roses, primroses, pansies, &c., in bloom. *Henley-in-Arden.*—Mean temperature 47·3, 7·3 higher than mean of the ten previous years. *Spondon.*—Crocus, snowdrop, and narcissus already above the ground. *Kibworth.*—During the month we have gathered roses, stocks, wallflowers, cowslips, polyanthus, forget-me-nots, mignonnette, double daisies and violets. *Waltham-le-Wold.*—Many wild flowers in bloom.

STATION.	OBSERVER.	RAINFALL.				TEMPERATURE.			
		Total for M.	Greatest fall in 24 hours.		No. of rainy d.	Greatest ht.		Greatest cd.	
		In.	In.	Date.		Deg	Date.	Deg	Date.
OUTPOST STATIONS.									
Spital Cemetery, Carlisle	J. Cartmell, Esq.	3·53	·58	30	17	60·7	15	25·4	18
Scarborough *(a)*	F. Shaw, Esq., F.M.S.	1·81	·50	26	18	61·1	14	33·5	1
Blackpool *(a)*—North Shore	C. T. Ward, Esq., F.M.S. ..					56·9	11	32·1	1
South Shore		5·51	·69	27	28	56·7	11	29·7	18
Llandudno *(a)*	J. Nicol. Esq., M.D., F.M.S.	3·06	·63	30	16	62·8	8	35·3	1
Boston	W. H. Wheeler, Esq.	2·43	·49	4	15	56·0		33·0	
Lowestoft *(a)*	H. E. Miller, Esq.	1·25	·30	3	11	60·0	4	36·0	1
Carmarthen *(a)*	G. J. Hearder, Esq., M.D...	6·92	·89	30	27	63·7	8	33·9	29
Sidmouth *(a)*	W. T. Radford, Esq., M.D..	4·12	·64	4	24	59·6	12	36·3	2
St. Augustine's, Ramsgate *(a)*	Rev. J. C. Swanson, O.S.B.	2·01	·51	26	15	60·2	14	31·5	1
MIDLAND STATIONS									
GLOUCESTERSHIRE.									
Strond	S. J. Coley, Esq.	4·[illegible]0	·58	28	20	61·0	5	32·0	29
Cheltenham *(a)*	R. Tyrer, Esq., F.M.S.	3·25	·66	26	23	61·3	4	28·8	18
WILTSHIRE.									
Marlborough *(a)*	Rev. T. A. Preston. F.M.S.	3·82	·74	24	19	60·1	13	31·1	18
SHROPSHIRE.									
Woolstaston	Rev. E. D. Carr	3·74	·80	30	22	59·0	4,13	31·0	1
Stokesay	M. D. La Touche	3·74	·61	26	25	60·8	13	29·0	18
Bishop's Castle	E. Griffiths, Esq.	3·55	·46	26	20	60·0	4	26·0	1
More Rectory	Rev. A. S. Male	3·90	·59	26	25	61·0	8	31·0	18
Dowles, near Bewdley	J. M. Downing, Esq.	3·02	·45	27(?)	16	65·0	13	24·0	18
HEREFORDSHIRE.									
Burghill *(a)*	J. G. Chapman, Esq.	2·33	·38	26	18	63·9	13	32·7	18
Stoke Bliss	Rev. G. Alexander	2·81	·35	21	17	59·0	4,12,13	31·0	28
WORCESTERSHIRE.									
Orleton, Tenbury	T. H. Davis, Esq., F.M.S. ..	3·33	·47	26	20	62·8	13	28·8	18
West Malvern	A. H. Hartland, Esq.	2·80	·72	26	19	58·0	4	31·0	2
Evesham	T. J. Slatter, Esq., F.G.S...	2·78	·57	26	19	59·8	4	30·5	1
Pedmore	E. R. Marten, Esq.	2·29	·44	26	18	64·0	4	31·0	17
Stourbridge	Mr. J. Jefferies	2·88	·43	26	15	60·0	4	32·0	2,18
Cawney Bank, Dudley	Mr. C. Beale	2·76	·43	26	17	57·0	4	33·0	1
STAFFORDSHIRE.									
Dennis, Stourbridge *(a)*	C. Webb, Esq.	2·98	·17	26	18	62·5	13	31·0	17
Kinver	Rev. W. H. Bolton	3·41	·49	26	20	59·[illegible]	13	30·0	17
Walsall	N. E. Best, Esq.	3·49	?·59	26	22	57·0	4	30·0	1
Lichfield	J. P. Roberts, Esq.	2·31	·26	3	17	60·0	10	31·0	17
Thorganby Villa, Wolverhampton	G. J. C. Broom, Esq.	2·46	·47	24	18				
Weston-under-Lyziard	Hon. & Rev. J. Bridgeman .	2·42	·39	30	22	61·0	4,13	30·0	1,2
Wrottesley *(a)*	E. Simpson, Esq.	2·48	·41	26	18	60·2	13	31·2	1
Heath House, near Cheadle *(a)*	J. C. Philips, Esq., J.P.	[illegible]·51	·54	16	20	60·8	13	29·8	1
Oakamoor, Churnet Valley *(a)*	Mr. E. E. Kettle	3·82	·48	26	17	60·4	4,13	27·8	30
Beacon Stoop, Weaver Hills *(a)*	Mr. James Hall	2·10	·33	30	15	56·3	4	26·9	1,2
Alstonfield	Rev. W. H. Purchas	5·04	·[illegible]1	26	20	58·4	13	24·0	1
WARWICKSHIRE.									
St. Mary's College, Oscott *(a)*	J. MacElmail. Esq.	2·16	·33	26	13	61·7	13	30·6	1
Henley-in-Arden	T. H. G. Newton, Esq.	3·[illegible]7	·50	30	22	61·0	4	29·0	17
Kenilworth *(a)*	F. Slade, Esq., C.E., F.M.S.	3·06			21	60·1	13	29·6	18
Coundon, Coventry	Lieut.-Col. R. Caldicott....	2·87	·51	26	19	59·0	4	32·0	1,17
Rugby School	Rev. T. N. Hutchinson	3·25	·50	26	23	59·6	12	29·8	1
DERBYSHIRE.									
Stony Middleton	Rev. V. Smith	4·15	·66	26	17	58·0	12	29·0	1
Fernslope, Belper	F. J. Jackson, Esq.	3·96	·65	16	18	60·0	13	30·0	1,30
Linacre Reservoir	C. E. Jones, Esq.	3·39	·64	26	20				
Spondon	J. T. Barber, Esq.	2·92	·35	3	18				
Duffield	W. Bland, Esq.	3·74	·58	25	13				
NOTTINGHAMSHIRE.									
Mansfield *(a)*	W. Tyrer, Esq., F.M.S.	2·81	·35	3,16,26	20	61·1	13	31·0	18
Park Hill, Nottingham	H. F. Johnson, Esq.	2·80	·84	3	18	58·7	13	30·9	1
Hodsock Priory, Worksop *(a)*.	H. Mellish, Esq., F.M.S. ..	2·08	·41	26	16	64·5	13	29·2	18
Tuxford	J. N. Dufty, Esq., F.G.S. ..	2·03	·35	26	16	56·0	14	30·0	1
LEICESTERSHIRE.									
Loughborough *(a)*	W. Berridge, Esq., F.M.S...	2·58	·59	26	18	62·7	13	31·1	18
Syston	J. Hames, Esq.	1·93	·45	26	21	57·0	4,13	31·0	2
Town Museum, Leicester	J. C. Smith, Esq.	2·35	·44	26	20	60·2	13	31·0	1,18
Ashby Magna	Rev. Canon Willes	2·84	·39	26	21	58·0	4		
Kibworth	T. Macaulay, Esq.	2·79	·48	26	19	59·0	4	31·0	1
Waltham-le-Wold	Edwin Ball, Esq.	2·75	·43	26	16	57·0	13	32·0	28,17
Dalby Hall	G. Jones, Esq.	2·20	·35	2[illegible]	19	58·0	13	26·0	18
Coston Rectory, Melton *(a)* ..	Rev. A. M. Rendell	2·35	·35	25,26	19	60·0	13	29·0	30
NORTHAMPTONSHIRE.									
Towcester	J. Webb, Esq.	3·16	·56	25	18				
Kettering	J. Wallis, Esq.	2·91	·51	26	16	62·0	1	31·0	1,3
BEDFORDSHIRE.									
Aspley Guise, Woburn *(a)*	E. E. Dymond, Esq., F.M.S.	2·42	·55	26	15	60·0	6	30·8	1
RUTLAND.									
Northfields, Stamford	W. Hayes, Esq.	2·64	·41	25	18	60·0	4	27·0	1

(a) At these Stations Stevenson's Thermometer Screen is in use, and the values may be regarded as strictly intercomparable.

Oakamoor, Churnet Valley, October, 1881.—Total rainfall, 3·531; greatest fall, 1·080, on 13th number of rainy days, 13; maximum temperature, 60·7, 2nd; minimum, 22·8, on 17th.

Correspondence.

Mercurialis Perennis.—On October 16th this plant was in blossom in Streatley Woods, South Beds. Some scores of staminate flowers were seen, but only two or three pistillate ones. They occurred in a clearing in the woods, on the N.W. side, where there is a sub-soil of stiff clay. Associated with them were numerous primroses in blossom. Possibly the excessive rains of August, with the subsequent comparative heat, may have had some effect on the autumn blossoming of these plants.—J. Saunders, Luton.

Late Flowering.—On December 27th I found *Mercurialis perennis* (Dog's Mercury), abundantly in flower (staminate) at Marston Green, four miles south of Birmingham. Hawthorn near was in full leaf.—Geo. E. Harrison. On December 22nd a labourer showed me some branches of hawthorn, covered with blossom, which he had brought from a village near Worcester.—W. J. H.

Botany of Malvern.—The following plants either new or rare in the neighbourhood of Malvern have been met with during 1881 :—*Stachys ambigua*, Sm., new ; *Galeopsis versicolor*, Curt., new ; *Rumex pulcher*, Linn., rare ; *R. sanguineus*, Linn., rare ; *Anacharis alsinastrum*, Bab., new ; *Carex axillaris*, good, a curious congested variety ; *C. strigosa*, Huds. ; *C. distans*, Linn. ; *Festuca myurus*, Linn., rare ; *Brachypodium pinnatum*, Beauv., rare. Also a remarkable very small (white) flowered and apparently evergreen variety of *Rosa stylosa* has been found in the neighbourhood, by Mr. A. D. Melvin. This Rose has very small fruit, which had scarcely changed colour on November 17th, when I last visited the bush.—R. F. Towndrow, Malvern Link.

Quartzite Pebbles.—I should be pleased to communicate with readers of the "Midland Naturalist" who live in neighbourhoods where the hard quartzite pebbles—petrified kidneys, as they are often called—are largely broken up for road-mending or any other purpose. The locality from whence these pebbles have come is one of the unsolved problems in British geology. If local observers would diligently look over the heaps of the broken pebbles and pick out any containing fossils they would be aiding in the solution of this question.—W. J. Harrison, 43, Golden Hillock Road, Birmingham.

Leach's Petrel and Stormy Petrel in Oxfordshire.—A specimen of the Fork-tailed or Leach's Petrel (*Procellaria Leachii*) was picked up dead, and in a very emaciated condition, at Lower Heyford, in this county, early in December. About the same time a Stormy Petrel (*Procellaria pelagica*) was procured near Oxford. These birds were, of course, blown inland by the storm of the 27th November or thereabouts.—Oliver V. Aplin, Banbury, Oxon, 1881.

Curious Capture of a Pochard.—On the night of the 9th inst., the inmates of a house in this town were aroused by the smashing of glass in an adjoining outhouse. On going into the place they found that a duck (which was quite uninjured) had dashed itself through the skylight. I went down to see the bird, and found a fine male Pochard (*Fuligula ferina*). A faint light was shining on the glass, which was frosted over, and I imagine that the bird mistook it for a patch of water, and accordingly pitched on it.—Oliver V. Alpin, Banbury, Oxon, Dec., 1881.

Gleanings.

Mr. Charles Moore.—We regret to announce the death of this gentleman, the well-known geologist of Bath.

Marine Organisms.—Mr. E. Wade Wilton, Northfield Villas, Leeds, has issued a circular, in which he states that if he obtains a sufficient number of subscribers he will, in the Spring, open a "Microscopists' and Naturalists' Studio," at Clovelly, for the supply of living marine objects for the microscope. Terms of subscription will be forwarded on application to Mr. Wilton, as above.

Geological Survey.—With the honour of knighthood, Sir A. C. Ramsay leaves the post of Director General of the Survey. His successor is Prof. A. Geikie, the head of the Scottish Survey, to whose place, in turn, his brother, Dr. Jas. Geikie, has been appointed. Professor Geikie is a worthy successor to the three great geologists—De La Beche, Murchison, and Ramsay—who have controlled and directed the execution of the geological map of the British Isles. We trust he will live to see the completion of the task, and that, if possible, he will hasten on not only the field-work of the survey, but, more especially, the publication of the maps and memoirs as soon after their execution as possible. According to an official return there must be no fewer than one large sheet and fifty-three quarter-sheets of the one-inch map, of which the actual survey has been completed, but which have not yet been issued to the public. The survey of one of these quarter-sheets was completed as long ago as 1867! This state of things has lately received a severe reprimand from the Science and Art Department (of which the Geological Survey forms a section), so that we may expect increased activity in the office staff for the future.

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY. —General Meeting, December 6th.—Mr. J. F. Goode presented to the Society eight physiological slides, illustrating the embryology of the chick. Mr. J. E. Bagnall exhibited *Rubus hemistemon* (a new record for Warwickshire); *Rubus hirtifolius* and *Pyrus Briggsii*, from Devonshire; and *Isnardia palustris*, from South Hants; also, on behalf of Dr. Fraser, *Potentilla fruticosa* and *Arbutus uva-ursi*. Mr. W. R. Hughes exhibited *Bopyrus squillarum* (male and female), parasites infesting the Common Prawn—specimens prepared by Mr. F. W. Sharpus. Mr. W. B. Grove exhibited *Stemonitis obtusata* (syn. *Comatricha Friesiana*), a myxomycete, from Sutton. Mr. J. Levick exhibited *Œcistes umbella*, *Melicerta tubicolaria*, and a gigantic amœba, *Lithamœba discus* (Ray Lankester), from his own aquarium. December 13th.—Biological Section.—Mr. W. G. Blatch exhibited *Choragus Sheppardi* and *Lathridius rugosus*, two rare beetles, new to Warwickshire. Mr. J. E. Bagnall exhibited *Chara contraria*, var. *hispidula*, and *Chara Hedwigii*, from Sow Waste (new to Warwickshire); and *Nitella flexilis*, from Olton; also, *Agrostis nigra*, of Withering (new to Warwickshire). Mr. J. E. Bagnall read a "Note on *Agrostis nigra*, of Withering, as a Warwickshire plant." He minutely described the characters of this species, and pointed out the distinction between it and *Agrostis vulgaris*, with which it has often been confounded. It is a singular fact that this plant, which was mentioned by Withering in 1796 and 1811, has been omitted in all floras since that time, therefore the discovery of it in Warwickshire by Mr. Bagnall has reinstated it as a British plant.

December 20th.—MICROSCOPICAL MEETING—Dr. A. Milnes Marshall and Mr. W. P. Marshall presented the first portion of a "Report on the Pennatulida collected in the Oban Dredging Excursion," which is printed in this number. Mr. W. R. Hughes exhibited, through the kindness of Dr. Cobbold, eggs of *Bilharzia hæmatobia* (from the living subject), from which the embryos were hatched in the room. Bilharzia is a trematode entozoon, and undergoes alternations of generations similar to those of the liver fluke, *Fasciola hepatica.* It is especially prevalent in Egypt, the young being found, according to some authorities, in the waters of the Nile, in the fishes which abound therein, or even in bread, grain, and fruit. Dr. Cobbold, however, who has paid great attention to this parasite, considers "that the larvæ in the form of cercariæ and sporocysts will be found in certain gastropod molluscs, from which the adult forms have been obtained." The perfect fluke—the male of which measures about half an inch in length, and is shaped somewhat like a horse-leech, with one sucker; the female is smaller, being about four-fifths of an inch—has only been found in man and the quadrumana. In these it mainly exists in the portal system of blood-vessels. In man it is known to give rise to very serious symptoms, causing diarrhœa, hæmaturia, great prostration of the vital powers, and even death. The eggs are variable in outline, mostly oval or pyriform, furnished with a spine-like process, and having an operculum. The living embryos,on being hatched in tepid water,swim about vigorously by means of their cilia. They are conical in shape, and measure about $\frac{1}{225}$ in. in length, and $\frac{1}{678}$ in. transversely. Mr. Hughes remarked that too much importance could not be attached to the study of the entozoa generally from a sanitary point of view. Dr. Cobbold had again and again insisted on the trite proverb—"prevention is better than cure," and if due attention were paid to the cooking of meat and vegetables, and no salads were eaten without being thoroughly washed in pure water and dried first, and no water drunk, except of the purest kind, unless it had been well filtered, many valuable lives would annually be saved. In the case of the present exhibit, Dr. Cobbold had shown that the malady was due to the patient drinking unfiltered water.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—November 14th.—ANNUAL MEETING.—Mr. J. W. Turner elected president. November 21st. —Mr. Boland exhibited various land shells, among which were *Acme lineata* and *Bythinia Leachii.* Mr. Delicate exhibited common squirrel, which had eaten away one of its fore-paws, that had become entangled in the branches of a tree; and Mr. J. W. Neville microscopical coal sections, showing fern sporangia with spores *in situ*, and transverse section of fern stem, *Rachiopteris cylindrica.* A paper was read by Mr. Searle on "Our Common Trees," illustrated by sketches and specimens of leaves, flowers, and fruit. November 28th.—Mr. Darley showed sword grass satellite, and November and December moths, taken at Sutton Park; Mr. Boland, land shells from Africa and the Philippine Islands; Mr. J. W. Neville, transverse section of sugar-cane. Mr. Blay, *Euomphalus discors*, and *Strophomena*, from Wenlock Beds, Benthal Edge; Mr. Delicate, transverse section of pine stem and lilac; Mr. J. Wykes, an astronomical telescope, by which was seen Saturn, with its ring and satellites; the Moon, its hills and their craters, were well seen under a high power. December 4th.—Mr. J. W. Neville showed lingual ribbon of *Haliotis tuberculata*, under microscope; also shell of same; Mr. Deakin, *S. convolvuli*, caught at Handsworth 16th of September of the present year; ditto from Gloucester; also a number of Ichneumons from various moth chrysalides, and several peculiar Dipterous parasites from Magpie Moth, *A. psi*, and *P. rapæ;* Mr. Baxter, sori of Haresfoot Fern. December 12.—Mr. Insley exhibited specimens of Encrinites from Wenlock Beds, Dudley, showing stem, tentacula, and their fringes of cilia; also specimens of Neuropteris from the coalfields, Bilston. Mr. J. W. Neville exhibited coal section showing excreta of insects deposited in the tissues of plants which they had eaten, probably while in the larval stage; Mr. Boland, male Kestrel Hawk, caught in the neighbourhood; Mr. Wykes, vertical section of tooth of pig, and coal section showing sporangia.

CHELTENHAM NATURAL SCIENCE SOCIETY.—November 17th.—Sir W. Brook-Kay, Bart., read a paper on "The Science of Language." December 22nd. —Mr. G. B. Witts read a paper on the "Ancient Inhabitants of the Cotteswolds."

NOTTINGHAM G.R.S. NATURALIST SOCIETY.—The first anniversary of the above Society, which is an offshoot of the Working Men's Naturalist Society, was held in the Society's rooms, People's Hall, on December 16th. Alderman Turney presided.—Mr. Rigby read the report of the origin and work of the Society during the year. The Society was formed, we learn from the report, by Messrs. Gent, Rigby, and Stanley, in consequence of the rejection of a motion not to hold the meetings of the parent Society at a public-house. The Society now numbers about a score members.—Mr. Gent read the financial report, which showed a balance of £1. 5s. 10d. in the hands of the treasurer.—The Society's transactions were next read by the Corresponding Secretary, Mr. Perry. Papers were also read during the evening by Mr. J. J. Ogle on "A Piece of Elder Pith," by Mr. Perry on "The Telephone," by Mr. T. Goldsmith on "The Carrion-eating Birds," and by the President (Mr. W. Rigby) on "The Garden Snail." All the papers were illustrated by diagrams or models. Mr. Turney congratulated the Society on its success. He thought a right step had been taken in disassociating the Society from a public-house. He hoped the Society would prosper until it became a fully recognised institution of the town. He had great pleasure in placing at the disposal of the Society the sum of £15, to be used in the purchase of books and objects in furtherance of its work. A hearty vote of thanks was passed acknowledging this liberality.—Mr. T. Goldsmith, President of the Working Men's Naturalist Society, spoke in favour of a union of the two Societies, and promised to do all in his power to bring about such a result.—There was an excellent exhibition of ornithological, botanical, entomological, and other natural history objects, and microscopes.

OXFORDSHIRE NATURAL HISTORY SOCIETY.—November 24th.—A meeting was held in the University Museum—Prof. Westwood, F.L.S., in the chair. After formal business, Mr. T. F. Richards, M.A., gave his notes on the Welsh Flora, the places especially searched being Barmouth and its vicinity, Cader Idris, Conway, and the Orme's Head, Llangollen, and the Glydyr Mountains. The list of plants included most of the rarities of North Wales, including Cotoneaster, *Helianthemum canum*, *Hutchinsia Silene nutans*, on the Orme; *Silybum marianum*, *Dianthus deltoides*, on Deganwy, *Lavatera*, *Smyrnium*, *Orobanche hederæ*, and *Dianthus plumarius*, at Conway; *Carex extensa* near the Torrent Walk. Dolgelly; *Asplenium septentrionale*, and *germanicum*. the latter a noteworthy discovery, in the vicinity of Cader, and on that mountain most of the typical plants. Barmouth added to these some interesting introductions, while the Glydyrs afforded *Rhodiola rosea*, *Saxifraga hypnoides*, but not the chief object of search, the Cambrian Lily, *Lloydia serotina*; at Festiniog the handsome *Vicia orobus* was met with. Mr. Bolton King, in the discussion that followed, added to the plants noticed on the Orme by Mr. Richards *Epipactis ovalis*, and said that after much searching a single plant of Cotoneaster was met with. Mr. G. C. Druce alluded to the gradual disappearance of *Dianthus plumarius* from Conway Castle and said that on the cliffs of the Twl Dhu he had gathered plants which had been named *Polygala grandiflora*. Mr. Bolton King then gave an account of a three weeks' tour in Ireland. the route being from Westport to Clifden, by Glendalough and Maam, to Cong, Portumna, Lough Dearg, Killarney, the Brandon Mountains, Dingle, and Berehaven. The number of plants found showed that a great amount of work had been compressed into the time. Mr. King had been fortunate to add *Rosa sepium* and *Aira alpina* to the Irish flora, and a new variety of Chara, *i.e.*, *Chara tomentosa*, var. *curta*. Among the other plants gathered were *Dabeocia polifolia*, *Erica Mackaii*, and *Hibernica*, *Arabis ciliata*, *Polygala grandiflora*. *Eriocaulon septangulare*, *Inula salicina*, *Saxifraga geum*, *hirsuta*, *punctata*, *affinis*, and *decipiens*, *Sisyrinchium Bermudianum*, *Potamogeton sparganifolius*, *linearis*, and *nitens*, *Euphorbia hiberna*, *Naias flexilis*, *Spiranthes gemmipara*, *Isoëtes echinospora*, &c. December 7th.—Professor Westwood, F.L.S., in the chair. The Hon. Sec. (Mr. G. C. Druce), after reading the minutes and correspondence, announced that the papers promised for next term included notes on the Goldfinch, and the Fauna of Auvergne, the Flora of Ross and Cromarty, the Birds of North Oxfordshire, &c.—Professor Westwood then drew attention to a number of insects injurious to cereal crops, such as the Wireworm, describing their life-history, etc., especial attention being directed to an Oat Fly, only recently noticed in England, which had proved most destructive to a crop of oats, almost every kernel being eaten up and its place filled by the pupa of one of the oat flies. Professor Westwood suggested a plan to prevent its increase, and exhibited specimens of the fly and the oats damaged by it.—Mr. E. B. Poulton then gave a lecture on his exploration during the long vacation of Dowker Bottom Cave, in Craven, Yorkshire, a sectional diagram being shown to illustrate it. Mr. Poulton first sketched the history of the cave and its previous working, and then a detailed description of the various passages and chambers, and the means of egress, etc. After dividing the second chamber into square yards by means of wire, they commenced excavating the floor, the contents of each square yard worked being most carefully examined (as instanced by finding the teeth of a field-mouse) and the bones, etc.,labelled at once, so that it was known from which particular square yard of the cave it was brought. So the work went on down through thick tenacious yellow clay, in which were embedded huge boulders, which had apparently dropped from the roof above into the shallow lake which once occupied the chamber. In this thick clay but few bones were found, and the workers were continually bothered by permanent springs being tapped, and it was only after an immense amount of labour had been carried on that they reluctantly gave up for the season the search for the solid stone floor which some geologists said it possessed. Mr. Poulton exhibited some dozens of specimens found in the clay and talus, such as bones of pigs, sheep, very small, even smaller than the Shetland sheep, rock-pigeon not found at the present time near Craven, and many other interesting relics of post-Roman times. Of Roman and pre-Roman relics there were brooches, pot boilers, slabs of micaceous sandstone for baking bread, British pottery, Samian ware, flint weapons, etc., all pointing to its occupation by mankind in early days.

PETERBOROUGH NATURAL HISTORY, SCIENTIFIC, & ARCHÆOLOGICAL SOCIETY.—November 8th.—Ordinary Meeting in the Museum, when an address was given by Mr. Yates Aston, on "Geological Evidence of Life on the Globe." November 22nd.—Soirée at Orton Hall, the residence of the Marchioness-Dowager of Huntly. Amongst those present were the Marchioness-Dowager of Huntly, Lord and Lady Granville Gordon, Lady Elena and Lady Ethel Gordon, Professor and Miss Tylor, J. Pickover and Miss Pickover, of Wisbech. During the evening Professor Tylor, F.R.S., delivered an address on the "Roman Remains of this and other Neighbourhoods," of which the following is an abstract. He said he was to a certain extent taking the place of his friend, Mr. Skertchley, who was unable to be present, and who, in referring to the Fen country, had followed somewhat the lines he (the lecturer) had before laid down that they could not explain the formation of the Fens unless they attributed it to a very wet period, during which the gravel and the soil accumulated. He calculated that there must have been at one time as much as 300 inches of rain, that the rivers were of enormous size, and that immense deposits of gravel were formed under conditions very different from any we had experienced in the present day. Near Orton the Nene was, no doubt, formerly very wide, probably half-a-mile in width, and the existing gravelly soil which contained so many remains was, no doubt, the result of that period. It must have taken a river of great expanse to have formed the large beds of stones with which they were familiar. In Lady Huntly's collection there were a great many specimens of the teeth of the elephant found in the neighbourhood, and also a Palæolithic flint implement, the only one found in that locality. Probably many others had been broken up for the roads. It was a rough flint, and evidently formed before the art of grinding was invented. It therefore took them back to the earliest time, and there could be no doubt that it was with such instruments as the one shown that pre-historic men who lived in the valley of the Nene killed the elephant and other animals. It was a most remarkable specimen, and he considered it the gem of Lady Huntly's beautiful collection. After the pre-historic tribes, probably what they might call the British population, their successors, inhabited that part of England. They were, no doubt, excellent potters, and gained the reputation of "the great potteries of the Durobrivæ," which, he supposed, were inhabited by people who might have lived along the banks of the Nene for ten or twelve miles. The greatest quantity of remains had been found at Castor, on the north side of the river, and at Chesterton on the south. After the British came the Romans, and the very beautiful specimens of pottery on the table were of that period. The subjects depicted were the chase—an admirable representation of hare and hounds. There were no better specimens, he thought, anywhere. Perhaps one at Colchester, however, might claim superiority. It was a very important thing for this district that Lady Huntly had paid so much attention to collecting. Her library was very valuable, and so was her collection, and he was glad that at last Peterborough had tried to compete with her by founding a library and museum. No doubt the competition would be productive of good results. It was difficult to say what was the relation of Peterborough to Orton and Castor. Roman remains had lately been found in Peterborough, and no doubt as further excavations were made greater results would appear. It was supposed there was no Roman occupation of Peterborough, but that was entirely a mistake. He thought it was probable that the British Road passed through Peterborough, and that the famous Roman Road, Ermin Street, which passed near Orton, Castor, and Chesterton, was really a deviation from the main line of work, and intended to give access to the very important potteries in the district. On all parts of the Continent the Durobrivæ pottery was valued for its quality and colour. Instead of baking clay in the ordinary way the ancient Britons, and their successors the Romans, mixed chaff or grain with the clay, and burnt it in a kiln to carbonise the whole and give it a black appearance. They also invented the important process of closing the kiln after the pottery was nearly baked and letting the smoke colour the productions. The dark colour in the specimens before him was really produced in that curious manner. He had a map, to which he drew attention, showing the direction of Ermin Street. There was quite a straight line from London to Huntingdon, where there was a sudden turn to the left. The Romans always tried to make their road as direct as possible, and the deviation may have been caused by the Fen water troubling them; but as soon as they got to a hill they went perfectly straight to Castor. After passing the bend in the river at Peterborough they paused to make another turn near Barnack, and so on to Stamford. It appeared as if the Romans deviated from their rule of making straight roads in order to get access to the important quarries at Barnack. The Romans travelled on horseback, and had stations every seven or eight miles. They had a complete line of way from Constantinople to Rome, from Rome to Boulogne, and thence across in boats to Sandwich or Dover. Evidence still remained of that passage, so that he was not speaking from hearsay. Anybody could examine those Roman roads and be perfectly certain of their identity. He though it was very important that the subjects discussed by such societies as theirs should have a real basis in fact. They had the advantage of beautiful objects collected by Lady Huntly with a great deal of care, and the works of an artist and writer of the neighbourhood, so that everything presented to their notice that evening was an absolute fact, and no theory at all. If they looked at the map they would see the Roman stage from Dover to London, the place where Julius Cæsar landed near Deal, and they would find it passed through the town of Canterbury, over Rochester Bridge, and touched the Thames embankment. Before the Romans came to England there was no necessity for a direct road, as there was no direct traffic; but when London had to be governed from Rome it was very important they should have a good straight track. The Romans followed their usual rule, and the fact of their making deviations in this neighbourhood showed that there must have been a good cause for it, viz., the potteries. Referring to a perfectly good leaden vessel, which must have been in the ground 1,700 years, he said there was reason to believe that Britain traded with Egypt in tin, and had the credit of smelting lead at least 2,000 years before Christ. He concluded by expressing the pleasure it gave him to see the beautiful collection of Roman remains before him. Lady Huntly was so well acquainted with the subject that he felt she might have treated it much better than he had done. The exhibits included Roman cinerary urns, fibulæ, and coins collected by Lady Huntly; leaden coffer found in London by Professor Tylor; Roman jewels and coins, lent by Dr. T. J. Walker; Bellamine vases, etc. December 6.—ORDINARY MEETING, when an address was given by the Rev. H. J. Fry, F.R.G.S., on "The Land's End District." The lecturer said that the district west of Penzance was a tableland, with a ridge of hills near the northern coast, and deep intersecting valleys. The whole is composed of a grey granite containing large crystals of felspar. The country has all the peculiarities of a granite district, such as castle-like escarpments on the hill sides, cairns, or great piles of granite, a precipitous coast, immense boulders, and a light shallow soil. The climate of the Land's End District is very mild; myrtles and hydrangeas grow to a great size, and cauliflowers and potatoes are sent very early to the London market. The tin mines of Cornwall are not worked so much as formerly, owing to the valuable ores imported from Australia. The Cornish, however, unlike the Irish, do not cling to the soil when there is no chance of getting a living from it; they remove to other parts of England, or emigrate to other countries. Trees are found only in the valleys of the district, the strong winds preventing them from growing on the higher ground. Many plants common in other parts of England are rare here, such as the dog-rose, cowslip, buttercup, and others. On the other hand, plants rare in more northern counties grow here in abundance. Some of the smaller valleys are full of the royal fern (*Osmunda regalis.*) *Wahlenbergia hederacea* is also found, and samphire and the sea spleenwort (*Asplenium marinum*) are plentiful. The Land's End district seems to have been one of the last parts of England subdued by the Saxons. Athelstan defeated the Cornish in a great battle near St. Burian, in A.D. 926, and afterwards made an expedition to the Scilly Isles. The Cornish language only lingers in the names of places and people—

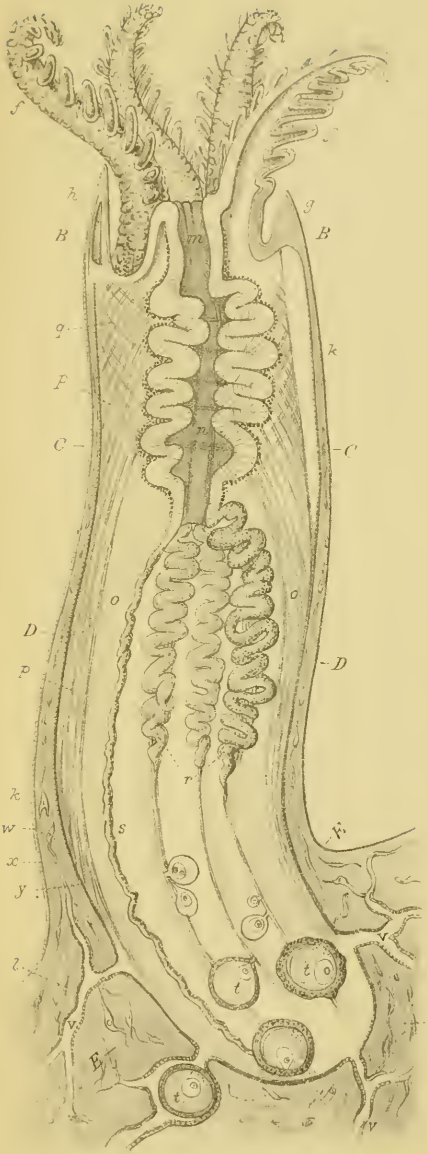
"By Tre, Pol, and Pen,
You may know the Cornish men."

Cornwall, especially that part of it near the Land's End, is full of antiquities, and, according to Dr. Borlase, these were much more numerous a hundred years ago. In the parish of St. Burian, where the lecturer resided, there are seven ancient crosses, two Druidical circles, some holed stones, and several cairns, barrows, and tall granite pillars. Cromlechs are abundant in the district, and so are ancient encampments. There is an inscription on a large stone which marks the grave of Kioval, the son of Cunoval, who is supposed to have reigned in Cornwall about A.D. 454. In some parts of the Land's End district there are also curious huts, built in the shape of Esquimaux snow houses. These were probably built on the surface, but, perhaps owing to the action of earth-worms, they are now beneath the ground. Mr. J. W. Bodger exhibited, in the absence of Mr. Markland, an unusually fine specimen of *Natica gigantea*, from the Ketton Oolite. December 14th.—Lecture by the Rev. J. G. Wood, on "Bee Life."

CORRECTION.—*Bopyrus squillarum.*—My friend, Mr. H. E. Forrest, has called my attention to an error in the "Description of Plate X.," at page 273 of the December number. Figs. 4 and 5 should be reversed to agree with the plate. This will be obvious on comparing the figures with the description. The text needs no alteration.—W. R. H.

Plate II.

Fig. 10.
× 22



Section of Tentacle.

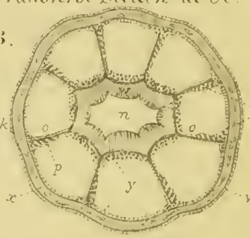
Fig 11.
× 70

Transverse Section at B B

Fig. 12.
× 22

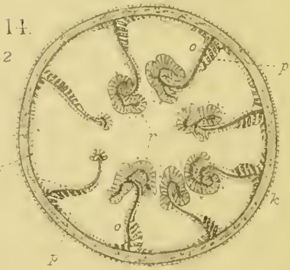
Transverse Section at C C.

Fig. 13.
× 22



Transverse Section at D D.

Fig. 14.
× 22



Transverse Section at E E.

Fig. 15.
× 22

A M Marshall del. F Huth, Lith[r] Edin[r]

FUNICULINA QUADRANGULARIS.

REPORT ON THE PENNATULIDA COLLECTED IN THE OBAN DREDGING EXCURSION OF THE BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY, AUGUST, 1881.

BY A. MILNES MARSHALL, M.A., D.SC., PROFESSOR OF ZOOLOGY IN OWENS COLLEGE, AND W. P. MARSHALL, M.I.C.E.

(*Continued from page 9.*)

4.—*Anatomy of the Polypes*—

The following description of the anatomical and microscopical structure of the polypes is based on the examination of whole specimens and of sections prepared in the manner already noticed.

The structure of a polype is shown in the series of figures on Plate II. Fig. 10 shows a polype bisected longitudinally along its whole length; Figs. 12, 13, 14 and 15 represent transverse sections taken at various points of the length; and Fig. 11 is a more highly magnified section of one of the tentacles.

The polype (Fig. 10) resembles in structure a somewhat elongated Sea-anemone, consisting of a firm body-wall (*k*) continuous below with the fleshy cœnenchym (*l*) of the rachis, and forming above a calyx (*g*), which surrounds the tentacles (*f*) and has its free margin produced into a series of eight pointed processes (Plate I., Fig 7), alternating with

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DESCRIPTION OF THE FIGURES IN PLATE II.

All the figures in this Plate are drawn from polypes taken from the largest living specimen. Fig 10 is constructed from a series of camera drawings taken from different specimens. Figs 11 to 15 are drawn with the camera from single sections. The magnifying power is indicated in diameters for each figure.

Alphabetical List of References.

- *f.* Tentacle.
- *g.* Calyx.
- *h.* Cavity in calyx-process.
- *i.* Spicule.
- *k.* Body-wall.
- *l.* Cœnenchym, or fleshy body-substance.
- *m.* Mouth.
- *n.* Stomach.
- *o.* Mesentery.
- *p.* Retractor muscle.
- *q.* Protractor muscle.
- *r.* Short mesenterial filament.
- *s.* Long mesenterial filament.
- *t.* Ovum.
- *v.* Smaller canals of cœnenchym.
- *w.* Ectoderm.
- *x.* Mesoderm.
- *y.* Endoderm.
- *z.* Thread-cell or nematocyst.

Fig. 10.—A single polype, with the part of the rachis from which it springs, bisected longitudinally along its whole length; the plane of bisection adopted being the *plane of symmetry:* shows the whole structure of one of the polypes, and the communication of its body-cavity with the canal system of the rachis, × 22.

Fig. 11.—Transverse section through one of the tentacles at about the middle of its length; the section passing, on the right side, through the base of one of the pinnules. Shows structure of tentacle and pinnule and arrangement of thread-cells. × 70.

Fig. 12.—Transverse section through a polype at the line BB in Fig. 10; passing through the calyx, the bases of the tentacles, and the mouth. × 22.

Fig. 13.—Transverse section through a polype at the line CC in Fig. 10, showing the stomach and the mesenteries with their retractor muscles. × 22.

Fig. 14.—Transverse section through a polype at the line DD in Fig. 10, showing the mesenteries with the retractor muscles, and the long and short mesenterial filaments. × 22.

Fig. 15.—Transverse section through the lower part of a polype at the line EE in Fig. 10, showing the ova *in situ*, the long mesenterial filaments, and the openings of the cœnenchymal canals into the body-cavity of the polype.

the tentacles. The tentacles, eight in number, are hollow (Fig. 10), and are fringed on each side by a series of hollow pinnules.

The tentacles are arranged in a whorl round the mouth (Fig. 10, *m*), which leads into a short tubular stomach (*n*) with folded walls, and opening below into the body-cavity. The stomach is connected with the body-wall by a series of eight vertical mesenteries or septa (Figs. 10 and 13 *o*), which extend below the stomach to the bottom of the body-cavity (Figs. 10, 14, and 15). The free edges of these mesenteries below the stomach are thickened, forming twisted cords—the mesenterial filaments (Figs. 10 and 14, *r*, *s*,); of these two are slender and extend the whole length of the body-cavity (Figs. 10, 14 and 15, *s*), while the other six are thick and short, only extending part of the way down the body-cavity (Figs. 10 and 14 *r*). The free edges of these six mesenteries bear, below the mesenterial filaments, the reproductive organs (Figs. 10 and 15 *t*).

We propose now to describe these several parts in more detail, taking them in the order given above.

a. The Body-wall.—This consists of a firm gelatinous *mesoderm* (Figs. 10, 12, 13, and 14, *x*), which forms the greater part of the thickness of the wall, and is clothed on its outer and inner surfaces by thin cellular membranes—the *ectoderm (w)* and *endoderm (y)*.

The ectoderm, which in our specimens is not in good histological condition, appears to consist of a single layer of columnar cells, which are often much vacuolated and contain, especially in their deeper parts, very numerous, minute, highly-refractive particles of a dark brown colour. So far as we have been able to determine, the ectoderm of the body-wall contains no thread-cells; but on this, and on many other points of interest involving histological determinations, we are unable to speak with certainty, owing to the imperfect preservation of the specimens.

The mesoderm consists of a matrix of considerable thickness and consistence, which in its outer part is homogeneous, but in its inner portion is, in places, more or less distinctly fibrillated. Imbedded in the matrix are cells of two kinds:—(1) Spherical nucleated cells, closely resembling ordinary cartilage-cells in appearance; (2) Fusiform nucleated cells with long processes, which often branch and become connected with the processes of adjoining cells.

The mesoderm is traversed by a network of very fine canals, which are less abundant and of less size in the upper part of the body-wall than at the lower part, where they become continuous with the canal system of the rachis, which has already been described. The finer canals do not appear to have distinct walls, but seem to be mere channels in the matrix of the mesoderm; in the larger canals, however, a very evident epithelial lining is present, which becomes continuous with the endoderm at the points where the canals open into the body-cavity (Figs. 10 and 15). This canal system probably serves to convey nutrient matter from the body-cavity, where it is prepared, to the various parts of the body-walls and cœnenchym; and inasmuch as it communicates with the body-cavities of all the polypes it affords a means by which food digested by one polype may be conveyed to others, and so supply them with nutriment. The canal system forms thus the great bond of union between the several individuals of the colony, connecting them together into one organic whole. To what extent the several members of the colony are actually, during life, dependent on one another; and whether the normal duration of life of the colony is or is not simply that of the oldest polypes, are questions which, though of great interest, we cannot yet answer with any certainty. Concerning the first of these we may, however, note that the smallest zooids have no mouths, and therefore must be absolutely dependent for nutriment on the supply brought to them by the canal system from the polypes and the larger zooids; while as regards the latter question it is certainly worth noticing that in each of the specimens of *Funiculina* taken alive all the polypes and zooids were living and healthy; no dead or diseased individuals being seen.

The endoderm of the body-wall is a single layer of rather long columnar cells. In many places these are distinctly ciliated, and it is probable that the ciliation really extends over the whole surface. The endoderm, as just noticed, lines the larger canals of the mesoderm, passing into them at the points where they open into the body-cavity; here also it is ciliated, and it is probable that to these cilia are mainly due the currents which in the living animal undoubtedly pass along these canals.

Between the mesoderm and endoderm is, as usual among *Actinozoa*, a system of muscular bands. These are, however, only very feebly developed in the body-wall of *Funiculina*: they consist of—(1) *longitudinal fibres*, whose direction corresponds with the length of the polype, and which will be noticed again when the mesenteries are described, and (2) *circular fibres*, which run transversely round the body-wall: these are but slightly developed; they do not form a continuous sheath as in most *Actinozoa*, but occur as irregular bands, usually not extending round more than three-fourths of the circumference of the body-wall.

The body-wall is thickest below, at its junction with the rachis, and gradually diminishes in thickness as it passes upwards, the alteration affecting the mesoderm only. Owing to the stiffness of this semi-cartilaginous mesoderm the polype body is non-retractile, a point that distinguishes *Funiculina* from *Pavonaria* and other allied genera, and one which is clearly correlated with the very feeble development of the muscular system just noticed.

b. The Calyx.—The calyx with its pointed processes forms a kind of low wall surrounding the bases of the tentacles when these are fully expanded, as in Fig. 7; but when the tentacles are retracted, the pointed processes of the calyx are pulled in slightly towards one another, as shown in some of the polypes of Fig. 3, and so serve to partially close and protect the entrance to the polype-cavity. The structure of the calyx is very similar to that of the body-wall, of which indeed it is only the uppermost portion. Each of the eight pointed processes into which it is produced (Fig. 7) is hollow, its cavity (Figs. 10 and 12 *h*), which is lined by endoderm, communicating somewhat obliquely with the body-cavity. In their upper portions these cavities, like the processes in which they are contained, are situated between the tentacles, as shown in the transverse section drawn in Fig. 12; but the lower portions pass obliquely downwards, so as to open opposite the cavities of the tentacles into the chambers between the mesenteries. In Fig. 10 the plane of section passes on the left side of the figure between two of the tentacles, and therefore along the middle of one of the pointed processes of the calyx, the cavity of which is seen in the upper part of the process; on the right hand side of the figure the section passes down the middle of a tentacle and through the opening of the cavity of a calyx-process into the body-cavity of the polype.

Each of the calyx-processes is stiffened by one or more calcareous spicules of a very curious shape. These are shown *in situ* in Fig. 7 (*i*) and in Fig. 12, in which latter they are seen cut transversely. Each spicule is a calcareous rod (Fig. 8) about 0.02 inch long, and 0.0009 inch diameter: in transverse section it is, as shown in Fig. 9, triradiate with thickened edges. This triple-ribbed form, which is clearly shown in the figures referred to, and which appears to have escaped notice hitherto, is singularly appropriate from a mechanical point of view, forming an admirable combination of lateral strength with lightness of material. Similar spicules, though usually somewhat smaller, are sometimes found in the upper part of the body-wall (Fig. 7).

The calyx and its processes are devoid of muscles, even the feeble muscles of the body-wall ceasing below the calyx, so that the slight approximation of the points which occurs when the tentacles are retracted must be effected simply by the muscles attached to the bases of the tentacles, the arrangement and mode of action of which we shall notice when describing the mesenteries.

c. The Tentacles are eight hollow * prolongations of the body-wall surrounding the mouth, and fringed on each side by a row of hollow pinnules, usually nine or ten in number. The general characters of the tentacles and their pinnules are shown in Plate I., Fig. 3, and Plate II., Fig. 10, and the microscopic structure in Plate II., Fig. 11, the latter figure representing a transverse section across a tentacle taken about the middle of its length and passing through the base of one of the pinnules.

The tentacles and pinnules being, as before stated, prolongations of the body-wall, consist, like it, of ectoderm, mesoderm, and endoderm; but the intimate structure and relative proportions of the three layers differ very considerably from those we have found to obtain in the body-wall.

* Forbes incorrectly describes the tentacles as solid. *Vide* Johnston: "British Zoophytes," 2nd Ed., 1847, p. 166.

The ectoderm (Fig. 11 *w*) is the thickest of the three layers: in it the outlines of the component cells are very difficult to make out, and it is only in the most favourable specimens that this can be done with any certainty. The individual cells are long, thin, and columnar, ciliated at their free ends, and arranged in a single layer, each cell extending through the whole thickness of the ectoderm: in the deeper parts of the ectoderm, between the bases of these columnar cells, smaller cells of a spherical or fusiform shape occur, but in no great number.

Imbedded in and between the ectoderm cells are very numerous thread-cells or nematocysts (Fig. 11 *z*), the characteristic weapons of the *Cœlenterata*. Each of these is a capsule of an elongated oval shape, and about 0.0004 in. long, within which is contained a long spirally-coiled hollow thread, visible in many of our specimens when examined with sufficiently high powers (¼th or $\frac{1}{15}$th in.) In the Sea-anemones, and in the common fresh water *Hydra*, in which similar thread cells occur, any external irritation, such as contact with a foreign body, causes the thread to be shot out from the capsule with great force and rapidity, penetrating the irritating body, and exercising on it, if an animal, an instantaneous numbing or paralysing action.* We had no opportunity of testing their action in the living *Funiculina*, but there can be no doubt that it is the same as in the anemones and *Hydra*.

In the tentacles of *Funiculina* the thread-cells (Fig. 11) are most abundant close to the surface, where they are closely packed side by side, with their outer ends just beneath the surface, and their long axes perpendicular to it; large numbers also occur in the deeper parts of the ectoderm. In shape and mode of arrangement the thread-cells of *Funiculina* agree very closely with those of *Sagartia troglodytes*, as described and figured by Heider,† and with those of the anemones generally, as described by the brothers Hertwig ‡; the thread-cells of *Hydra* are larger and much more globular in shape.

The mesoderm, which is the thinnest layer of the three, consists almost entirely of muscles; a very powerful external layer of longitudinal muscles, seen cut across in Fig. 11, and an inner less powerful layer of circular muscles. By these muscles the movements of the tentacles in the living animal are effected, and also, in part, the retraction of the tentacles when disturbed.

The endoderm does not differ markedly from that of the body-wall: it consists of a single layer of columnar cells, often swollen at their inner ends. In the cavities of the tentacles, the size of which varies much with the extent to which the tentacles are expanded, very

* For a very complete and admirable account of these thread cells and their mode of action in sea-anemones, *vide* Gosse: "British Sea-anemones and Corals, 1860," pp. xxix-xl.

† *Heider.* Sagartia troglodytes. Sitzb. der K. Akad. der Wissensch. z. Wien Bd. lxxv. 1877, pp. 22-24; and Plates III., IV., and VII.

‡ Oscar und Richard Hertwig: Die Actinien. 1879.

numerous spherical nucleated cells occur: these are always in close contact with the endoderm cells, but whether they properly belong to the endoderm or not we have been unable to determine. They may perhaps be described as mucus cells.

The pinnules have the same structure as the tentacles. Each is hollow, its cavity opening into that of the tentacle (Figs. 10 and 11), and its wall consisting of ectoderm, mesoderm, and endoderm, having the same structure and proportions as in the tentacles, differing only in being of less thickness.

d. The Stomach.—The mouth is not circular, but, as in the majority of *Actinozoa*,* a transverse slit. The section drawn in Fig. 12, though taken a short distance below the mouth, shows this character very well. The direction of the axis of the mouth, which is a constant one, we shall refer to after considering the arrangement of the mesenteries.

The mouth leads by a short œsophagus into the stomach (Fig. 10 *n*), the walls of which are thrown into transverse folds, as shown in the figure: these folds become much more marked when the tentacles are retracted, the whole stomach being then shortened by the approximation of the folds, somewhat after the manner of a concertina, and thus providing space within the calyx in which the retracted tentacles are lodged. At its lower end the stomach opens into the body cavity by a slit-like orifice, the direction of which corresponds to that of the mouth.

The stomach-wall consists (Fig. 10) of (1) an inner lining membrane which at the margin of the mouth becomes continuous with the external ectoderm, and is therefore described as ectoderm; (2) of a thin mesoderm; and (3) of an outer layer or endoderm continuous with that of the tentacles and of the body-wall.

The ectoderm (Figs. 10 and 13, *w*) is a thick layer, consisting of much elongated columnar ciliated cells, between which are other elongated cells with a very granular appearance, and probably of a glandular nature: at the inner or free surface are seen at intervals what appear at first sight to be clear spaces, but which are almost certainly cells similar to those described in Anemones by the Hertwigs as mucous cells.† The deepest or outermost part of the ectoderm contains fusiform and spherical cells imbedded between the bases of the longer ciliated and glandular cells.

The mesoderm of the stomach (Figs. 10 and 13, *x*) is a very thin fibrillated layer of connective tissue, in which we have not detected any definite muscular bands. We have found no traces of sphincter muscles round either the mouth or the lower aperture of the stomach.

The endoderm (Figs. 10 and 13 *y*) is chiefly characterised by containing an enormous number of extremely minute and highly

* Vide Gosse; Heider, etc., *op. cit.*

† O. und R. Hertwig: *Op. cit.*, pp. 58-60, and Taf. III., Fig. 6, where the two kinds of gland-cells, viz., granular and mucous, are described and figured.

refractive particles, which completely conceal the outlines of the endoderm cells. These particles, seen singly, appear of a pale yellowish-brown colour; but, in quantity, impart a deep brown or even black colour to the endoderm of the stomach, which is very evident in all the specimens. Concerning the use of these granules we have no evidence whatever. They appear to be the same things described by Gosse,* in *Actinoloba*, *Tealia*, *Peachia*, *etc.*, as "a nearly uniform mass of yellow fat-cells," and as hepatic in function. We much doubt the correctness of either of these statements. It has been shown that in allied forms these granules are insoluble in ether, and are therefore not fat; and concerning their supposed digestive functions, it must be noted that they are confined to the endoderm cells, and never, so far as our observations go, occur in either the mesoderm or ectoderm of the stomach, so that they could only act on food not in the stomach, but in the compartments of the body-cavity outside it, a position in which it is very doubtful whether food is ever found. Moreover, we shall find shortly that it is very doubtful whether digestion, at any rate of animal matter, is really effected in the stomach at all, as supposed by Gosse. And, finally, we would notice that the granules in question are very closely similar to, if not indeed identical with, the brown granules already described as occurring in the deeper parts of the ectoderm cells of the body wall.

e. The Mesenteries.—These are the eight vertical partitions or septa which connect the stomach to the body-wall, and so divide the body-cavity round the stomach into a series of compartments; below the stomach they extend, as previously noticed, to the bottom of the body-cavity.

Each mesentery consists (Figs. 10, 13, 16, and 15 *o*) of a thin central mesodermal plate, clothed on each side by endoderm.

The endoderm (*y*) is very similar to, but slightly thinner than, that lining the body-wall, with which it is directly continuous. It consists of a single layer of short columnar cells, which contain, especially near the stomach, granules of the same character as those just described in the endoderm of the stomach.

The mesoderm is a thin connective tissue lamella, continuous on the outer side with the mesoderm of the body-wall, and on the inner side with that of the stomach. Between the connective tissue lamella and the endoderm covering it, is a well-developed system of muscles, the most powerful of which form the great retractor muscles of the polype (Fig. 10 *p*), by which the stomach can be drawn down, and the tentacles pulled back within the calyx.

Each retractor muscle, as shown in Fig. 10, extends the whole length of the septum to which it belongs. Arising from the body-wall, along the whole length of the base of attachment of the septum, the fibres pass up in bundles in the substance of the septum,

* Gosse: *Op. cit.*, Introduction, p. xvii.

and are inserted mainly into the walls of the stomach, especially its upper part, and partly into the bases of the tentacles and the parts immediately around the mouth. Below the stomach each retractor muscle (Figs. 10 and 14 *p*) does not extend over the whole width of the septum, but is confined to its outer half.

The transverse sections drawn in Figs. 13 and 14 show some further points of importance concerning these muscles. They show, firstly, that the retractor muscles, which lie between the mesoderm (*x*) and endoderm (*y*) do not lie on both sides of the septa, but only on one side of each. A more important point, shown clearly in the figures referred to. is that the muscles do not lie on the same side of all the septa. Thus, on the left hand side of Figs. 13 and 14, is a compartment of the body-cavity, bounded by two mesenteries in which the retractor muscles face away from one another; while on the right hand side of the figures is one in which the retractor muscles face towards one another. In the intermediate septa, whether above or below the stomach in the figures, the retractor muscles are all on the right hand side of the septa.

Owing to this arrangement it is seen at once that there is only one possible bisecting plane that will divide the polype longitudinally into two perfectly symmetrical halves, *i.e.*, a plane passing through the middle of both the right hand and the left hand compartments; or in Plate II., a plane indicated by a horizontal line drawn across the middle of the figures in question.

This *plane of symmetry*, as is shown in Figs. 12 and 13, is also the one which passes through the long axis of both the mouth and the opening from the stomach to the body-cavity, and is the plane of bisection adopted in Fig. 10.

A less important point, shown by the sections in Figs. 13 and 14, is that the longitudinal muscles extend a short distance round the body-wall on either side of the lines of attachment of the septa, forming, by so doing, the system of longitudinal muscles of the body-wall referred to on a preceding page.

Besides the large retractor muscles there is in the upper part of the polype, a second much weaker set of muscles crossing the former at right angles, and having an antagonistic action. These protractor muscles (Fig. 10 *q*) arise from the upper part of the body-wall, and from the calyx, run downwards and inwards in the septa, and are inserted into the mesoderm of the stomach walls. Their action is to pull up the stomach after it has been drawn down by the retractors.

f. The Mesenterial Filaments.—These, as stated above, are the thickened convoluted free edges of the mesenteries below the stomach (Figs. 10 and 14, *r* and *s*). They are of two kinds:—(1.) A set of two (*s*), which are much more slender than the others, but much longer, extending to the bottom of the body-cavity: these we shall refer to as the *long mesenterial filaments*. (2.) A set of six (Figs. 10 and 14 *r*), which are much thicker and more convoluted, but also much shorter, only extending about half-way from the lower end of the stomach to the bottom of the body-cavity: these are the *short mesenterial filaments.*

In the sections drawn in Figs. 13, 14, and 15, the septa bounding the left hand compartments are those which bear the long mesenterial filaments, so that the plane of symmetry, as defined above, passes between them, and therefore divides the mesenterial filaments, as it divides the retractor muscles and the stomach, into two perfectly symmetrical halves.

The structure of the mesenterial filaments is shown in Figs. 10 and 14: each is a single band, although, owing to its convolutions, it may be cut more than once in a single transverse section (Fig. 14). Each filament consists of a central mesodermal connective tissue lamella, continuous with that of the septum, and clothed by a thick layer of endodermal cells of a special character. These cells are of two chief kinds:—(1.) Columnar ciliated cells; and (2) large granular gland-cells. These latter are very numerous, and give the special character to the filaments. Numerous spherical nucleated cells, similar to those described as occurring in the cavities of the tentacles, are found lying in contact with the endoderm cells, and apparently belonging to them (Fig. 14.)

The structure of the long mesenterial filaments is very similar to that of the short ones; the endoderm is, however, distinctly thinner, and the gland cells not so numerous relatively to the ciliated cells.

Notwithstanding very careful examination, we have failed to detect thread-cells in the mesenterial filaments of *Funiculina*. From the descriptions of Gosse, Heider, the Hertwigs, etc., thread-cells appear to be present in the mesenterial filaments of all other *Actinozoa* that have been examined hitherto, so that if they be really absent in *Funiculina* the point would be important. It is, however, a difficult matter to establish a negative, especially in histology; and bearing in mind the facts that our specimens were neither examined perfectly fresh, nor were prepared for the purpose of histological examination, we can merely record that we have failed to find them. There is, perhaps, no point on which we have more reason to regret the imperfect histological condition of our specimens than the present one, for the presence of thread-cells in the mesenterial filaments, *i.e.*, endoderm, of *Actinozoa* in general, has always been a great difficulty to morphologists, who are inclined to view thread-cells as belonging properly to the ectoderm only, so that their absence from the endoderm of *Funiculina*, should it prove to be a real and constant one, would become a point of much interest and importance.

Gosse, in his account of the mesenterial filaments of the Sea-anemones,* describes them as of two kinds, which he distinguishes by the names of *craspeda* and *acontia*, assigning the former name to the thickened cord-like edge of the mesenteries, and the latter to certain spirally-twisted threads similar in structure to the *craspeda*, and

* Gosse, *op. cit.*, Introduction, pp. xxiii-xxix.

attached to them by one end, but with the greater part of their length lying freely in the body-cavity, and capable of being shot out through special apertures (*cinclides*) in the body-wall. From the description given above, it is evident that *Funiculina*, to use Gosse's nomenclature, has *craspeda*, but no *acontia*. Heider* and others have indeed doubted whether Gosse's *acontia* really exist in the Sea-anemones.

Concerning the function of these mesenterial filaments there has been so much dispute that a few words may not be out of place here, although the subject is one which we have had no opportunity of investigating physiologically in *Funiculina*, and which, therefore, does not, strictly speaking, fall within the limits of the present report.

By different writers all possible functions appear to have been assigned to these organs. Contarini, Delle Chiaje, Spix, Johnston, Wagner, and Owen, describe them as the male reproductive organs, either essential or accessory; by Rapp, Cuvier, R. Jones, and Quatrefaga, they were regarded either as ovaries or oviducts; others have considered them to be bile vessels; while Frey, Leuckart, Schmarda, and more recently Heider and the Hertwigs, are of opinion that as they contain both gland-cells and thread-cells their main function is probably that of digestive organs, the thread-cells serving to paralyse or kill the prey after being swallowed alive, and the gland-cells to digest it when dead.

By far the most important evidence on the subject, however, is that submitted by Dr. Krukenberg † as the result of a direct physiological investigation of the action of the mesenterial filaments of Sea-anemones. He finds that the mesenterial filaments have a very considerable power of digesting albuminous substances, such as raw fibrin or raw pieces of flesh; and by mixing portions of the filaments with small pieces of raw meat in a very finely-divided state, he was able to watch the process of solution, *i.e.*, digestion of the meat under the microscope. Furthermore, by experimenting in a similar manner with portions of the stomach, tentacles, body-wall, etc., of the Anemone, he was led to the important conclusion—that not only have the mesenterial filaments the power of digesting albuminous bodies, but that they are the only portions of the body which possess this power: that they are not only digestive organs, but *the* digestive organs of the Anemone so far as proteid matters are concerned.

For digestion to take place it is necessary for there to be absolute contact between the gland-cells of the filaments and the food; from which Dr. Krukenberg concludes that digestion is not effected by means of a fluid secretion poured out over the food, but by the direct those in the endoderm of the stomach. This outer capsule has its

* Heider, *loc. cit.*

† Krukenberg. Vergleichend physiologische Studien an den Küsten der Adria. Erste Abtheilung, 1880, pp. 38-56. Ueber den Verdauungsmodus der Actinien. For a knowledge of this interesting and important paper we are indebted to Professor Ray Lankester.

action of the cells themselves. Watery or glycerine extracts of the mesenterial filaments of *Sagartia* or *Anthea* are found to digest fibrin rapidly at a temperature of 100°-105° F.

From the above account, which we have quoted because it is the only one based on direct physiological experiments, and also because it appears to be as yet but little known in this country, there can no longer be any doubt as to the function of these hitherto mysterious mesenterial filaments.

g. The Reproductive Organs. The sexes among the *Pennatulida* are distinct so far as is as yet known, the polypes of each individual Sea-pen being either all male or all female.* Of the specimens of *Funiculina* obtained living at Oban the two larger ones, which alone have been examined for the purpose, are both females, a circumstance we much regret, inasmuch as no description of a male *Funiculina* has yet appeared; the statement that the sexes are distinct resting merely on the analogy furnished by allied genera such as *Halisceptrum* † and *Pennatula*,‡ and on the fact that in the female specimens described, *all* the polypes examined bore eggs. As we shall find when dealing with the historical portion of our subject, only a very limited number of specimens of *Funiculina* have yet been examined with any care, so that it is hardly safe to generalise concerning the apparent rarity of male specimens; but it may well be that the male pens are either really less numerous than the female, or else that they are as a rule smaller, and therefore disregarded. We trust that the Society will on some future occasion be able to determine this point.

The ovaries of *Funiculina* (Figs. 10 and 15) are the free edges of the six mesenteries which bear, higher up, the short mesenterial filaments. The ova, or eggs (*t*), are developed as little prominences attached by short stalks to the edges of the mesenteries, from which, when ripe, they become detached, and then lie free in the body-cavity, as shown in Fig. 10.

Each ovum is apparently a single endodermal cell, which becomes bigger than its neighbours, and so projects above the surface of the ovary: each is, from a very early period, enclosed in a thin capsule, very similar in appearance and in behaviour with staining fluids to the connective tissue mesodermal lamella of the mesentery; though whether it is actually developed from this lamella, as maintained by the Hertwigs § in the case of the Anemones, we have not been able to determine. Later on each egg becomes invested by a second outer capsule, which is much thicker than the first, is clearly derived from the endoderm cells surrounding the ovum, and contains numerous minute pigment granules very similar in appearance to surface, in the fully-developed egg, raised into a series of low ridges, forming an irregular surface pattern.

* Kolliker: *Op. cit.*

† Kolliker: *Op. cit.*, pp. 147-172, and Plate XI., Fig. 95, Plate XII., Fig. 94.

‡ An account of the male *Pennatula*, of which no description has hitherto been published, is given in the second part of this Report.

§ O. und R. Hertwig: *Op. cit.*

Each egg has from its earliest appearance a very large conspicuous *nucleus* or germinal vesicle, containing one and sometimes two *nucleoli* or germinal spots. The germinal vesicle, which increases greatly in size with the growth of the egg, consists of a tough, elastic, and fairly thick membrane, with clear, apparently fluid, contents: it lies opposite the stalk of attachment of the egg, and in many cases projects into this stalk for a short distance. The nucleolus is spherical, of a yellowish colour, and distinctly granular.

The average diameter of the mature eggs is 0·0014 in., and the thickness of the capsule 0·0001 in.; while the germinal vesicle, which is usually oval, measures 0·0003 in. by 0·0002 in.

Whether fertilisation and the early stages of development are, as is most probable, effected within the body-cavity of the parent we have had no opportunity of determining. In no case have the eggs in our specimens commenced to develope; indeed the germinal vesicle is still present and unaltered in every one of the eggs we have examined.

We have not observed a micropyle, though from the thickness and toughness of the egg capsule it is not improbable that one exists.

Eggs sometimes occur within the cœnenchymal canals, as is shown in the lower part of Fig. 10. The eggs so found are usually either fully developed ones, or else eggs that are very nearly mature. As we have noticed several instances of this we are inclined to view it as a normal condition, though how the eggs get into the canals, whose diameter is much smaller than that of the mature eggs, and still more how they get out again, is far from obvious. It may be, that the eggs are accidently dislodged when young and carried with the nutrient matter into the canals, where they remain, and, receiving a plentiful supply of food, grow.

Besides the sexual process of reproduction there can be but little doubt that *Funiculina* can multiply asexually by gemmation or budding; this asexual process serving, as in other colonial *Cœlenterata*, to increase the number of individuals in the colony, whilst it is by the sexual process alone that new colonies can be started.

(*To be continued.*)

THE BIRDS OF LEICESTERSHIRE.

PART III.—OUR RESIDENTS.

BY THOMAS MACAULAY, M.R.C.S.L., ETC.

No record of the birds of a county would be complete without a list of residents; but as these are, probably almost without exception, common to every county in England, very little more than a list will be necessary. They are fifty-four in number:—

1.—The Kestrel (*Tinnunculus alaudarius*). Common.
2.—The Sparrow Hawk (*Accipiter nisus*). Common.
3.—The White Owl (*Strix flammea*). Common (locally).
4.—The Tawny Owl (*Syrnium aluco*). Common.
5.—The Missel Thrush (*Turdus viscivorus*). Common.
6.—The Song Thrush (*Turdus musicus*). Common.
7.—The Blackbird (*Turdus merula*). Common.
8.—The Hedge Accentor (*Accentor modularis*). Common.
9.—The Redbreast (*Erythaca rubecula*). Common.
10.—The Stonechat (*Pratincola rubicola*). Common.
11.—The Golden-crested Wren (*Regulus cristatus*). Not very common.
12.—The Greater Tit (*Parus major*). Common.
13.—The Blue Tit (*Parus cæruleus*). Common.
14.—The Cole Tit (*Parus ater*). Common.
15.—The Marsh Tit (*Parus palustris*). Rare.
16.—The Longtailed Tit (*Parus caudatus*). Common.
17.—The Pied Wagtail (*Motacilla Yarrellii*). Common.
18.—The Meadow Pipit (*Anthus pratensis*). Common.
19.—The Skylark (*Alauda arvensis*). Common.
20.—The Bunting (*Emberiza miliaria*). Common.
21.—The Reed Bunting (*Emberiza Schœniclus*). Not by any means common, but I have seen it, as also has Rev. A. Matthews, on several occasions, and both in winter and summer.
22.—The Yellow Bunting (*Emberiza citrinella*). Common.
23.—The Chaffinch (*Fringilla cœlebs*). Common.
24.—The Tree Sparrow (*Passer montanus*). Not common.
25.—The House Sparrow (*Passer domesticus*). Common.
26.—The Greenfinch *Coccothraustes chloris*). Common.
27.—The Hawfinch (*Coccothraustes vulgaris*). Has become more common of late years, and thanks to the "Wild Birds Preservation Act" will, no doubt, be more so in the future. It has bred at Gumley, and Sir G. Beaumont, of Coleorton Hall, tells me he has "hawfinches breeding there every year." Some years ago there was a nest in an apple tree at Blaby.
28.—The Goldfinch (*Carduelis elegans*). Hunted down by the bird-catchers in former times, and in consequence somewhat scarce. We may now hope to see them more abundant in years to come.
29.—The Siskin (*Carduelis spinus*). Not common.
30.—The Linnet (*Linota cannabina*). Common.
31.—The Redpole (*Linota linaria*). Occasionally found.
32.—The Bullfinch (*Loxia pyrrhula*). Common.
33.—The Starling (*Sturnus vulgaris*). Common.
34.—The Carrion Crow (*Corvus corone*). Common.
35.—The Rook (*Corvus frugelius*). Common.
36.—The Jackdaw (*Corvus monedula*). Common.
37.—The Magpie (*Pica caudata*). Common.
38.—The Jay (*Garrulus glandarius*). Common.
39.—The Green Woodpecker (*Picus viridis*). Common.
40.—The Creeper (*Certhia familiaris*). Not very common.
41.—The Wren (*Troglodytes Europæus*). Common.
42.—The Nuthatch (*Sitta cæsia*). Tolerably common.
43.—The Kingfisher (*Alcedo ispida*). Common.
44.—The Ring Dove (*Columba palumbus*). Common.
45.—The Stock Dove (*Columba œnas*). Common.
46.—The Pheasant (*Phasianus colchicus*). Common.
47.—The Partridge (*Perdix cinerea*). Common.
48.—The Redlegged Partridge (*Perdix rufa*). Common.

49.—The Peewit (*Vanellus cristatus*). Common.
50.—The Heron (*Ardea cinerea*). Common.
51.—The Water Rail (*Rallus aquaticus*). Common.
52.—The Moorhen (*Gallinula chloropus*). Common.
53.—The Wild Duck (*Anas Boschas*). Common.
54.—The Little Grebe (*Podiceps minor*). Frequent.

Since my notice of the Summer migrants, in the November number, I have received a letter from my friend, Mr. Montagu Browne, upon the subject of the Reed Warbler. His letter is so interesting to Ornithologists that I ask you to add it to this paper.

(*Copy*).

My Dear Sir,

I see in your interesting and useful lists of the Birds of Leicestershire you mention not having *seen* the "Reed Warbler." I can, however, set the question at rest as to whether "Acrocephalus streperus" (Vieill), your "Salicaria strepera" may be considered as inhabiting or breeding in Leicestershire.

Last year, when I first came to Leicester, I took a few short walks for purposes of observation, and during one of them came to a spot in which I should expect to find nesting the "Sedge Warbler," "Acrocephalus Schœnobœnus" (L), and possibly the Reed Warbler in question. This spot, though close to Leicester and of considerable extent, is yet very difficult of approach to pedestrians; accordingly, in the following May, I, with a young friend, launched my double canoe and paddled through the reeds until we could find a landing-place. The season being very backward the new growth of reeds was but just springing, and we had an almost uninterrupted view of any birds we might flush. Soon I had the pleasure of seeing, and hearing the notes of, both birds we came in search of, and then we commenced nest hunting in earnest, with the result that in about an hour we had found eleven nests of four species of birds, three of which were those of *Acrocephalus streperus*. They were not, however, so forward in construction as the Sedge Warblers, or the other birds, all of which latter had eggs. We contented ourselves that day with merely looking on and admiring; but on the 9th June we paddled down again with some ladies, and in addition to finding many more Sedge Warblers' nests, found several more of the Reed Warbler, a beautiful specimen of which, with five eggs, we took for the Leicester Museum, as also one with four eggs of the "Sedge." In fact, so abundant then did we find both species that we might, had we been so minded, have taken twenty or more nests; but so charming were they *in situ* that we were loth even to rob the two we did.

The nest we have is very beautiful, of a deep cup-like form, placed between three old, and four newly grown, reeds, built externally of pieces of coarse grass, moss, sheeps' wool, string, and one or two pieces of swan's down, superimposed on a stratum of last year's flower-heads of the reed, which flower-heads are so arranged that the softest part is woven towards the inside, so as to form an elastic and fitting receptacle for the eggs. Why the greatest quantity of wool and down should be woven outside the nest I cannot tell, but in all the nests we examined, we found this the case.

I am sorry I can give no definite information as to the locality for the Orphean Warbler, Savis Warbler, Rufous Warbler, Richards' Pipit, Water Pipit, and Golden Oriole, in the Bickley Collection of the Leicester Museum, but I imagine them to be of foreign origin, as I notice in the same collection various other specimens bearing unmistakable evidence of the same origin. It is a great pity that in most public collections we find the same want of care in tabulating the localities of rare or little known species. We hope, however, in the future to do better at Leicester in this direction.

I am, dear Sir,

Yours truly,

MONTAGU BROWNE,

Curator.

Town Museum, Leicester,
28th November, 1881.

THE FLORA OF WARWICKSHIRE.

AN ACCOUNT OF THE FLOWERING PLANTS AND FERNS OF THE COUNTY OF WARWICK.

BY JAMES E. BAGNALL.

(Continued from page 16.)

TRIFOLIUM.

T. subterraneum, *Linn.* *Subterranean Trefoil.*
Native: In old pastures. Very rare. May, June.
II. Milverton old green; old pastures. Sherbourne, *H. B. Herb. Brit. Mus.*, 1866; Abbott's Salford, *Rev. J. C.*

T. pratense, *Linn.* *Red Clover.*
Native: In pastures, and on roadsides and waste places. Common. May to October.
Var. *a. sylvestre.* Frequent in all the districts I have visited. The Rev. W. W. Newbould says that it is local in the Stour basin.
Var. *b. parviflorum.* Whitnash, *H. B.*
Var. *c. sativum.* Occasionally in a semi-wild state.

T. medium, *Linn.* *Zigzag Trefoil.*
Native: On banks, roadsides, and in fields. Locally common. June to August.
I. Sutton Park; Wishaw; Tyburn.
II. Oversley, *Purt.*, i., 304; Leamington, *Perry Fl.*; Sherbourne; Whitnash, *Y. and B.*; near the Lime Works, Lawford. *R.S.R.*; Little Alne; Wixford; Ragley.
[*Trifolium incarnatum*, Linn., occurs as an escape or a remnant in fields at Castle Bromwich and Knowle, and is also recorded from near Milverton, *H. B.*; and near Rugby, *R. S. R.*]

T. arvense, *Linn.* *Hare's Foot Trefoil.*
Native: In sandy fields and by roadsides. Locally rare. July to October.
I. Sandy spots in Old Chester Road, near Erdington; Witton; by the new Hotel, Sutton; on new dam, Bracebridge Pool. Sutton Park, 1880.
II. Salford; Dunnington, *Purt.*, i., 345; Leek Wootton Fields; Stone Quarry, Woodloes, *Perry Fl.*; Rugby district, *R. S. R.*, 1871; Kenilworth Castle, *Y. and B.*

T. striatum, *Linn.* *Soft Knotted Trefoil.*
Native: In sandy and gravelly soils. Local. June, July.
I. (*Trifolium nodiflorum.*) On Dosthill, near Middleton, *Ray. Cat.*, 305; new dam, at Bracebridge Pool, Sutton Park, abundant in 1880.

II. Milverton, *Y. and B.*; Near Little Lawford, *R.S.R.*, 1877; Sherbourne, Hampton-on-the Hill; Kenilworth ruins; Heathcote, Warwick, *H.B.*; Honington; Tredington, near the gravel pit, *Newb.*; walls at Coughton Court; Salford Priors; Hatton Rock; Southam.

Var. *b*, *erectum*, Sandrock, Woodloes, near Warwick, *H. Bromwich, Herb. Brit. Mus.*

T. scabrum, *Linn.* *Rough Rigid Trefoil.*
Native: On waste places. Rare. June.

II. Sherbourne, *Y. and B.*
I have never seen this plant growing in Warwickshire.

T. hybridum, *Linn.* *Alsike Clover.*
Casual: In fields, and on roadsides and railway banks, fully established in many of the districts. Locally common. July, August.

I. Waste places, Marston Green; Sutton Park railway banks, abundant.

II. Kenilworth and Milverton, *Y. and B.*; near Rugby, *R.S.R.*, 1870; Honington, Tredington, Blackwell, *Newb.*; hilly pastures, Great Alne; Studley railway bank; Tardebigg.

Var. *elegans*, near Harborough Magna, *Rev. A. Blox.*

T. repens, *Linn.* *White or Dutch Clover.*
Native; In fields, pastures, waysides, &c. Common. May to November. Common throughout the county.
Frequent with foliaceous flowers in some seasons.

T. fragiferum, *Linn.* *Strawberry-headed Clover.*
Native: On waysides and borders of fields in marly and Lias soils. Rather rare. June to September.

II. Oversley and Kinwarton. *Purt.*, i., 306; Whitnash, Southam, *Y. and B.*; Lawford and Dunchurch Roads, *R.S.R.*, 1867; Myton, Tachbrook, Bishop's Itchington, *H.B.*; Honington, Tredington, Blackwell, Shipston-on-Stour, *Newb.*; Gaydon, *Bolton King*; canal bank, Bearley, *W. B. Grove*; stone quarry, near Exhall; roadsides from Stratford to Eatington.

[*T. resupinatum*. Linn. is recorded by the *Rev. J. Caswell* as a garden weed in Oscott College grounds.]

T. procumbens, *Linn.* *Hop Trefoil, Hop Clover.*
Native: On marly and sandy banks, by waysides and in pastures. Common. May to October.
More or less common throughout the county.

T. minus, *Relhan.* *Lesser Yellow Trefoil.*
Native: On banks and waste places, &c. Common. April to November.
Very common throughout the county.

T. filiforme, *Linn.* *Least Yellow Trefoil.*
Native: In old pastures and on turfy roadsides. Rare. June, July.

I. Turfy waysides near Castle Bromwich; Coleshill Heath; turfy waysides between Barston and Temple Balsall; Barston Marsh; near Solihull.

II. Near Harboro' Magna, *Rev. A. B., R. S. R.*, 1871: Sherbourne, *H. B. Herb. Brit. Mus.*; Honington, *Newb.*; Milverton, Hampton-on-the-Hill, Yarningale Common, *H.B.*; between Kineton and Edge Hills, 1867; old pastures on the mobs, Henley-in-Arden; Lye Green.

LOTUS.

L. corniculatus, *Linn.* *Bird's-foot Trefoil.*

Native: In pastures and on heaths and roadsides. Common. May to July.

Common throughout the county.

L. tenuis, *Kit.* *Slender Birds'-foot Trefoil.*

Native: In fields, and on banks and roadsides, in marly and calcareous soils. Local. June to September.

II. Dunchurch Road, near Rugby, *Rev. A. B., N. B. G. S.*, 1837; near Birdingbury Station, *H. W. T.*; Whitnash, Chesterton, *Y. and B.*: Hampton-on-the-Hill! *H. B.*; abundant on the Fosseway, near Darlingscote, *Newb.*; Harbury, *W. B. Grove;* Binton; Grafton; Wilmcote; Studley; Bearley; Exhall; Bidford; and between Kineton and Edge Hills.

L. major, *Scop.* *Marsh Bird's-foot Trefoil.*

Native: On moist heaths and banks, ditch sides, &c. Locally common. June to September.

I find this in all the districts throughout the county.

ASTRAGALUS.

A. glycyphyllus, *Linn.* *Wild Liquorice.*

Native: On roadsides and in pastures, in calcareous or marly soils. Rare. June.

II. Oversley, Grafton, *Purt.*, i., 309; Bidford, *Bree.*, *Mag. Nat. Hist.*, iii., 165; Tachbrook, near the Fosse Road, *Y. and B.*; Billborough Hill, near Alcester, *Blox.*, *N. B. G. S.;* Morton Bagot; Ashorne; Lighthorne; Binton.

ORNITHOPUS.

O. perpusillus, *Linn.* *Least Bird's-foot.*

Native: On heathy footways and sandy fields. Local. June to September.

I. Hartshill! on gravelly soils. *J. P., MS. note in B. G.* Sutton Park; Old Chester Road; Coleshill Heath; Bannersley Rough; Berkswell; Hampton-in-Arden; Sandy Quarry, Cornels End.

II. Leamington, Kenilworth, *Y. and B.;* Lye Green.

[*Hippocrepis comosa*, Linn. *Horse-shoe Vetch.* Mr. Bromwich has found this on high banks, in Lias soils, near Morton Morrell; but it cannot be considered as more than a casual weed in the county. Morton Morrell, *June*, 1864, *H. B.*, *Herb. Brit. Mus.*]

ONOBRYCHIS.

O. sativa, *Lam.* *Sainfoin, Cockshead.*

Native: In arable land, and by roadsides, etc., in marly and calcareous soils. Local. June to August.

II. (*Hedysarum Onobrychis*). Rare. Grafton! Billesley! *Purt.* i., 341; Harbury, *Y. and B.;* Binton; road from Stratford to Bidford; Red Hill; Wixford; banks near Rose Hall, Oversley; railway banks, Studley. In many of the habitats merely the remains of former cultivation.

VICIA.

V. hirsuta, *Koch.* *Hairy Tare.*

Native: On banks, by roadsides, and in fields. Common. May to August. Found throughout the county.

V. tetrasperma, *Moench.* *Smooth Tare.*

Native: In arable land, on banks, etc., in marly districts. Local. June to August.

I. Railway banks near Knowle Station; in fields about Elmdon and Coleshill Heath. Abundant on the new dam, Bracebridge Pool, Sutton Park, and on the railway banks.
II. Whitnash, *Y. and B.*; near Bilton! Rugby, *R. S. R.*, 1877; fields near Marl Cliff; Oversley Wood; Cold Comfort, near Alcester; pea field near Wilmcote; canal bank, Bearley, etc.

V. gracilis, *Lois.* *Slender Tare.*
Native: On cultivated land in calcareous soils. Rare. June, August.
II. Whitnash, *Y. and B.*; Morton Morrell, *Herb. Brit. Mus.*, *H. B.*, 1867; Tredington, in a few places, *Newb.*; pea field near Wilmcote.

V. Cracca, *Linn.* *Tufted Vetch.*
Native: In hedges, woods, etc. Common. June to September. Area general.

V. sylvatica, *Linn.* *Wood Vetch.*
Native: In woods. Very rare.
I. "Hort's Hill, Hey's Wood, ten miles from Coventry,"* *Aliquis*, *Mag. Nat. Hist.*, v., p. 768, 1832; Hart's Hill Hayes, *Rev. A. B.*, *Phyt.*, iii., 324; Merevale Park, *J. Power*, *MS. note in B. G.*

V. sepium, *Linn.* *Bush Vetch.*
Native: In woods, and on banks, etc. Common. May to July. Frequent throughout the county.

V. sativa, *Linn.* *Cultivated Vetch.*
Denizen: On railway banks, and in cultivated land. May to July.
Although I not unfrequently see solitary specimens of this plant, they are never more than stragglers from cultivation, and I cannot look upon it as more than a casual weed.

V. angustifolia, *Roth.* *Common Wild Vetch.*
Native: In cultivated fields, on heath lands and hedge banks. Rather common. May to August.
Var. *a. segetalis*, Koch.
I. Sutton Park; Coleshill Heath; Knowle railway bank, etc.
II. Kenilworth, *Y. and B.*; Tredington, Honington, *Newb.*; waysides, Iron Cross, near Salford Priors, etc.
Var. *b. Bobartii*, Koch.
On banks and heathy waysides. Rather rare.
I. Coleshill Heath.
II. Milverton, *Y. and B.*; railway bank near Hatton Station.

V. lathyroides, *Linn.* *Spring Vetch.*
Native: In sandy and gravelly soils. Very rare, or overlooked.
II. On the side of the Bridle Road from Spernal Ash to Studley, *Purt.*, i., 337. As a casual near Milverton, *H. B.*

LATHYRUS.

L. Aphaca, *Linn.* *Yellow Vetchling.*
Colonist: In Lias and marly fields. Very rare.
II. Alne Hills, *Purt.*, i., 340; "Warwickshire," *Syme*, *E. B.*, *ed.* 3, iii., 101; as a garden weed at Myton, *H. B.*
Although I have made several special visits to the Alne Hills, I have never been able to find this plant there.

* "It grows in thousands, perhaps tens of thousands, in Hort's Hill, Hey's Wood, just ten miles from Coventry, festooning the underwood with its beautiful chocolate striped petals, etc."

L. Nissolia, *Linn.* *Grass Vetch.*
Native: In fields, on banks, and roadsides in Lias soils. Rare. June, July.
I. Caldicote, *J. P.*, *MS. note in B. G.*
II. Coughton, Great Alne, *Purt.*, i., 339; Wilmcote, *Rev. A. Blox.;* Tachbrook; Stratford Road from Warwick, *H. B.;* Honington, *Newb.* Abundant on the road from Stratford to Binton bridges; canal bank near Bearley, and in fields near Aston Cantlow.

L. pratensis, *Linn.* *Meadow Vetchling.*
Native: In fields, and pastures, and on banks, etc. Common. June to August. Frequent throughout the county.

L. sylvestris, *Linn.* *Narrow-leaved Everlasting Pea.*
Native: In woods and bushy places. Rare. July, August.
I. Near Arbury Hall, *T. Kirk*, *Phyt.*, ii., 970.
II. (*L. latifolius*,) Spernal Park, *Purt.*, i., 339.; Green's Grove, Hatton! in a thicket near Baly's Locks, Warwick, *Perry*, *Fl. p.*, 61; in a thicket between Alcester and Oversley Wood; Bubbenhall Bree, *Purt.*, iii., 373; Chesterton! *Y. and B.;* Hampton Lucy; Milverton, *H. B.*
[*L. latifolius*, Linn. Occurs abundantly on a waste bank near Harbury Railway Station, and has been established there many years, but has no claim to a place in this flora.]

(To be continued.)

METEOROLOGY OF THE MIDLANDS.

THE WEATHER OF DECEMBER, 1881.

BY CLEMENT L. WRAGGE, F.R.G.S., F.M.S., ETC.

Periods of great mildness were experienced, readings were especially high about the 2nd, 6th, 27th and 29th, and vegetation was unusually forward;—wall-flowers, violets, primroses, daisies, &c., being in bloom. At Cheltenham, indeed, clematis shoots were 8 inches long; and at Alstonfield "on the 6th a gooseberry tree had five or six expanded flowers." Temperature it seems was, nevertheless, rather below the average in Central England, but slightly above it in the extreme South-west and in the North. At Orleton the mean was about 1 degree below the average of the last 20 years. Colder weather occurred during the second week, and about the 23rd. S.Wly. winds prevailed, and fogs were of frequent occurrence. The remarkable oscillations of the barometer prove that the atmosphere was still in a very unsettled condition. The following are readings from the Cheadle instrument at 32 F. and 646 feet above sea during the times of the most marked elevation and depression:—13th 9 P.M. 29·61, 17th 9 P.M. 28·32, 19th 9 A.M. 28·76, 20th 9 A.M. 28·14, 23rd 9 P.M. 29·80, 27th 9 A.M. 29·83. The solar maximum thermometer at Aspley Guise recorded 84·4 on the 20th, and the terrestrial minimum at Oscott marked 14·0 on the 23rd. Sunshine at Hodsock 45 hours; at Aspley Guise 54 hours, 20 minutes. Lunar halos were seen at Oxford on the 5th and 28th, and lunar coronæ on the 2nd and 30th. There was some deficiency of ozone. Mean sea temperature at Scarborough 44·1.

STATION.	OBSERVER.	RAINFALL. Total for M. In.	RAINFALL. Greatest fall in 24 hours. In.	RAINFALL. Greatest fall in 24 hours. Date.	RAINFALL. No. of rainy d.	TEMPERATURE. Greatest ht. Deg	TEMPERATURE. Greatest ht. Date.	TEMPERATURE. Greatest cd Deg	TEMPERATURE. Greatest cd Date
OUTPOST STATIONS.									
Spital Cemetery, Carlisle	J. Cartmell, Esq.	2·45	·18	3	18	52·8	3	18·0	23
Scarborough (a)	F. Shaw, Esq., F.M.S.	2·4	·62	20	17	49·4	2	29·0	10
Blackpool (a)—North Shore	C. T. Ward, Esq., F.M.S.					50·1	29	25·4	16
Blackpool (a)—South Shore	C. T. Ward, Esq., F.M.S.	3·98	·62	16	23	51·3	3	22·[illegible]	23
Carmarthen (a)	G. J. Hearder, Esq., M.D.	5·63	1·38	16	22	53·0	2	20·3	11
Altarnum	Rev. J. Power, M.A.	8·66	1·37	17	24	53·0	3	22·0	23
Sidmouth (a)	W. T. Radford, Esq., M.D.	2·74	·37	19	19	54·2	2	28·0	23
MIDLAND STATIONS.									
GLOUCESTERSHIRE.									
Cheltenham (a)	R. Tyrer, Esq., F.M.S.	2·90	·97	17	16	54·0	2	19·0	24
WILTSHIRE.									
Marlborough (a)	Rev. T. A. Preston. F.M.S.	3·52	·84	17	18	51·8	5	22·3	23
SHROPSHIRE.									
Woolstaston	Rev. E. D. Carr	4·10	1·26	16	18	51·0	6	27·5	14
Bishop's Castle	E. Griffiths, Esq.	3·78	1·13	16	17	57·0	2	22·0	24
Dowles, near Bewdley	J. M. Downing, Esq.	2.89	·65	17	17	68·0	5	14·0	11
HEREFORDSHIRE.									
Stoke Bliss	Rev. G. Alexander	2·64	·66	17	15	52·0	2	24·0	23
WORCESTERSHIRE.									
Orleton, Tenbury	T. H. Davis, Esq., F.M.S.	2·59	·74	17	18	54·0	6	22·2	23
West Malvern	A. H. Hartland, Esq.	3·60	·75	17	25	49·5	2,6	25·5	10
Evesham	T. J. Slatter, Esq., F.G.S.	2·57	·94	17	16	51·3	2	22·3	24
Pedmore	E. R. Marten, Esq.	2·91	·76	17	15	52·0	2	23·0	10,23
Stourbridge	Mr. J. Jefferies	2·93	·84	18	14	51·0	2,4	20·0	10
Cawney Bank, Dudley	Mr. C. Beale	2·37	·69	17	18	48·0	2,4,6	25·0	10
STAFFORDSHIRE.									
Dennis, Stourbridge (a)	C. Webb, Esq.	2·78	·74	17	14	52·5	2	19·5	10
Kinver	Rev. W. H. Bolton	2·48	·66	17	17	51·0	2	21·0	10
Walsall	N. E. Best, Esq.	3·09	·96	16	15	57·0	2	23·0	9
Lichfield	J. P. Roberts, Esq.	2·70	·78	17	12	52·0	2	22·0	10
Weston-under-Lyziard	Hon. & Rev. J. Bridgeman.	2·81	·64	17	17	51·0	2	21·0	11
Wrottesley (a)	E. Simpson, Esq.	2·53	·67	17	13	50·6	2	0·4	23
Heath House, near Cheadle (a)	J. C. Philips, Esq., J.P.	2·96	·75	17	17	50·4	2	22·5	24
Oakamoor, Churnet Valley (a)	Mr. E. E. Kettle	3·41	·70	17	16	50·9	6	20·1	23
Beacon Stoop, Weaver Hills (a)	Mr. James Hall (b)	1·31	·21	17	14	47·6	6	24·5	14,24
Alstonfield	Rev. W. H. Purchas	4·08	1·13	16	16	49·7	1	14·1	18
Grammar School, Burton	C. U. Tripp, Esq., M.A.	2·44	0·55	17	20	52·0	2	19·0	11
WARWICKSHIRE.									
St. Mary's College, Oscott (a)	J. MacElmail, Esq.	2·53	·76	17	11	52·3	27	19·9	10
Henley-in-Arden	T. H. G. Newton, Esq.	3·11	·84	17	17	52·0	2	19·0	23,24
Kenilworth (a)	F. Slade, Esq., C.E., F.M.S.	2·98	·88	17	17	51·6	2	20·4	24
Coundon, Coventry	Lieut.-Col. R. Caldicott	2·94	·84	17	19	49·0	2,6	23·0	13
Rugby School	Rev. T. N. Hutchinson	3·29	·85	17	20	52·0	2	19·0	24
DERBYSHIRE.									
Stony Middleton	Rev. V. Smith	3·88	·90	26	11	49·0	2	19·0	9,22,23
Fernslope, Belper	F. J. Jackson, Esq.	2·77	·69	17	14	51·0	2	23·0	24
Duffield	W. Bland, Esq.	2·70	·95	17	14				
NOTTINGHAMSHIRE.									
Mansfield (a)	W. Tyrer, Esq., F.M.S.	2·58	·52	17	18	50·9	2	21·0	24
Hodsock Priory, Worksop (a)	H. Mellish, Esq., F.M.S.	2·23	·55	19	19	52·0	2	20·3	24
Tuxford	J. N. Dufty, Esq., F.G.S.	2·57	·57	19	16	49·0	25	21.0	23
LEICESTERSHIRE.									
Syston	J. Hames, Esq.	2·63	·78	17	17	47·0	6,7	23·0	24
Town Museum, Leicester	J. C. Smith, Esq.	2·76	·80	17	17	52·2	3	21·5	25
Ashby Magna	Rev. Canon Willes	2·54	·77	17	13	51·0	2		
Kibworth	T. Macaulay, Esq.	3·13	·78	17	16	50·0	2	25·0	22
Waltham-le-Wold	Edwin Ball, Esq.	3·75	·77	17	15	48·0	3,6	20·0	23
Dalby Hall	G. Jones, Esq.	1·69	·80	17	13	47·0	6	15·0	24
Coston Rectory, Melton (a)	Rev. A. M. Rendell	2·66	·74	17	15	52·0	2	17·0	24
NORTHAMPTONSHIRE.									
Towcester	J. Webb, Esq.	3·36	1·05	17	16	50·0	7,17	26·0	11,14
Kettering	J. Wallis, Esq.	3·03	·83	17	16				
OXFORDSHIRE.									
Ratcliffe Observatory, Oxford	The Staff	3·26	·96	17	16	52·1	2	21·4	24
BEDFORDSHIRE.									
Aspley Guise, Woburn (a)	E. E. Dymond, Esq., F.M.S.	3·57	1·38	17		54·0	2	24·8	24
RUTLAND.									
Northfields, Stamford	W. Hayes, Esq.	2·55	·28	17	12	52·0	1	28·0	11
Uppingham (a)	Rev. G. H. Mullins, F.M.S.	2·67	·77	17	16	50·5	2	21·8	24

(a) At these Stations Stevenson's Thermometer Screen is in use, and the values may be regarded as strictly intercomparable.

(b) Since April 1st last two standard rain-gauges have been in use at my station on Beacon Stoop, one on the apex of the hill, 1,216ft. above sea, and the other on the plateau adjacent, about 1,200ft. Much more rain falls into the gauge on the plateau than into that on the apex. The rainfall statistics of this station have hitherto, for this Magazine, been taken from the apex gauge, that first established (including the figures in the table above); but as the differences are of the highest interest, the results already obtained from the two gauges will in a future number be discussed side by side; and in future synopses the totals from the plateau gauge will be given. C. L. W.

The query attached to the Walsall "Greatest Fall" for November, 1881, must be considered as withdrawn. The value is 0·59.

TO OUR METEOROLOGICAL OBSERVERS.

A new Form is in the course of despatch. Several alterations have, it will be noticed, been made in the Headings and Instructions in order to ensure *absolute uniformity* of entry for purposes of scientific comparison with the abstracts, etc., of the Meteorological Society. Henceforth, commencing with our abstract for January, 1882, 0·006 and above will constitute a day of rain; and the mode of dealing in future with the extreme shade temperatures will appear from the following:—If the maximum and minimum thermometers are read and set in the evening the extreme readings are to be entered, invariably, as usual to the days on which they are observed; but if read and set in the morning the absolute or extreme maximum is to be entered against the *previous* day (although in cyclonic weather it may be known to have actually occurred during the early morning hours), and the absolute minimum to the day on which it is read (notwithstanding it may be known to have taken place under certain conditions on the day preceding). All of our observers, but especially those who do not observe for the Society, and are unaccustomed to its rules, are most earnestly requested in the interests of science, which cannot in the Meteorological branch be entirely advanced except by the strictest uniformity and method, to rigidly adhere to the plan and instructions of the new Form. It would be well if all observers adopted Stevenson's Thermometer Screen and verified instruments placed four feet above grass, and at least twenty-five feet from any wall or fence. All readings would then be strictly intercomparable, and immense good would ultimately accrue to meteorological research. Some of our best observers, now doing good work, would vastly increase the value of their results by entering into the general plan and adopting perfect uniformity of observation and exposure of instruments. A single observer, acting by himself, can do little more than local good; but when forming one of a scientific body, acting with its members in perfect harmony and accord, he becomes as it were an important wheel in that mighty system of machinery that has for the object of its labours the solving of the all important problems in Meteorology, and the ultimate advancement of the public good. I most cordially thank one and all for the generous and valuable assistance they have already given to the Meteorological Department of the "Midland Naturalist."

January, 1882. CLEMENT L. WRAGGE.

Review.

On a Discovery of Fossil Fishes in the New Red Sandstone of Nottingham.

By E. Wilson, F.G.S.*

I wish to call the attention of the Section to a recent discovery of fossil fishes in the Lower Keuper Sandstone of England, a circumstance of sufficient rarity in itself, apart from any palæontological results, to deserve at least a passing notice.

During the construction of the Leen Valley Outfall Sewer, in 1878, a remarkably interesting section was given by the tunnelling driven through Rough Hill, or Colwick Wood, near Nottingham, showing the

* Communicated to the British Association York Meeting, 1881

lower beds of the Waterstones resting on a denuded surface of the "Basement Beds" of the Keuper.

The lowest stratum of the Waterstones was a sandstone about a foot thick, with streaks of red and green marl, and a seam of pebbles at the base. The fishes occurred in this bed, and chiefly in a thin seam of red marl, overlying the pebbly seam at the very bottom of the Waterstones. They were present in large numbers, as if in a shoal. for a distance, in the line of section, of about 33ft.

The specimens I obtained have been examined by several competent authorities, but unfortunately their state of preservation is so bad that nothing certain can be made out as to their precise zoolcgical affinities. Dr. Traquair, however, believes that they probably belong to some species, new or old, of the genus Semionotus.

The occurrence of these fossils at the junction of two distinct sets of beds—the Basement Beds and the Waterstones—is probably not a mere chance coincidence. The characters of the preceding Keuper Basement Beds—false-bedded, coarse, grey sandstones and conglomerates with large fractured quartzite pebbles, and lenticular beds of red marl—prove them to have been formed during a period of great violence; while those of the Waterstones—regularly-bedded fine-grained yellowish sandstones and red marls covered with ripple-marks, sun-cracks, and pseudomorphs of common salt—show that they were formed in quiet and shallow waters. It appears pretty certain, then, that these fishes did not live in this area during the turbulent times of the Basement Beds, but came in when subsidence let in the quieter waters of the Waterstone epoch.*

Correspondence.

A Large Otter in the Trent.—Mr. John Glover, of Newark, very recently succeeded in shooting an exceedingly fine otter in the Muskham fishery, near Newark. The animal was very large, weighing twenty-six pounds, and appears to be about six years old. Much damage has been caused to the fishery by otters of late, and it is very likely indeed that there are several there yet.—J. P. B., Nottingham.

Practical Botany.—We have received from Major Barnard, of Bartlow, Leckhampton, near Cheltenham, some very well-drawn illustrations (by Mrs. Barnard) of British plants, in which the chief points of their botanical structure are clearly and characteristically brought out. One set is intended to illustrate Houston's "Practical Botany;" while a second set includes examples of nearly all the important genera of British flowers. They are sold at a shilling a dozen, whether of the same plant or of different plants. Teachers of botany, or private students, will find these drawings very useful; they show one just what to look for.—W. J. H.

* I should mention that I obtained the specimens under somewhat unfavourable circumstances, namely, in the roof of a tunnel, several hundred feet from daylight, and after the rock had been defaced by smoke and dirt. The fossiliferous bed lies only a few feet below the surface of the ground, and if carefully opened from above, better and perhaps identifiable examples might possibly be obtained.

Early Flowers.—Ivy-leaved Speedwell (*Veronica hederifolia*) in full flower in the open fields, January 7th. Bulbous Buttercup (*Ranunculus bulbosus*), single flower, on sheltered hedge bank, with S.W. aspect, January 13th. Vernal Whitlow Grass (*Draba verna*) in full flower, on walls, 15th.—O. V. A., Banbury.

Ornithological Notes.—A female Shoveller (*Anas clypeata*) was killed on the Cherwell, near Aynho, on the 13th December. It is the only specimen I have seen from this immediate neighbourhood, although a male bird was procured from the same locality some fifteen years or so ago. Walking home along the meadows on the 24th of that month, my brother and I counted twenty-six Magpies as they flew out of a row of trees. Although this is a plentiful species here, and I have frequently noticed parties of ten or a dozen, I think it is unusual to meet with so large a number as this together. The Carrion Crow is also gregarious sometimes in the autumn, and I once shot two from a party of about twenty-five coming to roost in a small oak spinney. The Goldfinch is now getting very scarce in this district, and I was accordingly much pleased to see on the 26th December a flock of about a score of them feeding on the remains of some thistle heads in a low lying pasture field. The winter has been very noticeable so far for the great scarcity of winter birds. I have only seen *four* Fieldfares (and can hear of no others being seen by my friends), and not more than a dozen Redwings. I never knew either of these birds so scarce. Wildfowl, too, of all kinds have visited us in very small numbers. On the 27th I saw a few Lesser Redpoles (*Linota rufescens—Vieillot*) feeding on the seeds of some alders, but I have heard of no Siskins or Bramblings, and only one or two Short-eared Owls. My brother informs me that a Chiffchaff (*Phyllopneustes rufa*), has frequented his garden for some time, in full song, and on the morning of the 15th he saw the bird plainly. Although not without precedent, such occurrences are very rare. A Blackbird's nest with young was found, as I am informed, near Aynho, on the 13th of last month. Truly the winter is an extraordinary one.—Oliver V. Aplin, Banbury, Oxon, January 17, 1882.

A New Agent of Denudation.—A correspondent sends the following note:—"Professor Ball tells geologists that they must "hurry up their phenomena," for astronomers cannot allow them more than some fifty millions of years. It seems that about that time ago, or a little earlier, the moon parted company with the earth, and commenced to circle round it at great speed, and in close company. Ever since, the moon has been gradually receding from us. It fo lows from this theory that the *tides* were formerly of immensely greater height than at present; for, the nearer the moon was to the earth, the greater would be its attraction on the waters. In Silurian times, for instance, we must picture to ourselves tides of 600 or 700ft. in height, continually rolling round the earth. This is an attractive theory, and would be useful to geologists in some respects, as in explaining our old plains of denudation, etc., but in some respects it seems to prove too much. With our present agents of denudation—rain, rivers, frost, the sea, etc,, it has been a cause of wonder to great geographers, "how there could be any land at all," or "how the land could get its head above the waters;" but how are we to explain the great continents which certainly existed in the Old Red Sandstone epoch, and, probably, also in Silurian and Cambrian times? With tides such as Prof. Ball describes it is, indeed, difficult to imagine the formation or existence of land surfaces of any extent."

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—MICROSCOPICAL GENERAL MEETING.—January 24th.—Mr. J. Levick exhibited the circulation in the young and perfectly transparent rootlets or shoots of Chara. Mr. J. E. Bagnall exhibited the very rare peristome of *Fontinalis minor*, a moss which, from its aquatic habitat, very rarely produces perfect fruit. Mr. W. B. Grove exhibited the following species of Myxomycetes, found in the neighbourhood, in illustration of his paper: *Pyhsarum sinuosum*, *Didymium cinereum*, var. *costatum*, *Craterium vulgare*, *C. leucocephalum*, *Leocarpus fragilis*, *Tilmadoche nutans*, *Spumaria alba*, *Comatricha Friesiana*, *Stemonitis fusca*, *Trichia fallax*, *T. varia*, *T. nigripes*, *Hemiarcyria rubiformis*, *Arcyria punicea*, *A. incarnata*, *A. cinerea*, *Prototrichia flagellifera*, and *Perichæna corticalis*. He gave a brief *résumé* of the present state of knowledge concerning this interesting group of Fungi. They differ from all other Fungi in the fact that the spore gives origin to a naked mass of protoplasm, which possesses a nucleus and contractile vesicle, and afterwards developes a flagellum, in which state it resembles a free swimming monad. It then passes through an amœboid state. A vast number of these amœboid bodies unite together to form a cake-like or reticulated mass, which itself possesses the power of locomotion, and from which are produced the spore-cases or sporangia. In the first part of this life-cycle the organism possesses the characteristics of animal life; in the latter part it resembles the Fungi. On this account naturalists are at present divided in their opinions as to the proper place of the Myxomycetes in their classification. Mr. Grove gave his decision in favour of retaining them amongst the Fungi, as an aberrant group approaching the animal sub-kingdom of the Protozoa. Mr. A. W. Wills made a few remarks, in which he gave a sketch of Professor Huxley's opinion on the borderland between the Animal and Vegetable Kingdoms.

BANBURYSHIRE NATURAL HISTORY SOCIETY.—December 5th.—Mr. Charles Gillett in the Chair. Various species of Rotifers were exhibited by Mr. E. A. Walford, and a Polecat (*Mustela putorius*), from the neighbourhood, by Mr. O. V. Aplin. A paper on Meteorological Observations was read by Mr. Symington. Mr. C. E. Gillett gave an account of his ascent of Ben Nevis in the summer. January 2nd.—Mr. S. Stutterd in the Chair. Exhibits: Several species of *Thysanura*, by Mr. Stutterd; *Epipactis ensifolia* from the Chiltern Hills, Oxon, by Mr. O. V. Aplin. Micro-photographs by Mr. E. A. Walford, and Mosses and Lichens by Mr. Symington. The Chairman made some remarks on *Thysanura*, illustrated by specimens under the microscope and photographs. Mr. J. R. Davis communicated a note on the food of the Water Vole (*Arvicola amphibius*). A short paper on the desirability of a series of Phenological observations being made by members was read by Mr. O. V. Aplin, and forms for observations during the month of January were distributed. The Secretary (Mr Walford) gave an interesting sketch of a Banbury botanist, the late Mr. Alfred French.

NORTHANTS NATURAL HISTORY SOCIETY.—JANUARY 17.—The first of a series of Gilchrist Lectures, under the auspices of this Society, was given in the Town Hall, Northampton, by Professor Ball, Astronomer Royal for Ireland, on "The Telescope and its Uses." January 24, Microscopical Meeting.—Mr. Kempson exhibited *Epistylis gracilis*; Mr. Osborne, slides, illustrating the anatomy of spiders; Mr. E. A. Durham, *Hydra vulgaris*, diatoms, etc.; Mr. Gregory, sections of leaves, etc., stained, section of Lepidodendron, parasite of owl, mounted by the exhibitor without pressure, and minute moths; Mr. Dangerfield, specimen of adulterated mustard.

REPORT ON THE PENNATULIDA COLLECTED IN THE OBAN DREDGING EXCURSION OF THE BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY, JULY, 1881.

BY A. MILNES MARSHALL, M.A., D.SC., PROFESSOR OF ZOOLOGY IN OWENS COLLEGE, AND W. P. MARSHALL, M.I.C.E.

(Continued from page 36.)

5. *Anatomy of the Zooids*—

The only important points in which the zooids differ from the polypes are the following:—

1. They have no tentacles, and no distinct calyx.
2. They have only two mesenterial filaments, viz., those corresponding to the two long filaments of the polypes: like these latter they extend to the bottom of the body-cavity. The remaining six mesenteries are present, but their free edges below the stomach are not thickened to form mesenterial filaments.
3. They have no reproductive organs.

Whether these distinctions are absolute is, however, very uncertain. In the younger specimens there appears to be a gradual passage from zooids to polypes (Fig. 6), though whether zooids are in all cases destined ultimately to grow up into polypes must be left for the present undecided.

Polymorphism, *i.e.* the existence of structural differences between individuals living together and fundamentally alike, is very widespread, and attains a high degree of development among *Hydrozoa*, where we commonly find in a single colony (*a*) nutritive individuals with mouths and tentacles, which digest food not only for themselves, but for the rest of the colony as well, but are often destitute of means for capturing their prey; (*b*) prehensile individuals, richly provided with thread-cells, capturing the prey and conveying it to the nutritive individuals to be digested, but themselves destitute of mouth or stomach; (*c*) reproductive individuals, often with no mouth or stomach. To these may be added, in many cases, locomotive individuals, whose sole function is to propel the colony through the water; protective individuals, and a variety of other forms.

Among *Actinozoa*, on the other hand, though we have an equally marked tendency to the formation of colonies by budding, polymorphism is exceedingly rare, all the individuals composing the colony being as a rule alike: the most marked example of polymorphism is shown by the group with which we are now dealing—the *Pennatulida*—and even here we only meet with two kinds of individuals, the polypes and the zooids, between which the distinction may be as in *Funiculina* by no means an absolute one.

Zoological Position and Affinities.

The general zoological position of *Funiculina* is shown in the Table given on page 1 of this Report. The generic characters, as given by Kölliker, our greatest authority on the group, are as follows :—*

"Genus : *Funiculina.* Long slender Sea-feather ; stalk short, with no conspicuous dilatations ; polypes inserted directly into rachis ; stem quadrangular. Polypes protruding from long cups whose margins are produced into eight pointed processes, each of which contains in its interior a prolongation of one of the body compartments surrounding the stomach, and in its walls longitudinal series of long slender calcareous needles which extend a certain distance down the cups and end in a number of oblique and transversely placed needles. Polypes in obliquely placed rows on the dorsal angles and adjoining sides of the rachis : tentacles with no calcareous needles. Zooids of same form as polypes lying on dorsal surface of rachis nearer the middle line than the sexual animals : at the lowermost end of the feather the zooids take the place of the polypes and end in single rows on the lateral surfaces of the rachis. Sexual organs in the body-cavities of all adult polypes. Radial nutrient canals not present. Integument of both rachis and stalk beset with calcareous needles, especially abundant in the stalk."

Kölliker only recognises a single species, viz., *Funiculina quadrangularis.* He gives the following list of synonyms and definition of the species :—†

Synonyms.—*Penna del pesce pavone.* Bohadsch.
Pennatula quadrangularis. Pallas.
Pennatula antennina. Linnæus, Ellis, and Solander.
Funiculina tetragona. Lamarck.
Pavonaria Antennina. Cuvier, Schweigger, Ehrenberg.
Pavonaria quadrangularis. Blainville, D. Chiaje, E. Forbes, Johnston, M. Edwards.
Funiculina antennina. V. D. Hoeven.
Funiculina Forbesii. Verrill.
Funiculina quadrangularis. Herklots.

Definition of Species.—"Colony up to 53 inches long, and at its widest part 0·4 to 0·5 inch breadth. Feather five to six times as long as stalk. Polype cups cylindrical, forming a conical pointed end when closed, very numerous, arranged in oblique rows or clusters on the dorsal angles and neighbouring parts of the dorsal and lateral surfaces ; the larger polypes 0·2 to 0·4 inch long. The pointed processes of the cup-border (calyx) up to 0·02 inch long. Prolongations of the body-cavity into the cup-border (calyx) 0·05 to 0·06 inch long. Calcareous needles of the cup up to 0·024 to 0·028 inch long."

By Verrill, as we have already seen, two species of *Funiculina* were distinguished, the name *Funiculina Forbesii* being proposed for the

* Kölliker, *op. cit.*, p. 250.

† Kölliker, *op. cit.*, p. 256.

Scotch specimens, to distinguish them from the Mediterranean ones. We have in a former section of this Report fully explained the reasons which have led us to reject this division.

Dr. Gray describes three species of *Funiculina*:*—*Funiculina quadrangularis*, *F. Forbesii*, and *F. Philippinensis*. Concerning the two first of these species the distinction is that proposed by Verrill, which we have found is not valid. Concerning the third species all that Dr. Gray tells us is the following:—

"3. *Funiculina Philippinensis*. B.M.
Axis quadrangular, about a foot long.
Hab. Philippines (Cuming)."

Kölliker makes no reference to it, although his monograph is of later date than Dr. Gray's catalogue; and on inquiry at the British Museum we find that the specimens are no longer in existence.

If no mistake has been made, this species, concerning which, in the absence of any specimens, we must feel doubtful, is of considerable interest as coming from an otherwise unrecorded locality.

History and Literature.

We propose under this heading to give as complete a list as we have been able to compile of the descriptions and figures of *Funiculina* published hitherto, arranged according to date of publication. We have purposely omitted references to works on systematic zoology, in which *Funiculina* is merely mentioned in its proper zoological position, but have included all original works and papers bearing on the subject with which we are acquainted. We have indicated by an asterisk all works to which we have not been able to refer directly.

*1761.—*Bohadsch*: "*De quibusdam Animalibus Marinis*," p. 112, and Plate IX., Figs. 4 and 5. Contains description and two figures of the first recorded specimen of *Funiculina*, discovered by himself at Naples in 1757. This specimen was, according to Bohadsch, 58ins. long, but broken at the lower end. He notices the quadrangular shape of the stem, also that the polypes cover three-fourths of the upper part of the rachis, but leave the fourth bare. The polypes were 1,310 in number, and are noted as being non-retractile.

1764.—Ellis: "Philosophical Transactions," vol. liii. pp. 423-425. Translates part of Bohadsch's description, and copies, on Plate XX., Fig. 8, one of his figures on a scale one-third the natural size. This figure has also been copied by Blainville.

*1766.—Pallas: "*Elenchus Zoophytorum*." Assigns the name *Pennatula quadrangularis* to Bohadsch's hitherto un-named specimen.

1786.—Ellis and Solander: "Natural History of Zoophytes," pp. 63-64. Refer to Bohadsch's specimen, which appears to be the only one described up to that date, under the name *Pennatula antennina*, given it by Linnæus.

* Gray: "Catalogue of the Sea-Pens or Pennatulariidæ in the collection of the British Museum." 1870, pp. 12—13.

1844.—Edward Forbes: "Annals and Magazine of Natural History," vol. xiv., pp. 413-414. Describes the capture of the first British specimens of *Funiculina*; the first indeed recorded from any locality other than Naples. The specimens, which were dredged by Mr. MacAndrew, were obtained, "both dead and alive, in twenty fathoms water, off the island of Kerrera, near Oban, the bottom being mud, in which it doubtless stands erect, after the manner of *Virgularia*." One of the specimens, 30ins. in length, was exhibited at the Natural History Section of the British Association at the York Meeting in 1844.

1847.—Edward Forbes, in "Johnston's British Zoophytes," 2nd ed., vol. i., pp. 164-166, mentions obtaining specimens of *Funiculina*, the largest of them 4ft. long, in twelve to fifteen fathoms of water, "near Oban, but nowhere else:" describes them as rose-coloured, when living, and brilliantly phosphorescent. In vol. ii., Plate XXXI., Figs. 1—7, he gives seven figures of *Funiculina* from his own drawings. These, which are the only figures yet published of British specimens, give a fair general idea of *Funiculina*, but are in many respects exceedingly inaccurate.

1851.—Kölliker: "Zeitschrift für wissenschaftliche Zoologie," Bd. iii., p. 91, in a letter to Siebold, mentions obtaining, while in Scotland, a specimen, 3ft. long, which he took back with him to Würzburg, and which, he remarks, was probably the first specimen ever seen in Germany.

1855.—Gosse: "Manual of Marine Zoology," Part I., p. 35, Fig. 55. Copies on a reduced scale two of Forbes' figures given in "Johnston's Zoophytes."

1856.—Sars, Koren, and Danielssen: "*Fauna littoralis Norvegiæ*," Andet Hefte, pp. 73 and 92. Mention the capture of a specimen, 4ft. long, at Eisvaag, in the Fiord of Bergen, in 100 fathoms of water, and note that this was the first, and up to the date of publication, the only specimen obtained from the Scandinavian shore.

*1858.—Herklots: "Notices pour servir à l'étude des Pennatulides, Bijdragen, tot de Dierkunde, Amsterdam," p. 8. We have been unable either to consult this work or even to obtain any second-hand account of its contents as regards *Funiculina*. As the reference is merely to a single page, it can hardly contain any anatomical account.

1860.—Gray: Revision of the family *Pennatulidæ*. "Annals and Magazine of Natural History," p. 20.

1864.—A. E. Verrill: List of the Polypes and Corals sent by the Museum of Comparative Zoology to other institutions in exchange, with Annotations; published in the "Bulletin of the Museum of Comparative Zoology," at Harvard College, Cambridge, Mass., p. 30. Describes Scotch specimens obtained from Mr. Stimpson as of a distinct species (*F. Forbesii*) from the Mediterranean one.

1869.—Richiardi: "Monografia della Famiglia dei Pennatularii: Bologna," pp. 89-95. Disputes the accuracy of Verrill's distinction, stating that he has obtained from the Mediterranean complete series of specimens leading from Verrill's *F. Forbesii*, which he considers merely a young form, to the typical *F. quadrangularis*. Gives on Plate XII., Figs. 95 and 96, a very imperfect and greatly reduced figure in two halves of the adult *Funiculina*.

1870.—Gray: "Catalogue of the Sea-Pens or Pennatulariidæ in the Collection of the British Museum," pp. 12-13, adopts Verrill's species (*F. Forbesii*), and proposes a classification of his own, which has not met with acceptance.

1872.—Kölliker: "Anatomisch-systematische Beschreibung der Alcyonarien. Erste Abtheilung: Die Pennatuliden." In this extremely important and copiously-illustrated work a very full description of the anatomy of *Funiculina*, the only one that has yet appeared, is given on pp. 250-261, and an excellent series of figures, all original, on Plates XVI., XVII., and XVIII., Figs. 145, 148—154. These figures show an entire young specimen of the natural size; enlarged views of various portions of the feather, showing the arrangement of the polypes and zooids; and more highly magnified views of transverse sections of the whole rachis and of a portion of the stalk. All the drawings are, however, unfortunately taken from specimens in which the tentacles are completely retracted, and consequently do not represent correctly the appearance of the polypes in the living state. In the letterpress, besides the anatomical description, there is a very complete bibliography, and a list of all the specimens and localities known to exist at the date of publication.

We are indebted to this work for many of the details incorporated in the present paper.

1873.—Sir C. Wyville Thomson: "Depths of the Sea," pp. 149 and 178, describes dredging *Funiculina* in about 100 fathoms of water in Raasay Sound, along the east coast of the Isle of Skye. The specimens from this new locality were obtained on September 13th, 1869, during the third cruise of H.M.S. "Porcupine." Their capture is described thus: "The *Pavonariæ* (*Funiculinæ*) were resplendent with a pale lilac phosphorescence like the flame of cyanogen gas; not scintillating like the green light of *Ophiacantha*, but almost constant; sometimes flashing out at one point more brightly, and then dying gradually into comparative dimness, but always sufficiently bright to make every portion of a stem caught in the tangles or sticking to the ropes distinctly visible. From the number of specimens of *Pavonaria (Funiculina)* brought up at one haul we had evidently passed over a forest of them. The stems were a metre (about 39ins.) long, fringed with hundreds of polypes."

We learn from Professor Herdman that during the third cruise of the "Porcupine" *Funiculina* was dredged at one other locality besides the one just mentioned. Among the "Porcupine" stores is a bottle containing one specimen of *Funiculina*, eight inches long, and with the following label: "Porcupine, No. 54, 19-8-69. 363 fathoms. Bottom, stony." From the map illustrating the third cruise of the "Porcupine,"* and from the tables giving the positions, etc., of the several dredging stations† we find that station 54, this new locality for *Funiculina*, is in latitude 59° 56′ N., and longitude 6° 27′ W., about midway between the island of Lewis in the Hebrides, and Suderöe the southernmost of the Faröe Islands, and in very nearly the same latitude as Bergen. This locality is of considerable interest for many reasons: it is the most northerly British locality recorded; the depth (363 fathoms) is the greatest from which living specimens have ever been obtained; the bottom

* Thomson: "Depths of the Sea," Plate IV., p. 106. † *Ibid.*, p. 143.

temperature was very low, 31·5° F.; and the bottom stony instead of as in other localities mud. An additional point of interest lies in the fact that while all other recorded localities are either in land-locked channels, or else close to the mainland, this is in the open ocean.

1880.—Kölliker: "Report on the Pennatulida dredged by H.M.S. 'Challenger': Zoology of 'Challenger' Expedition," Part II., p. 34. Gives a new classification of the Pennatulida, in which the zoological position and affinities of *Funiculina* are determined. No specimens of *Funiculina* were obtained by the "Challenger" during the whole of her three years' cruise; but two new allied genera were discovered, of which one genus, *Stachyptilum*, is represented by a single specimen from the west coast of New Guinea; while of the other genus, *Anthoptilum*, three species were discovered, two in the South Atlantic Ocean, one of them near Buenos Ayres, and the other near the oceanic Islands of Tristan d'Acunha, and the third in the North Atlantic, near Halifax, in Nova Scotia.

Geographical Distribution.

Funiculina has a very limited distribution indeed; the only localities recorded hitherto being the following:—

A.—*Mediterranean:*

1. Naples, where it was first discovered in 1757.

2. Adriatic Sea. The canal of Novi in Dalmatia is mentioned by Kölliker as a locality from which the natural history dealer, Fric, of Prague, obtained several specimens, the largest measuring 50 ins. long.

B.—*Scotland:*

3. Oban, off the Island of Kerrera. First discovered by MacAndrew in 1844. Largest recorded specimen mentioned by Forbes as 48 ins. long.

4. Raasay Sound. Discovered by Thomson during dredging cruise of "Porcupine," 1869. Loch Torridon, near Raasay Sound, is mentioned as the locality whence the specimen, 53 ins. long, in the Newcastle Museum (*vide infra*) was obtained.

5. A spot in the North Atlantic in lat. 59° 56′ N., and long. 6° 27′ W.; station 54 of the third cruise of the "Porcupine," 1869, under Sir W. Thomson.

6. Hebrides. Mentioned, without further particulars, by Kölliker as locality whence MacAndrew obtained specimens.

C.—*Scandinavian Shores:*

7. Bohuslän, in the Kattegat. Specimen 53 ins. long.

8. Eisvaeg, in the Fiord of Bergen.

9. Glaesvae, in the Fiord of Bergen. The largest recorded specimen, a dead stem upwards of 7 ft. long, was obtained from here.

10. Danish Coast. Mentioned without further particulars by Kölliker as a locality.

Not only is the geographical distribution of *Funiculina* a very limited one, but wherever it does occur it seems to be confined to a very small spot, in which it occurs fairly abundantly; as we infer from the facts that (1) in Raasay Sound, although Thomson found it once only, yet he then dredged it "in quantity." (2) That *Funiculina* is included in the catalogues of duplicates for sale or exchange published by both Dr. Dohrn, of Naples, and Dr. Malm, of Göttingen, in Sweden.

As to limits of depth we have no very certain knowledge. The Oban specimens were found at depths from 12 fathoms (Forbes) to 22 fathoms (Birmingham Natural History Society). The Raasay Sound specimens were obtained ("Depths of the Sea," p. 149) in about 140 fathoms water, and the single specimen from station 54, of the "Porcupine" cruise, at a depth of 363 fathoms; the greatest recorded depth. The first Swedish specimen was obtained in 100 fathoms water, and the large dead stem from Glaesvae in 350 fathoms.

Notes on Specimens in Other Museums.

We conclude our account of *Funiculina quadrangularis* by a brief notice of some of the larger and more important specimens preserved in other museums. Though the genus has now been known for considerably more than a century, yet the actual number of specimens preserved in museums is very small. In drawing up the following list our statements concerning the Continental specimens are taken from Kölliker's monograph.

A.—*Great Britain :*

1. London : British Museum. The specimens in the British Museum are the following :—*

  a. Seven specimens in spirit, labelled *Funiculina Forbesii*, Scotland, varying in length from 18ins. to 37ins.

  b. One specimen dried and mounted on a card, 41ins. long, from Sweden.

  c. Two very fine specimens from Sweden, received in exchange from the museum at Stockholm, 46ins. long. These specimens agree in their proportions very closely with the large Oban specimen, differing only in their greater size, and the consequent greater number and closer crowding of the polypes.

  Other specimens in the British Museum labelled *Funiculina* do not really belong to that genus at all, as defined by Kölliker.

2. Edinburgh. In the Natural History Museum there are no specimens of *Funiculina* ; but among the stores of the "Porcupine"† are eighteen specimens obtained by Sir W. Thomson, and varying in length from 8ins. to 32ins.

3. Glasgow. In the University Museum there is one specimen of *Funiculina* in fragments ; no locality marked.

* We desire to acknowledge the courtesy of Dr. Günther, and of Mr. Ridley, of the British Museum, in giving us free access to all the specimens in the Museum, and in affording us valuable aid in examining them.

† We are indebted to Prof. Herdman, of University College, Liverpool, for the details we give concerning these specimens.

4. Newcastle-on-Tyne. In the Museum of the Natural History Society of Northumberland, Durham, and Newcastle-on-Tyne, there are two specimens of *Funiculina*, 53 and 42ins. long respectively, which were obtained by Joshua Alder from Loch Torridon in Ross-shire, a locality not far from Raasay Sound, where Sir W. Thomson obtained his specimens. The 53ins. specimen, which is equal in length to the largest living specimen recorded from any locality, is divided into three portions, and the smaller one is doubled in the middle, presumably for convenience of preserving in spirit.

With the exception of the Birmingham specimens the above are, we believe, all the examples of the genus in this country.

B.—*Continent :*

1. Paris : Jardin des Plantes. A specimen, 52ins. long, from the Kattegat.

2. Copenhagen. A very fine specimen, 53 ins. long, from the Kattegat.

3. Hamburg. Johanneum. Dead stem, 89 ins. long, obtained by Herr Schilling in 350 fathoms of water, near Glæsvae, in the Bergen Fiord. By far the largest specimen yet discovered.

4. Würzburg. A number of specimens collected by Kölliker while preparing his monograph. The largest of these, 50 ins. long, is from the Adriatic.

The following table shows the actual dimensions, in inches, of the large Oban specimen, and of the largest specimens recorded from other localities, together with the museums in which they are preserved :—

	Hamburg Johanneum : Dead Stem from Bergen Fiord.	Newcastle Museum : from Loch Torridon, West Coast of Scotland.	Copenhagen Museum : from Kattegat.	Paris, Jardin des Plantes : from Kattegat.	Würzburg Museum : from Adriatic.	Würzburg Museum : from Naples.	Mason College, Birmingham : from Oban.
	in.	in.	in.	in.	in.	in.	in.
Total length	89	53	53	52	50	50	39
,, ,, Feather ..	..	46	46	44½	41	43½	33
,, ,, Stalk ..	..	7	7¼	7½	9	6½	6
Width of Rachis, widest..	..	..	0·30	0·34	0·48	0·28	0·22
,, Stalk, ,, ..	..	..	0·28	..	0·32	0·22	0·20
,, Stem in Feather	..	..	0·08	..	0·08	..	0·06
,, ,, Stalk..	..	..	0·13	..	0·14	..	0·10
Length of Polype (largest)	..	..	0·30	0·22	0·38	0·26	0·28
,, Zooid (largest)	..	..	..	..	0·07	..	0·05

THE FLORA OF WARWICKSHIRE.

AN ACCOUNT OF THE FLOWERING PLANTS AND FERNS OF THE COUNTY OF WARWICK.

BY JAMES E. BAGNALL.

(Continued from page 43.)

OROBUS.

O. tuberosus, *Linn.* *Tuberous Bitter Vetch.*

Native: In woods, and on banks and roadsides in marly soils. Locally common. May to August.

I. (*Astragalus sylvaticus*) *Warwicii frequens. Ray Cat.*, 1672. Marston Green; Shustoke; Coleshill Heath; Arley; near Old Fillongley Hall, etc.

II. Crackley Wood, near Kenilworth; Green's Grove. *Perry*, 1871; Honily, *Y. and B.*; Combe Wood, in "Twelve o'clock Drive!" *R. S. R.*, 1877; Umberslade, *W. B. Grove*; Oversley Wood; Ragley.

Var. *b. tenuifolius*, Mr. Bromwich finds this in Warwick Old Park. I find this variety with all the intermediates in most places where the plant is abundant.

Coronilla varia, Linn., was established for many years in a hedge at Wylde Green, near the road to the Railway Station, and was abundant until within the last three years.

ROSACEÆ.

PRUNUS.

P. spinosa, *Linn.* *Blackthorn or Sloe.*

Native: In hedges, woods, and bushy places. Common. March, April. Distribution general.

P. insititia, *Linn.* *Bullace.*

Native: In hedges, woods, and bushy places. Local. April.

I. Coleshill Heath; Elmdon; Lane from Olton Station to Elmdon; Marston Green; Bentley Heath.

II. Hatton, *Y. and B.*; Willington, *Newb.*; Salford, *Rev. J. C.*

P. domestica, *Linn.* *Wild Plum.*

Alien: In hedges. Rather rare. April, May.

I. In a hedge near Hockley, in fruit, 1878; Elmdon.

II. In a hedge at Pinley! *H. B.*; Salford, *Rev. J. C.*; Claverdon.

P. Avium, *Linn.* *Wild Cherry.*

Native: In hedge rows. Rather rare. April.

I. Several fine trees near Elmdon in the Coventry Road; Fillongley; Coleshill Heath; Olton; Bentley Heath; Monkspath.

II. Lower Norton, *Perry*; near the Windmill Inn, *W.C.*, *Herb. Per.*; hedges near Harborough-Magna, *Rev. A. B.*, *R. S. R.*, 1872; Ufton; Wroxall, *Y. and B.*: Warmington, *Bolton King*; Pinley.

P. Cerasus, *Linn.* *Dwarf Cherry.*

Denizen: In hedges and woods. Rather rare. April, May.

I. Coleshill Heath; Solihull; Elmdon.

II. Alcester; Edge Hills, *W. C.*; Binley Common Wood, *T. K.*; Oakley Wood, *H. B.*, *Herb. Per.*; near Rugby, on the Lawford Road, *Rev. A. B.*, *MS. note*; near Harborough-Magna, *Rev. A. B.*, *R. S. R.*, 1872; Wolstone Heath; Lapworth Street; Pinley.

P. Padus, *Linn.* *Bird Cherry.*

Native: In woods and copses. Rare. May.

I. In wild meadows near Monkspath, Shirley; in a plantation on the Erdington Road, planted.

II. Calloways Wood, near Stratford-upon-Avon; Edge Hills, *W. C.*, *Herb. Per.*

Probably not native in the county.

SPIRÆA.

S. Ulmaria, *L.* *Meadow Sweet.*

Native: By pools, streams, ditches, and other watery places. Common. June to August. Area general.

S. Filipendula, *L.* *Dropwort.*

Native: On banks and in marly fields. Local. July.

II. Sperual, Arrow, *Purt.*, i., 239; between Marton and Southam, *Bree. Mag. Nat. Hist.*, iii., 164; abundant near Wilmcote, *Rev. A. B.*; Whitnash, *H. B.*, *Herb. Brit. Mus.*; Itchington! Burton Dassett, *Y. and B.*; Morton Morrell, *H.B.*: Salford Lodge Wood, *Rev. J. C.*; Lighthorne; Compton Verney, *Bolton King*; Armscote Meadows, *F. Townsend.* In a field near Claverdon Station; railway bank near Studley Railway Station; Snitterfield.

I have not seen or heard of this being found in the Tame basin district.

AGRIMONIA.

A. Eupatoria, *Linn.* *Common Agrimony.*

Native: On hedge banks and waysides, and in fields. Common. July to August. Distribution general.

A. odorata, *Miller.* *Fragrant Agrimony.*

Native: In woods and bushy places. Rare. July, August.

II. New Waters, Warwick, *Herb. Per.*; Snitterfield Bushes! *W.C.*, *Herb. Per*; Rounshill Lane, *H. B.*; Honily, *Y. and B.*; Oversley Wood, 1878, abundant.

SANGUISORBA.

S. officinalis, *L.* *Great Burnet.*

Native: In meadows, on marly soils. Locally common. June to August.

I. Curdworth; Marston Green; near Solihull; Hart's Hill; Barston.

II. Moist meadows at Upton in Haslor parish, *Purt.* i., 93; meadows round Warwick, *Perry*, 1817; meadows near the Avon at Rugby, *N. B. G.*; Binley, Arbury Hall, Pinley, Stivichall, *T. K.*, *Phyt.* ii., 969; Salford, *Rev. J. C.*; near Brandon.

POTERIUM.

P. Sanguisorba, *Linn.* *Common Salad Burnet.*

Native: On marly banks, in pastures, &c. Local. May to July.

I. Oscott plantations, *Rev. J. C.*; railway banks near Knowle Station, 1878; near Sheldon Church.

II. Lambscote; Tredington; Honington, *Newb.*; Salford, *Rev. J. C.*; waysides between Stratford-on-Avon and Alcester; near Binton; meadows near Henley-in-Arden; Ashorne; near Brandon.

P. muricatum, *Spach.* *Muricated Salad Burnet.*

Denizen: On banks and in cultivated fields. Local. May to July.

I. Knowle Railway Bank.

II. Railway cutting between Kenilworth and Leamington, *Anna Russell*, *Herb. Brit. Mus.*; "In various places on the slopes of the Coventry and Leamington Railway," *T. K. Phyt.*, iii., 715; "The variety *a*, *platylophium* I have from Kenilworth, Warwickshire," *Syme*, *E. B.*, iii., 135; Pinley, *T. K.*, *Herb. Per.*; Hatton, *Y. and B.*; near the footpath to Lawford, *R. S. R.*, 1877; Harbury; Red Hill; Binton; Ladies Wood, near Ragley; banks near Prince Thorpe.

ALCHEMILLA.

A. arvensis, *Scop.* *Field Ladies' Mantle.*
Native: In fields and on heathy waysides, etc. Common. April to August. Area general.

A. vulgaris, *Linn.* *Common Ladies' Mantle.*
Native: In pastures and on waysides, etc. Local. April to August.
I. Tanworth, *Purt.*, i., 102; Coleshill Heath; Ballard's Green, Arley; Hampton-in-Arden; Bentley Heath, etc.
II. Oversley, *Purt.*, i., 102; Wroxall; Budbrook, *Y. and B.;* near Lawford, *R. S. R.*, 1877; Iddicote, *Rev. J. Gorle*; High Cross, etc.
The variety *b*, *montana*, Willd, appears to be the most frequent form in the county.

POTENTILLA.

P. Fragariastrum, *Ehrh.* *Barren Strawberry.*
Native: On dry banks, in woods, and on waste places. Common. March to June. Area general.

P. Tormentilla, *Schenk.* *Common Tormentil.*
Native: On heaths, banks, and in woods. Common. May to August. Area general.

P. procumbens, *Sibth.* *Creeping Tormentil.*
Native: On heath lands, woods, and bushy places. Rare. May to August.
I. Coleshill Heath; Shelly,* near Solihull; Four Ashes.*
II. King's Lane, near Stratford-on-Avon; Hampton-on-the-Hill, *Herb. Per.;* Rounshill Lane! Itchington Holt; Highdown, Tachbrook, *H. B.*
* The form from these localities is probably *P. mixta*, Nolte.

P. reptans, *Linn.* *Creeping Cinquefoil.*
Native: On marly banks, heathy waysides, etc. Locally common. May to September.
I. Sutton Park; Coleshill Heath; Hampton-in-Arden, etc.
II. Warwick, *Perry Fl.*, 44; Honington, Tredington, Willington, *Newb.;* Whatcote, *Rev. J. Gorle;* Drayton Bushes.
A variety having four petals occurs near Water Orton, on gravelly waysides; it does not otherwise differ from the type.

P. anserina, *Linn.* *Silver Weed.*
Native: On damp, sandy waysides. Common. May to August. Area general.

P. argentea. *Linn.* *Hoary Cinquefoil.*
Native: On heathy and sandy places. Rare.
I. Coleshill Heath, *Bree. Purt.*, iii., 40.
II. On a sand-rock near the Woodloes! *Perry Fl.*, 44, Griff Hollows, *Kirk*, *Herb. Per.;* Gaveston Hill, *H. B.*

(*To be continued.*)

THE MINERALS OF THE MIDLANDS.

BY C. J. WOODWARD, B.SC.

I am indebted to a Nottingham correspondent for a statement that he has found Galena near the town, in Permian Limestone, and also that in the Cresswell Crags occur dendritic markings, probably of Manganese.

The following paper, read before the Chemical Society, (see Journal, 1876, vol. i., p. 154.) is not, I think, much known, so I give it here nearly in full:—

ON THE OCCURRENCE OF NATIVE CALCIUM CHLORIDE AT GUY'S CLIFFE, WARWICKSHIRE.

BY JOHN SPILLER, F.C.S.

In the course of a holiday tour through Warwickshire, made in the month of September last, I visited the Grounds at Guy's Cliffe, situated on the Avon, about one mile from Warwick Castle. At this point the New Red Sandstone (Keuper) crops out in the form of a low cliff, with grass lawn at the foot sloping down to the Avon; and at the time of my visit I noticed a black slimy exudation upon several parts of the cliff face, which in places, and particularly on the river front, presented the appearance of having been bedaubed with tar. Occasionally it occurred only in patches, but in Guy's Cave and other excavated or sheltered positions the walls were uniformly covered with black slime to the height of about 6ft., the top line of demarcation being sometimes very sharply defined, as though dependent upon the porosity of the sandstone strata. The Monks' Cells, at a higher elevation (in the courtyard behind the house), also showed the same indications, and I learnt by inquiries on the spot that this was the normal condition of the rocks at Guy's Cliffe.

Desirous of ascertaining the composition of this black slime, I scraped off a sample from the face of the rock, and brought away with me likewise a few pieces of the sandstone, on which, although occurring close by, there were apparently no traces of the dark-coloured exudation. Both these substances were submitted to analysis, and I have only to remark that, inasmuch as my sample of the black slimy matter had a few dead leaves and stalks in it, besides living Algæ hopelessly intermingled, it was impossible to ensure uniformity of composition by depending on the original weights. The analysis had, therefore, to be performed by the system of general (or standard) solution, equal portions being taken for the estimation of the several ingredients, and the ratios deduced from the products severally obtained. Then it was only necessary to add on the water given by a direct determination, in a picked sample, to become possessed of all the data requisite for the calculation of the percentage quantities.

THE ROCK, GUY'S CLIFFE.

A friable, micaceous Sandstone, colour greyish white. Treated for analysis with very dilute hydrochloric acid. The following are the analytical results:—

Composition in 100 Parts.

Sand and mica	95·64
Alumina, ferric oxide, etc.	1·24
Calcium carbonate	2·00
Magnesium carbonate	·66
Moisture and loss	·46
	100·00

THE SALINE DEPOSIT, GUY'S CLIFFE.

Composition in 100 Parts.

Potassium chloride	1·21
Sodium chloride..	11·03
Magnesium chloride	3·81
Calcium chloride..	27·15
Calcium sulphate	14·55
Calcium nitrate	Trace.
Water and vegetable extractive matter ..	42·25
	100·00

GENERAL REMARKS.

As this appears to be the only instance on record of the occurrence (away from the sea) of native chloride of calcium in Great Britain, I should mention that there are no manufacturing works in the neighbourhood, nor other obvious means of accounting for its formation artificially. Nothing is known as to its origin; but Lady Charles Percy, who has long been in occupation of Guy's Cliffe, informs me that she "never remembers to have seen the cliff without it, and that the black slime is now apparent *as usual* on the face of the rock." Thus, notwithstanding the long continuance of wet weather during the past autumn, the material, if washed away by the rains, is as constantly renewed. This circumstance would point to the existence of hidden salt beds, from which possibly the material may have been originally derived. Dana ("System of Mineralogy," p. 119) mentions the occurrence of a double chloride of calcium and magnesium in the salt beds of Stassfurt, which has been analysed by Rammelsberg, and described under the name of Tachydrite. Like my specimen, it is very deliquescent, and contains 42 per cent. of water; but the composition is altogether different as regards the relative proportions of calcium and magnesium. The same remark applies to the varieties of Carnallite analysed by Oesten (*ibid.*), which contained at most 3 per cent. of calcium chloride. Lastly, it may be noted that Mr. David Forbes (Phil. Mag., 1866, xxxii., 135) found from 0·33 to 0·45 per cent. of calcium chloride in certain varieties of native nitrate of sodium, worked at La Noria, thirty miles east of Iquique, Peru, and at an altitude of 3,050 feet above the sea.

THE BIRDS OF LEICESTERSHIRE.

BY THOMAS MACAULAY, M.R.C.S.L., ETC.

PART IV.—OUR VISITORS.

This portion of my task will, I think, be found to be full of interest to the Ornithologist. Hitherto no attempt has been made, so far as I am aware, to publish a list of rare and occasional visitors to this county, and that which I now offer will be seen to contain many species which on account of their rarity could scarcely be expected to be found in the Midlands. Notably amongst these are the White-tailed Eagle, the Kite, the Dartford Warbler, the Rose-coloured Pastor, the Hoopoe, the Cream-coloured Courser, the White Stork, the Glossy Ibis, Temminck's Stint, the Great Northern Diver, and many others. The list comprises no less than eighty species, and brings the grand total of birds noted in the county to 185.

It will be noticed that I have been largely assisted by many kind friends, without whose help I should have been quite unable to fulfil my task. My friend, Rev. A. Matthews, Mr. M. Browne, Sir G. Beaumont, Mr. Davenport, and others have placed their observations at my disposal. To each and all I tender my grateful thanks, and I trust they will find that in compiling these notes I have done ample justice to their assistance.

1.—The Golden Eagle *(Aquila chrysaëtus)*. I have one record only, which I believe to be trustworthy. In May, 1863, my friend, Rev. A. Matthews, saw an Eagle flying west over Gumley. My informant is well acquainted with the flight of this bird, having seen them on the wing on several occasions, and he has no doubt about the species. Moreover, his well-known accuracy of observation in other branches of Natural History makes his testimony more reliable.

2.—The White-tailed Eagle *(Haliaëtus albicilla)*. Potter, in his "History of Charnwood Forest," records the capture of an immature specimen at Bradgate Park in April, 1841. A very fine specimen was shot by Sir G. Beaumont's keeper at Coleorton in November, 1879, which I had the pleasure of seeing when set up by Mr. White, of Castle Donnington. I may add that during last autumn (1881) Sir G. Beaumont saw an Eagle soaring over his grounds, but it was at too great a distance for him to make out the species.

3.—The Osprey *(Pandion haliaëtus)*. Potter reports one taken at Bradgate, without date. He also mentions one killed at Donnington in 1841. One was shot some years since at Noseley, and is now in the possession of Sir A. Hazelrigge. My friend, Mr. Montagu Browne, Curator of the Leicester Museum, reports to me that one was shot at Bradgate Park September 18th, 1879. The bird was a female; weight, 4lbs. 2oz.; extreme length, 23in.; spread of wing, 5ft. 4in. It was shot by Mr. C. Overton, and is now in the possession of the Earl of Stamford and Warrington.

4.—The Peregrine Falcon *(Falco peregrinus)*. In the month of October, 1877, after a night of furious gale, I noticed a pair of these birds engaged in hawking over a field of turnips at Saddington, and watched them for some time. The Rev. A. Matthews has also seen them several times.

5.—The Red-footed Falcon *(Falco vespertinus)*. The only record I can find is one shot near Leicester July 1st, 1865. "This specimen is now in the Leicester Museum."—(M. Browne.)

6.—The Goshawk *(Astur palumbarius)*. One was seen in Allexton Wood in 1881. I am indebted for this note to my friend Mr. Davenport.

7.—The Kite *(Milvus regalis)*. I find in Potter's "Charnwood" a record of this bird having been taken on that forest many years ago. It is scarcely likely that a similar note will ever recur again.

8.—The Buzzard *(Buteo vulgaris)*. Very rare indeed. Has been shot on Charnwood Forest (Potter), in Allexton Wood (Davenport), and seen in Gumley Wood (A. Matthews).

9.—The Rough-legged Buzzard *(Buteo lagopus)*. I have three records: One killed at Bradgate Park November 15th, 1839; "this specimen is now in the Leicester Museum"—(M. Browne); one seen at Gumley (A. Matthews); and one killed near Ashby-de-la-Zouch, 1880.

10.—The Honey Buzzard *(Pernis apivorus)*. Potter mentions one killed on Charnwood Forest in 1841. One was shot at Theddingworth on 18th June, 1879, by Mr. W. Hart, who described it as haunting the vicinity of wasps' nests. Mr. M. Browne writes to me of this bird: "On dissection, a great quantity of small wasps, *Crabro* (sp. inc.), and larvæ of various Lepidoptera heterocera, with a few common Coleoptera, were discovered as having formed its latest meal." This specimen is now in the possession of Mr. R. W. Chase, Hagley Road, Birmingham, whom I have also to thank for a note of it.

11.—The Hen Harrier *(Circus cyaneus)*. One instance only recorded by Potter, on Charnwood Forest, in 1841. The bird was seen, but not killed.

12.—The Long-eared Owl *(Otus vulgaris)*. Again I am indebted to Potter's book for a Charnwood specimen, though without date. Mr. Browne informs me of one killed at Gopsall, Lord Howe's seat, in 1880.

13.—The Dipper *(Hydrobata cinclus)*. This bird has been occasionally seen and obtained on the trout streams in Bradgate Park. One was shot some years ago out of a brook near Noseley, and is now in Sir A. Hazelrigge's collection.

14.—The Dartford Warbler *(Melizophilus provincialis)*. Rev. F. O. Morris, in his "History of British Birds," states that a specimen of this bird has been killed at Melton Mowbray, but he gives no date. There is in the Leicester Museum, a magnificent collection of British birds, presented by the late Mr. Bickley, of Melton Mowbray, and amongst them is a Dartford Warbler. I fondly hoped for some time that this might be the identical bird mentioned by Morris as having been taken there, but I have recently ascertained that the Leicester bird was procured in Nottinghamshire. I mention this in order that any ornithologists of the latter county may lay claim to its appearance.

15.—The Fire-crested Regulus *(Regulus ignicapillus)*. Mr. Davenport tells me that he saw a pair of these birds in some fir trees, at Skeffington, in 1880. I have no doubt, if carefully looked for, they would be occasionally found.

16.—The Bohemian Waxwing *(Bombycilla garrula)*. I am informed by Mr. Bickley, of Melton Mowbray, whose late brother presented the collection of birds bearing his name to the Leicester Museum, that the specimen of this bird in that collection was shot near Melton Mowbray.

17.—The Crossbill *(Loxia curvirostra)*. This is another bird which is not sufficiently looked for, or it would be more frequently observed. Rev. A. Matthews has seen it on many occasions at Gumley, and I saw several specimens at one time in that locality some years ago. They have been seen there during the past autumn.

18.—The Rose-coloured Pastor *(Pastor roseus)*. One was seen near Foxton, about 1870, by my late lamented friend, Rev. H. Matthews. It was in the company of a flock of starlings. The observer was so true and thorough a naturalist that his testimony is not open to doubt in the minds of those who knew him. In the winter of 1880 I believe I saw one also amongst a flock of starlings, but though I followed and stalked the flock for some distance, I could not be quite positive; but I do not believe the markings I observed were those of a pied bird.

19.—The Raven *(Corvus corax)*. One was shot at Saddington, many years since, by Mr. Johnson. It was feeding on a portion of a sheep that had been hung up for dogs' meat, in a plantation. Rev. A. Matthews saw one at Gumley—the date is uncertain, but more than twenty years ago. One was shot at Rothley in 1881.

20.—The Hooded Crow *(Corvus cornix)*. Not often seen so far inland. It has been observed by Rev. A. Matthews at Gumley. One was obtained at Skeffington in 1875, another was shot at Rothley in 1881, a third killed at Skeffington in 1880, and I am informed by Mr. M. Browne, that a specimen was obtained near Leicester in January of this year, and is now in the Museum.

21.—The Great Spotted Woodpecker *(Picus major)*. Very rare. Potter mentions it occurring on Charnwood Forest. Sir G. Beaumont writes me that he has seen it at Coleorton. The Rev. A. Matthews shot a female at Gumley in November, 1864; and Mr. Davenport informs me that one was killed at Loddington in 1881.

22.—The Lesser Spotted Woodpecker *(Picus minor)*. Still more rare than the last. Rev. F. O. Morris says it has occurred in Leicestershire. In the summer of 1878 a pair built their nest in an orchard at Gumley; but, sad to say, it was discovered by a mischievous boy, who robbed the nest and destroyed the old bird, which allowed itself to be captured rather than desert.

23.—The Hoopoe *(Upupa epops)*. There are two local specimens in the Leicester Museum. Mr. Browne writes me that they were shot at Lutterworth before 1849. He further tells me, on the authority of Mr. J. E. Weatherhead, that another was killed at Stapleton in 1851. Sir G. Beaumont says: "A good many years ago my head-gardener saw a bird which (from his description) I took to be a hoopoe.

24.—The Black Grouse *(Tetrao tetrix)*. No doubt in by-gone times black game was common enough in Charnwood Forest. Potter mentions them as being found there. Sir G. Beaumont says: "I can remember perfectly killing black game on Charnwood Forest about 1847 or 1848, and during the next ten years I killed several grey hens in South Wood, near Coleorton."

25.—The Red Grouse *(Tetrao lagopus)*. Now only an occasional visitor, though formerly it had a home on Charnwood. Potter mentions it as being found there. In 1861 a solitary grouse was killed at Skeffington by Rev. J. Davenport, and one was also found and killed at Noseley by Sir A. Hazelrigge some years since.

26.—Pallas' Sand Grouse *(Syrrhaptes paradoxus)*. In 1867, there came a large flight of these birds to our shores, and they were seen and killed in all parts of England. Five were seen near Laughton, four miles from here, but unfortunately no specimen was procured.

27.—The Cream Coloured Courser (*Cursorius gallicus*). This elegant bird, a native of Africa, has been very rarely seen in England. Morris only mentions six occurrences (including the object of this note) between 1793 and 1827, and none later. The bird was killed on the 15th of October, 1827, on Charnwood Forest. It was the last bird figured by Bewick, and Selby's plate was drawn from the same specimen.

28.—The Great Plover (*Œdicnemus crepitans*). My authority for including this bird in a list of Leicestershire visitors is the late James Harley, Esq., of Leicester, who says in a letter quoted by Morris—"It is a regular summer visitor, but only very locally distributed, namely, on the north-east side of the county, abutting on Lincolnshire."

29.—The Pratincole (*Glareola pratincola*). Mr. M. Browne informs me that "there is a specimen in the Leicester Museum marked in an old MS. catalogue as 'shot near Leicester.'"

30.—The Golden Plover (*Charadrius pluvialis*). A winter visitor, rarely seen, and still more rarely obtained. An occasional small flock may be heard passing overhead on a winter's day, and recognised by their characteristic whistle. One was shot this winter at Skeffington, on 26th December, by Mr. Davenport. Four were killed at Smeeton some years since, and one at Gumley. Sir G. Beaumont also mentions its occurrence at Coleorton. No doubt it has been occasionally killed in other parts, and notably on Charnwood Forest.

31.—The Dotterel (*Charadrius morinellus*). A rare visitor in spring. In March, 1879, I saw three on a fallow field. If I had had a gun I could have secured one or two. There is a specimen in Sir G. Beaumont's collection at Coleorton Hall.

32.—The Ringed Plover (*Charadrius hiaticula*). This pretty little bird, common enough on the coast is yet a "rara avis" in the Midland Counties. Mr. M. Browne writes to me: "I saw a specimen of this in possession of a man named Turner, said to have been shot in the Abbey Meadow, close to Leicester in 1881."

(*To be continued.*)

Reviews.

The Seals and Whales of the British Seas, by Thomas Southwell, F.Z.S. 4to. London: Jarrold and Sons. 1881. Price, 6s.

While the marine mammalia that are occasionally stranded upon our shores or caught in our seas always possess great interest, not only to the student of science, but to the public at large, it may perhaps be questioned whether they come within the special province of the "Midland Naturalist." Nevertheless when Mr. Southwell tells us that the Common Seal, *Phoca vitulina*, frequents the sand-banks left dry at low water in the Wash, and that some years ago two Seals were killed in the Severn, we may feel satisfied that the Natural History Societies of Peterborough and Cheltenham, among those included in the Midland Union, would not consider these facts to be beyond the limits of their respective spheres of observation. And when we are told that Cetaceans have been brought, both living and dead, to Birmingham and other places inland, at great expense, and from long distances, we need feel no hesitation in introducing Mr. Southwell's book to the notice of our readers, as one having some points of considerable local interest, apart from its general merits as a contribution to science. It will be remembered that in the "Midland Naturalist" for March, 1880, we called attention to the new edition of Lubbock's "Fauna of Norfolk," which had then been recently published under the editorship of Mr. Southwell. In the present work the author has brought together all the leading facts relating to the Seals and Whales met with around the British Islands. Avoiding, as far as possible, all technical terms, he has given a description of each species sufficient for its proper determination, and in most cases an excellent portrait of it. These descriptions are combined with very interesting records of the habits, and geographical distribution of the animals; and with accounts of the whaling-trade, and of the seal-fisheries in the Greenland seas, though the latter are associated with incidents of a painful nature.

The two groups are conveniently united for the purposes of description, as well as of study. The Seals, classed as *Pinnipedia* (a sub-order of Carnivora,) are divided into the *Phocidæ*, or true Seals; the *Trichechidæ*, represented by the Walrus only; and the *Otariidæ*, or Eared Seals. It is mentioned that the Walrus, still a rare and accidental straggler on the British coasts, is gradually becoming exterminated. In the fifteenth century it was probably not uncommon on our shores.

More familiar to most of us are the members of the other order, Cetacea, divided into the *Mystacoceti* or Whalebone Whales, and the *Odontoceti* or Toothed Whales; and including, besides the forms popularly known as Whales, the Grampus, Porpoise, and Dolphin. While, through ignorance or inadvertence, these animals are not unfrequently spoken of as "fishes," such want of respect in misrepresenting their rank and title may be pardoned, when we learn that both Ray and Pennant had assigned to them such an inferior position; and when also we find it customary to speak of the Whale-fisheries, as well as the Seal-fisheries. The records of both trades tell an unhappy tale of decline.

Among the Toothed Whales, the sub-family *Ziphiinæ* is of remarkable interest, for Mr. Southwell observes that until the present century the Ziphioid Whales were, with one exception, known to science only from their fossil remains found chiefly in the Crag deposits. Even ten years ago few specimens had been obtained, and their habits were then almost absolutely unknown. This lack of knowledge may serve to nourish the hope of those who are sanguine enough to believe in the existence of the Great Sea Serpent. And it may not be out of place to mention that in "Nature," for February 10th, 1881, Mr. Searles V. Wood has suggested that this famous monster may after all be "a hitherto unknown group of carnivorous cetaceans, with necks of extraordinary length," perhaps allied to the *Zeuglodon*. This form, at present only known in the fossil state, is regarded by Professor Huxley as intermediate between the true Cetaceans and the Seal. No less than twenty-two species of living Cetacea are recorded as British, of which three belong to the Ziphioid group; the Seals, including the Walrus, number six species. We may add that the work is an amplification of articles contributed to "Science Gossip," by Mr. Southwell, and it contains a number of woodcuts in addition to those previously published. Footnotes indicate the sources where more detailed information may be obtained; hence the work will be found a most useful handbook for Naturalists, while containing plenty of matter interesting to the general reader. H.B.W.

The Geology of the Country Around Nottingham. By W. Talbot Aveline, F.G.S. Geological Survey Memoir. Second Edition, 1880, 51 pp., price 1s.

This Memoir describes the area included in Quarter-sheet 71 N.E., on the southern edge of which Nottingham stands. The first edition appeared in 1861, but since that time, as the author points out in the preface, "much additional geological evidence has come to light," and the result is that the number of pages is more than doubled. The geological formations represented are the Coal Measures, the Permian, and the Trias. Much of the interest of the district clusters round the Permian, which in its extension southward from Durham here dies out. The Keuper Rocks, with the newly-discovered Basement Beds, and the thin bed of conglomerate that forms the lowest bed of the "Waterstone" sub-division are described; but Mr. Aveline differs from the discoverers of the Basement Beds. He not only considers the identity of the white sandstone at the base of the Keuper at Nottingham with the Keuper Basement Beds of Cheshire and Staffordshire as uncertain, but regards some outliers of these beds four or five miles west of Nottingham as belonging rather to the conglomerate at the base of the "Waterstones," and has so mapped them. It should be mentioned that they were originally mapped by Hull as Bunter Pebble Beds, which they resemble in some respects, and are at least sixty feet thick. It is, therefore, extremely unlikely that they can be the equivalents of the few inches of conglomerate that represent the ancient shingle beach of the Keuper "Waterstone" period. All the formations are faithfully and tersely described, and the Memoir contains as much information compressed into its pages as it would be possible to introduce within the same limits. There is a good deal of useful colliery information, and the work is illustrated with half-a-dozen woodcuts. Not the least valuable feature of the Memoir is a list of the books and papers bearing on the geology of Nottingham that have been printed since 1719. This is the work of Mr. W. Whitaker, B.A., F.G.S. J. S.

METEOROLOGY OF THE MIDLANDS.

THE WEATHER OF JANUARY, 1882.

BY CLEMENT L. WRAGGE, F.R.G.S., F.M.S., ETC.

January, 1882, is a very remarkable month in the records of meteorological science. Atmospheric conditions were, in some respects, even more exceptional than during the closing months of the past year. The two great features were :—1st, The extraordinarily high pressures ; and, 2nd, the great mildness of the weather. Depressions crossed on the 3rd and 6th. The latter one proved serious in Scotland in its course from W.S.W. to E.N.E., and brought gales, floods, and thunder and lightning there, with strong winds in Central England. Two other and small depressions followed ; and then, on the 11th, the great barometric rise finally set in. At first it appeared to be mainly owing to the disappearance from our area of the depression-system ; but it was soon evident that a most important anticyclone was forming. Its centre shortly became established in southern districts, and when the crest was fully developed on the 18th, the corrected and reduced reading at the Radcliffe Observatory, Oxford, was actually "30·99 at 10 A.M." This is the highest reading I can find in my returns and papers relating to this remarkable barometric maximum ; and probably there is no instance of such a wonderful pressure within upwards of a century. The barometer continued very high to the 25th (but gently dipped on the 23rd). A cyclonic centre came up on the 27th—though readings remained in a high part of the scale—and the mercury was again rising on the 31st. At Loughborough the mean temperature was 40·8, or 3·2 degrees above the average ; and at Orleton the mean for the month was more than 2·5 above the average of the last twenty years. Temperature dropped, however, when the centre of the great anticyclone came over any district, as is usual with this type of weather when the sun has a south declination. The cold air from above probably descending on the anticyclonic crest, and feeding it, as it were, would in the characteristic calms exert its influence in lowering the temperature, and occasion the dense fogs experienced at the time. Naturally there was a general absence of rain during the sway of the high pressures ; but the depression crossing on the 28th and 29th brought heavy falls, with some hail and snow. The solar maximum thermometer at Hodsock, on the 23rd, registered 88·9, and the terrestrial minimum at Oscott, 19·6 on the 25th. At Strelley, the mean temperature of the ground, at a depth of one foot, at 9 A.M., was 39·0 ; the duration of sunshine 33·7 hours, and eighteen sunless days were recorded. At Hodsock 39·7 hours of sunshine were registered, and fourteen sunless days. In the South Midlands so cloudy was the sky that twenty sunless days were noted at Marlborough. The mean relative humidity for the entire Midlands was about 92 per cent. At Blackpool ozone was registered on twenty-seven days, and the daily average was 5·5 : At Carmarthen the mean for the month was 3·6. Mean sea temperature at Scarborough 42·7, about two degrees warmer than last year. Lunar halos were observed on the 1st and 5th. South-west breezes prevailed, but the wind was frequently light and variable.

NOTES BY OBSERVERS.—*Burton.*—Wild hyacinth showing above ground on 15th. *Belper.*—*Galanthus nivalis* in bud on 9th. *Loughborough.*—Primroses in flower on 3rd. *Ashby Magna.*—The mildest January ever known in these parts. *Kibworth.*—Gathered *wild* violets on 3rd ; crocus, snowdrop, anemone, primrose, etc., in flower. *Waltham-le-Wold.*—Many plants in bloom. *Coston.*—Snowdrop in flower on the 12th. *Kettering.*—Many of the Spring flowers in full bloom.

STATION.	OBSERVER	RAINFALL. Total for M.	Greatest fall in 24 hours.		No. of rainy d	SHADE TEM. Absolute Maximum.		Absolute Minimum.	
		In.	In	Date.		Deg	Date.	Deg	Date.
OUTPOST STATIONS.									
Spital Cemetery, Carlisle	J. Cartmell, Esq., F.M.S.	1·90	·36	4	16	52·8	6	30·0	29
Scarborough	F. Shaw, Esq., F.M.S.	1·60	·83	29	10	52·1	5	31·0	27
Blackpool (a, b)—South Shore	C. T. Ward, Esq., F.M.S.	2·85	·60s	29	18	50·4	5	29·3	19
Llandudno (a, b)	J. Nicol, Esq., M.D.	3·19	·69	29	15	55·5	14	31·1	29
Lowestoft (a)	H. E. Miller, Esq.	1·38	·69	8	9	53·0	6	30·0	21
Carmarthen (a)	G. J. Hearder, Esq.	5·47	1·40	8	19	53·4	11	26·5	19
Altarnum, near Launceston	Rev. J. Power, M.A.	4·56	1·12	8	21	53·0	12	24·0	24
Sidmouth (a, b)	W. T. Radford, Esq., M.D.	1·26	·27	1	13	55·5	10	29·3	24
Guernsey (a, b)	A. Collenette, Esq., F.M.S.	1·72	·45	2	11	53·6	28	30·8	25
MIDLAND STATIONS.									
HEREFORDSHIRE.									
Burghill (a, b)	T. A. Chapman, Esq.	1·92	·86	28	13	56·0	11	28·9	25
Stoke Bliss	Rev. G. Alexander	2·34	·68	28	13	54·0	5, 6	30·0	20
SHROPSHIRE.									
Woolstaston	Rev. E. D. Carr	3·17	·85	28	16	51·0	5, 6	29·0	20, 21, 27
Stokesay (a, b)	M. D. La Touche	2·67	·94	28	13	53·5	5	25·5	18
Bishop's Castle	E. Griffiths, Esq.	2·95	·96	28	13	51·0	5, 6	26·0	18
More Rectory	Rev. A. S. Male	2·82	·73	3, 28	17	53·0	5	28·0	21
Dowles, near Bewdley (b)	J. M. Downing, Esq.	2·18	·70	29	12	56·0	23	28·0	18
WORCESTERSHIRE.									
Orleton, near Tenbury	T. H. Davis, Esq., F.M.S.	2·57	·64	8	15	5·6	6	25·0	25
West Malvern (b)	A. H. Hartland, Esq.	2·04	·71	8	12	49·5	6, 11	28·5	26
Evesham	T. J. Slatter, Esq., F.G.S.	2·36	·93	8	12	50·3	5	27·5	25
Pedmore	E. R. Marten, Esq.	2·17	·53	28	10	50·0	2, 11, 6	29·0	20, 2t
Stourbridge	Mr. J. Jefferies	2·15	·53	28	11	51·0	2, 3, 4, 5	25·0	23
Cawney Bank, Dudley	Mr. C. Beale	2·52	·55	8	13	50·0	6	30·0	20, &c.
STAFFORDSHIRE.									
Dennis, Stourbridge (a)	C. Webb, Esq.	1·99	·51	28	10	54·0	6	26·0	24
Kinver	Rev. W. H. Bolton	2·16	·55	28	13	53·0	6	25·0	24
Walsall	N. E. Best, Esq.	3·13	·85	28	12	50·0	5, 6	29·0	20
Lichfield	J. P. Roberts, Esq.	2·50	·65	29	10	54·0	6	29·0	24
Burton-on-Trent	C. U. Tripp, Esq., F.M.S.	2·34	·72	29	16	54·0	6	27·0	21, 25
Weston-under-Lyziard	Hon. & Rev. J. Bridgeman	2·48	·66	28	15	53·0	5	26·0	25
Wrottesley (a)	E. Simpson, Esq.	2·31	·61	28	11	52·5	5	27·9	25
Barlaston (a, b)	W. Scott, Esq., F.M.S.	2·44	1·00	30	10	57·2	26	29·4	18
Tean (b)	Rev. G. T. Ryves, F.M.S.	2·79	·73	29	15	53·2	5	26·0	25
Heath House, Cheadle (a, b)	J. C. Philips, Esq., F.M.S.	2·71	·68s	28	12	51·4	5	28·3	18
Oakamoor, Churnet Valley (a, b.)	Mr. E. Marlow	2·89	·84s	29	17	53·4	6	26·6	25
Beacon Stoop, Weaver Hills (a, b.)	Mr. James Hall	3·19	..	..	..	48·6	..	27·0	..
DERBYSHIRE.									
Stony Middleton	Rev. U. Smith	3·87	..	..	8	48·0	28	29·0	17
Buxton (a, b)	E. J. Sykes, Esq., M.B.	4·25	·75	2	12	50·1	11	28·0	19
Fernslope, Belper	F. J. Jackson, Esq.	3·39	1·43	30	10	52·0	5, 6	27·0	19
Belper (a, b)	J. Hunter, Esq., C.E., F.M.S.	3·35	1·40	29	12	52·2	5	26·0	19
Spondon	J. T. Barber, Esq.	2·52	1·02	29	11	..	..	..	..
Duffield (b)	W. Bland, Esq.	3·22	1·45	29	11	..	..	..	..
NOTTINGHAMSHIRE.									
Mansfield (a)	W. Tyrer, Esq., F.M.S.	3·23	1·75	29	12	..	..	..	..
Park Hill, Nottingham (a, b)	H. F. Johnson, Esq.	2·20	1·07	29	15	52·5	6	27·5	18
Strelley (a, b)	T. K. Edge, Esq.	2·55	1·00	29	14	52·2	6	26·8	19
Hodsock Priory, Worksop (a)	H. Mellish, Esq.	2·40	1·28	29	14	52·5	2	25·8	19
Tuxford	J. N. Dufty, Esq., F.G.S.	2·60	1·52	29	6	49·0	5, 6	25·0	18
LEICESTERSHIRE.									
Loughborough (a, b)	W. Berridge, Esq., F.M.S.	2·27	·60	8	11	52·6	5	28·2	21
Syston	J. Hames, Esq.	2·09	·59	8	12	49·0	4, 5	29·0	19, 21, &c.
Town Museum, Leicester (b)	J. C. Smith, Esq.	2·11	·59	8	12	52·3	5	30·0	19
Ashby Magna (b)	Mr. T. Carter	2·09	·74	8	8	52·0	5, 6	28·1	21
Kibworth	T. Macaulay, Esq.	2·03	·70	8	14	50·0	2	30·0	21
Waltham-le-Wold	Edwin Ball, Esq.	2·01	·59	28	12	47·0	2, 5	28·0	18, 31
Dalby Hall	G. Jones, Esq.	1·84	·64	8	9	49·0	6	25·0	19
Coston Rectory, Melton (a)	Rev. A. M. Rendell	1·96	·48	8	13	51·7	6	26·8	25
WARWICKSHIRE.									
St. Mary's College, Oscott (a, b.)	J. MacElmail, Esq.	2·23	·65	8	10	52·6	6	29·5	26
Henley-in-Arden	T. H. G. Newton, Esq.	2·41	·97	8	14	52·0	6	22·0	25
Kenilworth (a, b)	F. Slade, Esq., C.E., F.M.S.	2·33	·94	8	10	51·3	5	24·8	25
Coundon, Coventry	Lieut.-Col. R. Caldicott	2·34	·75	8	15	51·0	5	28·0	24
Rugby School	Rev. T. N. Hutchinson	2·10	·79	8	11	52·0	6	29·0	25
NORTHAMPTONSHIRE.									
Sedgebrooke, Northampton	C. A. Markham, Esq.	1·61	·67	8	10	53·0	6	23·0	21
Towcester	J. Webb, Esq.	1·76	·93	8	8	..	..	..	..
Kettering	J. Wallis, Esq.	1·63	·59	8	8	53·0	7	30·0	19
OXFORDSHIRE									
Ratcliffe Observatory, Oxford	The Staff	1·12	·47	9	8	54·4	12	21·2	25
WILTSHIRE.									
Marlborough (a, b)	Rev. T. A. Preston, F.M.S.	1·67	·48	8	11	51·4	11	24·4	25
GLOUCESTERSHIRE.									
Cheltenham (a, b)	R. Tyrer, Esq., F.M.S.	2·12	·73	8	11	52·5	28	25·0	25

(a) At these Stations Stevenson's Thermometer Screen is in use. (b) These observations recorded on the plan of the new Form.

Gleanings.

Journal of the Northampton Natural History Society.—The first volume of this admirably-conducted journal has been completed by the issue of Part VIII. It does great credit to its conductors, to the Society, and to the authors of the valuable papers it contains. Of these, many of which are of special local value, we will specify Lord Lilford's interesting "Notes on the Birds of Northamptonshire," and Mr. R. G. Scriven's account of some of the more famous trees of the county, which are illustrated by exquisite photographs, printed by the Woodbury permanent process. Sir Herewald Wake, Bart., Mr. G. C. Druce, Mr. S. Sharp, F.S.A., F.G.S., Mr. C. E. Crick, and other local naturalists have contributed a number of good, useful papers, and Mr. S. J. Newman has rendered the journal valuable assistance by his excellent drawings. The journal deserves the support of all the members of the Society.

British Fossils.—The new volume of the Palæontographical Society will appear early in April. Dr. Davidson's contribution, "Supplement to the Silurian Brachiopoda," is both large and important.

Birmingham Free Library.—It is hoped that the new building will be ready for occupation by April. From the large funds at their disposal, the Committee have for a long time been steadily purchasing all the good and available books in the market. Scientific experts have been asked to send in lists of books in the branches with which they were conversant, and their recommendations have been very fully complied with. After the opening of the Library we shall give a brief account of the valuable books of reference which will be found on its shelves, and which will prove a great boon to dwellers in the Midlands.

The Menacing Comet.—The story which has been going the round of the papers that Mr. Proctor had predicted the destruction of the world by fire, in 1897, in consequence of the immense heat which would then be developed by a comet rushing into the sun, turns out to be a gross exaggeration, or rather to have originated in a complete misconception. It is comforting to know that the eloquent editor of "Knowledge" thinks the world is much more likely to last for fifteen millions of years than to come to an end in fifteen. The comet in question will be absorbed into the sun, but it will be eaten up by degrees, and not at one huge mouthful. Rich people who have thought of hiring collieries, in order to be able to retreat into the bowels of the earth for a season, need no longer contemplate such geological abodes!

Science in Elementary Schools.—The famous engineering firm of Tangye Bros., of the Cornwall Works, Soho, Birmingham, has just presented the sum of £200 to the Birmingham School Board to found a Science Scholarship in the Board Schools; they offer to increase the sum to £250 if others will make the total up to £1,000. This handsome donation is valuable, not merely as a large sum of money, but as a token that the scheme of science-teaching now being carried out by the Science Demonstrator in the Board Schools has the approval of such excellent practical judges as Messrs. R. and G. Tangye.

Local Geology.—The work on the Geology of the Counties of England and of North and South Wales, on which Mr. W. J. Harrison has been engaged for a considerable period, makes its appearance simultaneously with this issue of the "Midland Naturalist" (see advertisement). A review will shortly appear in our pages by Mr. W. Whitaker, B:A., F.G.S., of H.M. Geological Survey.

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—January 31st.—MEETING OF THE GEOLOGICAL SECTION.—Mr. Thomas Bolton exhibited a curious Caddis Worm in a chitinous sheath. Mr. F. T. S. Houghton, M.A., F.G.S., read an interesting paper on "The Cambridge Coprolite Beds." These beds lie between the Upper Gault and the Chalk Marl, and were formerly thought to represent the Upper Greensand. They consist of a sandy matrix, coloured green by grains of glauconite, and containing about ten per cent. of the so-called coprolites. These are in reality nodules, consisting of casts or concretions, often with sponge spicules or other organisms as nuclei. The deposit is being extensively excavated for the sake of the phosphatic nodules, which are very useful for agricultural purposes. The organic remains are partly derived and partly indigenous. The derived fossils are much broken and worn, and are principally characteristic of the Gault. The indigenous species appear to belong to the age of the Chalk Marl. It seems probable that after the Gault was deposited it underwent considerable denudation, the clay being washed away, and the fossils and nodules left on the surface. These were afterwards covered by the Chalk Marl and mingled with the remains of that period. The paper was illustrated by numerous maps, diagrams, and specimens, and was followed by a brief discussion. February 7.—The ANNUAL MEETING was held at Mason College, the president, Mr. Edward W. Badger, in the chair. The Committee presented an encouraging and interesting report of the proceedings for the past year, which, with the treasurer's accounts, was unanimously received and adopted. Mr. Badger then delivered an address "On the work of Natural History Societies," which, together with the Committee's Report, was ordered to be printed and circulated among the members. The following officers for the ensuing year were then elected :—President, J. Levick ; Vice-Presidents, T. H. Waller, B.A., B.Sc., W. G. Blatch ; Ex-Presidents (who are Vice-Presidents), Edward W. Badger, W. Southall, F.L.S., F.R.M.S., W. P. Marshall, M.I.C.E., A. W. Wills ; Treasurer, Charles Pumphrey ; Librarian, James E. Bagnall ; Curators, R. M. Lloyd and H. Miller ; Secretary of Biological Section, J. F. Goode ; Secretary of Geological Section, J. F. Goode ; Honorary Secretaries, John Morley and W. B. Grove, B.A. February 14th—BIOLOGICAL SECTION.—Mr. A. W. Wills was elected chairman and Mr. J. F. Goode secretary for the ensuing year. Mr. Bolton exhibited a curious parasitic growth in and around a desmid (Closterium), which was believed by Mr. Wills to be a low form of unicellular algæ, probably a form of Chytridium, distinguished by Pringsheim under the name of Pythium, the cells of which are globular, and occur in the infected algæ, pushing a long tubular neck out through the cell-wall. Mr. Blatch exhibited *Oxytelus fulvipes*, a rare and very local beetle, recently found in Sutton Park, the only other English locality for the species being Needwood Forest. Also a number of rare coleoptera from Sutton Park. Mr. R. W. Chase exhibited *Ampelis garrulus* (female), the waxwing, shot at Rednall, January 30th, 1882. Mr. W. B. Grove exhibited two Myxomycetes—*Enerthenema elegans*, Bowman, a very rare and curious species, and *Physarum cinereum*, Batsch,—both from Sutton ; the plasmodium of the latter was observed for three weeks previously creeping in various directions over a rotten stump and frequently changing its position.—Mr. Pumphrey exhibited *Actinophrys Sol.* Mr. E. de Hamel read a paper on "Beavers and the Bute Beavery," which will be printed in the "Midland Naturalist." The paper was illustrated by diagrams prepared by Mr. de Hamel, with chips of wood cut from the pine trees, a bundle of deal slivers which composed their bedding, and skulls, kindly lent for the evening by Professor Bridge. A unanimous vote of thanks was accorded to the reader.—MICROSCOPICAL GENERAL MEETING.—February 21.—Mr. J. E. Bagnall exhibited *Erica Watsoni* and *Pinguicula grandiflora*, from Cornwall ; *Ammi majus*, *Echinospermum Lappula*, *Amaranthus retroflexus*, and *Malva borealis*, from near Kenilworth ; and several mosses. Mr. W. B. Grove exhibited a *Vaucheria* (probably *sessilis*), growing on damp soil, and the plasmodium of a Trichia (a

Myxomycete) spreading in a reticulate manner over the hymenium of *Polyporus versicolor;* these protoplasmic threads, during the course of the evening, drew themselves together and began the formation of the sporangia. Dr. John Anthony exhibited a preparation of the dried skin of the earthworm, showing the ambulacral spines, in illustration of his paper on "The Ambulacra of the Earthworm," in which he described the observations he had made concerning their mode of action. He referred to the cirrhi of a related species, *Nais proboscidea*, a fresh-water annelid, in which the action of the muscles is easily observed, owing to its transparency. These the animal can use either for pushing, pulling, or swimming, according to its desires. The ventral surface of the common earthworm, when examined closely, is seen to be provided with four rows of spines or short projecting bristles, each of which is seated upon a small elevation of the skin. It is by means of these that the worm is able to resist so strongly the efforts to drag it from its burrow. The question to which the paper was chiefly devoted was to ascertain whether these spines were used voluntarily as in the Nais, or merely automatically as a fixed part of the segment on which they were placed. The writer considered that the former view was the correct one, not only by reasoning from the analogy of allied forms, but as the only means of accounting for the power which the worm possesses of turning upon itself in its narrow burrow, and replacing itself end for end.

BURTON-UPON-TRENT NATURAL HISTORY AND ARCHÆOLOGICAL SOCIETY.—February 7th.—Mr. R. Thornewill, President, in the chair. The paper read was on "Examples of Mimicry among Lepidoptera," by the Rev. C. F. Thornewill, M.A. February 14th.—Mr. R. Thornewill, President, in the chair. The paper read was on "Aids at determining the Dates of our old Churches," by Mr. Alexander Scrivener (Vice-President of the North Staffordshire Field Club and Archæological Society). Mr. Scrivener exhibited diagrams illustrative of the different styles of architecture. At this meeting some curiously marked and lettered tiles, recently found in the Priory at Burton, were exhibited.

NOTTINGHAM WORKING MEN'S NATURALISTS' SOCIETY.—At the annual exhibition and dinner of the members of this society, held at the Sir Francis Burdett, Mount Street, there was a large attendance. Mr. Goldsmith presided. After the repast and the usual loyal toasts, Mr. Allen, secretary, read the annual report, from which it appeared the Society is in a very healthy condition, the accounts showing a balance in hand of £3 1s. 10½d. The toast of the evening, "Success to the Society," was given by Mr. Bellaby, and replied to by Mr. Goldsmith, who said he wished to bring to their notice that they were assembled that evening to celebrate the seventh year of their existence, during which time they had the kind assistance of many honorary members. He had also great pleasure in announcing the admission of the Society to the Midland Naturalists' Union, and the insurance of the Society's property to the sum of £150. The proceedings were agreeably interspersed with recitations and songs. A paper was read by Mr. Goldsmith on the "Crow Family."

BANBURYSHIRE NATURAL HISTORY SOCIETY.—February 6th.—Mr. S. Stutterd in the chair. Exhibits: *Scyphophorus coniferus* and *Xylaria hypoxylon*, by the President; eggs of *Collembola*, by the Chairman; collection of eggs of the Common Guillemot *(Uria troile)*, to illustrate their great diversity in colour, by Mr. O. V. Aplin; *Trigonia costata*, var. *pulla*, from Lower Tadmarton, by Mr. E. A. Walford; and a collection of Lichens and Mosses from Dartmoor by Mr. Symington. The President's meteorological report for January was read. The most noticeable feature in the month was the almost if not quite unprecedented height of the barometer—on the 18th it reached 30·62 inches. The temperature was four degrees above the average. Mr. O. V. Aplin read a note on some rare ornithological occurrences in the district. Mr. E. A. Walford, spoke at considerable length upon some of the common fossils of the neighbourhood, illustrating his remarks with numerous sketches. Forms for phenological observations for February were distributed.

THE MYXOMYCETES.*

BY W. B. GROVE B.A.,

Hon. Sec. Birmingham Natural History and Microscopical Society.

The group of organisms named Myxomycetes,† or Myxogastres, constitutes a curious debatable land, concerning the nature of which the most diverse opinions have been and continue to be expressed. They form one of the groups which Haeckel united to form his new sub-kingdom—the Protista—which was intended to embrace all those simple forms of life in which the Animal and Vegetable Kingdoms approach one another. His object in instituting this arrangement was to get over the acknowledged difficulty of distinguishing between what of these are animals and what are plants. But, as Saville Kent lately,‡ and long before him Professor Huxley,§ pointed out, he gets over the difficulty in a curious way. He proposes that, instead of having one line of demarcation to puzzle over, we shall in future have two, namely, that between undoubted animals and the Protista, and that between the Protista and undoubted plants. This, however, would not be an objection to his classification if it could be proved on other grounds to be desirable; for the question is not solely what course will be the easiest for us, but what will most truly represent the facts. Some of his proposed Protista, as the Diatoms, the Sponges, the Rhizopoda, the Noctilucæ, have now had their position definitively settled one way or the other. Others, such as Englena, are still perhaps *sub judice*, and, since Saville Kent has made his recent and determined attack upon them, the Myxomycetes must now be considered to belong to the same doubtful category.

On inquiry into the facts known concerning this group, it will be apparent that the settlement of the question is by no means easy when all things are taken into consideration. There are, of course, three possible conclusions open to us: We may decide that the Myxomycetes are animals; or that they are plants; or that they are the former at one period of their existence, and the latter at another. The last-named possibility, however strange it may appear, must not be overlooked, since it is evident that the belief in the fundamental distinction of the two classes of living things, founded, as it was originally, upon an acquaintance only with the higher forms, has of late years received many a rude and, it may be, fatal shock. It is easy to denounce such a conclusion as the refuge of timidity; it is another thing to prove that the dividing line in Nature is really an impassable one. The mycologists of this country have long made up their minds in favour of the truly vegetable nature of the group, and most of them

* Read before the Birmingham Natural History and Microscopical Society, January 24th, 1882.

† *I.e.*, Slime-fungi.

‡ "Manual of the Infusoria," p. 44.

§ "Quarterly Journal of Microscopical Science," 1868, p. 127.

‖ "Manual of the Infusoria," pp. 41–3, 193, 470–2; and "Popular Science Review," April, 1881, would be sorry to lose a class of Fungi in which some of the most remarkable and beautiful species are to be found. But at the same time it is quite certain that the position formerly assigned to them among the Fungi is no longer tenable, being founded upon a gross disregard of many of their characteristics.

There is one point which it seems to be essential to consider, but which, so far as I have read, has not been introduced into the controversy. If we believe that all animals and plants are genetically connected, that is, are all descended alike from one or more primordial forms of life, we should anticipate not only that there would be a point of contact between the two living kingdoms of Nature, but that there would be several such, and these, perhaps, occurring at parts of our classification far removed from one another. Botanists know that no large group of plants can be arranged in a linear series so as to display fully their mutual affinities. The species of a large genus, or the genera of a large order, require to be grouped on a plane, or it may be even in space of three dimensions, in order to show how they are connected with one another. It is of course understood that in a perfect arrangement the points of junction would really indicate genetic descent. In the same degree, then, at least, or more probably in a greater, ought we to find many points of junction between animal and vegetable forms. While the Fungi merge insensibly in the Algæ, and the Algæ in the Protozoa, yet there may be a point where the Fungi are connected with the Protozoa immediately, and that is through this group of Fungi, the Myxomycetes.

OUTLINE OF THE CONTROVERSY.

It will be well to give a short outline of the opinions about the Myxomycetes before proceeding to describe them. Up to and including the year 1857, when Rev. M. J. Berkeley published his "Introduction to Cryptogamic Botany," the Myxogastres, as they were then called, were placed among the Gastromycetes, their nearest allies being the Trichogastres or Puffballs. At this time nothing was known of their development. In 1859 Dr. de Bary, Professor of Botany at the University of Freiberg, for the first time observed the germination of the spores, and found that, instead of giving rise to a jointed hypha or filament, as other Fungi do, they produced an actively locomotive creature resembling a monad. After examining a number of the Myxogastres, and finding the germination of the spores the same in all, he considered that he had grounds for the opinion that these organisms had more affinity with the Protozoa than with Fungi, and proposed for them the name Mycetozoa.* These results were independently confirmed by a Polish observer, Cienkowski, and armed with this confirmation, de Bary published, in 1864, a larger work, in which he repeated his belief in the animal nature of these creatures.† About 1868, Haeckel proposed his idea of including these, as well as other

* *I.e.*, Fungus-animals.

† This belief he has now changed; "he holds and teaches that they are veritable plants,"

doubtful forms, in a distinct group, the Protista. In 1871 appeared Cooke's "Hand-book of British Fungi," which is merely, as far as concerns the larger divisions, a reprint of Berkeley's classification, which is itself taken mainly from the great Swedish Botanist, Fries. In 1875, another Pole, Rostafinski, issued a Monograph of the Mycetozoa, in which he appears, though not very clearly, to incline to the animal side of the controversy.

In 1875 also the English edition of "Sachs' Botany" was published, in which the Myxomycetes, as they are there called, were placed as a supplement or appendix to the Fungi. In the same year appeared the fourth German edition of Sachs', in which a change was made in the classification. The Algæ and Fungi are there arranged in two parallel series, distinguished from one another solely in the fact that one series produces chlorophyll and the other not. The Bacteria are placed, as the lowest Fungi, on a level with the unicellular Algæ, and next (passing over the small group of Saccharomycetes) we have the Myxomycetes, paralleled in the other column by the Volvocineæ among the Algæ. Professor Allman, in his Presidential Address to the British Association in 1879, declares that, "though the affinities of the Myxomycetes with the Fungi are, perhaps, closer than with any other plants, they differ from them in so many points, especially in their development, as to render this association untenable."*

Saville Kent, in his "Manual of the Infusoria," and more recently in the "Popular Science Review," adopts the animal hypothesis, and offers many new facts and parallels from the Animal Kingdom in support of his belief. To this, at present, no reply has been given, except to tell Saville Kent that he "has gone out of the way to meddle with a subject which he does not understand." It is evident that a wider and deeper knowledge of the facts concerning not only the Fungi, but the Protozoa, is needed, before the problem can be completely settled. One writer has even suggested lately "the abolition of the group, and the placing of their principal divisions in the various orders of Fungi to which their fructification presents the closest resemblance."† This method of treating them would be similar to that which has been adopted so successfully by modern cryptogamists with regard to the group of Mosses, formerly named Phasceæ, though in that case leaf-structure formed the basis of the distribution.

DESCRIPTION OF A MYXOMYCETE.

The following is a brief account of a fully-developed Myxomycete. It consists mainly of a spore-case or sporangium, which assumes one or other of two distinct forms: first, it may be definite in shape, spherical, hemispherical, ovoid, lenticular or reniform, stalked or sessile; or, second, it may be without a very definite outline, forming merely an extended cake-like or reticulated mass, which takes its shape for the most part from the accidents of its position. The sporangia vary in

* British Association Report, 1879, p. 14.

† Van Tieghem, Bull. Soc. Bot France, xxvii., p. 322.

size, from a little rounded heap just visible to the naked eye, to a mass two feet long and an inch or more thick. This sporangium may have one or more walls, either of which may contain a deposit of lime—usually, it is said, in the form of oxalate—either in thinly-scattered crystals or granules, or forming the greater portion of its substance. The walls of the sporangium and the stem are destitute of proper cells: they are often composed of a delicate homogeneous membrane, or only bear a few thickenings on the surface in certain forms peculiar to the different species. The stem often springs from a small patch of a similar homogeneous substance, called the hypothallus, by which it is attached to the matrix.

The contents of the sporangium most often consist of a vast number, sometimes millions of millions,* of spores, amongst which there is present, in addition, a structure called the capillitium; in a few cases the capillitium is apparently wanting. The capillitium is composed of threads, sometimes simple, sometimes branched; sometimes free, sometimes combined; in one species formed of delicate tubes with translucent walls, in another furnished with spiral markings or ridges or spines projecting from their outer surface; sometimes containing air, and at other times filled with lime. In many cases, also, the knots or points of junction of the threads are enlarged, and these knots may, or may not, contain lime. The mode of attachment of the capillitium is also extremely varied. In Trichia the threads are perfectly free at both ends. In Prototrichia and Enerthenema they are attached to the sporangium at one end only. In Didymium and allied genera they are arranged radially. But in the majority of the species they form a more or less complicated network, in which a few of the ends may be free, while most of them are attached to the wall of the sporangium. In Stemonitis and Comatricha the stem penetrates the sporangium, forming an axis, called the columella; in other species the columella is the swollen summit of the stem, or merely a denser portion of the capillitium; in some it is altogether absent. The spores in all cases densely fill up the interstices of the capillitium. When mature the sporangium dehisces either irregularly, as in Trichia, or radially, forming segments which curl back like those of a Geaster, or the petals of a flower, as in some species of Chondrioderma, or longitudinally, as in *Physarum sinuosum.* In Craterium a distinct lid or operculum is formed, and in Perichæna the wall of the sporangium splits in a circumscissile manner, like the capsule of the Henbane or Field Pimpernel. Oftentimes the upper portion of the wall of the sporangium splits off in minute fragments, and the capillitium is left exposed, and in the case of Arcyria its elasticity causes it to enlarge to several times its original size. The spiral threads of Trichia twist about like the elaters of the Hepaticæ under the influence of alternations of heat and moisture. In these various ways the spores are dispersed.

* I have calculated, from measurements, the number of spores in one sporangium of *Comatricha typhina*; there were at least one thousand millions. The number in an æthalium of Reticularia or Fuligo must be enormously greater.

The spores are spherical, usually with a smooth, but frequently with a ribbed or spiny coat. They fall into two groups as regards colour: in one group the spores are dull-coloured, either brown or brownish-violet, almost black; in the other they are of a bright colour, such as yellow, ochreous, red, purple, or pink. In this, as in many of the lower plants, we find colour, which, in the higher groups, is so untrustworthy, furnishing one of the primary bases of classification. The spores of many species, too, are remarkable for their size, which is almost exactly a micro-millimeter—*i.e.*, $\frac{1}{100}$th of a millimeter, the unit now generally adopted by microscopists for the measurement of all minute objects, and denoted by the Greek letter μ. It was long ago proposed that they might be used as a guide in measuring the size of other minute objects on the same slide, and the average of some species of Trichia seems to be constant enough to serve this purpose. In a few genera, as Badhamia, the spores are at first collected in groups.

(*To be continued.*)

THE BIRDS OF LEICESTERSHIRE.

BY THOMAS MACAULAY, M.R.C.S.L., ETC.

PART IV.—"OUR VISITORS."

(*Continued from page 65.*)

33.—The Oyster-catcher (*Hæmatopus ostralegus*). These birds again, though common enough, are not often driven a hundred miles inland. Mr. James Harley records (through Morris) the capture of two within the borders of this county in January, 1838. Rev. A. Matthews reports one seen at Gumley in 1881.

34.—The Bittern (*Botaurus stellaris*). Rapidly becoming extinct, this bird, immortalised by Tennyson, under the name of "butter-bump" in his poem "The Northern Farmer," is yet occasionally found. The only records I have are one specimen killed at Enderby in 1872 and now in the Leicester Museum, and a note from my friend Mr. M. Browne to the effect that "two were reported in a Birmingham paper as having been killed at Lutterworth, October or November, 1881."

35.—The White Stork (*Ciconia alba*). When the fens *were* fens, this bird was not an unfrequent visitor, but that a specimen should be found straying on the outskirts of the town of Leicester, as late as 1873 is somewhat remarkable. The bird was shot at West Leigh on March 6th in the above year, and is now in the Leicester Museum.

36.—The Glossy Ibis (*Ibis falcinellus*). The Bickley collection in the Leicester Museum includes a specimen of this bird. I have been recently informed by the donor's brother, who assisted very materially in forming the collection, that it was killed on the border of the county and within it.

37.—The Curlew (*Numenius arquata*). Not an uncommon visitor in the winter. It has been noticed both by myself and others on many occasions.

38.—The Whimbrel (*Numenius phæopus*). Occasionally met with. I have not seen it myself, but Rev. A. Matthews tells me that he has done so.

39.—The Black-tailed Godwit (*Limosa ægocephala*). "The Leicester Museum possesses one in summer plumage, marked 'Leicestershire, 1869.'"—(M. Browne.)

40.—The Redshank (*Totanus calidris.*) I am indebted to Rev. A. Matthews for being able to say of this bird, "occasionally found."

41.—The Spotted Redshank (*Totanus fuscus*). I am not going to claim for this bird an absolute place in the list of Leicestershire visitors, because I have grave doubts of the correctness of the observation. I give it, therefore, *cum grano*, and for what it is worth. I am informed by Dr. Wright, of Markfield, that a specimen was killed at Groby Pool in 1879.

42.—The Green Sandpiper (*Totanus ochropus*). Not very rare. Has been occasionally seen by myself and other observers.

43.—Temminck's Stint (*Tringa Temminckii*). A specimen of this bird was shot at Saddington Reservoir in 1860, by Rev. H. Marriott. The bird was seen and identified by Rev. A. Matthews.

44.—The Dunlin (*Tringa variabilis*). Occasionally seen on our Reservoir in small parties. I noticed a flock of fourteen there during the past winter, 1881.

45.—The Spotted Crake (*Crex porzana*). This lovely bird has been shot five or six times in this neighbourhood during the last twenty years. I have killed three. One was obtained at "Melton Mowbray, October, 1881, and is now in the Leicester Museum."—(M. Browne.) They lie very close, and are difficult to flush.

46.—The Coot (*Fulica atra*). A visitor only as far as Leicestershire. is concerned. They come to Saddington Reservoir every spring to breed, and depart as soon as the young are able to travel. Very rarely met with in winter, though I killed one during last month, on January 13th, which is now in the Leicester Museum.

47.—The Hooper (*Cygnus ferus.*) Potter mentions that several have been killed on Charnwood Forest, presumably on some of the large pools of water which exist about Bradgate Park. I have heard of the occasional passage of a flock of wild swans in very severe winters, but have no information as to any being obtained.

48.—The Egyptian Goose (*Anser Egyptiacus*). Mr. M. Browne informs me that "there are two specimens in the Leicester Museum—one marked in the old MS. catalogue as "shot on the River Soar, 1843," and the other marked "Withcote Hall, 1858." He adds his opinion that they were probably *escapes*.

49.—The Canadian Goose (*Anser Canadensis*). There are two in the Leicester Museum, marked in the old MS. catalogue as "shot on Groby Pool, April, 1844. Part of a flock of twenty."—(M. Browne.)

50.—The Sheldrake (*Tadorna vulpanser*). Three were shot at Barkby in 1880, and I saw one of them, a male, in the possession of a bird-stuffer, named Donnell.

51. The Shoveller (*Anas clypeata*). According to Potter they have been killed at Bradgate Park. Rev. A. Matthews, some years since, got two at one shot, at Gumley.

52. The Scoter (*Œdemia nigra.*) Not unfrequently driven in by the easterly gales, and appearing upon our Reservoir. During September, 1881, three were obtained at Saddington, one of which I had the pleasure of presenting to the Leicester Museum.

53.—The Pochard (*Fuligula ferina.*) "Occasionally has been seen."—(A. Matthews.)

54.—The Scaup Duck (*Fuligula marila*). An unfrequent but occasional visitor. I killed one on Saddington Reservoir in 1874.

55. The Tufted Duck (*Fuligula cristata*). "Occasionally seen," says Rev. A. Matthews. One was killed at Coleorton Hall, 1865. I shot one at Saddington in the winter of 1880. Another was shot at Smeeton, 1881. Lord Boyle saw two and shot one at Saddington Reservoir, January 11th, 1882.

56.—The Golden Eye (*Fuligula clangula*). This duck is also an occasional visitor in hard weather, and has been shot in this neighbourhood on several occasions, and doubtless in other parts of the county.

57.—The Redbreasted Merganser (*Mergus serrator*). About 1860 one was shot by the keeper, upon the pool at Coleorton Hall. It is now in Sir G. Beaumont's collection.

58.—The Goosander (*Mergus castor*). A specimen was killed on the Smeeton Canal, in 1862, by Mr. Hildebrand. It has also been obtained on two occasions at Saddington Reservoir.

59.—The Great Crested Grebe (*Podiceps cristatus.*) Frequently seen and obtained. For some years they bred regularly at Saddington Reservoir. At least ten specimens have been killed there within as many years. Amongst these are two fine adult males and a female in my collection, and a female which I sent to the Leicester Museum.

60.—The Red-necked Grebe (*Podiceps rubricollis*). One of this species was shot on Saddington Reservoir in 1874.

61.—The Great Northern Diver (*Colymbus glacialis*). In the winter of 1872 one of these birds took up his abode at Saddington Reservoir, and remained nearly a fortnight, and though I and others made many attempts to secure it, it took its departure at last unharmed.

62.—The Black-throated Diver (*Colymbus arcticus*). One was shot on Saddington Reservoir in the winter of 1874.

63.—Red-throated Diver (*Colymbus septentrionalis*). Rev. A. Matthews reports this bird as of not uncommon occurrence on Saddington Reservoir and elsewhere.

64.—The Guillemot (*Uria troile*). I have a specimen which I found in a baker's house. He shot it many years since on the River Soar, when he occupied a mill there.

65.—The Gannet (*Sula alba*). The only occurrence I know of is an immature specimen, picked up half dead at Shangton in 1878. It had been wounded. I saw it, after it was set up, in the possession of Mr. Glover's bailiff, who found it.

66.—The Common Tern (*Sterna hirundo*). Scarcely a winter passes without our seeing one or more of these pretty birds. They are driven in by the easterly gales, and frequent the freshwater pools until they fall to the gun. Two local specimens were sent to the Leicester Museum in 1881.

67.—The Arctic Tern (*Sterna macrura*.) The above remarks apply also to this species, except that it is not quite so frequently seen as the Common Tern.

68.—The Black Tern (*Sterna fissipes*). Very rare. I have two notes. The first was shot at Saddington Reservoir in 1865 by Rev. A. Matthews, and is now in his collection. For the second note I am in debt to Mr. Browne, who writes me:—"Mr. E. Bidwell, of Surbiton, Surrey, informs me that he bought a specimen at Leicester, said to have been killed in the Abbey Meadow.

69.—The Black-headed Gull (*Larus ridibundus*). Potter mentions its occurrence on the Bradgate pools. "Two, male and female, specimens, in winter plumage, were shot at Belgrave, November 3rd, 1881, and are now in the Leicester Museum—" (M. Browne.)

70.—The Kittiwake (*Larus tridactylus*). Common enough, and might be obtained every year; but, as a rule, this bird is spared, at least by all lovers of nature. I shot one this last winter for the Leicester Museum, which is sadly in want of new specimens.

71.—The Common Gull (*Larus canus*). Not unfrequently seen on the inland freshwater pools, but generally spared (like the last-named species) by the shooter. I have no record of one being killed here for many years.

72.—The Herring Gull (*Larus argentatus*). Has been occasionally seen, but not so often as either of the two last-named species.

73.—The Great Black-headed Gull (*Larus marinus*). Rev. A. Matthews says that he has seen this species passing over in small parties occasionally, and he once saw seven together.

74.—The Lesser Black-headed Gull (*Larus fuscus*). Mr. Montagu Browne writes thus: "I saw an adult specimen from Bradgate in the autumn of 1880, in the possession of a man named Donnell, of Leicester. The Leicester Museum also possesses one, shot at Melton, in 1881."

75.—The Common Skua (*Lestris cataractes*). Mentioned in Potter's book as having occurred at Bradgate in 1841.

76.—The Pomatorhine Skua (*Lestris pomatorhinus*). "The Leicester Museum possesses an immature specimen of this, shot at Somerby in November, 1881."—(M. Browne.) One was killed near Hinckley in 1879, and is now in the collection of Mr. R. W. Chase, of Birmingham, to whose courtesy I owe the note.

77.—Richardson's Skua (*Lestris parasiticus*). "In the autumn of 1880, I saw, in the possession of the man Donnell, a nearly adult specimen of this, said to have been shot at Enderby."—(M. Browne.)

78.—The Manx Petrel (*Puffinus anglorum*). In 1867, one was picked up, nearly dead, at Gumley. It is in the collection of Rev. A. Matthews. Another was found dead at Billesdon in 1879.

79.—The Storm Petrel (*Thalassidroma pelagica*). In 1862 a specimen was found dead at Gumley, and is in the possession of Rev. A. Matthews.

MIDLAND UNION OF NATURAL HISTORY SOCIETIES.

NOTTINGHAM MEETING, 1882.

Members of the Societies in the Union will be glad to read the following details of the arrangements for the coming meeting.

The Joint Committee of representatives of the three Nottingham Societies subscribing to the Union, viz:—The Nottingham Literary and Philosophical Society, the Nottingham Naturalists' Society, and the Nottingham Working Men's Naturalists Society met together at the School of Art, Nottingham, on Friday, March 17th, when T. Appleby Stephenson, Esq., M.D., President of the Nottingham Literary and Philosophical Society, was elected President of the Union for 1882, and Mr. Edward Wilson, F.G.S., 18, Low Pavement, Nottingham, Local Hon. Secretary.

The Annual Meeting was fixed to be held on Thursday and Friday, 15th and 16th June next. The following Excursions were agreed upon if arrangements for them can be made :—

1. Welbeck Abbey and Cresswell Crags.
2. Castleton.

Welbeck Abbey, on the north borders of Notts and Derbyshire, is the seat of His Grace the Duke of Portland, and is celebrated for its remarkable edifices, riding school, and tan gallop, underground galleries, conservatories, etc., erected by the late Duke, while Cresswell Crags are of great interest on account of the caves in the Magnesian Limestone, containing remains of extinct mammalia and rude implements of prehistoric man.

Castleton, in North Derbyshire, the route to which would take the visitors through the beautiful dale scenery of the Derwent and Wye, followed by a drive across the Derbyshire Moors within view of the Peak, is celebrated for its remarkable scenery, its caverns, dry gorge, and subterranean watercourse through limestone rocks of carboniferous age, its interesting fossils and minerals, its ruined castle (the Peveril Castle of Sir Walter Scott) possesses also a capital and well-arranged museum of geological specimens, and very fair hotel accommodation.

A large and influential General Committee was appointed, consisting of the above-mentioned representatives and other gentlemen, men of position, or those who possess scientific attainments or encourage students of Natural History in the town and neighbourhood.

It was proposed that the past Presidents of the Union should be Vice-Presidents of the Nottingham Meeting. Two Sub-committees were appointed : 1. Reception and Finance ; 2. Conversazione and Excursion. Other arrangements are in progress, and will be announced in due course.

The Nottingham Literary and Philosophical Society have placed their room at the School of Art at the service of the Local Committee for Committee Meetings.

THE FLORA OF WARWICKSHIRE.

AN ACCOUNT OF THE FLOWERING PLANTS AND FERNS OF THE COUNTY OF WARWICK.

BY JAMES E. BAGNALL.

(Continued from page 59.)

ROSACEÆ.

COMARUM.

C. palustre, *Linn.* *Marsh Cinquefoil.*
Native: In marshes and bogs. Local. June, July.

I. Coleshill Bog! *Purt.*, i., 248; N. side of Bannersley Pool! *Perry Fl.*, 45; S. W. side of Edgbaston Pool, *With.*, iii., 588; Sutton Park! *Freeman Phyt.*, i., 262; marsh near Packington.

II. Allesley Wood, *Bree. Purt.*, iii., 362.

FRAGARIA.

F. vesca, *Linn.* *Wild Strawberry.*

Native: In woods and on hedge banks. Locally common. April to July. Area general.

F. elatior, *Ehrh.* *Hautbois Strawberry.*

Alien: In woods, copses, and on hedge banks. Rare. April and May.

II. "Grounds round Coton House." *N. B. G.*, ii., 613; Edge Hill, *Herb. Per.;* Hampton-on-the-Hill; Norton Lindsay; Wroxall, near the Abbey, *H. B.;* in ballast pits, Lower Hill Morton Road, *R. S. R.*, 1869; wood at Barford, *H. B.*, *Exchange Club Report*, 1879, p. 7; coppice in the Warwick Road, near Wroxall.

Flowers very scarce in some seasons. Cultivated varieties of the Strawberry are occasional on banks near gardens, and assume a semi-wild habit.

RUBUS.

R. Idæus, *Linn.* *Raspberry.*

Native: In woods, copses, and damp waysides. Locally common. May, June, or later.

I. Woods, Coleshill! *Bree*, *Purt.*, iii., 362; Sutton Park; Knowle; Marston Green; near Berkswell, etc.

II. Woods about Allesley! *Bree*, *Purt.*, i., 242; near Rugby! *Baxter*, *Purt.*, iii., 361; Kingswood; Honily, etc.

A variety having a nearly prostrate habit and ternate leaves is abundant near Meriden Shafts.

Var. *b.* Leesii, *Bab.* *Lees' Raspberry.*

In marshy places. Very rare. Woodloes, near Warwick! *H. B.*, *Herb. Brit. Mus.*, 1875.

Some valuable and interesting notes on this plant are given in the "Journal of Botany," 1878, pp. 85, 86, in "Notes on Rubi." *C. C. Babington, F.R.S.*

R. suberectus, *Anders.* *Sub-erect Bramble.*
Native: In damp woods and by pools. Rare. June.
I. (Warwickshire, *Blox.*, *Bab. Brit. Rub.*, p. 53.) Iron Wood, near Oldbury; Arley Wood; wood in Wheyporridge Lane, near Solihull; Olton Pool.
II. Clodyland Wood, near Honily, 1867, *H. Bromwich, Herb. Brit. Mus.*

R. fissus, *Lindl.* *Lesser sub-erect Bramble.*
Native: In damp woods and boggy heath lands. Rare. June to August.
I. Sutton Park, very abundant; Trickley Coppice; Chelmsley Wood; Cut-throat Coppice, Solihull.

R. plicatus, *W. and N.* *Plaited-leaved Bramble.*
Native: In woods and on heath lands. Rather rare. June to August.
I. Baxterley Common and Bentley Wood, *Blox.*, *Bab. Brit. Rub.*, p. 67; common land near Bentley; heathy footways, road from Stonebridge to Castle Bromwich; Sutton Park,* abundant on the heath lands.

R. affinis, *W. and N.* *Intermediate Bramble.*
Native: In woods, on heath lands, and heathy waysides. Rather rare. June to August.
I. Stream near Powell's Pool, near Perkins' Pool, etc., Sutton Park; Marston Green; Hampton-in-Arden.
II. Dunchurch Road, near Rugby, 1880.

R. hemistemon, *Müll.*
Native: In thickets and quarries. Rare. May to August.
I. Atherstone Outwoods, *Rev. A. Blox.*, *Herb. Bab.;* sand quarry, Cornel's End, near Berkswell, July, 1874.
This species is described for the first time as a British plant in Bab. Man., ed. 8, p. 108, 1881.

R. Lindleianus, *Lees.* *Lindley's Bramble.*
Native: In hedges and on heath lands. Rather common and widely distributed. July, August.
I. Atherstone! *Blox.*, *Bab. Brit. Rub.*, p. 80. Sutton Park; Coleshill Pool, Marston Green; near Bannersley Pool; Knowle; Hampton-in-Arden.
II. Rugby, *Blox.*, *Bab. Brit. Rub.*, p. 80. Rowington; Woodloes, near Warwick: Kenilworth Common, etc.
A broad-leaved form, the *R. nitidus*, Bell Salt., is abundant in some of the stations here cited.

R. ramosus, *Blox.*
Native: In hedges and quarries. Rare, but abundant where found. July, August.
I. Lane at Minworth, occurring in great abundance; stone quarry at Hartshill, abundant.
II. Near Rugby, *Blox.*
The Warwickshire plants appear to differ from those found by Mr. Briggs in Devon and Cornwall, but are, I think, connected with them by intermediates. Plants from Minworth were submitted to Mr. Bloxam and confirmed as his plant. *R. ramosus* is fully and ably described in Jour. Bot., ix., 330, 332.
A plant formerly named *R. ramosus* by Mr. Bloxam, from Sutton.

* Prof. Babington considers this very like the variety he calls *rosulentus*.

R. rhamnifolius, *W. and N.* *Buckthorn-leaved Bramble.*
Native: In hedges and thickets. Local. July, August.
I. Pool Hollies Wood, Sutton Park; Hay Lane, Solihull; Brockhill Lane, Honily; Ridge Lane, near Bentley Park; lane from Stonebridge to Castle Bromwich; lane by Chalcot Wood; Marston Green.
II. Near Haywoods; near Allesley; Rounshill Lane, Kenilworth; lane from Kingswood to Rowington.
The form which Mr. Bloxam called *R. cordifolius* occurs occasionally with the type.

R. discolor, *W. and N.* *Common Bramble.*
Native: In hedges and thickets. Common. July, August.
More or less abundant throughout the county.

R. thyrsoideus, *Wimm.* *Thyrsus-flowered Bramble.*
Native: In hedges. Rare. July, August.
I. Stoke and Hartshill. *Bab. Brit. Rub.*, p. 111; Marston Green; a rampant form of this also occurs near Hoare Park, Atherstone Road.
II. Near Alveston Pastures, collected when botanising there with the Rev. W. W. Newbould; Kingswood.
The plants from the above stations are what Mr. Bloxam considered to be typical *R. thyrsoideus.*
Var. *macroacanthus*, Blox.
Native: In hedges and on banks in marly soils. Local.
I. "R. discolor, *c*, macroacanthus, *Bell Salt*, 10 Bab. Syn.; between Mancetter and Hartshill! abundant; *A. Bloxam in Herb. Bor.;*" lanes about Shirley.
II. Abundant on marly banks near Tardebigg and Hewell Grange. *Herb. Brit. Mus.*, 1875, *J. Bagnall.*
On the plant from Tardebigg Professor Babington remarks, "This I call a fine form of *R. thyrsoideus*, very near to, if not identical with, Bloxam's *macroacanthus*, but his authentic specimens have rather different-shaped leaves," 1874.
The plant at Hartshill is certainly very near the Tardebigg plant, but has more strongly deflexed prickles on the panicle. It was abundant in the lane from Mancetter to Hartshill in 1875.

R. leucostachys, *Sm.* *Long-clustered Bramble.*
Native: In heathy places and hedges. Common. July, August.
I. Atherstone, *Blox.*, *Bab. Brit. Rub.*, p. 122; Sutton Park; Maxtoke Park; lanes about Solihull; Meriden; Knowle, etc.
II. Near Rugby, *Blox.*, *Bab. Brit. Rub.*, p. 122; Weston Wood; Stivichall Common; Kenilworth, etc.
Var. *b. vestitus*, Weihe.
On banks and in woods. More frequent than the type.
I. Olton canal bank; near Maxtoke Priory; Meriden Shafts; Ballard's Green, Arley; near Moor Hall, Sutton; Trickley Coppice, etc.
II. Coventry Park, *T. Kirk. Herb. Brit. Mus.:* Kenilworth Heath; Allesley; a peculiar form with ternate leaves and very hairy glandular stem is abundant on banks near Hewell Grange, and a similar form having sepals adpressed to the fruit is abundant in Little Shortwood in the same district.
It is often difficult to separate these varieties satisfactorily.

R. Grabowskii, *Weihe.* *Grabowski's Bramble.*
Native: In hedges and woods. Rare. July, August.
I. Hartshill Wood, *Bab. Brit. Rub.*, 126. A plant very closely like this occurs in hedges, Warwick Road, between Solihull and Olton Reservoir; it is, however, more robust than Mr. Bloxam's specimens, which were garden grown. The plant occurred as late as 1875 in the Rev. A. Bloxam's garden, at the Rectory, Harborough Magna!

R. Colemanni, *Blox.* *Coleman's Bramble.*
Native: In hedges. Rare. July, August.
I. A plant apparently identical with Mr. Kirk's specimen of the Coventry plant in Perry's herbarium occurs at the north end of Sutton Park. A peculiar form of this from the lane near New Park, Middleton. Abundant in a stone quarry near Hartshill, confirmed by Professor Babington.
II. Near the railway station at Coventry, *Bab. Brit. Rub.*, 130; *R. infestus*, near the six fields, Coventry, *T. Kirk*, *Herb. Per.*

R. Salteri, *Bab.* *Salter's Bramble.*
Native: In woods. Rare. July, August.
I. In a small wood, Wheyporridge Lane, Solihull, named for me by Professor Babington; Arley Wood. Professor Babington confirms this as Bloxam's *Salteri*.
Var. *b. calvatus*, Blox.
Native: In hedges and quarries. Rare. July. August.
I. Abundant in a sandstone quarry, Cornels End, near Berkswell; Oldbury, near Atherstone.
II. Wyken Lane, near Coventry; named by Professor Babington.
The plant from Wyken Lane is a very different plant in many respects from the Cornels End plant.

R. carpinifolius, *W. and N.* *Hornbeam-leaved Bramble.*
Native: On heath lands. Rather rare. July, August.
I. Abundant on Sutton Coldfield. The plant from this locality determined by Professor Babington. Middleton Heath; Brookhill Lane, Berkswell.
II. Kenilworth Heath. Confirmed by Professor Babington, who says. "It is very like the tomentose plant referred to in 'Brit. Rubi.,' p. 139, from Dr. Hort."

R. villicaulis, *W. and N.* *Pilose-stemmed Bramble.*
Native: In hedges and woods. Local. July, August.
I. Atherstone and Hartshill, *Bab. Brit. Rub.*, 146; Doe Bank, near Sutton; Trickley Coppice; New Park; Middleton Park. The plants from the last three stations differ from the type in having a more glandular, setose, and prickly stem. Hay Lane, Solihull; lane from Meriden to Hampton-in-Arden; near Moor Hall, Sutton; Bentley Park.
Var. *b. derasus*, Müll., *adscitus*, Genev.
I. Coventry Road, between Allesley and Meriden. The plant from this station was so named by Professor Babington.
A plant closely allied to this, *R. heteroclitus* (Blox.), is abundant in New Park, Middleton. See "Journal of Botany."*
A plant closely like *R. Warrenii* (Blox.), abundant near Temple Balsall.

(*To be continued.*)

* Notes on Rubi. "Journal of Botany," 1878, p. 208.

Reviews.

Geology of the Counties of England and of North and South Wales. By W. J. Harrison. 8vo. London, 1882; pp. 16, xxviii., 346. Price 8s.

The geology of England, as a whole, has of late years been described in two volumes: Mr. Harrison has now added a third, and so brought the subject up to the standard of the regulation novel. Sir A. Ramsay, in his "Physical Geology and Geography of Great Britain," has treated English geology from the physical standpoint, entering largely into such questions as the conditions that prevailed during various geological periods, and the causation of our hills, plains, valleys, and lakes. Of this work it is enough to say that it reached a fifth edition in 1878, and that it has grown from a wee volume to a bulky one of over 650 pages.

Mr. H. B. Woodward, in his "Geology of England and Wales" (496 pages, published in 1876), has given us a systematic description of our various rocks in stratigraphical order, so that his book is essential to workers on English geology, and forms a fit companion to that of Sir A. Ramsay.

One would have thought that these two geologists had exhausted the subject, as far as a general treatise is concerned; but Mr. Harrison has cleverly cut in with a third work on a different plan, namely, from a topographical standpoint.

After a short introduction on the principles of Geology, with an outline of the geology of England, and a list of the chief books and papers thereon, he describes the various counties in alphabetical order. At the head of each of these 45 descriptions is a list of the Scientific Societies and Museums that flourish in the county or district, of the Geological Survey publications referring to it, and of the other chief works on its geology up to the latest date. The formations are then noticed, beginning with the oldest, and are illustrated by more than a hundred woodcuts of sections, views, and fossils.

Of course the descriptions of the various districts cannot be of a very detailed nature, their length varying from four pages, in the case of Huntingdonshire and Rutland, to twelve with Lancashire, Leicestershire (it would have been hard if the author had not brought this county to the front!), the West Riding of Yorkshire, and North Wales. Should any southern geologist feel hurt at the natural preponderance of these last divisions, it may comfort him to know that Hampshire and the Isle of Wight have together 15 pages. By the use of small but very clear type, the author has managed, however, to stow away a large amount of information under each heading, quite enough for the great majority of those wishing for geologic food; whilst his lists of works enable any heavy feeders, who, like Oliver Twist, ask for more, to satisfy their abnormal appetite to any extent.

Of course no one accustomed to geological work needs to be told that the author cannot have evolved such a book from the depths of his own inner consciousness: it must have involved almost unlimited use of the writings of geologists at large. What will be the feelings of those who expect that everything should be original when Mr. Harrison acknowledges having consulted more than 4,000 papers, etc.? In this, clearly, he has taken the proper course, and geologists will allow that he has gathered his harvest of knowledge discreetly.

With regard to the woodcuts. Old friends are constantly showing their faces, and many a geologist will even recognise his own children! Here, too, our author seems to have taken the wisest course, in ransacking the works of his brethren for the figures that may best illustrate his descriptions, instead of striving for novelty, which is not needed in a work of this kind. The selection of these figures has been carefully made, and their reproduction admirably carried out.

I have left fault-finding to the last; it is so pleasant to have a parting-fling at an author! The first sixteen pages of the book are without paging, though the index (which might, perhaps, come better at the end) can hardly have been so small a matter as to count for nought; but this is Mr. Harrison's look out. If he choose to make as little as possible of his work, one must admire his modesty. Again, with the proverbial perversity of human nature, he has not made his work of the same size, nor its binding of the same colour, as the kindred works of Ramsay and Woodward, alongside of which it should be found on the shelves of English geologists. At present we have to sandwich his more slender brown book between the two stouter green ones. Let us hope that whilst the latter may grow taller in new editions, the former may speedily fatten and become verdant. W. W.

The Flora of the Clent and Lickey Hills and Neighbouring Parts of the County of Worcester. By William Mathews, M.A. Stourbridge: Mark and Moody.

This is a second and enlarged edition of a well-known little book, originally prepared in 1868. It would be superfluous for our local readers to be told that it is a book well and carefully done, and thoroughly to be relied on. It would be impossible for Mr. Mathews to write a book of a different character. We can cordially recommend it to all who are interested in the district. E. W. B.

Report of the Rugby School Natural History Society for the Year 1880. A. J. Lawrence, Rugby, 1881; 64 pp. and six plates.

Rugby has long been distinguished among our great public schools for the able and practical teaching of science. Its masters have always included science teachers of ability, who have been able to communicate to many of the boys the enthusiasm with which they were themselves inspired. The present report contains some capital papers by various members of the school, among which we note those on the "Carboniferous Limestone of Denbighshire," by E. H. Acton, and on "Bells," by H. J. Elsee. The report of the geological section includes a valuable list of Rugby fossils, showing their zones and localities. Among these, however, it has surprised us to see that *Avicula inæquivalvis* (young) and *Cardium truncatum* have been obtained from the Rhætic beds. The report of the Temple Observatory by that able astronomer, Mr. Seabroke, is given as usual in the appendix. W. J. H.

The British Moss-Flora. By R. Braithwaite, M.D., F.L.S. Part V. 4s.
Fam. vi., Leucobryaceæ.
Fam. vii., Dicranaceæ. (Part I.)

This part contains the history and generic characters of the family Leucobryaceæ, and gives a full and able description of the sole European species *Leucobryum glaucum*, together with the synonymy of the plant from the time of Ray's Synopsis to that of the most recent British and foreign bryologists. This species is illustrated by an Imperial 8vo. plate, giving beautifully drawn figures of the plant, natural size, and magnified figures of the fruit, the peristome, the leaves, and transverse sections of the leaves to show the foramina and chlorophyllose ducts.

Following this is an account of the family Dicranaceæ, with a useful table of the sub-families, genera, and species of that family. This part treats of the sub-families Ditricheæ and Dicranelleæ, and descriptions are given of all the British species belonging to the genera Archidium, Pleuridium, Ditrichum, Swartzia, Dicranella, and Anisothecium.

To each species a full synonymy is given, so that the plant may be readily traced through any flora past or recent. These sub-families are illustrated by three Imperial 8vo. plates, giving full illustrations, natural size and magnified, of leaves, fruit, leaf sections, and cell structure of each species, with that fidelity and fulness which is so characteristic of the author. The work is published by the author, at 303, Clapham Road, London J. E. Bagnall.

Guide to the Geological Collections in the University Museum, Oxford. By Professor Prestwich. Clarendon Press, 1881.

The Oxford Museum now contains excellent collections of rocks, minerals, and fossils. The materials of the building itself were specially selected to display the ornamental and building stones of the British Isles, and the specimens within show the result of the able work for many years of the late (Professor Phillips) and present (Professor Prestwich) occupants of the geological chair. This guide to the Museum includes sixty-four pages of close print, and will be useful not only to local students, but to all who collect and arrange geological specimens. A good point in the arrangement is that the rich local collections from the Stonesfield slate, etc., are kept separate from the general or typical series. W. J. H.

METEOROLOGY OF THE MIDLANDS.

THE WEATHER OF FEBRUARY, 1882.

BY CLEMENT L. WRAGGE, F.R.G.S., F.M.S., ETC.

The month opened with fine, quiet weather and high pressures, and some subsequent fog occurred. The continued mildness was the characteristic feature; and the mean temperature for Central England may be given as 42·0. At Loughborough the mean was nearly five degrees above that of February, 1881, and at Orleton it was rather more than $1\frac{1}{2}°$ above the average of the last twenty years. Vegetation was very forward, and many wild flowers were in bloom.

STATION.	OBSERVER.	RAINFALL. Total for M. In.	Greatest fall in 24 hours. In.	Date.	No. of rainy d.	SHADE TEMP. Absolute Maximum. Deg	Date.	Absolute Minimum. Deg	Date.
OUTPOST STATIONS.									
Spital Cemetery, Carlisle	I. Cartmell, Esq., F.M.S. ..	1·80	·54	25	12	56·8	22	25·7	2
Scarborough (*a*)............	F. Shaw, Esq., F.M.S.......	1·42	·67	26	11	55·3	22	9·3	2
Blackpool (*a*)—South Shore..	C. T. Ward, Esq., B.A., F.M.S.	1·77	·51	26	18	51·9	25	29·4	2
„ North Shore..	„ „			—	—	50·1	25	29·6	2
Llandudno (*a*)............	J. Nicol, Esq., M.D.........	1·66	·38	27	16	—	—	31·8	2
Lowestoft (*a*)............	H. E. Miller, Esq...........	1·64	·67	14	8	52·8	26	29·2	3
Carmarthen (*a, b*)............	G. J. Hearder, Esq., M.D...	4·58	·85	25	—	54·0	14	32·6	5, 16
Cardiff (*a*)................	W. Adams, Esq., C.E.	2·56	·60	28	15	57·0	21	30·5	4
Altarnum, near Launceston..	Rev. J. Power, M.A.	4·02	1·53	26	16	55·0	15	25·0	9
Sidmouth (*a*)............	W. T. Radford, Esq., M.D.	2·02	·62	28	10	57·2	24	33·0	5
Les Ruettes Brayes, Guernsey (*a*.)	A. Collenette, Esq., F.M.S.	2·31	·66	25	15	51·5	12	30·5	7
Guernsey	F. C. Carey, Esq., M.D.....	1·36	·54	25	9	51·0	26	32·3	7
MIDLAND STATIONS.									
HEREFORDSHIRE.									
Burghill (*a*)............	T. A. Chapman, Esq.	2·56	·78	28	11	54·6	13	29·3	2
SHROPSHIRE.									
Woolstaston	Rev. E. D. Carr	3·27	·73	26	14	54·5	13	29·0	2
Stokesay (*a*)............	M. D. La Touche	1·86	·58	13	8	55·9	13	27·5	2
Bishop's Castle	E. Griffiths, Esq.	2·89	·68	25	12	54·0	21	30·0	16
More Rectory............	Rev. A. S. Male............	2·96	·69	28	14	53·9	12	32·0	20, 16
Dowles, near Bewdley	J. M. Downing, Esq.	1·34	·55	15	8	58·0	17	23·0	2
WORCESTERSHIRE.									
Orleton, near Tenbury (*a*)....	T. H. Davis, Esq., F.M.S. ..	3·41	1·13	28	12	5·7	13	25·0	2
West Malvern	A. H. Hartland, Esq.	2·[illegible]5	·80	28	13	50·5	13, 25	28·0	1
Evesham	T. J. Slatter, Esq., F.G.S...	2·05	·67	14	10	54·5	25	26·8	2
Pedmore	E. R. Marten, Esq.	2·70	·87	28	10	56·0	13	29·0	1, 15, 20
Stourbridge	Mr. J. Jefferies	2·78	·87	28	14	55·0	18	26·0	1
Cawney Bank, Dudley	Mr. C. Beale	2·68	·78	28	10	50·0	13, 18, 25	31·0	2, 15
STAFFORDSHIRE.									
Dennis, Stourbridge (*a, b*)....	C. Webb, Esq.	2·60	·88	28	13	54·0	13	29·0	1
Kinver	Rev. W. H. Bolton	2·56	·71	28	13?	5[illegible]·0	17, 25, 26	26·0	4
Walsall	N. E. Best, Esq.	3·08	·93	28	14	50·0	20, 25, 26	26·0	1
Lichfield	J. P. Roberts, Esq.	2·28	·76	28	11	57·0	19	27·0	3
Burton-on-Trent (*c*)............	C. U. Tripp, Esq., F.M.S. ..	2·11	·66	28	16	55·0	13	26·0	2, 14
Weston-under-Lyziard	Hon. & Rev. J. Bridgeman	2·70	·78	28	17	55·0	13	26·0	2
Wrottesley (*a*)	E. Simpson, Esq.	2·8[illegible]	·81	28	13	53·8	13	2[illegible]·5	2
Barlaston (*a*)	W. Scott, Esq., F.M.S.	2·60	·52	28	9	53·0	22	28·4	2
Tean (*c*)	Rev. G. T. Ryves, F.M.S. ..	2·81	·91	28	14	53·6	13	25·0	2, 4
Heath House, Cheadle (*a*) ..	J. C. Philips, Esq., F.M.S.	2·79	·91	28	15	53·1	13	26·8	2
Oakamoor, Churnet Valley (*a*)	Mr. Williams	3·32	·85	28	16	52·3	25	28·7	3
Beacon Stoop, Weaver Hills (*a*)	Mr. James Hall	3·28	—	—	—	49·8	—	25·5	—
Alstonfield	Rev. W. H. Purchas	3·67	·96	26	—	51·3	13	22·2	2
DERBYSHIRE.									
Stony Middleton	Rev. Urban Smith	2·97	1·16	28	12	52·0	13, 25	29·0	1
Fernslope, Belper............	F. J. Jackson, Esq.	2·36	1·00	28	11	54·0	13	25·0	2
Belper (*a*)............	J. Hunter, Esq., C.E., F.M.S.	2·36	·97	28	14	53·8	18	24·9	2
Spondon	J. T. Barber, Esq...........	2·26	·84	28	12	—	—	—	—
NOTTINGHAMSHIRE.									
Mansfield (*a*)	W. Tyrer, Esq., F.M.S.	1·99	·74	28	12	53·2	18	27·4	2
Park Hill, Nottingham (*a*) ..	H. Johnson, Esq.	1·[illegible]8	·75	28	13	54·4	13	27·2	3
Strelley (*a*)	T. L. K. Edge, Esq.	2·12	·80	28	15	53·0	13	26·3	2
Tuxford	J. N. Duffy, Esq., F.G.S. ..	·74	·30	26	12	56·0	13	25·0	1
LEICESTERSHIRE.									
Loughborough (*a*)............	W. Berridge, Esq., F.M.S...	2·07	·67	14	13	55·5	13	27·0	2
Syston	J. Hames, Esq...............	1·62	·70	14	11	55·0	25	27·0	4
Town Museum, Leicester ..	J. C. Smith, Esq.	2·32	·81	14	14?	55·0	13	27·2	4
Ashby Magna	Mr. T. Carter	1·90	·74	28	11	54·0	25, 26, 27	—	—
Kibworth	T. Macaulay, Esq.	1·89	·68	14	12	51·0	12, 24	28·0	1
Waltham-le-Wold	Edwin Ball, Esq.	1·83	·73	14	11	53·0	26	26·0	1
Dalby Hall (*b*)	G. Jones, Esq...............	1·65	·77	14	12	52·0	21	23·0	2
Coston Rectory, Melton (*a*) ..	Rev. A. M. Rendell........	1·68	·71	14	12	54·3	13	24·3	2
WARWICKSHIRE.									
St. Mary's College, Oscott (*a*)	J. MacElmail, Esq.	2·35	·76	28	10	57·5 ?	18	—	—
Henley-in-Arden	T. H. G. Newton, Esq.	2·14	·73	28	12	54·0	25	26·0	2, 4
Kenilworth (*a*)	F. Slade, Esq., C.E., F.M.S.	1·99	·60	14	10	54·8	25	26·5	4
Coundon, Coventry (*b*)	Lieut.-Col. R. Caldicott....	1·72	·74	14	10	53·0	13	27·0	2
Rugby School (*c*)	Rev. T. N. Hutchinson	2·14	·75	28	11	56·2	12	26·4	2
NORTHAMPTONSHIRE.									
Sedgebrooke, Northampton	C. A. Markham, Esq.	1·99	·72	14	11	55·0	13, 26	24·0	2
Towcester	J. Webb, Esq.	1·91	·68s	13	10	—	—	—	—
Kettering............	J. Wallis, Esq.	1·89	·65	14	10	55·0	26	26·0	2
BEDFORDSHIRE.									
Aspley Guise, Woburn (*a*)....	E. E. Dymond, Esq., F.M.S.	1·48	·35	28	10	54·2	26	28·0	2
OXFORDSHIRE									
Ratcliffe Observatory, Ox. (*a*)	The Staff	1·53	·58	28	8	55·8	26	25·1	4
WILTSHIRE.									
Marlborough (*a*)	Rev. T. A. Preston, F.M.S.	2·35	·57	28	9	55·0	14	25·3	4
GLOUCESTERSHIRE.									
Cheltenham (*a*)	R. Tyrer, Esq., B.A., F.M.S.	2·98	·84s	14	12	55·0	13, 25, 26	26·2	5

(*a*) At these Stations Stevenson's Thermometer Screen is in use, and the values may be regarded as strictly intercomparable.
All observations received on the new Form except those marked (*b*).
(*c*) Glaisher's pattern of thermometer screen employed at these stations.

Only some four or six frosts occurred, and it appears that snow (mingled with rain) fell only during the depression of the 15th. Some hail fell in the Churnet Valley at that time. The barometer again ran high on the 20th, and a deep depression crossed on the 27th, bringing in some places nearly two-thirds of the total rainfall of the month. The mean amount of cloud was about 8·5 (scale 0—10), and the mean relative humidity about 90 per cent. South-south-westerly winds prevailed. The Solar radiation thermometer, black bulb *in vacuo*, registered 104·7 on the 17th, and the terrestrial radiation instrument 17·2 on the 2nd, both extremes occurring at Aspley Guise. Total duration of sunshine 44 hours at Strelley, 47 at Aspley Guise, and 41 at Oxford. At Blackpool ozone was registered on 21 days, and the average amount was 5·3, the mean at Carmarthen was 4·0, and at Oxford only 0·6. Mean temperature of the soil at Strelley 40·0, at a depth of one foot. Sea temperature at Scarborough 42·3, or about two degrees warmer than the average of the previous five years.

Notes by Observers.—*Dennis.* —So mild throughout that snowdrops, crocuses, violets, wallflowers, pansies, etc., have been blooming from the beginning of the month. *Burton.*—18th, Hazel catkins numerous; common elder in leaf. 19th, Gorse in flower. 20th, Celandine in flower. 23rd, Cuckoo actually heard at Rolleston. 21st, Black currant in leaf. 25th, Lark, thrush, etc., in full song, and most birds building. 28th, Rhubarb and gooseberry in leaf. *Kenilworth.*—8th, Catkins on nut trees. 10th, Gooseberry and black currants shooting. 14th, Gathered single wild daffodil. 19th, *Salix* in blossom. 24th, Gathered double daffodil in garden. 20th, Red currants and raspberries shooting, and elms budding. *Cheltenham.*—Honeysuckle leaves well expanded at the close, and violets in full bloom.

Correspondence.

Primula Vulgaris.—If the stigma and pollen of *Primula vulgaris* are microscopically examined, say with a power of about seventy diameters, certain marked characters will be noticed. As is well known, there are two forms of *Primula vulgaris*—(1), in which the anthers are situated at the top of the corolla tube, and the stigma occurs about half-way up the corolla tube; (2), in which the anthers occur about half-way up the corolla tube, and the stigma is found at the top of the corolla tube. The first form is called the rose-centred form, the second is called the pin-centred form. If the pollen of the rose-centred form (1) is examined microscopically it will be found to be twice the size of that of the pin-centred form (2); and if the stigma of form (1) is examined it will be seen to be covered by very slight elevations or is what may be termed papillate, whilst the stigma of form (2) will be found to be covered by a thick coating of longish hair-like processes. These differences, I find, are also to be seen in the two forms of the cowslip, and in the two forms of the polyanthus. I find also that the form (1) has its stigma invariably dusted with its own pollen; out of all the specimens examined during the past ten years I have never seen the pollen of the form (2) on the stigma of form (1). The stigma of form (2) I have invariably found dusted with the pollen of form (1). It would be interesting to note which of the two forms produces most seeds, form (1), which I have always found self-fertilised, or form (2), which appears to be always cross-fertilised.—J. E. Bagnall.

Plants in Bloom First Week of January, 1882.—I enclose a list of plants found by myself in bloom in the first week of this year. I thought such a list would prove interesting. It shows how extremely mild the winter is this year. If you remember, the winter of 1877 and opening months of 1878 were remarkably mild, but I am under the impression that the present winter is milder. There are not so many plants in flower, for this reason that many of the late summer flowers were killed by the frost and snows in November or early part of December. Vegetation is everywhere remarkably forward, and in many trees the new buds are opening. Rumex obtusifolius, Sisymbrium thalianum, Potentilla Fragariastrum, Sisymbrium officinale, Cardamine hirsuta, Heracleum Sphondylium, Ranunculus Ficaria, Seneci vulgaris, Geranium molle, Draba verna, Lactuca muralis, Lychnis vespertina, Veronica Buxbaumii, V. agrestis, V. hederifolia, Scleranthus annuus, Viola tricolor, Calluna vulgaris,' Capsella Bursa-pastoris, Lamium album, L. amplexicaule, L. purpureum, Cerastium viscosum, C. vulgatum, Bellis perennis, Helleborus fœtidus, Taraxacum Dens-leonis, Ulex Europæus, Vicia hirsuta, Alchemilla arvensis, Rubus communis, Sherardia arvensis, Lapsana communis, Spergula arvensis, Sagina procumbens. Euphorbia peplus, Galanthus nivalis, Primula vulgaris, Fumaria officinalis, Urtica urens, Ranunculus repens, Matricaria inodora, Carduus nutans, Euphorbia helioscopia, Sinapis arvensis, Sonchus oleraceus, Myosotis collina, Matricaria parthenium, Hieracium sylvaticum, and male catkins of Alder and Hazel.—J. Caswell, St. Mary's, Oscott, January 19th, 1882.

Botanical Notes from South Beds, with Voucher Specimens :—

Name.	Date. 1880.	Date. 1881.	Date. 1882.	Aspect.	Situation, Soil, etc.
Helleborus viridis ...	Feb. 11	—	Jan. 7	Open	Moist meadow—First foliage and inflorescence
Cardamine hirsuta ...	April 5	Mar. 15	Jan. 10	N.E.	Wall top—In *fruit* this year Jan. 10; the other dates in *flower* only.
Corylus Avellana ...	Feb. 22	Feb. 13	Jan. 14	Open	Hedge row.
Potentilla Fragariastrum	—	Mar. 26	Jan. 15	W.	Coppice.
Tussilago Farfara ..	Mar. 3	—	Jan. 25	S.	Railway bank.
Ranunculus Ficaria ...	Mar. 13	—	—	Open	Boggy soil.
Ranunculus Ficaria ...	—	Mar. 6	Jan. 29	W.	Warm bank, sandy soil; not general till middle of February in 1882.
Draba verna ..	—	Mar. 8	Feb. 19	Open	Fallow fields.
Adoxa moschatellina	Mar. 20	April 5	Feb. 12	S.	Warm bank—Foliage & inflorescence about 3 in. high, but flowers unopened.
Anemone nemorosa ...	Mar. 13	Mar. 18	Mar. 3	—	Woods.
Salix caprea ...	Mar. 13	—	Mar. 5	Open	Hedge rows.
Petasites vulgaris ...	Mar. 13	Mar. 29	Mar. 10	Open	Boggy meadow.
Caltha palustris ...	Mar. 13	Mar. 15	Mar. 10	Open	Boggy meadow.
Prunus spinosa ...	April 18	—	Mar. 16	Open	Hedges.

It should be stated that the stations of the above were the same in each season, or with precisely similar conditions. During the whole of the present abnormal winter, from October, 1881, primroses and dog mercury have been in blossom in coppices where the undergrowth had been previously cut down, but none appeared where this had not been done. In fallow fields *Veronica arvensis* and *Scandix Pecten-veneris* have been in blossom both plentifully and continuously.—J. Saunders, Luton, March 18th, 1882.

Dates of Flowering, &c., around Nottingham, with Soil, Aspect, &c. —*Tussilago Farfara* (Coltsfoot), February 20th, on both north and south sides of sandy railway embankment. *Primula veris* (Primrose), Feb. 5th, in wooded dale, clay soil. *Viola odorata*, March 5th, in wooded dale; damp; clay soil. Apricot, in bloom, March 12th, wall facing east. Hedge, in leaf, Feb. 24th, on edge of wood, and sheltered from north and north-west. First lark heard, Feb. 1st.—H. F. Johnson, Nottingham.

Gleanings.

The Scientific Roll.—Six numbers, constituting Part I. of this new publication, have now been issued, the subject dealt with being "Climate." The first number of Part II. will be issued in May next, and will be devoted to "Aqueous Vapour." The conductor of the "Scientific Roll" (Mr. Alexander Ramsay, F.G.S.) requests that all communications be addressed to him at 10, Bouverie Street, London, E.C.

The Minor Planets.—We now know 220 tiny orbs—*asteroids* as they are called—which circle round the sun in paths which lie between the orbits of Mars and Jupiter. Certain astronomers make it their business to look for these minute members of the solar system, but all of any size seem to have been discovered, for during 1881 only one new minor planet was observed, and this by Herr Palisa of the Vienna Observatory. Setting aside the two or three largest of the asteroids, the diameter of these little planets varies from five to fifteen miles. The conditions of existence (supposing it to be possible) on one of these small asteroids, and the scientific phenomena which would be seen by a dweller on one, are full of fascinating problems.

Fossils in Meteors.—Our readers will remember that the late Sir Wyville Thomson, in his presidential address to the British Association at Glasgow, hinted at the possibility that the first germs of life might have been brought to the earth by or on a meteor! More recently a German doctor named Hahn professed,—and professes, for he refuses to believe anything to the contrary,—to have discovered traces of many species of fossils in sections of meteors which he has examined under the microscope. All the meteoric masses hitherto discovered are irony or stony masses, indubitably of igneous origin, and although the microscopic structure of the minerals composing these meteors is often curious and complex, yet no microscopist skilled in the examination of rocks has ever hinted at having seen anything, which by any possibility could be considered organic. Dr. Hahn, however, has been sending specimens and papers describing them over all Europe, and he appears at last to have begun to disseminate his discoveries in the New World. The American Journal called "Science" (Vol. II., p. 410) has an extraordinary account of an interview between Dr. Hahn and Mr. Darwin. Of course no such interview or conversation took place.

Eozoon Canadense—is it a Fossil?—In a work lately published by Professors King and Rowney, they make a fresh onslaught on the organic nature of the famous *Eozoon*, stating that from their researches among metamorphic rocks they are led to the belief that the various markings, tubes, etc., to which the name *Eozoon* has been applied, are all of a mineral origin, resulting from changes which have taken place since the formation of the rocks containing them. The authors give numerous illustrations of structures resembling *Eozoon* which they have seen in serpentine and allied rocks; rocks which it is admitted can contain no true fossil remains, being of an igneous nature.

Mr. Clement L. Wragge.—We learn from the *Glasgow Herald* that at the half-yearly meeting of the Scottish Meteorological Society, held at Edinburgh, on 22nd March, the report of the Council was read, giving an account of the operations during the last six months, and referring particularly to the observations made by Mr. Wragge on Ben Nevis. Mr. Wragge followed with an interesting statement of his work, and Mr. Buchan, the secretary, having referred to the possible results that might be obtained from these observations, Sir William Thomson moved a resolution, recommending the Council of the Society at once to appeal to the British public for funds to erect on Ben Nevis a permanent meteorological observatory. This was seconded by Professor Douglas Maclagan, and unanimously agreed to. The proceedings were brought to a close by the presentation to Mr. Wragge of a gold medal, in commemoration of the remarkable work he carried on last summer.

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—February 28th.—Geological Section—Mr. W. J. Harrison, F.G.S., was re-elected president, and Mr. A. H. Atkins, B.Sc., secretary of the section. Mr. Rabone presented to the Society a fine specimen of the *Cyclopteros lumpus*, or Lump Fish (caught at Tenby), which was described by Professor Bridge. Mr. W. Southall exhibited a number of stones collected by earthworms at the mouth of their burrows. Mr. T. H. Waller, B.A., B.Sc., then read a paper on "The occurrence of Carbonic Acid in Crystals." Small cavities are common in quartz and other crystals, containing water, chloride of sodium, carbonic anhydride, etc. The presence of carbonic acid has been proved by its great expansion when heated, and by means of the spectroscope. It exists in the liquid state at ordinary temperatures, and must therefore be under great pressure. When warmed up to 89 deg. F., the bubble disappears, being converted into gas, for at that temperature, which is called the critical point, no pressure whatever can keep it in the liquid form. This was beautifully shown by causing a current of warm air to impinge on a thin section of quartz while under the microscope. These investigations have led to several theories concerning the temperature and pressure at which granite was crystallised. The heat must at least have been equal to the critical temperature of water, viz., 790 deg. F., or the heat of melting zinc, and the pressure immense. Some of the bubbles of liquified gas are in a state of perpetual motion, as if trying to escape from their minute prison-house, which movement some of the slides exhibited remarkably well. The reasons for this curious phenomenon do not seem to be well understood, though several causes have been assigned for it. The paper was illustrated by many microscopical sections besides those mentioned, and was listened to with great interest. March 7.—Mr. R. W. Chase exhibited a specimen of the White-tailed Eagle, *Haliaëtus albicilla*, shot at Stornoway, Isle of Lewis, and also some parasites (mounted) taken from the bird. Professor T. W. Bridge read a paper on "Deep-Sea Fishes," in which he gave an account of the recent additions to our knowledge of this subject. Before 1876 not more than thirty deep-sea forms were discovered; now, through the voyage of the Challenger, more than 300 are known. A deep-sea fish may be defined as one which lives at a depth of more than 200 or 250 fathoms. At these great depths, reaching from that limit down to 4,500 fathoms, the animals are subject to peculiar conditions, which have modified the species in accordance with their environment. (1) There is at that depth no trace of sunlight. (2) At all depths below 1,000 fathoms the water is everywhere only a few degrees above freezing point. (3) The pressure at 800 fathoms amounts to one ton per square inch, at 1,600 to two tons, and so on whilst at the surface animals live under a pressure of 14lbs. only per square inch. But difference of pressure is comparatively ineffective to produce any change, as the pressure without is always exactly counterbalanced by the pressure within. (4) The deep-sea fishes, which are mostly carnivorous, live on smaller fishes; these again depend for their sustenance on the remains of surface forms, which, when dead, sink slowly towards the bottom. They also live on algæ which are similarly sinking. The stomachs of fishes taken from 4,500 fathoms have been found to contain sea-weed. The modifications effected by these conditions are of three kinds:—(1) In the absence of sun-light the colours of the fishes are mostly of a simple kind, as black or silvery; only in a few cases do we meet with such colours as purple. The eyes are modified in two ways—they either become smaller and disappear, or are greatly enlarged, or if they remain unchanged the fish is provided in addition with sensitive tactile organs, such as long streaming tentacles, which atone for the want of sufficient vision. But the most remarkable case is where we see the production of accessory visual and light-producing organs. On some species is found a row of accessory eyes, ranged longitudinally down each side of the body, and also on the tail. These consist of parts answering to the cornea, the crystalline lens, the vitreous humour, the retina, and the optic nerve of the human eye, and it is impossible to resist the conclusion that they are eyes capable of seeing. Still more strangely, between them are placed glandular structures secreting a mucus which emits a phosphorescent light. These are really so many small lamps, and thus the animal is a source of light to itself. Very many other marine forms are phosphorescent, and there is in these great depths, no doubt, a magnificent system of submarine lighting. (2.) The skeletons of many deep-sea fishes, when brought to the surface, are excessively spongy, the calcareous matter is wanting, and the muscles are flabby. This appearance, however, may be owing to the rapid change of pressure to which they are subjected when raised from the depths. The minute quantities of gas contained in the blood and other fluids must expand and rupture the tissues. (3.) At all great depths the conditions are practically the same all over the world, so that there is nothing to prevent deep-sea fishes from migrating to any part of the deep sea. Accordingly we find that many of them have a wide range, not only over the Atlantic, but also over the Pacific. Uniformity of conditions produces uniformity of distribution. In the ocean depths there exist no effective barriers like that furnished by a mountain range on the surface of the earth. Mr. W. R. Hughes called attention to the various orders of marine animals in which phosphorescence occurs, instancing especially the phosphorescent light observed by the members of the Marine Excursion to Oban in the Pennatula which they captured on that occasion. March 14th.—BIOLOGICAL SECTION—Mr. S. Wilkins exhibited *Prunus spinosa* (the blackthorn) in bloom, from Dorset; Mr. Morley exhibited *Hymenophyllum Wilsoni*, crested, from North Wales, and *Stigeoclonium protensum*, from Barnt Green; Mr. Blatch exhibited *Leptusa fumida* and *Phloeopora corticalis*, two species of coleoptera, from Sutton Coldfield, both rare, and new to the district. Mr. R. W. Chase exhibited four specimens of a rare migrant, *Plectrophanes lapponica*, taken near Brighton. Mr. J. E. Bagnall exhibited *Riccia glauca* from Erdington, also stigmas and pollen of the two forms of *Primula vulgaris*, showing a difference in character of the long and short styles, and also in the size of the pollen. Mr. W. B. Grove exhibited and described on behalf of Mr. A. W. Wills, who was unavoidably absent, a series of microscopic slides, illustrating the Palmellaceæ, a family of confervoid algæ, growing in water or on damp surfaces. March 21st.—Mr. Bolton exhibited a great number of specimens of the beautiful *Eolis Landsburgii*, and other marine organisms, from Bangor.—Mr. Goode read the general report drawn up by himself and Mr. W. P. Marshall, on the dredging operations at Oban in July last. He gave a description of the mode in which the dredging was carried on, the apparatus used, which was exhibited, and a list of the dredging stations, together with an abstract of the material obtained at each. The report also contained a number of valuable suggestions for improving the apparatus and the manner of using it in future dredging excursions.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—February 6th—A meeting devoted to Special Entomology. Exhibited by Mr. J. W. Neville, Slide of Dissections of House Spider, showing falces, tongue, &c. by Mr. Wykes, Proboscis of Moth showing organs of taste), and Eggs of Blow-Fly by Mr. Delicate, Common Flea, stained; by Mr. Darley, Foreign Lepidoptera; by Mr. Poland, Stuffed Specimens of Night Jar (foreign); by Mr. Bradbury, Micro Dissections of the Colorado Beetle. February 13th:—Exhibited by Mr. Darley, Pale Brindled Beauty, and Dotted Border Moths, from Sutton; by Mr. Baxter, *Ophiocoma rosula* under microscope; by Mr. Moore, Common Stickleback, which was infested in a remarkable manner by a fungoid growth, proceeding in tufts two-and-a-half inches in length, entirely covering the tail and a third of the creature; a paper, "Hints on Dry Mounting," was read by Mr. Baxter. February 20th.—Microscopical and General—Exhibited by Mr. J. W. Neville, Skin of *Synapta adhærens*, showing anchors and plates *in situ*; by Mr. Wykes, Sand, from Trent, containing foraminifera; by Mr. Delicate, Skin of Lizard, under the microscope; by Mr. Dunn, Marine Algæ, *Polysiphonia fastigiata* showing antheridia, also *Chylocladia articulata*. February 27th.—Exhibited by Mr. Delicate, Slide of Polycistina, from Barbadoes chalk; a paper was read on "Ice and its Work," by Mr. Hindmarsh.

CHELTENHAM NATURAL SCIENCE SOCIETY.—This Society has been doing admirable work during the winter by the reading of papers of high quality on various interesting subjects, on the regular meeting nights; and devoting extra nights to a series of connected addresses, by competent authorities, dealing with the lower forms of life. The president, Dr. T. Wright, F.R.S., started this series with "An Outline of the Animal Kingdom;" Dr. A. Pullar next read a paper on "The Protozoa" (the simplest forms of life); on the third evening, Dr. Edward T. Wilson treated of the "Porifera and Cœlenterata." In each case the papers were fully illustrated by specimens under the microscope, &c. On the 13th of April, Dr. Wright will occupy the fourth and last extra night of the session with a paper on the "Echinodermata." The example of this Society might be followed with great advantage by many other natural history societies.

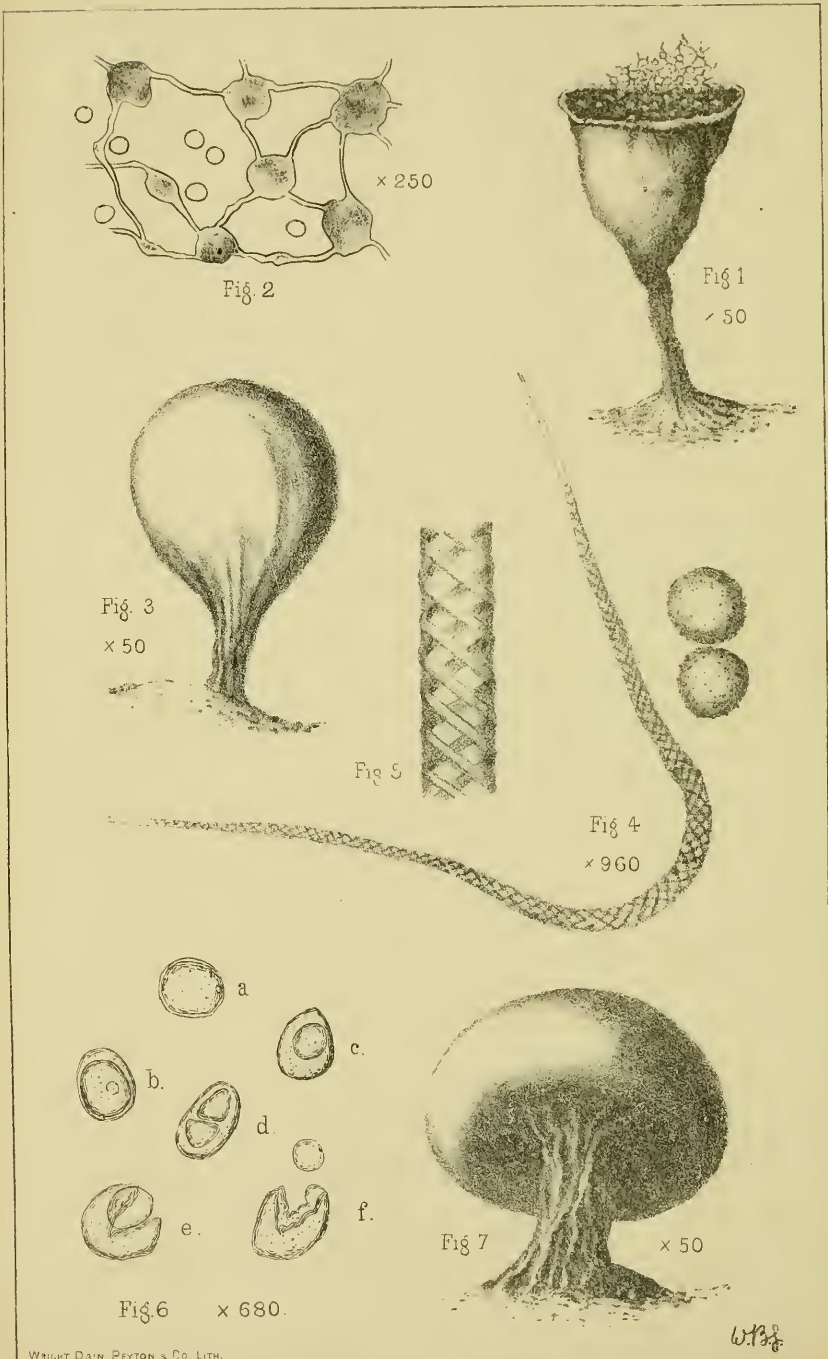
THE OXFORDSHIRE NATURAL HISTORY SOCIETY.—February 14th.—At the University Museum. Professor Westwood, M.A., F.L.S., in the chair. Mr. H. Macpherson, B.A., read "Notes on the Year 1881" (which have appeared *in extenso* in the "Zoologist"), dwelling especially on his researches in the Auvergne, about Geneva, and in Paris. The objects noted included the edible Frog, the palmate Newt, Vipers, blue-throated Warbler, etc. He then read a continuance of his notes on the Goldfinch, which will be printed in a future number. Mr. O. V. Aplin, President of the Ornithological section, read a summary of the Ornithological Occurrences in North Oxfordshire for the year 1881. Prof. Westwood, F.L.S., then exhibited some plates of various Oak Galls, mentioning as a curious fact in the life history of one of the species that the early brood produced a different Gall, from which emerged an insect so very dissimilar from the latter brood as to be distinguished by a separate name and placed in a different genus, a fact which had only recently been pointed out. Prof. Westwood also exhibited and described a mole's nest which had been presented to the Museum. There was also exhibited by Mr. Macpherson for Mr. Darby a specimen of the tufted Duck, shot near Oxford, and two of his own specimens—a hybrid between the Bullfinch and Goldfinch—and a Lapland Bunting from Kent.—Mr. Aplin showed a Hairy Woodpecker, supposed to have been killed in North Oxon about five years ago; a Snow Bunting, found in Aston-le-Walls, Northamptonshire, January, 1879; a Crossbill, in Bodicote, Oxfordshire, in red plumage; a blue variety of egg of common partridge, taken near Banbury from a nest containing other eggs of the normal colour; eggs of Tree Sparrow, from North Oxon; and *Alcedo ispida*—England, and *Alcedo Bengalensis*—India, pointing out their resemblance in colour, but great difference in size. *A. Bengalensis* takes the place of *ispida* in the East, and may almost be considered as the *eastern form*.

March 9th, at the University Museum, Professor Westwood, M.A., F.L.S., presiding.—E. B. Poulton, Esq., M.A., delivered a lecture on the geological causes of varied scenery. He commenced by describing the term "rock," because it was on the various forms of rock of harder or softer nature that the various denuding agents, subaërial or otherwise, acted with greater or lesser power. The action of the atmosphere, the rainfall, and the great power exerted by glaciers over rocks, wearing them away in different manners, were fully described. Taking a stand-point, the Lecturer said, on one of the Malvern hills, and looking eastward, one would observe the hills dwindling gradually till the gently-undulating country, such as his audience were familiar with, presented itself. This country was all formed of rocks of a newer era than the hill of Gneiss on which the observer stood. Looking west to Wales, the mountains became higher, and of more rugged outline, just as they were composed of older and harder strata—the Cambrian or Silurian rocks—while on the eastern side they were made up of newer and softer rocks—oolites, lias, &c.—with their strata gently dipping eastward. So that, from the relative hardness of the rocks was caused, on the one hand, the rugged, mountainous district of Wales, while the softer rocks produced the gently-undulating land of central and eastern England. Mr. Poulton then gave a striking instance of a piece of this flat, fertile region being contained in a mountainous district, as in the Vale of Clwyd, about St. Asaph. So, too, the valley of the Conway showed that an older and a newer formation of a similar rock gave a distinct character to the scenery; the lower and older Silurian, on one side, made steep cliffs, on which but little vegetation, save the pine could grow: while the other, of softer and newer rock (the upper Silurian) made a gentle slope, on which grew a rich vegetation. Mr. Poulton then alluded to the fact that the short and steep hills were all met with in going from Oxford to Reading, although the latter place was really lower than Oxford; while, on the return journey, long, gentle inclines were met with; and this was caused by the strike of all the strata facing northwards, while the gentle inclines were down the "dip" of the strata. The sinuous course of the river itself was also determined by the rocks, the river running along the out-crop, and then suddenly cutting its way through the ridges. He then described the terms "synclinal" and "anticlinal," and gave Snowdon as an interesting example of the former. The lecture was concluded by a description of geology, as influencing plant and animal distribution, the migration of birds, and the specialisation of animal forms. Mr. Macpherson read a short note on the nidification of the Serin-finch, in the Isle of Wight, which had been noticed by Mrs. Prestwich, in 1868, near Freshwater, this being almost the first verified occurrence in Great Britain. A collection of plants from Cincinnati was exhibited by Mr. G. C. Druce.

BLACKBURN FIELD NATURALISTS' SOCIETY.—The present session was opened by a meeting and conversazione, held on 16th February last, in the Free Library. The Mayor of Blackburn presided, and recommended the members to devote themselves chiefly to the study of local natural history. The Rev. J. Shortt, M.A., one of the vice-presidents, read a most interesting paper on "The Study of Nature in the Field," in which he enlarged on it as a fascinating and instructive study. He claimed for the Society that it was a truly philanthropic one. "Its object," he said, "is to promote genuine human enjoyment, by furnishing men and women with an unfailing, inexhaustible source of amusement and interest. There can be no tedium of life to one who enters thoroughly into its spirit." A large display of microscopical and other natural history objects then engaged the attention of the company, and Mr. J. D. Geddes, the secretary, exhibited a variety of living and other objects by means of the oxyhydrogen microscope. A well-arranged musical programme added to the pleasures of a most enjoyable evening.

ERRATA.—In February number, page 34, omit bottom line. Page 35, insert same line between second and third lines from bottom. Page 36, lines 9 to 11, read 0·014 in., 0·001 in., 0·003 in. by 0·002 in.

PLATE IIa.



THE MYXOMYCETES.

THE MYXOMYCETES.

BY W. B. GROVE B.A.,

Hon. Sec. Birmingham Natural History and Microscopical Society.

(Continued from page 77.)

DEVELOPMENT OF A SPORE.

Let us now trace the development of the spore of a typical Myxomycete. When one of these is placed in suitable conditions, as in water, it dehisces, and its contents pass out as a transparent, colourless sphere of protoplasm, possessing sometimes a nucleus and a contractile vacuole.* This remains for a time motionless, but soon we can perceive little undulations of its contour, which gradually increase in extent until the shape becomes elongate, and then suddenly there is developed at the end next the nucleus a long flagellum, which flickers gently at first, then more rapidly, and at last attains power enough to move the body from its position. The object then resembles an ordinary free-swimming flagellate monad. After swimming about for a few hours or days it sinks to the bottom of the water, and there creeps about by throwing out pseudopodia, while it still retains its flagellum, and in this state it resembles the Infusoria known as Mastigamœba and Reptomonas. The flagellum is then absorbed, and the creature becomes extremely similar to an ordinary amœba. Both in this stage and the preceding it increases by fission, and takes in solid particles of matter, and apparently extracts the nutriment from them just as an amœba does. This point seems to be set at rest by the very definite observations that have been made, and is acknowledged by Sachs, who places the Myxomycetes among the Fungi, as much as by Saville Kent, who claims them for the Protozoa, although some mycologists appear to regard the statement as incorrect.† De Bary and Cienkowski both witnessed the ingestion of solid food. Saville Kent fed his specimens upon carmine, and after a time found the solid particles embedded in the protoplasm, just as we find diatoms in an ordinary amœba.

Description of the Figures in Plate IIa.

Fig. 1.—*Craterium pedunculatum*, Trent.
Fig. 2.—Capillitium and spores of the same
Fig. 3.—*Trichia fallax*, Pers.
Fig. 4.—Elater and spores of the same.
Fig. 5.—Diagram of portion of elater of the same, to show arrangement of spirals.
Fig. 6.—*a, b, c, e, f,* spores of *Physarum cinereum*, (Batsch.) dehiscing in water; *d*, less usual form, with the protoplasm divided into two masses.
Fig. 7.—*Didymium squamulosum*, (A. & S.), var. *costatum*.
All the figures are drawn from nature, except fig. 5, which is diagrammatic.

* See Plate III., Fig. 6. † Grevillea, ix., 43.

Erratum.—In the previous number, p. 77, the value of μ micro-millimeter was inadvertently misstated; it should be $\frac{1}{1000}$th of a millimeter.

It may be as well to pause here for a while to point out the significance of these facts. The capacity of taking in solid food is usually considered the prerogative of animals; plants imbibe their food in a liquid condition; and Saville Kent, who insists that the statement in this naked form furnishes a distinct line of demarcation between the Animal and Vegetable Kingdoms, considers that this one point, well established, decides the question. But if we consider the difference more deeply, I do not see that it affects the controversy in any way. Why do plants usually imbibe their food in a liquid form? Because the protoplasm of plants has the habit of surrounding itself with a wall of cellulose, in which are no pores capable of admitting solid particles of even microscopically visible size. Animals on the contrary have a mouth, by which they can take in particles of various sizes according to the capacity of the opening, or else, as in the Rhizopoda, their protoplasm is not surrounded by an impermeable wall. In either case, however, the nutriment is reduced to a liquid form, by digestion, before it actually enters and becomes a part of the substance of the body.

If, then, we should meet with a plant in which the protoplasm was naked, we should expect it to possess also the power of ingesting solid food. It need not be said that naked protoplasm is met with in the Vegetable Kingdom, as in all kinds of spermatozoa or antherozoids, and the zoospores of Algæ, and you will remember the curious observations of Francis Darwin upon the protrusion of naked protoplasmic filaments from certain glands on the leaves of the Teasel, and also from the cells of the stem of *Agaricus muscarius*.* The real difficulty is to explain why these fungi do not develop cellulose coats to their protoplasm, not to account for their taking in solid food. The flagellum, too, is nothing more than a minute thread of protoplasm projected from the body, and is possessed alike by the gonidia of Volvox, and most zoospores and antherozoids.

Again, the possession of a contractile vesicle is urged as a proof that these creatures cannot be plants. Saville Kent says that, according to his observations, a rhythmically pulsating vesicle is possessed by none but members of the Animal Kingdom. But here there is a great temptation to reason in a circle; first, to make the possession of a contractile vesicle the criterion of animality, and then to declare that none except animals possess one. There are, no doubt, a few difficulties in the way. Our esteemed member, Mr. Wills, quotes, though without actually approving it, the statement of Busk, that the gonidia of Volvox, when young, possess one or more contractile vesicles. Saville Kent tries to explain the origin of the statement by the supposition that Uroglena was mistaken for Volvox. But the zoospores of Peronospora, of Cystopus, of some Saprolegnieæ, of Ulothrix, of Chætophora, of some Palmellaceæ, of *Microspora floccosa*, and of *Stigeoclonium tenue*, etc., have also been observed to be furnished with contractile vacuoles.†

* "Quarterly Journal of Microscopical Science," 1878, pp. 74–82.
† Huxley, "Science and Culture," pp. 164, 170, and "Comptes Rendus," June 16, 1879.

Lastly, it may be objected that the power of amœboid movement is characteristic of animal organisms. But, here again, the Volvocineæ come to our aid. Archer, in 1862, observed the primordial cells of Stephanosphæra (an Alga allied to Volvox) leave the hyaline sphere in which they are usually contained, and move about the field exactly in the manner of a green Amœba.* In fact, although they moved, like Amœba, by extensions and retractions of pseudopodia, they went so fast that they might have given even *Lithamœba discus* fifty micro-millimeters start out of a hundred, and yet have won the race. Various other cases of the same kind are recorded among mosses, algæ, fungi, etc.,† and Sachs instances the amœba-like movement of the protoplasm which escapes from a ruptured cell of Vaucheria, as similar in its character.‡

We left our Myxomycete in an amœboid form, creeping over the matrix upon which it grew, increasing by fission, and feeding perhaps upon the bacteria and other organised substances in the fluid. In this state it has received the name of Myxamœba. Where one spore has germinated there will probably be many more, and these, creeping about, meet and unite with one another in gradually increasing numbers, and at last form a mass, technically known as a plasmodium, which is relatively of colossal size, and which creeps about in a reticulate manner over the matrix.§ It sends out pseudopodia in various directions, and retracts them again, just like a gigantic amœba or some species of Foraminifera.

Moreover this plasmodium consists of an outer denser transparent layer not containing granules, and an inner granular mass in which are embedded a number of contractile vesicles derived from the units of which the mass was formed. The plasmodium is continually moving while the conditions are favourable: those of the larger species can creep some distance and ascend bushes and plants. A distinct circulation or cyclosis can be observed in the contents, a streaming motion of the protoplasm, like that of Nitella, but more resembling the motion of the reticulated protoplasm of the Foraminifera, as in Gromia and Labyrinthula.

Should the conditions become unfavourable, this plasmodium will pass into an encysted or resting stage, but if they continue suitable, the net-work begins to contract and to put forth outgrowths upwards of the form of the future sporangia. It then forms a firm membrane on the outside, usually without any trace of structure, while the enclosed mass proceeds to resolve itself into spores by free cell formation. If the sporangium is to contain threads, part of the protoplasm collects into stringy filaments. The lime is crystallised

* "Quarterly Journal of Microscopical Science," 1865, pp. 116, 185.
† "Quarterly Journal of Microscopical Science," 1862, pp. 96-103.
‡ Sachs' Botany, p. 41.
§ I have seen a plasmodium of *Physarum cinereum*, forming a patch of jelly-like substance nearly as large as one's hand, which roamed about the surface of a rotten stump for three weeks, and finally retreating to the base formed its sporangia in a few hours. In a day or two the sporangia were ripe and dehisced, and in a week nothing was left but their bleached and empty bases.

out, either in the wall of the sporangium or in the capillitium, or in both, and the water is expelled or evaporates. This process takes place very quickly, and thus the cycle of development is completed.

In a few instances, as in Enerthenema and Ophiotheca, the spores are described as being attached to the threads, but it is possible that this is a mistake, and that the spores are really always free, being formed like those of the Ascomycetes. Certainly I could find no trace of their attachment in any specimen of Enerthenema which I have examined.* It will be seen that, in this formation of the spores by endogenous division, the Myxomycetes differ essentially from the Trichogastres and the Nidulariacei, between which they are placed in Berkeley's classification, as well as from the other Gastromycetes, in which the spores are always borne upon sporophores, just as in the higher group.

It is but just to say that the foregoing account of the germination of the spores is not uncontradicted. Both Berkeley and Currey † mention having observed the spore of a Myxomycete germinate in the ordinary way by the emission of a hyphal filament; but we may more easily suppose that in these cases the spore of some extraneous species was accidentally present than that all other observers are wrong, or that both methods of germination are possible. Van Tieghem has recently described a modification of the process related above, where the myxamœbæ, instead of forming a plasmodium in which the units of which it is composed are undistinguishable, remain completely independent though aggregated together, each forming itself into a single spore with a cellulose coat.‡

(*To be continued.*)

NOTES ON BEAVERS AND THE BUTE BEAVERY.§

BY EGBERT DE HAMEL.

Amongst the Mammalia is a most interesting group of animals, many species of which exist or have existed in Great Britain, whose domestic economy is to a large extent unobserved owing to their extreme timidity and consequent shy and nocturnal habits, albeit their names are for the most part familiar to us. I refer to the order Rodentia, or gnawing animals, which includes the various genera of rat, mouse, squirrel, hare, rabbit, porcupine, capybara, guinea-pig, and the subject of my present paper, the beaver.

* Dr. Quelet has recently asserted that the spores of all species are borne on the threads as sporophores, apparently on his own authority. But then he also calls the plasmodium by the totally inappropriate name of mycelium — "J. de Photo. et de Micro.," 1881, translated in "Northern Microscopist," March, 1882.

† "Transactions of the Linnean Society," xxiv., p. 156.

‡ Van Tieghem, Bull. Soc. Bot. France, xxvii., pp. 317—22.

§ Read before the Birmingham Natural History and Microscopical Society, February 11th. 1882.

The chief characteristics of this order are the incisor teeth in the centre of each jaw, the absence of canine teeth, and the wide space between the incisor and molar teeth, an arrangement admirably qualifying them for gnawing solid substances, to which end the incisors are enamelled only on the front surface, so that the back part being softer is by gnawing worn away fastest, and the cutting edge kept sharp. To remedy the loss of substance a constant growth takes place from the root; they are, moreover, semicircular in form, three-fourths of which being buried in the jaw adds enormously to their power. The molar teeth are broad and calculated for masticating vegetable food; the articulation of the lower jaw works in a longitudinal groove in the skull, affording great facilities for grinding their food: the feet are furnished with toes and nails, and are more or less webbed; the fore paws are remarkably handlike, the hind legs much the longest.

I shall now confine my observations to the "species" Beaver, and endeavour, first, to point out to you such of its life-history as I have been able to gather from the many writers on the subject, following these particulars with a description of what I witnessed on the occasion of a special visit paid to the Marquis of Bute's beavery at Mount Stuart, near Rothesay, in the island of Bute, at the latter end of August, 1878.

The earliest notice we have of the beaver occurs during the 9th century, where we find that whilst an otter's skin was only worth twelve pence, that of the Llosdlydan or beaver was valued at one hundred and twenty pence.

This animal was not uncommon in the rivers of Wales towards the close of the 12th century. Giraldus Cambrensis informs us that the species became extinct in 1188, but according to some historians it was a native of Scotland and England until the 15th century. It has not been found in Ireland or any trace of its existence recorded there.

There are two living species of beavers, the one inhabiting Europe and Asia *(Castor Fiber)* being still found in Siberia on the river Pelyin, five having been captured there so recently as 1876; and a few colonies exist on the banks of the Weser, Rhone, and Danube. Lord Clermont in his "Guide to European Quadrupeds," published in 1859, stated, "it is found in greatly reduced numbers on the Danube, Rhine, and Rhone, on which last it inflicts considerable injury to the willow plantations." It is rare in Russia, except on the Dwina and Petchora, but numerous in Tartary and the Caucasus.

The other variety (*Castor Canadensis*) inhabits North America, comprising in its range a district bounded on the south by California, on the west and east by Vancouver's Island and Newfoundland, and north by the limit of trees, some distance within the Arctic circle.

Along with these two species lived in Pre-Glacial times a gigantic beaver known to science as Cuvier's. It did not, however, survive the Glacial period. The smaller and more recent species possibly with-stood the intense cold by migrating to southern Europe. The comparison in size between these two beavers, at one time contemporaneous, coupled with anatomical characters, seems to preclude the possibility of the larger being a more highly developed race of the smaller.

The bones of beavers have been dug up in the lower brick earths of the Thames and under the streets of London; and there can be no doubt that at one time the beaver built its dam on this river and its tributaries. Its remains were also found by Pengelly in Kent's Cavern, near Torquay.

In appearance the beaver is like a great rat—about two feet long and one foot high, its body thick and heavy, weighing about 34lbs.; the head is compressed and somewhat arched at the front, the upper part rather narrow, the snout much so; the eyes are placed rather high on the head, and the pupils are rounded; the short ears are almost concealed by the fur; the skins (a good one when dried weighs about 2lbs.) are covered by two sorts of hair, of which one is long, rather stiff, elastic, gray two-thirds of its length, the remainder being tipped with shining reddish-brown points; the other short, thick, tufted, and soft, being of different shades of silver gray or light lead colour; the hair is shortest on the head and feet; the hind legs are longer than the fore, and the hind feet only completely webbed; there are five toes on each foot; the tail is ten or eleven inches long, and, except the part nearest the body, entirely covered with hexagonal scales; it is flattened horizontally, and nearly oval in shape. From a habit the creature has of giving self-satisfied slaps with this organ, the idea has been entertained that it uses it for a trowel; but this is now known to be an error; it is certainly employed as a means of alarm.

The incisor teeth are semi-circular in shape, the enamel orange-coloured and intensely hard. Before the introduction of iron the Indians fixed them in handles and employed them as chisels for carving wood and horn.

These animals secrete a peculiar substance known as castoreum, extensively used by the slave and dog-rib tribes of Indians in the manufacture of medicine, and as a perfume for enticing both beaver and lynx to the traps or snares laid for them.

The flesh and tail are amongst the most prized dainties of Indian epicures: the former when first smoked and then broiled is not at all unwelcome food; the latter when boiled is a noted article of trapper luxury, though, forsooth, if the truth must be told, somewhat gristly and fat, and rather too much for the stomach of anyone but a north-western hunter or explorer. "He is a devil of a fellow," they say on the Rocky Mountain slopes, "he can eat two beavers' tails."

The scrapings of the beaver's skin form one of the strongest descriptions of glue, not affected by water, and used by the Indians as paint for their paddles.

Smellie, in his "Philosophy of Natural History," devotes a chapter to the Society of animals, in which he reminds us that the associating principle from which so many advantages are derived, is not confined to the human species, but extends in some instances to every class of animals.

Man possesses a portion of the reasoning faculty highly superior to that of any other animal. He alone enjoys the power of expressing his ideas by articulate and artificial language. With its aid, and the habit of association, the human intellect in the progress of time arrives at a high degree of perfection.

Society gives rise to virtue, honour, government, subordination, art, science, order, happiness; under its auspices, as in a fertile climate, human talents germinate and are expanded, the mechanical and liberal arts flourish; poets, orators, historians, philosophers, lawyers, physicists, "microscopists," and theologians are produced, and its advantages are immense despite the inconveniences, hardships, injustice, oppressions, and cruelties which too often originate from it.

Now Society may be divided into two kinds—1st, Proper Societies, in which the individuals not only live together in numbers, but also carry on operations having a direct tendency to promote the welfare of the community; and 2nd, Improper Societies, in which the individuals merely herd together from the love of company, without carrying on any common operation.

Next to the intelligence exhibited in human society, that of the beavers is most conspicuous. Their operations in preparing, fashioning, and transporting the heavy materials for building their winter habitations are truly astonishing, and when we read their history we are apt to think we are perusing the history of man in a period of society not inconsiderably advanced.

It is only by the united strength and co-operation of numbers that the beavers could be enabled to produce such wonderful effects; for in a solitary state, as they at present appear in some northern parts of Europe, the beavers are timid and stupid animals; they neither associate, nor attempt to construct villages, but content themselves with digging holes in the earth.

Like men under the oppression of despotic governments, the spirit of the European beavers is depressed and their genius extinguished by terror and a perpetual and necessary attention to individual safety.

The northern parts of Europe are now so populous, and the animals there are so perpetually hunted for the sake of their furs, that they have no opportunity of associating, and of course those wonderful marks of their sagacity, which they exhibit in the remote and uninhabited regions of North America, are no longer to be found.

The society of beavers is one of peace and of affection. They never quarrel or injure one another, except during the period of courtship, for even amongst beavers Eve is ever the cause of evil, but live together in different numbers, according to the dimensions of particular cabins, in the most perfect harmony.

The principle of their union is neither monarchical nor despotic, for the inhabitants of the different cabins, as well as those of the whole village, seem to acknowledge no chief or leader whatever. Their association presents to our observation a model of a pure and perfect republic, the only basis of which is mutual and unequivocal attachment.

I have already drawn your attention to the difference that oppression occasions in the animate works of nature, and this because I find in reading numerous authors on the subject that their accounts of the works and their opinions of the intelligence of these most interesting mammals differ very considerably, and at the same time with much apparent truthfulness. I also note that the older observers, *i.e.*, those who studied these animals when their fur *first* came into great request, and therefore at a time when persecution had not wrought its natural result in the degradation of the species, give glowing accounts of their wonderful villages; whilst living writers "pooh-pooh" all this as a legend, and declare their structures, though parallel in idea, to be slovenly and indifferent. I shall prefer those descriptions which best illustrate the palmy days of the species.

In the fall of the year the beavers generally migrate up stream to a more favourable situation for procuring a supply of winter food. About January their tracks may be seen in the snow near the outlet of the lakes, where young fir trees abound, their bark now being preferred, as the sap has not risen in the willow and alder; some of the beavers become torpid during January, especially those living near lakes, swamps, or large sheets of water, which are frozen.

If February is open the beavers begin to come out of their retreats and frequent any running water near them; but it is generally March before the bulk of them vacate their winter quarters. When they appear they are lean, but their furs are still good, and continue so until the middle of May.

About the end of March they begin to "call." Both males and females "call and answer" one another. Sometimes on one "calling" half-a-dozen will answer from different parts of the lake. They occasionally "call" as late as August. Males fight during this season most fiercely; hardly a skin is without scars, and large pieces are often bitten out of their tails.

The young are born about the end of June, and are about three or four in number; but whether produced in the houses, hovels, or amongst the sedge, is not known for a certainty.

When this interesting event is expected, the old male takes the young of last year (for sometimes as many as three generations will remain around the paternal abode) and retires several miles up a river, considerately remaining there as long as requisite.

The young at first are called "kittens;" when twelve months old, "small medlars;" at two years, "big medlars;" and in the third year, when they also have families, "old beavers."

(*To be continued.*)

DERBYSHIRE LAND AND FRESHWATER SHELLS.
CLASS I., CONCHIFERA.

FAMILY I., SPHÆRIIDÆ.

GENUS I., SPHÆRIUM.

Sphærium corneum, very common.
var. flavescens, canal at Cromford, Bretby.
rivicola, Canal at Matlock and Willington.
lacustre, var. Ryckholtii, Pool near Winster.

GENUS II., PISIDIUM.

Pisidium amnicum, Canal at Ambergate.
fontinale, Stanton in the Peak.
var. cinerea, Stanton in the Peak.
pusillum, Pools near Winster.
,, var. obtusalis, Pools near Winster.
nitidum, Via Gellia.

FAMILY II., UNIONIDÆ.

GENUS I., UNIO.

Unio tumidus, Canals at Cromford and Willington.
var. radiata, Park Pond, Repton.
var. ovalis, ,, ,,
pictorum, Cromford Canal, Park Pond, Repton.

GENUS II., ANODONTA.

Anodonta cygnea, common.
var. Zellensis, Park Pond, Repton.
anatina, ,, ,,
var. ventricosa, ,, ,,
var. complanata, ,, ,,

FAMILY III., DREISSENIDÆ.

GENUS I., DREISSENA.

Dreissena polymorpha, Canal at Willington.

CLASS II., GASTEROPODA.
ORDER I., PECTINIBRANCHIATA.
FAMILY I., NERITIDÆ.

GENUS I., NERITINA.

Neritina fluviatilis, Canal, Willington.

FAMILY II., PALUDINIDÆ.

GENUS I., PALUDINA.

Paludina vivipara, common.

GENUS II., BYTHINIA.

Bythinia tentaculata, common.
var. decollata, Cromford.
Leachii, Eggington.

FAMILY III., VALVATIDÆ.

GENUS I., VALVATA.

Valvata piscinalis, common.

ORDER II., PULMONOBRANCHIATA.
FAMILY I., LIMNÆIDÆ.

GENUS I., PLANORBIS.

Planorbis albus, Pond at Milton.
glaber, Pits near Willington.

Planorbis spirorbis, Cromford Canal.
vortex, common in ponds and canals.
carinatus, ,, ,,
corneus, ,, ,,
contortus, Old Trent, Ponds at Repton.
complanatus.
var. albida, Top Dam, Repton.

GENUS II., PHYSA.

Physa hypnorum, River Dove; ditches, Repton.
fontinalis, common.

GENUS III., LIMNÆA.

Limnæa peregra, common.
var. ovata, Matlock.
var. acuminata, Matlock.
var. picta, rare, pool at Winster.
auricularia, Cromford Canal and Repton.
var. acuta. ,,
stagnalis, common.
palustris, Old Trent, near Repton.
var. elongata, Old Trent, near Repton.
var. tincta, ,, ,,
var, albida, ,, ,,
truncatula, common in ditches.
var. major, Winster.

GENUS IV., ANCYLUS.

Ancylus fluviatilis, River Derwent, Repton Brook.
var. albida, Pond near Ambergate.
lacustris, River Trent, near Newton Solney.
var. albida, ,, ,,

TERRESTRIAL.

FAMILY I., LIMACIDÆ.

GENUS I.

Arion ater, common.
flavus, ,,
hortensis, ,,

GENUS III., LIMAX.

Limax agrestis, common.
maximus, ,,

FAMILY III., HELICIDÆ.

GENUS I., SUCCINEA.

Succinea putris, common.
elegans, edge of pools in Via Gellia.

GENUS II., VITRINA.

Vitrina pellucida, common.

GENUS III., ZONITES.

Zonites cellarius, common.
var. albida, Miller's Dale.
alliarius, ,, and Repton.
nitidulus, common.
radiatulus, Repton.
nitidus, ,,

Zonites excavatus, Robin's Wood, near Repton.
,, var. vitrina, Robin's Wood, near Repton.
crystallinus, Miller's Dale, Repton.
fulvus, Robin's Wood, near Repton.
var. Mortoni, Robin's Wood, near Repton.

GENUS IV., HELIX.

Helix aculeata, Robin's Wood, near Repton.
aspersa, Repton (not common in the Peak.)
nemoralis, common.
var. hortensis, Matlock, Repton, &c.
var. hybrida, ,, ,,
var. major, Youlgreave.
arbustorum, plentiful at Matlock and Dovedale.
var. flavescens, Winster.
var. albida, ,,
var. alpestris, Monsal Dale.
rufescens, scarce, a few specimens at Matlock.
concinna, common.
var. albida, Monsal Dale.
hispida, common.
virgata, near Ticknall.
caperata, Ticknall Quarry.
ericetorum, Dovedale and Monsal Dale.
var. albida, Dovedale.
rotundata, common.
rupestris, Dovedale.
pygmæa, Matlock.
pulchella, Repton.
lapicida, common in Peak District.
var. albida, Matlock.

GENUS V., BULIMUS.

Bulimus obscurus, common in Via Gellia, Matlock, &c.

GENUS VI., PUPA.

Pupa umbilicata, common on limestone rocks.
edentula, Winster.
marginata, Dovedale.

GENUS VII., VERTIGO.

Vertigo edentula, Bretby Wood, near Repton.

GENUS VIII., BALIA.

Balia perversa, on rocks under moss at Matlock, but not common.

GENUS IX., CLAUSILIA.

Clausilia rugosa, common.
var. albida, Matlock.
laminata, locally plentiful, Matlock.

GENUS X., COCHLICOPA.

Cochlicopa tridens, a few specimens at Matlock.
lubrica, common.

GENUS XI., ACHATINA.

Achatina acicula, Repton, Miller's Dale.

In compiling the foregoing List of the Land and Freshwater Shells of Derbyshire, I am indebted to Mr. J. Hagger and Mr. Edward Collier for their kind co-operation. The list is corrected to October last.

H. Milnes, The Vicarage, Winster, Derby.

THE FLORA OF WARWICKSHIRE.

AN ACCOUNT OF THE FLOWERING PLANTS AND FERNS OF THE COUNTY OF WARWICK.

BY JAMES E. BAGNALL.

(*Continued from page 85.*)

ROSACEÆ—Continued.

RUBUS, continued.

R. macrophyllus, *Weihe.* *Large-leaved Bramble.*
Native: July, August.
a. umbrosus, Arrh.
In hedges, heaths, and quarries. Rather common.
I. Sutton Park; Coleshill Heath; Ansley; Bentley Park.
II. Rounshill Lane; lanes about Coventry, etc.
b. macrophyllus, W. and N.
Hedges and bushy places. Rather common.
I. Shelly Lane; Bentley Heath; Shirley Street; Trickley Coppice; Arley, etc.
II. Green Lanes, near Coventry, *T. Kirk, Herb. Brit. Mus.;* Hill Clump, Honington, *Fredk. Townsend;* Kenilworth Heath; Dunchurch Road, near Rugby.
c. Schlechtendalii, W. and N.
In hedges, woods, and heath lands. Local.
I. Sutton Park, abundant; confirmed by Professor Babington. Baulk Lane, Berkswell; road from Nuneaton to Atherstone, near the turn for Hartshill; lanes about Baddesley Clinton.
II. A form closely allied to this is abundant in Haywoods. It is a more glandular plant than the type, but agrees well in general characters with a plant which Professor Babington considers to be *R. Schlechtendalii.*
d. amplificatus, Lees.
In hedges and woods. Locally common.
I. Lanes about Solihull; Coleshill Heath; Arley, etc.
II. "Hedges, Old Park, Warwick," *H. B., Exchange Club Report*, 1879; near Rugby; Coventry and Kenilworth, abundant.
e. glabratus, Rubi Germ.
In woods and on heath lands. Local.
I. Sutton Park, abundant; determined by Professor Babington. Small wood in Wheyporridge Lane, Solihull; lane at Minworth; School Rough, Marston Green; lane from Meriden to Hampton-in-Arden.
A marked form allied to *R. macrophyllus*, abundant at Hartshill in stone quarries.

R. mucronulatus, *Bor.* *Cuspidate-leaved Bramble.*
Native: In hedges, banks, and woods. Local. July, August.
I. Hartshill Wood! *Bab. Brit. Rub.*, p. 162; Marston Green; Bentley Park; near Atherstone, on the Tamworth Road; Trickley Coppice.
II. Dilke Lane, Rowington; Crackley Wood, Kenilworth.
The plants in Bentley Park and Hartshill Wood are more glandular than the type, and are probably the *R. festivus*, Müll. See "Notes on Rubi, Journal of Bot.," 1878, p. 116.

R. Sprengelii, *Weihe. Sprengel's Bramble.*
Native: In woods, on banks and heaths. Locally common. July, August.
I. Atherstone! *Bab. Brit. Rub.*, p. 166; *Herb. Brit. Mus.;* Ansley Coalfield Heath; near Coleshill Pool; Chelmsley Wood; Marston Green; Sutton Park, abundant; Four Ashes, Knowle; Lanes about Solihull and Shirley.
II. Near Rugby! confirmed by Professor Babington; specimen from Rev. A. Bloxam, *Herb. Bor.;* Cathiron Lane, near Brinklow.
Both the varieties of this species occur in the county, but although widely different in their extreme forms, seem to blend into each other so truly that I have not here attempted to separate them.
c. rubicolor, Blox., MS.
I. "Near Mancetter, Warwickshire (Rev. A. Bloxam), from which place he has kindly supplied me with specimens." *Syme, E.B., ed.* 3, iii., 180.
Although I have made special visits to this locality, the exact whereabouts having been communicated by the Rev. A. Bloxam, I have not been able to find the plant.

R. Bloxamii, *Lees. Bloxam's Bramble.*
Native: In hedges, woods, and heaths. Locally common. July, August.
I. Near Hartshill! *A. Blox., Herb. Bor.*, 1846, confirmed by Prof. Babington; near Atherstone, *Bab. Brit. Rub.*, p. 177; Ansley Heath; Arley; Coleshill Heath; Middleton Heath; Sutton Park; near Little Hell, &c.
II. Near Rugby! *A. Blox., Herb. Bor.;* lanes about Brandon; Rounshill Lane, Kenilworth; lanes about Allesley.
A form of this, which Professor Babington considers closely resembles the *R. thyrsiflorus* in the Rubi Germanici (tab. 34), was found by Mr. T. Kirk near Kenilworth; *Bab. Brit. Rub.*, p. 171. I find a similar form in Hay Lane, Solihull.

R. Hystrix, *Weihe. Hedgehog Bramble.*
Native: In woods and hedges. Rather rare. July, August.
I. Atherstone, *Bab. Brit. Rub.*, p. 176; Hoare Park, near Shustoke; lane by Bentley Park; field path from Ansley Coalfield to Hurtshill Wood; Arley Wood; lane from Mancetter to Oldbury; Darnell Hurst, Sutton Park.
II. Combe Woods; Crackley Wood, Kenilworth.

R. rosaceus, *Weihe. Rose-flowered Bramble.*
Native: Woods and hedges. Rather rare. July, August.
I. Near Hoare Park, Atherstone Road; confirmed by Professor Babington; near Meriden Shafts, and Boultbie Wood, Ballard's Green, Arley.
II. Near Corley Village; abundant in Combe Abbey Wood, end nearest Brinklow; Alveston pastures.

R. scaber, *Weihe. Rough Bramble.*
Native: On damp heaths and in woods. Rather rare. July, August.
I. Hartshill Wood, *A. Bloxam, Herb. Bor.*, 1847; Sutton Park, abundant, two distinct forms here; Trickley Coppice.
II. Rounshill Lane, near Kenilworth; Old Park, Warwick.

R. rudis, *Weihe. Coarse Bramble.*
Native: In hedges and bushy places. Local. July, August.
I. Sutton Park; lanes between Hurley and Whitacre; Ansley Coalfield; lane by Iron Wood, Oldbury; Ansley; Shelly and Shirley, near Solihull; Damson Lane, Solihull, &c.

II. Compton Wynyates, *F. Townsend;* near Oakley Wood; near Leek Wootton; Kenilworth; near Combe Abbey; Corley Moor; Arrow Lane; Oversley Wood, &c.

A small-leaved variety, the *microphyllus* of Bloxam's *fasciculus*, occurs on heath lands near Sutton, and near Leek Wootton.

R. Radula, *Weihe. File-stemmed Bramble.*

Native: In hedges. Common. July, August.

I. Sutton Park; Middleton Heath; Marston Green; Forge Mills; Solihull, &c.

II. Near Rugby; Harboro' Magna; Allesley; Kenilworth; Oversley Wood, &c.; (near Kenilworth Castle, *A. Bloxam, Herb. Bor.*, 1846.)

Two distinctly marked forms of this sub-species occur throughout the county, but as I have seen no authentic specimens of the described varieties, I have not here attempted to separate them.

R. Koehleri, *Weihe. Koehler's Bramble.*

Native: In hedges, woods, and heathlands.

a. Koehleri. Rather rare.

I. Kingsbury Wood; Slowly Hill; meadows near Maxtoke Castle;* Sutton Park;* road from Honily to Balsall Street.

II. Road to Combe Abbey from Coventry, 1880.

Var. *b. infestus, Bab.* Rather rare.

I. Bentley Park; Merivale; near Stockingford Village; Sutton Park, abundant on the heathlands.

Var. *c. pallidus, Weihe.* Rather common.

More or less abundant throughout the county.

In Trickley Coppice I find a variety of this which closely resembles the variety *R. cavatifolius*, Müll.

R. fusco-ater, *Weihe. Brownish-black Bramble.*

Native: In hedges and woods. Rare. July, August.

I. Sutton Park, *Bab. Brit. Rub.*, p. 216; lane at Minworth, *Notes on Rubi, Journal of Bot.*, 1878, p. 176.

II. Wyken Lane, near Coventry, *Bab. Brit. Rub.*, p. 216; near Oakley Wood.

R. emersistylus, *Müll.* (*R. Bagnallii*, Blox).

Native: In woods and hedges. Rare. July, August.

I. Abundant in Haywoods; *Herb. Brit. Mus.*, 1877, *J. E. Bagnall.*

A description is given of this variety by Professor Babington in Notes on Rubi, *Journal of Bot.*, 1878, pp. 175-6, where it is considered to be a variety of *R. emersistylus*, Müll. Professor Babington adds some valuable and interesting remarks to the description.

R. diversifolius, *Lindl. Various-leaved Bramble.*

Native: In hedges, woods, etc. Locally common. July, August.

I. Middleton Heath; near Langley; lanes about Wishaw; Olton Canal Bank, near Knowle; Coleshill Heath, etc.

II. Hill Clump, Honington; *J. Townsend;* road from Stratford to Alcester; Shelfield.

A form which Professor Babington considers near *R. horrefactus*, Müll, from a wood near Tardebigge. A strongly marked variety occurs in the lane from Brandon to Twelve o'clock Riding. On this Professor Babington remarks: "It is very like the plant noticed from Waith in 'The British Rubi,' p. 224. At present I place it under *R. diversifolius*, for I do not think it belongs to *R. Koehleri*. It is a very beautiful plant."

* The plants from these stations authenticated by Professor Babington.

R. Lejeunii, *Weihe. Lejeune's Bramble.*
Native: In woods and on hedge banks. Rare. July, August.
I. Near Maxtoke Priory, *Rev. A. Blox., MS. Note*, 1877: Friars' Wood, Bentley Park; lane by Bentley Park; border of small wood near Oldbury.

R. Guntheri, *Weihe. Gunther's Bramble.*
Native: In woods and on damp heaths. Rather rare. July, August.
I. Abundant in Hartshill Wood! *A. Blox., Herb. Bor.*, 1846; Atherstone Outwoods; *Bab. Brit. Rub.*, p. 238; Sutton Park in several places; Friars' Wood, Bentley Park; wood near Hoare Park: Atherstone Road.
II. Fern Hill Wood; Haywoods; spinney at Baddesley Clinton; Old Park Wood, near Arrow.

R. humifusus, *Weihe. Trailing Bramble.*
Native: In woods. Very rare. July, August.
"Reported from Warwickshire," *Syme E. B.*, iii., 189.

R. foliosus, *Weihe. Leafy-flowered Bramble.*
Native: In woods and hedges. Rare. July and August.
I. Annesley Coalfield Heath! *Syme, E. B.*, iii., 190; Hartshill Wood! *Bab. Brit. Rub.*, p. 245; lane from Hartshill to Mancetter; stone quarries between Nuneaton and Hartshill; very abundant in the Ansley Coalfield district in 1877, but is being rapidly destroyed there by the building operations which are being carried on.

Dr. Boswell says in E.B., iii., 190, "Apparently confined to Warwickshire." Mr. T. R. Archer Briggs, however, has kindly sent me from Devonshire specimens of a plant named *R. foliosus* by the Rev. A. Bloxam. It differs from the Warwickshire plant in the form of its leaflets, and in the clothing and armature of the barren stem, and is in my opinion nearer to the figure in "Rubi Germ," t. 28, than is the Warwickshire plant.

Var. *atro-rubens*, Blox.
Native: In hedges and woods. Locally abundant.
I. Sutton Park; lane from Chelmsley Wood to Marston Green; lane near Plant's Brook, Minworth; lanes about Solihull; Temple Balsall; coppice at Elmdon; near Knowle; *Herb. Brit. Mus., J. E. B.*
II. Haywoods; Dilke's Lane, Kingswood; Tile Hill Wood; Alveston Pastures Wood.

A valuable comment on this plant is given in "Notes on Rubi," *Journal of Bot.*, 1878, p. 197.

R. glandulosus, *Bell. Glandular-stemmed Bramble.*
Native: In woods. Rare. July, August.
a. Bellardi.
I. Hartshill Wood; wood above Hoare Park, Atherstone Road.
Sub-var *dentatus*, Blox.
I. Atherstone; (Blox.), *Bab. Brit. Rub.*, p. 253; wood near Hoare Park, Atherstone Road; near Boultbie Wood, Fillongley; Hartshill Wood.
II. Wood near Allesley, Coventry Road; Anstey Wood, near Wooton Wawen.
Var. *b. hirtus*, Wald.
I. Borders of Weigh Wood, Fillongley.
II. Haywoods.
Sub-var, *rotundifolius*, Blox,

I. Border of a small wood between Bentley Park and Oldbury; lane above Hoare Park.

R. Balfourianus, *Blox.* *Balfour's Bramble.*
Native: In hedges. Locally common. July, August.
I. Lanes about Shirley and Solihull, abundant; near Packington Hall; near Stonebridge.
II. Near Rugby! *A. Blox.*, 1847, *Herb. Bor.*; near Coventry! *T. Kirk*, *Herb. Bor.*; Mill Lane, Coventry (Kirk), *Bab. Brit. Rub.*, p. 261; Lutterworth Road, near Combe Abbey; Twelve o'clock Riding, Combe Woods; Tile Hill.
A variety, which may be *tenuiarmatus*, Lees, near Hoare Park, Over Whitacre.

(*To be continued.*)

MIDLAND UNION OF NATURAL HISTORY SOCIETIES.*

(*Continued from Vol. IV., page 217.*)

The Burton-on-Trent Natural History and Archæological Society dates from October, 1876. It numbered on the 1st January, 1881, 136 Ordinary Members, paying an annual subscription of 5s. per annum; five Honorary Members; and fifteen Associates, paying 1s. per annum. The number of Ordinary Members and Associates increased considerably during the past twelve months. Evening meetings are held about once a month, from October to March, ending with the Annual Meeting at the end of March. Six or more General Field Meetings are usually held each year, mostly in the summer. The Geological Section (under Mr. Heron) has fortnightly walks and other excursions during the winter, and monthly ones in summer. Field and Evening Meetings are also arranged specially for the Associates. About fourteen papers have been read before the Society during the year. The Society publishes a carefully prepared Report and Transactions, a yearly Calendar of Nature, made up from the observations of Members; and a valuable record of Local Meteorology. The discovery of ancient remains at Stapenhill, in the borough of Burton-on-Trent, has afforded the Society scope for some interesting work, of which the following account has been forwarded to the Council by Mr. Heron, the secretary of the Exploration Committee:—"At the Annual Meeting of the Society held on March 28th, 1881, the Mayor, Alderman Evershed, in the chair, Dr. Perks, on behalf of the Exploration Committee, gave a statement relative to the discoveries recently made at Stapenhill. Early in February, as some workmen were excavating for clay in the brickfield at Stapenhill, belonging to Messrs. Chamberlain and Haynes, they came across what afterwards proved to be two cinerary urns containing cremated bones; unfortunately, when they came into the possession of the Society they were broken into several fragments, many of which were missing. Shortly after this discovery was made, the men, whilst continuing their excavations, came across some skeletons. Near the head of one of these a large spear head was found. Mr. Chamberlain, who was present when this was discovered, immediately communicated with the Society, who thereupon took up the work of excavating in a

* The accompanying particulars of the Societies are printed from the Report of the Council presented to the Annual Meeting at Cheltenham, held last year.

systematic manner, by driving trenches 3ft. wide, and at intervals of 3ft. apart across the brickfield from north to south. These explorations resulted in showing that a very valuable archæological find had been made, and that an extensive Pagan Saxon burial ground had existed here. The graves being opened up, objects usually characteristic of Saxon interments were found, such as sepulchral urns, some of them highly ornamented with bosses and cord-like patterns in relief. In some of the urns were found burnt human bones, with beads, &c. Several fibulæ, iron knives, spear heads, and bronze ornaments were also found. Since then the explorations have been carried on more extensively, and probably some years will elapse before the investigations will be completed." Mr. Robert Thornewill, The Abbey, Burton-on-Trent, is the President; and Mr. C. U. Tripp, M.A., Grammar School, Burton-on-Trent and Mr. J. O. Sullivan, the Hon. General Secretaries; Mr. J. Heron and Mr. T. C. Martin, the Hon. Secretaries for Excursions.

The Cheltenham Natural Science Society was commenced in January, 1878. It has ninety-seven Members, paying 10s. yearly, and four Honorary Members. Meetings are held on the third Thursday of the month from October to April; the General Meeting is held on the first Thursday in October. During the last Session seven papers, described as "all exceedingly interesting and of a high order," were read before the Society. At present the Society has not published an Annual Report, but it issues to the Members, monthly during the Session, a full report of the papers read and the discussions thereon, reprinted from one of the local newspapers. The President, (who is also the honoured President of this Union,) Dr. Thomas Wright, F.R.S., F.G.S., 4, St. Margaret's Terrace, Cheltenham, has won a world-wide reputation by his grand monographs, published by the Palæontographical Society, on "British Fossil Echinodermata," Oolitic and Cretaceous, and "The Lias Ammonites of the British Islands." The Hon. Sec. is Colonel Basevi, Elm Lodge, Prestbury, Cheltenham.

The Dudley and Midland Geological and Scientific Society and Field Club dates from 1862, and has 148 Members subscribing 10s. 6d. a year, and fifteen Honorary Members. It holds a winter Meeting for business, and has six or seven Field Meetings during the summer, which are largely attended. The papers read before it are limited to a description of the Geology of the districts visited during its excursions. It publishes Transactions from time to time. This Society organised the successful excursion of the Union at its first Annual Meeting in 1878, including the inspection of the underground workings (258½ yards deep) of the Lye Cross Coal Pit, at Rowley, by more than 400 Members and Friends of the Union, many of whom were ladies. Mr. Alfred Freer, M.R.C.S., Stourbridge, is the President, and Mr. W. Madeley, Kingswinford, near Dudley, the Secretary.

The Evesham Naturalists' Field Club was formed on the 1st July, 1873. It has 33 Members, who pay a subscription of 2s. 6d. annually. It meets monthly, and during the summer has excursions monthly. One of its Members, Mr. R. F. Tomes, F.G.S., has for some time past been engaged in the study of Fossil Corals; and has contributed papers to the Journal of the Geological Society. The Society does not publish an Annual Report. The President is Mr. Thomas James Slatter, F.G.S., The Bank, Evesham; and the Hon. Sec. Mr. Thomas E. Doeg, Evesham.

The Leicester Literary and Philosophical Society held its first Meeting in September, 1835, and is one of the oldest Societies in the Union. At its last Annual Meeting the roll of Members contained the names of 279 subscribing 21s. annually, twenty-two Lady Associates subscribing 10s. 6d. annually, and twenty-four Hon. Members; total, 325. The Society publishes its transactions and an Annual Report. From the last published report it appears that during the forty-fifth session of the Society, fourteen Ordinary Meetings were held, at which the usual number of six professional and eight non-professional lectures were delivered. The Natural History Section held fifteen Meetings. This Section has for some time past been busily occupied with the preparation of a Leicestershire Flora upon the basis of Coleman's MS. The plan of the work has been finally determined, and the materials collected are being rapidly put in form; it will, however, be a considerable time yet before the work is ready for the press. The Society has also Geological, Microscopical, Meteorological, Archæological, and Fine Art Sections, and renders important services to the Town Museum, of which Mr. Montagu Browne, F.Z.S., a Member of the Union, is Curator. The Society makes one excursion annually. The Natural History section makes several excursions during the summer. The Rev. Joseph Wood, Leicester, is President of the Society; Mr. Geo. Hull, London Road, Leicester, and Mr. W. Simpson, 47, New Walk, Leicester, are the Hon. Secs. The second Annual Meeting of the Union (1879) was held in connection with this Society.

The Northamptonshire Natural History Society and Field Club was formed on March 7th, 1876. It numbered about 140 Members on 1st January last. The annual subscription is 10s. Meetings are held monthly. Sectional meetings for special branches of science are held occasionally in addition. Whole-day excursions are made monthly during five months of summer and autumn; evening walks, starting about 5 o'clock p.m., are made at intervals of about a fortnight. Five papers were read before the Society during the past year. The Society has a Photographical Section which has provided the Society with a number of valuable albums of local scenery and buildings. Some of the most important labours of this Society are expended on the quarterly Journal, which is issued to the Members free of charge, and to Honorary and Corresponding Members at the cost price, viz., 5s. per annum. Six numbers have at present been issued, each containing a photograph of some remarkable Northamptonshire tree, the photograph taken by a member of the Photographical Section, and the tree described by Mr. R. G. Scriven. Of the papers which have at present appeared in this journal, and which are of special local value, the following are the principal :—"Birds of Northamptonshire," by the Lord Lilford, F.L.S., F.Z.S. etc.; "Northants Flora," by Mr. G. C. Druce, F.L.S., and "Local Geology," by Mr. B. Thompson, F.G.S., F.C.S.; besides these, each number contains Meteorological reports from different stations in the county, summarised by Mr. H. Terry, reports of meetings of the Society, and various other papers and notes relating to general science. The journal is edited by the Rev. S. J. W. Sanders, M.A., Mr. R. G. Scriven, and Mr. B. Thompson, F.G.S., F.C.S. It is hoped eventually to print papers dealing with the whole of the Natural History of Northamptonshire. The Right Hon. the Lord Lilford, Lilford Hall, Oundle, is the President of the Society, and Mr. T. L. Cordeaux, Queen's Cottage, Northampton, and Mr. C. E. Crick, 1, the Horsemarket, Northampton, are the Honorary Secretaries. The Annual Meeting of the Union was held in connection with this Society in 1880.

(To be continued.)

Review.

A Sketch of the Geology of Lincolnshire. By W. J. HARRISON, F.G.S. (in "White's Directory, History, and Gazetteer of Lincolnshire.") Sheffield, 1881.

THE appearance of this "Sketch" will be welcome to a number of students of the science of Geology who live in Lincoln or in the bordering counties, or whose business or pleasure takes them thither; the more so since accurate and reliable information on the subject has not hitherto been readily obtainable. The study of the geology of Lincolnshire has been until quite recently more neglected than that of any other district of equal size in England, and this work is probably the first attempt to give a complete account of the whole of the rocks of the county. Isolated papers have, indeed, been given by various authors on a variety of special subjects connected with the geology of the district, but for the most part these lie buried in the volumes of the journals of the Geological and other learned Societies. To Mr. Harrison belongs the credit of having satisfactorily accomplished the task of compiling from these hidden sources a connected and readable account of the geological structure of the county.

Commencing with a general introduction to the science of Geology, accompanied by a table of the order of the succession of the stratified rocks, and followed by a list of the works that have hitherto been published which bear upon the geology of Lincolnshire, the author proceeds to describe the general structure of the district. The question of the extension of the older rocks beneath Lincolnshire is first considered, some clue as to which was recently furnished by the unsuccessful boring for coal at South Scarle, between Newark and Lincoln. Mr. Harrison rightly concludes that productive coal measures do underlie the western half of the county, but at such great depths (3,000ft. to 4,000ft.) that it will be difficult, if not impossible, ever to work them profitably. The stratified rocks of Mesozoic age that show at the surface, viz., the Keuper and Rhætic, Lias and Oolite, Neocomian and Cretaceous formations are then treated in detail, their lithological and palæontological characters described, and their geographical distribution indicated. The Pleistocene rocks are next examined. These deposits are of considerable importance in Lincolnshire. They include the Fen Beds—accumulations of gravel, silt, and peat, and buried forests, that occupy an area of 1,300 square miles, about half of which lie in the county of Lincoln. In conclusion, the author has a few words to say on the evidence of pre-historic man in Lincolnshire.

Mr. Harrison has evidently derived considerable assistance from a knowledge of the work of the officers of the Geological Survey in the southern portion of the district. It is to be hoped that the hostile influences which are perpetually endeavouring to prematurely hasten the com pletion of this grand work may not cause the survey of North Lincolnshire to be scamped. In different parts of that district there are contained in certain of the Secondary rocks very valuable deposits of iron ore, in particular the Frodingham stone from the *Am. semicostatus* zone of the Lower Lias, of which ore no less than 695,000 tons, valued at over £100,000, were raised in 1879. It is of the highest importance that the outcrops of this band of ironstone should be accurately traced by trained hands. The same remark will apply to the more important building stones of the district. Another important work of the Survey is the special mapping of the superficial deposits. The value of the knowledge this will give the Lincolnshire farmer of the nature of the soils and sub-soils of his land is pointed out by the author.

All who take an interest in the county—and, on account of the rapid growth of the mineral industry, as well as of the increasing popularity of the sea-side resorts, the number of these is increasing every year—should possess themselves of a copy of Mr. Harrison's able treatise.

E. Wilson, F.G.S.

METEOROLOGY OF THE MIDLANDS.

THE WEATHER OF MARCH, 1882.

BY CLEMENT L. WRAGGE, F.R.G.S., F.M.S., ETC.

March was generally dry, with an unusually high temperature. Strong gales or winds occurred early in the month, a period of fine and calmer weather followed, succeeded by tempestuous weather during the last week, with snow. At Orleton the mean temperature was more than three degrees above the average of twenty years. But comparatively little rain fell during the first three weeks. The highest pressure occurred on the 15th, when the barometer corrected and reduced to sea level read 30·6 ; the lowest reading was noted on the 1st and was 28·8. The mean amount of cloud was about 6·1 (scale 0 to 10), and the mean relative humidity 83°/₀. West-south-westerly winds prevailed. The highest reading in sun's rays was 115·8 at Loughborough, and the lowest on grass 18·2 at Hodsock. Bright sunshine 118·2 hours at Hodsock, 121·4 at Strelley, 162·9 at Marlborough. At Blackpool ozone was registered on thirty days, and the daily average was 7·3. The mean temperature of the soil at Strelley, at a depth of one foot, was 42·4. Sea temperature at Scarborough 43·8, or 2·3 degrees warmer than the preceding five years' average. Several lunar halos and lunar coronæ were observed. Vegetation at some places about a month in advance.

STATION.	OBSERVER.	RAINFALL. Total for M. In.	Greatest fall in 24 hours. In.	Date.	No. of rainy d.	SHADE TEMP. Absolute Maximum. Deg.	Date.	Absolute Minimum. Deg.	Date.
OUTPOST STATIONS.									
Spital Cemetery, Carlisle	I. Cartmell, Esq., F.M.S. ..	2·30	·46	22	19	57·5	20	30·5	7
Scarborough (a)............	F. Shaw, Esq., F.M.S.......	1·52	·35	24	12	66·3	16	31·6	22
Blackpool (a)—South Shore..	C. T. Ward, Esq., B.A., F.M.S.	2·66	·54	2	20	54·7	24	33·3	22
Llandudno (a)	J. Nicol, Esq., M.D.........	2·62	·58	25	17	56·3	10	34·0	21
Lowestoft (a)	H. E. Miller, Esq., F.M.S...	1·10	·70	25	10	62·0	16	28·0	18
Cardiff (a)............	W. Adams, Esq., C.E.	2·26	·53	25	19	56·9	15	31·5	22
Altarnun, near Launceston (c)	Rev. J. Power, M.A.	3·98	1·19	1	20	65·0	17	28·0	3
Sidmouth (a)	W. T. Radford, Esq., M.D.	1·10	·28	25	14	56·7	24	31·3	23
Les Ruettes Brayes, Guernsey (a)	A. Collenette, Esq., F.M.S.	2·62	·43	26	19	59·3	18	31·5	22
Guernsey (a)	F. C. Carey, Esq., M.D.....	1·82	·34	25	19	59·0	18	35·8	22
MIDLAND STATIONS.									
HEREFORDSHIRE.									
Burghill (a)............	T. A. Chapman, Esq., M.D.	·91	·42	25	8	63·7	18	28·6	4
SHROPSHIRE.									
Woolstaston	Rev. E. D. Carr	2·62	·79	25	15	63·0	18	27·0	22
More Rectory............	Rev. A. S. Male............	2·01	·74	25	13	59·0	18	28·0	22, 23
Dowles, near Bewdley	J. M. Downing, Esq.	1·67	·61	26	9	67·0	10	19·0	23
WORCESTERSHIRE.									
Orleton, near Tenbury (a)....	T. H. Davis, Esq., F.M.S. ..	1·23	·51	25	13	64·8	16	26·7	4
West Malvern	A. H. Hartland, Esq.	1·26	·57	25	12	64·0	18	25·5	21
Evesham	T. J. Slatter, Esq., F.G.S...	1·14	·40	25	11	58·3	11, 18	27·8	23
Pedmore	E. R. Marten, Esq.	1·47	·67	25	13	64·0	18	26·0	3, 22
Stourbridge	Mr. J. Jefferies	1·21	·75	25	10	59·0	18	26·0	22
Cowney Bank, Dudley	Mr. C. Beale	1·46	·72s	25	10	57·0	18	28·0	21
STAFFORDSHIRE.									
Dennis, Stourbridge (a)......	C. Webb, Esq.	1·25	·68	25	9	64·5	16, 18	28·0	23
Kinver	Rev. W. H. Bolton	1·22	·64	25	11	60·0	10	27·0	3, 22
Walsall............	N. E. Best, Esq.	2·33	1·06	25	12	57·0	10	29·0	3, 21
Lichfield	J. P. Roberts, Esq.	1·68	·84	25	11	68·0	18	28·0	3, 13
Burton-on-Trent (c)........	C. U. Tripp, Esq., F.M.S. ..	1·61	·76	25	15	65·0	16, 18	26·0	23
Weston-under-Lyziard	Hon. & Rev. J. Bridgeman	1·94	·75	25	18	61·0	10, 16	27·0	4, 22
Wrottesley (a)	E. Simpson, Esq.	1·70	·81	25	11	61·2	18	26·3	22
Barlaston (a)	W. Scott, Esq., F.M.S.	2·65	·68	25	15	65·0	18	28·8	22
Tean (c)	Rev. G. T. Ryves, F.M.S. ..	1·84	·75	25	11	63·0	18	25·0	23
Heath House, Cheadle (a) ..	J. C. Philips, Esq., F.M.S.	2·07	·76s	25	13	61·3	18	27·5	22
Oakamoor, Churnet Valley (a)	G. Williams	3·30	·86	25	14	53·8	8	27·9	14
Alstonfield	Rev. W. H. Purchas	2·85	·86	25	12	60·4	16	21·2	22
DERBYSHIRE.									
Stony Middleton	Rev. Urban Smith	1·59	·47	24	8	61·0	18, 19	27·0	31
Spondon	J. T. Barber, Esq...........	1·65	·96	25	9	—	—	—	—
NOTTINGHAMSHIRE.									
Hodsock Priory, Worksop (a)	H. Mellish, Esq., F.M.S. ..	1·24	·55	25	12	64·1	16, 18	26·3	17, 23
Park Hill, Nottingham (a) ..	H. F. Johnson, Esq.	1·60	·83s	25	10	64·5	18	20·5	22
Strelley (a)	T. L. K. Edge, Esq.	1·77	·87	25	11	62·5	18	27·0	4
Tuxford	J. N. Dufty, Esq., F.G.S. ..	1·79	·65	25	10	59·0	10	27·0	23, 24
RUTLANDSHIRE.									
Uppingham............	Rev. G. H. Mullins, M.A. ..	1·21	·95	25	9	61·9	18	28·2	23
LEICESTERSHIRE.									
Loughborough (a)............	W. Berridge, Esq., F.M.S...	1·35	·69	25	9	65·2	18	27·2	23
Syston	J. Hames, Esq.	1·11	·62	25	13	63·0	16, 18	27·0	23
Ashby Magna	Mr. T. Carter	1·24	·91	25	10	62·0	18	24·0	23
Kibworth (b)	T. Macaulay, Esq.	1·34	·97	25	10	—	—	—	—
Waltham-le-Wold	Edwin Ball, Esq.	1·34	1·01	25	10	57·0	7, 10, 18	26·0	23
Dalby Hall (b)	G. Jones, Esq.	·88	·63	25	8	59·0	10	24·0	23
Coston Rectory, Melton (a) ..	Rev. A. M. Rendell........	·98	·72	25	9	65·0	18	23·5	23
WARWICKSHIRE.									
Henley-in-Arden	T. H. G. Newton, Esq.	1·82	·69	25	15	63·0	18	25·0	23
Kenilworth (a)	F. Slade, Esq., C.E., F.M.S.	1·64	·67	25	14	61·9	18	26·9	23
Rugby School (c)	Rev. T. N. Hutchinson	1·32	·87	25	12	63·4	18	27·2	23
NORTHAMPTONSHIRE.									
Sedgebrooke, Northampton	C. A. Markham, Esq.	1·41	1·04s	25	10	66·0	18	26·0	14
Towcester	J. Webb, Esq.	1·13	·64	25	10	—	—	—	—
Kettering............	J. Wallis, Esq.	1·39	1·04	25	10	59·0	19	29·0	23
OXFORDSHIRE.									
Radcliffe Observatory, Ox. (a)	The Staff	1·72	·58	1	11	64·0	18	29·0	23
WILTSHIRE.									
Marlborough (a)	Rev. T. A. Preston, F.M.S.	1·86	·55	25	15	64·1	18	26·2	23
GLOUCESTERSHIRE.									
Cheltenham (a)	R. Tyrer, Esq., B.A., F.M.S.	1·52	·39	25	13	62·0	18	25·0	23

(a) At these Stations Stevenson's Thermometer Screen is in use, and the values may be regarded as strictly intercomparable.

All observations received on the new Form except those marked (b).

(c) Glaisher's pattern of thermometer screen employed at these stations.

The Beacon Stoop observations will appear at foot in next number.

Correspondence.

Adders in Sutton Park.—The Adder has for some time been considered scarce at Sutton Park, but on March 19th five large ones were taken on the common, near Streetly Wood, by Mr. F. Shrive, and on March 26th another specimen was taken near the same place. Many traces of others were seen.—H. Insley, Birmingham.

Foraminifera in the Trias.—In the "Quarterly Journal of the Geological Society," vol. xvi., p. 452, Professor Rupert Jones, and Mr. W. R. Parker, describe a series of foraminifera, which they state were obtained from certain blue clays of Keuper age, associated with the gypsum beds at Chellaston, near Derby. Since the publication of this paper these fossils have been referred to by various authors as being of high importance in connection with the study of the Triassic Rocks. No other observers, however, have confirmed the observations of Messrs. Jones and Parker, although, to my own knowledge, large quantities of clay from the locality and beds referred to have been examined with great care in a similar manner. I have heard it publicly stated, on more than one occasion, that the specimen of clay which was examined by the authors, was not obtained by them from the rock *in situ*, so that it is possible that some mistake may have been made in the collection, or during the transfer of the clay. Now I know well that the gentlemen in question stand far too high in the world of Science to wish to perpetuate an error, if such it be, which may have considerable influence on the researches which are now being made into the Triassic Rocks of the Midlands. If Professor Jones can give us any information, one way or the other, as to the source of the clay he examined, I can assure him that many working geologists of the Midlands will be truly thankful for it.—F. G. S.

Fossiliferous Pebbles in the Bunter.—Some years ago I was looking at a fresh-cut section of Bunter Pebble Beds, in one of the streets in the heart of Nottingham, when my attention was attracted by a pebble of rather unusual shape and character, not unlike a piece of roofing tile. It proved to be a fragment of indurated greyish-white shale, almost unwaterworn, which, when split open, was found to contain three or four minute impressions of a crinoid, apparently all of the same species, but in different stages of growth. Although very interesting, as being the first pebble containing a fossil that I had ever seen in the Bunter, it lay by in my drawers undetermined and well-nigh forgotten till just lately, when one of my students—Mr. J. Bradley—brought me another fossiliferous pebble, also found in the Bunter Pebble Beds, while excavating a grave in the General Cemetery, about half-a-mile from where the first pebble was found. This pebble was likewise very nearly as angular as it must have been when first broken off the parent rock, and the fossil it contained—one valve of a *Strophomena*—had not only lost its hinge, but was otherwise sadly mutilated. Imperfect and obscure as the fossils undoubtedly are, however, Professor Etheridge (of the British Museum of Natural History, South Kensington), who very courteously undertook to examine them for me, was able to identify them, respectively, as *Glyptocrinus basalis* and *Strophomena grandis*, the latter a Caradoc form—indeed both, as Mr. Etheridge adds, Caradoc species. These pebbles, along with the quartzite containing *Orthis redux*, found by Mr. I. Jennings in a roadside stone-heap, but presumably derived from the Bunter (*Mid. Nat.*, vol. ii. p. 286), are, I believe, the only fossiliferous pebbles yet found in that formation at Nottingham.—J. Shipman, Nottingham.

Mr. Charles Darwin, the greatest of naturalists, died on Wednesday, the 19th ultimo, in his 74th year, and was buried on the Wednesday following in Westminster Abbey, close to the spot where Sir Isaac Newton was buried in 1727. The funeral was attended by such numbers of the representative men of the time, of all classes and shades of opinion, as showed in the most decisive manner the national appreciation of the claims of Mr. Darwin as a man and as a philosopher. In our next number we hope to present our readers with a woodcut portrait of the great naturalist, reproduced from the exquisite medal cut by Mr. Moore for the "Darwin Prize," which is open to members of the Midland Union of Natural History Societies.

Sir Herewald Wake's Prize.—We remind our Entomological readers of the prize offered by the ex-President of the Midland Union for "The best original Essay on the Life History of any one Genus of Insects indigenous to the Midland Counties, written by a member of one of the Societies in the Union." The essays should be sent without delay to Sir Herewald Wake, Bart., Courteen Hall, Northampton.

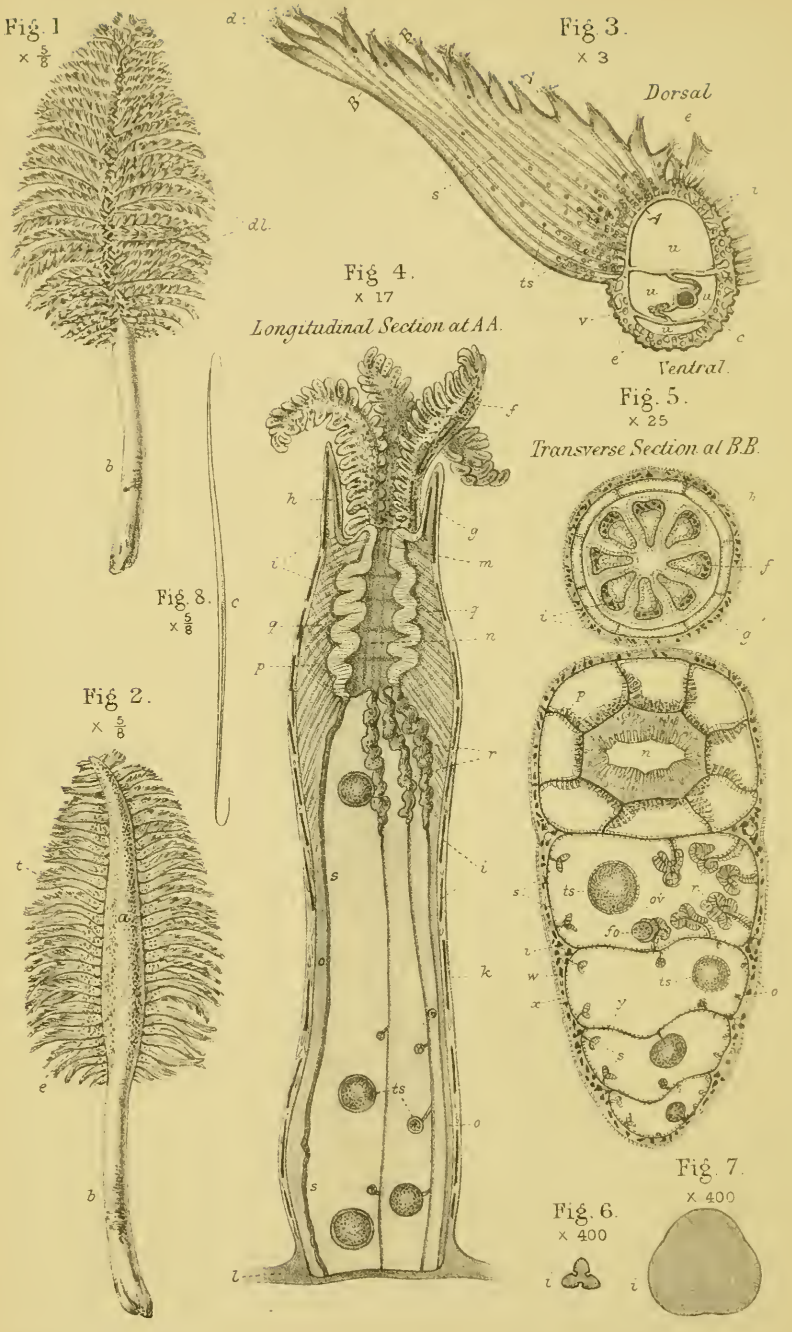
Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—Geological Section.—March 28th. Mr. W. Harrison exhibited a fine specimen of pseudomorphous salt crystals from the red marl at Yardley. Mr. W. J. Harrison, F.G.S., gave an interesting lecture on "The Quartzite Pebbles in the Drift." These hard pebbles of various colours are very common in the midland counties of England, where they are used for road paving and repairing. They appear to have been derived from the pebble beds of the Bunter Conglomerate, one of the lower divisions of the Trias formation. This is, however, still doubted by some geologists, though the weight of evidence seems to be in its favour. The lecturer then proceeded to discuss the various theories which have been propounded to account for the first origin of these pebbles. Mr. Hull, of the Geological Survey, considered that they were brought from the Old Red Conglomerates of Scotland; but the distance is very great, and a recent investigation of the latter has shown that the fossils in the quartzites are very different to those in this neighbourhood. Professor Bonney ascribes them to currents from the north-west of Scotland, basing his theory principally on microscopical examination. Others think that they came from Normandy, where the rocks are found *in situ* with similar fossils to those found in the pebbles of the drift. Similar fossils occur in great numbers in the pebble beds at Budleigh Salterton, in Devonshire. The Rev. P. B. Brodie advanced the opinion that they were due to a former land surface of older rocks which ran like a barrier across England. The lecturer adopted this view, and ably supported it by numerous facts and arguments, pointing out that the old rocks of Charnwood Forest, Malvern Hills, and the Wrekin appear to be remains of this ancient reef, and also that deep borings have proved the presence of bosses of these Palæozoic formations under the newer beds. In the discussion which ensued other evidence in support of this view were adduced. The lecture was illustrated by many maps and diagrams, and by numerous specimens, principally from the Drift Beds at Moseley, including some exceptionally well-preserved and unique specimens of *Lingula Lesueuri*.—April 4th. Mr. R. W. Chase exhibited *Larus minutus*, the Little Gull, and *Phalaropus fulicarius*, the Grey Phalarope. Mr. J. Levick made a few remarks on the progress of the Society's work during the past year, in which he mentioned the increased energy displayed in the study of fishes, birds, and fungi, and enumerated still unworked fields, in which rich harvests might be gathered. Dr. J. Anthony, F.R.C.P., exhibited and described about ten kinds of pocket magnifiers, and showed by diagrams on the black board their respective advantages, and how to obtain from each lens the utmost of which it was capable. The lecture, which was full of useful practical hints, was deservedly applauded. BIOLOGICAL SECTION.—April 11th. Mr. Morley exhibited on behalf of Mr, W. R. Hughes a collection of plants from Brixham. Mr. R. M. Lloyd exhibited a curious insect, found in a fern case, which he had not yet been able to identify. Dr. A. Milnes Marshall gave Part II. (*Pennatula phosphorea*) of the Report on the *Pennatulida* collected in the Oban dredging excursion, prepared by himself, and Mr. W. P. Marshall, which contained some new and interesting points in the structure of that genus. The report was illustrated by numerous diagrams and a beautiful series of preparations under the microscopes. April 18th.—Mr. R. W. Chase exhibited striking varieties (pied) of the common Bunting, the Linnet, and the Song Thrush, from Cambridgeshire, and a specimen of *Ruticilla tithys*, the Black Redstart, from near Brighton. Mr. J. Morley exhibited *Spirotœnia condensata* and other Desmids living, and the head of the common wasp mounted without pressure by Mr. F. Enock. Mr. R. M. Lloyd exhibited a small mollusc, *Vertigo moulinsiana*, from near Hitchin. Mr. W. B. Grove exhibited the Fungi collected during the Cheltenham excursion, and *Sphœria moriformis*, from King's Lynn. GEOLOGICAL SECTION. — April 25th. Mr. W. J. Harrison exhibited Galena in Silurian Limestone and Coal, showing "slickensides" from a coal pit near Dudley, and specimens of Dolerite and Pitchstone from Scotland. Mr. C. H. Mather exhibited quartzite pebbles from the Bunter conglomerate of Great Barr, showing worm borings of *Trachyderma Serrata*. Mr. W. B. Grove showed microscopical sections of *Puccinia umbilici* and *Corticium sanguineum* from Shifnal, Salop. Mr. J. E. Bagnall exhibited some mosses, *Dicranum montanum*, from two new Warwickshire stations, and *Sphagnum fimbriatum* and *Fontinalis antipyretica* from the neighbourhood of Maxtoke. He also showed for Mr. J. Bragg a fasciated branch of *Acer pseudo-platanus*. Mr. T. H. Waller then read, on behalf of Mr. Dr. T. Wright, F.R.S., of Cheltenham, a paper on "Basalt;" being the abstract of an address delivered to the members on the occasion of the visit of the Society to Oban. He described very vividly the volcanic rocks of that district, especially with relation to Staffa and Fingal's Cave, which the party visited. The paper was illustrated by sketches, photographs, and specimens, and was followed by an animated discussion.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—March 13th. Exhibited by Mr. Darley, an external parasite of Humble Bee. Mr. Dunn, *Volvox globator*, which had reappeared in an old locality. A paper, "How Rocks are Formed," was read by Mr. H. Insley. Micro sections of Landovery Sandstone and Lickey Quartzite were shown.—March 20th. First night of meeting in new quarters, Graham Street. Public admitted by ticket; 300 present. Mr. F. Shrive exhibited group of five Adders, caught at Sutton Park, (living,) also collection of British reptiles. Exhibited by Mr. Deakin, British Lepidoptera; by Mr. Boland, Conchological Collection. A number of microscopes were devoted to pond life, &c. Mr. Betteridge exhibited a pair of Smew, male and female, shot in the district. Mr. J. W. Neville delivered an address on "The Work of the Society."—March 27th. Mr. J. W. Neville exhibited stomach of Common Flea; Mr. Darley, female Emperor Moth; Mr. Moore, Horsehair Worm, 6in. in length. A paper was read by Mr. Boland on "The Natural History of the Silkworm." Specimens were shown in illustration.

DUDLEY AND MIDLAND GEOLOGICAL AND SCIENTIFIC SOCIETY AND FIELD CLUB.—The Annual Meeting was held in the Society's Museum, Dudley, on Monday, the 17th April, when the Committee's report and statement of accounts were received, and officers for the present year were elected. Subsequently, an address, illustrated by drawings and specimens, was delivered by Mr. W. J. Harrison, F.G.S., "On the Nature and Fossil Contents of the Quartzite Pebbles found in the Drift and Bunter Beds of the Midland Counties." A number of interesting fossils and microscopic and other objects were exhibited.

Plate III.



A M Marshall del

F. Huth, Lith[r] Edin[r]

PENNATULA PHOSPHOREA.

REPORT ON THE PENNATULIDA COLLECTED IN THE OBAN DREDGING EXCURSION OF THE BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY, JULY, 1881.*

BY A. MILNES MARSHALL, M.A., D.SC., PROFESSOR OF ZOOLOGY IN OWENS COLLEGE, AND W. P. MARSHALL, M.I.C.E.

(Continued from page 56.)

PART II.—Pennatula Phosphorea. Linnæus.

Of this species two living specimens were obtained, of $5\frac{1}{2}$ and $4\frac{3}{4}$ inches length respectively. They were both found in the same locality (Station I. of the General Report of the Dredging Excursion), two

Description of the Figures in Plate III.

Figures 1 and 2, representing the female specimen, are drawn directly from the object. Figs. 3-7 are taken from the male specimen; figs. 3, 6, and 7 being drawn direct with the camera from the original objects, while figs. 4 and 5 are constructed from separate camera drawings of the several parts shown. Fig. 8 is taken from one of the specimens from Naples.

Alphabetical List of References.

- *a.* Rachis.
- *b.* Stalk.
- *c.* Stem.
- *d.* Polype.
- *dl.* Leaf.
- *e.* Zooid.
- *f.* Tentacle.
- *fo.* Foreign body, swallowed as food.
- *g.* Calyx.
- *h.* Cavity in calyx process.
- *i.* Spicule.
- *l.* Cœnenchym, or fleshy body-substance.
- *m.* Mouth.
- *n.* Stomach.
- *o.* Mesentery.
- *ov.* Egg of Entomostracon embedded in mesenterial filament.
- *p.* Retractor muscle.
- *q.* Protractor muscle.
- *r.* Short mesenterial filament.
- *s.* Long mesenterial filament.
- *t.* Ovum.
- *ts.* Spermatosphere.
- *u.* Main canals of rachis.
- *v.* Smaller canals.
- *w.* Ectoderm.
- *x.* Mesoderm.
- *y.* Endoderm.

Fig. 1.—Dorsal view of the female specimen. $\times \frac{5}{8}$.

Fig. 2.—Ventral view of the female specimen, showing zooids on ventral surface of rachis: also ova at bases of leaves. $\times \frac{5}{8}$.

Fig. 3.—Transverse section through the rachis of the male specimen, with the whole of the 13th left leaf, and the base of the 13th right leaf. Shows mode of formation of leaf by lateral fusion of polypes; also arrangement of zooids on rachis. On the right leaf the spicules are represented, but on the left they have been omitted for the sake of clearness. $\times$ 3.

Fig 4.—Longitudinal section of a single polype along the line AA in Fig. 3; the plane of section being the *plane of symmetry*, perpendicular to the flat surface of the leaf: shows whole structure of a polype. $\times$ 17.

Fig. 5.—Transverse section through six contiguous polypes taken along the line BB in Fig. 3, cutting the several polypes at different portions of their lengths. The uppermost section passes through the calyx and base of the tentacles. The second section passes through the stomach, and shows the mesenteries and the arrangement of the retractor muscles. The third section passes through the mesenterial filaments below the stomach, and shows their division into two small and six large ones: shows also food particles in the act of being digested by the filaments, and a ripe spermatosphere. The fourth, fifth, and sixth sections are below the lower ends of the short mesenterial filaments; they show the long filaments, and the various stages of development of the male reproductive organs. $\times$ 25.

Fig. 6.—Transverse section through one of the smaller spicules. $\times$ 400.

Fig. 7.—Transverse section through a large spicule. $\times$ 400.

Fig. 8.—Separate view of bare stem. $\times \frac{5}{8}$.

* Read before the Birmingham Natural History and Microscopical Society, April 11th, 1882.

miles N.W. of Oban, and about a mile from the shore, in twenty fathoms water, one being brought up by the tangle and the other inside the dredge-net. A third, smaller, specimen obtained from the same locality was not preserved.

The specimens prove on examination to be of different sexes, a rare piece of good fortune, which has enabled us to make our report far more complete than could otherwise have been the case, and also to give an account of the structure and development of the male reproductive organs of *Pennatula*, of which no satisfactory description has hitherto appeared.

In order to investigate the anatomical structure a pair of leaves with the corresponding part of the rachis were removed from the male specimen, the less perfect of the two, and of these sections were made in various planes. The knowledge obtained in this way, which was still deficient in many important points, we have supplemented by an examination of specimens of *Pennatula phosphorea* in the Owens College museum, originally obtained from Naples, and in this way have been enabled to prepare a fairly complete account of the anatomy of *Pennatula*. Concerning the histology we have been less successful owing to the imperfect preservation of the specimens.

As in the case of *Funiculina*, we have given special attention to the figures on Plate III., all of which have either been drawn directly from the objects themselves, or else constructed from camera drawings of the several parts shown.

GENERAL ACCOUNT.

The general appearance of *Pennatula phosphorea* is shown in Figs. 1 and 2, the former figure representing the dorsal and the latter the opposite or ventral surface, both figures being drawn from the female specimen.

As in *Funiculina* there is a cylindrical axial portion, of which the lower $\frac{2}{5}$ths, forming the stalk (Figs. 1 and 2 *b*), are bare and in the living animal probably planted in the sea-bottom, while the upper $\frac{3}{5}$ths, or rachis (Fig. 2 *a*), support the polypes.

These polypes are arranged in transverse rows along each side of the rachis, the several polypes of each row being fused together along nearly their whole length, so as to form broad horizontal *leaves* (Figs. 1, 2, and 3 *ll*), projecting out at right angles to the rachis. The presence of these leaves forms the most marked point of difference between *Pennatula* and *Funiculina*, in which latter each polype is quite free from its neighbours and inserted independently into the rachis.

As in *Funiculina* the polypes are placed along the dorsal and lateral surfaces of the rachis, but not on the ventral surface (Figs. 2 and 3), which however, unlike *Funiculina*, is thickly studded with zooids (Figs. 2 and 3, *e*).

As shown in Figs. 1 and 2 the leaves are not all of equal length; the longest ones, in the female specimen, are at about one-third of the length of the rachis above its commencement, from which point they diminish gradually in length towards the upper end of the rachis, and much more rapidly towards the lower end. The number of polypes composing the leaves varies according to the length of the leaf; the greatest number, found in the longest leaves, being twelve in the female specimen (Fig. 3 *d*), and in the male fifteen; while the topmost leaves consist of three or even only two polypes each.

The rachis and leaves are of a deep red colour, due, not to the fleshy body-substance which is nearly colourless, but to red calcareous spicules which are present in immense numbers throughout these portions of the Pen (Figs. 3, 4, and 5 *i*). The stalk is much paler, the spicules in it being colourless.

Anatomical Description.

1.—*The Stalk and Rachis*—

The stalk (Figs. 1, 2, 3) which forms about 2-5ths of the entire length of the Pen, is cylindrical, with a diameter, in the female specimen, of 0·21in. along the greater part of its length. The bottom third is somewhat dilated and bulbous, and the upper end, just at the junction of stalk and rachis, slightly constricted, forming as in *Funiculina* the narrowest portion of the stalk.

As the Oban specimens were destined for museum purposes, we have been unable to investigate the structure of the stalk in them, and the following account is based on a series of preparations made from a couple of specimens in the Owens College Museum, obtained from Naples.

The stalk is really a tube, being traversed along its whole length by an axial canal, whose diameter along the greater part of the length is about $\frac{1}{2}$ that of the stalk itself, somewhat exceeding this in the upper and lower thirds, and being rather smaller in the middle third. At the bottom of the stalk this canal is said by Kölliker to open to the exterior by a minute orifice, the existence of which we have, however, been unable to confirm.

The central canal is divided into two along the whole length of the stalk by a longitudinal partition; and in the upper half of the stalk, owing to the presence of two other partitions, into four, whereof one is dorsal, one ventral, and two lateral.

The walls of the stalk present the following structure:—On the outer surface is an epidermis, which, although of some thickness, consists of only a single layer of closely-packed columnar cells. Beneath this is a thick connective-tissue layer, or dermis, forming from $\frac{1}{3}$ to $\frac{1}{2}$ the total thickness of the wall. Imbedded in this dermis are an immense number of calcareous spicules crossing one another at every conceivable angle, and set so closely together that in many places the connective tissue matrix is completely concealed by them. These spicules which, unlike the spicules of the rachis and leaves, are colourless, have an average length of 0·013in., and width of 0·001in., the total thickness of the dermis, to which they give considerable strength and toughness, being about 0·016in.

Beneath the dermis is a well-developed system of longitudinal muscles, arranged so as to form not a simple ring round the stalk, but an extremely sinuous or corrugated one, the loops being very deep and close together, and the total thickness of the layer about ¼ that of the entire wall. Within the layer of longitudinal muscles is a connective tissue layer of varying thickness in different parts, and traversed by ill-defined bands of muscular fibre whose general direction is parallel to the surface of the stalk, though not forming a distinct system of circular muscles. This layer forms also the basis of the septa or partitions dividing the central canal. Finally, the central canals are lined by a single layer of short columnar epithelial cells.

The walls of the stalk are farther traversed by an irregular system of canals or vessels of no great size, the largest of which have a longitudinal direction and are situated in the loops formed by the layer of longitudinal muscles.

The lower third of the stalk differs materially in appearance from the upper two-thirds. Its walls are softer and paler in colour, and owing to the action of the spirit in which the specimens have been preserved, are very distinctly wrinkled. This difference is due partly to the wall of the lower third being somewhat thinner than that of the upper part, but far more to the fact that in this portion the dermis, which, owing to its calcareous spicules, is the most rigid layer of the stalk, is barely half the thickness that it has above.

We have described the stalk as seen in our spirit-preserved specimens, but before leaving it a point of some interest remains to be noticed. The stalk of *Pennatula phosphorea* is described and figured by some writers as of very much greater thickness than we have stated above, and is said to become inflated under certain circumstances or at certain times of the day. Thus Sir John Dalyell* says that the whole Pen may distend itself with water, the distension being most marked in the stalk. He remarks that "No one could anticipate the effect of intumescence from its form in a contracted state." Also, that "it enlarges remarkably as evening comes on," *Pennatula* being, according to him, "strictly nocturnal," and, at any rate in captivity, only expanding fully in the evening or at night.

Johnston† also notices that "when placed in a basin or plate of sea-water, *Pennatulæ* . . . . inflate the body until it becomes to a considerable degree transparent, and only streaked with interrupted lines of red."

On the other hand, Panceri‡, who has made careful observations on living *Pennatulæ*, holds that this state of distension is not a natural one. He says, "When these zoophytes, living at a depth of 40 or 100

* Dalyell: "Rare and Remarkable Animals of Scotland," Vol. ii., 1848, pp. 191-194, and Plate xliv.

† Johnston: "British Zoophytes," Second Edition, 1847, Vol. ii., pp. 160-161; also, Figure 35, p. 158, where *Pennatula phosphorea* is figured with the stalk thus inflated.

‡ Panceri: "Etudes sur la phosphorescence des animaux marins," Annales des Sciences Naturelles, Cinquième Série, tome 16, 1872, p. 15.

metres (22 to 54 fathoms), or more, are suddenly removed from their natural resting place at the bottom of the sea, and transferred to an aquarium, they undergo so great a change in the pressure, temperature, degree of saltness of the water, and conditions of existence generally, that they swell up gradually to an enormous extent—up to double their natural size." He brings forward as further evidence that this dropsical condition is an unnatural one, the fact that *Pennatulæ* in this state respond exceedingly feebly to stimuli, whether mechanical, chemical, thermal, or electrical, to which, in their natural undistended condition they answer readily.

The above quotations suggest two points for consideration :—(1.) Is this inflation of the stalk of *Pennatula* a constantly occurring or only an exceptional phenomenon? (2.) If constant, is it to be regarded as a normal or as an abnormal occurrence, due, as Panceri suggests, to the exceptional conditions under which the Pen is placed?

Concerning the first point, the united testimony of Dalyell, Johnston, and Panceri proves that at any rate this inflation is no rare event under the conditions named; and through a valuable observation of Mr. J. F. Goode, who kept the log of the Oban excursion, we are enabled to give some account of the process of inflation as it actually occurred in one of the Oban specimens. We learn from Mr. Goode's MS. notes and from a drawing made by him at the time, that when one of the *Pennatulæ*—the male specimen—was placed, immediately after its capture, in a shallow pan of sea-water, the stalk was at first cylindrical with a slightly bulbous extremity (very similar to Figs. 1 and 2); but that shortly afterwards "it was seen to undergo a gradual change of form. A slight constriction took place near the extreme end, driving the fluid contents forward towards the upper part (near the rachis), which became much swollen, leaving only a small bulb at the opposite end. . . . . This form was not at all permanent, continued change still going on, evidently with the object of regaining its original form, the fluid seeming to oscillate from one end to the other. The above changes took place in the first twenty minutes from the time of capture."

With regard to the second point, which can, of course, only be settled by direct observations on living specimens, we will only remark here that Mr. Goode's observation that at the moment of capture the proportions of the stalk were those we have decribed and figured from spirit specimens, is important testimony in favour of these proportions being the normal ones; and further, that Panceri's suggestion appears to us to be of much weight, and that it is quite possible that it also gives the clue to Sir John Dalyell's statement concerning the "nocturnal habits" of *Pennatulæ*. The bottom of the sea at twenty to forty fathoms depth must be very dark indeed as compared with the surface, and it seems to us very probable that a *Pennatula* "in a basin or plate of sea-water" does not expand its polypes fully until the evening, simply because it is only then that the amount of light approximates to what it is accustomed to receive in the day time at the bottom of the sea.

The *rachis* (Fig 2 *a*), or axial portion of the feather or polype-bearing part of the Pen, is widest about the junction of its middle and lower thirds. From this point, at which, in the female specimen, it has a width of 0·29in., it tapers gradually in both directions. Its dorsal surface (Fig. 1) is completely concealed by the polypes, and of the lateral surfaces only small portions are visible between the bases of the leaves. The ventral surface is, however, exposed along its whole length (Figs. 2 and 3); it is marked by a shallow median longitudinal groove, more pronounced in the female than the male specimen, and is studded all over with the zooids or rudimentary polypes. In colour it contrasts strongly with the stalk, being of a bright red colour, excepting the median groove which is pale yellow.

The internal structure of the rachis is shown in Fig 3. The central canal, which is of very large size, is divided by the septa shown in this figure into four; a very large dorsal one, two large lateral ones, and a small ventral one, crescentic in transverse section. In the great size of these canals, which do not appear to have been figured hitherto, *Pennatula phosphorea* contrasts remarkably with the allied species *Pennatula rubra*, as described and figured by Kölliker,* in which the dorsal canal is very small, and far removed from the others, which are themselves much smaller than in *P. phosphorea.*

The structure of the wall on the mid-dorsal and on the ventral surfaces is, but for the presence of the zooids, much the same as that of the stalk. A single-layered epidermis covers a thick dermis exceedingly thickly studded with calcareous spicules, packed together if possible even more closely than in the stalk; beneath the dermis is a well-developed layer of longitudinal muscles, having the same arrangement as in the stalk; and underneath this a connective-tissue layer which differs considerably from that of the stalk, for instead of forming a dense compact layer it has the character of a loose spongy meshwork, traversed by large irregular canals and passages, freely opening into one another and into the canal system between the folds of the longitudinal muscles.

At the sides the structure of the wall between the several polype-leaves is much the same as that just described on the dorsal and ventral surfaces, with the exception that the longitudinal muscle layer is absent, and the spongy connective-tissue layer consequently thicker; but opposite the bases of attachment of the leaves it is very different. As shown on the left-hand side of Fig. 3, the wall is here reduced to a thin connective-tissue membrane, separating the bottoms of the polype cavities from the main dorsal and lateral canals.

The partitions separating the main canals from one another are, as in the stalk, formed by prolongations of the connective-tissue layer;

* Kölliker: Anatomische-systematische Beschreibung der Alcyonarien. Erste Abtheilung: Die Pennatuliden, 1872, Plate VIII., fig. 72.

the canals themselves being lined by a single layer of epithelial cells. In the septum dividing the two lateral canals from one another is contained, as will be described more fully below, the calcareous axial rod or stem (Fig. 3, *c*.)

The function of the whole canal system of *Pennatulida* is a matter of much uncertainty. The meshes of the spongy connective-tissue communicate freely with the cavities of both polypes and zooids, and also, according to Kölliker, with the main canal system of the rachis and stalk. The fluid in this system is probably a nutritive one, mixed, however, very largely with sea-water; and the well developed muscular system may be supposed to have for its main function the maintaining, by compression of portions of the spongy connective-tissue meshwork, of currents from one part of the Pen to another, and in part to effect the slight movements of the leaves described by many writers, notably by Dalyell, who says that "the animal has also much control over the dimensions, reciprocal position, and direction of the lobes,"* *i.e.*, leaves.

2.—*The Stem*—

As in *Funiculina*, the stalk and rachis are traversed by a central firmly-calcified stem (Fig. 8), situated, as shown in Fig. 3 *c*, in the middle of the septum dividing the two main lateral canals from one another. We have investigated the structure and anatomical relations of the stem in two of the specimens of *Pennatula* from Naples referred to above.

The first of these specimens has a total length of 4½in., whereof the stalk forms the lower 1⅝in., and the rachis the remainder. The rachis bears twenty-seven leaves on each side, each of the larger ones being composed of eleven polypes. The stem (Fig. 8 *c*.) is thickest at the point of junction of stalk and rachis, at which place it has a diameter of 0·044in. A point of considerable interest is that at this spot the stem is very distinctly quadrangular in transverse section, the sides being even slightly concave, as in *Funiculina*. This quadrangular shape of the stem of *Pennatula* appears to have been hitherto very generally overlooked. From the point mentioned the stem extends down to the bottom of the stalk, preserving its quadrangular character until very close to the bottom where it becomes cylindrical. Its diameter diminishes at first very gradually, but in the bottom half-inch very rapidly. On reaching the bottom of the stalk it is bent back on itself, so as to form a hook, the loop of the hook being in contact with the bottom of the stalk, and the upturned limb of the hook, which is ¼in long, being extremely slender and only very imperfectly calcified. The extreme tip is bent back a second time towards the lower end of the stalk for a length of about ⅛in.

In the rachis the stem loses its quadrangular character almost immediately, becoming cylindrical; its transverse section being circular or somewhat oval (Fig. 3 *c*). It tapers gradually in passing

* Dalyell, *op. cit.*, p. 192.

upwards, and on reaching a point $\frac{3}{4}$in. from the top of the rachis bends back on itself for a length of about $\frac{1}{8}$in., ending in an extremely slender and flexible thread.

In the second specimen, which has a total length of $5\frac{1}{2}$in., of which the stalk forms the lower 2in., and which has thirty-one leaves on each side of the rachis, each of the larger ones consisting of twelve polypes, the general relations are very similar. The stem is again distinctly quadrangular at the junction of stalk and rachis, its sides being even more decidedly concave than in the former specimen. The quadrangular character is preserved until very near the bottom of the stalk. As before, the stem diminishes in diameter very slowly at first, but rapidly in the last half inch. It extends to the bottom of the stalk, and then turns back on itself for a length of $\frac{1}{8}$in., forming a hook and ending in a very slender thread.

In the rachis the stem becomes cylindrical almost at once, and, unlike the former specimen, slightly increases at first in size, its greatest diameter, 0·047in., being attained about $\frac{1}{2}$in. above the commencement of the rachis. From this point it tapers gradually to its upper end. It extends up as far as the level of the eighth pair of leaves, $\frac{3}{8}$in. from the top, and then bends back on itself, forming a loop about $\frac{1}{4}$in. long, and ending as before in an exceedingly slender thread.

In the Oban specimens we have been able to confirm the above description to a certain extent. Owing to the thinness of the wall of the lower end of the stalk, it is easy to satisfy oneself that the stem extends quite down to the bottom and then turns back on itself for a certain distance; also, that it is thin and flexible at this lower end. In the rachis it is, as shown in Fig. 3 *c*, oval in transverse section; and concerning its extent upwards, it appears, so far as can be determined by external manipulation, to stop about half an inch from the top.

The stem consists of a dense fibrous matrix, in which the fibres are mainly concentric, but partly radial, impregnated with calcareous salts. Unlike *Funiculina*, the central part of the stem is as firmly calcified as the exterior.

The quadrangular character of the stem in the stalk is of interest, as it has hitherto been very generally considered diagnostic of *Funiculina*, which, however, unlike *Pennatula*, preserves the quadrangular form in the rachis as well.

Concerning the proportions of the stem at different parts of its length, the remarks that we have already made when considering *Funiculina** apply also to *Pennatula*, the proportions being precisely those which, mechanically considered, adapt it most perfectly to the erect posture with the stalk planted in the mud of the sea bottom. We shall return to this point further on.

(*To be continued.*)

* *Supra*, pp. 5-6.

MIDLAND UNION OF NATURAL HISTORY SOCIETIES.

THE NOTTINGHAM MEETING OF 1882.

ANNUAL MEETING.

The Fifth Annual Meeting of the Midland Union of Natural History Societies will be held in the Lecture Theatre, at University College, Nottingham, on Thursday, June 15th, at Three o'clock, the President of the Union (Appleby Stephenson, Esq.) in the chair. The business of the Meeting will be to receive the Report of the Council and the Treasurer's Accounts; to fix the place of the next Annual Meeting in 1883; to award the Darwin Medal for the year 1881-2; to consider any suggestions that Members may offer; to discuss the work of the Union during the coming year; and to transact all necessary business. The President will open the Meeting with an Address.

CONVERSAZIONE, &c.

A Conversazione will be held at the Mechanics' Institution, Mansfield Road, Nottingham, on Thursday evening, June 15th. There will be an exhibition of objects of general scientific interest, Microscopy, the various departments of Natural History, Archæology, and Art. Members of Societies in the Union willing to contribute Specimens, or to exhibit or lend Microscopes, will oblige by at once communicating with the Local Secretary, Mr. E. Wilson, 18, Low Pavement, Nottingham, from whom tickets (one shilling each) may also be obtained.

The room of the Literary and Philosophical Society, at the School of Art, Waverley Street, Nottingham, will be opened as a Reception Room for Members of the Union and visitors, and letters may be addressed there. An Arrival Book will lie on the table, and it is hoped that visitors will enter their names and temporary addresses in it for the information of friends who may desire to communicate with them. The Library and Herbarium of the Society will be open to the inspection of Members of the Union.

Local Excursion to the Hemlock Stone, Bramcote, Notts.—On Thursday Morning, June 15th, arrangements will be made for a party to visit the "Hemlock Stone" (a curious isolated rock of that part of the New Red Sandstone formation known as the Keuper Basement Beds), five miles from Nottingham, in conjunction with a party of the Leicester Literary and Philosophical Society. Breaks may be engaged at 2s. 6d. per head to leave Nottingham at 9.30 a.m., arriving in return at 12.0 noon. If a sufficient number send in their names to Mr. E. Wilson (Local Secretary) on or before Saturday, June 10th, he will engage carriages and arrange as to place of starting.

Local Institutions, Manufactures, &c.—On Thursday, June 15th, parties will be formed to visit the Art Museum at Nottingham Castle, which the Curator will show to the visitors; the University College, Laboratories, Natural History Museum, and Free Library, which will be shown by the Professors and the Librarian; the Nottingham School of Art; and one or more Lace Manufactories in the neighbourhood.

THE EXCURSIONS.

On Friday, June 16th, there will be two Excursions, viz: one to Castleton, and the other to Belvoir Castle and district.

The Castleton Party will leave Nottingham by the 9.50 a.m. (M.R.) train for Chapel-en-le-Frith. From Chapel the party will drive to Castleton. The Blue John Cavern, the Windy Knoll Limestone Quarry, and Mam Tor ("The Shivering Mountain") will be called at on the way. At Castleton dinner will be taken at 2.30. The Geological and Archæological Museum, the Peak Cavern, Peveril Castle, and Cave Dale will be here inspected. The party will drive back to Chapel-en-le-Frith, passing through the Gorge of the Winnatts *en route*. Tea will here be taken at Seven o'clock. The return train leaves Chapel at 7.43 (via Derby) for Nottingham, arriving there at 10.52. Tickets, Ten Shillings each, including dinner and tea.

The Belvoir Party will leave Nottingham by the 9.45 a.m. train (G.N.R.) to Elton. Here the Gypsum Pits (with Rhætic above) will be visited. From Elton the party will drive by Redmile to Belvoir, arriving about 11.30. By kind permission of His Grace the Duke of Rutland, the Castle and Grounds will be thrown open to Members of the Midland Union and their friends. The woods, country lanes, and stone quarries in the vicinity will afford matter of interest to the Botanist, Ornithologist, and Geologist, Luncheon will be taken at Two o'clock. At Three o'clock carriages will be ready for Croxton, Waltham, Stonesby, where Lincolnshire Limestone and Upper Lias may be seen. Thence the party will drive to Eastwell Ironstone Pits, and walk to Clawson Cutting to view the Drift. The return train leaves Clawson Station at 7.5 p.m., arriving at Nottingham at 7.50.; or an earlier return may be made by the 4.42 train, arriving at Nottingham at 5.27. Tickets Seven Shillings and Sixpence each, including luncheon.

Tickets must be applied for not later than Saturday, June 10th, and may be procured from Mr. E. Wilson, 18, Low Pavement, Nottingham.

The Nottingham Meeting promises to be a most successful one; the local Societies, including the Nottingham Literary and Philosophical Society, the Nottingham Naturalist's Society, and the Nottingham Working Men's Naturalist's Society, have worked together energetically to arrange the thorough and attractive programme laid down above; several of the other Societies in the Union have made the days of the meeting a leading feature in their fixtures for the year, and we hope to see a meeting of Midland Naturalists worthy of the importance of a Union whose ranks comprise more than 3,000 members.

The new University College will form an admirable centre for the business of the General Meeting, while the spacious rooms of the Mechanics' Institute will give ample space for an interesting and instructive evening and exhibition of scientific objects of every class.

The Excursions will only require fine weather to make them in the highest degree enjoyable. We can promise botanists a rare treat in the Alpine garden and shrubberies at Belvoir Castle; whose galleries contain, too, many magnificent paintings. The excursion to this district will be under the care of Professor Blake, whose new book on "Silurian Cephalopoda" has just appeared.

The Castleton excursion will be led by Messrs. J. J. Harris Teall and E. Wilson, and promises a long and very pleasant day. We trust that many old friends, among the scientific workers of the Midlands will meet at Nottingham, and that many new friendships will be made there.

THE GOLDFINCH (*Carduelis elegans*).*

BY HUGH A. MACPHERSON, B.A.

I propose to read to you to-day a brief *resumé* of the notes which I have collected on the Goldfinch since the reading of my first paper (published in "Midland Naturalist," Vol. IV., p. 225 *et seq.*)

When I passed through Paris, June 2nd, 1881, I found the bird shops well supplied with fine, bright, mature males of this species. About 6 a.m. on June 24th, in the neighbourhood of Clermont, two immature birds passed me on the wing. Shortly afterwards I crept within a yard or two of two old males, feeding hungrily on the seeds of a ragged, yellow daisy. In the neighbourhood of Mont Dore, in Auvergne, to which we proceeded, goldfinches were numerous. They did not appear to breed in the wilder parts of the valley, but only in the immediate vicinity of the village, and on level ground. All requests for the patois names of small birds were met with the remark, "chardonneret," regardless of identity.

Even during the severest noonday heat the male finches sang vigorously to their sitting mates. On July 9th a little greypate strayed from a nest situated in one of the ash trees of our hotel garden. Glancing at the shoulders, I recognised it as a female, and recommended that it should be returned to its parents. As the nestlings of this family grew strong, they constantly fluttered about our garden and the adjoining park. Between July 15th and 20th I daily enjoyed the sight of two other broods in course of learning to fly. It was on July 22nd that we came upon a very large body of goldfinches, engaged in feeding on the seeds of some large thistles on the edge of a cornfield. This occurred at a village where our horses baited, in the wild country between Mont Dore and Clermont. As I followed the goldfinches up and down, they grew timid, and some left the thistles; I counted between twenty and thirty, old and young, sitting in one long row on the telegraph wire above the road. Between this date and August 10th many young broods of goldfinches were to be seen on the south side of the town of Geneva. A tailor showed me a number of nestlings which he had reared by hand. At Interlaken, on August 19th, I saw four (or five) tiny chicks, straining eagerly out of their nest, in anxiety to secure the lion's share. An old bird fed them repeatedly as I stood below; though the branch, at the extremity of which the nest was situated, might easily have been taken from any passing vehicle. The tree selected was a walnut, close to the Hotel Richardt. The only other goldfinch which I saw at Interlaken (and they failed to ascend to our quarters at Beatenberg) was an immature example, which flew past me in Interlaken on August 21. I did not meet with any more goldfinches until September 13, when, during a heavy shower, I came across two old birds and three young ones in a garden at Montreux.

* Read before the Oxfordshire Natural History Society, February 14, 1882.

On September 14 my diary ran: "Such numbers of goldfinches are now feeding on the low thistles that stud much of the Rhone valley, before the river enters the lake. They fly in droves, varying from twenty to thirty, or thereabouts. Some of the males sing in the poplar trees. Food is so abundant that they do not admit a very close approach. Now and then a tiff arises, when they scold one another famously. Occasionally they rise high in the air and wheel *en masse* up and down the valley." Most of these birds appeared to have partially moulted; but on September 28 I stood for a minute or two just under two examples, entirely in nest dress. On October 7 goldfinches were on flight in the neighbourhood of Geneva. The Marché des Oiseaux, on October 9, contained a large number of fresh caught examples, many of which were purchased for importation to England by Mr. Etable, the obliging dealer of Great Portland Street, who happened to transport his birds by the steamer which I myself crossed upon on October 10. At Paris, as also at Geneva, I met with fine white-throated examples, males, obtained in the environs of these two cities.

After returning to England, I saw no goldfinches until November 29, when I observed a single example perched on some teazle growing on the edge of the East Cliff at Eastbourne.

During January, 1882, I examined as many caged examples as possible, from County Limerick, Hereford, and other quarters. Among the Irish birds were a male and a female of the bastard-cheverel variety, the male being as nearly as possible "clean-cut."

In a German male, of great beauty, I noticed the crimson band on the neck, described p. 231, vol. iv., "Midland Naturalist."

With regard to the goldfinch crossing with other native species, I have to report that a hybrid, reared in confinement, between a male goldfinch and a female siskin, was exhibited at the Alexandra Palace Bird Show in October last. This example, the only one which I am aware of as having been produced in England (for it has occurred previously in Germany), exhibited little of the goldfinch tints, and reminded most of those who saw it of a female siskin. Nevertheless, it had also a strong look of the young goldfinch, and may probably become brighter in years to come.

My statement that the goldfinch is "eight or ten weeks" old when it commences to don the bright adult flourish, should probably be rather extended; most young individuals moult in September, though some early birds commence the process in August. With regard to the late habits of nesting, characteristic of the goldfinch, my friend, Mr. J. Young (a member of the "Ibis"), kindly tells me that he found a completed nest on May-day, 1880, when the chaffinches were only beginning to build. He has noticed a preference on the part of this species for ilices. Mr. Aplin kindly suggests that the dark streaks to be seen on the flanks of most "dark" goldfinch males (as, indeed, on some canaries) may be attributed to the wild canary's blood.

The reason why the goldfinch is a favourite in sacred art is, of course, because of its crimson "face," as associated with legends of the Crucifixion. It only remains for me to say how strongly I feel that Members should support the protection which the Act of 1880, with its penalty of £1 per goldfinch, endeavours to preserve this fast decreasing species. Probably upwards of a hundred goldfinches, on a rough computation of my own, were netted during last autumn in the neighbourhood of Oxford, although our bird-catchers complain of the unusual scarcity of this species.

I am happy to say that such has not been the case in Mr. Aplin's neighbourhood. It is certainly much to be regretted that the close season for this charming bird does not extend until the middle or end of October. The great mortality among grey-pates netted in August is one of the chief reasons for the fact that the demand for examples so much exceeds the supply. The bird upon the table before you is a female hybrid between the male goldfinch and female bullfinch. It was reared in confinement, on the outskirts of Oxford, during 1881.*

THE MYXOMYCETES.

BY W. B. GROVE, B.A.,

Hon. Sec. Birmingham Natural History ahd Microscopical Society.

(Continued from page 100.)

AFFINITIES OF THE MYXOMYCETES.

We are now prepared to consider what the affinities of the Myxomycetes are, and it becomes at once apparent that the question, so far from being capable of settlement off-hand, as some would treat it, is really very complex; for the analogies which we can perceive between these organisms and other members of the animal and vegetable world are very numerous and far-reaching. It becomes a question, then, which analogies indicate affinity, and which are merely those apparently accidental resemblances which occur throughout every department of Nature.

The sporangia bear a considerable likeness to those of some Gastromycetous Fungi, especially in the fact that the interior, when mature, is filled with a dusty mass of threads and spores, but as already mentioned the origin of the spores is quite different in the two cases. The sporangia resemble also more remotely the capsules of Mosses and Hepaticæ, while the spiral threads which are mixed with the spores of Trichia remind us of the elaters of the Jungermannieæ; but from these they differ in the fact that the elaters are cells, with a separable spiral coiled within, while the Trichia threads, even if it be

[* Further data on the goldfinch, addressed to Hugh A. Macpherson, Esq., B.A., Oriel College, Oxford, would be thankfully received.—Eds., "Midland Naturalist."]

granted that they are cells, contain no spiral, the appearance being an optical effect produced merely by a rounded spirally-arranged elevation of the outer wall.* The spores also outwardly are like the spores of many other Fungi, but the development of the spore is *sui generis*, and its contents, as soon as they have developed their flagellum, resemble common free-swimming monads, and in their creeping stage, first, the infusorian Mastigamœba, and, secondly, the rhizopod Amœba. Again, we can compare the huge plasmodium formed by their union with the ramifications of the protruded protoplasm of the Foraminifera, in which also the same cyclosis or slow circulation of the contents is observed. It may also be compared, according to Saville Kent, to the homogeneous sarcode which forms the basis of sponge structure, which in the same way is composed, if our authority be correct, by the amalgamation of a vast number of amœbiform units. Moreover, the substance of the threads which occur with the spores, according to the same author, bears some likeness to that of the keratose or horny fibres of the order of Sponges called *Ceratina*, while still more strangely the calcareous deposits in many species simulate those of the order of Sponges called *Calcarea*, and in a few, he says, even assume a regular six-rayed form, reminding one irresistibly of a sponge spicule. But in these respects the author's enthusiasm seem to have outrun his judgment; the threads of the Myxomycetes are not of a very horny nature, nor are the crystals by any means so regular as he would imply.

But, even allowing these resemblances, and that the Sponges belong to the Protozoa, can we find anything in the Protozoa at all comparable to the last spore-bearing stage of the Myxomycetes? Saville Kent answers in the affirmative, and compares it with the encystment of species of Monas and Heteromita, such as has been revealed by the labours of Messrs. Dallinger and Drysdale, a process similar to which, according to Saville Kent's own observations, is very prevalent among the Protozoa, although unknown a few years ago. The chief difference is one of degree, the sporangium in the Myxomycete being formed by the union of a vast number of amœbiform units, and in the Protozoan usually by the combination of a few only. But this difference is bridged over by those species with aggregated plasmodium, described by M. Van Tieghem (supposing them to belong really to the Myxomycetes), where the sporangium is formed at times by a small number of myxamœbæ only.†

The only real distinction‡ between the Animal and the Vegetable Kingdoms (if there be one at all) is founded upon their physiology. Plants possess the power of building up organised substances out of dead matter; animals require ready organised material for their food. Fungi, indeed, resemble animals in this respect, that they usually live

* "Quarterly Journal of Microscopical Science," 1855, pp. 15-21. But the opposite opinion has been maintained; "Transactions of the Linnæan Society," xxi., pp. 221-3, where, however, the figure contradicts the text.

† Van Tieghem, "Bull. Soc. Bot. France," xxvii., pp. 317-22.

‡ Huxley's "Science and Culture," p. 162.

upon the nutriment already elaborated for them in vegetable cells, but that they do possess the characteristic power of plants every yeast cell thriving in Pasteur's solution is a living witness. The Myxomycetes ingest solid particles within their protoplasm, but the quantity of nutriment thus obtained must be very small, and the huge masses, which are sometimes so quickly formed and in such unlikely places,* must depend for their growth chiefly upon inorganic material obtained from the water and the air surrounding them. They are, therefore, plants. But it may be urged that, if so, many monads must be plants also. This may be a "logical consequence," but logical consequences have no terror for the seeker after truth. In the discussion of these questions there is no room for prejudices or personalities; the mind must calmly weigh the evidence, and judge without fear as without favour.

Reviewing then the whole question, we decide at once that the position assigned to the Myxogastres by Fries is quite untenable. In fact, nearly the whole of Berkeley's main classification (adopted in the Handbook) is now out of date, and does not represent the present state of knowledge about the Fungi. Its chief recommendation is that it is easy to understand and apply, but it is in many respects nearly as artificial as was the system of Linnæus in the Phanerogams.

Saville Kent's contention also, that these organisms belong to the Protozoa, is as untenable. He lays the whole stress of his argument upon their mode of development, but it is usually allowed that the true position of any organism is determined by the affinities of its adult condition. He says, that "with those mycologists to whom every spore-capsule is necessarily a fungus, and whose vision is sealed to every organism beyond their special line of research, the Mycetozoa will to the end of time be Fungi still," and although it is to be feared that few mycologists will recognise themselves in that very comprehensive definition as those "to whom every spore-capsule is necessarily a fungus," yet they do for the present believe that they are "Fungi still." But they must place them in a position like that assigned to them in the fourth (German) edition of Sachs' Botany, where they are considered as one of the lowest and most aberrant groups of Fungi, forming equally with the lower Algæ a point of approach to the Protozoa.

FIRST LIST OF THE MYXOMYCETES OF THE NEIGHBOURHOOD OF BIRMINGHAM.

The species are arranged according to the method of Rostafinski, with the synonyms of the "Handbook" added.

1.—*Physarum cinereum* (Batsch.), *Didymium cinereum*, Fr. Sutton, on a decayed, polyporus-covered stump. (See page 99.) Feb.

2.—*P. sinuosum* (Bull.), *Angioridium sinuosum*, Grev. Sutton park, on a dead holly leaf. Sep.

* The Myxomycetes are found usually on rotten wood or other decaying substances, but they seem to be indifferent as to the matrix on which they grow. One species was found on iron which had been heated only a few hours before, another on a leaden tank, another on cinders. See Berkeley's "Introduction to Cryptogamic Botany," p. 310.

3.—*Craterium vulgare*, Ditm., *C. pedunculatum*, Trent. Sutton Park and Olton Reservoir, on dead bramble twigs. Oct.
4.—*C. leucocephalum* (Pers.) Sutton, on dead bark. Jan.
5.—*Tilmadoche nutans* (Pers.), *Physarum nutans*, Pers. Sutton and in Sutton Park, on dead bark Oct., Nov.
6.—*Leocarpus fragilis* (Dicks.), *Diderma vernicosum*, Pers. Sutton Park, on leaves of grass and stems and leaves of bilberry. Sep.
7.—*Didymium squamulosum* (A. and S.), var. *costatum*. Oscott, on dead bark. Jan.
8.—*Chondrioderma difforme* (Pers.), *Diderma cyanescens*, Fr. Sutton and Sutton Park, on dead bark. Oct., Nov.
9.—*Spumaria alba* (Bull.) Sutton, on petioles of coltsfoot. Sep., Oct.
10.—*Stemonitis fusca* (Roth.) Sutton, on dead wood. Sep.
11.—*Comatricha Friesiana* (D By.), *Stemonitis obtusata*, Fr. Sutton, on dead wood and decayed polyporus. Oct.—Jan.
12.—*Enerthenema papillata* (Pers.), *E. elegans*, Bowman, *not* Cooke. Sutton, on rotting wood. Feb.
13.—*Reticularia lycoperdon* (Bull.), *R. umbrina*, Fr. Sutton and Oscott, on logs. Oct., Nov.
14.—*Trichia fallax*, Pers. Sutton, on rotten wood. Oct.—Jan.
15.—*T. varia*, Pers. Sutton, on rotten wood. Aug.—Nov.
16.—*T. varia* (Pers.), var. *nigripes*, *T. nigripes*, Pers. Oscott and Sutton, on rotten wood or bark. Nov.—Jan.
17.—*Prototrichia flagellifera* (B. and Br.), *Trichia* (?) *flagellifer*, B. and Br. Sutton, on rotten wood or bark. Sep., Feb.
18.—*Hemiarcyria rubiformis* (Pers.), *Trichia rubiformis*, Pers. Sutton, on rotten wood. Sep., Oct.
19.—*Arcyria punicea*, Pers. Sutton, on rotten wood. Aug.—Oct.
20.—*A. cinerea* (Bull.), *A. cinerea*, Schum. Sutton, on decorticated branches. Nov.
21.—*A. incarnata*, Pers. Sutton, on rotten wood. Oct., Nov.
22.—*Perichæna corticalis* (Batsch), *P. populina*, Fr. Sutton and Sutton Park, on the inner side of dead bark, often covering a large area. Sep.—Nov.

THE FLORA OF WARWICKSHIRE.

AN ACCOUNT OF THE FLOWERING PLANTS AND FERNS OF THE COUNTY OF WARWICK.

BY JAMES E. BAGNALL.

(Continued from page 112.)

ROSACEÆ—Continued.

RUBUS, continued.

R. corylifolius, *Sm.* *Hazel-leaved Bramble.*
Native: In hedges. Rather common. June to August.
a. sublustris, Lees.
I. Near Sutton; near New Park, Middleton; Marston Green; Hampton-in-Arden; near Shelly Coppice, &c.
II. Folly Lane, near Stoke, *T. Kirk, Herb. Brit. Mus.;* Myton, near Warwick; near Rugby.
b. conjungens, Bab. Local.

I. Sutton Park; named for me from this locality by Professor Babington. Lane near Solihull.

II. Shrewley Common; Stoke Heath; Lutterworth Road, near Coomb Abbey; Dunchurch Road, near Rugby.

c. purpureus, Bab. Locally abundant.

I. Abundant in the lanes about Minworth and Curdworth; lane by Arley Station. A very leafy form of this near Astley.

II. Banbury Road, near Warwick; Hatton; abundant in the Banbury Road, from Stratford to Eatington; bridle road to Luddington.

d. spinosissimus, Blox. Rare.

I. Abundant on a hedge bank in Monkspath Street; Wyken Lane, Coventry.

A form, apparently like Bloxam's specimen of *R. deltoideus*, Müll., in the fasciculus, occurs in a wet lane at Forge Mills.

R. althæifolius, *Host. Mallow-leaved Bramble.*

Native: In hedges. Rare. July, August.

II. Near Coventry, *Rev. A. Blox.;* the specimen in my own herbarium a very unsatisfactory one. Wyken Lane, Coventry, 1880; in a hedge near Salford Bridge, near Bidford; in hedges between Alcester and Great Alne; rough pastures near Honington Hall; Rounshill Lane, Kenilworth; Hearsall Lane, near Coventry.

R. tuberculatus, *Bab. Tubercular Bramble.*

Native: In hedges. Rather rare. July, August.

I. Lane from Solihull Railway Station to Shirley; lane from Three May Poles to Warrener's Heath; lane out of Atherstone Road to Ridge Lane; Little Packington, near the Rectory.

II. Hill Clump, Honington, *F. Townsend.* A form very near this species abundant on the Banbury Road, near Eatington; Old Park, Warwick; Packwood Heath.

A prostrate form on the heathy footways near Marston Green is very near this species.

R. cæsius, *Linn. Dewberry.*

Native: In woods and on banks. Locally abundant. June, July.

a. umbrosus, Reich.

II. Salford, *Rev. J. C.;* Drayton Bushes, named by Professor Babington; near Brinklow; near Princethorpe, Chesterton Wood; Alveston Pastures.

b. tenuis, Bell-Salt.

I. Maxtoke Priory ruins; walls near Maxtoke Churchyard.

II. In a garden at Myton, Warwick; Oversley Hill, near Alcester; Twelve o'clock Riding, Coomb Abbey; Steeple Hill, Bidford.

c. ulmifolius. Presl.

I. Near Bannersley Pool; Monkspath, near Shirley.

II. Hazeler, near Alcester, by the church on the banks of the River Alne; near the tollgate between Alcester and Red Hill; borders of Chesterton Wood; Corley Moor.

d. intermedius, Bab.

II. Lane from Shelfield to Great Alne.

The plant is identical with a specimen from the Rev. A. Bloxam.

GEUM.

G. urbanum, *Linn. Wood Avens.*

Native: On banks, in woods, &c. Common. May to July. Generally distributed.

G. intermedium, *Ehrh.* *Intermediate Avens.*
Native: In damp woods. Very rare. May, June.
II. Chesterton and Ufton Woods, *Y. and B.;* brook, near Honily, *H.B.;* woods, near Coomb Abbey.

G. rivale. *Linn.* *Water Avens.*
Native: In woods and damp hedge banks. Rare. May, June.
I. Arley Wood, *W. T. Bree*, *Mag. Nat. Hist.*, iii., 165. Damp meadows, near Solihull.
II. Near Wilmcote, *Rev. A. Blox;* Chesterton and Ufton Wood! *Y. and B.;* Rowington, *Rev. P. Brodie;* woods, near Coomb Abbey. Abundant.
"In Warwickshire," *Ray Cat.* Purton does not appear to have found this plant in the county.

ROSA.

R. spinosissima, *Linn.* *Common Burnet Rose.*
Native: In hedges and on heath lands. Rather rare. June.
II.—(Var. *flore rubro*, at Guy's Cliff, *Rev. W. T. Bree*, *Purt.*, iii., 44.;) Yarningdale Common; Snitterfield Bushes; Hampton-on-the-Hill; Sherbourn; Norton Lindsay, *H.B.;* Lighthorne; Wellesbourn, *Bolton King.* Arrow Lane; Billesley; Haseler; Oakley.
Var. *b.* with aciculate peduncles. More rare. Chesterton Wood! High Down, near Bishop's Tachbrook; Morton Morrell, *H.B.;* Little Alne.

R. involuta, *Sm.* *Sabine's Rose.*
Native: In hedges and bushy places. Rare. June.
a. Sabini. Woods.
I. Near Hampton-in-Arden.
II. "On high bank, Wood Bevington," *Purt.*, iii., 45.
Near Oakley; Tachbrook; Lye Green, *H.B.*; Chesterton Wood.
b. Doniana. Woods. Very rare.
II. At Allesley! *Rev. W. T. Bree*, *Purt.*, iii., 46: Claverdon, *Bree*, *Mag. Nat. Hist.*, iii., 164; Woodloes, near Warwick! *H.B.*; Coventry Road, near Kenilworth! *H.B.*
[*R. hibernica*, Sm. Several bushes of this plant in Harborough Magna Churchyard, in 1875, which Mr. Bloxam informed me he had grown from seeds.]

R. mollissima, *Willd.* *Soft-leaved Rose.*
Native: In hedges. Rare. June, July.
I. Lane above Hoare Park, Atherstone Road; Meadows near Blythe Bridge, confirmed by Dr. Christ; Wheyporridge Lane, Solihull; near Meriden Shafts.
II. Pophills Lane, *Purt.*, iii., 44; Oakley, *H.B.;* Allesley, *Bolton King!* Wood by canal tunnel, near Tardebig; Arrow Lane.
(*R. villosa.*) Portway between Alcester and Birmingham, *Purt.*, iii., 44.

R. tomentosa, *Sm.* *Downy-leaved Rose.*
Native: In hedges, woods, and bushy places. Local. June, July.
I. Sutton Park; Trickley Coppice; lane from Fillongley to Packington.
I. Allesley; *Bree*, *Mag. Nat. Hist.*, iii., 164.
b. subglobosa, Sm.
I. Coleshill Heath; near Blythe Hall; Trickley Coppice; Four Oaks, near Sutton; near Maxtoke; Bentley Heath.
II. Chesterton Wood, *H.B.;* Arrow Lane; near Exhall.
d. scabriuscula, Sm.

I. Meadow path, Baulk Lane, Berkswell; *fide* Dr. Christ.
II. Chesterton Wood, *H.B.*, *Herb. Brit. Mus.* Haseler Common, *H.B.* Rowington; Pinley Green.

e. sylvestris, Woods. Rare.

I. Near Shustoke.
II. In the churchyard at Harborough Magna and in the Rectory garden, planted by Rev. A. Bloxam; Chesterton Wood! Wellesbourne Hastings! *H.B.;* near Harborough Magna! *Rev. A. Blox.;* lane from Yarningale Common. Dr. Christ refers the specimen from the last four localities to *R. fœtida*, Bast. The plant in the churchyard at Harborough Magna is the true plant; the roots are from North Wales.

Var. *Deseglisei*, from Rugby, and var. *cuspidata*, from near Atherstone, are both in Mr. Bloxam's fasciculus of British Roses. I should refer the specimens I possess to *R. fœtida*, Bast.

R. rubiginosa. *Linn.* *Eglantine*, *Sweet Briar.*
Native: In hedges and bushy places. Rare. June, July.

I. Coleshill Heath; meadow path from Solihull to Blythe Bridge.
II. Alne Hills, above the village, *Purt.*, i., 248: Hampton-on-the-Hill; Crackley Wood, near Kenilworth; Yarningale Common, *H.B.;* Salford Priors, *Rev. J. C.;* Bushy common, Billesley.

R. micrantha, *Sm.* *Small-flowered Sweet Briar.*
Native: In woods and hedges. Local. June, July.

I. Shustoke; lane from Knowle to Hampton-in-Arden; a small neat-leaved form in Wheyporridge lane, Solihull; Coleshill Heath.
II. Between Bidford and the Grange, at Allesley, *Rev. W. T. Bree*, *Purt.*, iii., 40; Norton Lindsay, Chesterton Wood, Morton Morrell, *H.B.;* Bishop's Green, Lighthorne, *Bolton King*; Shortwood Coppice, near Tardebig: Ragley Woods; heathy pastures, Billesley; Drayton Bushes; Oakley: Wroxall; Itchington Holt, abundant.

[*b. Briggsii*, Baker. Two or three bushes of this occur in Harborough Magna churchyard and one bush in the Rectory garden; these are grown from seeds set by the late Rev. A. Bloxam, sent to him by Mr. T. R. A. Briggs! These plants prove that this variety maintains its varietal characters true from seeds.]

c. hystrix, Leman. Very rare.

II. Heathy pastures, Billesley, named for me by Dr. Christ, 1880.

(To be continued.)

MIDLAND UNION OF NATURAL HISTORY SOCIETIES.*

(Continued from page 114.)

The Nottingham Literary and Philosophical Society was founded in 1865, the inaugural meeting being held on the 23rd March of that year. It numbered 207 Members on 1st January, 1881, 90 being Members paying annual subscriptions of 21s., 98 Associates, of whom part pay 15s., and the remainder 10s. annually, and 19 Section-associates, each paying 5s. or 2s. 6d. annually. The ordinary meetings are held every alternate Thursday from the commencement of October to the end of March. Sectional meetings are held in addition. There are two excursions open to all the Members made annually in the summer. Excursions are also made by the sections for field work. Ten papers have peen read before the Society during the past twelve

* The accompanying particulars of the Societies are printed from the Report of the Council presented to the Annual Meeting at Cheltenham, held last year.

months. One of these on "The Permian Formation in the North-East of England," by Mr. Edward Wilson, F.G.S., published in the "Midland Naturalist," to whom the "Darwin Medal" has been awarded. The Society publishes an Annual Report and Proceedings. Dr. T. Appleby Stephenson, Burns Street, Nottingham, is the President, and Mr. A. H. Scott White, B. Sc., B.A., 99, Waterloo Crescent, Nottingham, and Mr. J. J. Harris Teall, M.A., F.G.S., All Saints' Street, Nottingham, are the Honorary Secretaries.

The Nottingham Naturalists' Society was formed in 1851. On 1st January 1881, it consisted of 73 Members, who pay a subscription of 5s. a year. It meets on the first and third Wednesdays in each month; and twelve papers have been read before the Society during the year. It makes one excursion annually. One of its members, Mr. James Shipman, (a frequent and valued contributor to the "Midland Naturalist,") has been engaged in the study of the "Triassic Rocks of Cheshire and their Equivalents at Nottingham," on which subject a Paper was communicated to the Society and published separately. The Society publishes an Annual Report. Dr. Claude Taylor, North Circus Street, Nottingham, is President; and Mr. Levi Lee, Drury Hill, Honorary Secretary. This Society has invited the Union to hold its meeting in 1882 at Nottingham.

The Oswestry and Welshpool Naturalists' Field Club and Archæological Society, formed August, 1857, has thirty-nine Members, who subscribe 5s. each annually. No return has been made as to Meetings. Excursions are made monthly during the summer. Major Barnes, Brookside, Chirk, Ruabon, is President, and the Rev. Oswald M. Feilden, M.A., Frankton Rectory, Oswestry, Hon. Sec.

The Oxfordshire Natural History Society was founded in May, 1880. On 1st January, 1881, it consisted of 40 Members. The annual subscription is 5s. Meetings are held fortnightly and excursions are made about every three weeks during term. During the past twelve months eleven papers have been read before the Society. Most of the Members are actively engaged in the study of some branch of Natural Science. Professor Westwood's work is too well known to need more than a passing reference. The following names and the work which is specially occupying their attention just now will give some idea of the material of which this Society consists: Professor Lawson is engaged on *Algæ;* Mr. Bolton King, *Phanerogamous Plants;* Mr. H. Boswell, *Mosses;* Mr. G. C. Druce, *A Flora of Oxfordshire;* Mr. Macpherson and Mr. Aplin, *Ornithology;* Mr. E. B. Poulton, *Geology.* The Society intends publishing a Report annually. Professor Westwood, F.L.S., Woodstock Road, Oxford, is the President; and Mr. G. C. Druce, F.L.S., 118, High Street, Oxford, is the Hon. Sec.

The Peterborough Natural History, Scientific, and Archæological Society was formed in 1871. It now consists of 112 Members, being a considerable increase during the year. The annual subscription varies—some Members pay 5s., others 10s. 6d., 21s., £3 3s. During the winter the Meetings are bi-monthly; at other times of the year, monthly. Excursions are made weekly all through the summer, and the Bank Holidays are devoted to day excursions. Eight papers have been read before the Society during the past twelve months. From May, 1880, to May, 1881, the Society has made collections within a radius of ten miles (1) of Land and Fresh-water Shells; (2) Plants from the Oxford clay and Fen-lands; (3) a Collection of Water-colour Drawings of British Wild Flowers has been commenced. The Society publishes an Annual Report. The Very Rev. the Dean of Peterborough, The Deanery, Peterborough, is President of the Society, and Mr. J. W. Bodger, 18, Cowgate, Peterborough, Hon. Sec.

THE SEVERN VALLEY NATURALISTS' FIELD CLUB, founded in 1863, held its first Meeting in the month of May of that year at Bridgnorth. It has sixty-seven Members, who pay a subscription of 5s. yearly; a number of Lady Members, who have paid an entrance fee of 5s., and are virtually life Members, (without power of voting;) twelve Honorary Members, and the Officers of seven other Clubs, who are Honorary Members, *ex-officio*. One Meeting is held in the winter for business purposes. Three excursions are made during the summer; of these, two occupy one day each only; the third extends over two or three days. This Club claims to have originated this form of Meeting in 1868, at Llangollen, and has continued the practice every year since. It has recently made a two days' visit to Tewkesbury. Mr. T. Martin Southwell, 57, West Cromwell Road, London, S.W., is President, and Mr. Rowland W. Ralph, Honnington Grange, Newport, Salop, the Hon. Secretary.

THE SHROPSHIRE ARCHÆOLOGICAL AND NATURAL HISTORY SOCIETY was originally formed in 1835, and reorganised in 1877. It has 248 Members, each subscribing 21s. annually, and two Honorary Members. It holds one Meeting and makes one excursion every year. It publishes annually a volume of papers contributed by Members on Archæological subjects mainly. The Right Hon. the Earl of Bradford, Weston Park, Shifnal, is President of the Society, and Mr. F. Goyne, Dogpole, Shrewsbury, the Sec.

THE TAMWORTH NATURAL HISTORY, GEOLOGICAL, AND ANTIQUARIAN SOCIETY was formed in May, 1871, and consists of 128 Members, paying 5s. per annum. A Junior Branch, for young persons under the age of eighteen, has been commenced this year, the subscription being 1s. per annum. Prizes (books) are offered to the juvenile Members, as follows:—*In Geology*—For the best collection of coal measure fossils, with name of locality at which each specimen is obtained. *In Botany*—For the best twelve distinct and rarer local species of dried wild flowers, with date, locality, and name. *In Icthyology*—For the best list of local fish with an account of their habits and habitats. *In Entomology*—For the best life history of any one insect that occurs locally. *In Ornithology*—For the best life history of one bird that occurs locally. *In Zoology*—For the best life history of one wild animal that occurs locally. *In Archæology*—For the best list of distinctive names of Fields, Houses, Lanes, and Brooks in the locality, stating their position. The ordinary meetings of the Society are held bi-monthly: excursions are made twice or thrice a year. Twenty papers have been read before the Society during the past twelve months. No Annual Report is published. The Society has invited the Union to hold its Annual Meeting in 1883 at Tamworth. Mr. W. Lucy, J.P., Tamworth, is the President for this year, and Mr. W. G. Davy, Elford, Tamworth, the Hon. Sec.

Correspondence and Gleanings.

CONCHOLOGY.—On Saturday, May 6th, during an excursion to the Wren's Nest, near Dudley, with the members of the Birmingham Microscopists' and Naturalists' Union, I found one specimen of *Achatina acicula*, a shell that is rare in this district.—J. MADISON.

BEAVERS.—To the European rivers named by Mr. E. de Hamel as still frequented by Beavers the *Elbe* should be added. I saw an account of the capture of one either in 1875 or 1876. It was, as near as I can remember, about 50 miles *below* Dresden; certainly between Dresden and Magdeburg, and I am *nearly* certain above Wittenberg. I think I saw it in the "Illustrierte Zeitung," but am sorry to say I made no note of the occurrence at the time.—J. E. Clark, Bootham, York.

Minerals of the Midlands.—I do not think Mr. Woodward has a record of *Galena*, from the Silurians of South Staffordshire. Mr. C. Cochrane, of Stourbridge (to whom I am indebted for much information respecting the geology of South Staffordshire), has in his collection a fine specimen of this mineral in a block of Silurian Limestone from near Dudley.—W. J. H.

Cambrian Rocks in Warwickshire.—A very interesting and remarkable discovery has lately been made by Professor C. Lapworth and Mr. W. J. Harrison, of Birmingham. All the quartzite rocks which lie between Nuneaton and Hartshill, in Warwickshire, together with a considerable thickness of overlying shaly beds, belong to the Cambrian formation, instead of being millstone grit and coal-measures, as they were mapped by the Government Geological Survey. Midland workers in geology will no longer have to go so far as Wales to examine Cambrian rocks, or to seek for Cambrian fossils, for here, at their very doors, are the oldest positively fossiliferous strata in the world. The beds are being diligently worked, and details of this important discovery will shortly be made public.

Æcidium or Œcidium?—Almost all English botanists write the name of this genus of leaf-fungi with the Æ, while the best French botanists have for several years adopted the correct spelling, Œ. Those who adopt the former spelling give its derivation from *αἰκίζειν*, "to affect injuriously;" but it requires very little knowledge of Greek to see that this etymology is impossible. As a matter of fact, the question is not one which admits of dispute. The original creator of the genus, John Hill, in his "History of Plants," published at London in 1773 (p. 64), indicates the derivation in the following terms:—"Æcidium . . . . we have called this genus, distinguished by its peculiar cells, Æcidium, from the Greek *οἰκίδιον*, *cellula*," i.e., a little room or apartment. Here, it is true, the author or the printer (most probably the latter) has put Æ instead of Œ; I say the printer, because in the index at the end we find Œcidium, and, as every one knows, the index, being printed last, affords the author an opportunity of correcting the typographical errors of the text. The interchange of these digraphs is one of the commonest of printer's errors. Some compiler-botanists would, indeed, regard a typographical mistake of this sort as sacred; but Æcidium cannot come from *οἰκίδιον*, as John Hill says *his* word does; therefore his word was not Æcidium, but Œcidium, a title very applicable to the pustules of these Uredineæ.—See Bull. Soc. Bot. France, 1880, pp. 288-9.—W. B. Grove, B.A.

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—General Meeting, May 2nd. Mr. W. B. Grove presented to the Society, on behalf of Mr. C. B. Plowright, the eminent fungologist of King's Lynn, a collection of ninety Fungi, many of which have been discovered by Mr. Plowright himself since the publication of Cooke's Handbook. The President described his visit to the meeting of the Royal Microscopical Society during the previous week, and some of the chief novelties he had seen there. The Rev. J. E. Vize, M.A., then read a paper on "English Wheat," in which he traced its growth, and the enemies, animal and vegetable, which it has to contend with. He also spoke of the different sorts of wheat, and of the different ways in which the grain can be treated to obtain the various kinds of flour. He advocated strongly the use of semolina flour. The paper was illustrated by specimens of wheat, and the fungi which attack it, and by drawings on the black board. BIOLOGICAL SECTION, May 9th.—Mr. Levick exhibited *Volvox globator*, to show the cilia, and, on behalf of Mr. E. de Hamel, *Fritillaria meleagris*, from Tamworth. Mr. J. E. Bagnall exhibited a number of mosses from St. Mintz and other localities in the Engadine, *Cinclidotus aquaticus*, named by Schimper, and other mosses collected and named by Lorentz; also *Grimmia crinita*, from the only known British station, near Hatton; *Archidium phascoides*, *Tetraplodon mnioides*, *Phascum triquetrum*, and other microscopic objects. Mr. W. B. Grove exhibited *Puccinia malvacearum*, on mallow, from Alvechurch; *Puccinia graminis* (uredo form) on grass, from Barnt Green; *Œcidium urticæ*, from Alvechurch. Mr. C. Pumphrey exhibited *Cardamine pratensis, flore pleno*, a field specimen. Mr. A. W. Wills exhibited a slide of Desmidieæ containing more than fifty distinct species, many new or rare. Mr. J. Morley exhibited *Draparnaldia glomerata* and four slides of Desmidieæ. MICROSCOPICAL GENERAL MEETING, May 16th.—Mr. W. B. Grove exhibited *Aspergillus glaucus*, common blue mould, on bread, to show the spores *in situ*. Mr. J. Morley exhibited *Mesocarpus scalaris*, *Batrachospermum stagnale*, and *B. vagum*. Mr. J. Levick exhibited *Œcistes umbella*, *Tubicolaria naias*, *Melicerta ringens*, *Nassula ornata*, and *Trachelius ovum*. GEOLOGICAL SECTION, May 23rd.—Mr. A. H. Atkins exhibited a pebble from a bed of drift sand near Castle Bromwich, which, as the impressions caused by intense pressure were distinctly visible, tended to prove the derivation of the Drift Beds from the Bunter Conglomerates, as these marks are characteristic of the latter formation. He also showed a piece of blood-red sandstone from Kinver Edge. Mr W. R. Hughes then read, on behalf of Dr Wright, of Cheltenham, a short paper on "Glaciation." His remarks principally referred to glacial striæ and *roches moutonnées* occurring near Oban, and the paper was, in fact, the abstract of an address to the members of the Society on the occasion of their excursion to that place. Mr. A. H. Atkins then gave a short sketch of glacial action in the Midlands, and described some specimens lent by Mr W. J. Harrison to illustrate Dr. Wright's observations. After some remarks by the other members present, a cordial vote of thanks was accorded to Dr Wright for his interesting paper.

BANBURYSHIRE NATURAL HISTORY SOCIETY AND FIELD CLUB.—March 6th. Annual Meeting and Soirée, held in the Council Chamber and adjoining rooms of the Town Hall, which were beautifully decorated with pot flowers, palms, and ferns. A large number of members and their friends were present during the evening. The officers of the Society having been elected, and the reports adopted, the members proceeded to inspect the large and interesting collection of exhibits which had been brought together for the occasion. The Society commences its second session with over seventy members. The Hon. Secretaries for the present session are Mr. E. A. Walford, F.G.S., West Street, Banbury, and Mr. L. Gunn, Grimsbury, Banbury. April 6th.—Monthly Meeting, Mr. T. Beesley, F.C.S., President, in the Chair. The President read his Meteorological Report for February and March. The mean temperature of February was 40·5, being 1·5 above the average; mean height of barometer, 29·842 inches; rain fell on fourteen days, amounting to 2·02 inches. The mean temperature of March was 43·9, being 2·5 above the average; mean height of barometer, 29·684 inches; rain fell on thirteen days, amounting to 1·17 inches; snow and sleet fell on the night of the 25th, to the amount of ·62 inch; fog on seven days, and high winds on a like number. Mr. S. Stutterd, Vice-President, gave a short account of some curious habits of the Humble Bee. He spoke first of its habit of freeing itself from insect pests which had probably accumulated during the winter hibernation. This it did by fixing itself firmly to to a wall by means of its fore legs, and scraping off the incumbrances with its other limbs. He then alluded to the flower *Corydalis solida*, which had so long a spur that few bees could get at the honey which lay at its extremity. The bee solved the difficulty by biting a hole towards the end of the spur, and thence extracting the honey. Mr. O. V. Aplin read a paper on "British Rodents, with some remarks on the order Rodentia." Having pointed out the characteristics of the order, he gave a short account of the British genera and species, alluding especially to those found in the district. He illustrated his remarks with specimens and drawings. The President exhibited specimens of, and made remarks on, the geology of the Banbury streets. He enumerated eight kinds, viz., (1) Quartzites, or "Hartshill Stone;" (2) Basalt; (3) Altered or Weathered Basalt; (4) Syenite; (5) Hornblende Granite; (6) Diorite or Greenstone; and (8) Pebble or Lydite, or Touchstone; and also described the structure and composition of each kind and their various uses. Forms for phenological observations during April were distributed. May 6th.—Field Day. An excursion was made to Edgehill. The members visited on their way the fine old church of Warmington—the exterior of which is principally of later Fourteenth Century or Decorated work, although there are traces of the materials of the preceding (Norman) Church having been rebuilt into the walls. In the churchyard was noticed a gravestone which records the burial on the 24th October, 1642, of Captain Gourdin (Gordon ?) who seems to have been mortally wounded in the battle of the preceding day. Arrived at Edgehill, the party proceeded to botanise in the woods. *Lamium Galeobdolon* was here found in abundance, this being the only locality for it in the district. The "blue bells," which here grow in the greatest profusion, presented a beautiful sight. The "Marlstone" Quarries (long famous for their paving and gravestones) having been reached, a short description of the beds, as well as of the zones of the middle and lower lias "cropping out" on the slope of the hills, was given by the President and General Secretary, and copies of a diagram were distributed. This bed produces, by its weathering, the rich red soil of the north of Oxfordshire, and portions of the adjoining counties. At Edgehill House, the residence of J. N. Godson, Esq., the members and their friends were most hospitably entertained. The interval before tea afforded an opportunity of examining many interesting relics from the battlefield. Of especial interest was a basket-hilted sword, having on the guard a "Saracen's head," the crest of the Earl Lindsay, who was mortally wounded in the battle. A short visit was then paid to the "Red Horse," a rude figure of the animal carved in the sloping turf, and said to commemorate the slaughter of his horse by the Earl of Warwick, at the battle of Towton, fought on Palm Sunday, 1461. Mr. Godson pointed out, as far as the hazy atmosphere would allow, the distant eminences visible from the spot, including a faint glimpse of the Malvern and the Clee hills. A sunset, somewhat hidden by clouds, but of which the rosy tints were of exquisite beauty, closed a most successful day. May 8th.—Monthly Meeting. Mr. T. Beesley, F.C.S., President, in the Chair. Mr. J. E. Littleboy, of the Watford Natural History Society, read a most interesting paper on "The Migration of Birds." He attributed migration to hereditary instinct or impulse, and accounted for southern migration in the autumn by the fact that the birds were compelled to do so by the exigencies of life, and for the northern movement in the spring because the districts to which they resorted were not only their breeding haunts but their natural homes. It was, however, impossible to lay down any hard and fast line in reference to the subject, for contradictions of a difficult kind were met with at every turn. The coast lines were the great means by which migrants found their way, and these they followed. The paper was replete with most interesting and instructive matter bearing on the subject. After some little discussion on the paper, a warm vote of thanks was passed to Mr. Littleboy. Mr. Stutterd exhibited the Plantain Leopards-bane, *Doronicum plantagineum*, Linn. from Upper Boddington, which was new to the district. Forms for phenological observations during the month were distributed.

REPORT ON THE PENNATULIDA COLLECTED IN THE OBAN DREDGING EXCURSION OF THE BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY, JULY, 1881.

BY A. MILNES MARSHALL, M.A., D.SC., PROFESSOR OF ZOOLOGY IN OWENS COLLEGE, AND W. P. MARSHALL, M.I.C.E.

(Continued from page 128.)

3.—*The Polypes and Zooids*—

The differences between the two kinds of individual animals, polypes and zooids, composing the colony, are far more marked in *Pennatula* than in *Funiculina*, owing mainly to the fact that instead of both polypes and zooids being inserted separately into the rachis, the polypes are fused together to form the leaves, while the zooids, as in *Funiculina*, are planted independently of one another.

The structure of one of these leaves is shown in Fig. 3. Each leaf is triangular in shape, having a short base by which it is attached to the side of the rachis, and long dorsal and ventral borders. The leaf consists of a number of polypes placed side by side and fused together along nearly the whole of their length, the distal or mouth ends along being free. It is important to realise this fully, and to avoid the very common error of speaking of the polypes as "borne on or by the leaves." The leaves simply consist of the polypes, each one of which is directly attached to the rachis.

The free or oral ends of the polypes are situated along the dorsal border of the leaf; and each polype, as is clearly shown in Fig. 3, extends down to the rachis and is separately inserted into it. The consequence of this is that the several polypes composing a leaf are of very different lengths, the ones whose mouths are nearest the median plane of the whole *Pennatula* being very short, while those whose mouths are at or near the apex of the leaf are of very great length.

It will further be seen from the figure that while the base of the triangular leaf is formed by the lower ends or bases of the several polypes, and the dorsal border by their free oral ends, the ventral border is formed exclusively by the most ventrally situated of the component polypes, which is also the longest of the whole set. The dorsal and ventral borders of the leaf are not quite straight, but curved as shown in the figure.

The number of leaves in the male specimen is thirty-six on either side, and in the female thirty-four. The leaves are not arranged strictly in pairs on the opposite sides of the rachis; at certain parts they may be so paired, while in others they alternate regularly. The successive leaves are, as shown in Figs. 1 and 2, placed very close together, their bases being separated by only a thin strip of the side of the rachis, less than half the thickness of a leaf.

As already noticed, and as shown in Figs. 1 and 2, the leaves are not all of the same size; the largest, which have a length of $\frac{7}{8}$in. in the female specimen, being situated in it a little below the middle of the rachis, but in the male specimen a little above this point. This difference in the position of the largest leaves causes a characteristic difference in the general shape and appearance of the two specimens; a difference which may possibly prove to be an external sexual distinction, though we have as yet no further evidence in support of this suggestion.

The number of component polypes varies, as already noticed, with the length of the leaf; the maximum number, fifteen in the male and twelve in the female specimen, being only found in the leaves about the middle of the series.

The base of each leaf extends very nearly, but not quite, to the mid-dorsal line of the rachis (Fig. 3). The most dorsally situated polype of each leaf, which we have seen is also the shortest, usually projects over towards the opposite side beyond the middle line (Fig. 3), and these dorsal zooids projecting across the middle line alternately from either side give rise to the zigzag appearance seen down the mid-dorsal line in Fig. 1.

Concerning the mode of development of the leaves we have noticed the following points. The most dorsally situated polype of a leaf is very often decidedly smaller than the other polypes, and this is especially the case in small and apparently young specimens. Towards both top and bottom of the rachis the leaves are smaller, and consist of fewer polypes than in the middle portion; but between the top and bottom leaves there is this difference: in the top leaves all the polypes are large, fully formed, and of equal size; but in the leaves at the bottom of the rachis all the polypes are below the average size, the dorsal ones are the smallest of all, and may be rudimentary, while the more ventrally situated ones gradually increase in size, and the largest of all is the most ventral one.

From these facts we conclude (1) that in the development of each leaf the ventral polypes are formed first, and the others in succession, one above the other, so that the the ventral polype of a leaf is not only always the longest but also always the oldest, while the most dorsally situated one is both the shortest and the youngest. Each polype is thus at the time of its first appearance the most dorsal one of the leaf to which it belongs, and becomes subsequently pushed down towards the ventral surface by the formation of younger ones still more dorsally situated, space being provided for these new ones by the lateral growth of the rachis itself. This view also explains the fact, noticed above, that the most dorsal polype of each leaf projects across the middle line over to the opposite side, this being the only direction in which its growth is not opposed by neighbouring polypes. (2) That the uppermost leaves are the first-formed ones, and therefore the oldest, and that new leaves are formed at the bottom of the rachis below the previously-formed ones, the lowest leaf being always the youngest.

These conclusions agree completely with what we have said already concerning *Funiculina*, in which, as in *Pennatula*, development of the polypes appears to proceed from the dorsal towards the ventral surface, and from below upwards, the ventral polypes being always the biggest and oldest, and the dorsal ones the smallest and youngest.

The zooids, or rudimentary asexual individuals, cover as already noticed the whole ventral surface of the rachis excepting the median groove, which is often barely perceptible in the upper half of the Pen. They also extend up the sides of the rachis, between the bases of the leaves (Fig. 3 *e*), and form on the dorsal surface little clusters between each pair of leaves. The zooids exactly reverse the arrangement we have found to hold among the polypes, the ventral zooids being the smallest, and the dorsal clusters invariably the largest. In the case of the younger leaves these dorsal zooids are not much smaller than the youngest, or most dorsal polypes, and it is possible that they may develope into them, as we have supposed to occur in *Funiculina*. We have not, however, had sufficient material at our disposal to enable us to determine this point.

4.—*Anatomy of the Polypes.*

The polypes of *Pennatula* agree in all essential features with those of *Funiculina* already described,* the differences, which are of merely secondary importance, being due mainly to the fusion of the polypes to form leaves in *Pennatula*.

The structure of the polypes is shown in Figs. 3, 4, and 5; Fig. 3 representing a whole leaf, with its component polypes; Fig. 4, a longitudinal section through one polype taken along the line AA in Fig. 3 vertically to the surface of the leaf; whilst Fig. 5 represents a transverse section of the leaf along the line BB in Fig. 3, the section cutting the six most ventrally-situated polypes of the leaf at different points of their length.

We propose now to consider the several parts of the polype, taking them in the same order as in the description of *Funiculina*.

a. The Body-wall consists, as in *Funiculina*, of a firm gelatinous mesoderm (Fig. 5 *x*), clothed on its outer and inner surfaces by ectoderm, *w*, and endoderm, *y*, respectively. The mesoderm, and therefore the body-wall of which it forms the greater part of the substance, is thinner than in *Funiculina*, from which it differs further in being very thickly beset with the characteristic red calcareous spicules (Figs. 3, 4, 5 *i*). These spicules are of very various sizes and placed in different directions, though usually with their long axes more or less parallel to that of the polypes; their shape and other characters will be described further on.

The partition walls between the several polypes of a leaf have the same structure as the external body-wall, but are very much thinner, the mesoderm being hardly thicker than the cellular endoderm

* *Supra*, pp. 25—36.

clothing it; they are also devoid of spicules (Fig. 5). These partitions are, so far as we have been able to determine, imperforate, so that the body cavities of the several polypes are completely separated from one another, and in this respect our observations accord with those of Kölliker on *Pennatula*, though in the allied genus *Pteroeides* he has shown that wide apertures exist in the septa, thus placing the polypes in direct communication with one another

The bottom of the polype cavity is separated from the dorsal or lateral canal of the rachis by a very thin wall (Figs. 3 and 4), and the cavities of the ventral polypes appear to communicate with the meshes of the spongy connective-tissue of the rachis-wall.

The free oral ends of the polypes have thicker walls than the parts which are fused to form the leaf; and these free ends are strengthened by numerous very large and stout spicules, whose direction is mainly longitudinal.

The longitudinal muscles of the rachis are not prolonged into the leaves, the muscular system of which is extremely feebly developed.

b. The Calyx.—As in *Funiculina*, the calyx (Figs. 3 and 4 *g h*,) is produced into eight hollow processes, alternating with the tentacles. These processes are longer and more pointed than in *Funiculina*, and are stiffened by very numerous spicules, many of which are of very large size; indeed the spicules are both more abundant and of greater size in the calyx than in any other part of the polype. In most of the polypes the ends of the spicules project freely beyond the ends of the processes for a short distance; but this condition is almost certainly to be ascribed to the action of the spirit in which the specimens are preserved having caused the fleshy body substance to contract and so leave the ends of the spicules bare.

When the polypes are retracted, the calyx processes are by the action of the retractor muscles (Fig. 6 *p*) pulled in towards one another, and meeting in the middle form a pointed conical cover completely protecting the entrance to the polype cavity (Fig. 3.)

The calcareous spicules, which form so characteristic an element in the structure of *Pennatula*, may be described here. They occur in great numbers along the whole length of both upper and under surfaces of the leaves, being more closely placed along the lines of division between the component polypes (Fig. 5) than at the intervening portions. In the free oral ends of the polypes, and especially in the calices, they are far more numerous than in other parts of the polypes, being set so close together as to be almost in contact with one another.

They are also, as we have seen, exceedingly abundant in the dermis of both stalk and rachis.

The spicules, which are always mesodermal structures, vary much in size in different places. They are straight rods, about twenty times as long as they are wide. In the polypes the smallest spicules have a length of about 0·005in., while the largest ones measure 0·046in. long by 0·002in. wide, the average length being about 0·015in. The transverse section varies in shape according to the size of the spicules. The smaller spicules are, as shown in Fig. 6, very distinctly triradiate, but of a heavier and less elegant pattern than in *Funiculina* (*c f*, Plate I., Fig. 9). In the larger spicules the grooves between the ribs are filled up more or less completely, as shown in Fig. 7, while the largest spicules of all have entirely lost the triradiate character, and are circular in section. This relation between the size of the spicules and their shape in tranverse section appears to be a very constant one, so that for each length of spicule there is a characteristic shape in section, which is rarely departed from to any considerable extent.

The spicules are not unfrequently rather wider in the middle than towards the ends, which latter are slightly rounded off. As already stated, the spicules are bright red, the red colour of the leaves and rachis being due entirely to them.

c. The *Tentacles*, as in *Funiculina*, are eight hollow processes of the body-wall placed round the mouth, and bearing on each side a row of from ten to fifteen hollow pinnules (Fig. 6, *f*). The tentacles are shown in transverse section near to their bases in the uppermost section of Fig. 5, which shows their structure at this part. Each consists of an outer layer or ectoderm, with abundant thread-cells or nematocysts; an endoderm lining the central canal, and continuous with the endoderm of the body-cavity; and a mesoderm, which at the sides and inner surface of the tentacle is thin, as in *Funiculina*, and consists principally of a layer of longitudinal muscles, with an inner much weaker layer of circular muscle-fibres. At the outer side of the tentacle the mesoderm (Fig. 5) is very much thicker, and resembles in structure the mesoderm of the body-wall, consisting, in addition to an outer layer of longitudinal muscles, of a gelatinous connective-tissue matrix in which are embedded a number of calcareous spicules (Fig. 5, *i*).

The pinnules are at the lower end of the tentacle rather long, thin, and some distance apart; towards the upper end they become thicker and more closely set together. Their cavities open into the central cavity of the tentacle, and their structure is the same as that of the tentacle itself. They may even contain small calcareous spicules.

d. *The Stomach*, as seen in Figs. 4 and 5, is very similar to that of *Funiculina*. It is short, and is entirely contained in the free portion of the polype. Its walls are thrown into transverse folds, which, when the polype is retracted, are approximated like the folds of a concertina so as to reduce the stomach to less than half its normal length.

The walls of the stomach agree in structure with those of *Funiculina*, consisting of a thin glandular lining membrane or ectoderm, which is distinctly ciliated, a thin connective-tissue mesodermal layer, and a moderately thick outer or endodermal layer, containing numerous spherical highly refractive granules similar to those described in *Funiculina*.

e. The Mesenteries, Figs. 4 and 5 *o*, eight in number, connect the stomach to the body wall, and extend below the stomach the whole length of the polype, right down to the rachis. They may be divided into a set of two, situated on the upper surface of the leaves, and bearing below the stomach the long mesenterial filaments *s*; and a set of six which bear the short mesenterial filaments *r*, and of which two are attached to the under surface of the leaf, two to the dorsal wall of the polype, and two to the ventral wall.

Around the stomach the eight mesenteries are arranged at nearly equal intervals, as shown in the second section of Fig. 5; but even here it will be noticed that the mesenteries are rather closer together toward the right-hand side of the figure, corresponding to the lower surface of the leaf, than they are on the left-hand side of the figure, or upper surface of the leaf.

Below the stomach, this asymmetry becomes still more marked, the set of six mesenteries becoming crowded together towards the under side of the leaf, while the two upper mesenteries, bearing the long mesenterial filaments *s*, move slightly away from one another, and become situated as shown in the lower section of Fig. 5, close to the partitions dividing the polype from its neighbours on either side.

Still nearer the rachis, *i.e.*, below the lower end of the short mesenterial filaments, the six mesenteries become more irregularly arranged; they now form (*vide* Fig. 4 *o* and the three lower sections in Fig. 5 *o*) very small longitudinal ridges, only projecting a very short way into the cavity of the polype; as a rule, three of the six are situated on the under surface of the leaf, owing to one of the lateral ones shifting its attachment from the side to the under surface. This arrangement, which is acquired shortly below the lower end of the short mesenterial filaments (Fig. 4 *r*) persists down to the bottom of the polype cavity.

The structure of the mesenteries and the arrangement of their muscular system is the same as in *Funiculina*. The retractor muscles of the polype—Figs. 4 and 5 *p*—arise from the body wall and run up in the mesenteries to be inserted into the mesodermal layer of the stomach; while the protractor muscles—Fig. 4 *q*—which are much feebler, arise from the upper part of the sides of the body, and running downwards and inwards in the mesenteries, are inserted, like the retractors, into the stomach wall.

As shown in the second section of Fig. 5, the protractor muscles are situated on one face only of the mesenteries, and a comparison of this figure with Fig. 13 of Plate II. will show that the actual arrangement is the same as in *Funiculina*. The two upper mesenteries, which bear below the stomach the long mesenterial filaments, and are situated on the left hand side of both the figures referred to, have the retractor muscles on the sides facing away from one another; the two opposite mesenteries, those on the lower surface of the leaf and the right hand side of the figures, have the retractor muscles on the sides facing one another, while the intermediate or dorsal and ventral mesenteries bear the muscles on their right hand sides in the figures.

It is clear therefore, that as in *Funiculina*, there is only one bisecting plane that will divide the polype into two perfectly symmetrical halves, and it is also evident from Figs. 3 and 5, and from the description given above that the *plane of symmetry* is perpendicular to the flat surface of the leaf, and is therefore the plane of section adopted in Fig. 4.

The retractor muscles pull back the bases of the tentacles at the same time shortening the stomach, as described above, so as to make room for them; the completion of the retraction of the tentacles is effected by their own intrinsic system of longitudinal muscles; and the final action of the great retractor muscles is by pulling on the bases of the calyx processes to bring these towards one another and so completely close the mouth of the polype cup.

(To be continued.)

MIDLAND UNION OF NATURAL HISTORY SOCIETIES.

NOTTINGHAM MEETING, JUNE 15TH, 1882.

The Fifth Annual Meeting of the Union was held in the University College, Nottingham, on Thursday, the 15th of June. The Council of the Union assembled at half-past Twelve, when delegates were present representing fourteen Societies. Various Reports were received and considered; the Nottingham G. R. S. Naturalists' Society was formally admitted to the Union; and the invitation from Tamworth, to meet there in 1883, was accepted.

The Annual General Meeting was held in the Lecture Theatre of the College, at Three o'clock, the President of the Union (Dr. Appleby Stephenson) in the chair. Among those present at the Council Meeting and General Meeting, were Messrs. H. R. Hind and C. O'Sullivan (Burton-on-Trent), S. J. Newman and C. E. Crick (Northampton), C. T. Musson and B. S. Dodd (Nottingham Naturalists' Society), Rev. O. M. Feilden (Oswestry), Rev. Provost Warmoll and F. W. Crick (Bedford), F. T. Mott and Geo. Hull (Leicester), Horace Pearce (Stourbridge), J. Levick (Birmingham), E. D. de Hamel (Hon. Treasurer), Dr. Colin Campbell and T. Cooke (Tamworth), G. B. Rothera and Rev. Dr. Dixon (Nottingham L. & P. Society), Dr. A. C. Taylor, C. Wheatley, Dr. White, Dr. Ransom, Rev. J. F. McCallan, J. P. Briscoe, W. Rigby, C. Perry, J. T. Jepson, N. Allen, H. Blandy, E. G. Gordon, E. M. Kidd, &c., and the Hon. Secs. of the Union, W. J. Harrison (Birmingham) and E. Wilson (Nottingham).

The minutes of the Cheltenham Meeting of June 16th, 1881, having been read and confirmed, the PRESIDENT delivered his Address (which will appear in the next number of the *Midland Naturalist*).

Mr. E. D. DE HAMEL proposed, Mr. H. PEARCE F.L.S., F.G.S., seconded, and it was unanimously resolved "That the thanks of this Meeting be given to Appleby Stephenson, Esq., M.D., for his able and interesting Address, and that it be printed in the *Midland Naturalist*."

Mr. W. J. Harrison then read the

REPORT OF THE COUNCIL.

The history of the Union during the past year has been a comparatively uneventful one. No society has seceded, and but one additional society—the Nottingham G. R. S. Naturalists' Society—has been admitted to the Union. The name of the Derbyshire Naturalists' Society has been removed from the following list, since it appears to have ceased to exist. The total number of Societies in the Union is now twenty-five, including—

Banburyshire Natural History Society.
Bedfordshire Natural History Society and Field Club.
Birmingham Microscopists' and Naturalists' Union.
Birmingham Natural History and Microscopical Society.
Birmingham Philosophical Society.
Birmingham and Midland Institute Scientific Society.
Birmingham School Natural History Society.
Burton-on-Trent Natural History and Archæological Society.
Caradoc Field Club.
Cheltenham Natural Science Society.
Dudley and Midland Geological and Scientific Society and Field Club.
Evesham Field Naturalists' Club.
Leicester Literary and Philosophical Society.
Northamptonshire Natural History Society.
Nottingham Literary and Philosophical Society.
Nottingham Naturalists' Society.
Nottingham Working Men's Naturalists' Society.
Nottingham G. R. S. Naturalists' Society.
Oswestry and Welshpool Naturalists' Field Club.
Oxfordshire Natural History Society.
Peterborough Natural History and Scientific Society.
Severn Valley Naturalists' Field Club.
Shropshire Archæological and Natural History Society.
Stroud Natural History Society.
Tamworth Natural History, Geological, and Antiquarian Society.

It is impossible to give here a complete resumé of the work done by each Society during the year, interesting as such a record would be, partly because of the length to which it would extend, and partly because of the failure of the Secretaries of many of the Societies to furnish any particulars whatever of the work of their Society. The post of Hon. Secretary of a local Natural History or Literary Society is one which involves a great deal of trouble without much recompense, but it should certainly be considered as entailing on the holder the necessity of writing a reply after not less than, say, *three* applications from the governing body of the Union to which the said Local Secretary's Society is supposed to belong. A full account of the position, number of members, officers, and general or detailed work of each Society in the Union, was, however, given in the last Report, and has been published in the *Midland Naturalist.*

All, or nearly all, the Societies belonging to the Midland Union have held field meetings during the summer, when practical botanical, zoological, or geological work was carried out. Probably much more might be done at these field meetings if they were carried out on some definite plan, with some definite objects, and if the aid of experts (whose expenses should, of course, be defrayed) could be secured, to give short, practical demonstrations.

During the winter evenings, lectures, and the exhibition and explanation of specimens, with an occasional conversazione, have continued and supplemented the work of the summer months. Here again, an interchange of lectures would be beneficial in many ways; the Council would request that all gentlemen who are willing to read papers, or give lectures, should send in their names to the Hon. Sec. of the Union, who would keep a register of them and communicate a list to the local Secretaries.

By five or six of the Societies the evening lectures have been organized so as to form a course on some branch of Natural History; or such a connected course, of a simple and elementary character, has been given in addition to the regular evening meetings of the Society; in this manner courses on Geology have been delivered to the Geological Section of the Birmingham Natural History Society, and to the Evesham Field Club, a course on the Invertebrata to the Cheltenham Natural Science Society, etc. The success of these courses depends largely on their being couched in clear and simple language, and on their being well illustrated by specimens, diagrams, and the microscope; it is not necessary, indeed it is almost impossible, that the whole of the course should be given by one person; but by six or eight members joining together the toil is lessened while the sum of the knowledge given forth remains the same.

The Council notice with approval a plan for the encouragement of field-work, which has been adopted by the Northamptonshire Naturalists' Society. Each working member is provided with a card, stating that the bearer is a member of the Society, and that permission has been given by the landowners of the district (whose names are printed on the card) to pass over and examine their demesnes for scientific purposes. The Council think that this plan might be more generally adopted, as keepers and others naturally look with suspicion upon casual visitors.

Botany.—Two local floras are preparing for publication; Mr. Bagnall's *Flora of Warwickshire* has been appearing for some time in the pages of the *Midland Naturalist.* If a sufficient number of subscribers can be obtained it is proposed to publish this valuable work in a separate form; it will constitute a volume of about 450 pages.

The *Flora of Leicestershire* is being prepared by a Committee of the Leicester Literary and Philosophical Society, mainly under the direction of Mr. F. T. Mott. It is impossible to value too highly the publication of carefully prepared local lists, such as these two books will be. They will not only throw light on many botanical problems of great interest, but they will furnish an aid to local workers and give a stimulus to local work, which should cause us to prize them highly. It is much to be desired that a flora of each county within the limits of the Midland Union should be carefully worked out.

Geology.—The problem of the Glacial drift continues to prove itself one of the most difficult questions in geology. Probably local workers will do better to attack it piece-meal, or by sections, rather than to attempt its consideration as a whole at once. The existence, dimensions, &c., of large boulders is a point of great interest, and one which it is comparatively simple and easy to work out.

During the year the quartzite pebbles which form so remarkable a feature in the drift between the Thames Valley on the south and the Pennine Range on the north, have been in part investigated;* they

* "On the Quartzite Pebbles found in the Drift and in the Trias of the Midlands, and on their probable derivation." By W. Jerome Harrison, F.G.S., in the Proceedings of the Birmingham Philosophical Society, Vol. II.

have been found to be, to some extent, fossiliferous and to be derived from the Bunter Conglomerate, which latter formation is derived from a ridge of old land which extended from the Malverns to Charnwood Forest. Vestiges of this old land occur not only in Charnwood and the Malverns, but in the Hartshill Range of Warwickshire, and the Lickey Hills of Worcestershire; rocks of Cambrian and Pre-Cambrian age have quite recently been detected in both these localities; rocks which had been wrongly mapped by the Geological Survey as Upper Silurians, Millstone Grit, and even as coal measures! It is most clear that the Government map should be very closely scrutinized and regarded with a "healthy scepticism" instead of the implicit acceptance with with it has hitherto been received. The neighbourhood of Nottingham has shown the same thing; the able and long continued researches of Mr. James Shipman having enabled him to correct in many points the work of the Survey, and to construct the large-scale geological map of the town and neighbourhood which is exhibited at this meeting.

Although in other branches of science less marked discoveries have been made, yet the progress has been satisfactory. In Entomology many beetles new to the Midlands, and one or two species which are probably new altogether, have been found by Mr. W. G. Blatch.

The organ of the Union—*The Midland Naturalist*—has been issued with regularity during the year, and has maintained the high place in local scientific literature which it assumed on the appearance of the first number. It cannot be doubted that in future years the value of perfect sets of *The Midland Naturalist* to all scientific workers in the Midlands will be very great. It is greatly to be regretted that this Journal is not better supported by the members of the societies whose official organ it purports to be; the army of grumblers is very large, but the number of those who render active aid of any kind is very small, and the whole burden devolves, and has devolved from the beginning, upon a few willing shoulders. The more important papers published during the year include "The Desmidieæ of North Wales," by *A. W. Wills*, "Flora of Warwickshire," by *J. E. Bagnall*, "Entomological Rambles," by *W. G. Blatch*, "Minerals of the Midlands," by *C. J. Woodward*, "Meteorology of the Months," by *C. L. Wragge*, "The Permian Formation," by *E. Wilson*, "Ancient Inhabitants of the Cotswolds," by *H. Bird*, "A Nest-building Fish," by *Silvanus Wilkins*, "Migratory Birds," by *O. V. Aplin*, "The Archæan Rocks," by *Dr. C. Callaway*, "The Goldfinch," by *H. A. Macpherson*, "Fresh-water Aquaria," by *R. M. Lloyd*, "Study of Fungi," by *Dr. M. C. Cooke*, "Birds of Leicestershire," by *T. Macaulay*, "Note on *Bopyrus Squillarum*," by *W. R. Hughes*, "Report on *Pennatulida*," by the *Messrs. Marshall*, "The *Myxomycetes*," by *W. B. Grove*, "Beavers and the Bute Beavery," by *E. D. De Hamel*, "Derbyshire Land and Freshwater Shells," by *Rev. H. Milnes*, &c., &c. Mr. W. J. Harrison has written several reviews of scientific works for the Magazine.

Darwin Prize.—The award of the first Darwin Medal was made known at the fourth annual meeting of the Union, at Cheltenham, in 1881. The medal could not be presented at that meeting, as the dies were not ready, but the delay is not to be regretted, since, as the medal was won by a Nottingham geologist—Mr. E. Wilson, F.G.S., —there is a peculiar appropriateness in its actual presentation to that gentleman taking place at the present meeting.

The subject of the Darwin Prize for 1882 was Biology. This subject is such an extremely wide and comprehensive one, and the difficulty of comparing papers on botanical subjects with papers on zoological questions is so great, that it has been decided to separate the subject of Biology into the two branches of Zoology and Botany, and to make each of these the subject for a year's work. The Darwin Medal will, therefore, be awarded in

1882 for Zoology,
1883 ,, Archæology,
1884 ,, Botany,
1885 ,, Geology.

It has also been decided that all papers shall be eligible for the medal which have been sent in for publication in the *Midland Naturalist* since the expiration of the last term for which a medal was awarded for the same subject. For example, any paper on Geology received between March 31st, 1881, and March 31st, 1885, will be considered in awarding the Darwin Medal for 1885.

At a meeting of the Management Committee of the Union, held in the Room of the Natural History and Microscopical Society, at Mason College, Birmingham, the following gentlemen were requested to act as adjudicators of the Darwin Medal for 1882:—

Prof. T. W. Bridge, M.A.
H. J. Carter, Esq., F.R.S.
Dr. Spencer Cobbold, F.R.S.
Rev. W. Houghton, F.L.S.
G. B. Rothera, Esq.

and Mr. W. J. Harrison, F.G.S., was requested to act as Secretary to the adjudicators.

The Council has received from Mr. Harrison the following report:—

Report of the Adjudicators of the Darwin Medal, 1882.

The adjudicators have great pleasure in awarding the Darwin Gold Medal for Zoology to Prof. A. M. Marshall, M.A., M.D., D.Sc., and W. P. Marshall, M.I.C.E., for their paper on the "Pennatulida," now appearing in the magazine which is the organ of the Union—*The Midland Naturalist.*

Each adjudicator made a searching and minute enquiry into the work submitted for their consideration, and the following extracts from their individual reports will indicate the care and thought bestowed by them upon the matter.

Dr. Spencer Cobbold, F.R.S., writes:—"Considering the work done, I deemed it only fair that a prolonged and careful scrutiny should be made. I assign to the paper on the "Pennatulida," by Prof. A. M. Marshall, 100 marks. From the plan I have adopted it will be understood that the acquisition of 100 marks implies that this memoir is regarded by me as a practically, if not an absolutely, perfect paper of its kind."

H. J. Carter, Esq., F.R.S., remarks:—"As to the "Pennatulida" paper by the Messrs. Marshall, this, in point of arrangement, description, and illustration, is a very excellent and instructive contribution.

Prof. T. W. Bridge, M.A., states that "The paper by Prof. Marshall and Mr. W. P. Marshall on the "Pennatulida" is an able, admirably ilustrated paper, and contains several important additions to our knowledge of an interesting, but comparatively little-known group of animal forms. After quoting Kölliker's scheme for the classification of the group, the authors give (1) a brief general account of the species, (2) an anatomical description, which includes an account of the mechanical properties of the skeleton, the anatomy and histology of the cœnenchyma and polypes, and the polymorphism of the zooids. Reference is then made to the other existing species of Funiculina, and the paper concludes with a discussion of the zoological position and affinities, the history and literature, the geographical distribution of the genus, with a brief note on specimens in the various English Museums. The paper is an exceedingly complete and useful compilation of the salient features in the anatomy, histology, geographical distribution, and affinities of a rare and interesting "Pennatulid." The beautiful plates accompanying the letterpress are original; moreover they are of considerable value, inasmuch as they supplement the incomplete and often inaccurate figures given by Kölliker in his classical work on the "Pennatulida." The paper also proves that *Funiculina quadrangularis* is not confined to the Mediterranean Sea and Scandinavia, as stated by Verrill and Gray, but is to be also regarded as a Scotch species. I regard the authors of this paper as fully deserving the award of the Darwin Medal."

The Rev. W. Houghton, F.L.S., etc., believes "that the Darwin Medal, bestowed annually, is doing much to promote investigation and observation among the members of the Midland Union of Natural History Societies." He adds that "the paper on the "Pennatulida" is a valuable contribution to our knowledge, and displays an excellent method of scientific treatment."

G. B. Rothera, Esq., places Professor Marshall's paper "in the rank of those which serve to illustrate more completely the methods and aims of science, by tracing out the evolution of the organism and its relation to its environment: of this paper (on the "Pennatulida") it would be almost impossible to speak in terms of too high praise, and I consider it in every sense deserving of the Darwin Medal."

The Council, therefore, recommend that the Darwin Medal for Zoology (1882) be awarded to the Messrs. Marshall, and they congratulate the members upon the reception of so valuable a contribution to zoological literature as the paper on the *Pennatulida* to which the Gold Medal has been awarded.

The death of the famous naturalist after whom the Darwin Prize was named, must be recorded here in terms of the deepest regret. Mr. Darwin strongly approved of the scheme of the Midland Union, and was one of the first subscribers to the *Midland Naturalist*. He entirely approved of the scheme according to which the Darwin Prize was to be awarded, and expressed great pleasure at its establishment. Your Council believe that the permanent endowment of the Darwin Prize and Medal would form a most fitting memorial of this great naturalist, who may fitly be called "The Shakespeare of Science." If we despair at his loss, knowing that "none but himself could be his parallel," we may be comforted by reflecting that "he was not for an age, but for all time," for he has left us in his books a monument of insight and patient research which will aid and encourage every subsequent worker in the field of natural science. The sum required to endow the Darwin Medal would be about £250, and for such an object it is believed this sum could be readily raised. The Societies in large towns might each give a conversazione for this object, at which the work of Darwin should be specially illustrated, and the funds derived from the sale of admission tickets be devoted to the "Darwin Memorial" here proposed.

The Mason Science College, Birmingham.—Allusion has been made to this valuable institution in each of the last two reports of the Council. It is gratifying to learn that the number of students continues to show a regular and rapid increase, the number on the books for the present term being 197. The Medical Students of the Queen's College, Birmingham, now receive their scientific training in Chemistry, Physiology, and Botany, at the Mason College, an arrangement which is greatly to the advantage of both Institutions.

Mr. Hillhouse, B.A., of Cambridge, has been appointed Professor of Botany, and the class in this subject has made an excellent start. Professor Lapworth has established a practical class for Geology, and has, with great kindness, invited Birmingham geologists to join in the Saturday afternoon excursions made by this Class.

The Scientific Library possessed by the Mason College now numbers over 10,000 volumes of the best books in all departments of science; it is greatly indebted to the fostering care of Dr. Heslop.

Both the Birmingham Philosophical Society and the Birmingham Natural History and Microscopical Society are housed in the Mason College, to the mutual advantage of these Societies and the Institution.

Birmingham Free Library.—The Reference Department will be opened in the new buildings on June 26th. Lists of the best books in every branch of science have been furnished (at the request of the Committee) by local experts in science, and were presented through the Birmingham Natural History and Microscopical Society. No provincial library will contain a more complete set of valuable scientific publications. This work has been earnestly promoted by Mr. E. Tonks, B.C.L., who was the first President of the Midland Union.

Science Teaching in Elementary Schools.—The practical teaching of elementary science continues to be most successfully carried on in 56 departments (28 Boys' and 28 Girls' Schools) of the Schools under the Birmingham School Board.* A Central Laboratory and Lecture Room is in course of erection, which will enable the work to be carried on more perfectly; 2,000 children and 200 pupil-teachers now receive these science-lessons in Birmingham, and it cannot be doubted that in future years they will furnish a strong contingent of members to the ranks of the local scientific societies. Your Council record, with pleasure, a recent donation of £200 by the famous firm of Tangye Brothers (Messrs. R. and G. Tangye) to the Birmingham School Board for the purpose of establishing science scholarships. An examination for eight science scholarships has recently been held by Professor Poynting, of the Mason College, and in his report on the papers worked the examiner states that, "The answers, as a whole, speak very highly for the carefulness and accuracy of the teaching which the boys have received. Hardly any of the questions could be answered without independent thought on the part of the candidates, and I had very few answers show a want of such thought. The boys showed that they had seen and understood the experiments which they described; that they had been taught to reason for themselves upon them, and that they were not merely using forms of words which they had learned without attaching physical ideas to them." The trustees of Mason College have placed six free exhibitions at the disposal of the School Board, and the two first boys in the above examination will go for a time to the King Edward's School, Birmingham, and afterwards to the Mason College, also receiving £25 per annum for their maintenance. The next six boys receive Scholarships of £10 per annum with free tuition in science; prizes of scientific books are awarded to those who stand next in merit.

The Council note the appearance during the past year of a list* of the local Scientific and Literary Societies of England, classified according to their counties, and including about 190 names. The Midland Union includes only the central counties; if similar associations were formed for (1) the six northern counties, (2) the eastern and south-eastern counties, and (3) the southern and south-western

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* For a full account of the system pursued see a paper by Mr. W. J. Harrison in the Proceedings of the Birmingham Philosophical Society, Vol. II., p. 274.

counties, it cannot be doubted that the organisation would result in much good. A Yearly Conference of the officers of these four divisions might be held, with a general Congress of the members (say) every five (or ten) years.

The following list of Scientific Societies in the Midlands which do *not* as yet belong to the Midland Union, is taken from the work referred to above. It is greatly to be desired that all the Societies whose members do real work in science, as distinguished from those which are "Popular Lecture" Societies only, should be welded into one homogeneous whole, so as to "keep touch" with one another, and mutually aid and encourage one another.

List of Societies in the Midlands which do not belong to the Union.

DERBYSHIRE.—Chesterfield and Derby Institute of Engineers.
LEICESTERSHIRE.—Scientific Association of Leicester.
Loughborough Literary and Philosophical Society.
HERTFORDSHIRE.—Watford Natural History Society, and Herts Field Club.
HEREFORDSHIRE.—The Woolhope Field Club.
CAMBRIDGESHIRE.—Cambridge Field Naturalists' Club and Entomological Society.
Cambridge Natural Science Club.
BUCKS.—High Wycombe Natural History Society.
BERKSHIRE.—Wellington College Natural Science Society.
Newbury District Field Club.
Reading Microscopical Society.
WARWICKSHIRE.—Smallheath Literary and Scientific Society.
Warwickshire Natural History and Archæological Society.
Warwickshire Natural History and Archæological Field Club.
Rugby School Natural History Society.
Leamington Philosophical Society.
WORCESTERSHIRE.—Worcestershire Natural History Society.
Worcestershire Natural History Field Club.
Malvern Field Club.

In accordance with a suggestion made last year, application has been made to certain of the railway companies to extend to naturalists the privileges afforded to members of fishing clubs, of travelling to certain localities, and on half-holidays, at cheap rates. This application has hitherto not been successful, the difficulty being that the botanist or geologist does not usually carry about with him so much cumbrous apparatus as the angler, so that, while the errand of the latter is pretty plain to the booking clerk, there is no similar surety for the nature of the trip of the man of science; but, besides this, several other difficulties presented themselves.

The time of the Annual Meeting has hitherto been necessarily taken up with business relating to the establishment and organization of the Union. At future meetings it may be possible to arrange for the reading of short papers desciibing any important work done by members of the Union during the past year.

An invitation to the Union to meet at Tamworth, in 1883, has been received from the Tamworth Natural History, Geological, and Antiquarian Society, and the Council recommend its acceptance, feeling sure that the central position of the town, the attractive nature of the

* In the "Geology of the Counties of England and of North and South Wales," by W. Jerome Harrison, F.G.S. (London, Kelly and Co.)

neighbourhood, and the well-known energy of the members of the Local Society will ensure a successful and well-attended meeting. The Council recommended that Mr. W. G. Davy, of Tamworth, and Mr. W. Jerome Harrison, F.G.S., of Birmingham, be appointed General Honorary Secretaries for the ensuing year.

It was resolved, on the motion of the President, seconded by the Rev. J. F. McCallan, that the report be received, adopted, and printed in the *Midland Naturalist.*

PRESENTATION OF THE DARWIN MEDAL FOR 1881.

The President, in handing the Darwin Medal to Mr. Edward Wilson, F.G.S., said that it was no slight honour to have one's name associated with that of Charles Darwin. This was the first medal that had been awarded by the Union, and he was very proud to think that it had been won by a Nottingham geologist.

A vote of thanks to the adjudicators of the Darwin Medal was moved by Mr. J. P. Briscoe, seconded by Mr. W. Rigby, carried, and acknowledged by Mr. G. B. Rothera. A vote of thanks was also passed to Sir Hereward Wake, Bart., for his renewal of his offer of a prize for Entomology.

Mr. W. J. Harrison proposed, and it was resolved, "that a copy of the Darwin Medal be presented to the family of the late Charles Darwin." It was stated that the dies for the Medal had been most admirably executed by Mr. Joseph Moore, of Birmingham; it bore on one side a bas-relief bust of Darwin, and on the reverse a branch of coral, emblematic of one of the greatest researches of the deceased naturalist.

Mr. E. D. de Hamel (hon. treasurer) next read his statement of accounts, from which it appeared that the receipts for the past year amounted to £27 13s. 11d., which, with a balance from the preceding year of £33 2s. 4d., made a total of £60 16s. 3d.; the expenditure amounted to £55 5s. 7d., leaving a balance of £5 0s. 8d. Subscriptions, however, were still due from four Societies, amounting to £7 7s. 7d. For the Darwin Medal Die Fund a sum of £14 2s. 6d. had been either received or promised, the cost of the dies being £15.

It was resolved that the Treasurer's accounts be received, accepted, and entered on the minutes.

Mr. W. J. Harrison (Birmingham), and Mr. W. G. Davy (Tamworth), were elected Hon. Secretaries, and Mr. Egbert de Hamel, Hon. Treasurer.

The thanks of the meeting were given to the officers of the Union for their services during the past year; to the officers and members of the Nottingham Literary and Philosophical Society, Naturalists' Society, Working Men's Naturalists' Society, and G. R. S. Naturalists' Society, for the very complete and admirable arrangements made by them for the present gathering; and to the President of the Union (Dr. A. Stephenson) for his able and courteous conduct in the chair.

VISIT TO THE HEMLOCK STONE.

In the morning Mr. J. J. H. Teall, M.A., F.G.S., accompanied a party of visitors to the remarkable pillar of rock on Stapleford Hill, known as the Hemlock Stone. This rock is formed out of the Keuper Basement Beds, and, although the Government Geological Surveyor (Professor Hull) would assign its origin to the action of the sea, yet there can be no reasonable doubt but that it has been sculptured out by atmospheric denudation.

VISITS TO LOCAL INSTITUTIONS, FACTORIES, &c.

Few towns have advanced so rapidly as Nottingham has done during the last few years. The members of the Midland Union viewed with admiration the splendid Art Museum, which now occupies Nottingham Castle, and over which they were conducted by the able curator, Mr. Wallis. The School of Art is fitly housed near the Arboretum—a beautifully laid out public garden, belonging to the town. But the University College—a grand pile of buildings, having the Natural History Museum on one side, and the Free Library on the other—was considered the crowning-point of all. This fine Institution is supported at a total cost to the rates of about £6,000 per annum, but there can be no doubt that it will turn out the best investment ever made by the public-spirited inhabitants of Nottingham. Many members visited one or other of the lace factories, and received ideas as to the complexity and perfection of the machinery employed which they will never forget.

THE CONVERSAZIONE.

The evening meeting was held in the Large Room and Lecture Hall of the Mechanics' Institute. The local scientists and naturalists had taken great pains to collect a most extensive and interesting series of specimens illustrating nearly every branch of natural science; the members of the local soirée committee, too, must have worked extremely hard to display the objects in so satisfactory a manner The principal exhibitors were:—Mr. N. Allen, entomological specimens; Mr. T. S. Bavin, section and cores of the boring for coal at South Scarle, Lincolnshire; Mr. F. Clements, historical maps, charts, &c., of Nottingham, illustrations of book "From whence Nottingham Sprang," antique brass clock, case of relics; Mrs. Cowen, fossils from the chalk and greensand formations; Mr. E. S. Cowen, photographs of antiquities near Nottingham, drawings of vibration curves, drawings of tesselated pavement, at Barton, Notts; Mr. P. J. Cropper, collection of fossils; Mr. B. S. Dodd, marine algæ, hydrozoa, British and European mollusca; Mr. W. J. Harrison, F.G.S., fossils in quartzite pebbles, specimens of Cambrian rocks from Dosthill and Hartshill, in Warwickshire; Mr. J. S. Hedderley, drawings of British wild flowers; Mr. F. Jackson, geological specimens, antique bronzes, Roman plaque; Mr. A. L. Kohn, minerals and rocks of Auvergne, Central France, sketches of extinct volcanoes, scientific worthies; Mr. L. Lee, cases of mounted specimens of mammals, birds, &c., with some skeletons of the same; Mr. J. Marriott, Lias fossils of Leicestershire; Mr. C. T. Musson, local land and fresh-water shells, marine shells; Mr. H. Pearce, F.G.S., F.L.S., glacially striated stones, granite boulders, mineral specimens; Mr. C. Perry, local British insects; Mr. G. B. Rothera, orders of insecta, exotic lepidoptera, invertebrata, sponges, sea-pens, corals, starfish, shells, &c., specimens from the Lincolnshire coast (Skegness and Wainfleet), shells from North Devon, rock specimens, pass of Llanberis during the glacial period; Mr. W. Rigby, bird's nests with eggs (local), gums and resins, young crocodile, just hatched, in spirits, crustacea; Messrs. Rose and Son, cases of herons, owls, grebe, fox, and teal, wild ducks, and the osprey in their natural habitats, chimpanzee; Mr. J. Shipman, specimens of the Keuper basement beds of Nottinghamshire, Staffordshire, and Cheshire, fossiliferous pebbles of the Nottingham Bunter sandstone, vegetable remains from the alluvium of the Leen Valley, local geological sections, new geological map of Nottingham; Mr. Louis Simon, half-horse power new noiseless gas engine; the Rev. Edwin Smith, M.A., flint and other implements of the stone age found in the Trent Valley, near Nottingham, fossils from Cromer, bones and teeth of elephants, &c., beetles (chiefly local), rare British plants, galvanometers, showing currents in living plants and thermo-electric phenomena; Mr. Appleby Stephenson, M.D., Japanese, Indian, and Chinese curiosities, books of autographs, and rare prints; Mr. Stones, case of ferns; Mr. J. J. Harris Teall, M.A., F.G.S., microphotographs of rock sections; Mr. W. E. Thornton, local rock and other geological specimens; Mr. C. H. Torr, New Zealand ferns; Messrs. G. E. Webster and Co., sanitary gas stoves for green-houses and bedrooms; Mr. E. Wilson, F. G. S., Keuper fishes, Carboniferous fishes, local geological sketches and diagrams, photographs of rock scenery, flake of grey chalk from Channel Tunnel; Mr. D. Wright, stereoscopic gallery, with views of foreign scenery. Microscopes were exhibited by Messrs. H. Blandy, G. E. C. Casey, T. W. Cave, Mrs. Cowen, Messrs. C. E. Crick, R. T. Higham, J. Levick, H. Miller, C. Perry, H. E. Perry, John Rogers, G. B. Rothera, E. Smith, J. Smith, J. J. H. Teall, W. E. Thornton, and J. White.

NOTES ON BEAVERS AND THE BUTE BEAVERY.

BY EGBERT DE HAMEL.

(Continued from page 104.)

About the months of July and August the male beavers and last year's young, who have been enjoying the spring and summer amongst the woods, collect in large numbers on the lakes and watercourses, on which they had left their houses and females in the spring, for the purpose of uniting into society, and of repairing or adding to their villages.

These villages are very interesting, and consist of hovels, cabins, and stores, with the addition, in the case of a watercourse, of a dam, which is not required if the village is situated on a lake.

The following description will give you a good general idea of the whole arrangement, to which I will afterwards add some further details:—

In rivers or brooks where the water is subject to risings and fallings, they build a bank, which traverses the watercourse from one side to the other like a sluice, and is often 80 to 100 feet long by 10 or 12 feet broad at the base. One on the Metapediac in New Brunswick was 150 yards long, and by its aid the beavers had converted a stream about 15 or 20 feet wide into a pool an acre in extent and 8 feet deep in the middle. This dam was semicircular and convex to the stream. The spot for building it had been chosen with remarkable judgment, and all natural features, such as little islands, rocks, and stumps of trees, had been turned to good account. The centre of this dam was about 5 feet high, and so compact that it took two men with axes an hour to cut a 6-feet aperture through it.

The camp was situated near the centre of the pool, on the original bank of the stream; it was about the size and shape of an ordinary haystack, a little flattened down ; rather more than two-thirds, about 8 feet, showed above the water ; internally it contained one large circular apartment about 6 feet 6 inches in diameter ; the roof, which was dome-shaped, being 2 feet 3 inches high in the centre, gradually sloping downwards to the edge ; the floor was 10 inches above water mark, and contained four beds, made of chips of wood cut very fine ; the walls were from 4 to 5 feet thick, made altogether of earth and wood. There were three entrances, all under water.

Close to the camp was the storehouse, an accumulation of fresh logs and branches submerged in the water for winter use. There must have been half-a-dozen ordinary cart loads. They had been hauled 60 yards by land and twice as far by water. Trees of all sizes, from a foot in diameter downwards, that had been felled by the beavers, lay scattered all around the pond and in the water, some freshly cut, others decayed and covered with moss. The boughs of the larger ones had been lopped off and carried to the storehouse, the bark of the stems being eaten on the spot. Smaller trees had been felled, cut into logs, and carried bodily off. Saplings the size of an axe handle had been cut as with one slanting blow of an axe, but the larger trees were gnawed all round, and dry sticks and roots that obstructed their roads had been cut neatly off at the proper breadth and the pieces thrown aside.

In constructing a dam the beavers select a spot where two trees grow opposite to one another on each bank. These they fell in such a way that they meet in the bed of the stream, and are inclined upwards. This done, more trees above are cut down, and the pieces dragged along the roads I have described to the water and floated, under the guidance of two or more beavers, who take advantage of all side eddies as will suit the purpose, to the dam, against which they are placed horizontally. The interstices are next most carefully filled with grass, fibres, and tempered clay. Nature now lends her assistance by accumulating against the upper side the *débris* which would otherwise have travelled far beyond. Some of the boughs strike root, and the dam becomes so strong as to be used as a bridge by man and beast. Occasionally flood holes are made in it to permit the passage of water after rain, and all damage to it from whatever cause is instantly repaired.

The dam being complete, and the water above it having been raised by its aid to a depth and width in proportion to the size of the colony, the next business is to build the houses, the sites of which are generally, but not always, chosen near the side. These are formed of water-logged sticks placed horizontally in the water ; they have always two or more entrances, and a small chamber ; the top of the house is very thick, to guard against attacks by animals (chief amongst these being the panther, wolf, and wolverine), and as this roof is added to every season it is sometimes eight feet through, and during frost frozen as hard as iron. Mud and roots are used to make the house solid, but no mud is seen from the outside, as the top is covered with loose sticks left there by the beavers after eating off the bark.

The "swell" houses have two flats, and may accommodate as many as sixteen beavers. The lowest is on a level with the water; the upper one is used to sleep in, and has communication with the water through the bottom; the top one has also direct and covered communication with another chamber on the land. The entrances, two in number, are subaqueous, and called angles, one being on the upper, the other on the lower side of the house.

The beavers usually have two houses, a summer house and a winter house (just as we have a town house and a country house). The former is generally situated near the mouth of the brook, as the food of the beavers during the summer months consists in great measure of the stems and roots of the pond lily *(Nuphar advena)*, which is called beaver-root by the settlers.

Whilst the winter house is building the beavers often live in a deep hole in the bank, which is called a "hovel" or "wash." The entrance to this hole is always under water, and when it has extended some distance inland it rises to a chamber which is not only high and dry, but has a ventilating hole for the admission of air.

Although birch and willow trees as large as a man's thigh are frequently cut down, the beavers appear only to make use of the smaller branches, which are cut into suitable lengths and carried to the house, near which they are sunk by means of mud until a very considerable pile of them is raised to some height above the water. The beavers always draw their supply from the base of this stack, so as to feed on the most sodden bark. Until winter compels them to consume this store they feed upon the land or upon browse collected on the top of the house. Their principal food, however, consists of the bark of the aspen, willow, birch, poplar, and occasionally the alder. They rarely resort to the pine tribe unless from severe necessity.

I will now proceed with my description of the Bute Beavery, so that you may compare an account of their actual doings in free or unmolested confinement with the review of the habits of the species I have just concluded.

Having been favoured by Mr. Hughes, the great Birmingham Naturalist, with a letter of introduction to Mr. Barker, of Rothesay, and having also presented this letter and gained the latter gentleman's cordial co-operation, we started from the Queen's Hotel on a very beautiful morning, and after about an hour's drive stopped between two of the Mount Stuart fir woods, whilst my friend summoned the keeper, Black, from his cottage hard by, to show and explain the "Beavery" to us.

Crossing a stile and plunging at once into the depths of the wood, a sharp walk of some ten minutes found us close by a dwarf wall surmounted by a light iron fence. Climbing over this we entered an enclosure of some three acres, containing a valley whose banks were clothed with fir and an undergrowth of bracken, whilst along the bottom trickled a tiny burn. Within this space the Marquis of Bute, about four years since, turned out two pairs of beavers; but as he did not know then that they required willow bark for their sustenance one pair perished. On willow branches being furnished to the other two they prospered, and at the present time (*i.e.*, 1878) have increased to sixteen; and not only so, but curiously enough, the locally bred beavers have adapted themselves to their environment and taken to feeding on the fir bark, sooner than eat which their predecessors succumbed.

The first thing that attracted my attention was a broad yellow ring round the base of many of the trees, and as we got nearer I saw they had been beautifully cut by the teeth of these animals, the chips (of which I brought a few to show you) being profusely scattered around. Then I observed that many trees were prostrate, and others quite ready for the final cut to fell them. When engaged in this operation the beavers sit on their haunches, and, taking two horizontal cuts, tear out the piece between them, exactly as a carpenter does when reducing wood with his chisel; and in order to cause the tree to fall in the required direction (never failing in this unless an adverse wind springs up at the critical moment) they cut the wood *away most* on the *opposite* side, leaving a slender support a little thicker, but not much thicker, than one's wrist. At this stage the beavers retire a little and inspect the tree, then all but one move to a safe distance, and that one proceeds cautiously with the cutting until the tree, with a graceful motion, obeys the will of its persecutor.

As soon as the tree is down, the beavers separate the branches close to the stem and carry them away, then eat the bark off the butt, after which an old beaver scores the latter at equal distances of about two or three feet to indicate the spots at which it is to be divided into logs by the others.

They had also been very busy tearing up the grass and turf in search of "Tormentil root." We followed their example, and on tasting it recognised strongly the flavour of acorns.

At this point the keeper again drew my attention to the little brook, whose top, so narrow was it, was often hidden with overhanging ferns, and assured me it was originally exactly the same right through the enclosure. Guess my astonishment then, for I had not heard so much about beavers at that time as you have to-night, when on turning a little knoll we came in view of a decent sized pond with a round island in the middle, and a dam at the lower end, making an average depth of about three feet of water. Proceeding a short distance farther we came upon a good fair pool, the size of which you may judge from the enlarged sketch I have here, which was published in the January, 1878, number of the "Animal World," and taken on the spot by Mr. Walter Severn.

The dam at the lower end of this pool is semicircular, convex to the stream, 62 feet long by 10 feet wide, the greater part being under water and sloping to the pool. The top was about two feet wide, and so strong that the three of us walked over without hesitation or difficulty. One of the boughs used as a backing was as thick as a man's leg. Black, who frequently spends a night at the top of a tree to watch his charges at work (under the disadvantage of their doing most when the nights are darkest), saw this log deposited. He said the beaver floated it down stream to the dam, on which it climbed and drew the log after it ; then, placing the thin end against the back edge of the dam, it took the butt in its paws, and raising itself to its full height pushed it with such force and precision that it was at once so firmly fixed that although we grasped it fairly no movement was perceptible. In another spot a horizontal bough had been carefully wedged behind an upright fork.

The sloping face of the dam was composed of clay and stones, the original material of the present ponds. This clay they puddle with their feet, make into balls, and pile in a heap in the middle of the pool until required. In carrying it through the water they hold it between the fore paws and the chin, swimming with the tail and webbed hind feet. If alarmed, or when in the act of diving, they strike the water with their tails, and thus occasion a loud report.

Their house, which is near the right bank, looking down stream, is 9ft. high (5 of which are above water), 10ft. long, and 8ft. wide, oval in shape, and difficult, in spite of its size, to recognise at first, owing to their having nearly covered it with growing turf, boughs and stems of fern, the leaves of which they had eaten. Along the top was a backbone of boughs left open as a ventilator. and through which heat was perceptibly rising from the chamber within. Close to the water on the upper side was a narrow terrace, on which Black said the tenants liked to sun themselves when all was quiet.

My friend climbed on the top of the house, to the consternation of the inmates, who bolted in all directions, their hidden tracks being marked by lines of rising bubbles. In stepping back to land he put his foot on a tree stump, and instantly fell all his length. We found he had gone through to the land chamber of the house. Black was horrified. I was delighted, and at once commenced an inspection.

This chamber was as big as a wheel-barrow, and contained two beds of wood shavings like spills (a few of which I brought away), which are prepared by the beavers from the small boughs on the bark of which they have fed. The house side of this chamber had been built of boughs and sods, the projecting ends of the branches being neatly dressed off, and the stump of the tree had been hollowed until only a thin shell remained, which accounted for its having given way so unexpectedly.

In the centre of the pool they collect their winter store of boughs, which, when complete, stands high out of the water, and is used from below.

Round the sides of the pool they have made several burrows, or "washes," or "hovels," as they are variously called, which penetrate from 20 to 30 feet into the bank, where they rise above water-level and form a small chamber, in the top of which an air hole, stuffed full of sticks, is made from the inside for ventilation but not for egress. Between the submerged entrances to these holes, and the equally subaqueous approaches to the house (one being on the upper and the other on its lower side), they have cut grooved channels in the bottom of the pool, which conduct them safely when diving from one to the other. Upon the bank they have numerous runs terminating in shallow water, the sides of which are marked by the *débris* of ferns and twigs.

Their working hours are between 7 o'clock at night and 7 o'clock in the morning. One beaver is always on duty at each dam, and whatever they do is achieved with great rapidity. Black thinks they breed in January, but all authorities are against this opinion, which is probably owing to the kittens first appearing in public about that time of the year.

One fault alone I had to find with my little friends, and that was the apparent extravagance with which they had "ringed" a very high percentage of the standing timber in the enclosure, without intending to promptly finish the work, as evidenced by the stale appearance of the chips.

Beavers are captured either by trapping, drawing, or by storming their fortresses.

In the first instance an iron trap is set close by the bank in shallow water, but with chain enough to reach into a depth of at least four feet. Upon the bank above a little castoreum, mixed with rum or cinnamon, is spilt; the beaver is attracted by the scent, and when caught dives into deep water, where the weight of the trap holds down and drowns it. Should it, by reason of the river having fallen, not reach the deep water, it will bite off its leg at a joint, draw the sinews out of the shoulder, and escape.

The second method consists in noiselessly removing part of the dam. As soon as the beavers find the water sinking they come out of their houses and holes to repair the breach, and are then shot.

Thirdly, the Indians search round the beaver pools for the "washes," opposite each of which they make a hole in the ice; the women then break intc the beaver-house. which affords the unfortunate animals the choice of three evils—either to stay under the ice and get drowned, or to stay in the house and be killed by the women, or bolt to their "washes" and be killed by the men, who detect their entrance by the ripple in the ice-hole as they pass under, when the aperture is immediately staked, the "wash" opened from above, and the poor beast caught, either by hand or with a hook made for the purpose. Sometimes they merely stake the two entrances to the house, break into it, and spear or tomahawk the imprisoned beavers; or, if it is a lake, simply frighten the beavers out of their houses and shoot them as they come to the surface, as they cannot long exist without air.

In 1808 the Hudson's Bay Company imported 126,927 pelts, each worth about 19s.; in 1820 only about 50,000, showing how rapidly their numbers were decreased.

The fur when shaved off the pelts with a sharp knife was winnowed in a tube to separate the long hair from the wool; the latter was then kneaded into felt, through which it worked until it appeared as a perfect surface on the other side, and was ready to make into hats.

As pets in confinement, beavers are most affectionate and entertaining. Did time permit I could give you numberless anecdotes of their sagacity; but the length my paper has already reached precludes any such extension. I trust that in what I have told you there is sufficient to convince you that if we, lords and tyrants of creation as we are, vacated the earth, the lower organisms of which the subject of our paper to-night is a good example, would find their lives far more agreeable, and a wider scope for the exercise of their intelligence.

How far it rests with man to render the lives of animals more endurable I leave with you, and in conclusion add—

"The heart is hard in nature * * * *
* * * * * * * that is not pleased
With sight of animals enjoying life,
Nor feels their happiness augment his own."

Correspondence, etc.

Saxifraga granulata.—Whilst entomologising in Repton Shrubs on the 20th of last May, I came across several plants of the Common Meadow Saxifrage (*Saxifraga granulata*) with double flowers. Have any of your readers noticed a similar variety?—T. Gibbs, Bretby, Burton-on-Trent.

Meteorology.—We are, unfortunately, unable to present in this issue our usual monthly reports on the weather. Mr. Clement L. Wragge, to whom we are indebted for the reports which have appeared in our pages for some time past, has been so incessantly occupied in connection with his arduous meteorological work at Ben Nevis, that he has been unable to prepare the report on the weather of May in time for press. In the August number the reports will be resumed, and a synopsis for April and May (the omitted months) will also be given.

Œcidium.—If Mr. W. B. Grove's reference is correct, as it appears to be, his correction of an old error is a valuable one. The word Æcidium has always been a stumbling-block to beginners. The Rev. M. J. Berkeley, in the "British Flora," and in his "Outlines," gives Persoon as the founder of the genus, and Mr. Berkeley is followed by Dr. M. C. Cooke, the Rev. John Stevenson in "Mycologia Scotica," and by other authors. Mr. Berkeley gives the date of Mr. John Hill's "History of Plants" as 1751, not 1773 like Mr. Grove; these figures clearly antedate the writings of Persoon, which range from 1796 to 1828. Mr. Berkeley does not give the derivation of Æcidium from αἰκίζειν, "to affect injuriously," but from αἰκιον, "a wheel."—W. G. S.

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—General Meeting, May 30th.—Mr. R. M. Lloyd exhibited *Coprinus micaceus*, from a fern case in Birmingham. Mr. W. B. Grove exhibited *Puccini lychnidcarum*, from Holt Fleet, and *Eurotium herb rum.* Mr. W. J. Harrison exhibited slides, diagrams, models, etc., illustrating the best means of teaching Human Physiology, and lucidly explained the advantages of the same. General

Meeting. June 6th.—Mr. George Heaton exhibited seeds of plants, etc., washed by the Gulf Stream to the Coast of Donegal, N.W. of Ireland. Mr. W. B. Grove exhibited the following Fungi from Sutton, *Nectria sanguinea*, *Sphæria ovina*, and *Peziza fusarioides*, and also *Calocera cornea* from dead wood at Rotten Park Reservoir. Mr. J. Morley exhibited *Luzula albida*, from his garden. Microscopical General Meeting, June 20th.—Mr. J. Madison exhibited *Succinea putris*, a white variety from Stonehouse, and *Limnæa peregra*, var. *ovata*, having an additional interior lip. Mr. W. B. Grove exhibited *Lycogala epidendrum* (Wolf's-milk Fungus), and *Tilmadoche mutabilis*, two Myxomycetes, from Sutton. Professor A. M. Marshall read the third and concluding part of the Report on the Pennatulida obtained at Oban, which treated of *Virgularia mirabilis*. At the end he thanked the Society for reproducing his drawings in such a worthy and successful manner. Mr. W. R. Hughes read a short note on an abnormal form of star-fish, *Asterina gibbosa*, with six instead of five rays. He showed the great interest of such a specimen from an evolutionist's point of view, since the additional ray would tend in several ways to aid it in the struggle for existence. The specimen was exhibited as well as the normal form.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—April 3rd.—A Meeting devoted to "Pond Life." Exhibited by Mr. Wykes, great number and variety of Rotifers found in tap water; by Mr. Dunn, *Stephanoceros eichhornii*; by Mr. J. W. Neville, *Plocamium coccineum* in fruit; by Mr. Sheldon, *Polytrichum commune*, with Antheridia. April 17th.—Microscopical and General Meeting. Exhibited by Mr. Delicate, transverse section of Hedge Maple: by Mr. Darley, cocoon of Fox Moth; by Mr. H. Insley, *Puccinia* on leaf of Box and *Asterosporium hoffmanni* from bark of Beech tree. April 24th.—Exhibited by Mr. Darley, Pupa of May Fly, showing circulation of blood; by Mr. Dunn, Sucker-foot of *Dytiscus marginalis*; by Mr. Delicate, Section of Stem of Common Elm; by J. W. Neville, transverse section of Human Colon, and section of Human Lung. Paper on "The Circulation of the Blood," by Mr. Madison.—May 1st.—Microscopical and General Meeting. Exhibited by Mr. Dunn, parasite of Dor Beetle; by Mr. Darley, Ovipositor of Ichneumon Fly (Ophion); by Mr. F. Shrive, three Adders, from Sutton Park, living; by Mr. Bradbury, young of common Eel; by Mr. J. W. Neville, Hair of Sea Mouse; by Mr. Madison, an abnormal form of *Limnæa peregra*, having a second lip within the mouth of the shell; by Mr. H. Insley, prothallus of *Lastrea dilatata*, growing, and the same mounted for the microscope, showing antherids and archegons; also young plant emerging from prothallus. May 6th.—An excursion to the Wren's Nest, Dudley. Fossils and land shells were the chief spoils. Among the latter, *Achatina acicula*, May 8th.—Specimens found at excursion exhibited. Paper: Notes on Daphnia. by Mr. Dunn. May 15.—Special Botany. Large number of common plants shown by Mr. Boland, specimens of *Unio margaritifer*, living. May 20th.—Excursion to Sutton Park. A specimen of Ribwort Plantain, found near Bracebridge Pool, showing an abnormal form of inflorescence. At the base of each spike two rows of smaller spikes, five in each row, alternating with each other, were formed. The small spikes were sessile, and nearly at right angles with the larger one. May 22nd.—Microscopical and General Meeting. Exhibited by Mr. Darley, large Ingrail and Tissue Moths, from Sutton Park; by Mr. Moore, imago of *B. cynthia*; by Mr. Sanderson, *Lycopodium clavatum*, from Yorkshire.

BIRMINGHAM SCHOOL NATURAL HISTORY SOCIETY.—The usual Fortnightly Meeting was held on May 17th.—A paper was read by the President of the Botanical Section (J. Turner, Esq.), on "The Orchid Family." The members were provided with specimens of *Orchis morio*, which was minutely described in the paper. In concluding the President referred to the indefatigable labours of the late Mr. Charles Darwin in connection with the Orchid family. Some beautiful specimens of the Orchid family, lent by members of the Society, were exhibited.

MIDLAND UNION OF NATURAL HISTORY SOCIETIES.

ADDRESS BY APPLEBY STEPHENSON, Esq., M.D.,

President of the Union.

I cannot for a moment justify my appearance in this distinguished position, but at least I can explain it. I owe it entirely to the fact—not of any special fitness or suitability, and certainly of no desire—but simply to the accidental circumstance that for two consecutive years I was President of the "Literary and Philosophical Society of Nottingham," and so by "natural selection" it would seem it came to me. Yet in justification of myself I am bound to tell you I accepted this post of honour under pressure and under protest. I can only see one advantage that will accrue—my predecessors will by this contrast derive additional distinction and lustre, and 'twill be far easier for any successor to succeed me than I now feel it to take the place of those that are past. Still, I must not be wanting in gratitude—if in gratulation—and must remember that the most important duty which devolves upon me, as President of your Union, is the delivery of an address at this, the annual meeting. In considering my incapacity to fulfil such a task properly—certainly to my own satisfaction—I am reminded of, though I cannot emulate, the poet Campbell's ready wit when in a seeming dilemma. A young lady presented her album to him with the request that he "would write something *original* in it," on which he at once penned these lines:

"An 'original something,'
Fair maid, you would woo me
To write;
But how shall I begin?
For I fear I have nothing original in me
Excepting original sin!"

However, it only remains for me to execute my task to the best of my ability, and, if I do not further dispraise myself, it is because to do so would be to find fault with those who have placed me here.

I have thought my best course to take would be a brief notice of the special naturalistic peculiarities of this district, and on such I shall mainly address you.

INTRODUCTION.

The Union started with 17 Societies (January, 1878); the present number in the Union is 25. The Subscription for the first two years, was 1d. per member, but this has since been raised (May, 1879) to 3d. per member. The present number of members in the Union is nearly 3,000.

Among the advantages of the Union may be named the manner in which it has brought the various Midland Societies more closely together. In the first list issued by the projectors of the Union (January, 1877) only 13 Societies are named, and several of these are wrongly designated. The Annual Meetings have caused many acquaintances to be formed among scientific workers in the Midlands. Five vols. of *The Midland Naturalist* have been issued, which will form a permanent record of the work done by the various Societies.

The Darwin Prize was founded 1881; and the first award was to a Nottingham geologist—E. Wilson, Esq., F.G.S. Mr. Darwin has always taken an interest in the Union, and was a subscriber from the first to its organ, *The Midland Naturalist.*

I shall now offer a few remarks, first on "General Geology" and the "Glacial Drift Deposits," for the sake of referring to the work which has been done by some of our members, and shall follow these by more extended notices of "The Geology of the Nottingham District," the "Mollusca" of the county, its "Ornithology" and "Botany."

GENERAL GEOLOGY.

The work of the Geological Survey must not be considered as final, but only as indicating the lines for local research. Mr. Shipman has made important corrections and additions in the Nottingham district. Professor Lapworth and Mr. F. T. S. Houghton have shown that the quartzite of the Lower Lickey Hills, near Bromsgrove, is not of Llandovery age, for which it was mapped by the Government Survey, but that it is immensely older, belonging to the Lower Cambrian formation. A patch of Llandovery sandstone rests, at one point, against the quartzite. Mr. W. J. Harrison has found that the rocks of Dosthill, in the North of Warwickshire, mapped as "Greenstone" by the Survey, are really fossiliferous Cambrian shales, traversed by dykes of diorite; the same geologist has shown, in conjunction with Prof. Lapworth, that the Hartshill quartzite, which forms a ridge between Nuneaton and Atherstone, is, together with a mass of overlying shaly beds, also of Cambrian age, being the equivalent of the Lickey rock.

GLACIAL DRIFT DEPOSITS.

Little progress has been made with this subject, the complexity and difficulty of which becomes yearly more apparent. Mr. Harrison has furnished Mr. Searles V. Wood with a number of observations made by himself on the drift of Leicestershire, and he has used these in his paper on the "Newer Pliocene Period in England," read before the Geological Society of London, and published in their journal (vol. 36, p. 457). In a paper Mr. Harrison lately read before the Philosophical Society of Birmingham, on the "Quartzite Pebbles in the Drift," he endeavours to show that these are derived firstly from the Bunter Conglomerate of the Trias. The latter bed is itself derived from an old Palæozoic ridge which stretched across Central England; and not from the Old Red Conglomerate of Scotland, as the usually accepted theory put forth originally by Prof. E. Hull would have us believe.

The question of the nature and origin of the Glacial Deposits is so wide and so difficult, that, for purposes of individual research, it is well to subdivide it. The quartzite pebbles form an easily recognisable division, and now that they have been shown to be fossiliferous, their study will prove highly interesting.

THE GEOLOGY OF THE NOTTINGHAM DISTRICT.

The rocks of Nottinghamshire though generally devoid of palæontological interest—fossils as a rule being conspicuous by their absence—are yet of interest from the important evidence they furnish as to the stratigraphical relationships of the lower Mesozoic to the upper Palæozoic formations. Exclusive of the post-Tertiary rocks, viz., glacial and alluvial clays, sands, and gravels, the rocks of Nottinghamshire naturally fall into two groups of easterly-dipping formations—the Carboniferous and the post-Carboniferous—which are separated from each other by a clearly defined unconformability,—an unconformity that is proved by the changing strike of the outcropping coal measures, and by the constantly increasing depth beneath the base of the Permian rocks of particular coal seams going east from the Magnesian Limestone escarpment on the borders of Notts and Derbyshire, and which may be seen in surface exposures at Kimberley, five miles west of Nottingham.

The Coal Measures.—The only Carboniferous formations represented in Notts occupy but a small surface area on the western borders of the county, but without doubt underlie the newer rocks of the whole of the county, except perhaps in its southern extremity. The coal measures of Notts are of very great economic importance from the large and constantly increasing supplies of fossil fuel that are drawn from them, and they are destined to become of even greater importance in the future. The fossils of this series are almost entirely limited to the ordinary coal measure plants and mollusca, though scanty fish remains, a fossil scorpion and one or two limuloid and other crustacea, have been found.

The Permian Formation.—The lowest of the post-Carboniferous formations consists of the following sub-divisions:—Marl Slates with breccia at base, Lower Magnesian Limestone, Middle Permian Marls and Sandstone, Upper Magnesian Limestone and Upper Permian Marls. The last two divisions are, however, scarcely seen in the county. The limestone is largely quarried for building purposes, yielding a rough-hewn stone well adapted for outer walls, and is also burnt for lime, while the marls are manufactured into bricks and pottery. The magnesian limestone, which dies out finally near Nottingham on the south, from its uniform durability has come to form a very evident dip slope from the high ground overlooking the Derbyshire coalfield on the west to where it becomes covered by Triassic rocks on the east. For further information on these rocks, including some interesting speculations as to their probable origin, I must refer you to the paper by Mr. E. Wilson, F.G.S., "On the Permian Rocks of the North-east of England," published in last year's *Midland Naturalist*, for which the first Darwin Medal has been awarded.

Next above the Permian rocks and separated from them by a slight but still perceptible unconformity comes the Triassic series, the rocks of which, striking nearly due north and south, occupy the major portion of the county. The Lower Division, or Bunter Sandstone, is represented by the Lower Mottled Sandstone and the Pebble Beds. The Lower Mottled Sandstone yields moulding sand for the iron furnaces. It is well exposed at Mansfield, and at several points in the Leen Valley. The Pebble Beds are finely shown in the cliff-like eminence on which Nottingham Castle stands. The Bunter Sandstone occupies a considerable area in North Notts, comprising much of the region once occupied by Sherwood Forest. Being a porous sandstone, resting on impervious strata, it forms an excellent natural reservoir for water supply. Its dryness also well adapts it as a site for building purposes. Being comparatively soft and easily hewn, dwelling places were hollowed out in it by the ancient inhabitants of the country. Hence the earliest Saxon settlers termed the place Suodena-gabam (the home of caves). The rock beneath the town is honeycombed by extensive cellars and long passages. At Snienton Hermitage some of the caves are still faced with doors and windows and inhabited, and the "Park holes" bear traces of a primitive kind of sculpture. Beneath Nottingham Castle are extensive dungeons, and the bold escarpment in front is traversed from top to bottom by a tortuous subterranean passage known as Mortimer's Hole. The Upper Trias or Keuper series is represented by three subdivisions—the Basement Beds, the Waterstones, and the Red Marl. The Basement Beds, a fluctuating series of red and white coarse sandstones, are only well shown in Stapleford Hill and the Hemlock Stone, but have been temporarily exposed on the east side of Nottingham. The Waterstones consist of alternating porous sandstones and red marls. They are exposed at several points on the east side of the town. Both these rocks have in past times been quarried for building purposes, and may be seen in several old walls and buildings. The Red Marl is a series of bright red clays with a few thin beds of hard white sandstone, with veins and sometimes thick beds of gypsum. The Red Marl and also the clays of the Waterstones have for long past been extensively worked for bricks on the high ground east of the town, and Nottingham may truthfully be said to have once lain on Mapperley Plains. The Triassic series is almost entirely destitute of fossil organisms. The Bunter Sandstone yields nothing excepting the occasional fossiliferous quartzite pebbles which have been derived from metamorphosed Silurian rocks. From the uppermost gypsiferous beds of the Red Marls a suite of Foraminifera has been described by Messrs. Parker and Jones, from Chellaston Hill (Derbyshire), but as these were not actually found *in situ* a certain amount of doubt appears to hang over their authenticity as Triassic—a doubt that it would be satisfactory to see cleared up. A few fish scales have been found at Newark, annelid tracks occur now and then; a Cheirotherium footprint was found some years ago by Mr. Irving at Colwick, and lately Mr. Wilson came upon quite a shoal of fishes in a seam of marl at the very base of the Waterstones in Colwick Wood. Above the Triassic rocks come the Rhætic beds, a thin series of dark-coloured shales which help to connect the Trias with the Lias. The outcrop of these beds strikes north and south and N.E. and S.W. across the county, from Gainsborough to Newark, and thence by Elton and Stanton-on-the Wold into Leicestershire—and is often indicated by a low level-topped escarpment. Exposures of the Rhætics are rare, but they may be seen in the gypsum pits at Newark-on-Trent, and there is a very good exposure at Gainsborough.

Last of all comes the Lias. The lower Lias limestones and shales only are represented in Notts. They crown the high ground in the south of the county which runs from Bunny to Cropwell Wolds, and stretch thence to the Vale of Belvoir. The blue lias limestone is worked for cement at Barnston. A detailed account of the Lias would belong rather to the geology of Leicestershire than of Notts. The excursion to-morrow to Belvoir Castle under the able leadership of Professor Blake, will give the members of this Association an opportunity of examining these rocks in that county.

Glacial drift occurs in several places, usually as thin patches of sand and gravel, but does not as a rule attain a sufficient thickness to seriously modify the nature of the soil. The high ground extending from Robin Hood's Hills through Annesley Park is thickly covered with drift. Near Blidworth are large isolated masses of cemented drift gravel. On the high ground, six miles south of Nottingham, where the Lias comes in, there is a great accumulation of Boulder Clay, which at Stanton-on-the-Wolds attains a thickness of sixty feet or more, and is largely constructed from the grinding down of the Lias, Rhætic, and Keuper shales of the district, but contains erratics which have come from considerable distances.

The floor of the valley of the Trent, which has in this district an average width of about two miles, is occupied by alluvial deposits of gravel and sand, about twenty feet in thickness on the average, with a top crust of alluvial silt or mud or a peaty soil a foot or two in thickness. The Leen valley is occupied by a narrow fringe of similar deposits, as also are some of the smaller brooks and a rather extensive alluvial flat formed of stiff dark clay, known as Bingham Moors, lies on the south-east side of the district.

MOLLUSCA.

In Mollusca the district is fairly well represented. We have recorded 100 species in the county of Notts out of about 130 British species.

We find that Nottinghamshire mainly consists of Triassic and Permian rocks, together with Oolitic Boulder Clays and Alluvium to a smaller extent, the soil not being particularly rich in carbonate of lime. The land species are pretty equally distributed over these different formations, the sandy districts being least prolific of life in these forms, whilst the Magnesian Limestone districts are the richest.

Of the freshwater species the greater number are to be found in the river valleys, the canals being richest in point of numbers, comparatively few species being found in the ponds above the river levels. Many of our best localities for rare species have disappeared through the march of improvements or trade enterprise; notably in the case of a pond at Barton, where once was found a rare bivalve (*Sphærium lacustre*); there are now none at all, on account of the enlargement of the pond and the consequent destruction of the species. In the same way some of our best botanical hunting grounds are lost to us. Linley Wood is closed; Bulwell Bogs are gradually disappearing, owing to the encroachments of a railway; and a pond at Wollaton, in which once grew in profusion the beautiful water violet (*Hottonia palustris*), has now disappeared, and in its place is a hideous shale heap deposit from a neighbouring colliery.

Amongst our locally rarer species of shells may be noted:—

Sphærium lacustre (var. Bronchiana). In Clumber Lake.

Sphærium ovale. Canal at Beeston.

Planorbis lineatus, Highfield House lake (E. J. Lowe), the furthest recorded northern locality.

Limnæa glutinosa. Found at Beeston Rylands by Mr. Lowe some years ago, but not lately found in the district.

Ancylus lacustris. At Beeston, on the stems and leaves of aquatic plants.

Testacella haliotidea. Introduced. Found at Welbeck Abbey.

Helix revelata. Stanton-on-the-Wolds (E. J. Lowe). The only recorded inland locality, being generally found near the sea coast.

Helix fusca. Highfield House (Lowe). Rare.

,, sericea ,, ,, ,,

,, lapicida. Pleasley Vale and Creswell Crags; also dead specimens at Halloughton; very plentiful on the rocks at Castleton and in Dove Dale.

Pupa secale. Nottingham Castle (Lowe).

,, ringens. Highfield House (Lowe).

Clausilia laminata. One dead specimen at Pleasley Common; at Matlock and Crich Hill.

Achatina acicula. Plentiful in rejectamenta of a small stream at Tollerton; also found at Colwick, Attenborough, and Highfield House.

Cochlicopa tridens. Pleasley Vale, rare; and plentiful amongst moss at Belper.

Balia perversa. Rare, Colwick and Highfield House.

Vertigo pygmæa. Rare, Widmerpool and Wollaton.

There are some peculiarities with respect to habitat that are interesting to geologists. Some kinds of freshwater univalves have the faculty of enduring a partial change or difference in their usual habitat which would be fatal to other kinds. Nilsson, the Swedish naturalist, relates that two species of *Limnæa* described by him, as well as *Neritina fluviatilis*, live in the Baltic, adhering to sea-weeds, and sometimes at a distance from the mouth of any river. With these live certain marine mollusca, such as the common mussel and cockle, Mya arenaria, and Tellina Balthica. Limnæa is Pulmonobranch, and Neritina is Pectinibranch. The same peculiarity has been observed in the case of a freshwater bivalve, though not of so permanent a character.*

The common pond mussel (Anodonta cygnea) is said to live in the River Trent, which is salt at high water. The fresh water, being lighter, forms the upper stratum, while the sea water covers the bed of the river inhabited by the Anodonta.

Dreissena polymorpha (a kind of mussel which abounds in many of our rivers and canals) M. Marcel de Serres is of opinion was originally marine, from the circumstance of the shells being found in tertiary strata of marine formation. The Russian traveller Pallas (who first discovered or made known this species) described one variety of it as marine, and the other as inhabiting fresh water.

Planorbis corneus, a well-known and widely-distributed fresh water snail. Lister tried in vain to fix the purple dye yielded by this species in such quantity.

Monstrosities, or abnormal forms of the Mollusca in this district have been rarely observed, particularly so among the land Mollusca.

Species of Helix, during the pairing season, are furnished with *crystalline darts*, which they shoot at one another. These curious *love weapons* have been observed sticking to the bodies of snails after such conflicts. They are contained in a special pouch or receptacle ready for use. In some species each individual has only one of these missiles, in others two, and a few species have none at all. They are not often observed by conchologists.

ORNITHOLOGY.

Nottinghamshire, from its diversity of character, is rich in the variety of its feathered tribes. Here are vast tracts of cultivated land giving support to those species which thrive and increase on the fruits of man's labour; there is also a large area of wood and waste almost in its primitive condition, harbouring other species, which invariably retire before the encroachments of the axe and plough; many large ponds or lakes, fed by rivulets, giving an asylum to aquatic birds, and the great river Trent, attracting not only the various ducks and waders, the denizens of fresh water, but also those of marine origin, many of which appear to migrate from the south-western coast,

* Jeffreys, vol. 1, chap. vi. (ci.)

following the course of the Severn and Trent to the eastern shores in the spring or early summer, and returning westward in the autumn; three or four kinds of sea gull, three terns, and the green cormorant may be included in this category.

Referring to the green cormorant, a remarkable circumstance occurred two or three years since, during an autumnal gale. A flight of these birds, not being able to make headway against the strong westerly wind, alighted on the tops of various high buildings in the town, and in this situation several were shot by city gunners.

Amongst the rare birds procured in the neighbourhood may be mentioned the Rough-legged Buzzard, a winter visitor, the Peregrine Falcon, Osprey, Great Grey Shrike, Hoopoe, Bee-eater, Redneck Phalarope, Squacco Heron, Spotted Crake, Redneck Grebe, Little Bittern, White-fronted Goose, Lesser Tern, and others. The ornithologist has in the county an opportunity of making acquaintance with the major part of the list of British birds, over 200 species being known, either resident or visiting this locality.

BOTANY.

The Flora is such as is found in moist meadow-land and woodland, and upon sandstone and Magnesian Limestone. No alpine or subalpine plants. The flora is an abundant one. In the county are found of flowering plants 836 species belonging to 189 genera, and of flowerless plants 302 species belonging to 87 genera, that is, altogether, 1,138 species belonging to 276 genera. Amongst rare plants may be mentioned: *Crocus vernalis*, the Spring Crocus, and *Crocus nudiflorus*, the Autumn Crocus. These have become for at least two centuries naturalised in the Nottingham meadows, and when in flower make such a show as can be seen nowhere else in Britain. Acre upon acre of meadow is so thickly covered that the green appearance of the fields is changed to a most lovely blue purple. Since building has encroached upon the meadow-land, however, the crocus is dying out. The only other locality in England where the crocus is found wild is at Mendham, Suffolk.

Vinca major and *minor*, the greater and less Periwinkle, found near Colwick, near Farnsfield, and in Kirklington Wood. *Paris quadrifolia*, Herb Paris, found in Colwick Wood, at Aspley, and in Linby Wood. *Parnassia palustris*, Grass of Parnassus, in a close beyond Scottum, (*Scotholme* now), in bog land near Bulwell, &c. *Silene nutans*, the Nottingham catch-fly. This is found on the Castle Rock, and upon rocks at Sneinton. A variety is found upon Dover Cliffs. The Castle Rock is remarkable for the very large number of plants to be found upon it, many being of a somewhat rare description.

Amongst distinguished botanists who have written upon or collected the county flora may be mentioned Deering. He published "Catalogus Stirpium: a catalogue of plants naturally growing and commonly cultivated in divers parts of England, more especially about

Nottingham. Distribution according to Mr. Ray. By C. Deering, M.D., Nottingham. Printed for the author by G. Ayscough, and sold by Rivington at the Bible and Crown, St. Paul's Churchyard, London, 1738." He refers (as to a newly-ascertained fact) to the dilatation produced in the pupil of the eye by application of a bit of leaf of *Atropa Belladonna*. In naming some habitats of plants, he refers to the Castle Rock, the Park, the Hell-closes by the Leen, the Nottingham Gallows; and names some plants that are now extinct in this neighbourhood, as the *Nymphæa alba*, or White Water Lily, which he states is found in "the great Cheney Pool, and in a ditch between Lenton and Beeston." He describes as a new plant, "*Solanum tuberosum esculentum*, *Battatos*, of late much cultiated, and turned to good account."

Ordoyno wrote "Flora Nottinghamiensis: T. Ordoyno, nurseryman and seedsman, Newark, 1807," dedicated to a botanist, Mrs. Sherbrooke, of Oxton. He mentions the fact of Dr. Smith acknowledging in his Flora Britannica," the receipt of the Crocus from the above-named lady.

Howitt wrote "The Nottinghamshire Flora: containing the Flowering Plants, Ferns, Mosses, Hepaticæ, Lichens, Characeæ, and Algæ: By Godfrey Howitt, M.D., London, 1839," a small, but invaluable work, embracing the facts as to local distribution observed by Deering, Ordoyno, Jowett, and himself. Jowett was a collector (and writer ?). Lowe, of Beeston High Fields, wrote "A History of British Grasses," and also "Ferns, British and Exotic," both profusely illustrated, and the latter work an authority on the subject. Dr. Mitchell made a large collection of dried plants, now in the Museum of the University College. Lastly, Dr. Wilson largely verified Howitt's book, and collected a nearly complete County Flora. This collection is the finest we have in the town; many of the specimens are quite remarkable for the beautiful preservation of the colours. An attempt is being made to make of this collection a Flora Britannica, but there are many gaps to fill up.

At a meeting like this, composed largely of workers in natural history, it is impossible not to refer to the great naturalist who has recently departed from us, Charles R. Darwin. Always more or less an invalid, but ever an incessant worker, he had the good fortune to live to see his famous theory of evolution almost universally adopted—an anti-evolutionist being now as rare as an evolutionist once was. His modesty, justice, and fairness to others were proverbial. He was the intellectual parent of hundreds, and his burial at Westminster was a great testimonial to the growth of liberal thought among our clerics. In the future, Darwin must rank among the world's foremost truth-seekers, after Plato and Cicero, and as the greatest man of science England has produced since Newton.

Three duties now alone remain for me. In the first place, I must thank several gentlemen who have aided me in the preparation of this address, including Dr. Truman and Messrs. E. Wilson, B. S. Dodd, J. S. Hedderley, and W. J. Harrison. Then I wish to offer the warmest of welcomes to those visitors from the various scientific societies of the Midlands who have honoured and gratified us by their presence here to-day; and, lastly, I desire to express my personal obligations to this audience for the patience and courteous attention with which they have favoured me.

THE FLORA OF WARWICKSHIRE.

AN ACCOUNT OF THE FLOWERING PLANTS AND FERNS OF THE COUNTY OF WARWICK.

BY JAMES E. BAGNALL.

(Continued from page 139.)

ROSACEÆ—Continued.

ROSA, continued.

R. sepium, *Thuill.* *Small-leaved Sweetbriar.*
Native: In hedges. Very rare. June.
b. Billietii, Puget.

II. "In a small hedge-row in a pasture field near Bidford Grange," *Bree, Purt.*, iii., 41. "In Britain I have seen this only from Allesley, in Warwickshire," *Baker*, *Mon. Brit. Roses*, p. 224. Mr. Bloxam informed me that the late Rev. W. T. Bree transplanted the rose from Bidford to his Rectory garden at Allesley. Bloxam's *fasciculus* specimens were from this locality.
d. pulverulenta, Bieb.

II. A single bush in a field in Cathiron Lane, near Harborough Magna! also by the Railway Crossing in the same lane, in 1875! *Rev. A. Blox.*

R. canina, *Linn.* *Dog Rose.*
Native: In hedges, woods, heath lands, &c. June, July.
a. lutetiana, Leman. Common. Area general.
b. surculosa, Woods. Rather rare.

I. Marston Green; Coleshill Bog.

II. Barnes Green, near Coventry, *T. Kirk, Herb. Brit. Mus.*; lane, Aston Cantlow to Billesley; lane near Exhall; fine form, with subglobose fruit, field path to Bilton Church, Rugby; Cathiron Lane; Lutterworth Road, near Coomb Abbey; Itchington Holt.
c. sphærica, Gren. Rare.

I. Robust form in lane to New Park, Middleton; Dosthill, in the Kingsbury Road.

II. Lane near the Golden Cross, Exhall.
d. senticosa, Ach.

I. Wild lane near Knowle Railway Station; Hay Lane, near Solihull; confirmed by Dr. Christ.

e. dumalis, Beck. Common. Area general.

f. biserrata, Merat. Rather rare.

I. Near Patrick Bridge, Hampton-in-Arden.

II. Oakley Wood, *H.B.*; Shortwood Coppice, near Tardebig; Golden Cross Lane, Exhall, confirmed by Mr. J. G. Baker; near Harborough Magna, 1875.

g. urbica. Leman, Common. Area general.

I find a marked form at Over Green, near Wishaw, which Dr. Christ refers to *R. platyphylla*, Rau.

h. frondosa, Steven. Very rare.

I. Near Patrick Bridge, Hampton-in-Arden. This is apparently the same plant as the Rev. A. Ley's plant from Welsh Newton.

II. Near Bishop's Tachbrook, *H.B.*

i. arvatica, Baker. Rather rare.

I. Curdworth Bridge, confirmed by Mr. J. G. Baker; Baker's Lane, near Knowle; Hampton-in-Arden; Baulk Lane, Berkswell.

II. Harborough Magna, *Rev. A. Blox.*; Milverton, Oakley Wood, *H.B.*; Rowington Green.

The plant from Baker's Lane Dr. Christ considered to be the *R. concinna*, Puget.

j. dumetorum. Thuill. Rather local.

I. Small-leaved form, Marston Green; lane to New Park; Baker's Lane, Knowle; Baulk Lane: Over Whitacre, &c.

II. Myton, Chesterton! Hatton! *H. B.*; Shrewley Common; Marl Cliff, a robust form with numerous flowers; Butler's Lane, near Hewell Grange; near Chesterton Wood.

- *obtusifolius*, Desv. Baker, *Journal of Bot.*, viii., 79, 80. Rather local.

I. Near Patrick Bridge, Hampton-in-Arden, *Herb. Brit. Mus.*, *J. E. B.*; Brockhill Lane, near Berkswell; Coleshill Road from Stonebridge; Doe Bank, Sutton.

II. Hampton-on-the-Hill; Hampton Lucy, *H. B.*: Beausale Common.

m. tomentella, Leman. Rather local.

I. Sutton Park: Trickley; Wishaw; Shustoke; Berkswell, &c.

II. Myton, Kenilworth, *H. B.*; near Coomb Abbey; Harborough Magna; Cathiron Lane.

A variety of this occurs at the north end of Sutton Park, which Dr. Christ refers to *R. affinis*, Rau.

n. andegavensis, Bast. Rare.

I. Wheyporridge Lane, Solihull.

II. Myton, Pinley Green, *H. B.* Golden Cross Lane, Exhall; confirmed by Dr. Christ and Mr. J. G. Baker.

o. verticillacantha, Merat. Local.

I. Sutton Park; near the Cock, Wishaw; near Curdworth Bridge; near Stonebridge, in the Coleshill Road, with glandular sepals; Solihull, in lane to Sharman's Cross, with intermediate prickles, (*R. latebrosa*, of Déséglise.) The Solihull plant is pronounced to be *R. micrantha, nuda, Briggsii*, by Dr. Christ. I think he is mistaken. It has been confirmed as *R. latebrosa* by Mr. T. R. Archer Briggs, and is apparently identical with Mr. Briggs's Devonshire specimens labelled *R. latebrosa*.

II. Chesterton Wood! *H.B.*; Harborough Magna! *Rev. A. Blox.*: Shrewley Heath; Cold Comfort.

p. collina, Jacq. Very rare.

I. Lane from Water Orton to Minworth; near the Cock Inn, Wishaw; an intermediate between this and *R. cæsia* occurs near Curdworth Bridge.

q. cæsia, Smith. Rare.

I. Wheyporridge Lane, Solihull; Over Green, near Wishaw.

II. In several localities near Harborough Magna! *Rev. A. Blox.*; Oakley Wood, *H.B.*: Shrewley Heath, near ShrewleyPool: a robust form, with clustered fruit, lane from Stratford-on-Avon to Loxley.

s. decipiens, Dumort. Very rare.

I. Doe Bank, near Sutton. *Herb. Brit. Mus., J.E.B.*

II. Near Cathiron Lane, Harborough Magna! *Rev. A. Blox.*: Rounshill Lane, Kenilworth, *H.B.*

t. Reuteri, Godet. Rare.

I. Lane from Solihull to Sharman's Cross, *Herb. Brit. Mus., J.E.B.*; lane from Hartshill to Mancetter; lane from Slowly Hill to Over Whitacre; lane from Berkswell Station to Meriden.

II. Beausale Common, near Hatton, *H.B.*: Hampton-on-the-Hill.

u. subcristata, Baker. Rare.

I. Monkspath, near Shirley, near the Boxtrees.

II. Hedge at Hatton, with aciculate peduncles! *H. B.* Old Park, Warwick, *H. B.*: Allesley! *Bolton King.* Hampton-on-the-Hill; lane from Butler's Hill to Bordesley Park.

v. Hailstoni, Baker Very rare.

II. In Shortwood Dingle, two or three bushes in 1872; named *R. Hailstoni* by Mr. J. G. Baker.

Remarkable for having the intermediate armature of the *Sabini* group.

w. implexa, Gren. Very rare.

I. Two bushes in Shelly Lane; this is closely related to *R. Reuteri*, but has the leaves hairy beneath.

x. coriifolia, Fries. Very rare.

I. Lane from Water Orton to Minworth, *Herb. Brit. Mus., J.E.B.*; confirmed by Dr. Christ and Mr. J. G. Baker. In the Atherstone Road near Over Whitacre.

y. Watsoni, Baker. Very rare.

I. Ash End near Middleton; confirmed by Mr. J. G. Baker, 1872. Hedge below Middleton Village.

a. *Borreri*, Woods. Very rare.

I. Lane to Shelly Farm, Solihull; Baulk Lane, Berkswell, *Herb. Brit. Mus., J. E. Bagnall.*

II. Woodloes, Warwick! *H. B.* Butler's Hill, near Tardebig.

b. *Bakeri*, Deseg. Very rare.

II. Old Park, Warwick! confirmed by Mr. J. G. Baker. *H. B.* I think that this plant is *R. pulverulenta.*

c. *marginata*, Wallr. Very rare.

I. Meadow near Blythe Bridge, Solihull; confirmed by Mr. J. G. Baker, but pronounced to be *R. Reuteri* by Dr. Christ. I think he is mistaken. Shelly Lane.

II. Near Baddesley Clinton; Cold Comfort; Butler's Hill; Dr. Christ says the plants from the last three stations all belong to *R. Blondeana*, Rip.; this Mr. Baker quotes as a synonym for *R. marginata*, Wallr.

R. stylosa (?), *Desv.* *Columnar-styled Dog Rose.*

Native: In hedges and woods. Very rare. June.

d. gallicoides. Baker.

II. Chesterton Wood! Warwickshire. *H. Bromwich, Bak. Mon.*

This plant Dr. Christ believes to be a hybrid between *R. arvensis* and *R. rubiginosa.* I believe it to be a hybrid between *R. arvensis* and *R. spinossisima.* I do not think any variety of *R. stylosa* occurs in Warwickshire.

R. arvensis, *Huds.* *Field Rose.*

Native: On hedge banks, heaths, and in woods. Common. June, July. Area general.

b. bibracteata, Bast. Rare.

I. Near Bannersley Pool, Coleshill, Lane from Solihull to Shirley.

II. Near Harborough Magna, *Rev. A. B.;* Loxley; plentiful, Butler's Hill, near Tardebig.

A setose glandular form, nearer typical *arvensis*, occurs by Chesterton Wood; this variety I have called *R. setosa* on my herbarium specimens.

CRATÆGUS.

C. Oxyacantha, *Linn.* *Hawthorn, Whitethorn.*

Native: In woods, on heathlands and in hedges. Common. May, June.

a. oxyacanthoides, Thuill. Local.

I. Near Solihull. Hedges near Packwood House.

II. Chesterton Wood, *H. B.;* Old Park, Warwick! *Y. and B.:* Tredington, *Newb.;* Lapworth Street; Arrow Lane; Ufton Wood; Bascott Heath.

b. monogyna. Jacq.

Common. Area general.

(To be continued.)

SUMMER MIGRANTS.

NOTICE OF THE ARRIVAL OF MIGRATORY BIRDS IN NORTH OXON IN THE SPRING OF 1882, WITH NOTES.

The early and genial spring which we have experienced this year, one might think, would have influenced our summer birds of passage, and induced them to put in an appearance at an earlier date than is their wont. Such, however, as far as I have noticed here, does not seem to have been the case, at least to any great extent. One or two species were, perhaps, a trifle earlier; whilst, at the same time, others were certainly behind time. The Chiffchaff, our earliest visitor, I did not notice till March 25th, when I observed one busily hawking for midges, which swarmed under the shelter of a tall hawthorn hedge already green. It frequently took the insects on the wing, flying out the distance of a few feet from the hedge after the manner of a fly-catcher, but generally preferred to secure those within easier reach by flitting from twig to twig. Its song was faint, but, three days after, I heard another "chip-chopping" loudly. Swallows were reported here by the 6th April; I myself did not see them till the 13th, and they were not plentiful before the 17th. On the 12th I noticed a Willow-Wren in full song; this is about their average date. In another week the migrants began to arrive in strong force; on the 19th I noticed four new ones, viz.:—House Martin, Yellow Wagtail—rather ate this year,—Tree Pipit, in full song, and Redstart. The last named had young flying on June 10th. There must have been a rush of migrants on the night of the 20th, for the next morning I noticed a dozen or more Common Whitethroats singing lustily within a short distance of one another, besides Sedge Warblers. It would appear, either that when the warblers reach this district only a portion of the detachments remain, whilst the others push on, or that they arrive here in small bodies, and then scatter. A species may be very plentiful one day in a certain locality—the hedges seeming alive with them—where a few days after but few will be noticed, whilst at the same time they will be found more generally diffused. Some such hypothesis as the above-mentioned seems necessary to account for this. The day following (20th) a Corncrake was captured in the town of Banbury, having probably come in contact with the telegraph wires, as it was a good deal injured. I did not hear any "craking" until May 12th. It is difficult to say when the Cuckoo really *did* appear; it was reported from the end of March onwards, but I could get no useful observation till the middle of April; by May 2nd they were plentiful, growing hoarse by the 18th, and on the 30th of that month I heard one cry, like Chaucer's, "three cuckoos to one coo." On May morning I observed a pair of Lesser Whitethroats; this species, like its larger relative, will sing on the wing. On the evening of the next day a Blackcap sang beautifully. This bird generally arrives during the first or second week in April, and probably did so this season. I noticed three Swifts swinging round and screaming loudly on the 9th, and two days afterwards they were numerous. Turtle Doves appeared on the 12th. A keeper told me the same evening that he had just seen a Common Sandpiper sit on their bridge wall, and that although the birds visited their moat every spring, he had never seen them settle on a wall before. They generally appear early in May. As I was walking in that neighbourhood on the evening of the 2nd, a small flock of birds passed me flying rapidly and rather low in the direction of the moat;

it was growing dusk, so that I could not make sure, but I believe from their appearance they were Sandpipers. The Nightingale was noted here on the 19th April, but it grows very scarce. I did not hear it once, myself, till the middle of May, when, driving past a wood some miles from here, the beautiful song reached us from an adjacent thicket. I have observed a good many Garden Warblers, but not till long after their probable arrival; their sweet rich song is second only to the Nightingale's, though that of the Blackcap runs them close. Passing along the road one morning I roused a party of Sparrows from some faggots on the roadside, and amongst them, strange to say, a Wryneck; the light coloured patch between the shoulders makes this bird very conspicuous at a short distance. Spotted Flycatchers I did not see till May 21st, but they must have arrived earlier, as they had full-fledged young in the same garden by June 23rd. Sand-Martins were nesting when I visited a colony on May 29th. On June 16th, Whinchats had young well able to fly. A few days afterwards I was much pleased at watching a pair of these birds, which, doubtless, had young in the vicinity, flitting about over a field of mowing grass, and frequently settling on the large white flower heads of the cow parsnip (*Heracleum sphondylium*) which grew plentifully among the grass. When thus perched they looked extremely pretty, the brown and pale red tints of the male contrasting well with the white flowers and surrounding green.

Banbury, Oxon, July, 1882. OLIVER V. APLIN.

FUNGI OF THE NEIGHBOURHOOD OF BIRMINGHAM.

FIRST LIST, 1881-82.*

AGARICINI.

Agaricus (Amanita) phalloides, Fr. Sutton Park, borders of woods. Frequent. Sept.—Oct.

Ag. (Am.) pantherinus, DC. Sutton Park, borders of woods. Sept.—Oct.

Ag. (Am.) rubescens, Pers. Sutton Park, open places among trees, in woods and their borders. Common. Summer and Autumn.

Ag. (Am.) asper, Fr. Sutton Park, borders of woods. Sept.

Ag. (Lepiota) rachodes, Vitt. Sutton Park, borders of woods. Sept.

Ag. (Lep.) cristatus, Fr. Driffold Lane, Sutton. On chips and saw-dust. Sept.—Nov.

Ag. (Lep.) granulosus, Batsch. Sutton Park, on the heath, and in the woods, amongst grass. Common. Sept.—Oct.

Ag. (Armillaria) melleus, Vahl. Sutton Park, on old stumps. Abundant. Sept.—Nov

Ag. (Tricholoma) rutilans, Schäff, Sutton Park, at the roots of pines, in Holly and Nut Hursts. Sept.—Oct.

Ag. (Trich.) vaccinus, Pers. Sutton Park, in woods. Sept.

* This list contains only those which I have myself observed, and which have been determined without doubt. I have to thank Messrs. M. C. Cooke and W. Phillips for kind help in naming some of them.

Ag. (Trich.) saponaceous, Fr. Sutton Park, border of Lower Nut Hurst. Oct.

Ag. (Trich.) nudus, Bull. Sutton Park, in woods, underneath the shelter of bushes. Common. Sept.—Nov.

Ag. (Clitocybe) nebularis, Batsch. Roadside, near Sutton. Oct.

Ag. (Clitoc.) phyllophilus, Fr. Sutton Park, in woods. Oct.

Ag. (Clitoc.) cyathiformis, Fr. Small Heath; Driffold Lane, Sutton, amongst grass. Nov.

Ag. (Clitoc.) brumalis, Fr. Sutton Park, in woods. Common. Oct.—Nov.

Ag. (Clitoc.) laccatus, Scop. Common everywhere. Sept—Nov. The purple variety in Sutton Park, in woods. Sept.

Ag. (Pleurotus) ostreatus, Jacq. Sutton Park and Driffold Lane, on dead trunks. Common. Sept.—Jan. Having eaten this, I can bear testimony to its delicious flavour, which is equal, if not superior, to that of the common mushroom. It was often 4 inches in diameter.

Ag. (Pleur.) chioneus, Pers. Sutton Park, on fragments of bark. Rare. Oct.

Ag. (Collybia) platyphyllus, Fr. Sutton Park, by the sides of alleys in the woods. Rare. Oct. I am not sure that any of the specimens were other than the variety *repens*.

Ag. (Coll.) maculatus, A. & S. Sutton Park, on the heaths, among furze. Common. Sept.—Oct.

Ag. (Coll.) butyraceus, Bull. Sutton Park, in woods. Oct.

Ag. (Coll.) velutipes, Curt. Everywhere, on dead stumps and rails. Common. Aug.—May.

Ag. (Coll.) cirrhatus, Schum. Sutton Park, amongst little heaps of dead leaves and sticks. Sept.—Oct.

Ag. (Mycena) galericulatus, Scop. Common. On stumps, Sept.—Nov.

Ag. (Myc.) acicula, Schäff. Sutton Park and Driffold Lane, on dead sticks. Sept.—June.

Ag. (Myc.) galopus, Schrad. Sutton Park; Solihull. In woods, on dead sticks and leaves. Common. Sept.—June.

Ag. (Myc.) epipterygius, Scop, Sutton Park; Solihull. On dead leaves. Common. Sept.—Oct.

Ag. (Myc.) tenerrimus, Berk. Driffold Lane, Sutton, on dead bark. Oct.—Jan.—May.

Ag. (Omphalia) umbelliferus, Linn. Sutton Park; Oscott. On banks. amongst grass. Sept.—Oct.

Ag. (Chamæota) echinatus, Roth. Driffold Lane, Sutton, on roots of elder. Rare. Oct.—Nov.

Ag. (Pluteus) cervinus, Schäff. Driffold Lane, Sutton, on sawdust. Sept.—Dec.—June.

Ag. (Pholiota) heteroclitus, Fr. Driffold Lane, Sutton, on logs. Oct.—Nov.

Ag. (Phol.) mutabilis, Schäff. Sutton Park; Oscott. On stumps. Sept.—Nov.

Ag. (Galera) tener, Schäff. Olton, among grass. Oct.

Ag. (Tubaria) furfuraceus, Pers. Driffold Lane, Sutton, on chips. Sept.

Ag. (Stropharia) æruginosus, Curt. Common, especially among nettles. Aug.—Nov.

Ag. (Strop.) semiglobatus, Batsch. Common. Sutton Park, etc. Sept.—Nov.

Ag. (Hypholoma) sublateritius, Fr. Sutton Park, on stumps. Oct.—Nov.

Ag. (Hyph.) fascicularis, Huds. Abundant, on stumps. Aug.—May.

Ag. (Hyph.) udus, Pers. By Bracebridge Pool, Sutton Park. Rare. Oct.

Ag. (Psilocybe) semilanceatus, Fr. On damp pasture, Sutton Park. Oct.—Nov.

Ag. (Panæolus) separatus, L. Common, on dung.

Ag. (Pan.) fimiputris, Bull. Common, on dung.

Ag. (Psathyrella) disseminatus, Fr. Driffold Lane, Sutton, on bark.

W. B. GROVE, B.A.

(To be continued.)

METEOROLOGY OF THE MIDLANDS

BY CLEMENT L. WRAGGE, F.R.G.S., F.M.S., ETC.

THE WEATHER OF APRIL AND MAY, 1882.

April.—Very genial weather prevailed until the 12th, followed by a period of excessive rain, with thunderstorms, hail, and gales during the last week. The gale of the 29th reached the force of a hurricane at Marlborough. Temperature appears to have been much about the average. The rainfall, however, was much above the average, the totals being generally between 3 and 5in. The barometer read highest on the 8th, and lowest on the 29th, 30·440 and 28·915 being about the mean values respectively at 32 Fahr. and sea level for central districts. The mean amount of cloud may be given as 7·0 (scale 0 to 10), and the mean relative humidity as 83%. North-easterly winds were very frequent. The mean temperature of the soil at Strelley, at a depth of 1ft., was 45·4, and the total duration of sunshine 139·8 hours.

May.—Temperature was above, and rainfall generally about the average. Highest reading of barometer, 30·520, and lowest, 29·355, on the 17th and 24th respectively (means for Central England at 32 Fahr. and sea level). The mean amount of cloud was about 6·0 (scale, 0 to 10), and mean relative humidity about 73%. North-easterly winds again very prevalent. The mean temperature of the soil at Strelley was 51·6 at depth of 1 foot; and duration of sunshine, 245·8 hours.

THE WEATHER OF JUNE, 1882.

This was a wet and unsettled month, with an abnormally low temperature, and ungenial weather generally. At Hodsock it was "the coldest and wettest June in eight years' observations." At Orleton the mean temperature was 2¼ degrees below the average of 20 years, and the rainfall was nearly double the average. The highest pressure was recorded on the 1st, when the barometer corrected and reduced to sea level at 32 Fah. read 30·365 over central England; and the lowest reading was 29·380, on the 9th, as means respectively. The mean amount of cloud was about 8·0 (scale 0 to 10), and the mean relative humidity 78 %. Westerly winds prevailed. The mean temperature of the soil at Strelley, at a depth of one foot, was 55·9; and the total duration of sunshine 144·7 hours. Snow was reported to have fallen in the Staffordshire moorlands. On Ben Nevis early in the month the snow averaged 4 feet in depth, and heavy snowfalls occurred afterwards. Sea temperature at Scarborough, 51·9.

STATION.	OBSERVER.	RAINFALL. Total for M. In.	Greatest fall in 24 hours. In.	Date.	No. of rainy days.	SHADE TEMP. Absolute Maximum. Deg.	Date.	Absolute Minimum. Deg.	Date.
OUTPOST STATIONS.									
Ben Nevis (*a*)	C. L. Wragge, Esq., F.M.S.	9·13	1·10	14	27	54·0	29	23·1	12
Fort William (*a*)	C. L. Wragge, Esq., F.M.S.	3·95	·75	17	20	74·0	30	38·4	16
Spital Cemetery, Carlisle	I. Cartmell, Esq., F.M.S.	2·68	·40	3	16	73·5	28	35·3	16
Scarborough (*a*)	W. C. Hughes	3·36	·72	10	20	65·8	4	42·6	13
Blackpool (*a*)—South Shore	C. T. Ward, Esq., B.A., F.M.S.	3·57	·61	13	20	67·9	26	36·3	17
Llandudno (*a*)	J. Nicol, Esq., M.D.	2·99	·72	13	20	68·5	28	43·2	10, 11
Lowestoft (*a*)	H. E. Miller, Esq., F.M.S.	3·00	·70	18	16	69·7	7	40·0	16, 17
Carmarthen (*a*)	G. J. Hearder, Esq., M.D.	3·76	·49	17	21	72·8	30	38·3	17
Cardiff (*a*)	W. Adams, Esq., C.E.	4·28	·82	5	20	72·4	30	41·3	17
Altarnun, near Launceston (*c*)	Rev. J. Power, F.M.S.	5·38	1·22	6	21	72·0	30	37·0	16, 17
Sidmouth (*a*)	W. T. Radford, Esq., M.D.	4·10	·60	28	22	71·1	30	41·5	17
Les Ruettes Brayes, Guernsey (*a*)	A. Collenette, Esq., F.M.S.	2·91	·84	21	22	68·6	30	44·8	17
Guernsey (*a*)	F. C. Carey, Esq., M.D.	2·55	·61	21	22	68·5	30	45·3	17
MIDLAND STATIONS.									
HEREFORDSHIRE.									
Burghill (*a*)	T. A. Chapman, Esq., M.D.	2·64	·40	5	20	74·2	28	36·8	17
SHROPSHIRE.									
Woolstaston	Rev. E. D. Carr	4·13	·78	4	20	73·5	30	40·5	13
Stokesay (*a*)	M. D. La Touche	4·39	·80	4	18	75·9	30	35·5	18
More Rectory	Rev. A. S. Male	4·36	·89	3	21	75·0	30	36·0	17
Dowles, near Bewdley	J. M. Downing, Esq.	4·25	·73	5	20	82·0	29	28·0	17
WORCESTERSHIRE.									
Orleton, near Tenbury (*a*)	T. H. Davis, Esq., F.M.S.	4·77	1·08	4	19	76·0	30	37·2	13
West Malvern	A. H. Hartland, Esq.	2·94	·63	5	20	75·0	27	38·5	12, 15
Evesham	T. J. Slatter, Esq., F.G.S.	3·20	·46	22	19	76·3	29	40·5	13
Pedmore	E. R. Marten, Esq.	5·13	·92	4	18	77·0	27, 29	40·0	16
Stourbridge	Mr. J. Jefferies	5·31	1·03	4	21	75·0	28	41·0	13, 19
Cawney Bank, Dudley	Mr. C. Beale	5·01	·88	4	15	66·0	30	41·0	12
STAFFORDSHIRE.									
Dennis, Stourbridge (*a*)	C. Webb, Esq.	5·37	1·28	4	18	73·0	27	39·0	17
Kinver	Rev. W. H. Bolton	4·82	·96	4	20	74·0	29	38·0	16
Walsall	N. E. Best, Esq.	5·59	·98	4	19	67·0	27, 30	42·0	12, 16, 17
Lichfield	J. P. Roberts, Esq.	5·16	·68	3	19	76·0	30	38·0	16
Burton-on-Trent (*c*)	C. U. Tripp, Esq., F.M.S.	4·81	·90	5	21	76·0	29	36·0	17
Wrottesley (*a*)	E. Simpson, Esq.	5·49	·88	4	19	72·1	29	41·0	13, 17
Barlaston (*a*)	W. Scott, Esq., F.M.S.	7·38	1·77	30	14	65·8	7	40·8	15
Tean (*c*)	Rev. G. T. Ryves	6·27	·84	3	19	75·0	30	35·0	17
Heath House, Cheadle (*a*)	J. C. Philips, Esq., F.M.S.	5·87	·95	4	15	69·5	29	40·6	13
Oakamoor, Churnet Valley (*a*)	Mr. J. Williams	6·75	2·00	4	1[illegible]	69·4	3	32·7	20
Alstonfield	Rev. W. H. Purchas	6·05	·84	22	19	74·3	20, 28	33·2	13
DERBYSHIRE.									
Stony Middleton	Rev. Urban Smith	6·41	1·10	22	20	73·0	30	37·0	16
Spondon	J. T. Barber, Esq.	3·98	·61	3, 5	15	—	—	—	—
Fernslope, Belper	F. J. Jackson, Esq.	4·27	·75	5	19	74·0	29	37·6	17
NOTTINGHAMSHIRE.									
Hodsock Priory, Worksop (*a*)	H. Mellish, Esq., F.M.S.	3·69	1·05	22	22	72·2	29	36·8	17
Strelley (*a*)	T. L. K. Edge, Esq.	3·64	·67	22	18	72·7	30	38·0	13
Tuxford	J. N. Dufty, Esq., F.G.S.	2·68	·60	21	17	69·0	21, 26, 29	37·0	13
RUTLANDSHIRE.									
Uppingham	Rev. G. H. Mullins, M.A., F.M.S.	3·15	·98	3	20	75·1	29	39·5	13
LEICESTERSHIRE.									
Loughborough (*a*)	W. Berridge, Esq., F.M.S.	4·13	·93	22	17	74·6	30	41·3	17
Syston	J. Hames, Esq.	4·11	1·22	22	21	70·0	30	42·0	13, 17
Town Museum, Leicester	J. C. Smith, Esq.	4·11	1·09	22	15	73·2	30	41·0	13
Waltham-le-Wold	Edwin Ball, Esq.	4·35	1·09	22	21	74·0	28	38·0	13
Dalby Hall	G. Jones, Esq.	3·74	·79	22	19	80·0	30	34·0	1
Coston Rectory, Melton (*a*)	Rev. A. M. Rendell	3·68	·81	3	19	69·8	29	38·0	1, 17
WARWICKSHIRE.									
St. Mary's College, Oscott (*a*)	W. Middleton, Esq.	3·54	·49	22	17	71·8	30	41·9	16, 17
Henley-in-Arden	T. H. G. Newton, Esq.	4·58	·66	13, 22	19	75·0	27, 30	38·0	16
Kenilworth (*a*)	F. Slade, Esq., C.E., F.M.S.	3·95	·72	22	18	71·3	30	37·9	17
Rugby School (*c*)	Rev. T. N. Hutchinson	4·75	1·52	22	17	71·0	29	40·0	1
NORTHAMPTONSHIRE.									
Pitsford, Northampton	C. A. Markham, Esq.	3·64	·78	9	19	79·0	25	36·0	17
Towcester	J. Webb, Esq.	3·22	·37	3	20	—	—	—	—
Kettering	J. Wallis, Esq.	2·70	·77	3	18	72·0	30	42·0	13
BEDFORDSHIRE.									
Aspley Guise, Woburn (*a*)	E. E. Dymond, Esq., F.M.S.	2·50	·62	3	18	71·7	27	40·0	13
OXFORDSHIRE.									
Radcliffe Observatory, Ox. (*a*)	The Staff	3·30	·70	21	17	71·0	29	41·1	17
WILTSHIRE.									
Marlborough (*a*)	Rev. T. A. Preston, F.M.S.	5·84	1·25	22	21	70·2	27	37·1	13
GLOUCESTERSHIRE.									
Cheltenham (*a*)	R. Tyrer, Esq., B.A., F.M.S.	3·47	·52	26	19	73·0	29, 30	34·5	16

(*a*) At these Stations Stevenson's Thermometer Screen is in use, and the values may be regarded as strictly intercomparable.

(*c*) Glaisher's pattern of thermometer screen employed at these stations.

Synopsis of the observations taken at my station on Beacon Stoop, 1,216 feet above sea, are unavoidably held over until a future number.—C. L. W.

Correspondence.

Protective Resemblance.—While botanising recently in the New Forest, Hampshire, with Mr. Bolton King and Mr. G. Stapleton, we noticed on the head of the meadow thistle, *Cardinis pratensis*, a common skipper, which did not fly on our near approach, and seemed rather mysteriously fastened to it. Closer examination revealed the cause: a spider had seized it by its head, and its bite had already paralysed it. The curious fact is that the spider was exactly of the same colour as the thistle head, and its legs most difficult to distinguish from the florets. Through Professor Westwood's kindness, I am enabled to say that the spider's name is *Thomisus abbreviatus*, the peculiar colour and its six eyes, with the strange-shaped abdomen, making it a rather extraordinary creature. The colour is described as normally of a pale yellow—can it be chameleon like, the colour depending upon its home, which, in this case, was of most "protective resemblance."—G. C. Druce, F.L.S., Oxford.

Edelweiss.—Last week I saw four or five plants of the "Edelweiss," growing, and growing well, in a garden near Arnold, in Sherwood Forest. They were brought over by the owner some four years since, but did not show until the first of the last hard winters, when they came up, and are now fine plants. Facing east on a rockery border to a garden walk, they have every appearance of living well.—Hy. D. Crompton, 1st July, 1882.

[The plant is growing and thriving on a rockery at Moseley, near Birmingham, aspect the same—east.—Eds. M.N.]

Silene anglica. *Linn.* — I have recently found *Silene anglica* growing abundantly in a sandy field near Coleshill. Here I believe the plant is a native plant, as the field in question has never been under cultivation; so that I now consider the plant native and not alien, as I formerly thought. In the stations mentioned in my notes on the Flora of Warwickshire, the plant is undoubtedly of foreign origin, of uncertain occurrence, and in the Sutton Park Station not truly established.—J. E. Bagnall.

Warwickshire Grasses.—In June last, I found an abundant growth of two comparatively rare Warwickshire grasses, viz., *Avena pratensis* and *Koeleria cristata*, near Hampton-in-Arden. This is the first time either of these grasses has been recorded for North Warwickshire. I have seen both in several localities belonging to what I have termed the Avon basin district, but have sought both in vain, until recently, in the Tame basin district.—J. E. Bagnall.

Dicranum montanum.—Since I last noticed this moss as a Warwickshire plant in the "Midland Naturalist," Vol. iv., page 116, I have made a special point of collecting any moss that I found growing near the roots of oak trees, in woods, that bore any outward resemblance to this moss. I have invariably found that all the mosses I collected near the roots of oaks were *Dicranum montanum*, whilst those collected high up the trunk have most frequently been *Weissia cirrhata*. In my former note I mentioned the characteristic differences between these plants, and need not here repeat them. By this minuter inspection of the likely habitats for *Dicranum montanum*, I have been able materially to increase my knowledge of its occurrence in Warwickshire, so that in addition to the two stations formerly mentioned, I have now found it abundantly in Crackley Wood, near Kenilworth; The Shawberries, near Shustoke; Hardings Wood and Birch Moor Stump, near Maxtoke; Meriden Shafts and Boultbie Wood, near Fillongley (in all these stations on the oak); and sparingly on alder roots in Brown's Wood, near Solihull.—J. E. Bagnall.

Paris quadrifolia.—I yesterday found the *Paris quadrifolia* with *six* leaves; but seeing in John's "Flowers of the Field" that its name is derived from the "unvarying number of its leaves," I thought it might be of interest to make the fact known.—Charles Cochrane, The Grange, Stourbridge, July 6th, 1882.

Paris quadrifolia *(Herb Paris, Herb truelove, or one berry.)*—Mr. Cochrane's note on *Paris quadrifolia* is of much interest to myself, the 6-leaved form of this plant being of rare occurrence. I have never seen it. Smith (in "English Botany") and Hooker (in "British Flora") describe the plant as having usually 4—rarely 5—leaves. Bentham and Babington say 4 leaves; but Hooker (in "Student's Flora") says "leaves 4 (rarely 3-8.") Referring to the older botanists it is evident from his description that Gerarde (1633) had only seen the 4-leaved typical form; whilst Parkinson (1640) in his quaint style writes as follows:—"The ordinary *Herba Paris*, or Herbe true love, hath a small creeping roote, of a little binding, but unpleasant, loathsome taste, running here and there, under the upper crust of the ground, somewhat like a couch grass roote, but not so white, and not much lesser than the roote of the white wild *Anemone*, and almost of as darke a color, but much like thereunto in creeping; shooting forth stalks with leaves, some whereof carry no berries, and others doe, every stalk being smooth without joynts, and blackish greene, rising to the height of half a foote at the most, if it bear berries (for most commonly those that beare none, doe not rise fully so high) bearing at the top foure leaves, set directly one against another in the manner of a cross, or a lace or ribben, tyed as it is called in a true love's knot, which are each of them a part somewhat like unto a Nightshade leafe, but somewhat broader (yea, in some places twice as broad as in others, for it will much vary), sometimes having but *three* leaves, and sometimes *six*, and sometimes smaller and sometimes larger, either by a quarter or halfe, or, as I said before, twice as great," &c. Speaking of the *vertues* of this plant, Parkinson tells us that "although some formerly did account this herbe to be dangerous, if not deadly, as by the name of *Aconitum*, it may be gathered, because the forme thereof bred in them such a suspition, yet have not set downe any evill symptoms that it wrought;" and after relating certain experiments made upon dogs by *Pena* and *Lobel*, he states that "the leaves or berries alone are also effectuall to expel poisons of all sorts, but especially that of the Aconites, also the plague and other infectious diseases; it hath been observed that some have been holpen thereby that have lyen long in a lingring sickness, and others that by witchcraft (as it was thought) were become half foolish, as wanting their wits and sences, by taking a dramme of the seedes or berries hereof in pouder every day for twenty days together, were perfectly restored to their former good estate and health," &c. Since writing the foregoing, I find a notice of the plant by Rev. J. S. Henslow (in "Mag. Nat. Hist.," Vol. V., pp. 429-33), in which out of 1,500 specimens examined 1 had 3 leaves; 1,211, 4 leaves; 259, 5 leaves; and 29, 6 leaves. These observations were made by the great botanist above mentioned and Prof. Babington, then not so well known as now (only Mr. Babington then), *from 1828 to 1832*.—J. E. Bagnall.

Bombyx Mori.—In examining some larvæ of *Bombyx Mori* some time ago I noticed a peculiarity in one of them so unusual that I lost no time in preparing it for the microscope. The peculiarity consisted in its having a double row of hooklets on its pro legs, the second row being about half-way up the pro leg, where it appeared they could be of but little use to the creature. This abnormal development (for I can regard it as nothing else) applied to all the pro legs, and the hooklets in each row were equally well formed. I have examined many larvæ of various kinds, but do not recollect seeing one with this feature before, and should like to know whether any of the readers of the "Midland Naturalist" have met with a similar development.—M. Neville, Handsworth.

[Mr. Neville sent with his note a beautiful drawing showing the abnormal hooklets *in situ*, which we regret we are unable to reproduce along with his note.—Eds. M. N.]

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—Biological Section. June 13th. Mr. J. E. Bagnall exhibited *Escallonia rubra*, a native of South America, peculiar for its glandular leaves, stems, and flowers, with microscopical preparations of the same, showing epidermis of leaves, sections of ovary and ovules; *Aquilegia vulgaris*, Columbine, from woods near Middleton; also *Bartramia Oederi*, *Encalypta procera*, and other mosses from the Engadine. Mr. A. W. Wills exhibited Diatomaceæ from Chester town water; ditto, including *Asterionella formosa*, *Cyclotella* sp?, from Leicester waterworks filter beds; also Vaucheria, showing curious root growth. He presented six slides of Algæ to the Society's cabinet.—Geological Section. June 27th. The following exhibits were made:—Mr. Bailey, two indented pebbles, from the Perry trial sinking, 320 feet below the surface; Mr. W. J. Harrison, a specimen of quartz felsite, from Nuneaton, and *Monograpsus Salweyi*, from Walsall; and Mr. W. B. Grove, *Craterium minutum*, one of the Myxomycetes, from a straw heap at Water Orton. Professor C. Lapworth, F.G.S., then delivered a very interesting lecture on "The Discovery of Cambrian Rocks in the Midlands." He first referred to the Permian breccias of the Clent Hills, Northfield, &c., and showed that the theory of Professor Ramsay, who ascribed their origin to glacial action, was probably erroneous, and that these beds, together with the breccias and conglomerates of the Trias, were most likely *débris* formed from ancient rocks now in great part below the surface. The lecturer said that traces of these old cliffs still remain; as, for instance, at the Lickey Hills, Nuneaton, the Wrekin, &c. The quartzite of the Lickey has generally been described as altered Llandovery sandstone, but is now proved to be of Cambrian age with fossiliferous Llandovery rocks resting uncomformably on its flanks. But what is still more remarkable is, that these quartzites in turn rest unconformably on beds of Archæan or pre-Cambrian age. At Hartshill, near Nuneaton, a large bed of quartzite mapped by the survey as millstone grit is now proved to be Cambrian, and it is overlaid by shales, formerly marked as part of the coal measures, but which are found to contain characteristic Cambrian fossils, such as *Agnostus*, *Obolella*, *Lingulella*, &c. Till lately the Birmingham district was thought to have been accurately described and mapped by the Geological Survey, but Professor Lapworth has during the past few months led the van in a remarkable series of discoveries. Several local geologists have ably followed his lead, and researches are still being carried on which will make considerable differences in the geological maps of this neighbourhood. The lecture was illustrated by many specimens, diagrams, &c., and was followed by a brief discussion.

—GENERAL MEETING. July 4th. Mr. S. Wilkins exhibited *Merulius lacrymans*, the "Dry-rot Fungus." Mr. W. B. Grove exhibited *Polyporus betulinus*, the birch Polyporus, from a dead tree at Harborne, and (on behalf of Mr. C. E. Robinson) *Æthalium septicum*, the "flowers of tan," from a tree at Edgbaston. Mr. J. Levick exhibited *Lophopus crystallinus*, from Barnt Green. Mr. J. Rabone exhibited (on behalf of Mr. J. Edwards) an abnormal proliferous rose, the centre of which was metamorphosed into three or four distinct but undeveloped branches, each bearing many rose-buds. — BIOLOGICAL SECTION. July 11th. Mr. Wagstaffe exhibited an abundant supply of *Cosmarium botrytis*, in conjugation, from near Quinton.—MICROSCOPICAL GENERAL MEETING. July 18th. Mr. J. Morley exhibited *Pyrola minor*, from Scotland, and *Orobanche Hederæ* from Conway Castle. Mr. W. B. Grove exhibited three fungi: *Chondrioderma Michelii* (a Myxomycete) on straw, *Urocystis pompholygodes*, on Ranunculus, and *Coleosporium tussilaginis*, on Coltsfoot. Mr. S. Wilkins exhibited the imago of a large Dragon-fly (*Æschna affinis*), female, which emerged on July 15th, with the four preceding moults shed this year (reared in a small aquarium). Mr. Bagnall exhibited (on behalf of Mr. R. W. Chase) a large number of maritime plants, sent by him from Hunstanton, Norfolk. Mr. W. Southall exhibited two plants with proliferous growth, *Allium vineale* and *Euphorbia cyparissias*.

BIRMINGHAM MICROSCOPISTS AND NATURALISTS' UNION.—June 5th. FREE PUBLIC LECTURE, "South Staffordshire Coalfield," by Mr. L. Percival. A collection of fossil ferns was shown by Mr. H. Insley.—June 12th. MICROSCOPICAL AND GENERAL NIGHT. Mr. J. W. Neville exhibited microscopical section of Astromyelon and peculiar woody tissue, from coal measures; Mr. H Insley, Stigmaria (Fossil) and transverse and vertical section of the same under microscope; Mr. Dunn, transverse section of Fern stem from coal measures; Mr. Boland, *Helix Nemoralis* and its love darts, also *Helix Concinna* from Evesham.—June 19th. MICROSCOPICAL AND GENERAL. Mr. Bradbury exhibted an abnormal growth of Wallflower, in which nineteen stems had grown together, forming a broad blade-like stem, giving off leaves on each side, and flowers at the apex. The stems could be distinctly counted by the nodes at which leaves were given off. Mr. Betteridge exhibited a collection of common birds shot by himself in the neighbourhood, and the walking stick gun by which they were shot.—June 26th. Mr. J. A. Neville exhibited *Phlota plumosa*; Mr. Sanderson, *Marchantia polymorpha* in fruit; Mr. Darley, Bordered White Moth, Sutton Park. A paper was read by Mr. Deakin, "Notes on Parasites of Lepidoptera." The paper was illustrated by a collection on pupæ and imagos, and the infesting parasites from various moths and butterflies. Mr. Darley showed ovipositor and proboscis of Ichneumeon Fly, *Ophion lateum*, and proboscis of a dipterous parasite, found preying upon various Lepidoptera. Mr. J. W. Neville exhibited skin of larva of Emperor Moth, which had been pierced by Ichneumeon Fly.

BANBURYSHIRE NATURAL HISTORY SOCIETY AND FIELD CLUB.—May 30th. — Evening walk to Wroxton to collect *Microzoa*. Some fine specimens of the polyzoon—*Plumatella repens* (exhibited at the June Meeting by Mr. E. A. Walford)—were procured, also many fine Desmids. The rarest species was the minute *Dinobryon sertularia*. June 3rd.—Excursion to Fenny Compton and Avon Dassett. Dog Roses (*Rosa canina*), Woodbine (*Lonicera periclymenum*), and Spindle Tree (*Euonymus Europæus*) were noticed in bloom on Hardwick Hill. At Farnborough Hill the botanists found the rare evergreen Alkanet (*Anchusa sempervirens*) in some abundance. The spoil banks formed by the opening of the canal tunnel were then visited, and some of the ordinary fossils of the Jamesoni zone of the middle Lias (*Gryphæa obliqua*, *Pholadomya*, *Pecten*, *Lima*, *Spiriferina verrucosa*, *Waldheimia numismatis*, and numerous *Belemnites*) were collected. The bank of E. & W. J. Railway was then taken, and the bands of argillaceous limestone crowded with fossils, and the lines of claystone nodules so characteristic of the beds noticed. Rain now coming on heavily the visit to Avon Dassett was not attended with much advantage. June 5th.—MONTHLY MEETING.—Mr. T. Beesley, F.C.S., President, in the chair. The President read his Meteorological Report for April and May. Mean height of barometer for April, reduced to 32°, 29·348 in.: highest 30·040 in. on the 8th, lowest 28·774 on the 28th. Mean temperature 46·7° (1° above average), maximum on the 21st 63°, minimum on the 16th 32°. Rain on nineteen days amounting to 4 inches. Mean height of barometer for May, 29·687 in.: highest, 17th, 30·145 in., lowest, 26th, 29·021 in. Mean temperature 52·3°, about the average, maximum on 30th 70°, minimum on 17th 35°. Rain on fourteen days amounting to 2·13 inches. A violent thunderstorm on the 22nd. Mr. O. V. Aplin, read the Phenological report for the first quarter. The report showed an unusually forward state of vegetation. Many plants such as Red and White Dead Nettles, Shepherd's Purse, Whitlow Grass, and Field and Ivy-leaved Speedwells were in flower all the winter. By the third week in March the hawthorn hedges were quite green in slightly sheltered situations, and even the *flower buds* on some favoured bushes showed white by the end of the month. By the end of January many birds were in song, indeed some, as the Missel Thrush, Robin, Hedge Sparrow, and Wren, might be heard nearly every day through the winter. Gnats and Bees were to be seen on most days after the middle of January. The following were some of the earlier dates in the forms returned to Mr. Aplin:—Hazel, January 15th; Sweet Violet, February 1st; Coltsfoot, 15th Pilewort, 10th; Blackthorn, March 12th; Marsh Marigold, 17th. Rooks were building on March 4th, and Frog spawn was noticed in masses on the 8th of that month. Mr. J. H. Coombes gave an interesting account of the River Lamprey (*Petromyzon fluviatilis*) which is found in most of the streams of the district. He minutely described the structure of this curious species, and explained that the *Ammocœtes branchialis* (which has no teeth and undergoes metamorphosis) is now regarded as the young of the Lamprey. It takes four years to reach the adult stage, in which there is a persistent notochord but no true vertebræ. It has a distinct skull, but no part of the skeleton is ossified, being represented, where present, by cartilage only. After some little discussion on the paper, a warm vote of thanks was awarded to Mr. Coombes. Mr. S. Stutterd and the President then spoke of an electrical phenomenon observed during the storm of the 22nd of May; some discussion followed, and it appeared to be the general opinion that the phenomenon was an instance of ball-lightning. The President recorded *Lamium maculatum* from Lower Tadmarton, which was new to the district. Mr. E. A. Walford exhibited a minute scarlet fungus—*Peziza trechispora*, from the railway bank at Fenny Compton, and noticeable for its spinulose spores. The President exhibited a "Snailery" containing some fine living specimens of the Great Roman or edible Snail (*Helix pomatia*) from Stonesfield, Oxon.

PETERBOROUGH NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—On Whit-Monday, May the 29th, forty members and friends of this Society made an excursion to the Decoy in Boro' Fen, Croyland and Thorney. At the former place the party was received by the owner, J. B. Williams, Esq., and conducted over the Decoy and initiated into the art of taking the "wild fowl." This Decoy is situated between Peakirk and Croyland, in a very retired spot, being reached by a road which is planted on each side with willows flanked by ditches, the waters of which were carpeted with the delicate flowers of *Ranunculus aquaticus*, while the lovely showy spikes of *Hottonia palustris* and the gay heads of *Iris Pseud-acorus* rose through its midst. The area of ground enclosing the Decoy is about nineteen acres, that of the water 2½ acres. The pool is octagonal and has eight pipes leading from it which lie in the direction of the main points of the compass, *i.e.*, N. N.E., S. S.E., &c., &c. Every approach to the margin of the pool is carefully shut off by reed screens 6ft. high, or by trees and underwood. The eight areas between the pipes are thickly planted with willows (*Salix Russelliana*) from the trunks of which multitudes of *Aspidium Filix-mas and Polypodium vulgare* have sprung. Osiers (*S. vitellina*) are also thickly planted, and other trees and shrubs which afford good shelter. *Conium maculatum* is very abundant. Paths are left in the thickets for the decoy-men, by which they reach the screen near the *head-end* or mouth of the pipes, another entrance being made near the *point* or small end, which is screened by two reed fences, so that a passer-by is not seen even from the small end of the pipe. The pipes consist of a small end, the elbow, and the head-end, arched with netting, the meshes of which are from three to four square inches. A triangular piece of ground between the water of the pipe and the screen is called the *back shore*, and is made for the wild fowl to lodge upon. A narrow strip of land on the opposite side is called the *fore shore*. The head-end of the pipe is 15ft. across, at the elbow 12ft., and the small end 2ft. Here a movable net called the tunnel is placed, which opens to the pipe, and into which the wild fowl are driven and captured. The screens are so placed that the decoy-men can walk from the small-end of the pipe to the head-end without being seen by the birds, whether they are on the back shore or wing-pole. The piper (dog) is a necessary agent in the working of the decoy. He is early trained to leap over the board, receiving a piece of cheese as a reward; never to bark or play when on duty, or to take any notice of the fowl. There are about forty ducks of a wild-duck colour called Decoy Ducks kept in the pool; they breed upon the shores, and are trained not to enter the pipes, but to come to the head-end in answer to a faint whistle, and there to be fed. This takes place principally at night, when the wild fowl have left the Decoy. The wild fowl generally come to the Decoy in August, and are left in quietude till November. The birds leave the Decoy as night approaches and return in the daytime for shelter and apparent security. If a north-easterly wind is blowing work will be commenced at the north pipe, so that the wind would blow from the point nearly to the pool. The man throws the dog a piece of cheese, the "piper" leaps the nearest board fence, and runs along the fore-shore and returns through a small hole in one of the fences. The fowlers watch through little slits made in the screens. The man near the small end of the pipe gives sign by moving his hat in the air; another piece of cheese is thrown, the dog leaps again, tame ducks and wild ones are in the mouth of the pipe, the decoy man throws over the screen a few small dark seeds, the tame ducks begin to feed, the dog leaps again higher up the pipe, the wild fowl pursue him to gratify their curiosity, and leave the decoy ducks feeding; the man then comes to the open, and without noise drives the fowl into the small end of the pipe, and thence into the tunnel net, where the necks of the captives are wrung. The chief wild fowl are ducks, widgeon, and teal. Croyland Abbey was next visited, where an informal address was given by the Rev. T. H. Le Bœuf, many additional points of interest being pointed out by the Rev. W. D. Sweeting. The party next repaired to a large clay section about a mile from Croyland, on the estate of Lord Normanton. The section consists of from eight to ten feet of a blue greasy clay, which contains numerous land and marine shells, the trunks of trees, both erect and lying down, resting on from twelve to fourteen inches of peat, with green rush leaves, land and freshwater shells, and the roots of the trees, the whole resting on the boulder clay. It is evident that this deposit was made in a basin forming part of a large river mouth. The boulder clay came nearly to the surface, and the peat formed the ancient soil, subsidence took place, the area was flooded, the blue clay deposited after a lapse of a considerable time, and the whole of the land gradually raised to its existing level. At Thorney Abbey an address was given by the Rev. W. D. Sweeting, in which the details of its architecture, &c. were explained. The Annual Meeting of the Society was held on Monday, June 13th, when the report of the past year was read, and the election of officers took place. The Very Rev. the Dean of Peterborough was unanimously re-elected President, and Mr. J. W. Bodger Honorary Secretary. Excursions have been made in the neighbourhood on the Monday evenings since the 12th June.

EXCHANGE.—Canadian Minerals, Silurian and Pleistocene Fossils, and English Rhætic, Lias and Greensand Fossils, in exchange for other Fossils or Books.—Arthur Floyd, Stratford-upon-Avon.

REPORT ON THE PENNATULIDA COLLECTED IN THE OBAN DREDGING EXCURSION OF THE BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY, JULY, 1881.

BY A. MILNES MARSHALL, M.A., D.SC., PROFESSOR OF ZOOLOGY IN OWENS COLLEGE, AND W. P. MARSHALL, M.I.C.E.

(Continued from page 151.)

PENNATULA PHOSPHOREA *(continued).*

f. The Mesenterial Filaments.—The mesenterial filaments, which are simply the thickened edges of the mesenteries below the stomach, fall, as already noticed, into two groups: a set of two situated on the upper surface of the leaf and extending down to the bottom of the polype cavities, the *long mesenterial filaments*, Figs. 4 and 5 *s*; and a set of six, the *short mesenterial filaments*, Figs. 4 and 5 *r*, which only extend a short way below the stomach.

The long mesenterial filaments have the same character along the whole of their length. They are straight, or very slightly convoluted, and are in transverse section (Fig. 5 *s*) bifid, the filament and mesentery together having the appearance of a letter Y with very thick arms. Each arm consists of a thin stratum of connective tissue, clothed on its upper surface—that towards the upper surface of the leaf—by a thin layer of flat epithelial cells, and on its under surface by a single layer of elongated columnar ciliated cells, which are granular in appearance, and possibly in part of glandular nature. Concerning the function of these long mesenterial filaments we know nothing.

The short mesenterial filaments, Figs. 4 and 5 *r*, are like those of *Funiculina* thick and much convoluted. They are rather shorter than those of *Funiculina*, being not quite so long as the stomach in its expanded condition, and their length is the same in all the polypes of the leaf, however long or short these themselves may be. They commence about the spot where the polypes become free from one another, so that the greater part or whole of their length is contained in the leaf proper.

The structure of the short mesenterial filaments is, as shown in Figs. 4 and 5, the same as in *Funiculina*, each consisting of a connective tissue lamella clothed on each side by a thick layer of special glandular and ciliated endodermal cells. Concerning the function of these filaments we have been able to make some observations which tend to strongly confirm Dr. Krukenberg's conclusions* that they are really digestive organs.

In a number of the polypes we have observed solid bodies imbedded either partially or completely in the mesenterial filaments; examples of this are shown in the third section in Fig. 5, *f o*. These bodies are clearly of a foreign nature; they are also evidently organised, and appear to be undergoing decomposition. From the observations of Dr.

* *Vide supra*, p. 34.

Krukenberg on the digestive properties of these mesenterial filaments in Sea-anemones, there can be no doubt that these foreign bodies are organisms or portions of organisms which have been swallowed as food and are undergoing digestion. In this case it is of great interest to notice the very marked power possessed by the filaments of wrapping themselves around the food particle, so as to attack it, as it were, from all sides at once. The importance of this operation is seen at once from Dr. Krukenberg's account of the act of digestion as being a surface action, only occuring where there is actual contact between the filament and the food particle, and not effected by means of a fluid secretion poured out over the food.

It is also important to notice that the endodermal cells of the mesenterial filaments must in order to effect this enveloping of the food, manifest active changes of form, *i.e.*, must be amœboid, and the fact that those endoderm cells which are specially concerned in digestion are amœboid has now been established in a considerable number of *Cœlenterata*.*

In the case of one of the polypes of which we have prepared sections—the third section from the top in Fig. 5—an additional point of interest has presented itself. Lodged within the polype with its head just at the level of the bottom of the stomach, and its body lying imbedded among the mesenterial filaments, is an Entomostracon, apparently one of those parasitic or semi-parasitic *Copepoda* in which the jaws are retained in a well developed condition, but the other appendages are rudimentary. The ovaries of this Copepoda are in a condition of great activity, containing very numerous ova in various stages of development. Many of the ripe ova have left the parent and are either lying freely in the body-cavity of the polype or else are embedded in the mesenterial filaments in the same manner as are the food particles described above. An instance of this is shown in the third section of Fig. 5 at *o v*, which shows also that the egg after becoming completely embedded in the mesenterial filament has commenced to develope, the stage figured being that in which it has divided into four equal segments. Other eggs from the same specimens have proceeded considerably further in their development.

It is difficult in this case to determine whether, on the one hand, the Copepod has been swallowed as food and has escaped digestion so far owing to the thick cuticle covering and protecting its body, the eggs being also destined ultimately to serve as food, and being engulphed by the mesenterial filaments for that purpose, but having, owing to their firm investing membrane, not only escaped digestion, but been enabled to develope up to a certain point; or, on the other hand, whether we are not dealing with a parasitic animal which has planted itself at the bottom of the stomach, so as to intercept the food

* For a summary of recent observations on the amœboid condition of the endoderm in *Cœlenterata* and other forms, and for important observations on the process of digestion in the fresh-water Medusa *Limnocodium*, vide Lankester "On the Intracellular Digestion of Limnocodium," Quarterly Journal of Microscopic Science, January, 1881.

supplies captured by the polype, and which has found in the mesenterial filaments a suitable nidus for the development of its eggs.

Although the general appearance of the Entomostracon, which we have been unable to identify, suggests parasitic habits, and although there is no sign of either the animal itself or its eggs undergoing digestion, we are disposed, in the absence of any more definite evidence, to adopt the former view, though fully recognising the possibility that the latter one may prove to be correct.

g. The Reproductive Organs. Concerning the reproductive organs of *Pennatula*, we have been able to make some observations of interest, owing to the fact that the two Oban specimens are of opposite sexes.

Lacaze-Duthiers * was apparently the first to show that in *Pennatula* the male and female organs are borne on separate colonies. He examined, however, only a very small number of specimens, and merely records the fact that the sexes are distinct, without giving any description or figures of the reproductive organs.

Kölliker † also, though noticing that the sexes are distinct in *Pennatula*, describes them very briefly, and gives no figures; indeed, no satisfactory account appears to have been published hitherto.

Externally, there appears to be no definite or constant difference between the two sexes; a difference in shape between the two Oban specimens has already been alluded to as a possible distinction, but whether it is so or not could only be decided by an examination of a far larger number of specimens than we have had an opportunity of investigating.

In the female specimen, Figs. 1 and 2, the reproductive organs are closely similar to those of *Funiculina.* The edges of the six mesenteries which bear higher up the short thick filaments act as ovaries, and the ova appear as individual epithelial cells, which grow rapidly, and are from the start invested by a thin membranous sheath, and later on by a second outer, very thick and strong capsule, formed by the surrounding epithelial cells. During the greater part of their development the ova are attached by short stalks to the edge of the septa, and project freely into the body cavity of the polype.

When ripe the ova become detached from the stalks and lie freely in the polype cavity. Each ripe ovum is a spherical body about 0·015 in.‡ diameter, consisting of a very dense pigmented outer capsule of great strength and considerable thickness, with its surface marked as in *Funiculina* by an irregular network of low ridges, and presenting at one spot a very conspicuous aperture or *micropyle* for admission of the spermatozoa; within this capsule is a second inner and much thinner membrane, inside which is the ovum itself; this consists of granular protoplasm imbedded in which, usually close to one side, is a very

* Lacaze-Duthiers, "Des Sexes chez les Alcyonaires." Comptes Rendus de l'Academie Imperiale de Paris. 1865. Tome 60, pp. 840—843.

† Kölliker: *Op. cit.*, p. 125.

‡ In the account of *Funiculina* on p. 36, the diameter of the ova is stated by mistake to be 0·001 in., it should be 0·011 in., the thickness of the capsule 0·001 in., and the size of the germinal vesicle 0·003 by 0·002 in.

large and evident germinal vesicle containing one or more large spherical germinal spots.

Ova occur in all the leaves of the female specimen except the very youngest ones, those at the bottom of the rachis, and as a rule in each component polype of the leaf. They are far more abundant in all stages of development at the lower or basal end of the polypes, where they often form compact masses completely filling up the polype cavities, than at the upper ends.

The ripe eggs are found in small numbers near the upper part of the polypes, and, as Johnston has pointed out, "by a little pressure can be made to pass through the mouth." * Lacaze-Duthiers holds that fertilization and the earliest stages of development are effected within the body of the parent, the embryo escaping as a ciliated planula, which, after swimming freely for a time, fixes itself, grows up and developes by repeated budding into a *Pennatula*; and Dalyell's description of the process as observed by himself in *Virgularia* strongly supports this view.†

The male reproductive organs are very similar to the female ones. They develope in exactly the same situation, and in a very similar manner. When adult, they are almost identically the same size as the ova, and have very much the same appearance, even under moderately high powers of the microscope. So close is the resemblance, and so completely do the spermatospheres or spherical masses of spermatozoa (Figs. 3, 4, 5, *ts*) counterfeit the ova of the female, that nothing could be easier than to mistake the males for females.

We ourselves fell into this error at first, and for some time were under the impression that our male specimen was, from the apparently obvious eggs that it contained in such large numbers, really a female; and it was only after cutting sections of these supposed eggs and examining them with high powers ($\frac{1}{12}$ in. and $\frac{1}{16}$ in.), that we discovered their real nature.

Like the eggs in the female, the male organs are developed on the edges of the septa, which bear, higher up, the short, thick, mesenterial filaments. So far as we have been able to determine only four of these six septa bear these organs, namely, the dorsal and ventral pairs of each polype cavity, the pair belonging to the under surface of the leaf being, as a rule, if not indeed constantly, sterile.

As in the female the reproductive organs are borne by all the leaves except the very youngest, and by all the polypes of each leaf, being far more abundant in all stages of development at the basal ends of the polypes than towards their free extremities.

In the earliest stages of development that we have noticed, the male organs (Figs. 4 and 5, *ts*) are small knobs composed of spherical nucleated cells, surrounded by a capsule of flattened epithelial cells, and attached to the edge of the septum by a short stalk.

In the next stage, the spermatosphere, as we may call it, has

* Johnston: "British Zoophytes," vol. i., 2nd Ed., 1847, p. 159.
† Dalyell: "Rare and Remarkable Animals of Scotland," 1848, vol. ii., p. 188.

increased considerably in size, and the component sperm cells are far more numerous, though of smaller size, than before. A little later a central space appears in the middle of the spermatosphere, which has now a radiately striated aspect. Soon after this the spermatosphere becomes detached from its stalk and lies free in the polype cavity.

It is now a spherical body with an average diameter of 0·014 in., and consists of an outer cellular capsule much thinner and less tough than that of the egg; and within this a very thin membranous coat; inside which are an enormous number of minute, oval, highly refractive bodies, the heads of the spermatozoa, many of which have long filamentary tails attached to them. In the centre of the spermatosphere is a clear space in which no sperm cells or heads of spermatozoa are present, but in which the thread-like tails of the spermatozoa can be clearly distinguished under high powers of the microscope.

Spermatospheres having this structure are found far forward in the polypes close to the mouths through which they undoubtedly escape; but whether the spermatospheres break up on escaping from the polype into their constituent spermatozoa, or remain for a time in the condition described above, we have been unable to determine. We have seen no indication of a tendency to break up in any of the spermatospheres, and yet these have no inherent power of locomotion for the epithelial capsule enclosing them is not ciliated.

In order to satisfy ourselves as to whether the sexes are really distinct, we have examined the reproductive organs from about a dozen different leaves of each of the specimens, selecting leaves from both sides and from very various parts, with the result that all the leaves examined of the one specimen bear male organs and of the other female from which we feel justified in concluding that Lacaze-Duthiers is correct in stating that the sexes in *Pennatula* are distinct.

We have also investigated for the same purpose and in the same manner four specimens of *Pennatula* in the Owens College Museum, the result being to confirm the above conclusion in all cases.

Our account of the male *Pennatula* will be found to agree very closely with the description given by Kölliker* of the male in *Halisceptrum*, a genus belonging to the same family as *Pennatula*, and differing from it mainly in possessing no calcareous spicules in the leaves. Concerning the relative abundance of the two sexes, out of six specimens of *Halisceptrum* examined by Kölliker, five were females and only one a male; while of the six specimens of *Pennatula* we have had an opportunity of studying, two are females and four males. The close similarity, if not identity, in external form between the two sexes, and also the close resemblance of the spermatospheres to the ova, must make us very cautious about accepting statements concerning the sexuality of specimens, unless it is explicitly stated that the character of the genital products has been determined by the microscope.

* Kölliker: *Op. cit.*, pp. 164-167.

5.—*Anatomy of the Zooids.*—

The zooids of *Pennatula*, like those of *Funiculina*, differ from the polypes in the following structural points, besides the difference in size and position already noticed :—

1. Though there is a well-developed stomach, and as a rule a mouth as well, there are no tentacles or calyx.

2. All eight mesenteries are present around and supporting the stomach, but only two of the eight have their free edges below the stomach thickened to form mesenterial filaments. The two mesenterial filaments present extend down to the bottom of the body cavity of the zooid, and clearly correspond to the two long slender filaments of the polypes.

3. The zooids have no reproductive organs. The walls of the zooids are very thickly studded with calcareous spicules, and the lower ends of the zooid cavities communicate freely with the spongy canal system of the wall of the rachis. At least two thirds of the length of the zooid is embedded in the wall of the rachis, so that it is only by making sections of the rachis that the anatomy of the zooids can be ascertained. The smaller zooids have no mouths, and are therefore dependent for their nutriment on the supply brought by the canal system from the polypes.

Zoological Position and Affinities—

The general position of *Pennatula* in the order *Pennatulida* is shown in the table on page 1 of this report. The generic characters, as given by Kölliker,* are as follows :—

"Genus: *Pennatula*—True Sea-pens, with well developed leaves, in which there are no zooids and no very large calcareous rods † but a number of small spicules. Zooids situated along the whole ventral surface of the rachis, and also on the lateral surfaces between the leaves. Polypes in cups, beset with calcareous spicules; calyx processes variable in number."

Kölliker distinguishes four species of *Pennatula*, whose leading characters are as follow :—

1. *Pennatula phosphorea*. Leaves formed of single rows of polypes, eight to eighteen in number, eight calyx processes to each polype; reproductive organs contained in the leaves.

2. *Pennatula rubra*. Leaves formed of single rows of polypes, twenty-five to forty-six in number, placed alternately, so as to give appearance of double rows. Calyx processes usually three or four to each polype; reproductive organs confined to the parts of the leaves within the rachis.

3. *Pennatula borealis*. Large pens, up to thirty-two inches long; leaves thick, formed of two to four rows of polypes.

4. *Pennatula fimbriata*. Leaves formed of two rows of polypes.

* Kölliker: *Op. cit.*, p. 122.

† As in *Pteroeides, e.g.*

Of *Pennatula phosphorea*, to which the Oban specimens clearly belong, three chief varieties are mentioned by Kölliker :—

a. *P. phosphorea, var. angustifolia*. Leaves long and narrow; polype heads few in number, and wide apart.

b. *P. phosphorea*, var. *lancifolia*. Leaves lanceolate; polype heads numerous and placed close together. Of this variety, to which the Oban specimens are to be referred, Kölliker distinguishes four sub-varieties.

c. *P. phosphorea*. var. *aculeata*. Leaves narrow and some distance apart; on ventral side of rachis, four to six rows of prominent spines, connected with the zooids.

Habits—

1. *The Natural Position of Pennatula*.—On this point the various zoologists who have described *Pennatula* from living specimens differ remarkably.

Ellis,* speaking of *Pennatula*, says :—" This genus of animals differs remarkably from all the other Zoophytes by their swimming freely about in the sea, and many of them having a muscular motion as they swim along. I know of none of them that fix themselves by their base, notwithstanding what has been wrote." Other anatomists have described *Pennatula* as having the power of swimming freely, and Dr. Grant goes so far as to say that " a more singular and beautiful spectacle could scarcely be conceived than that of a deep purple *P. phosphorea*, with all its delicate transparent polypi expanded and emitting their usual brilliant phosphorescent light, sailing through the still and dark abyss by the regular and synchronous pulsations of the minute fringed arms of the whole polypi."

This is doubtless very beautiful, but unfortunately does not appear to have the smallest shred of direct evidence in its support. It is difficult to get to the origin of these accounts, but this is apparently to be found in an observation of Bohadsch, whom we have already mentioned as the first describer of *Funiculina*.

Bohadsch describes *Pennatula* as a deep-sea animal, which is sometimes caught " with other fishes." He notes its phosphorescent properties, to which we shall refer below, and then says † that on one occasion, in the year 1749, while sailing in the Mediterranean, he observed some phosphorescent body about four feet below the surface of the water, and being at that time " in historia naturali minime versatus " he asked the sailors what it was, and they told him that it was *Penna*, *i.e.*, a sea-pen or sea-feather.

Now Ellis avowedly obtained the greater part of his information concerning *Pennatula* from Bohadsch, and there is much reason for thinking that Dr. Grant's account is based on that of Ellis, so that it would really seem as if Dr. Grant's glowing description rests merely on a solitary observation made by a man who speaks of himself as

* Ellis and Solander, Natural History of Zoophytes, 1786, p. 60.

† Bohadsch " De quibusdam animalibus marinis," 1761, p. 107.

"knowing very little indeed about natural history at the time"; an observation which consisted in looking over the side of a ship and seeing something phosphorescent in the water, whose shape he was unable to make out, but which the sailors told him was a Sea-pen.

We are acordingly of opinion that the statements concerning *Pennatula* swimming freely cannot be accepted unless fresh evidence from direct observation is brought forward.

Assuming then that *Pennatula* does not swim, there still remains the question as to what is the natural position of the pen; it undoubtedly dwells at the bottom of the sea, but is it planted upright or does it lie horizontally on the bottom?

Sir John Dalyell, a very careful observer, expresses an opinion, though by no means a decided one, that the horizontal position is the natural one. He is however much troubled by the stem, whose use on his theory he is unable to understand.* A few other zoologists have adopted this view, prominent among whom is again Dr. Grant,† who says:—"the slow contraction of the *Pennatula phosphorea* coils up the thin flexible extremities of its calcareous axis, and moves the retroverted spines of its exterior surface so as to push the animal slowly along a rough surface."

Our own opinion is very strongly in favour of the now generally accepted view that *Pennatula* lives erect, planted in the sea-bottom. The absence of polypes on the stalk, the presence of the supporting calcareous stem, and especially the proportions of this stem in different parts of its length, and the pale colour of the stalk speak strongly in support of this view, to say nothing of the evidence yielded by the undoubted fact that in *Virgularia* the stalk is known to be planted in the mud of the sea-bottom.

In connection with this question we would direct special attention to the powerful system of longitudinal muscles present in the stalk of *Pennatula*. These muscles, as previously noticed, are arranged round the stalk, not in a simple ring, but in a deeply corrugated layer, and the disposition of the muscular bands is such as to suggest the power not only of a considerable longitudinal contraction, but also of a partial lateral or spiral contraction. We are, in fact, disposed to view these muscular bands as affording a means whereby a slight wriggling movement of the stalk could be effected, such as would enable the *Pennatula* to burrow down into the soft mud to a certain extent; and that the pen is probably possessed of such a power is evident from the consideration that the mud in which it is planted must always be liable to be washed away by currents and other causes, in which case the *Pennatula*, if it had no power of burrowing, would fall prostrate at once, in consequence of the small total depth of its insertion in the mud. We shall return to this point when dealing with *Virgularia*.

2. *Phosphorescence*.—The majority of the *Pennatulida* are phosphor-

* Dalyell: "Rare and Remarkable Animals of Scotland," vol. ii., 1848.
† Grant: "Outlines of Comparative Anatomy," 1841, pp. 132-133.

escent, and *P. phosphorea* receives its specific name from the fact that it exhibits this phenomenon in an exceptional degree.

This was well seen in the Oban specimens while living; the more perfect female specimen when suspended in a jar of sea-water in the dark, and irritated or excited by gently brushing the leaves, exhibited a fine display of phosphorescence, the different polypes when touched showing minute brilliant points of light which appeared to flash over the whole surface of the feather in rapid irregular corruscations.

Edward Forbes made some interesting observations on the phosphorescence of *Pennatula*, his main results being as follows:—The pen is phosphorescent only when irritated by touch; the phosphorescence appears at the place touched, and proceeds thence in an undulating wave to the extremity of the rachis, but never in the opposite direction; it is only the parts at and above the point of stimulation that show phosphorescence; the light is emitted for a longer time from the point of stimulation than from the other luminous parts; detached portions may show phosphorescence. Forbes also says that "when plunged in fresh water, the *Pennatula* scatters sparks about in all directions—a most beautiful sight; but when plunged in spirit it does not do so, but remains phosphorescent for some time, the light dying gradually away, and, last of all, from the uppermost polypes. One remained phosphorescent for five minutes in spirit."

Dr. Wilson,* who, at the request of Forbes, made a direct investigation of the phosphorescent properties of *Pennatula*, came to the conclusion that the phosphorescence was not an electrical phenomenon, but was probably due to some "spontaneously inflammable substance."

The most careful and systematic observations on the phosphorescence of *Pennatula* are, however, those of Panceri,† who has arrived at several results of great interest. He finds that the light emanates exclusively from the polypes and zooids, and not from all parts of these, but from certain special phosphorescent organs. These "cordoni luminosi" as he calls them are eight longitudinal bands of a fatty substance, situated on the outer wall of the stomach, one band in each of the compartments of the body cavity formed by the mesenteries (Fig. 5, second section); and that these phosphorescent organs retain their luminosity after removal from the polype. Panceri states that if any other portion of a polype exhibits phosphorescence it is merely due to the special organs having been broken up, probably by the act of stimulation.

Panceri finds that phosphorescence may be excited by very various stimuli, mechanical, chemical, thermal, electrical, etc. He finds that if any point in the rachis be stimulated, luminous currents starting from the point of stimulation run both up and down the rachis and along the leaves to their extremities; and that if a leaf be stimulated the current runs down the leaf to the rachis, then up and down the rachis and along all the other leaves to their extremities.

* Vide Johnston's "British Zoophytes," 2nd Ed., 1847, vol. 1., p. 150—155.
† Panceri. "Etudes sur la Phosphorescence des Animaux Marins." Annales des Sciences Naturelles. Cinquième Series, Tome xvi, 1872, pp. 13-21.

A further point of interest determined by Panceri is, that there is always a distinct interval between the application of the stimulus and the first appearance of phosphorescence, and that this latent period has a very constant duration of $\frac{4}{5}$ths of a second.

It will be seen that these "phosphorescent organs" of Panceri are the same things as the "hepatic cells" of Gosse, which have been described above both in *Pennatula* and *Funiculina*. *

Geographical Distribution—

Pennatula phosphorea is apparently a common species at various places round the British shores: Ellis says that "great numbers have been taken on the coast of Scotland, especially near Aberdeen."

Dr. Gray mentions the coast of England and the Hebrides; and Kölliker gives as localities, besides the coast of England and Scotland, the Mediterranean, especially Naples and the Adriatic, the coast of France, and the Kattegat; to which Sars adds the whole coast of Norway, from Frederickshald to Christiansund.

(*To be continued.*)

THE MINERALS OF THE MIDLANDS.

BY C. J. WOODWARD, B.SC.

(*Continued from page 59.*)

As far as I can learn, little has been written respecting the minerals of the Midland district, but I propose now presenting to the readers of the "Midland Naturalist" abstracts of the papers that have been already published. For this purpose "Ormerod's Index," published by the Geological Society, is invaluable, as it gives an index of localities, with references to papers bearing on Mineralogy that have appeared in the Transactions of the Society. With the help of this index the following abstracts have been prepared :—

DERBYSHIRE.

"Notice accompanying Specimens of Lead Ore found in Loadstone from near Matlock, Derbyshire," by Charles Stokes, Esq., F.R.S., &c. Read November 3rd, 1820. (Trans. Geolog. Soc. Second Series, vol. i., p. 163, 1824.) "The specimens of galena from the neighbourhood of Matlock which accompany this notice are from veins which have been washed with profit in the loadstone as well as in the limestone. One of them is from the Side Mine, under the High Tor, the other from the Seven Rakes Mine, on the right bank of the river, not far from the bridge. Mr. Tissington, the owner of the Side Mine, informs me that the veins in all instances he is acquainted with are continued through the loadstone, although they do not bear well in this rock; and also that a vein frequently changes its degree of inclination in passing through it, and sometimes after such a change in inclination the vein again returns at an abrupt angle, like a V placed horizontally."

* *Supra*, p. 8.

NORTHAMPTONSHIRE.

"On Allophane and an Allied Mineral found at Northampton," by W. Douglas Herman. (Quart. Journ. Geo. Soc., vol. xxx., p. 235).—"Dr. Charles Berrill discovered a mineral resembling the Charlton Allophane in physical properties in a pit opened in the ironstones of the Northampton Sand, (Inf. Oolite), in the grounds of the Northampton Lunatic Asylum. It occurs as an amorphous, translucent, somewhat hard and exceedingly brittle mineral, of a yellowish colour, inclining to red, and incrusting the surface of a sandstone rock.

Analysis.

		Northampton.			Charlton.
		I.	II.	Mean.	
Water expelled at 100°C.	..	24·70	24·88	24·80	27·11
Water fixed at 100°C.	..	14·54	14·54	14·54	15·80
SiO_2	..	23·09	22·92	23·01	20·50
Al_2O_3	..	31·24	31·42	31·33	31·34
Fe_2O_3	..	2·35	2·18	2·26	—
FeO	..	—	—	—	·31
CaO	..	2·51	2·48	2·49	1·92
MgO	..	·01	·01	·01	
Normal .. CO_2	..	1·28	1·28	1·28	1·69
As bicarbonate CO_2	..	—	—	—	1·04
		99·72	99·71	99·72	99·71

On the supposition that the mineral consists essentially of water fixed at 100°C., silica, and alumina, it would be represented by the formula $8Al_2O_3,15SiO_2 + 18H_2O$; but if the water that is given off at 100° be considered essential to its composition, it would be expressed by $Al_2O_3,2SiO_2 + 5H_2O$. The mineral dried at 100° is exceedingly hygroscopic, speedily regaining almost the whole of the water it had lost, and that too in well-ground tightly-fitting watch glasses. Consult "Midland Naturalist," vol. v., p. 12.

SHROPSHIRE.

"Observations on the Wrekin and on the Great Coalfield of Shropshire," by Arthur Aikin. (Trans. Geo. Soc., vol. i., 1811, p. 191).—The references to mineral localities in this paper are so indefinite as to be of no use. The curious band called *Curlstone*, occurring with the Pennystone iron ore at Ketley and the neighbourhood, is noticed at pp. 196-7.

"Notice concerning the Shropshire Witherite," by Arthur Aikin, Esq. (Trans. Geo. Soc., vol. iv., 1817, p. 438).—Refers to the Snailbeach Mine as the only one in which witherite has been found. After speaking of different ores it is stated that "in the lower part of the mine, where the vein is thick and sparry, the witherite is found in irregular masses, weighing from 40lbs. to 2cwt. or 3cwt., imbedded in heavy spar. It is called yellow spar by the miners, because if a candle is placed behind it the whole will glow with a yellowish light, a circumstance by which the miners distinguish it from heavy spar; this latter, from the looseness of its texture, being in large masses quite opaque. The colour of the witherite is white, with the slightest possible, if any, tinge of yellow; its fracture is broad striated, approaching to straight foliated; it is for the most part massive. I have seen only a single specimen that presented any indications of a regular crystalline form." On analysis the mineral gave—

Carbonate of barytes	96·3
Carbonate of strontites	1·1
Sulphate of barytes	·9
Silex	·5
Alumina and oxide of iron	·25
	99·05

STAFFORDSHIRE.

"Account of a variety of Argillaceous Limestone found in connection with the Ironstone of Staffordshire," by the Rev. James Yates, M.A. (Trans. Geo. Soc., vol. v., 1819, p. 375).—Describes this as a variety of limestone called by the miners *Curl*. It was inspected at the Coppice Mine (near Coseley ?) It contains small veins of calc spar passing vertically and without interruption through both ironstone and curl beneath it. It has recently been employed in considerable quantities for making Roman cement. It occurs in Shropshire, as mentioned by Mr. Aikin, and at the Ketley ironworks was used for a time as a flux. Mr. Sowerby has given two representations of this mineral in his "British Mineralogy," vol. ii., plates 148, 149, and he states that it occurs near Sunderland, at Bartonsel, at Cumberland, at Boulby in Yorkshire, and in Derbyshire. The variety found in Derbyshire is described and figured in Martin's "Petrifacta Derbiensia," Wigan, 1809, plate 27, fig. 4. It is found immediately above and attached to a stratum of ironstone which extends from Tupton Moor to Staveley. Incidentally it is mentioned in the paper that Werner gave to this substance the name of *Dutenmergel* or funnel marl, and that it occurs at G'ororps Mill, in Shoenen, and in the island of Bornholm, near the town of Rónne.

WARWICKSHIRE.

"Notice on the Black Oxide of Manganese of Warwickshire," by S. Parkes. (Trans. Geo. Soc., second series, vol. i., 1824, p. 168).—The specimens exhibited to the Society were found at Hartshill, near Atherstone. The manganese occurs in detached pieces distributed through the clay, weighing from one to fifty or sixty pounds each, and from one foot to six or eight feet below the surface of the ground. The first manganese was found on the estate of T. L. Ludford, Esq., of Ainsley Hall, about two miles from Atherstone. A poor man of the name of Hankinson, who possesses a small field adjoining Mr. Ludford's estate, has since found manganese in his land, and has raised a considerable quantity. A man of the name of Davis has also raised some, and sold it at a good price to the bleachers in Lancashire. Dr. Power, of Atherstone, has taken a great interest in the discovery.

WORCESTERSHIRE.

"On the Mineralogy of the Malvern Hills," by Leonard Horner, Esq. (Trans. Geo. Soc., vol. i., p. 281).—A description of the hills is given, and afterwards in speaking of the unstratified rocks reference is made to the minerals occurring in the rocks. "A great part of the End Hill is composed of granite, particularly on the west side, where it contains veins of quartz in several places. In the same part of the End Hill, but at a higher elevation than the granite, there is a rock which prevails very much throughout the whole range. It is of a purplish brown colour, with a fine close grained texture and an uneven fracture. It is composed of hornblende, felspar, and a little quartz; sometimes contains a small quantity of magnetic pyrites, and slender veins of compact epidote; in the fissures of it crystallised sulphate of barytes and minute rhomboidal crystals of ferriferous carbonate of lime are also occasionally met with. On the west side of the End Hill and in some part of the eastern side a rock is met with, the characters of which correspond very nearly with those of sienite. It is composed of hornblende and felspar, with a few spangles of mica." . . . "The Epidote is found on the End Hill under various appearances; in some of these the crystalline forms peculiar to this substance may be seen, but I did not meet with any complete, well-defined crystals. It is most commonly found in a compact and granular state, forming small veins of a yellowish green colour, which sometimes pass through the granite and sometimes through the sienitic rocks." . . . "On the north-east side of the Worcestershire Beacon, and in the road leading from Great Malvern to St. Ann's Well, I found a rock of loose, coarse-grained texture, with an earthy fracture composed of mica and hornblende in a state of decomposition, mixed with red felspar." . . . "This rock is traversed by a vein of sulphate of barytes about four inches in thickness, and which occasionally includes detached portions of the rock through which it passes. The particular spot where I saw this rock was where an excavation had been made in the hill round a house newly built, and as the rock was cut down to a considerable depth, a good section of it was exposed to view." . . . . Speaking of the Wych, Mr. Horner writes: "I found here some small portions of a granite partially decomposed, and the surfaces of the fragments into which it breaks are covered with dendritical delineations of manganese." . . The road now mentioned (Worcester and Ledbury road) rises along the side of the valley above Little Malvern, and winds round the northern face of the Herefordshire Beacon. In making it the rock has been cut down considerably on one side. I found a greater uniformity in the rocks of this part of the range than in those which compose the northern half; there is less granite, and hornblende also occurs more rarely. The most prevalent rock is one of a pale flesh-colour of a fine grain, and chiefly composed of compact felspar; it is very full of fissures, so that it easily breaks into small irregular fragments, the surfaces of which are covered with yellow oxide of iron, and on some of these are dendritical delineations of manganese. They are occasionally covered with small rhomboidal crystals of spathose iron of a golden yellow colour, with a metallic lustre. Calcareous spar sometimes in distinct crystals is likewise occasionally met with in it."

"A short way to the south of the Herefordshire Beacon there is a mass projecting above the surface, which consists of a fine conglomerate of a dark brown colour, composed of felspar, steatite, and calcareous spar, united by a ferro-argillaceous base, and containing some minute specks of a greenish-yellow substance, in diverging fibres, which is probably actinolite. The rock is attracted by a magnet. In a lane at the foot of the Herefordshire Beacon, on the western side, I found a vein of red hæmatite passing through a rock consisting of red felspar and quartz partially decomposed."

At the end of the paper are given analyses of the mineral waters of the Malvern Hills. I should insert them here, but I expect to meet with more recent analyses. Perhaps some of the readers of the "Midland Naturalist" can help me here.

"An Account of the Brine Springs at Droitwich," by Leonard Horner, F.R.S. (Trans. Geo. Soc., vol. ii., p. 94).—In this paper is given an analysis of the brine, and a quotation from Nash's History of Worcestershire describes the rock sunk through for brine. Gypsum, miscalled "talc," occurs apparently in considerable thickness—75 feet is mentioned—and on boring through this gypsum the brine rises and fills the pit. It is mentioned incidentally that slender veins of crystallised gypsum occur at Doder Hill. From the remarks of Nash it would seem that the springs are impregnated from a body of rock salt.

"On the Chemical Geology of the Malvern Hills," by the Rev. J. H. Timins, M.A. (Quar. Journ. Geo. Soc., vol. xxiii., p. 352).—The paper contains numerous analyses of the rocks of the Malvern Hills.

The following rocks, containing minerals, are referred to among others. The numbers correspond to the Roman numerals in the original paper:—

1.—Lava, forming thick bed north of Coal Hill—contains hornblende and felspar indistinctly crystallised.

3.—Calcareous lava, with imperfectly crystallised hornblende and minute red felspar crystals; from the Valley of the White-leaved Oak.

8.—Lava, from the footpath from Fowlett's Farm to the Valley of the White-leaved Oak—contains hydrated peroxide of iron in vesicular cavities.

23.—Fine-grained greyish rock of the structure of sandstone, with occasional thin lines of epidote, from a band in the Hollybush sandstone on the east side of the eruptive rock quarried on the south-west side of Midsummer Hill, passing into felspar.

25.—Lava, bed west of Castle Morton Common—matrix of a bluish colour; cavities filled with epidote.

37.—Bedded rock, south of the cave, near the footpath—contains a few grains of olivine and a little quartz in cavities.

57.—Fine-grained bed in diorite on the east slope of the North Hill—small crystals of hornblende, white uncrystallised felspar disseminated, and a little pyrites.

59.—Diorite, south of the large quarry at North Malvern—black hornblende, quartz, and pink and pinkish white felspar, of which the cleavage resembles orthoclase, but the chemical constitution is more nearly that of andesine.

62.—Trap near the summit of the West Peak of the Ragged Stone—dark bluish grey uncrystallised epidote in the interstices.

68.—From a mass of trap immediately south of the cave, on the west side of the ridge.—The fragment analysed was taken from the part of it which is in the wood. It contains hornblende labradorite, glassy felspar, and garnet. Some parts of this mass of trap contain, in addition to the above, hypersthene.

70.—From the east slope of the buttresses of the Herefordshire Beacon, south of the deep ravine which divides the buttresses from east to west, and overlooking a farm house at the extreme end of Castle Morton Common—hornblende, labradorite, a little glassy felspar, epidote, and hæmatite.

74.—From an irregular mass a quarter of a mile from the cave, and to the north-east of it.—It contains hornblende, yellowish-red orthoclase, and felspar, with the iridescent appearance of labradorite.

79.—Smooth amygdaloidal trap or lava, containing epidote in vesicular cavities, from the off-standing hill overlooking Little Malvern.

91.—From the more central portion of the large trap mass overlooking Halley Mount—hornblende crystals, of which a few are annular, and brownish uncrystallised felspar.

At the conclusion of the paper it was stated that "sulphate of baryta occurs in cavities and fissures, and as a cementing substance, it has clearly been precipitated from a state of solution, and, being itself insoluble, it must have been formed by the decomposition of carbonate or silicate of baryta by soluble sulphates. Bisulphurets abound, generally as pyrites; arseniates, south-west of the Midsummer Hill, and in the Ragged Stone; fluorides, in the trap dykes and lava beds, most abundantly in those of recent formation, as the bosses in the field near Fowlett's Farm."

THE FLORA OF WARWICKSHIRE.

ACCOUNT OF THE FLOWERING PLANTS AND FERNS OF THE COUNTY OF WARWICK.

BY JAMES E. BAGNALL.

(Continued from page 181.)

ROSACEÆ—Continued.

PYRUS.

P. torminalis, *Ehrh.* *Wild Service tree.*
Native: In hedges. Rare. June.
I. Two or three trees in the foot road from Olton to Elmdon.
II. On the footway to Mr. Petford's, Alcester Park, *Purt!* 236. Claverdon, *Bree, Mag. Nat. Hist.*, iii., 164; Great Alne; Oversley Wood.

P. Aria, *Hooker.* *Common Whitebeam.*
Native (?): In hedges and woods. Rare. June.
I. Sutton Park, near Bracebridge and Blackroot Pools, Upper Nuthurst; Marston Green.
II. Ipsley! pointed out in several hedges about here by Mr. T. J. Slatter, but has not been seen in flower in this district. Bascott Heath; Ufton Wood; Allesley.
I strongly doubt this tree being a native in any locality in which I have seen it in this county.

P. rupicola, *Syme, E.B.*
Denizen: In hedges. Very rare. June, July.
II. A fine tree in the lane from Billesley to Red Hill, in good flower and fruit, 1873. I think it is an introduced plant in this locality.
[*P. pinnatifida.* Sm. Several trees of this species near the Great Western Railway Station, Leamington; all, however, have been planted there].

P. Aucuparia, *Gaert.* *Mountain Ash.*
Native: In woods and hedges. Locally common. May, June.
I. Frequent in Sutton Park, springing up abundantly in the woods; New Park; Trickley; woods at Solihull, etc.
II. "It is very common in our woods here (Allesley), and, I believe, most other places."—*Rev. W. T. Bree, Purt.* iii., 361, *Note.* Hatton; Haywoods! *Y. and B.* Oversley Wood, etc.

P. communis, *Linn.* *Wild Pear.*
Denizen: In woods and hedges. Rather rare. May.
II. Great Alne! Kinwarton! *Purt. i.*, 237. Hampton-on-the-Hill, *Per. Fl.*, 43; Whitnash pastures, *H. Bromwich, Herb. Brit. Mus.;* Tachbrook, Rowington, *Y. and B.;* Stivichall; near Arbury, *T. K., Phyt.* ii., 990; near Arrow; Alcester; Red Hill; Spernall Ash; Drayton Rough Moors; Pinley; Bascott Heath; near Pillerton.

This seems as truly a native in these localities as does the Mountain Ash or the Apple. Both the varieties are found in the county, but I have not always discriminated between them in my note book.

P. Malus, *Linn.* *Crab Apple or Wild Apple.*
Native : In woods and hedges. Rare and local. April, May.
a. acerba. Local.
I. Sutton Park ; Coleshill Heath ; Solihull, etc.
II. Near Bascott Hall, *Y. and B.*, Bascott Heath ; Bidford, etc.
b. mitis. Rare.
I. Near Arley Village.
II. Beausale Common, *Y. and B.*, near Rugby, *R.S.R.*, *1868*, 52. Bascott Heath ; Claverdon ; Red Hill ; not unfrequent between Bascott Heath and Southam, 1876.

LYTHRACEÆ.

LYTHRUM.

L. Salicaria, *Linn.* *Purple Loosestrife.*
Native : By rivers, streams, pools, etc. Locally common. July to September.
I. Sutton Park ; Middleton Park ; Curdworth Bridge ; Stonebridge ; Knowle, etc.
II. Emscote Bridge, *Perry*, *Fl.*, 42. By the Leam and Avon, *Y. and B.* Honington, Tredington, *Newb.* Salford Priors ! *Rev. J. C.*, Stratford Canal, etc.
[*L. hyssopifolium*, Linn. Occurred as a weed in the kitchen garden of Myton House, near Warwick, *Cross.*]

PEPLIS.

P. Portula, *Linn.* *Water Purslane.*
Native : In pools, damp woods, and heathlands. Local. July to September.
I. Coleshill Pool ! *Purt*, i., 182. Sutton Park ! *Freeman*, *Phyt.* i., 261. Near Chelmsley Wood ; sand quarry, near Stonebridge ; sand quarry, near Cornel's End ; drive by Chalcot Wood ; Hartshill Hayes, etc.
II. At the top of Spernal Lane, *Purt.* i., 182. Lye Green, near Claverdon ! *Y. and B.* Kenilworth, *H. B.* Oversley Wood ; Haywoods ; Coomb Abbey Woods ; Alveston Pastures, near Stratford-on-Avon.

(To be continued.)

METEOROLOGY OF THE MIDLANDS.

THE WEATHER OF JULY, 1882.

BY CLEMENT L. WRAGGE, F.R.G.S., F.M.S., ETC.

A cold, wet, cheerless, and unsummerlike month throughout the Midlands. Hay crops much retarded, ruined, or seriously damaged in parts of our district.

STATION.	OBSERVER	RAINFALL. Total for M. In.	Greatest fall in 24 hours. In.	Date.	No. of rainy d.	SHADE TEMP. Absolute Maximum. Deg.	Date.	Absolute Minimum Deg.	Date.
OUTPOST STATIONS.									
Ben Nevis (*a*)	C. L. Wragge, Esq., F.M.S.	9·65	1·60	3	30	53·8	1	32·4	24
Fort William (*a*)	C. L. Wragge, Esq., F.M.S.	7·14	1·39	3	28	67·9	1	47·2	7, 27
Spital Cemetery, Carlisle	I. Cartmell, Esq., F.M.S.	1·66	·60	6	22	76·8	1	44·0	26
Scarborough (*a*)	W. C. Hughes, Esq.	2·74	·27	6	23	70·8	14	49·4	27
Blackpool (*a*)—South Shore	C. T. Ward, Esq., B.A., F.M.S.	5·78	·69	31	25	67·3	3	42·4	27
Llandudno (*a*)	J. Nicol, Esq., M.D.	2·55	·43	24	18	70·0	2, 3	49·2	27
Lowestoft (*a*)	H. E. Miller, Esq., F.M.S.	2·81	·74	11	15	73·0	14	43·5	27
Carmarthen (*a*)	G. J. Hearder, Esq., M.D.	7·28	·81	14	26	73·7	1	43·2	27
Altarnun, near Launceston (*c*)	Rev. J. Power, F.M.S.	7·86	1·39	9	22	75·0	3, 14	43·0	27, 28
Sidmouth (*a*)	W. T. Radford, Esq., M.D.	3·48	·57	11	18	69·5	30	48·0	27
Les Ruettes Brayes, Guernsey (*a*)	A. Collenette, Esq., F.M.S.	2·82	95	11	17	68·2	20	50·6	11
Guernsey (*a*)	F. C. Carey, Esq., M.D.	2·84	·60	10	18	67·5	18	52·0	11
MIDLAND STATIONS.									
HEREFORDSHIRE.									
Burghill (*a*)	T. A. Chapman, Esq., M.D.	3·81	·90	1	19	77·1	1	42·7	31
SHROPSHIRE.									
Woolstaston	Rev. E. D. Carr	4·09	·70	11	25	74·0	1	47·0	10, 25
Bishop's Castle	E. Griffiths, Esq.	3·89	·60	11	23	80·0	1	41·0	27
More Rectory	Rev. A. S. Male	4·11	·59	11	26	77·0	2	40·0	27, 31
Dowles, near Bewdley	J. M. Downing, Esq.	3·01	·53	11	21	82·0	2	38·0	20
WORCESTERSHIRE.									
Orleton, near Tenbury (*a*)	T. H. Davis, Esq., F.M.S.	3·50	1·32	11	23	77·0	2	41·6	10
West Malvern	A. H. Hartland, Esq.	5·52	2·30	11	20	78·5	29	46·5	9
Evesham	F. J. Slatter, Esq., F.G.S.	3·76	1·12	11	25	76·0	2	46·8	31
Pedmore	E. R. Marten, Esq.	3·52	·89	11	25	[illegible]	2	44·0	28
Stourbridge	J. Jefferies, Esq.	3·42	·80	11	22	78·0	2, 3	41·0	26
Cawney Bank, Dudley	C. Beale, Esq.	3·61	1·11	11	22	71·0	2	46·0	9
STAFFORDSHIRE.									
Dennis, Stourbridge (*a*)	C. Webb, Esq.	3·19	·80	11	25	76·0	2, 29	44·0	31
Kinver	Rev. W. H. Bolton	3·63	·92	11	25	77·0	2	45·0	9, 26, 30
Walsall	N. E. Best, Esq.	5·51	1·83	2	25	68·0	2	47·0	9
Lichfield	J. P. Roberts, Esq.	3·01	·81	11	26	76·0	29	43·0	26
Burton-on-Trent (*c*)	C. U. Tripp, Esq., F.M.S.	3·15	·70	28	22	77·0	2	41·0	27
Wrottesley (*a*)	E. Simpson, Esq.	3·72	·88	11	21	71·0	1	41·5	10
Barlaston (*a*)	W. Scott, Esq., F.M.S.	4·01	·51	6	21	77·2	2	43·7	30
Tean (*c*)	Rev. G. T. Ryves, M.A., F.M.S.	3·90	·54	11	25	75·0	2	42·0	26, 30
Heath House, Cheadle (*a*)	J. C. Philips, Esq., F.M.S.	3·86	·58	10	17	70·0	1, 3, [illegible]	45·0	10
Oakamoor, Churnet Valley (*a*)	Mr. J. Williams	3·89	·50	12	23	73·3	3, 16	41·6	10, 11
DERBYSHIRE.									
Stony Middleton	Rev. U. Smith	4·61	·78	25	23	74·0	29, 30	43·0	7
Fernslope, Belper	F. J. Jackson, Esq.	3·55	·40	11	26	75·0	3, 28	44·0	27
Spondon	J. T. Barber, Esq.	3·26	·57	2	24	—	—	—	—
NOTTINGHAMSHIRE.									
Park Hill, Nottingham (*a*)	H. F. Johnson, Esq.	3·79	·75	13	21	73·0	28, 29	45·7	10
Hodsock Priory, Worksop (*a*)	H. Mellish, Esq., F.M.S.	2·41	·56	15	19	72·8	3	0·3	1
Tuxford	J. N. Dufty, Esq., F.G.S.	2·52	·37	27	24	76·0	16	15·0	1, 27, 31
LEICESTERSHIRE.									
Loughborough (*a*)	W. Berridge, Esq., F.M.S.	3·40	·55	11	24	74·7	28	45·6	27
Syston	J. Hames, Esq.	2·71	·59	11	26	69·0	15	46·0	27
Town Museum, Leicester	J. C. Smith, Esq.	3·36	·97	11	13	74·3	2	46·8	10
Ashby Magna	Rev. Canon Willes	2·91	·79	11	[illegible]	77·0	3	43·0	10, 27
Waltham-le-Wold	Edwin Ball, Esq.	3·05	·68	11	22	[illegible]	2	13·0	1
Coston Rectory, Melton (*a*)	Rev. A. M. Rendell	2·86	·69	11	24	70·5	3, 14	40·0	27
WARWICKSHIRE.									
Kenilworth (*a*)	F. Slade, Esq., C.E., F.M.S.	3·71	·80	11	20	71·1	2	43·8	27
Rugby School (*c*)	Rev. T. N. Hutchinson	3·15	·89	10	21	75·0	2	41·6	7
NORTHAMPTONSHIRE.									
Sedgebrooke, Northampton	C. A. Markham, Esq.	4·44	1·20	11	23	79·0	2	42·0	27
Towcester	J. Webb, Esq.	3·50	1·10	11	20	—	—	—	—
Kettering	J. Wallis, Esq.	3·24	·78	11	22	71·0	17, 30, 31	49·0	1, 27
BEDFORDSHIRE.									
Aspley Guise, Woburn (*a*)	E. E. Dymond, Esq., F.M.S.	2·66	1·09	11	20	74·9	30	45·8	1
OXFORDSHIRE									
Radcliffe Observatory, Ox. (*a*)	The Staff	3·16	·76	11	19	74·3	3	48·0	1, 10
GLOUCESTERSHIRE.									
Cheltenham (*a*)	R. Tyrer, Esq., B.A., F.M.S.	3·61	1·15	11	24	74·9	2	40·4	31

(*a*) At these Stations Stevenson's Thermometer Screen is in use, and the values may be regarded as strictly intercomparable. (*c*) Glaisher's pattern of thermometer screen employed at these stations.

New stations have been recently founded at Bedford and Stafford; at the former place by the Bedfordshire Natural History Society, at the latter by Mr. Clement L. Wragge; and synopses of these new observations will appear in future numbers of the "Midland Naturalist." A short paper on "Natural History Notes by Observers" is intended for next Number.

At Orleton "the mean temperature of the month was more than 2 degrees below the average of 20 years, and the rainfall was much in excess." Highest reading of barometer (at Kenilworth) 30·43 on 27th; lowest 29·25, on the 6th. The mean amount of cloud was about 7·0 (scale 0 to 10), and the mean relative humidity 80 (saturation = 100). Southerly and westerly winds were very prevalent. The mean temperature of the soil at Hodsock at a depth of 1 foot was 60·9, and the duration of sunshine 162·8 hours. At Aspley Guise the duration of sunshine was 184 hours 20 minutes. Several thunderstorms occurred. A solar halo was noted at Loughborough on the 12th.

Correspondence.

Paris quadrifolia.—The correspondence in the August Number of the "Midland Naturalist" is my excuse for mentioning that this plant is locally abundant in South Beds, usually growing on a subsoil of clay over chalk. It is no uncommon occurrence to find it with five or six leaves.—J. Saunders, Luton.

Fontinalis antipyretica.—This moss is fruiting abundantly this summer in some clear water ponds at Limbury, South Beds. So far as observed the fruiting stems are suspended almost perpendicularly in the water, and are attached to projecting submerged branches and overhanging root stumps. By carefully passing one's hand along these stumps and branches the fruiting stems are easily recognised, as they have more scanty foliage and feel more wiry. Any of your readers who are interested in mosses may have a specimen by sending a stamped envelope to J. Saunders, Rothesay Road, Luton.

Mosses new to the Warwickshire Flora.—A short time since, when botanising in a wood near Maxtoke, I found *Dicranum fuscescens* (Turn.) growing rather sparingly on the trunks of oak trees. This has not before been recorded for Warwickshire, and is also new as a record for Severn basin, *i.e.*, Province V. of Watson's "Compendium of the Cybele Britannica." I also found another rare moss near Preston Bagot in the early part of July, namely, *Orthotrichum rivulare* (Turn.) This is new as a record for Warwickshire, and is a very interesting addition to our local Moss Flora.—J. E. Bagnall.

Hybernation of Mollusks.—About the middle of August last (1881) I brought home from Pembrokeshire some specimens of *Helix pisana*. All were duly killed and cleaned except one, which was overlooked, and remained with some other specimens till June 18, when, on picking it up, meaning to clean out the supposed dry remains of the animal, I found that it was not dead. I at once placed it in a jar of water, having previously broken down the skin-like barriers of slime stretched across the mouth of the shell, and in a little under an hour and a quarter the animal crawled out of the jar, to all appearance none the worse for its ten months' sleep. Everyone of course knows that snails retire during the winter months, appearing again with the mild showers of spring; but it is perhaps not so well known how quickly they are affected by a change in circumstances, and induced to come forth to life and activity even after a retirement of unusually long duration.—Oliver V. Aplin, Banbury, Oxon., Aug., 1882.

[The fact of mollusks being able to sustain life through long periods of hybernation, or to exist under conditions which would seem to an ordinary observer to ensure death, is well proven. The species inhabiting hot countries seem to be most capable of enduring long periods of cessation of active life. Water snails (*Ampullaria*) have been found alive after being in a drawer for five years in India; and South American *Bulimi* have been found alive after so long a period as twenty months in packages; and Madeiran *Helices* have been in pill boxes alive for thirty months. A specimen of *Helix desertorum* from Egypt was fixed on a tablet in the British Museum in 1846, and in 1850 it was noticed that it had crawled out of its shell. It was taken off the tablet and immersed in tepid water, and revived thoroughly. Its portrait was taken, and may be seen in "Woodward's Manual," a grand book. Australian fresh-water mussels have lived out of water for a year. I have known *Littorina littorea* keep alive in a box six weeks. Doubtless this is a power acquired by these creatures gradually through long periods of time, and under the varying conditions under which they are placed. Æstivation in summer droughts is analogous to hybernation in winter, although the action of the heart is more powerful in summer than in winter. To conchologists of any experience it *is* known how quickly mollusca arise from their sleep, either in summer or winter, if the conditions of the atmosphere change—damp in summer, warm days in winter; and all who have observed these creatures abroad (tropics) have remarked how quickly, upon the occurrence of rain after a dry period, the puddles become alive with snails and other aquatic life. In our own country it is curious to see how soon on the sandy dunes by the sea *Helix virgata* var. *submaritima*, and *Bulimus acutus* cover the ground in myriads after rain following hot days; and this has given rise to the idea that it sometimes rains snails. Much may be said on this matter did time permit. The incident related by Mr. Aplin is worthy of record as illustrating this power of sustaining life in a given species, and is an item of interest in its life-history.—G. Sherriff Tye, Birmingham.]

Leafing of the Oak and Ash.—During the first and second weeks of May in the present year, the leafing of these trees was carefully noted. Many hundreds of them were observed in South Beds and North Herts, and with one exception the oak was before the ash. The exception was noteworthy. It was one of a row of several which were growing alternately with oaks. This was not only more forward in its leafing than the others, but more so than any of the oaks that were near. On a closer inspection it was observed that it was the only barren ash tree thereabout, and the conclusion arrived at was that, not having been exhausted by fruit-bearing, it was more vigorous, and hence unfolded its leaves under a less external stimulus. Subsequently to this other trees were noted, and so far as limited observations were carried, the barren ash trees were more forward than those that had borne fruit the previous season.—J. Saunders, Luton.

[I think that Mr. Saunders is right in his opinion that the earlier leafing of some of the ash trees he noticed was constitutional. I have noticed the same circumstances myself. In a former note, Vol. III., p. 145, I mentioned that some of the beeches in the lane from Duke Bridge, Maxtoke, were in full leaf, whilst other beeches growing so near them as to mingle their branches were as yet only in bud. I was in this lane again in the early part of this year, and again observed the same circumstance, and noticed, too, that the same individual trees showed exactly the same differences with regard to their leafing.—J. E. BAGNALL.]

MACROPIS LABIATA.—It is with very great pleasure that I am able to report the capture of this very rare British Bee, in fact, it is the *rarest* mentioned by the late Fred. Smith, Esq., in his intensely interesting "Monograph of the Bees of Great Britain," published in 1855, and where he states that only three specimens (all males) were known, the last one captured by Samuel Stevens, Esq., at Weybridge, July 4th, 1842, more than forty years having passed before it has "turned up" again in the same county. I do not think I have gone out collecting bees in July and August without believing that I should at some time or other find this bee; and so *firmly* have I done this, that when a friend asked me just previous to my leaving London, "What do you intend to catch when you are in the country?" I answered, "Macropis," and this I did July 27th. I had just caught a large Halictus, on a thistle, and whilst holding it in my fingers I observed a bee flying along in a peculiar manner, quite different to anything I had yet seen. I did not wait to box the Halictus, but caught the other in a moment, feeling as I did so, that it was Macropis, though I had never seen a specimen in my life. I quickly examined my capture with my pocket lens, and positively started when I found the wings had but two submarginal-cells (most bees have three); but not feeling quite sure, I handed the bee to my friend, Sir Sidney Smith Saunders, who was with me at the time, and he immediately confirmed it, saying, "Why, it's Macropis!" After this I pill-boxed my grand capture, and though we searched the locality for some time, no more were seen that day; but on the 29th I visited it again, standing in *exactly* the same spot for over 2½ hours, watching most intently for anything passing, and I was rewarded by catching four males in succession, then a most lovely *female*. All were flying very rapidly over a patch of Wild Peppermint, but I cannot say whether they had any desire to alight thereon, as I did not give them time to consider. I may here mention that I would advise anyone desirous of capturing any rarity in a known locality to *stand still* and *watch* rather than walk up and down disturbing the flowers, for I have observed that bees (like ants) have their "runs," passing and repassing the same flowers in their rapid flight. Since the above dates I have taken several more specimens collecting pollen from the beautiful Great Loosestrife *Lysimachia vulgaris*, which grows somewhat plentifully in the neighbourhood of Woking Station, and next season I hope to find the burrows, and also a few facts in the economy of this beautiful and rare bee. Mr. Bridgman took specimens of Macropis in the neighbourhood of Norwich some few years ago.—FRED. ENOCK, Ferndale, Woking Station.

NOTES FROM MERIONETHSHIRE.—I recently observed that in the process of draining a peat-bog in this neighbourhood (Llanbedr, Merionethshire) a number of boulders had been taken out from a trench, varying in size from one or two hundredweight downwards, and that others remained, all being white, and presenting an appearance as if they had been whitewashed. A fracture of the stone showed that the change of colour penetrated only to the depth of about the tenth of an inch, below which the metamorphic rock presented its usual blue or green appearance. The occurrence is, I apprehend, not unusual, but I never noticed it so pronounced before; nor do I remember to have seen any explanation of the chemical change that has taken place, though that may be due to my want of knowledge. That oxidation has taken place, and that the humus acids of the peat may have been the cause, is all that I can suggest; but this of itself is interesting when we consider how very much longer the same rocks may remain buried in ordinary earth or clay; for example, in a moraine, of which there are so many instances near at hand, with almost no evidence of chemical action.—In common with, I believe, many of my moderately observant countrymen, I was under the impression that pigs evinced a decided objection to enter cold water, unless it was only a few inches deep, and had at least the consistency of pea-soup. What was then my astonishment the other day, when fishing in the River Artro, Merionethshire, to see a fine young porker rush to the bank and take a header into a not very deep but very rapid stream. It was soon evident that he intended to make his way across, and, helped by the boulders, he gradually got nearer the other side. Once he was carried swiftly down, and, knowing the dangers below, I thought he was a lost pig; but a rock fortunately pulled him up, and at last he reached the opposite bank, and, crossing a second smaller stream, he cantered up amongst the trees, evidently with some object in view. According to the old story, pigs cut their throats when swimming down the tide. I have not the quotation at hand, but this is doubtless a libel, as most of our quadrupeds can swim. In this case he may have first ventured when the water was lower.—In the same river, on the same day, a small flatfish was taken with a worm at least a mile and a half beyond, and perhaps a hundred feet above tidal influence. This may not be extraordinary, but it seemed to me worthy of a note. The creature does not look "cut out" for ascending rapids, however little difficulty a salmon may find in doing so.—On the neighbouring rugged mountain of Rhinog-fawr there are numerous wild goats. It is the custom to hunt these down with the active sheep dogs. When one is singled out he is generally driven to take refuge on a very inaccessible ledge, and a man is let down with a rope to secure him. There are, I believe, very few wild goats left besides these in North Wales.—In the same district I was told that kites were numerous. I did not see any, but should have been glad to catch sight of those noble birds. Buzzards were plentiful, and I think these must be mis-called kites.—W. SOUTHALL.

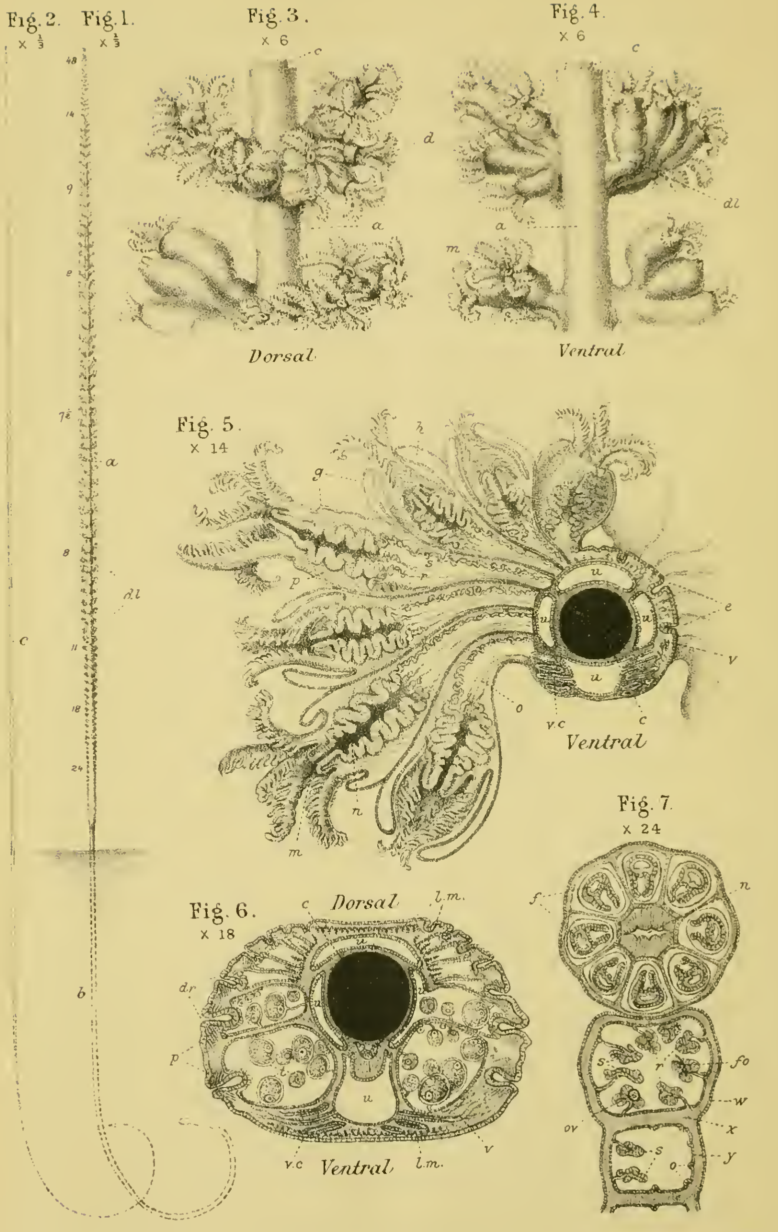
Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—GEOLOGICAL SECTION—July 25.—The following exhibits were made:—Mr. J. Morley: *Apiocystis Brauniana*; and, on behalf of Miss Taunton, some eggs of the common snake from Stockbridge. Mr. W. Southall: *Allium vineali*, with viviparous buds (gemmæ) taking the place of flowers, and *Euphorbia cyparissias*, with proliferous flowers. Mr. C. Mantell, jun.: a microscopic section of rock cut from specimens brought from the Pre-Cambrian rocks near Nuneaton at the last excursion of the Geological Section; also some pebbles from California, near Harborne, showing the glacial striæ very well. Mr. E. Wagstaff: *Fredericella Sultana*, from near Harborne. Mr. R. W. Chase: *Carduus nutans, Erythæa centaureum, Spiræa fillipendula, Lychnis Githago* and *Calamintha acinos*, all from Hunstanton, near St. Edmund's, Norfolk. General Meeting—August 1st.—Mr. J. Levick exhibited *Leptodora hyalina* from the Warwick Canal, near Solihull; also *Actinophrys viridis* and many Desmids from Sutton Park.—Mr. T. Bolton exhibited *Lucernaria auricula* from Swanage.—Mr. Wagstaff exhibited, as novel, the suckers of *Dyticus marginalis*, mounted dry while adhering to the cover-glass.—Mr. R.W. Chase exhibited *Salicornia herbacea*, from Hunstanton.—Mr. W. B. Grove exhibited two Fungi, *Epichloë typhina*, a curious parasite on grass-stems, from Hampton. It surrounds the stem just at the base of the upper leaf, preventing its further growth, and causing it to resemble in miniature the Reed-mace (*Typha*). It is at first white, then yellow, and about an inch in length. Also *Sphærella rumicis*, a common parasite on dock leaves, from Harborne. Biological Section—August 15th.—Mr. Wagstaff exhibited a fresh-water Alga from Barnt Green, which he believed to be a species of Chætophora.—Mr. W. H. Wilkinson exhibited a slide of stellate hairs of *Deutzia scabra*, prepared by Dr. J. G. Hunt, of Philadelphia, U.S.A. General Meeting—August 22nd—The President and Hon. Treasurer were appointed to represent the Society at the forthcoming meeting of the British Association at Southampton.—Mr. H. Miller exhibited *Lacinularia socialis* from Welshpool, forwarded by Mr. H. E. Forrest.—Mr. J. Levick exhibited Hæmatococcus, or the red stage of Protococcus, and a group of *Stephanoceros Eichornii* from Earlswood.—Mr. J. Morley exhibited *Raphidia viridis*, var. *Marginata*, from Earlswood.

BANBURYSHIRE NATURAL HISTORY SOCIETY AND FIELD CLUB.—July 1st—Field Day—Excursion to Aynho and Rainsborough Camp.—From Aynho station the party walked up the hill to the village, passing on their way over the Middle Lias, the Upper Lias, a clay nearly 100 feet thick, and a few feet of the sandy Inferior Oolite. Here they were joined by the Rev. E. W. and Miss Urquhart. A halt was made at an exposure of the lower beds of the Great Oolite, about fifteen feet in thickness, which are here seen to rest upon a little grey sand belonging to the Estuarine beds. Farther on a quarry of similar stone was noticed, but the junction with the sand is not reached. Many fossils, especially the fine Rhynchonellas, were obtained. A sand-pit of the Inferior Oolite was then visited, after which the party walked to Rainsborough Camp, collecting specimens of the Wild Liquorice (*Astragalus glycyphyllos*) by the way. This camp, which is unusually perfect, is situated on high ground, nearly 500 ft. above the sea, half a mile south of Charlton. It is of an irregular form, the longest diameter of the outer vallum being about 1,000 feet. Many remains have been found, but all of the time of the Romans. July 3rd—Monthly Meeting—Mr. T. Beesley, F.C.S., President, in the chair.—The President read his Meteorological Report for June. Mean height of barometer at 32°, 29·543 in.; highest on the 1st, 29·996 in.; lowest on the 9th, 29·037. Mean temperature, 56·1 (2° below average); maximum on the 29th, 72·5; minimum on the 17th, 40°. Rain on twenty-two days, amounting to 5·42 in., 2·04 in. being measured on the 22nd.—Mr. J. W. Symington read a paper on the Gape-worm (*Scelerostoma syngamus*), illustrated by drawings of the perfect insect and its worm-like larva. He gave a life-history of the insect, and described it minutely. The means of guarding against and destroying this pest of the chicken yard were carefully dealt with. The thanks of the meeting were unanimously accorded to Mr. Symington for his eminently practical and useful paper.—Mr. R. Charles Humfrey read a paper on the Caddis Worm. He said it was the larva of a trichopterous fly belonging to the natural order *Phryganeidæ*. A description of the worm followed, showing its reasons for building a portable home as a protection, etc. The cases of all the known British species were treated of, the way in which the homes are built, the materials they are composed of, and the silky secretions used as a cement being fully discussed. The species described were *Phryganea grandis*, *Limnephilus pellucidus*, *L. rhombicus*, *L. flavicornis*, *L. lunatus*, *Anabolia nervosa*, *Molana angustata*, *Sericostoma*, and *Setodes*, good specimens of which were exhibited—all collected in the vicinity of Banbury within a few days of the meeting. Mention was also made of the way in which the larva could be forced to leave its home uninjured, and, being placed in a saucer of water with coloured beads, etc., its mode of building could be watched. A fine specimen of *L. flavicornis* thus engaged was shown. The paper was replete with interesting matter, Mr. Humfrey being warmly applauded at its conclusion.—Mr. S. Stutterd gave an account of two species of *Smynthurus* which he had lately noticed on Snap-dragons, illustrating his remarks by specimens under the microscope, and by drawings. He also exhibited living specimens of *Smynthurus luteus* and *S. pallipes*, which at that time were abundant in gardens on the leaves of Snap-dragons and Phloxes. They are small insects of about 1·33 of an inch in length.—The President read a report of an excursion which some of the members had lately made to Stonesfield, Oxon, for the purpose of examining the beds of limestone yielding the well-known calcareous slates which still cover the roofs of many of the older houses in the town, and of collecting the rare snails for which the neighbourhood is famous, and the plants which love a limestone soil. The report contained much interesting matter. Lists of the various objects collected were on the table.—Mr. W. J. Patey exhibited specimens of, and read a note on, *Cephalanthera grandiflora*, which he had recently discovered near Faniborough, and which was new to the district. This is an Oxfordshire habitat, the beech copse in which the plant grew being just over the boundary. — The President exhibited *Hesperis matronalis* from Newbottle Spinney; Mr. R. C. Humfrey—17 species of land shells collected at Stonesfield, amongst which were *Helix pomatia*, *H. cantiana*, *H. caperata*, *H. pulchella*, and *Clausilia laminata*; the President and Mr. E. A. Walford, F.G.S.—characteristic fossils from the Stonesfield beds; Mr. O. V. Aplin—*Uredo saxifragarum*, from Wroxton (new to the district), *Geranium pusillum* (rare in the neighbourhood), and plants collected at Stonesfield. July 31st—Monthly Meeting—Mr. T. Beesley, F.G.S., President, in the chair.—The President read his Meteorological Report for July. Mean height of barometer at 32°, 29·553; highest on the 27th, 30·065; lowest on the 15th, 29·028. Mean temperature, 60°.6 (0°.5 below average); max. on 2nd and 3rd, 75°; min. on the 8th, 47·5. Rain fell on 21 days, amounting to 4·29 inches; thunder and lightning on the 2nd and 8th; hail on 7th and 8th. The abundance of weeds was mentioned, especially in the hedges, thistles and grasses almost hiding them. The weather was very unfavourable for hay-making.—The Rev. C. J. Bowen gave a most interesting account of "An afternoon in the Catacombs on the Appian Way." He first commented upon the fact of the Appian Way being a continuation of the old Roman Watling Street which traverses England. It was the custom of the Romans to raise monuments to their dead by the wayside. Though, he said, a few of the Pagans buried their dead, yet such was an exceptional method: the bodies were burned, and the ashes were placed in brazen vases in tombs, called Columbarii. The columbarii were descended into by steps, and the little recesses in which the vases were placed were easily distinguishable from the square stone shelves used by the early Christians. The tombs were cut in a kind of volcanic rock, called *tufa granulare*. The catacomb of San Calixto, so frequently visited, was only one of the many which surround Rome: there were reckoned to be from 500 to 600 miles of such mortuary subterranean passages. The longitudinal recesses in which the interments were made were closed with tiles, which generally bore the brand of the reign in which they were manufactured. The Cubiculi were often beautifully painted and decorated. So it was possible to determine not only the date of the tomb, but also, by aid of the designs and inscriptions, to find out what kind of martyrdom ennobled the occupants of these altar-tombs. Fastened to the cement of the loculi were found little bottles which had contained small portions of the blood of the martyrs. There were also in these recesses little oratories used by the early Christians with cemented roofs, in many cases beautifully decorated, those of the first century being the finest, those of subsequent date having been designed during the decline of art. Mr. Bowen exhibited some magnificently illustrated quarto volumes descriptive of the ground he had visited. The lecture was the first of a series. A warm vote of thanks to Mr. Bowen was passed.—Mr. E. A. Walford, F.G.S., read a short paper on "*Natica cincta*, its surface-markings and variations in growth." The characteristic feature of the shell was said to be the enormous increase in size of the lower or body whorl as compared with the spire. He pointed out two varieties, the one almost a counterpart of Phillip's type species, the other variety having waved lines passing from the summit to the base of the whorls. The top of the whorls showed a deep channel and traces of encircling lines. The waved lines were instanced as disappearing towards the mouth of the shell, where the thickness of the test was reduced to one millimetre, and where the ordinary lines of growth were noticeable as being distinct from the waved lines.—The President exhibited a specimen of a species of grass *(Bromus)* which had attained the height of seven feet.—Mr. O. V. Aplin exhibited living examples of the Natterjack (*Bufo calamita*, Buon.), originally from Surrey, but lately purchased in Seven Dials and sent to him.

OSWESTRY AND WELSHPOOL NATURALISTS' FIELD CLUB AND ARCHÆOLOGICAL SOCIETY.—On Thursday, July 6th, there was an excursion of this Society in the neighbourhood of Talerddig. The party arrived at Carno Station at 1 p.m., and followed the course of the River Carno up to Talerddig. Here they took refuge from a heavy thunder shower. This is the highest point of the Cambrian Railway. They then descended the great cutting which passes through beds of hard stone with layers of shale, on which are seen some good impressions of ancient wave-lines. This formation belongs to the Lower Silurian strata, but there is an absence of lime. About half way down the cutting there is a remarkable example of a natural arch or anticlinal ridge of strata on either side of the line, but the best is on the left hand. At this point the Lower Silurian beds give place to the Upper Silurian. A little lower down the party left the railway, and ascended the hills to the left, on the top of which there are some Druidic (?) remains consisting of four stones forming a square, called Lled Croen'r Yet, and not far off a perfect circle, about thirty yards in diameter, called Cerrig Caerau, and still farther on a smaller circle, called the Carnedd, the inner space of the latter being filled up with loose stones. Here there was a glorious view of the fine valley of the Twymyn, with Plynlimmon, Cader, and the Arans in the distance. They then descended the hill to Llanbrynmair, and walked down the valley to the Wynnstay Arms, where they did justice to an excellent tea. Among the plants found we may mention the small Butterfly Orchis (*Habenaria bifolia*); the blue and yellow Mountain Pansy (*Viola lutea*, with var. *amœna*); a white Foxglove, and three species of the genus *Lycopodium—clavatum*, *inundatum*, and *selago*.—The next excursion of this Society was on Tuesday, August 15th. Meeting at Broxton Station in Cheshire, the party ascended the Broxton hills, and had a magnificent view from the summit, extending over the plain of Cheshire to the Mersey and the Dee on the one side, and to the Welsh hills on the other. They explored some caves in the sandstone rock, said to be old workings for copper; and then went on to Fowler's Bench, the head of a picturesque ravine, commanding a beautiful peep at the distance. Here they entered the grounds of Peckforton Castle, and proceeded along a grassy drive through the woods to the castle, over which they were shown by the kind permission of Lord Tollemache. Next they visited a well in the gardens at the foot of the hill, called Horsley Bath, and supposed to be of Roman construction. They then went on to Beeston Castle, the ruins of which crown an isolated hill, very precipitous on three sides, and only approachable up the steep slope to the south. This castle was built by Ranulph, Earl of Chester, about the year 1200. It was very strong, and supplied with water from a well within the keep, said to have been 160 yards deep. In the Civil war the castle was besieged by the Parliamentary forces under Colonel Jones. The party returned home from Tattenhall station after a very pleasant excursion. There were no very rare botanical finds, but we may mention the Climbing Corydalis, Water Purslane (*Peplis portula*), Slender Cudweed (*Filago minima*), and the Golden-rod (*Solidago virgaurea*).

Plate IV.



A.M.Marshall & W.P. Marshall del.

F. Huth, Lith[r] Edin[r]

VIRGULARIA MIRABILIS.

REPORT ON THE PENNATULIDA
COLLECTED IN THE OBAN DREDGING EXCURSION OF THE BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY, JULY, 1881.

BY A. MILNES MARSHALL, M.A., D.SC., PROFESSOR OF ZOOLOGY IN OWENS COLLEGE, AND W. P. MARSHALL, M.I.C.E.

(Continued from page 202.)

PART III.—Virgularia mirabilis. Lamarck.

Of *Virgularia mirabilis* there were obtained—

a. Seven living specimens, varying in length from six to ten inches.

b. Two bare stems, of three and six inches length respectively.

The specimens were dredged at four spots: (1) off Dunollie Castle (Station I. of the General Report of the Dredging Excursion); (2) midway between Lismore Point and the mainland (Station III.); (3) the southern end of Kerrera Sound (Station IV.); and (4) off Lismore Point (Station VI.). In the first of these localities *Virgularia* was taken in company with *Pennatula*; and in the second and fourth with *Funiculina*. In all four cases the depth was about twenty fathoms, and the bottom mud.

Description of the Figures in Plate IV.

Fig. 1 is reduced from a drawing made from the specimen in the Glasgow Museum, referred to in the text as the only specimen at present known to be perfect at the top. The dotted outline of the stalk has been copied from a figure by Dalyell. Figs. 3 and 4 are drawn direct with the camera from one of the Oban specimens. Figs. 5, 6, and 7 are constructed from separate camera drawings of the several parts shown, the preparations in all cases being from one of the Oban specimens.

Alphabetical List of References.

a. Rachis.
b. Stalk.
c. Stem.
d. Polype.
d′. Leaf.
dr. Rudimentary polype.
e. Zooid.
f. Tentacle.
fo. Foreign body, swallowed as food.
g. Calyx.
h. Cavity in calyx.
lm. Longitudinal muscles of rachis.
m. Mouth.
n. Stomach.
o. Mesentery.
ov. Egg of Entomostracon, embedded in mesenterial filament.
p. Retractor muscle.
r. Short mesenterial filament.
s. Long mesenterial filament.
t. Ovum.
u. Main canals of rachis.
v. Small canals of rachis.
vc. Radial canals.
w. Ectoderm.
x. Mesoderm.
y. Endoderm.

Fig. 1.—View of an entire specimen of *Virgularia*: the rachis drawn from the specimen in the Glasgow Museum, and the stalk copied from a figure by Dalyell. The figures along the left-hand side of the rachis indicate the pitch of the leaves at the points opposite which they are placed. Thus the top figure (48) indicates that at this point the leaves occur at the rate of 48 per inch. $\times \frac{1}{2}$.

Fig. 2.—The stem of the specimen in Fig. 1, drawn partly from actual measurements, and the lower part added from figures by Dalyell, and Koren and Danielssen. $\times \frac{1}{4}$.

Fig. 3.—Dorsal view of a small portion of the rachis of one of the Oban specimens, showing one pair of leaves and part of a second pair, with the rachis connecting them. Shows clearly the characteristic bending upwards of the ventral angles of the leaves. $\times$ 6.

Fig. 4.—Ventral view of the same specimen as in Fig. 3. Shows the bare ventral surface of the rachis; the mode of attachment of the leaves to the rachis; and the fusion of the polypes to form the leaves. $\times$ 6.

Fig. 5.—A transverse section of the rachis about its middle, with the whole of one leaf and the base of its fellow of the opposite side. Shows structure of

As with *Pennatula* and *Funiculina*, so also with *Virgularia*, we have found the existing descriptions and figures to be very incomplete and, with few exceptions, inaccurate as well. English zoologists have hitherto been specially culpable in this respect. *Virgularia* has long been known to be abundant at many places along the Scotch coast, and yet the stock figure of this genus given in English books at the present day is not taken from a British specimen at all, but is copied from a figure by O. F. Müller in his "Zoologia Danica," published in 1776. This figure, the first ever published from a living specimen, and which in its original form is imperfect and unsatisfactory, has been copied and recopied, losing at each operation something of what truthfulness it originally possessed, until it has culminated in the absolutely unrecognisable travesty given in Gosse's "Marine Zoology," or, worse still, in Nicholson's "Manual of Zoology," a drawing which a moment's glance at an actual specimen would have shown to be absolutely false.

Partly in the hope of removing this national reproach, and partly in the endeavour to utilise to the best advantage the specimens so freely placed at our disposal by the Birmingham Natural History Society, we have been led to attempt as complete a description of the anatomy of *Virgularia*, as the imperfect histological preservation of our material has permitted, and to illustrate our description by figures drawn with the camera from the objects themselves.

General Account.

In general appearance, as shown in Plate IV., Fig. I., *Virgularia* is in many respects intermediate between *Funiculina* and *Pennatula*; for while it has the slender shape and proportions of the former (*cf.* Plate I., Fig. 1.), it agrees with the latter in that the polypes, instead of being inserted separately and independently into the rachis, are fused together so as to form leaves (*cf.* Plate III., Fig. 1).

As in the other two genera, so also in *Virgularia*, we distinguish a cylindrical axial portion traversed by a central calcareous stem, and divisible into an upper part, the rachis (Fig. 1. *a*) bearing the polypes, and a lower part or stalk (Fig. 1. *b*), which has no polypes, and is in the natural condition planted in the sea bottom.

Concerning the stalk, however, the Oban specimens tell us nothing, for they are all broken short either at the junction of the stalk and

rachis, with the stem, main canals, radial canals, and zooids; also the structure of the individual polypes, and their relations to one another and to the rachis. The most dorsal polype is represented entire; the others as if bisected horizontally. The several polypes are drawn in different degrees of expansion or retraction to show the alterations produced thereby in the arrangement of the parts, and especially in the calyx. × 14.

Fig. 6.—Transverse section through the lower end of the rachis, showing the stem, main canals, radial canals, rudimentary polypes; and the ova, both mature and developing. × 18.

Fig. 7.—A series of three transverse sections through different parts of polypes. The uppermost section passes through the base of the retracted tentacles, and through the œsophageal portion of the stomach. The middle section passes through the mesenterial filaments just below the stomach, and shows the arrangement of the filaments in a set of two long ones and a set of six short ones. The lower section passes through the body-cavity below the short mesenterial filaments; it shows the two long filaments and the six ridge-like mesenteries which bear higher up the short filaments. × 21.

rachis, or else some distance above this point. More than this, in addition to this imperfection at the lower end, all the specimens are imperfect at the upper end also.

All seven of the Oban specimens are, indeed, only fragments: in all cases both the tops and the stalks are wanting; in four specimens the fracture at the lower end has taken place at the junction of stalk and rachis; while in the remaining three it has occurred somewhat higher up, in the lower part of the rachis.

This mutilated condition of the specimens of *Virgularia* is a very interesting point. It might at first be thought that the Birmingham Society had for some reason or other been exceptionally unlucky, but this is not the case. The concurrent testimony of all naturalists who have dredged or described *Virgularia mirabilis* agrees in showing that this mutilation is not exceptional, but is on the contrary the almost invariable rule. Dalyell, writing on this point, says :—"Neither can I certify from what I myself have seen, or from the narrative of others, that in this country it has occurred entire and unmutilated on any occasion whatever. I have not had the good fortune of finding a representation of it in the perfect state ;" * and Kölliker, our greatest authority on the whole group of Pennatulida, remarks, that of *V. mirabilis* a perfect unmutilated specimen has never yet been seen.†

Specimens with the lower end or stalk complete are very rare, but a certain number have been described and figured by Dalyell, Kölliker, and others. No description has yet appeared, so far as we can ascertain, of a specimen with the upper end perfect, and Kölliker expressly states that he has never seen one. We have had the good fortune to find one such specimen in the Glasgow University Museum, believed to have been dredged off the west coast of Scotland, but with the exact locality and date of capture unrecorded. Though perfect at the top, this specimen, which is nine inches in length, is only a partial exception to the general rule concerning mutilation, for it is broken off below at what appears to be the usual place, the junction of rachis and stalk.

From this Glasgow specimen, which will be more fully described further on, the upper part of Fig. 1 has been drawn; *i.e.*, the rachis with its leaves of polypes. The stalk in this figure is copied from a figure given by Dalyell, and is indicated with dotted lines, as we have not ourselves had an opportunity of seeing it.

The almost invariable mutilation which specimens of *Virgularia* undergo is certainly a point of great interest, more especially as it does not appear to affect either of the two allied genera, *Funiculina* and *Pennatula*, which are found living side by side with it, and may be brought up in the same haul of the dredge. We shall return to this point further on.

The polypes, as already noticed, are fused together to form leaves,

* Dalyell: "Rare and Remarkable Animals of Scotland," 1848, Vol. II., p. 181

† Kölliker: Alcyonarien, 1872. p. 190.

and these leaves are placed in pairs along the whole length of the rachis (Fig. 1); the leaves in the middle of the rachis being further apart, and also rather larger than those at the two ends, but the difference in size being altogether insignificant in comparison with what occurs in *Pennatula* (*cf.* Pl. III., Fig. 1).

As in the two other genera, we distinguish in the rachis dorsal and ventral surfaces, the latter (Fig. 4) characterised by being bare and free from polypes along its whole length.

Imbedded in the rachis at the bases of the leaves are the zooids or rudimentary polypes, shown in Fig. 5 *e*.

The soft parts of *Virgularia*, contrary to what occurs in *Funiculina* and *Pennatula*, are completely destitute of spicules, calcification being limited to the axial rod or stem.

Anatomical Description.

1.—*The Stalk and Rachis.*—

The stalk (Fig. 1, *b*), as we have seen, is not present in any of the Oban specimens. From the descriptions and figures given by Dalyell,* Kölliker,† and Sars,‡ it appears that in the few specimens in which it has been preserved the stalk is cylindrical, with a slightly bulbous extremity; the dilated part, as in *Pennatula*, having much thinner walls than the rest.

The stalk is described as of considerable length, very much longer relatively to the whole colony than is the case in *Funiculina*. Dalyell figures a specimen in which the stalk is 8½in. long;* and both Dalyell and Kölliker agree in representing the lower end of the stalk as bent up in the manner we have represented in Fig. 1.

The longitudinal canals of the rachis are prolonged down the stalk, according to Kölliker. In its upper part there are four main canals—dorsal, ventral, and two lateral; but in the lower part the lateral canals disappear, and the dorsal and ventral alone remain.

The rachis is widest at its lower end, where the polype leaves are either absent or very rudimentary (Figs. 1 and 6). As we pass upwards and the leaves get bigger, the rachis at first diminishes in width somewhat rapidly (Fig. 1), but having attained a diameter of about 0·045in. it preserves this tolerably uniformly along the greater part of its length, tapering again gradually towards the upper end. It is traversed throughout its length by four main longitudinal canals (Figs. 5 and 6 *u*), one of which is dorsal, one ventral, and two lateral; these canals, as noticed above, extending down into the stalk.

The outer surface of the rachis is an epithelial layer forming the ectoderm; and the main canals have an epithelial endodermal lining. The rest of the substance of the rachis consists of mesoderm: this is very thin opposite the bases of the leaves, as seen in the

* Dalyell: *op. cit.*, Plate XLIII., Fig. 7.
† Kölliker: *op. cit.*, Taf. XV., Fig. 104.
‡ Sars: "Fauna littoralis Norvegiæ."

left-hand side of Fig. 5; but is of some thickness between the leaves, as shown in the right-hand side of the same figure. It is traversed by a network of very fine canals, and contains also definitely arranged muscular fibres. These latter are chiefly longitudinal in direction: they form a well-defined layer, with a crenated outline when seen in transverse section, running along the dorsal surface of the rachis a short distance below the surface epithelium (Fig. 6, *l m*), and a similar layer along the ventral surface, shown in the same figure. In the stalk, according to Kölliker's descriptions and figures, there is a continuous sheath of muscle extending all round; but in the rachis this sheath is interrupted at the sides by the polypes, and so loses its regular arrangement. The dorsal and ventral portions remain, as we have just seen, unaltered, but the lateral portions are much changed: they persist in part as the protractor and retractor muscles of the polypes (Fig. 6, *p*).

A deeper set of longitudinal muscles is developed in the lower part of the rachis in connection with the inner ends of the polype cavities: it is shown in Fig. 6.

The polype cavities communicate with the lateral canals, as shown in the right-hand side of Fig. 6; but this connection appears only to take place towards the bottom of the rachis. Through its means ova are enabled to pass from the polypes into the lateral canals.

On the ventral side of the rachis, and along its whole length, there is found a curious system of tubes, which we propose to speak of as the *radial canals*. These form two lateral masses (Figs. 5 and 6, *v. c.*) imbedded in the mesoderm on either side of the main ventral canal, each mass consisting of a number of branching tubes of tolerably uniform diameter, lined by a single layer of short columnar epithelial cells, which stain very readily with logwood or other colouring reagents. At intervals these tubes can be distinctly seen in transverse sections of the rachis to open into the main ventral canal, and such openings are shown in both Figs. 5 and 6.

Just before reaching the main canal the tubes are slightly constricted, and their epithelial lining suddenly changes its character, and becomes converted into the much flatter epithelium of the main canals. At their outer ends the radial canals can sometimes be traced into continuity with a system of very fine canals with no distinct epithelial lining, which branch in an irregular way through the mesoderm of the rachis, and communicate both with the polype cavities and with the main canals of the rachis, and which clearly correspond to the fine nutrient canals traversing the mesoderm of both *Funiculina* and *Pennatula*.

This system of ventral or radial canals has been described carefully by Kölliker in the genus *Halisceptrum*,* in which its main characters and relations appear to be the same as in *Virgularia*, though differing

* Kölliker: *op. cit.*, pp. 169, 170.

in some points of detail. We are in much doubt concerning the function of these canals. Kölliker says they are to be regarded as a modification of the nutrient canals, and possibly subserving some special function. The epithelium lining them has a very glandular appearance, and, bearing in mind their position at the points of communication between, on the one hand. the fine canal system which penetrates the mesoderm in all directions, and is in communication with the polype cavities, and, on the other hand, the main canal system of the rachis and stalk, it has occurred to us that they may very possibly be excretory organs and act as kidneys, separating effete matters from the fluid in the fine nutrient canals, and discharging it into the main canal system. This view derives some slight support from the fact that in more than one case we have seen small collections of débris over the orifices from the radial canals into the main canal, which were apparently being discharged from the former into the latter.

The chief difficulty in assigning this or indeed any other important function to this system of canals, lies in the fact that they are found only in certain members of the Pennatulida. They are present in *Virgularia* and *Halisceptrum;* but *Pennatula* and *Funiculina* have no trace of them. They can have nothing to do with the ova, for they are far too small to admit them; neither, so far as our observations go, do ova ever occur in the main radial canal, though, as we have seen, they do pass into the lateral canals.

2.—*The Stem.*—

The stem or calcareous axis of the rachis and stalk (Figs. 2, 3, 4, 5, and 6, *c*), is cylindrical, firmly calcified, and brittle. According to Dalyell it contains as much as 85 per cent. of mineral matter, chiefly carbonate and phosphate of lime, and only 15 per cent. of animal matter.

Not only does the stem of *Virgularia* differ from that of *Pennatula* or *Funiculina* in its greater brittleness, but the proportions at various parts of its length are also very different. Both in *Pennatula* and *Funiculina* the stem is thickest at or just above the junction of the stalk and rachis, from which point it tapers both upwards and downwards, ending at both ends in fine, imperfectly calcified, and very flexible points (*vide* Pl. I., Fig. 2, and Pl. III., Fig. 8). In *Funiculina* the stem extends the whole length of the colony, while in *Pennatula* the stem reaches the bottom of the stalk, but stops short some distance from the top of the rachis. In *Pennatula* it is also bent back on itself at both ends in the form of a hook.

In *Virgularia* the stem (Fig. 2) extends the whole length of the colony. In the stalk, according to Dalyell, Kölliker, and Koren and Danielssen, the stem tapers gradually downwards, ending in a fine flexible point, which reaches to the bottom of the bulbous termination of the stalk, and then turns back on itself for a short distance, ending in a small hook, much as in *Pennatula*. In the rachis, starting from below at its junction with the stalk, the stem at first enlarges slightly, attaining its maximum diameter at about the point marked *c* in Fig. 2; above this point it diminishes in size, but very gradually, remaining of considerable thickness throughout the length of the rachis, and ending at its top in an abruptly truncated extremity.

In the Oban specimens the diameter of the stem at its widest part varies from 0·026in. to 0·050in.; at its upper end, which, it must be remembered, is imperfect in all the specimens, from 0·016in. to 0·039in. The average taper from the widest part of the stem upwards is ·002in. per inch length of stem.

In the Glasgow specimen of *Virgularia mirabilis*, in which the top is perfect, the upper end of the stem projects above the top of the fleshy rachis for a length about equal to its own diameter; and a similar condition has been noticed by Herklots, Koren and Danielssen, and others, in perfect specimens of allied species of *Virgularia*. The most obvious explanation of this feature is that the fleshy cœnosarc has, owing to the action of the spirit in which the specimens are preserved, contracted slightly and so left the end of the stem bare; but there appears to be some doubt as to whether this is the true one. Koren and Danielssen speak on this point as follows:—"Herklots and several others have presumed that the reason of the axis being bare at the upper end is to be sought for in a contraction of the sarcosoma under the influence of the preserving liquid: this is, however, not the case; on the contrary, we are convinced that it is a natural state, and not produced by any contraction of the cœnosarc. As well in this species (*Virgularia affinis*) as in many other genera and species, all the specimens exhibited during life the same bare axis, and likewise the sarcosoma connate with (attached by growth to) the axis at the place where the axis begins to be bare. In one specimen we even saw several *serpulæ* attached to the bare part." * This last statement is certainly strong evidence in favour of the view advocated by the Swedish naturalists, for the specimen in question was brought up living, and the *serpulæ* certainly could not have attached themselves to the stem unless it had been already bare while in the water.

The present seems a suitable place to discuss further that curious mutilation of the specimens which we have seen to be so constant, nay almost universal, a feature of museum specimens of *Virgularia mirabilis*, and which applies also, though apparently in rather less degree, to other species of the genus as well.

The facts on which all authorities are agreed are the following:—

1.—The great majority of specimens of *Virgularia mirabilis* as brought to the surface by dredging are broken short at both ends.

2.—The fracture at the upper end occurs at very variable situations, but that at the lower end occurs very commonly at the junction of stalk and rachis, and nearly always within a short distance of this point.

* Sars, Koren and Danielssen; "Fauna Littoralis Norvegiæ," Part 3, 1877, p. 91, note.

3.—Specimens with perfect stalks are very rare, but a certain number have been obtained and described from various localities.

4.—Specimens with perfect tops appear, with the sole exception of the Glasgow specimen drawn in Fig 1, to be absolutely unknown. At any rate we have been unable to find any record of other specimens, and Kölliker, who has made a special study of the whole group, expressly states that he does not know of the existence of any.

Of these facts, acknowledged by all, no explanation has, so far as we can ascertain, been attempted hitherto. Under these circumstances we would venture to submit the following considerations, although from want of direct evidence we cannot yet offer a complete explanation. In the first place it must be borne in mind that *Virgularia* is found living alongside of two other closely allied and very similarly constituted genera, viz., *Funiculina* and *Pennatula*, and may even be brought up at the same haul with one or other of these; and yet while the specimens of *Virgularia* are invariably broken, those of *Funiculina* or *Pennatula* are as invariably unmutilated. The cause of the mutilation is, therefore, to be sought for in some one or more of those points in which *Virgularia* differs from the other two genera, and which in some way or other determine that it shall be broken, while the allied forms remain entire.

Now the chief points of contrast between *Virgularia* on the one hand, and *Funiculina* and *Pennatula* on the other, are—

1.—The great brittleness of the stem of *Virgularia*, and the fact that, instead of tapering upwards to a fine flexible point, it remains of considerable thickness up to the very top of the rachis.

2.—The length of the stalk in *Virgularia*, and its strongly marked hook-like termination. The stalk is much longer relatively than that of *Funiculina*, and is much longer absolutely than that of *Pennatula*.

We *know* from the observations of Rumph and Darwin, to be noticed further on, that *Virgularia* lives with the stalk planted in the sea bottom, and the rachis freely projecting above it; and from an observation of Captain Lancaster's* it appears to require a tolerably firm pull to draw out a *Virgularia* from its hole.

We would therefore suggest that the fracture at the lower end is caused at the time of capture, and is due partly to the brittleness of the stem, and partly to the firm implanting of the stalk in the sea bottom. The usual site of the fracture—at the junction of rachis and stalk (*vide* Fig. 1)—strongly supports this view, for while on the one hand the dredge dragging along the bottom would snap off the stem exactly at this point, on the other the tangles brushing against the rachis higher up would bend and break it at the very same spot, *i.e.*, its point of emergence from the ground. Knowing as we do that *Virgularia* when living undisturbed not only has the stalk, which is wanting in almost all dredged specimens, but also that the stalk is buried

* Kerr's "Collection of Voyages," vol. viii., p. 119. Quoted in Darwin's "Naturalist's Voyage round the World."

completely in the sea bottom, this part of the explanation seems to us entirely satisfactory.

Concerning the fracture of the upper end, however, the case is different. The cause here must be an altogether different and independent one. It is almost inconceivable that any influence at the time of capture could invariably break off the tops of the specimens. Neither the dredge, nor the rope, nor the tangles, could, so far as we can see, possibly effect this fracture: their tendency would always be, as we have just shown, to break the stem at its point of emergence from the ground. We are, therefore, driven to the conclusion that the upper fracture is not effected at the time of capture, but that *Virgularia*, while living undisturbed at the bottom of the sea, has already lost its top. This is confirmed by an observation of Darwin,* who describes the *Virgularia* (*Stylatula Darwinii* of Kölliker) seen by him living on the shores of Patagonia as truncated at the upper end.

Having thus narrowed our problem and defined its limits more precisely, we have now to determine, if possible, what are the causes which, acting normally during the life of a *Virgularia*, and quite independently of any influence exerted by man, lead to the almost invariable truncation of its upper end.

The first explanation that suggested itself to us was, that in the ordinary course of growth the top, after attaining its full development, dies, withers up, and drops off, and in this way causes the truncation. This is at first sight an attractive theory, and accords well with the fact that the leaves at the bottom of the stalk are always small and immature, and gradually increase in size and development as we pass upwards; *i.e.*, that the development of leaves appears to proceed from below upwards.

However, closer examination reveals fatal objections to this view. In the first place the actual upper ends of the specimens as dredged, show no sign whatever of disease, or of being about to perish. On the contrary, in all the specimens examined the rachis is perfectly healthy right up to the top. Secondly, the truncation does not occur always at or about the same spot in different specimens, but at various points of their length. In some (*cf.* Fig. 1) it occurs above the largest leaves, in others some way below them, and in others again about the position of the largest leaves; *i.e.*, the widest part of the rachis. This variability is certainly not what we should expect were the truncation due to death from natural causes. Thirdly, even though it were true that the polypes after living a certain time died and withered away at the top of the rachis, *this would not account for the stem being invariably broken off at the junction of living and dead polypes.* This stem contains, as we have seen, as much as 85 per cent. of mineral matter, and it could hardly be maintained that the death of the polypes encrusting it would so affect the stem as to cause it to continually break off at the exact boundary line between

* Darwin: "Naturalist's Voyage Round the World," 1860, p. 99.

living and dead polypes. The fact that the stems are frequently dredged up of dead specimens, from which the whole of the animal matter has been removed by decomposition, and which stems are very slightly if at all more brittle than stems of living specimens, proves conclusively that death of the polypes would not in any way cause or account for truncation of the stem as well. We are therefore compelled to reject this explanation altogether; firstly, because it has not been proved to be a true cause, for we have no evidence at all that the top does actually die down as suggested; and, secondly, even if a true cause, it is an insufficient one, because it leaves completely unexplained the truncation of the stem as well as of the soft parts.

If the cause of the truncation then does not lie in the *Virgularia* itself, it must be some force acting on it from without. Fish or other marine animals knocking up against the colonies, and so breaking them off, could not account either for the invariable occurrence of the truncation or for its situation, for lateral blows would tend to cause fracture not high up the rachis, but, as already explained, at the point of emergence from the ground; *i.e.*, junction of rachis and stalk.

The only other explanation that occurred to us, and the one we advanced when presenting our report to the Birmingham Natural History Society on June 20th, is that the truncation is due to the tops being habitually bitten or nibbled off as food by some marine animals, most probably fish. At the time of presenting our report, this explanation was offered as a pure hypothesis, in support of which we had no direct evidence, and to which we were driven simply from inability to conceive of any other that would satisfy the conditions of the problem. Since this time we have been fortunate enough to obtain direct evidence of a very striking and satisfactory nature in support of our view.

Mr. R. D. Darbishire, of Manchester, to whom we mentioned the difficulty, told us he remembered many years ago taking specimens of *Virgularia* from the stomach of a haddock caught off Scarborough. Fortunately these specimens, which bear the date of the 9th November, 1855, were preserved, and Mr. Darbishire has very kindly handed them over to us for examination. They consist of five fragments of *Virgularia mirabilis*, from three quarters of an inch to three inches in length, each fragment containing the portion of stem belonging to it, and all five showing evident signs of having undergone partial digestion.

The most interesting point still remains to be noticed. Of these five fragments no fewer than three are *tops*, *i.e.* actual perfect upper ends, a point the significance of which is at once evident when we remember that of the specimens of *Virgularia mirabilis* dredged either off our own coast or elsewhere, only one single specimen—the one in the Glasgow Museum—is known to have a perfect top.

Mr. Darbishire's observation proves that fish do actually bite off and swallow as food fragments of *Virgularia*; also that they are able to find specimens with perfect tops, for which tops they would appear to have some special liking. It need hardly be pointed out that this furnishes the strongest possible confirmation of the theory we had been led to frame on purely independent grounds.

Two points still require explanation. Firstly, why, if the fish bite off the tops and swallow them as food, do they not devour the whole of the rachis as well? Secondly, why do the fish eat the tops off *Virgularia* and leave untouched the allied genera, *Pennatula* and *Funiculina*, which are found growing alongside it, and of which the latter, at all events, would appear to be far more tempting as food, owing to the much greater bulk of fleshy substance it affords, and the much smaller thickness of its stem in the upper part. If it be supposed that the calcareous matter of the stem is the real attraction to the fish, it is difficult to understand why *Pennatula*, with its innumerable calcareous spicules, is allowed to escape.

We shall return to both these points further on.

(To be continued.)

BOTANICAL RAMBLES IN WARWICKSHIRE.

In the latter part of August the eminent fungologist Dr. M. C. Cooke paid a visit to Warwickshire, and as I had the pleasure of accompanying him to Crackley Wood and Sutton Park during his stay here, it may be interesting to some of the readers of the "Midland Naturalist" if I give a short account of our finds. The season was far from propitious from a *Fungus* point of view—the preceding dry weather having parched up the ground, so that although we found a few good things, they were only few, and occurred as solitary individuals in most cases.

Our first visit was to Crackley Wood, near Kenilworth, a locality that has been already worked and almost to exhaustion by the late Mrs. Russell. This lady not only recorded a long list of fungi from the district around Kenilworth, but also added to the value of her work by giving to the British Museum her beautiful illustrations of every species and variety she collected.

Our first find was *Amanita phalloides*, a local plant in the county. This we noticed on the grassy waysides outside the wood.

In the wood we noticed *Clitocybe laccatus*, *Collybia dryophilus*, *Collybia fusipes*, which my learned friend informed me was esculent, but which certainly does not look tempting. Here and there among the grass were solitary specimens of the pretty little *Mycena galopus*, and *Lactarius subdulcis*, and the very poisonous Liberty Cap *Psilocybe semilanceatus*, and upon the fallen branches scattered about the wood, *Grandinia granulosa*, *Trichoderma viride*, *Corticium Sambuci*, and *Bulgaria sarcoides*. In addition to these we found a solitary specimen of *Boletus subtomentosus*, in which the upper portions or caps of two individuals had become united, thus giving it the appearance of a Boletus with two stems.

Our most interesting finds, however, were *Russula rosacea*, recorded doubtfully by Mrs. Russell; *Polyporus nidulans*, a very rare species, and new as a record for Warwickshire; and *Clitocybe catinus*, first discovered in 1881 near Ludlow. Crackley Wood is the second British station for this very rare fungus. We also noticed that the leaves of *Lychnis diurna* were plentifully infested with *Puccinia lychnidearum*.

The following day we paid a visit to Sutton Park, and in passing over the grassy land bordering the Witton road Dr. Cooke collected two noticeable fungi, *Panæolus leucophanes* and *P. phalænarum*, both new to the county, and rare species. Sutton Park we found very barren of fungi, large areas being passed over without sighting even the commonest species. The most frequent, however, were *Panæolus fimiputris*, *Hypholoma appendiculata*, *H. sublateritius*, *Stropharia semi-globatus*, and *Panæolus separatus*. In the woods *Lactarius mitissimus*, *L. subdulcis*, and occasional specimens of the beautiful Stinkhorn, *Phallus impudicus*. But the more interesting species noticed were *Russula cyanoxantha*, *R. citrina*, *Inocybe asterosporus*, very local, and *Psilocybe udus*, all rare, and some new as records for the county. Although the results of our fungi rambles were on these occasions very meagre, they were very pleasing to me, giving me the advantage of many a pleasant chat with an old friend and very genial companion.

I may also mention that I recently found in meadows near Atherstone-upon-Stour, one of the stalked Polyporei, which Dr. Cooke decided to be *P. rufescens*, also new as a record for Warwickshire.

J. E. Bagnall.

ON A DRAGON FLY.*

By Silvanus Wilkins.

In April last I had the pleasure to win your kind attention to a short paper on *Fish Rearing*, written in plain purpose to show that some practical work can be done with little or no cruelty or waste of life if your tools are of the right sort.

I mentioned at the reading that I had been led to do this to refute a statement I had seen "that there was nothing to interest the naturalist in the Midlands, and that it was a district to be shunned." The Stickleback, I hope, furnished to my companions a fair instance of fish life-history, in, it would be thought, the least likely of regions.

I venture to fill up the allotted twenty minutes and space of five or six pages this time on *Insect Life*, limiting it, as before, to what anyone with patience may see or do, and as I am mildly indignant at the above aspersion against the Black Country as a libel, it suggests itself to me to choose the Libellulina for our notice, because it so happens that this is quite as good a spot for watching the habits of the Dragon-fly as it was for the fish, and perhaps that insect, having all the parts in perfection that constitute a type insect, offers, take it for all in all, from the egg to the imago, as quaint a series of pictures as can be found in any one creature (excepting man, of course).

* Read before the Birmingham Natural History and Microscopical Society, Nov. 22, 1881.

Space will limit me to mode of capture and life-habit mostly, and a full description of the mask apparatus, with its double joints and hinges, seems better suited to a mechanical magazine than one on natural history; but of its form and anatomy an excellent and full account can be found in Kirby and Spence's or Westwood's Entomology.

The larvæ can be caught by sweeping against and through the vegetation round the sides of pools with a strong net, or they may be found in hollow pieces of old wood, into which they will crawl and hide if placed in the shallows near the side; another good plan is to shovel up smartly some of the surface soil at the base of the rushes, etc., and throw it on the sloping bank, then with a fine rose-nozzle of a watering pot, wash out the mud steadily so that it drains back, when the chances are you will see one of the larvæ.

This strange being seems as ill-born as Caliban, and is the veriest dragon from the beginning, for it would appear that it is the nature of the embryo—of this alone of all embryos—to have the trick of always taking an obverse position in the egg.

The respiration might not incorrectly, I think, be called a perspiration only, and contains the principle of a patent to beat the screw propeller, if one only knew how to apply it, and one is set guessing if it is the inversion in the egg which has turned about the action of the breathing so curiously. I hope this order of being is not fated to be evil for ever because it had not the benefit of proper inspiration at first.

As for the larva, it is more masked or truly larva-like than any other I know. Its form, in the parts of head, trunk, and abdomen, seems an ensemble preserved to us in microed size, typical of life on the malignant side that became dominant and monstrous through the three great geological periods. In its jaws it has the faculty for snapping possessed by the huge mollusc; in its neck and body segments the writhing of the saurian; in its legs the grip of the cephalopod, and in the abdomen the vices that held to the mammalian.

In habit it has the stealth of a cat. It can prowl like a wolf, snatch like a monkey, snap like a crocodile, and bite like a bull-dog.

In fact, in both its states of water and air it can do everything wicked, except the one thing it popularly is supposed to do best—namely, sting, and it has a mean way of rarely seizing anything larger or stronger than itself, choosing small fry and never tackling big folk.

A caddis-worm, after the covering is cut off, makes a good supper for a dragon-fly larva; but it is careful to seize the caddis in the rear of the head for fear it would seem of the powerful mouth with which the latter is armed. These greedy creatures will also take an ordinary garden worm nearly every morning. One about their own length suits them best, for if the worm be too long so that one end of it can get a hold or purchase between two stones, it will draw away, dragging the larva until its large round jutting eyes meet the obstruction, and the enemy is peeled off to his amaze, if not to his damage. When a worm disappears in this way the larvæ will sometimes stay watching the opening for a long time with their heads turned down, and a little on one side, like a dog at a rat hole.

The snatch of their jaw-forceps is so quick it takes good eyesight to see it ; but a worm by its quickened movements when dropped into the water in front of them often causes them to miss once or twice, and the action repeated gives a good opportunity for catching sight of it. The worm can be lowered and dangled in front of them, held by just one turn of a fine silk thread, out of which they will drag it. They will gorge a worm their own length in two or three minutes, during which time the movement up and down of the abdomen in breathing is very marked, as if heaving to suck the food in. The gorging is helped by the nippers, which take a fresh hold higher up before each piece is bitten off by the jaws and passed into the gullet.

Although they will tackle a snail at times when hungry, with, however, the risk of being partly drawn into the mouth of the shell and held there for a time, they will, very strangely, let a snail slowly crawl along and over their body without starting away, as they mostly do when touched by other moving things in the water. I have thought that perhaps the sliding movement of the snail over them may groom or shampoo them, as it were, and clean off parasites and other attached things.

In ordinary course, when no prey is in sight, their crawling motion is very slow, as if their watery home made them stiff and rheumatic ; but this is only their artfulness, for they no sooner sight any choice food in motion at a short distance than their slow action is changed to one of great alertness. They raise their head and fore-part of their body by planting their first pair of legs like a carriage horse, and the action of the neck becomes grand, subtle, and free, as that of a snake or lizard, for a moment or two. They then advance like a cat after a bird, until within half an inch of their prey, when out shoot the jaw-calipers, and the object is seized. They will, however, if surprised with enticing prey, such as a young minnow, swim after it in rapid jerks, and make a dash at it as it moves ; but they appear to think twice in view of the spines of the Stickleback, and conclude him to be sour.

They are very careful, after a meal, to clean their face, removing all particles of skin or harder stuff that has not been sucked in, and which has got attached to their teeth and lips. This they do with their jaw-forceps, and these they then sweep clean with their fore-legs after the manner of a fly or a young rabbit cleaning his whiskers.

By means of its gluttony the larva stores up an energy for use in wing power in its aerial state more marvellous that Faure's cell of condensed electrical force, but only to be more dragonian. I notice the clergy explain this voracity by kindly calling it the balance of nature. Angels, however, are not perhaps so pink as they are painted, and if evil be that which is out of harmony with the laws of man's nature, one is bound to affirm at least in the Dragon-flies' favour that their ways do no known harm to him or his.

They are fond of a stick about a half-inch square in the aquarium to cling to, round which they will play bo-peep with you as you go near, slipping from side to side out of sight as you show yourself, but as if partly tamed with the regular feeding. They also prefer porous tile to smooth stones to hide under, as they can cling more easily to it. They refuse their food a day or two before each moult of skin, and the time of fasting is increased to about a week or ten days, just before they make the final change to the imago. During this period they climb up the stick or any stem to the surface, so as to expose their mouth and eyes slightly, and it is, I think, during this stage that the altered mode to breathing the common air is undergone. After this amphibious interval, the first hot day is chosen by them for the change to the higher life, the sight of which ought to be almost enough to awaken faith in an agnostic.

I do not know how many times altogether they moult from the egg to the imago, but I have seen that they shed the skin four times during the last six months before the imago comes out. Throughout the whole time and process of the larval state it is very necessary to keep the water well aerated by balanced vegetation or a syringe.

We will, if you please, resume our loafing at the old centre, namely, Edwards' Pools at Bilston, and need not go far to see all we want, as they can always be found here in summer in the winged state.

Choose the early hours of a fine day in July or August for a stroll round the borders of the pools. Near the edges or corners where the reeds, rushes, and flags are growing, you may soon find out by the numbers flying to and fro where these dragon-flies are colonised.

It adds much to your chances of observing if you first mark out where they are located, for they are shy, and as symbolised by the large development of eye-faculty they are correspondingly swift in flight; but the kind chiefly found here—the *Agrion*—is, luckily for learners, the least active. The eye of this species seems a millenocular stereoscope, and is a wonder under the magnifier, looking like the round knob of the stopper of a glass decanter cut into ten thousand facets, each one of which is said to receive a picture of the objects around. What can the optic lobe of its microscopic brain be like? This is a fine point. The best mode I know of preserving specimens of this is never to catch any, but to leave them to enjoy their existence. Some procure them to cure them, but it is a ragged piece of business at the best, and certainly is no longer necessary for anyone who will become a member of the Birmingham Natural History Society, with access to the beautiful works on their form and colour to be found in its library.

Don't make any attempt to chase or run them down, but seating yourself very gently, where you can look about and have them for a yard or two within reach, you leave them to their sports. They will hawk around, but never go far afield, and by remaining in one spot you are more likely to catch sight of a larva, like a Captain Boyton, or a diver in his water-tight dress, coming up out of the water on to the vegetation. The male in the winged form rather bears out the rule of the gayer clothing, but mostly in primitive or simple colour, and is of the two sexes a little more active. The females settle more frequently on the vegetation.

Very soon you will descry a male on the wing, which you keep in your eye as far as the range will admit without turning your head, on the look out for a partner. This is done with an *élan* that a Frenchman might admire, seizing her with such force, that sometimes, like a harrier overrunning his game, they topple over together. This brings their wings into such juxtaposition that their flight is impeded, and after a time they settle. Of about 200 sorts in England, nearly a tithe may be found here, mostly with blue about them, and to see this action of seizure you cannot resist the simile of a policeman chasing and securing a runaway.

The plan to keep them captured until the deposit of the eggs begins is this: For catching the Stickleback without hurt, the best plan is the open silk thread net which I suggested (" Midland Naturalist," 1881, page 110). In this case, to make your work easy, you have ready a glass shade about seven inches across and ten inches high, such as is used to cover small chimney ornaments. Let it be white and thin, with, if possible, a knob at the top, attached to about a foot of fine wire or thread so as to hang it from the stout joint of a fishing rod or a stick about five feet long. If it hasn't a knob you have to fix a lashing, which is awkward. You also have ready a thin piece of cork or light wood about nine or ten inches across. This is to slip under to stand the shade upon. Keep these and a pair of scissors all ready within reach.

Having beforehand chosen a good spot and placed yourself where you may sight them, which you may soon do should the morning be a hot one, you select those closest to the edge of the land or just over it, and quietly bring round with your left hand the glass shade somewhat above them, and gently lower it over them, then slipping the piece of cork under it as a base, and having the scissors handy to cut any stems in the glass which you leave there for them to cling to. The open mesh of the net puzzles the fish, and you will find that the transparency of the glass, in a similar way, puzzles the insect, so that if it be carefully managed they will not be disturbed, and you have them secured in a crystal palace.

This kind of glass shade, perforated with a hole through the knob at the top to let the air escape, can sometimes be used for securing water specimens by lowering it over them into the water. By standing your cork base with your glass shade upon it in the centre of a handkerchief, and tying the four corners over the top, you have a capital mode of sheepishly carrying your capture home.

I assume, as before, that your aquarium is well prepared; but the vegetation should be such that there may be several stems or floating leaves on the surface. The more light and sun they get the better; so if you can work, as I was able to do, at a tank in a conservatory (Hawkesford's) it is a great help. Before removing the glass shade and setting the cork afloat with your capture upon it, you need some kind of cover inverted over the aquarium. If you have the Agrion this may be a frame cover of leno lace, but if you have caught the larger kind they will gnaw through this, so it is best to invert another glass aquarium over them, turning in with them a good supply of flies, gnats, or spiders, which they will seize as they come across them, if they have not been hurt in transshipment. The full feeding is very necessary both in the larval and imago state.

As it is well, however, to keep as near to natural conditions as possible, your best plan, I think, is this: Having left them on the pond side for an hour or two, you raise the glass shade and set the captives free. If deftly done it is likely the gentleman will take part in assisting his lady in the duty of egg depositing, which begins about mid-day and goes on throughout the afternoon. Suspending her by his claspers round her neck, he sails away and brings her poised a few inches over the water, now and again lowering her with a sweeping stroke or dash down to the surface, she at the same moment releasing an egg at each dip. You may see this done to the number of twenty times or more by any one pair. There is an easy dancing action in this, which leads one to think that it is a great help to her in her efforts.

Should, however, the lady be left to herself, she no less faithfully fulfils her duty to the future offspring she will never see; but it is manifestly a work of greater labour alone. She then alights on the stems or leaves of plants near the surface, and you may see her bend her long body into a curve until the ovipositor touches the plant, and the eggs are laid there, one at a time, and may be found upon it. As the leaf decays it carries them to the bottom.

Most of the names of this genus imply a malignant power which is not inapt, and as I had my quirk last time at nomenclature I should not wish any scientist to arch his eyebrow again at me. I hope I regard all true science as the light of life and its laws.

It is more than half a score years since my spare time and walks were given to observing in this district, but as I pass through it by train or tram I can see from the windows many of the old haunts of hydra and entozoa, insect and fish, that I am sure would well repay the visit of naturalists any fine day in summer.

Mr. M'Lennan, in his work on primitive marriage by theft or force, traces the ceremonies and modes of seizure among the early traditions of nearly every race. I fancy, however, he cannot well begin or stop at primitive man or even vertebrates, but may carry the traces far beyond all record, and spell out an exemplification of early wife capture in the habits of the Dragon-fly.

Haeckel, Spencer, Darwin, Sir John Lubbock, Grant Allen, and others try to show us by means of Biology, that every animal has been slowly moulded through a wonderful series of metamorphoses into its existing shape by surrounding conditions, and that each bears in its parts or form the traces, when we can read them, of its development or evolution, and that mankind, step by step, sums up into himself, more or less, along an endless line of ancestors, all the antecedent life of a small trifle of eons of old times.

We may ask ourselves what kind of life has each race of man for the most part summed up into itself, and how much of the Dragon, for instance, has evolved or devolved for each of us. The manners, habits, and customs of a race, it has been suggested, are the key to this specialisation, and that running through the forms of lower life preserved to us we see the vestiges of all the earlier stages and changes.

If you then will throw your fancy into the scene among the Dragon-flies you may not be mistaken in finding many of the phases of wife capture after the old order of things brought down to our own days, as M'Lennan describes them.

Happily, with us, sweethearting has evolved from might into manners, from capture into courtesy, as Coventry Patmore depicts in the "Angel in the House":—

"Lo! how the woman once was woo'd—
Forth leapt the savage from his lair
And felled her! And to nuptials rude
He dragged her, bleeding, by the hair.
From that to Chloe's dainty wiles
And Portia's dignified consent—
What distance! But these Pagan styles,
How far below Time's fair intent.
* * * * *
Shall love where last I left him halt?
Nay; none can fancy or foresee
To how strange bliss may time exalt
This nursling of civility."

FUNGI OF THE NEIGHBOURHOOD OF BIRMINGHAM.

FIRST LIST, 1881-82.

(Continued from page 185.)

AGARICINI—*continued.*

Ag. (Amanita) vaginatus, Bull. Water Orton; Sutton Park; Warley Woods. Sept.
Ag. (Clitocybe) flaccidus, Sow. Sutton Park. Sept.
Ag. (Pleurotus) ulmarius, Bull. Sutton Park. Sept.
Ag. (Mycena) alcalinus, Fr. Sutton Park; Water Orton. Sept.
Ag. (Mycena) sanguinolentus, A. and S. Hams Hall. Sept.
Ag. (Pholiota) squarrosus, Müll. Driffold Lane, Sutton. Sept.
Ag. (Flammula) gummosus, Lasch. Driffold Lane, Sutton. Oct.
Ag. (Galera) hypnorum, Batsch. Sutton Park; Warley. Sept.

Ag. (Hypholoma) appendiculatus, Bull. Sutton Park. Sept., Oct.
Ag. (Psathyra) corrugis, Pers. Sutton Park; Perry Barr. Feb.—Sept.
Coprinus comatus, Fr. Edgbaston, *W. Southall.* Driffold Lane, Sutton; Water Orton. Sept., Oct.
C. atramentarius, Fr. Perry Barr; Sutton. Aug.—Oct.
Having eaten these two species, I can testify that they are fair substitutes for the common mushroom.
C. similis. B. and Br. Driffold Lane, Sutton. On dead wood. Sept.
C. micaceus, Fr. Oscott (Warwickshire); Sutton. Sept.—Nov.
C. plicatilis, Fr. Perry Barr; Hampstead; Driffold Lane. July—Oct.
Bolbitius titubans, Fr. Oscott (Wk.); Alvechurch; Driffold Lane, Sutton. May—Nov.
Cortinarius tabularis, Fr. Sutton Park. Sept.
Paxillus involutus, Fr. Sutton Park, abundant; Solihull. In woods. Sept., Oct.
Hygrophorus virgineus, Fr. In meadows, Olton; Warley. Oct.
H. ceraceus, Fr. In meadow, Warley. Sept.
H. miniatus, Fr. Sutton Park, in open ground, Lower Nut Hurst. Sept.
H. conicus, Fr. Amongst grass, Sutton. Aug.
H. psittacinus, Fr. With *H. miniatus*, Sutton Park; Warley. Sept.
Lactarius pubescens, Schrad. Sutton Park. Sept.
L. quietus, Fr. Sutton Park, abundant. Sept.—Nov.
L. rufus, Fr. Sutton Park, in woods, beneath firs. Sept.
L. mitissimus, Fr. Sutton Park. Sept.
L. subdulcis, Fr. Sutton Park; Warley. Sept., Oct.
Russula nigricans, Fr. Hams Hall. Sept.
R. virescens, Fr. Hams Hall. Sept.
R. cyanoxantha, Fr. Sutton Park; Hams Hall. Sept., Oct.
R. fœtens, Fr. Sutton Park. Sept.
R. emetica, Fr. Sutton Park, in woods. Sept., Oct.
R. ochroleuca, Fr. Sutton Park; Solihull. Sept., Oct.
R. fragilis, Fr. Sutton Park, in woods and their borders. Sept., Oct.
R. citrina, Cooke. Sutton Park. Sept., Oct.
R. alutacea, Fr. Sutton Park. Sept.
Cantharellus aurantiacus, Fr. Sutton Park, amongst firs. Sept., Oct.
Marasmius oreades, Fr. Oscott (Warwickshire). Sept., Oct.
M. rotula, Fr. Sutton, on stumps. Sept.
M. androsaceus, Fr. Sutton Park; Solihull. On dead leaves. Sept., Oct.

W. B. GROVE, B.A.

(To be continued.)

METEOROLOGY OF THE MIDLANDS.

THE WEATHER OF AUGUST, 1882.

BY CLEMENT L. WRAGGE, F.R.G.S., F.M.S., ETC.

The two distinct classes of weather marked the month of August. During the first fortnight the anti-cyclonic type prevailed, and it was fine, warm, and seasonable; while cyclonic conditions more or less ruled the second part of the month—bringing cloudy skies, reduction of temperature, rain, and unsettled weather, with thunder about the 15th and 24th.

STATION.	OBSERVER.	RAINFALL. Total for M. In.	Greatest fall in 24 hours. In	Date.	No. of rainy d.	SHADE TEMP. Absolute Maximum. Deg	Date.	Absolute Minimum. Deg.	Date.
OUTPOST STATIONS.									
Ben Nevis (*a*)	C. L. Wragge, Esq., F.M.S.	11·40	1·97	20	25	59·6	8	31·6	3
Fort William (*a*)	C. L. Wragge, Esq., F.M.S.	4·30	1·15	13	17	71·0	11	39·0	31
Spital Cemetery, Carlisle	I. Cartmell, Esq., F.M.S.	3·08	·56	28	13	77·8	14	36·3	31
Scarborough (*a*)	W. C. Hughes, Esq., F.M.S.	1·67	·27	18	16	74·7	11	47·7	16
Blackpool (*a*)—South Shore	C. T. Ward, Esq., B.A., F.M.S.	3·96	1·00	28	18	7[illegible]·3	13	44·0	16
Llandudno (*a*)	J. Nicol, Esq., M.D.	3·15	·53	28	15	70·6	10, 13	49·8	23
Lowestoft (*a*)	H. E. Miller, Esq., F.M.S.	1·61	·52	22	12	76·4	2	42·2	31
Carmarthen (*a*)	G. J. Hearder, Esq., M.D.	5·35	·98	15	20	77·2	9	44·1	28
Cardiff (*a*)	W. Adams, Esq., C.E.	5·75	1·14	22	16	76·3	12	46·7	28
Altarnun, near Launceston (*c*)	Rev. J. Power, F.M.S.	5·18	·82	25	18	77·0	13	43·0	6, 12
Sidmouth (*a*)	W. T. Radford, Esq., M.D.	2·97	1·18	31	16	75·0	6	48·2	9
Guernsey (*a*)	F. C. Carey, Esq., M.D.	2·65	·76	31	19	75·5	12	51·4	7
MIDLAND STATIONS.									
HEREFORDSHIRE.									
Burghill (*a*)	T. A. Chapman, Esq., M.D.	2·21	·54	15	15	77·9	6	42·0	11
SHROPSHIRE.									
Woolstaston	Rev. E. D. Carr	2·64	·55	22	17	74·5	6	46·0	16, 23, 24
Bishop's Castle	E. Griffiths, Esq.	2·53	·75	22	15	81·0	9	41·0	11
Stokesay (*a*)	M. D. La Touche	2·60	·65	22	14	78·9	10	38·9	28
More Rectory	Rev. A. S. Male	2·15	·61	22	14	77·0	12	43·0	11, 30
Dowles, near Bewdley	J. M. Downing, Esq.	1·85	0·38	22	13	83·0	5	38·0	24
WORCESTERSHIRE.									
Orleton, near Tenbury (*a*)	T. H. Davis, Esq., F.M.S.	2·55	0·43	22	17	80·2	6	41·0	11
West Malvern	A. H. Hartland, Esq.	2·99	·50	15	18	83·5	12	44·5	23, 27
Evesham	T. J. Slatter, Esq., F.G.S.	1·85	·42	22	16	77·3	12	45·0	24
Pedmore	E. B. Marten, Esq.	2·55	·51	22	16	87·0	12	43·0	10, 30
Stourbridge	J. Jefferies, Esq.	2·22	·52	22	11	78·0	13	44·0	23, 30
Cawney Bank, Dudley	C. Beale, Esq.	2·45	·51	22	15	72·0	12	45·0	15
STAFFORDSHIRE.									
Dennis, Stourbridge (*a*)	C. Webb, Esq.	2·29	·60	21	13	80·0	12	40·0	25
Kinver	Rev. W. H. Bolton	2·19	·55	22	14	79·0	18	40·0	10, 23, 30
Walsall	N. E. Best, Esq.	2·36	·45	22	16	70·0	1, 6, 9, 12, 13	45·0	23, 31
Lichfield	J. P. Roberts, Esq.	1·58	·35	22	17	83·0	12	43·0	30
Burton-on-Trent (*c*)	C. U. Tripp, Esq., F.M.S.	1·59	·35	24	15	80·0	12	39·0	31
Wrottesley (*a*)	E. Simpson, Esq.	1·95	·53	22	15	78·6	12	44·0	16
Stafford (*a*)	T. McCallum, Esq.	2·17	·42	22	15	74·9	12	40·3	29
Barlaston (*a*)	W. Scott, Esq., F.M.S.	3·69	·65	13-23	16	78·0	8	43·0	31
Tean (*c*)	Rev. G. T. Ryves, M.A., F.M.S.	2·86	·72	22	18	76·8	12	41·0	31
Heath House, Cheadle (*a*)	J. C. Philips, Esq., F.M.S.	2·68	·66	22	18	73·9	12	44·0	24
Oakamoor, Churnet Valley (*a*)	Mr. J. Williams	3·05	·86	23	20	75·0	18	41·0	11, 20
Beacon Stoop, Weaver Hills (*a*)	Mr. James Hall	4·5[illegible]	—	—	—	69·5	—	40·0	—
Alstonfield	Rev. W. H. Purchas	4·24	·78	22	16	79·5	9	38·1	24
DERBYSHIRE.									
Stony Middleton	Rev. U. Smith	3·16	·53	29	17	72·0	7, 8, 12, 13	41·0	22
Spondon	J. T. Barber, Esq.	1·50	·33	28	13	—	—	—	—
Fernslope, Belper	F. J. Jackson, Esq.	1·69	·42	22	12	76·0	11, 12	44·0	21, 31
NOTTINGHAMSHIRE.									
Park Hill, Nottingham (*a*)	H. F. Johnson, Esq.	1·50	·25	18	15	77·8	12	41·5	29, 31
Hodsock Priory, Worksop (*a*)	H. Mellish, Esq., F.M.S.	2·05	·62	22	17	76·0	6	40·1	16
Strelley (*a*)	T. L. K. Edge, Esq.	1·72	·36	28	17	76·6	6	41·9	31
RUTLANDSHIRE.									
Uppingham	Rev. G. H. Mullins, M.A., F.M.S.	1·58	·33	22	14	77·2	12	44·2	31
LEICESTERSHIRE.									
Loughborough (*a*)	W. Berridge, Esq., F.M.S.	1·94	·46	18	12	80·5	12	43·7	11
Syston	J. Hames, Esq.	2·06	·38	25	15	74·0	12	45·0	11, 31
Town Museum, Leicester	J. C. Smith, Esq.	2·23	·44	25	15	79·0	12	42·0	11
Ashby Magna	Rev. Canon Willes	1·50	·44	25	13	78·0	12	—	—
Waltham-le-Wold	Edwin Ball, Esq.	3·09	·65	25	18	76·0	14	41·0	17
Coston Rectory, Melton (*a*)	Rev. A. M. Rendell	2·72	0·58	25	18	75·0	12	39·8	11, 16
WARWICKSHIRE.									
Henley-in-Arden	T. H. G. Newton, Esq.	2·68	·57	22	16	82·5	6	40·5	4, 31
Kenilworth (*a*)	F. Slade, Esq., C.E., F.M.S.	2·22	·74	22	14	76·5	6	41·0	11
NORTHAMPTONSHIRE.									
Pitsford, Northampton	C. A. Markham, Esq.	1·76	·67	23	15	85·0	12	41·0	21
Towcester	J. Webb, Esq.	2·07	·56	22	16	—	—	—	—
BEDFORDSHIRE.									
Bedford (*a*)	H. J. Sheppard, Esq.	1·80	·30	15	13	80·2	12	44·8	31
Aspley Guise, Woburn (*a*)	E. E. Dymond, Esq., F.M.S.	1·50	·20	22	13	78·7	6	42·5	31
OXFORDSHIRE.									
Radcliffe Observatory, Ox. (*a*)	The Staff	0·94	·24	15	10	78·7	6	46·3	31
GLOUCESTERSHIRE.									
Cheltenham (*a*)	R. Tyrer, Esq., B.A., F.M.S.	2·95	·88	25	17	78·1	6	40·0	28

(*a*) At these Stations Stevenson's Thermometer Screen is in use, and the values may be regarded as strictly intercomparable. (*c*) Glaisher's pattern of Thermometer Screen employed at these stations.

Indeed, the summer characteristics of these two great types of atmospheric change were wonderfully marked in contrast. Especially was this the case on Ben Nevis, by the way, where, on the 8th the dry bulb read 54° at 9 a.m., and the wet bulb 44°, with a fine, clear sky and great diathermancy; whereas saturation, with a biting cold, drizzling or heavy rain, an envelope of "cloud-fog," and very raw weather are the more usual conditions on the mountain, and which prevailed during the second part of the month.

The highest reading of the barometer, corrected and reduced to mean sea-level, was 30·300 in central England, and occurred on the 4th; the lowest, about 29·150, took place on the 23rd. The mean temperature appears to have been below the average. The amount of cloud was about 7·5 (scale 0 to 10), and relative humidity 80 % as means for the Midland District. Westerly winds prevailed. At Loughborough the solar radiation thermometer reached 139·2 on the 14th, and the terrestrial minimum at Hodsock, 35·9 on the 31st. Bright sunshine, 178·6 hours at Hodsock, and 173·2 at Strelley. Mean temperature of soil at depth of one foot at Strelley, 59·1. The mean daily amount of ozone at Cheltenham was 2·6 (scale 0 to 10). Lunar halo at Loughborough early on morning of 31st.

Correspondence, etc.

Shall we have a Page for Questions?—An esteemed correspondent has made the following suggestion :—

"I venture to submit that without at all tending to degrade the present high character of the 'Midland Naturalist,' it would prove an element of popularity if a page in each number were set apart for answering questions relating to Natural Science, and naming specimens sent to the editors. The chief (perhaps the only objection) that presents itself is the additional trouble entailed on the editors. This need not be so great as appears at first sight. Volunteers may readily be found to take each his separate department, to whom all specimens and questions may be sent in time to enable him to answer for publication. Many a struggling student in out-lying places who has no friend at his elbow to answer the simple, but to him perplexing, questions that occur to him, would thus find in the 'Midland Naturalist' a silent 'counsellor and guide,' and numbers would be induced to subscribe who now find the contents of the work too much above them."

[We warmly thank our friend for his suggestion, and shall have very great pleasure in acting on it, and whenever any of our readers ask us for help and guidance in their studies, we will do our best to ensure for them the assistance and advice of at least some one of the many able naturalists whom we are proud to number among our staff of fellow-workers.—Eds. "M. N."]

A Brood of Hedgehogs in a Town Garden.—On Wednesday, September 6th, there was discovered in the garden of the Abbey, Burton-on-Trent, a brood of six fine young Hedgehogs. The garden is bounded on one side by the River Trent, and on two others by walls, the approach to the remaining side lying through a densely populated part of the town; and for the last eight years at least no Hedgehogs have been seen in the garden. It is difficult to understand how the brood just discovered got there. Can any of your readers suggest an explanation of the problem.—Chas. F. Thornewill, Burton-on-Trent.

New Localities for Rare Warwickshire Plants.—Recently I have found *Comarum palustre* in abundance in a marsh near Tile Hill; *Spiræa Filipendula* in dry pastures near Alveston Heath; and *Rosa collina* and *R. cæsia* in hedges near Tile Hill. All these are rare in the county.—J. E. Bagnall.

New Ascobolus.—A fortnight ago I found a small Ascobolus on cow-dung at Water Orton which I was unable to name. I sent specimens to the well-known specialist in this group of fungi, Mr. W. Phillips, of Shrewsbury, and he decided it to be a species, *Ascobolus minutissimus*, Boud., not hitherto found in Britain. It is therefore a welcome addition to our local Flora.—W. B. Grove, B.A., Sept. 20th.

Œnanthe Lachenalii, *Gmel.*, as a Warwickshire Plant.—In the early part of August of the present year I found *Œnanthe Lachenalii* fairly abundant in a marshy coppice near Stratford-upon-Avon. This is an interesting addition to the Warwickshire flora, and the more so from the fact of its being a semi-littoral plant, choosing rather salt-water marshes and the banks of tidal rivers than a fresh-water marsh in an inland county. In a wood near the marsh mentioned, I also found another maritime plant, *Carex distans*. The Rev. W. W. Newbould in a recent communication, remarks "I have a suspicion that it (*Œnanthe Lachenalii*) is a plant becoming extinct in Warwickshire rather than a recent importation. It is curious that so many plants usually found under sea influences should grow thereabout; *e.g.*, *Juncus Gerardi*, *Carex distans*, *Apium graveolens*, all growing within a few miles of the same place." I fully agree with the opinions of Mr. Newbould, and can state that in addition to the plants he mentions we also find in other parts of the Avon basin, *Samolus Valerandi*, *Rumex maritimus*, *Scirpus Tabernæmontani*, and *Scirpus maritimus*, and I think that a careful examination of the localities where these occur would also lead to the finding of *Glaux maritima*.—J. E. Bagnall.

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—Geological Section.—August 29th.—Mr. T. H. Waller, exhibited miscroscopical sections of Pre-Cambrian rock from Caldecott, near Nuneaton; Mr. C. A. Matley, a collection of fossiliferous quartzite pebbles, from the drift near Birmingham, some Sand Martin's eggs, with peculiar markings, and a few agates, carnelians, and onyxes, from Buenos Ayres; Mr. C. Mantell, jun., two fossil corals, *Isastræa oblonga* (Oolite,) and *Favosites cervicornis* (Devonian,) both from Torquay; Mr. G. F. Chantrill, of the Liverpool Microscopical Society, a leaf of *Anacharis alsinastrum*, with a curious fungus growth showing some beautiful crystals; also some curious and interesting crystallisation in cast-iron and Portland cement. General Meeting—September 5th.—Mr. W. G. Blatch exhibited *Cryptocephalus coryli* and *C. punctiger*, two rare species of Coleoptera, from Cannock Chase; new to the district. Mr. W. B. Grove exhibited three species of Fungi: *Stigmatea Robertiani*, on green leaves of Herb Robert; *Puccinia fabæ*, on leaves of bean; and *P. compositarum*, on leaves of *Centaurea nigra*. BIOLOGICAL SECTION—September 12th.—Mr. W. B. Grove exhibited *Erysiphe Linkii* (the Mugwort Blight); also *Peziza granulata* and *Ægerita candida*, from Water Orton. Mr. W. G. Blatch exhibited *Dysdera Hombergii*, a spider of the Senoculina group, found near Knowle, and new to the district. Mr. E. Wagstaff exhibited *Eremosphæra viridis*, from Sutton Park.* Mr. Bolton exhibited a piece of seaweed (*Ceratium*), from Llandudno, on which were growing two species of Polyzoa (*Membranipora pilosa* and *Bowerbankia imbricata*), numerous specimens of the fry of mussels (*Mytilus edulis*) were attached, and another mollusc (*Rissoa cingillus*) creeping over it. MICROSCOPICAL GENERAL MEETING—September 19th.—Mr. W. G. Blatch exhibited *Hylecœtus dermestoides*, a rare beetle found at Cannock Chase; new to the district. Mr. W. B. Grove exhibited *Corticium cæruleum* from Pembrokeshire, and *Ascobolus minutissimus*, Boud., a fungus now found for the first time in Britain, at Water Orton. Mr. T. Bolton exhibited *Bulbochæte setigera*. Mr. Blatch also exhibited a fragment from a large felsite boulder at Knowle. GEOLOGICAL SECTION.—September 26th.—The following exhibits were made:—Mr. W. J. Harrison, F.G.S., a copy of the Darwin medal, in bronze, intended for presentation to the family of the late Mr. Charles Darwin; Mr. R. W. Chase, a collection of fossils lately obtained on the Norfolk coast, including typical specimens from the red and white chalk of Hunstanton; part of the antler of *Cervus elaphus* from Thornham, and several large bones and a goat's skull from Beaucaster; Mr. W. H. Wilkinson, *Cornus muscula*, or Austrian cherry; Mr. W. Southall, Slate, bleached superficially through lying in a peat bog; Mr. T. H. Waller, a microscopical section of a boulder from Knowle; Mr. W. J. Harrison, jun., a specimen of *Lingula Lesueurii* in a quartzite pebble from Billesley Lane, near Sparkbrook; Mr. J. E. Bagnall, the following fungi from Middleton:—*Boletus laricinus*, *B. scaber*, *Clitocybe pithyophilus*, *Agaricus muscarius*, and *Cortinarius cinnamomeus*; Mr. W. B. Grove, B.A., the following fungi:—*Agaricus vaginatus*, *A. squarrosus*, *Hygrophorus virgineus*, *H. ceraceus*, *Fistulina hepatica*, and *Dædalea quercina*.

BIRMINGHAM AND MIDLAND INSTITUTE SCIENTIFIC SOCIETY.—September 6.—The Tenth Annual Meeting was held—Mr. C. B. Caswell in the Chair. The annual report stated that the present number of members was 180. Thirteen papers had been read, with an average attendance of 50·7 members. The total number of books issued during the year was 1145, and £2 16s. 3d. had been received in fines. During the session 52 volumes had been added to the library. During the past summer a section (now numbering 30 members) had been formed for the practical study of photography, one night per month being devoted to the section. The balance sheet showed a balance in hands of Treasurer of £5 3s. 5½d. The report having been received and adopted, it was ordered to be printed for distribution among the members. Votes of thanks having been passed to the Officers and Committee for their services, also to the Council for granting the use of a room for the Society's meetings, the following members were elected officers for the ensuing year:—Mr. C. R. Robinson, president; Mr. E. Evans, vice-president; Mr. C. J. Watson, treasurer; Mr. W. J. Morley, librarian; Mr. G. H. Twigg and Mr. C. J. Woodward, B.Sc., trustees; W. H. Cox, hon. sec. Mr. C. B. Caswell, F.I.C., the retiring President, then delivered an address on "The Value of Literary Culture to the Student of Science." After referring to the progress which has been made in the matter of scientific education throughout the Kingdom, Mr. Caswell said that it was needless to urge its further development before the members of the Institute Scientific Society, who were not only convinced of its importance, but were, perhaps, in danger of coming to regard it as a complete education in itself. He deprecated the light estimation

* This exhibit was omitted in last report.

in which literature, and especially poetry, was held by some students of science, and pointed out that although some of the early poets ignored, or even ridiculed, scientific teaching, it was gratefully accepted by modern poets, and actually used to illustrate and enforce their ideas. Mr. Caswell maintained that instead of being useless lumber to the man of science, literature is of great value to him in several ways. First, careful study of the best writers in our language is the only means of attaining the ease, clearness, and grace of expression, without which the communication of scientific knowledge will be laborious and unsuccessful. The lectures and addresses of Professors Huxley and Tyndall were pointed out as brilliant examples of the union of profound scientific knowledge with broad literary culture. The power of literature to liberate the mental faculties from the damaging influence of close attention to details was next referred to, and then its extreme value as an instrument for the cultivation of the imagination, without which it is difficult to realise the facts of science, and impossible to conduct the higher kinds of research. Finally, Mr. Caswell urged the importance of literature as a revealer of the moral and spiritual nature of man, as a teacher of the duties of domestic and political life, and as a corrective to the materialism of modern science. Passages were quoted from the writings of Mr. Tennyson, Mr. Carlyle, and Professor Tyndall reprobating materialism and denying that science can be all in all to men. Mr. Caswell concluded by referring to the inexhaustible pleasures to be derived from literature, and urged all scientific students from time to time to release their minds from the strain of their studies, and surrender themselves to the magical influence of genius, contending that after such recreation they would return to their work with renewed relish and vigour, and with faculties better fitted to bring those studies to a successful issue.—A hearty vote of thanks was passed to Mr. Caswell for his address and services during the year.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—July 3rd. —H. Insley showed upper jaw and tongue of *Helix nemoralis* and longitudinal section of Beech root; Mr. Chaplin, section of human jaw; Mr. Searle, *Achatina acicula*, English and African. Paper by Mr. Delicate on "The Atmosphere." July 10th.—J. W. Neville, showed jaws of Dragon-fly (*Agrion*); Mr. Baxter, *Cristatella mucedo;* Mr. Darley, pair of Wood Tigers, Sutton Park; Mr. H. Insley, frond of Neuropteris, which had become bipinnate in the lower pinnules; Mr. Beteridge, pair of Wood Wrens, reared by hand (living). July 17th.—Mr. Poland showed *Helix sericea*, *H. concinna*, and *Zonites glaber*. A paper was read by Mr. J. W. Neville, ou "Our Common Diatoms," which was well illustrated, and deposited in the library. *Campylodiscus*, from Black-root pool, Sutton Park, and *Coscinodiscus* (fossil form) were shown. July 24th.—Mr. Cook showed Privet Hawk Moth; Mr. Darley, a collection of insects caught during the year (moths and butterflies); Mr. Moore, larva of great Dragon-fly, and gizzard of the same under microscope, showing remains of creatures fed upon; Mr. Madison, *Helix obvoluta*, Hampshire; Mr. Darley, pair of Kestrel Hawks (young). July 29th.—Excursion to Salford Priors. July 31st.—Messrs. Deakin and Clark exhibited various land shells; Mr. Boland, abnormal form of *Anodonta cygnea*, which had formed each valve in a two lobed manner; Mr. J. Wykes, *Floscularia ornata;* Mr. H. Insley, fossil Limnæa, Isle of Wight. August 7th.—No meeting. August 14th.—Mr. H. Insley showed shark's teeth from Eocene seas, also spinal vertebræ of Icthyosaurus; Mr. Bradbury, Æcidium on Coltsfoot leaf. Mr. Delicate reported having cooked and eaten *Anodonta anatina*, and found them good food. SPECIAL GEOLOGY—August 21st.—Mr. Moore showed sections of mountain limestone, corals, and shells from Headon beds; Mr. Midgeley, Icthyolites from the coalfields, Manchester; Mr. J. W. Neville, section of flint showing Xanthidia; Mr. Grew, organic traces in fire coal; Mr. H. Insley, a collection of various ores and their accompanying rocks; Mr. Madison, oolitic fossil wood, Echinus (Lias), and Oyster (Greensand). August 28th.—Mr. Boland exhibited Echinus and shell of Pinna, from Tenby; Mr. H. Insley, Pecopteris from the coalfield, Bilston. Paper on "The Sun," by Mr. J. Grew.

REPORT ON THE PENNATULIDA

COLLECTED IN THE OBAN DREDGING EXCURSION OF THE BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY, JULY, 1881.

BY A. MILNES MARSHALL, M.A., D.SC., PROFESSOR OF ZOOLOGY IN OWENS COLLEGE, AND W. P. MARSHALL, M.I.C.E.

(Continued from page 227.)

PART III.—VIRGULARIA MIRABILIS. Lamarck.—(*Continued*).

3.—*The Polypes and Zooids.*—

The general arrangement of the leaves is shown in Fig. 1; and the leaves, together with the polypes of which they are formed, in Figs. 3, 4, and 5. In the Oban specimens each leaf is formed by the fusion of seven to eight polypes, placed side by side, the number being constant in all the leaves of any one specimen, but varying in different specimens. The leaves are arranged strictly in pairs at the two ends of the rachis, but about its middle often show slight irregularities, and may even alternate with one another for some little distance.

At the bottom of the rachis there is no trace of leaves or polypes, but about an eighth of an inch higher up the leaves begin to appear as small transverse ridges: they are at first very close together, and the component polypes very small; but passing upwards the polypes gradually get larger and the leaves wider apart. Having reached their maximum size and distance from one another, the leaves preserve these for some distance, and then, towards the top of the rachis, begin gradually to get smaller and closer together.

In the Glasgow specimen, which has the rachis perfect at both top and bottom, we have been able to measure accurately the number of leaves in each inch length of the rachis. In the following table these numbers are shown, as well as the " pitch " of the leaves at different parts of the length. By " pitch " we mean the number of pairs of leaves per inch length of rachis; *e.g.*, if in a given inch there are nine pairs of leaves, then the " pitch " at that part of the rachis is 9; or again, if in a given quarter of an inch there are four pairs of leaves, this is at the rate of sixteen pairs in an inch, which is expressed by saying that the " pitch " at this part is 16.

The total length of the rachis in the Glasgow specimen is 9 inches, and the pitch at different parts is as follows, commencing at the upper end :—

First	inch—first $\frac{1}{8}$ inch ..	9	pairs of leaves ; *i.e.*, pitch	72
	second $\frac{1}{8}$,, ..	6	,, ,, ,, ,,	48
	second $\frac{1}{4}$,, ..	4	,, ,, ,, ,,	16
	second $\frac{1}{2}$,, ..	7	,, ,, ,, ,,	14
Second	,, ...	9	,, ,, ,, ,,	9
Third	,, ...	8	,, ,, ,, ,,	8
Fourth	,, ...	$7\frac{1}{2}$	,, ,, ,, ,,	$7\frac{1}{2}$
Fifth	,, ...	$7\frac{1}{2}$	,, ,, ,, ,,	$7\frac{1}{2}$
Sixth	,, ...	8	,, ,, ,, ,,	8
Seventh	,, ...	11	,, ,, ,, ,,	11
Eighth	,, ...	18	,, ,, ,, ,,	18
Ninth	,, —first $\frac{1}{2}$ inch ..	12	,, ,, ,, ,,	24
	third $\frac{1}{4}$,, ..	17	,, ,, ,, ,,	68

Lower than this the leaves could not be accurately counted without putting the specimen under the microscope, which we had no opportunity of doing. In Fig. 1, which is drawn from the Glasgow specimen, the numbers along the left-hand side of the figure indicate the pitch at the points opposite which they are placed ; the number 48, for instance, near the top of the figure, indicating that the pitch at this point is 48—*i.e.*, that at this point the leaves are at the rate of 48 to the inch.

In the Oban specimens the tops are wanting, but the lower ends of the rachis are, in four out of the seven specimens, perfect ; and in these we have measured the pitch at different points, in order to compare with the Glasgow specimen. In one specimen which we select as apparently a fairly typical one, the total length of rachis is, as in the Glasgow example, nine inches ; but as the top has gone, the specimen when entire must have been considerably longer. The measurements of this specimen are as follows, commencing at the upper (truncated) end :—

First	inch	6	pairs of leaves ; *i.e.*, pitch	6
Second	,, ...	6	,, ,, ,, ,,	6
Third	,, ...	6	,, ,, ,, ,,	6
Fourth	,, ...	7	,, ,, ,, ,,	7
Fifth	,, ...	9	,, ,, ,, ,,	9
Sixth	,, ...	12	,, ,, ,, ,,	12
Seventh	,, ...	15	,, ,, ,, ,,	15
Eighth	,, ...	23	,, ,, ,, ,,	23
Ninth	,, —first $\frac{1}{2}$ inch ..	16	,, ,, ,, ,,	32
	third $\frac{1}{4}$,, ..	12	,, ,, ,, ,,	48

A comparison of this with the other Oban specimens has led us to a few general results of some interest. In the first place, we find that in no one of the specimens is the pitch at any part less than 6 ; *i.e.*, in no part are there less than six pairs of leaves in an inch length of rachis. We have already seen that the largest of the leaves are those which are furthest apart, so that it would appear that, so far as the Oban specimens are concerned, the limits of growth of the leaves are reached when these have attained a distance from one another of $\frac{1}{6}$ in.

In the table given above it will be seen that when this point has been reached growth stops, and in the upper three inches the pitch remains constant at the number 6; and the same thing applies to the other specimens as well. Secondly, in five out of the seven specimens the pitch at the upper end is 6, while in the remaining two specimens it is 8. If, as we have tried to show above, this number 6 is the limit, and is only reached in those parts which have attained their full growth; *i.e.*, in the parts at or about the middle of the entire colony (*cf.* Fig. 1), then these facts would seem to show that the tops are usually bitten off somewhere about, perhaps slightly above, the middle; *i.e.*, that in the Oban specimens at any rate, the rachis, if complete, would be something like double its actual length. Concerning the growth of the leaves it is clear that, as in *Pennatula*, the seat of development of the leaves is at the lower end of the rachis.

Although the leaves get smaller and closer together towards both upper and lower ends of the rachis, yet there is a great difference between the two cases. At the upper end, just as in *Pennatula*, though the leaves get smaller, the polypes remain fully formed—a point we have been able to confirm by an examination of the specimens taken by Mr. Darbishire from the haddock's stomach. At the lower end of the rachis on the other hand, not only do the leaves get smaller, but their component polypes get more and more imperfect, and at last (Fig. 6, *dr*) become reduced to mere pit-like depressions of the surface.

We conclude, therefore, that the topmost leaves are the oldest, the lowermost the youngest: that the seat of development of the leaves is the lower end of the rachis; and that each actual leaf took its rise at this point, and gradually travelled upwards as new leaves were developed in succession below it; that the colony grows along its entire length, but that the limit of growth is reached, as already explained, when the distance between successive leaves amounts to $\frac{1}{6}$ inch; that this limit is never reached by the oldest or uppermost leaves, which remain permanently small and close together, but that as the colony gets older and older the pitch finally attained by the leaves get larger and larger, until its final limit is reached.

It follows from this that all the part of a *Virgularia* above the point at which this final pitch is first attained has ceased to grow: and the part below it is still growing, but will cease to do so as soon as this limit is reached.

It will be seen that in many respects this mode of growth agrees closely with that we have described in *Pennatula*. In both cases the point of origin of new leaves is the bottom of the rachis, and in both we have the same arrest of development after reaching a certain limit.

In *Virgularia*, however, the successive leaves tend to separate from one another to a far greater extent than they do in *Pennatula*, while in the latter the lateral growth of the individual leaves is very much greater than in *Virgularia*. Another point of difference lies in the fact that while in *Pennatula* the several polypes of a leaf are developed successively, in *Virgularia* they appear simultaneously, the youngest leaves having the same number of polypes as the oldest or most mature ones.

Concerning the calcified stem it is clear that it also must grow so as to keep pace with the whole colony. From its extremely dense structure and the very large proportion of inorganic matter it contains, it seems very improbable that it can grow interstitially along its whole length; indeed, it appears almost certain that growth only occurs by the addition of new matter, either at the ends or on the outside of that which is already formed. If it be also true, as noticed previously, that the top of the stem normally projects bare for a short distance above the top of the rachis, then it is clear that the stem can only grow in length by addition to its lower end *i.e.*, that it is continually being pushed up, as it were, through the rachis from below, and that the growth of the stem in length, though not in thickness, is independent of that of the rachis. Increase in thickness is effected by the deposition of successive laminæ one outside another by the soft tissues of the rachis and stalk in contact with the stem.

Though the several polypes of each leaf come into existence simultaneously, and in the smallest leaves the number of polypes is the same as that in the most fully developed ones, yet we find that from the time of their very first appearance there is a gradual increase of size as we pass from the most dorsal polype of a leaf towards the most ventral one. This is shown clearly for the fully developed leaf in Fig. 5, and for the early stages of development in Fig. 6.

This difference in size between the dorsal and ventral polypes of a leaf might be explained, so far as the adult leaves are concerned, by the greater freedom and range of action, and consequent greater chances of obtaining food possessed by the ventral as contrasted with the dorsal polypes; but this explanation would hardly account for the difference in size being so marked in the very earliest stages of their development. We are disposed to think that the true explanation is that in the ancestral forms either of *Virgularia* itself, or that from which *Virgularia* was derived, the several polypes were, as in *Funiculina* and *Pennatula* at the present day, developed not simultaneously but successively one above another, the ventral ones first; and that though *Virgularia* has lost this primitive character, and has acquired the habit of developing all the polypes of a leaf simultaneously, it has still retained indications of its ancestral habits in the greater size of the ventral polypes, even in their earliest stages. It is just possible that more careful examination than we have had the opportunity of making would show that the ventral polypes actually appear slightly before the dorsal ones, which would completely prove our case. We shall find further on additional evidence that *Virgularia* is less primitive than either of the two other allied genera, *Funiculina* or *Pennatula*.

The dorsal polypes of each pair of leaves are (as shown in Figs. 3 and 5) separated from one another by a very short interval at their bases, while the most ventral polypes (Figs. 4 and 5) are separated by the whole width of the ventral surface of the rachis. In this respect *Virgularia* agrees with both the other genera.

The Zooids in *Virgularia* are exceedingly rudimentary; more so even than in *Pennatula*. They form small pit-like depressions on the sides of the rachis, placed in somewhat oblique rows at the bases of the leaves (Fig. 5 *e*).

4.—*Anatomy of the Polypes.*—

The polypes of *Virgularia* as might be expected are essentially similar to those of *Funiculina* or *Pennatula;* resembling, owing to their fusion into leaves, those of the latter rather more closely than the former genus.

The structure of the adult polypes is shown in Figs. 5 and 7, the former figure representing the seven polypes composing a leaf in their natural relation to one another and to the rachis; while the latter figure represents transverse sections of three polypes taken at different parts of their length, the upper section passing through the stomach and the base of the tentacles; the middle section through the mesenterial filaments immediately below the stomach; and the bottom section passing through the lower part of the body cavity, not far from the rachis.

Taking the component parts of the polypes in the same order as in the other two genera, we have to deal first with

a. The Body-wall: consisting of a firm gelatinous mesoderm (Fig. 7, *x*) covered on its outer surface by the ectoderm, *w;* and on its inner by the endoderm, *y*. Ectoderm and endoderm each consist of a single layer of epithelial cells, while the mesoderm is traversed by branching nucleated cells, and also by fine tubular channels, in connection with those of the rachis.

This mesoderm is tough, and has considerable powers of resistance to re-agents; it gives their definite shape to the polypes; and in specimens of *Virgularia* taken from a haddock's stomach at Scarborough in a partially digested condition, the mesoderm alone had escaped, ectoderm, endoderm, and all the internal organs being in most cases dissolved out completely.

At their lower ends the polype cavities (Fig. 5) are, as in *Pennatula*, separated by only very thin partitions from the main dorsal and lateral canals of the rachis; while the curious system of radial canals, (Fig. 5, *vc*) as already noticed, communicates with the body cavity of the most ventral polype of the leaf.

We have not noticed any perforations in the walls separating the several polypes of a leaf from one another, such as are described and figured by Kölliker as occurring in *Halisceptrum* and other genera.

The body-walls of *Virgularia*, as already noticed, contain no spicules; differing in this respect most markedly from those of *Pennatula*.

b. The Calyx.—This forms (Fig. 5, *g*), a wall surrounding the tentacles when these are either partially or wholly retracted. It differs from the calyx both of *Funiculina* and *Pennatula* in several respects. It has no strengthening spicules, and it is not produced at its margin into pointed processes, alternating with the tentacles, as is the case in the other two genera. The most important point of difference, however, lies in the fact that while in *Funiculina* and *Pennatula* the calyx is a permanent fold of the body-wall, in *Virgularia* it is only a temporary one and disappears altogether when the tentacles are fully expanded. This will become clear at once from an examination of Fig. 5, in which the several polypes of the leaf are drawn in different stages of expansion or contraction. Thus the second and seventh polypes, numbering them in order from the dorsal to the ventral surface, are shown almost completely retracted, and in these the calyx forms a deep fold of the body-wall surrounding the whole length of the tentacles. In the third and fifth polypes the tentacles have commenced to protrude, and it will be seen that as they rise up the calyx wall unfolds with them. In the sixth polype the tentacles are almost fully expanded, and the calyx is now reduced to a very low wall surrounding their bases. The fourth polype is drawn in a fully expanded condition, and it will be seen that the calyx (Fig. 5, *g*), is completely unfolded, and has in fact ceased to exist; its position being indicated only by a slight wrinkling of the body-wall at the base of the tentacles, and even this disappearing in extreme protrusion of the tentacles.

If this figure be compared with those already given of *Funiculina* (Plate II., Fig. 10) and *Pennatula* (Plate III., Fig. 4), it will be seen that the calyx is formed in exactly the same way in all three cases, by an infolding or inversion of the upper end of the body-wall; and that the difference, which is clearly connected with the existence or non-existence of spicules in the calyx, lies in the fact that in *Virgularia* this calyx-fold is completely everted and straightened out when the tentacles are fully expanded, while in the other two genera it is only partially so, the fold being to a certain extent permanent, the calyx still persisting even when the tentacles are protruded to their utmost extent.

c. The Tentacles (Fig. 5) are very similar to those of the other two genera. They form a whorl of eight hollow processes arranged round the mouth, each bearing along its inner edge a double row of pinnules. Each tentacle consists of an outer layer of ectoderm cells continuous with those of the body-wall, a middle layer of mesoderm cells, consisting chiefly of muscular fibres arranged in an outer longitudinal and an inner circular layer, and an inner lining of endoderm cells continuous, as is seen in the fourth polype of Fig. 5, with the endoderm lining the body-cavity of the polype.

Our specimens of *Virgularia* are in rather worse histological condition than those of either *Funiculina* or *Pennatula*, and we have been unable to determine with certainty whether thread-cells, the special defensive and offensive weapons of *Cœlenterata*, are present or absent. The point is one of some importance; for should they prove to be absent we might find in this the explanation of *Virgularia* being habitually devoured as food, while *Funiculina* and *Pennatula* are allowed to go unharmed.

This explanation is of course a purely hypothetical one, resting merely on our inability to find thread-cells in imperfectly preserved specimens. We have thought it worth while to record it, however, as it is one which the Society may have an opportunity at some future time of testing directly, and also because we know of certain other facts which seem to make it not altogether improbable. Thus we know from the observations of Kölliker, Koren and Danielssen, and others, that the truncation of the upper end occurs normally in certain species of *Virgularia*, but not in others; *i.e.*, according to our theory, that certain species of *Virgularia* are habitually eaten as food by fish or other marine animals, while other species escape. We know also from an observation of Rumph made more than a century ago, that some species of *Virgularia* possess a very remarkable power of stinging, due evidently to the possession of thread-cells, while in other species this stinging power is not perceptible, at any rate to ourselves.

Rumph's observations are so important that we shall quote them here. His specimens of *Virgularia*, of a species which has been since named by Kölliker, in honour of its discoverer, *Virgularia Rumphii*, were obtained at Amboyna, a small island in the Malay Archipelago, east of Celebes. Concerning them, he says:*—" If one handles them incautiously one experiences a burning sensation, and the hand becomes red; then ensues a violent itching, followed by the appearance of pustules, as if one had been stung by nettles, lasting for three days." Concerning another species, *Virgularia juncea*, Rumph remarks that he has not noticed that it causes any distinct burning or itching in the hand, although he had pulled them up by hundreds. Neither does Darwin, in his account of the South American *Virgularia*, say anything concerning it possessing a power of stinging, which he could hardly have failed to notice had it been actually present. We know also that both of these latter species are habitually truncated, so that there seems sufficient evidence to warrant our making the suggestion that *Virgularia mirabilis* may be devoured because it possesses no thread-cells, while *Funiculina* escapes because it is richly armed with these defensive weapons.

d. The Stomach.—The mouth, as shown in Fig. 5, *m*, is situated on the apex of a small papilla that rises up in the middle of the circle of tentacles, the outer wall of the papilla being continuous with the bases of the tentacles and the inner with the wall of the stomach. The mouth is a transverse slit (Fig. 7), whose long axis is at right angles to the flat surface of the leaf. The varying position of the mouth in different conditions of protrusion or retraction of the polype is well shown in the several polypes of Fig. 5. When the tentacles are completely retracted, as in the second and seventh polypes, the mouth

* Rumph: "T' Amboin 'sche Rariteitkamer," p. 43, Amsterdam, 1741. We have been unable to refer directly to this work, and take our account from a quotation in Kölliker's "Alcyonarien," p. 201.

is some considerable distance below the margin of the calyx, while in the fully expanded fourth polype the mouth is seen to be some distance above the calyx margin.

The mouth leads by a narrow œsophageal passage into the thick-walled stomach (*n*), which is thrown into folds closely similar to those of *Funiculina* or *Pennatula*. The concertina-like action of these folds as the polype is expanded or retracted is well shown in Fig. 5; in the retracted polype the folds of the stomach are closely pressed together, and the whole stomach is very short: when, on the other hand, the polype is protruded, the folds of the stomach-wall are pulled out, and the whole organ becomes at least double its previous length.

As in the other two genera the stomach-wall consists of a thick inner lining of ectoderm cells, a thin mesodermal layer, and a fairly thick outer coat of endoderm cells continuous with those lining the body-cavity.

e. The Mesenteries, like those of *Funiculina* and *Pennatula*, are eight vertical partitions or septa, uniting the body-walls and stomach together, and extending below the latter down to the bottom of the polype-cavity.

Round the stomach the mesenteries are arranged at nearly equal intervals, two being attached to the upper surface of the leaf, two to the lower, and two to each of the partition walls separating the polype from its neighbours on either side. Below the stomach the arrangement becomes asymmetrical, in the manner already described as occurring in *Pennatula*; *i.e.*, the two mesenteries attached to the upper surface of the leaf retain their position, or even move slightly away from one another, while the lateral ones shift downwards towards the lower surface. This change of position is well shown in the two lower sections of Fig. 7, which show also that while the upper two mesenteries remain of some width the whole way down the polype, the other six become very soon reduced to mere ridges.

The arrangement of the muscles in the mesenteries is the same as in the other two genera. The strong retractor muscles (*p*), by which the polype and tentacles are withdrawn into the calyx and the folds of the stomach approximated to one another, are shown in the several polypes of Fig. 5.

f. The Mesenterial Filaments.—Here again the arrangement is closely similar to that of *Funiculina* or *Pennatula*; as in these genera, there are in each polype six *short mesenterial filaments* (Figs. 5 and 7 *r*), which are thickenings on the edges of the lateral and under pairs of mesenteries, and which, commencing at the lower end of the stomach, only extend a short way down the polype cavity; and two *long mesenterial filaments*, formed on the edges of the upper pair of mesenteries (Figs. 5 and 7 *s*), and extending down quite to the bottom of the polype cavity. All the mesenterial filaments are much convoluted, and the two long ones are much thicker than in either of the other two genera.

We have obtained evidence concerning the digestive function of these mesenterial filaments of a precisely similar nature to that already brought forward in the case of *Pennatula ; i.e.*, we have found foreign bodies, such as diatoms (Fig. 7, *fo*), imbedded in the filaments, and clearly undergoing digestion. As these bodies become completely enveloped in and by the filaments, it is clear that these latter must have the power of changing their shape and spreading round any body that may come in contact with them, a power that is probably due to amœboid movements of the individual cells of the filaments.

We described in *Pennatula* the presence of an Entomostracon, apparently a parasitic Copepod in the body-cavity of one of the polypes; and we noticed also that ripe ova had been discharged from the Entomostracon and were lying in various parts of the polype, some freely and some imbedded in the mesenterial filaments; also, that many of these ova had commenced to develop.

We have found ova precisely similar to these present in large numbers in the polypes of *Virgularia* (Fig. 7, *ov*), and although we have not found the Entomostracon itself, we have no doubt, from the identical character of the eggs in the two cases, that those found in *Virgularia* belong to the same animal as those found in *Pennatula*, or to some very closely allied one.

We have also found, what we were not aware of when writing our account of *Pennatula*, that Entomostraca very closely similar to this one have already been found in corresponding situations in allied animals.

In 1859 Bruzelius* described under the name of *Lamippe rubra* a parasitic crustacean which he found inhabiting specimens of *Pennatula rubra* taken off the west coast of Sweden. Not long afterwards Claparède† found at Naples an allied form, which he called *Lamippe proteus*, dwelling parasitically in specimens of *Lobularia (Alcyonium) digitata*, and wrote a careful account with figures of both the male and female.

Quite recently M. Joliet‡ has described and figured a third species of this genus obtained from *Paralcyonium elegans*, and which he names *Lamippe Duthiersii*. He notices, like Claparède, that the sexes are distinct, and lays stress on the remarkable changes of shape which the body undergoes, and which led Claparède to name his species *L. proteus*. When at rest the animal is a somewhat cylindrical sac, about 0·04 inch in length, with two pairs of jointed antennæ at its anterior end in front of the mouth; two small pairs of legs a short way behind the mouth; a caudal-fork armed with setæ; and a straight alimentary canal with a distinct anus.

The Entomostracon we found, as described, in *Pennatula* clearly belongs to the same genus. Unfortunately we have as yet come across only a single specimen, and as that one is in a series of transverse

* Bruzelius: "Ueber einen in der *Pennatula rubra* lebenden Schmarotzer." (Archiv. f. Naturgesch, 1859, bd. i., p. 286.)

† Claparède: "Miscellanées Zoologiques," "Annales des Science Naturelles," "Cinquieme Série," tome viii., 1867, p. 23 *seq.*

‡ Lucien Joliet: "Observations sur quelques Crustacés de la Mediterranée," "Archives de Zoologie experimentale" tome x., 1882, p. 101 *seq.*

sections it is impossible to make out all its characters. It, however, does not agree with either of the species already described, and is probably an additional species of this curious genus, and one which we name provisionally *Lamippe Pennatulæ.*

Concerning the relations of *Lamippe* to the polype it inhabits, we were in doubt when describing *Pennatula* whether to regard it as a parasite or as an animal swallowed as food: it would appear now, from the additional evidence that has since come into our hands, that it is a true parasite. We have already mentioned that the eggs develop up to a certain stage within the polype, and Joliet has shown that they hatch in this situation and then escape as free swimming *Nauplii.* We have found numerous empty egg-shells, but have seen no free *Nauplii.*

(*To be continued.*)

FUNGI OF THE NEIGHBOURHOOD OF BIRMINGHAM.

FIRST LIST, 1881-82.

(*Continued from page 235.*)

AGARICINI (*continued*).

Ag. (Trich.) cuneifolius, Fr. Sutton. Oct.
Ag. (Trich.) grammopodius, Bull. Sutton. Oct.
Ag. (Trich.) brevipes, Bull. Sutton. Oct.
Ag. (Trich.) humilis, Fr. Edgbaston, *C. R. Robinson;* Sutton, on soil wet with dripping water. Oct.
Ag. (Clitoc.) cerussatus, Fr. Sutton. Sept., Oct.
Ag. (Clitoc.) flaccidus, Sow. (*not* Fries.) Sutton. Oct.
Ag. (Coll.) radicatus, Relh. Quinton. Sept., Oct.
Ag. (Myc.) filopes, Bull. Sutton. Oct.
Ag. (Plut.) nanus, Pers. Great Barr, on an old oak gate-post. Oct.
Ag. (Crepidotus) mollis, Schäff. Sutton. Oct.
Ag. (Nauc.) melinoides, Fr. Sutton. Oct.
Ag. (Hyph.) epixanthus, Fr. Sutton. Oct.
Ag. (Hyph.) velutinus, Pers. Sparkhill. Oct.
Ag. (Pan.) campanulatus, L. Great Barr. Oct.
Coprinus niveus, Fr. Great Barr, on horse dung. Oct.
C. radiatus, Fr. Water Orton, on cow dung. Sept., Oct.
Bolbitius fragilis, Fr. Great Barr. Oct.
Lactarius glyciosmus, Fr. Sutton. Distinguished by its pleasant scent. Sept., Oct.
Panus stypticus, Fr. Great Barr. Oct.

POLYPOREI.

Boletus luteus, L. Sutton Park. Sept.
B. badius, Fr. Sutton Park, (*fide* M. C. Cooke.) Sept., Oct.
B. chrysenteron, Fr. Sutton Park, common. Sept., Oct.
Polyporus squamosus, Fr. Barnt Green; Sutton. July, Aug.
Young specimens of this, well cooked, are not be despised, as I can testify from actual trial. But everything depends upon the way in which they are cooked.

P. sulphureus, Fr. Perry Barr; Driffold Lane, Sutton, on logs (magnificent specimens). June—Sept.
P. rutilans, Fr. Water Orton, on a felled willow. June—Sept.
P. fumosus, Fr. Edgbaston, *C. R. Robinson*. This species was remarkable, when fresh, for an odour exactly like strong ketchup; the pores were obsolete near the edge, forming a broad white margin underneath, exactly as in the allied species, *P. adustus*, from which it is, however, quite distinct.
P. adustus, Fr. Sutton Park, on stumps. Sept.
P. spumeus, Fr. Edgbaston, *C. R. Robinson*. The specimen was attacked by *Hypomyces rosellus*.
P. betulinus, Fr. Harborne, on a dead tree. Aug.
P. igniarius, Fr. Barston, within a dead willow. Aug.
P. annosus, Fr. Driffold Lane, Sutton. May.
P. versicolor, Fr. Abundant everywhere. Autumn.
P. medulla-panis, Fr. On bark. Sutton. Oct.
P. sanguinolentus, Fr. Driffold Lane, Sutton, on rotton wood and soil; Great Barr. Sept., Oct.
P. molluscus, Fr. Driffold Lane, Sutton. Rare. May.
P. vaporarius, Fr. Sutton Park; Solihull, etc. Common. Aug.—Oct.
Trametes gibbosa, Fr. On dead trunks, Sutton. Aug., Sept.
Merulius lacrymans, Fr. Common in a barren state. In good fruit, Birmingham, *S. Wilkins*. Driffold Lane, Sutton. Aug., Sept.,
Fistulina hepatica, Fr. On old oaks, Sutton Park, and Four Oaks Park. Sept.
This delicious fungus I have also eaten.

HYDNEI.

Hydnum udum, Fr. On a standing birch, causing the bark to fall off, Quinton. Sept., Oct.
H. niveum, Pers. Bromsgrove; Sutton. Aug., Sept.
H. farinaceum, Pers. Sutton. April.
Irpex obliquus, Fr. Sutton. March.

AURICULARINI.

Thelephora laciniata, P. Sutton Park, creeping over stones, sticks, bushes, etc., Lower Nut Hurst. Sept., Oct.
Stereum purpureum, Fr. Driffold Lane, Sutton. Sept.—Nov.
S. hirsutum, Fr. On stumps, etc. Common everywhere. Sept.—Nov.
S. sanguinolentum, Fr. On logs, Sutton Park. Sept.
S. rugosum, Fr. Driffold Lane, Sutton. Sept.
Corticium læve, Fr. On sticks, everywhere. Aug.—Oct.
C. quercinum, P. Sutton; Sutton Park; Solihull; Olton; Quinton. On birch and other trees. Sept., Oct.
C. cinereum, Fr. Oscott; Sutton. Sept., Oct.
C. incarnatum, Fr. Sutton Park. Sept.
Cypella capula, Fr. Alvechurch; Sutton Park. May—Oct.
Solenia anomala, P. (not *ochracea*). Driffold Lane, Sutton, on planks. May—Oct.

CLAVARIEI.

Clavaria inequalis, Müll. Sutton Park. Oct.
C. vermiculata, Scop. Quinton, in a meadow. Oct.
Calocera cornea, Fr. Driffold Lane, Sutton; Rotten Park Reservoir, Edgbaston. July, Aug.
Typhula Grevillei, Fr. Harborne, on dead leaves. Dec.

TREMELLINI.

Tremella foliacea, P. On logs, Sutton Park. Sept., Oct.
T. albida, Hud. Sutton; Sutton Park. Sept.—Nov.

T. tubercularia, Berk.	Sutton Park.	Sept.
T. torta, Willd.	On an old oak gate-post, Great Barr.	Oct.
Dacrymyces deliquescens, Dub.	Driffold Lane, Sutton.	Sept.
D. stillatus, Nees.	On rails and stumps, abundant.	Aug., Sept.

W B. GROVE, B.A.

(To be continued.)

FLOSCULARIA REGALIS.

BY C. T. HUDSON, M.A., LL.D., F.R.M.S.

This remarkable new floscule was sent to me a few days ago by Mr. Thomas Bolton, who found it on some Myriophyllum in a pond near Birmingham.

The same weed bore specimens of *F. campanulata*, *F. ambigua* (which is also one of Mr. Bolton's discoveries), *F. coronetta* and *F. ornata*. The new rotifer has a nearly circular cup-shaped disc, the edge of which bears six slightly recurved processes ending in knobs covered with long radiating setæ. The processes taper from their bases up to the knobs, and are set at regular distances round the cup, giving the rim quite a hexagonal appearance.

The two processes which are nearest to the dorsal surface are shorter than the others, and between them rises a triangular lobe longer than any of the processes, and also crowned with a setæ-bearing knob. The disc is thus a kind of cross between that of *F. coronetta* and *F. ornata*, only with this hitherto unique distinction, viz., that there are *seven* processes issuing from it.

All the previously known floscules have either five or three such processes, and there is only one known species that has the latter number—Mr. Hood's *F. trifolium.* Ehrenberg's six-lobed *F. proboscidea* is no doubt the five-lobed *F. campanulata.*

F. regalis (for so it is proposed to name it) is not one of the larger species. The majority of those I have seen were about $\frac{1}{60}$th of an inch, and the largest was $\frac{1}{50}$th. The smaller, and probably younger, ones were unusually transparent for floscules. The two eyes were readily found on the dorsal side, both by direct and by dark ground illumination. I was surprised also to find how easy it was to see the semicircle of small cilia which lies at the bottom of the cup on the ventral side. In the majority of the other species these are extremely difficult to make out. On the other hand, the tube of the new floscule was in every instance almost invisible. I could just make out its existence, but that was all. No great stress ought, however, to be laid on this, as the tubes of all species vary very much according to their habitat.

I will only add to this brief description that the floscule, when fully expanded, usually extends outwards all the six linear processes, but curves inward the seventh triangular one over the cup-shaped disc, and uses both it and its setæ to prevent the escape of its prey.

Sept. 24th, 1882.

THE FLORA OF WARWICKSHIRE.

AN ACCOUNT OF THE FLOWERING PLANTS AND FERNS OF THE COUNTY OF WARWICK.

BY JAMES E. BAGNALL.

(Continued from page 208.)

ONAGRACEÆ.

EPILOBIUM.

E. angustifolium, *Linn.* *Wild French Willow, or Rose-Bay.*
Native (?): In woods, copses, and on banks. Rare. July to September.
I. Hedge bank, Balsall Common, *H. B.* Railway banks near Berkswell.
II. Ryton Wood, *Bree, Mag. Nat. Hist.* iii., 164; near Coton House, and near Coventry, *Herb. Per.;* By the side of the L. & N. W. Railway, near Whitley Common, *Kirk. Phyt.* ii., 990; Frankton and Lower Hill Morton, *R. S. R.*, 1868; Fern Hill Wood! *H. B.;* Coppice on the Edge Hills, 1877; Crackley Wood, near Kenilworth, plentiful.
b. brachycarpum.
I. Near Mawkins Hall, Balsall Common, *H. B.;* Sutton Park! *Rev. J. C.*
I do not think that either of these varieties is more than an alien in Warwickshire.

E. hirsutum, *Linn.* *Great Hairy Willow-herb.*
Native: By rivers, streams and ditches. Common. July to September.
More or less frequent throughout the county.

E. parviflorum, *Schreb.* *Small-flowered Hairy Willow-herb.*
Native: In damp woods, by pools, &c. Locally common. July to September, Area general.

E. montanum, *Linn.* *Broad-leaved Willow-herb.*
Native: On banks, by waysides, and in woods. Common. June to August, or later. Area general.
The variety with white flowers is apparently rare; the Rev. J. Gorle records it from Sheldon, and I have seen it in the Dunchurch Road, near Rugby.

E. roseum, *Schreb.* *Small-flowered Smooth Willow-herb.*
Native: By streams, drains, and other damp places. Rather local. July to September.
I. Sheldon, *Rev. J. Gorle*, 1836. Waterwork grounds, Aston; banks of stream near Packwood Church; marshy land, Blythe Bridge, Solihull; drains about Hartshill; marsh near Packington.
Several plants as weeds in my garden, Aston, 1880.
II. Harborough Magna, *Rev. A. B.* Banks of the Avon and Leam, Radford, *Y. and B.* In a ditch near Essenhall, *R. S. R.*, 1872; Honington! *Newb.;* Offchurch; Milverton; Kenilworth; Stoneleigh; Charlcote, *H. B.;* Oversley Mill.

E. tetragonum, *Linn.* *Long-podded Square-stalked Willow-herb.*
Native: In damp woods and marshy places. Rare. July to September.
I. Water-works grounds, Aston.

II. Side of the Avon; marshes about Bidford! *Purt.* i., 91; between Warwick and Hampton-on-the-Hill, *Per. Fl.*, 34; Treddington, near Brailes; Rectory Garden, Shipton, *Newb.;* Milverton; Myton; Harbury, *H. B.;* Snitterfield; Chesterton, *Herb. Per.* Lane near Billesley; Alveston Pastures Wood, September 1880, pointed out by the *Rev. W. W. Newbould.*

E. obscurum, *Schreb. Short-podded Square-stalked Willow-herb.*
Native: By streams, pools, and damp, marshy places. Local. June to September.
I. Atherstone, *Blox.*, *Herb. Bab.;* Sutton Park; New Park, Middleton; Coleshill; Hartshill; Hampton; Meriden; Waterworks ground, Aston; sand quarry above Stonebridge, etc.
II. Wyken, *T. K.*, *Herb. Bab.;* Kenilworth; Beausale; Milverton, *H. B.;* Oversley Wood; Bearley Canal; Canal near Stratford-on-Avon, etc.

E. palustre, *Linn. Narrow-leaved Willow-herb.*
Native: In bogs, marshes, drains, and other wet places. Locally common. July to September.
I. Coleshill Bog! *Purt.* i., 191; Sutton Park; Bannersley Pool; marsh near Packington; near Middleton Hall; Hartshill.
II. Wilmcote, *Cheshire*, *Herb. Per.;* Arbury Park, *Kirk;* Tredington, *F. Townsend;* Fern Hill; Kenilworth; Leek Wootton; Haseler, *H. B.;* Oversley Wood; Stratford-on-Avon Canal; Combe Woods.

ŒNOTHERA.

[*Œ. biennis*, *L.* on the banks of the Arrow, *Purt.* iii., 356; railway bank near Warwick Priory, *H. B.;* Milverton, *H. B.*, *Herb. Bab.;* on the ground of New Waterworks, Coventry, *Kirk. Phyt.* ii., 969; lane near Solihull.]

[*Œ. odorata*, Jacq., near Coleshill, single plant; railway bank near Warwick Priory. Both these species are readily self-set, and cannot be more than strays from cultivation.]

CIRCÆA.

C. lutetiana, *Linn. Common Enchanter's Nightshade.*
Native: In woods and shady lanes. Locally common. July to September.
I. Wood near Escoles Green; Marston Green; Hartshill Hayes; Tile Hill Wood, with white flowers; lanes about Packwood, etc.!
II. Near Frankton Wood *R. S. R.*, 1877; Iddecote Wood, *Rev. J. Gorle*; Salford, *Rev. J. C.;* Alveston Pastures; Honington; Oversley; Combe Woods.

C. alpina, *Linn. Mountain Enchanter's Nightshade.*
Alien: On walls. Very rare. July.
I. Balsall Temple, Springfield, *Rev. W. Bree, jun.*, *Purt.* i., 54; Temple Balsall, *H. B.*, *Herb. Per.*
The specimens in Perry's Herbarium seem to belong to the var. *intermedia.*

HALORAGIACEÆ.

MYRIOPHYLLUM.

M. verticillatum, *Linn. Verticillate Water Milfoil.*
Native: In pools and canals. Very rare. July.
I. Packington; Countess of Aylesford, *Bot. Guide*, 636.
b. pectinatum.
II. Wyken Rumps, *Kirk, Herb. Per.;* Shrewley Pool; Brown's Over *Y. and B.;* Sow Waste Canal.

M. spicatum, *Linn. Spiked Water Milfoil.*
Native: In pools, streams and canals. Rather rare. July.

I. Sutton Park; Coleshill Pool; pool in Berkswell Park; pool in Maxtoke Park.

II. Black Pool between Spernal and Studley Church. In a pool at Sambourne, *Purt*, ii., 459; Napton Hills, *Kirk*, *Herb. Per.;* Chesterton Pool, *Y. and B.;* Compton Verney; Canal, Warwick, *H. B.;* Sow Waste Canal; Canal near Stratford-on-Avon; small pool near Birdingbury Wharf.

M. alterniflorum, *DC.* *Alternate Water Milfoil.*

Native: In rivers, streams, pools, and canals. Local. July.

I. Sutton Park; River Blythe, near Stonebridge; Coleshill Pool; pool near Berkswell Hall.

II. Allesley, *H.B.*, *Herb. Per.;* Compton Verney, *Herb. Per.;* Shrewley Pool; Chesterton Mill Pool, *H. B.*; pool near Farnborough.

HIPPURIS.

H. vulgaris, *Linn.* *Common Mare's Tail.*

Native: In pools. Very rare. June.

I. Tamworth, *Herb. Per.*

II. Compton Verney, *H. B.*, *Herb. Per.;* Chesterton Mill Pool, 1872.

CALLITRICHE.

C. verna, *Linn.* *Vernal Water Starwort.*

Native: In pools and streams. Very rare. May to July.

II. Woodloes, near Warwick? *H. B.* By the bridge at Honington, *Newb.;* pool in Banners Lane, Tile Hill.

This species has been recorded for many Warwickshire stations, but I think incorrectly. During the present year I have visited every locality where it was supposed to occur, but have invariably found the plants to be either *C. obtusangula*, or that form of *C. platycarpa* which most nearly resembles *C. verna*.

C. obtusangula, *Le Gal.* *Obtuse-fruited Water Starwort.*

Native: In pools and streams. Rather rare. May to July.

I. Sutton Park, very abundant in several of the streams; stream near Hampton-in-Arden; stream near Brown's Wood, Solihull.

II. Chesterton Pool! *H. B.* Pool near Farnborough; pool near Chadshunt; pool at Birdingbury.

Hitherto overlooked or labelled *C. verna* by local botanists.

C. stagnalis, *Scop.* *Large-fruited Water Starwort.*

Native: In pools, streams, canals, damp sandy or clayey drives in woods, and on mud. Common. May to July. Area general.

Two forms are common in the county—(1) a small form growing in sandy and clayey damp places in woods, and on mud, and always fruiting abundantly; (2) a larger, more robust form, growing in streams and pools; I can see no constant character by which these two forms may be distinguished.

C. hamulata, *Kutz.* *Hooked Water Starwort.*

Native: In pools and streams. Rare. June.

I. Sutton Park; lane from Water Orton to Minworth

(Var. *pedunculata*. Near Whitacre. 1872.) Near Arley Wood; Shrawberry Wood, Shustoke; Butler's Wood, Maxtoke.

II. Var. *sessilis*. *Bab.* Stagnant waters in Arbury Deer Park, *Kirk.*, *Phyt.* ii., 970; *Herb. Per.* Yarningale Common! Hascler, *H.B.:* pool in Banners Lane, Tile Hill.

The var. *sessilis* appears to be the most frequent form.

CUCURBITACEÆ.

BRYONIA.

B. dioica, *L.* *Red-berried Bryony.*

Native: In hedges and bushy places. Common. June, July. Area general.

GROSSULARIACEÆ.

RIBES.

R. Grossularia, *Linn.* *Gooseberry.*

Denizen : In hedges. Rather rare. April.

I. In a wood near Olton, *W. B. Grove;* Sutton Park; lanes near Marston Green; Water Orton; in a hedge near Hoare Park, Atherstone Road; lane to Windmill, Packwood.

II. Oversley Wood, and in hedges at a distance from any house, *Purt.* ii., 730; on the stump of a willow, by the side of the River Avon, Warwick, *Per. Fl.*, 23; apparently wild, growing on carriage road to Brown's Over, *R. S. R.*, 1877; near Ryton-on-Dunsmore; near Pinley Green.

R. alpinum, *Linn.* *Tasteless Mountain Currant.*

Denizen : In woods. Very rare.

I. In a wood on the south-west side of a pool at Edgbaston, plentiful, *With.*, ed. 7, ii., 334; side of Edgbaston Pool, *Freeman, Phyt.*, i., 261

R. rubrum, *Linn.* *Red Currant.*

Denizen : In woods and on river banks. Rare. May.

I. A single bush in lane out of Wheyporridge Lane, Solihull, probably planted.

II. On the banks of the Avon, near Warwick, *Rev. W. T. Bree, Purt.* iii., 19; side of the River Avon, between Emscote and Warwick, *Per. Fl.*, 22; Coventry Wood, Arbury Hall, *Kirk, Phyt.* ii., 970; in hedges, between Newbold-on-Avon and Harboro' Magna, also in a hedge near the Lime Works near Lawford, *R. S. R.*, 1877; Offchurch, *H. B.;* Old Park and River Avon, near Guy's Cliff, *H. B.;* Salford, *Rev. J. C.*

R. nigrum, *Linn.* *Black Currant.*

Alien: Damp woods, hedges and river banks. Rare. May. "We observed it (*R. nigrum*) in Warwick," *Ray, Syn.* iii., 456.

II. On the banks of the Arrow in the Hamlet of Oversley, *Purt.*, iii., 20; in a boggy spinney, called "The Alders," Arbury Deer Park, *Kirk, Phyt.* ii., 970; banks of the Sherbourne, *T. Kirk, Herb. Brit. Mus.;* Ragley Wood.

CRASSULACEÆ.

SEDUM.

S. Telephium, *Linn.* *Live-long* or *Everlasting Orpine.*

Native: In pastures and woods. Rare. July.

II. Alne Hills, *Purt.* i., 218; woods, Allesley, *Bree, Mag. Nat. Hist.*, iii., 164. Chesterton Wood.

Although quite abundant in Chesterton Wood I have never found it in flower there.

[**S. album,** *Linn.* *White Stonecrop.*

Alien: On walls, roofs, and in quarries in marly and calcareous soils. Rather rare. June.

II. On a wall at the back of Little Park Street, Coventry, *Kirk, Phyt.* ii., 970; Lighthorne, *Y. and B.;* roof at Berkswell, *H. B.;* quarry at Edge Hills, *Dr. Baker;* roof of cottage at Lapworth; walls about Temple Grafton and Binton; Edge Hills.]

Although admitted here this plant has no claim to a place in the flora of this county in my own estimation.

S. acre, *Linn.* *Biting Stonecrop* or *Wall Pepper.*

Native: On walls, roofs, and like places. Local. June.

I. Nuneaton Abbey; Hartshill Priory; walls at Meriden; walls and roofs at Coleshill, &c.

II. Walls at Wixford! *Purt.* i., 218; about Warwick! very common, *Per. Fl.* 41; Salford! *Rev. J. C.;* on walls and roofs about Binton; Temple Grafton.

[*S. sexangulare*, *Linn.* Has been found on walls at Whitacre and Binton, but in both instances planted.]

S. reflexum, *Linn.* *Yellow Stonecrop.*

Denizen: On walls, roofs, ruins, &c. Local. July, August.

I. Old walls, Nuneaton Abbey; Hartshill Priory.

II. On a wall at Salford! Alcester! &c., *Purt.* i., 218; walls about Warwick! Bidford! &c., *Per. Fl.*, 41; Kenilworth! *H. B.;* old walls at Bilton, Clifton, Hill Morton, *R. S. R.*, 1877; old walls at Treddington! Iddicote, *Newb.;* Oversley Mill; banks near Wootton Wawen; near Napton-on-the-Hill.

In most of the localities given above this plant is merely a straggler from cultivation. The variety most frequently found is var. *b albescens*.

SEMPERVIVUM.

S. tectorum, *Linn.* *Common House Leek.* *Cyphel.*

Alien: On roofs and walls, usually planted. Local. Rarely flowering. July.

I. Roofs about Whitacre; ruins, Hartshill Priory.

II. Old walls, Warwick! *H. B.;* Tredington, Honington, "planted," *Newb.*, near Coventry; Stratford-on-Avon, &c.

Established on many old walls and roofs in both basins; but as I have never regarded this as other than a cultivated plant I have only rarely noticed its occurrence in my note-book.

COTYLEDON.

C. Umbilicus, *Linn.* *Common Navelwort.* *Wall Pennywort.*

Native: On old walls and ruins. Very rare. June.

I. Maxtoke Priory! *Bree*, *Purt.* i., 225. Coleshill, rare; *Bree*, *N. B. G.:* walls of Hartshill Priory! *Canon Young.*

II. On the walls of the area of Guy's Cliff House! in the Old Pound, Coton-end, Warwick; *Per. Fl.* 41.

(*To be continued.*)

Reviews.

Geological Record for 1878: Edited by W. Whitaker and W. H. Dalton. Pages xxxi. and 496. Published by Taylor and Francis. Price (to subscribers) 10s. 6d.

It is to be regretted that this volume is so late in making its appearance. It is, of course, difficult for Mr. Whitaker so to manage his team of sub-editors as to obtain from each and all of them the same unwearying, continuous, and punctual attention as he himself, with his excellent coadjutor, Mr. Dalton, devotes to the task of cataloguing the geological work of each year; but there are plenty of able workers ready to lend a hand, and by making the necessary changes and, perhaps, by further sub-dividing the work, a more early issue may be hoped for in future, which, indeed, Mr. Whitaker promises. The 1878 volume is a bulky one, containing the titles of 3530 books, papers, etc. Some of these are, however, omissions from previous years, from 1874 (when the first volume of the Geological Record was published) to 1877 inclusive. We would suggest that it would be better to reserve these omitted papers, and publish a list of them, say once in every five or ten years, instead of every year as at present. They would then be far more easily referred to.

The book contains a list of all the works on geology, mineralogy, and palæontology, published during 1878, either in England or abroad, carefully classified, with a very brief *resumé* of the contents of each paper. In the present volume the large number of entries appears to have had the effect of compelling the editors to restrict very much this *resumé* of each paper, which seems a pity, as in many cases it leaves us in doubt as to the full scope of the paper. The price of the book is so low (compared with its size and the quantity of matter it contains) that we feel sure the subscribers would prefer to pay, say 15s., and receive a rather fuller account of each paper—an account which would in most cases save them from the trouble of obtaining the paper for themselves. As to time of issue it seems not unreasonable to ask that the volume for each year should appear during the first three months of the next year but one; for example, the volume for 1883 should be issued sometime between January and March, 1885.

W. J. H.

"*The Geology of the Neighbourhood of Chester*" (*80 S. W., Price 2/-*), *and* "*The Geology of the Country around Prescot, Lancashire*" (*80 N.W., price 3/-*). *Memoirs of the Geological Survey.*

It is refreshing to meet with a good account of a formation so comparatively little known as the Trias. For long years geologists have had to fall back for their knowledge of the Trias in its typical areas on the (very) general memoirs by Hull; but the Survey has at last furnished us with just the sort of detailed description of the Triassic Rocks of Cheshire and the adjacent parts of Lancashire that was long needed. The memoir on the neighbourhood of Chester is entirely the work of Mr. Strahan, F.G.S., but the Prescot memoir is a third edition, by Mr. Strahan, of Prof. Hull's work, which has been in print these twenty years. The description of the various sub-divisions of the Trias is chiefly contained in the memoir on Chester, but in order to get a complete knowledge of one of the minor sub-divisions—the Frodsham Beds—it is necessary to follow it into the Prescot district. Although less than half of each memoir is taken up with the description of the Triassic Rocks, geologists will hail with something like delight the charmingly lucid, and we might even say graphic, account given of a formation that has too long remained obscure. Indeed, no physical feature or point of detail that one would suppose could strike a field geologist has been left unnoticed by Mr. Strahan, and workers in other Triassic areas will find these two memoirs very useful as text-books, as well as for comparison.

For the first time in the classification of the English Trias, the Keuper is divided into three members in place of two, and we now have, in ascending order, the Keuper Basement Beds (hard red and white grits and breccias), Waterstones (soft brown sandstones and red marls), and the Keuper Marl. The separation of the hard conglomeratic grits from the soft sandstones of the Waterstones is an important step in the right direction, both on economical and stratigraphical grounds, as it is shown that there is a distinct break between the two. Unfortunately, however, the new editions of the map showing these additional lines and corrections have been kept back for some unintelligible reason, although the work was done three years ago.

It will startle many to find that after a careful examination of the evidence as furnished by the sections in Cheshire, Mr. Strahan comes to the conclusion that the supposed break between the Bunter and the Keuper, during which the English Triassic areas were believed to have formed land while the Muschelkalk of the Continent was accumulating, is a myth, and that "in this area the deposition of the Keuper followed on that of the Bunter under a continuance of the same physical conditions." This conclusion is based on "the close similarity of the conglomeratic beds of the two ages, and the repetition of all the phenomena in the one that are observable in the other." The only difficulty that presents itself to our mind in accepting the conclusion that there was no break between the Bunter and the Keuper in Cheshire is the sudden change in the texture of the rock that marks the dawn of the Keuper period, the highest beds of the Bunter consisting mostly of very fine rounded grains, while the Keuper is distinguished by the coarse and "sharp" or angular aspect of its component grains. This seems to point to considerable physical changes having taken place about this time.

What it was that produced this remarkable change all over the Midlands at the dawn of the Keuper period must remain, we suppose, an interesting point for future research. With regard to the German Muschelkalk it will probably turn out (if it is ever really known) to be represented in England by the Keuper Basement Beds.

The superficial deposits, with their numerous fossils, and the associated erratics, come in for a large share of attention, and are well illustrated with woodcuts; while an important section of each work is devoted to the various economical aspects of the rocks of each district. Appended are very useful lists of papers relating to the areas covered by the memoirs. These, it is scarcely necessary to add, are the work of Mr. W. Whitaker, B.A.

J. S.

METEOROLOGY OF THE MIDLANDS.

BY CLEMENT L. WRAGGE, F.R.G.S., F.M.S., ETC.

THE WEATHER OF SEPTEMBER, 1882.

During the first ten days the weather was fairly genial, but the remainder of the month was generally dull and cold. Fogs were frequent. Temperature was below the average; at Strelley by 2 deg., and at Orleton "the mean temperature of the month was nearly 3 deg. below the average, and was lower than that of any September, except that of 1877, for the last 21 years."

STATION.	OBSERVER.	RAINFALL. Total for M. In.	Greatest fall in 24 hours. In.	Date.	No. of rainy d.	SHADE TEMP. Absolute Maximum. Deg	Date.	Absolute Minimum. Deg.	Date.
OUTPOST STATIONS.									
Ben Nevis (*a*)	C. L. Wragge, Esq., F.M.S.	10·03	1·09	27	27	53·9	22	26·8	30
Fort William (*a*)	C. L. Wragge, Esq., F.M.S.	5·57	·68	27	23	63 9	1	36·6	30
Spital Cemetery, Carlisle	I. Cartmell, Esq., F.M.S.	1·88	·56	13	14	70·2	10	33·5	12
Scarborough (*a*)	W. C. Hughes, Esq., F.M.S.	1·08	·18	12	14	66·6	2	43·7	15
Blackpool (*a*)—South Shore	C. T. Ward, Esq., B.A., F.M.S.	2·01	·45	2	16	65·5	1	36·9	19
Llandudno (*a*)	J. Nicol, Esq., M.D.	1·95	·33	17	18	67·2	1	42·0	14
Lowestoft (*a*)	H. E. Miller, Esq., F.M.S.	2·32	·66	28	14	70·9	2	40·9	14
Carmarthen (*a*)	G. J. Hearder, Esq., M.D.	4·52	·90	1	19	67·2	9	34·0	14
Altarnun, near Launceston (*c*)	Rev. J. Power, F.M.S.	6·74	1·32	27	21	70·0	4	36·0	14, 19
Sidmouth (*a*)	W. T. Radford, Esq., M.D.	3·44	·65	1	18	66·0	4	38·7	14
Les Ruettes Brayes, Guernsey (*a*)	A. Collenette, Esq., F.M.S.	3·94	1·17	19	19	67·0	1	41·5	14
Guernsey (*a*)	F. C. Carey, Esq., M.D.	3·84	1·06	29	20	67·0	1, 9	43·8	14, 16
MIDLAND STATIONS.									
HEREFORDSHIRE.									
Burghill (*a*)	T. A. Chapman, Esq., M.D.	2·21	·48	28	16	67·2	2	30·0	16
SHROPSHIRE.									
Woolstaston	Rev. E. D. Carr	2·74	·44	26	21	65·5	16	41·0	13
Stokesay (*a*)	M. D. La Touche	2·54	·46	28	19	68·0	16	31·1	16
More Rectory	Rev. A. S. Male	2·36	·38	28	19	65·0	1, 2	32 0	12, 13, 14
Dowles, near Bewdley	J. M. Downing, Esq.	2·67	0·53	29	15	75·0	3	28·0	16
WORCESTERSHIRE.									
Orleton, near Tenbury (*a*)	T. H. Davis, Esq., F.M.S.	3·14	·58	28	20	68·2	8	31·8	15
West Malvern	A. H. Hartland, Esq.	2·85	·69	28	16	69·5	16	37·5	12
Evesham	T. J. Slatter, Esq., F.G.S.	3·07	·81	19	16	67·8	1, 2	34·5	16
Pedmore	E. B. Marten, Esq.	2·47	·59	3	17	71·0	7	32·0	11, 14, 15
Stourbridge	Mr. J. Jefferies	2·03	·40	28	15	69·0	3, 17	34·0	14
STAFFORDSHIRE.									
Dennis, Stourbridge (*a*)	C. Webb, Esq.	2·24	·43	20	15	68·0	8, 10, 16	32·0	16
Kinver	Rev. W. H. Bolton	2·58	·47	3	17	68·0	3	32·0	14
Walsall	N. E. Best, Esq.	2·03	·69	28	22	67·0	22	39·0	14
Lichfield	J. P. Roberts, Esq.	2·08	·55	28	15	69·0	7	34·0	11, 14
Burton-on-Trent (*c*)	C. U. Tripp, Esq., F.M.S.	2·19	·50	28	15	70·0	8	31·0	15
Wrottesley (*a*)	E. Simpson, Esq.	2·24	·63	3	14	64·8	3	36·5	15, 16
Barlaston (*a*)	W. Scott, Esq., F.M.S.	2·56	·46	4	13	68·5	16	36·4	12
Heath House, Cheadle (*a*)	J. C. Philips, Esq., F.M.S.	2·16	·34	3	13	64·2	8	38·9	15
Oakamoor, Churnet Valley (*a*)	Mr. J. Williams	2·96	·41	4	15	64·9	8	30·7	15
Alstonfield	Rev. W. H. Purchas	3·33	·86	27	12	69·3	16	25·8	15
DERBYSHIRE.									
Stony Middleton	Rev. U. Smith	1·92	·35	1	11	66·0	8	32·0	6
Spondon	J. T. Barber, Esq.	2·22	·68	3	14	—	—	—	—
Fernslope, Belper	F. J. Jackson, Esq.	1·97	·62	1	14	66·0	2	34·0	15
NOTTINGHAMSHIRE.									
Park Hill, Nottingham (*a*)	H. F. Johnson, Esq.	4·09	1·75	12	15	66·8	2	38·0	15, 16
Hodsock Priory, Worksop (*a*)	H. Mellish, Esq., F.M.S.	1·86	·37	28	15	67·2	8	31·2	15
Strelley (*a*)	T. L. K. Edge, Esq.	2·26	·63	3	14	66·8	2	35·9	15
RUTLANDSHIRE.									
Uppingham	Rev. G. H. Mullins, M.A., F.M.S.	2·23	·66	28	13	67·5	7, 16	37·9	15
LEICESTERSHIRE.									
Loughborough (*a*)	W. Berridge, Esq., F.M.S.	1·98	·57	28	13	70·0	8	32·7	15
Syston	J. Hames, Esq.	2·35	·51	28	17	67·0	4	37·0	15
Town Museum, Leicester	J. C. Smith, Esq.	2·51	·64	19	8	69·5	8	34·0	15
Ashby Magna	Rev. Canon Willes	2·65	·92	19	10	67·0	4	34·0	16
Waltham-le-Wold	Edwin Ball, Esq.	2·59	·68	28	13	68·0	3	40·0	23
Coston Rectory, Melton (*a*)	Rev. A. M. Rendell	2·61	·71	19	15	67·6	30	32·3	15
WARWICKSHIRE.									
St. Mary's College, Oscott (*a*)	W. Middleton, Esq.	2·30	·53	28	12	67·2	9	33·2	12
Henley-in-Arden	T. H. G. Newton, Esq.	2·58	·57	19	16	72·0	8	33·0	15, 16
Kenilworth (*a*)	F. Slade, Esq., C.E., F.M.S.	3·32	·72	28	14	66·8	2	32 0	15
Rugby School (*c*)	Rev. T. N. Hutchinson	2·73	·68	19	14	66·0	2	35·2	16
NORTHAMPTONSHIRE.									
Pitsford, Northampton	C. A. Markham, Esq.	2·76	·72	19	13	72·0	10	32·0	15, 16
Towcester	J. Webb, Esq.	2·94	·93	19	13	—	—	—	—
Kettering	J. Wallis, Esq.	2·43	·68	19-28	13	67·0	3, 4	40·0	15
BEDFORDSHIRE.									
Bedford (*a*)	H. J. Sheppard, Esq.	2·05	·72	19	11	68·6	10	36·4	15
OXFORDSHIRE.									
Radcliffe Observatory, Ox. (*a*)	The Staff	2·41	·55	19	14	67·4	3	35·7	16
WILTSHIRE.									
Marlborough (*a*)	Rev. T. A. Preston, F.M.S.	3·20	·85	19	11	66·5	3	33·7	4
GLOUCESTERSHIRE.									
Cheltenham (*a*)	R. Tyrer, Esq., B.A., F.M.S.	3·23	·70	19	14	67·4	1	34·0	16

(*a*) At these Stations Stevenson's Thermometer Screen is in use, and the values may be regarded as strictly intercomparable. (*c*) Glaisher's pattern of Thermometer Screen employed at these stations.

Rainfall appears to have been also below the average. The highest pressure occurred on the 7th, when the barometer reduced to 32 deg. F., and sea-level read 30·480 in Central England; and the lowest took place on the 27th, 29·247 being the value.

The mean amount of cloud was about 6·5 (scale 0 to 10), and the mean relative humidity about 87% in the Midlands. Northerly winds prevailed. The mean temperature of the soil at Hodsock at a depth of one foot was 55·8, and at Strelley 53·5. At the former station 108·9 hours of bright sunshine were recorded, at the latter 107·0 hours, or 28%. The solar radiation thermometer (black bulb *in vacuo*) reached 128·5 at Loughborough on the 7th, and the terrestrial minimum on grass 29·6 at Oxford on the 16th. The mean amount of ozone at the Radcliffe Observatory was 0·7 (scale 0 to 10). Thunderstorm on the 3rd. Mean sea temperature at Scarborough 55·3, being 1·2 degrees above 5 years' average.

Correspondence, etc.

Amblystegium riparium.—This moss has been fruiting abundantly during the summer just past in the ponds at Limbury, South Beds, where also *Fontinalis antipyretica* has been found in fruit, to which reference was made in the September number of the "Midland Naturalist." Since the notice just referred to was penned, both these mosses have been found in company fruiting copiously in a pond at Harlington, Beds, about five miles from the other station. At Limbury the plants that grew on stumps above the water produced numerous capsules on setæ about an inch long; but besides these there were curious, elongate, submerged forms also in fruit. Some of these measured six to seven inches in length, bearing capsules from one to two inches from the base, with setæ fully two inches long. These elongate forms produced a fair number of capsules, but not in such profusion as the aerial short stems, nor were they so well developed as those of the latter. It would appear from this and many other cases which might be cited that the vegetative and reproductive organs are usually developed in inverse ratio to each other. It should be stated that duplicates have been sent to Mr. Boswell for criticism and verification.—J. Saunders.

Osprey in Leicestershire.—On Friday, October 13th, the keeper at Saddington Reservoir noticed a large hawk circling and soaring over the pool, every now and then making a rapid stoop towards the water. He was near enough to note the colour and markings of the bird, and I had no difficulty, from his description, in identifying it as an Osprey. On October 18th a bird, supposed to be an Osprey, was observed circling at a great elevation over Gumley Wood and Pool, which are only half-a-mile distant from Saddington; and on Sunday, October 22nd, Rev. A. Matthews, of Gumley, saw an Osprey flying over his garden at 2 p.m., only 30 yds. to 40 yds. distant, and readily recognised the bird. From its large size he believed it to be a female.—Thomas Macaulay, M.R.C.S.L., &c.

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—General Meeting.—October 3rd.—Mr. W. B. Grove exhibited the following Fungi:—*Ag. radicatus* and *A. fimicola*, from Warley; *A. corrugis*, from Sutton; *Hygrophorus conicus, H. virgineus, and H. psittacinus*, from Sutton; *H. ceraceus* and *H. psittacinus*, from Quinton; *Cyathus vernicosus*, from Sutton; *Clavaria vermiculata*, from Quinton; *Hydnum udum* and *Corticium quercinum*, from Warley; and (on behalf of Mr. W. H. Wilkinson) *Geaster fimbriatus*, from Blockley, Oxon. Mr. J. Levick exhibited *Tubicolaria naias, Œcistes umbella, Cohnia roseo-persicina, Bursaria leucas*, and other objects. Mr. T. Bolton exhibited *Floscularia regalis*, Huds., new to science; *F. ambigua*, lately new, both discovered by him near Birmingham; and *F. coronetta*, new to the district, described in the "Microscopical Journal," 1869, since found near Dundee. Mr. J. Morley exhibited (on behalf of Mr. Burgess) *Achnanthes longipes*, Schizonema, and other diatoms. Mr. Wagstaff exhibited *Synura Uvella*, from Northfield. Biological Section.—October 10th.—Mr. W. R. Hughes exhibited (on behalf of Mr. George Heaton, Jun.) specimens of *Gnaphalium leontopodium*, the Swiss national flower (Edelweiss), taken in August last from the Engadine, 8,000 ft. above sea level; also *Chrysanthemum segetum* (common Marigold), from a field near Christchurch, Hants, showing bifurcation of peduncle and coalition of two capitula. Mr. Iles exhibited *Nais digitata*, also some excellent drawings of the same, showing the curious tentacles of the anal extremity. Mr. R. W. Chase exhibited a double nest of *Fringilla cœlebs* (the chaffinch), from Ely, each division containing eggs, and which, no doubt, two birds were employed in constructing. Mr. E. H. Wagstaff exhibited *Dendrosoma radians*, a species of Rhizopoda of the family Acinetina, from near Harborne. Mr. J. E. Bagnall exhibited Fungi from Ludlow: *Cortinarius sub-ferrugineus, Hydnum repandum, Tricholoma stans* (rare), *Lactarius insulsus, and L. uvidus;* also from Maxtoke, Warwickshire, *Lactarius hysginus* (rare), *L. vellereus, L. piperatus, L. pallidus* (new to Warwickshire), *Hygrophorus eburneus, Clitocybe cyathiformis*, and other fungi. Mr. W. B. Grove exhibited *Ag.* (*Nolanea*) *nigripes*, Trog., from Sutton Park, a species determined by experts at the Woolhope Fungus Foray, and new to Great Britain; *Cantharellus tubæformis*, from Shrewsbury, *Nectria sanguinea, Peziza microcystis, Melampsora Euphorbiæ, Trichoderma viride, Hysterium pulicare, Ægerita candida*, and *Epicoccum neglectum*. Mr. W. Southall read a paper entitled "Notes on Arable Land out of Cultivation." The observations were made on a small uncultivated farm of five fields in the neighbourhood of Sidmouth, Devon, and the subject was treated both from an economical and botanical point of view. As a result Mr. Southall recommended that where land was likely to remain uncultivated for any length of time tall-growing grasses should be sown at once, so that they might become established, and thereby keep out the noxious weeds. A discussion followed, in which the Chairman, Messrs. Morley, Bagnall, Sturge, and Greatheed, took part. Microscopical General Meeting.—October 17th.—Mr. J. E. Bagnall exhibited *Hydnum repandum, Craterellus cornucopioides* (rare), *Lactarius pyrogalus, Cantharellus tubæformis, Ag. Candollianus*, and *Ag. spermaticus* (all four new to Warwickshire), *Clitocybe fragrans*, and other Fungi from Shustoke; also (for Mr. C. R. Robinson) *Agaricus melaleucus*, but the correctness of this determination was questioned. Mr. W. B. Grove exhibited *Ag. sublateritius, Ag. flaccidus*, and *Ag. brevipes*, from Sutton; also (on behalf of Mr. Robinson) *Polyporus fumosus*, from Edgbaston. He also exhibited, beneath the microscopes, preparations showing the œcidia, uredo-spores, puccinia-spores, and other points connected with the life-history of the Corn-mildew and similar fungi, in illustration of his paper "Nomad Fungi: the Reclassification of the Uredineæ," which will appear in the "Midland Naturalist." Geological Section.—October 24th.—The following exhibits were made:—Mr. A. H. Atkins, some fine specimens of Lingulella, from the Hollybush Sandstone, Malvern Hills; Mr. T. H. Waller, sections of Picrite, from Inchcolm, Firth of Forth, including one with no olivine and much felspar; Mr. C. A. Matley, quartzite pebbles from the drift near Birmingham, containing *Orthis Budleighensis*, *Lingula Lesueuri*, Strophomena, and a trilobite tail; Mr. W. B. Grove, fungi from Great Barr and Sutton, *Agaricus cerussatus*, *Ag. galericulatus*, *Ag. velutipes*, *Ag. (Lepiota) cristatus*, *Ag. (Pluteus) nanus* (new to the district), *Ag. (Crepidotus) mollis*, *Ag. separatus*, *Bolbitius fragilis*, *Coprinus micaceus*, *Hygrophorus conicus*, *Panus stypticus*, *Polyporus spumeus*, *P. annosus*, *P. sanguinolentus*, *Chætomium elatum*, *Nectria coccinea*, *Hypomyces rosellus* (a fungus parasite on Agarics or Polyporus), *Dactylium roseum*, *Stysanus stemonitis*, *Tremella torta*, and *Arcyria incarnata;* Mr. E. Wagstaff, *Sarcina ventriculi* a fungus from the human stomach.

BIRMINGHAM MICROSCOPISTS' AND NATURALISTS' UNION.—September 2nd.—Excursion to Salford Priors. September 4th.—A Meeting (Special), "Conchology.' Mr. Madison exhibited *Helix caperata* var. *subscalaris*, and *Clausilia laminata*, from the Wren's Nest; Mr. Boland, thirty-one species and varieties of land shell, from Tenby; Mr. Chaplain, Swallow-tail Butterfly, caught at Basingstoke; Mr. J. W. Neville, shell and palate of Trochus. September 11th.—Mr. Deakin exhibited wing of Urania. September 18th.—Paper by Mr. Parkes on the "Life History of a Plant;" Mr. J. W. Neville showed transverse section of Hedge Maple; H. Insley, section of Sugar Cane. September 23rd.—Excursion to Berkswell; Volvox Globator found. September 25th.—Mr. Darley exhibited fossils from Great Orme's Head (corals and producti), also *Helix virgata*, *Bulimus acutus;* Mr. Bradbury, Swallow-tail Butterfly from Colorado; Mr. Wykes, Stentor; Mr. Dunn, Carchesium; H. Insley, leaves of Croton and Niphobolus, with ornate hairs; Mr. J. W. Neville, proboscis of Drone Fly. October 2nd.—Mr. H. Insley, mounted specimens of Fossil Wood, silicified and calcified; Mr. J. W. Neville gave an exposition of "Mounting Insects for the Microscope," showing every process from the commencement to a finished mount. October 9th.—Mr. H. Insley, showed a specimen of Limulus in a nodule of Clay Ironstone from the Derbyshire coalfield; Mr. Darley, larvæ of Broom Moth, Fox Moth, and Bordered White.

BIRMINGHAM AND MIDLAND INSTITUTE SCIENTIFIC SOCIETY.—September 27th.—Mr. J. W. Oliver gave a short address on "The Cambrian Age of the Hartshill and Lickey Quartzites." He also gave an account of the discoveries recently made by Professor Lapworth. October 4th.—Mr. J. O. W. Barratt, B.Sc., read a paper on "Siemens' Regenerative Furnace." The principles on which these furnaces are made were carefully set forth, and then a detailed description of the gas producers and regenerative chambers was given, this being well illustrated by diagrams. An interesting discussion on the practical value of these furnaces followed the paper. October 11th.—PHOTOGRAPHIC SECTION.—Mr. A. Pumphrey gave a practical demonstration on the working of the "Gelatine Films," which proved very successful. October 18th.—Mr. J. J. Gilbert, F.M.S., read a paper on "Weather Forecasts," and explained in detail the various instruments used. He also described how a weather chart was prepared for the newspapers, and at great length went into the subject of the connexion of strong winds with barometric differences. He concluded by saying the science was still in its infancy, and the knowledge could only be obtained by a series of regular and accurate observations.

BIRMINGHAM SCHOOL NATURAL HISTORY SOCIETY.—BOTANICAL SECTION.—The first meeting of the term was held on the 11th of October, Mr. E. W. Badger, M.A., in the chair. A very interesting and instructive paper was read by the President (Mr. J. Turner, F.L.S.) on the Torula, or Yeast Plant. Specimens illustrating the paper were exhibited under the microscope by R. Moore.

BANBURYSHIRE NATURAL HISTORY SOCIETY AND FIELD CLUB.—August 5th—FIELD DAY.—By the kind invitation of Archdeacon Holbech, the members made an Excursion to Farnborough Hall. Some time was spent in examining the fine paintings of views in Venice, by Canaletti, and the numerous interesting family relics, trophies, and curiosities accumulated by members of the family during the last two or three centuries. In the hall was displayed, for the inspection of the visitors, a fine collection of minerals and fossils, containing choice specimens of fossil stems from the coal, fossil shells from the Carboniferous Limestone, Greensand, and Tertiary beds, fossil-fishes from Monte Bolca, and fine specimens of schorl, etc. The party then walked through the plantations and grounds, collecting by the way specimens of *Epipactis latifolia*, and, taking a sweep round a neighbouring elevation—"Hall's Hill"—obtained a fine view over the Northamptonshire Marlstone escarpment. Hall's Hill, about 600ft. above the sea, is marked as Lower Lias on the Geological Survey map, but some indications led the geologists to believe (as, indeed, is actually the case in another spot, similarly marked, near Farnborough) that it is Upper Lias capped by Inferior Oolite. In few places can finer trees be seen than at Farnborough. The oaks and the ash are magnificent, not only for size but for picturesque grandeur, whilst the cedars—three of which, as tradition runs, were planted at the same time as three of those at Warwick Castle, and than which they are thought to be finer—are among the most beautiful of their race. A fine tulip tree *(Lir odendron tulipifera)* in full bloom, was by the aid of a pocket clinometer found to be approximately 75 feet in height. Tea was spread on one of the lawns (another noted beauty of the place), and that having been partaken of, the President took occasion to convey the best thanks of the Society to Archdeacon and Mrs. Holbech for their most enjoyable day. Passing along the "terrace"—a magnificent walk of smooth, shaven turf, nearly 20 yards broad and half a mile long, and occupying the brow of a hill gently rising to the north (from the openings between the grand old trees bordering it views extending to the Malvern Hills are obtained)—and from thence through the park, the party reached their carriages, and taking leave of their kind hosts, reached home after a pleasant drive. September 4th—MONTHLY MEETING.—Mr. S. Stutterd, Vice-President, in the chair. The Meteorological Report for August by Mr. T. Beesley, F.C.S., was read. Barometer at 32 degrees—mean height, 29·376; highest on the 10th, 29·998; lowest on the 23rd, 28·824. Thermometer—mean temperature, 58·6 (1·5 below average); maximum on the 6th, 76·5; minimum on the 31st, 44·5. Rainfall on sixteen days amounting to 2·26 inches. Thunder and lightning on the 25th, lightning on the 12th, high winds on 20th, 22nd, and 23rd. The Hon. Secretary read a note by Mr. Beesley, on "The 'Rust' of Wheat (*Trichobasis rubigo-vera*) and its Connection with the 'Barberry Blight'" (*Œcidium Berberidis*), which, during the present year, had been found by Mr. Plowright to be different forms of the same fungus. The latter has long been credited by old-fashioned farmers as the cause of rust in wheat, and Mr. Beesley in speaking on the subject last year had given it as his opinion that there was some reason to believe they were right in their warfare against Barberry bushes in their hedges. Mr. Patey exhibited specimens of and read a note on *Linaria repens* which he had lately found by the side of the railway, and which was new to the district. This plant, like *Linaria minor*, *Diplotaxis muralis*, and *Iberis amara*, had probably come to us by spreading along the railway line. Mr. O. V. Aplin exhibited *Orchis pyramidalis* from the district, and specimens of *Epipactis latifolia* from Farnborough and the Chiltern Hills, and drew attention to the fact, as stated by Darwin, of the fertilisation of this species by wasps alone. The Chairman exhibited in some sea water, *Laomeda geniculata* (a campanularian polyp), a polyzoon (*Membranipora* sp.), a small nautiloid annelide (*Spirorbis communis*), and some diatoms, the finest being *Pleurosigma elongatum*. Mr. O. V. Aplin, also exhibited a specimen of the Little Auk (*Mergulus alle*) from Massachusetts Bay, and an egg of the same from Davis' Straits, and made some remarks on the distribution of the species. Mr. F. H. Hood exhibited specimens of the more interesting rocks which had come under his notice during a recent visit to Scotland and the Orkney and Shetland Islands. Notes descriptive of the specimens, and of the formation of Arthur's Seat and the neighbouring elevations were read.

REPORT ON THE PENNATULIDA COLLECTED IN THE OBAN DREDGING EXCURSION OF THE BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY, JULY, 1881.

BY A. MILNES MARSHALL, M.A., D.SC., PROFESSOR OF ZOOLOGY IN OWENS COLLEGE, AND W. P. MARSHALL, M.I.C.E.

(Concluded from page 250.)

g. The Reproductive Organs.—The eggs in *Virgularia* occupy a very different position to that they hold in *Funiculina* or *Pennatula.* They are confined to the lower part of the rachis, and only occur in that part of it in which the polypes are either absent or very immature. In this lower part of the rachis, a transverse section across which is represented in Fig. 6, the canal system of the mesoderm becomes very greatly developed. In addition to the four main canals (*u*) there are large lateral chambers lined by endoderm, and from this endoderm at certain places the ova (*t*) are formed, and when ripe fall into the chambers, in which they lie free.

The actual development of the ova themselves is much the same as in the other two genera. Each ovum is a single endoderm cell which becomes bigger at the expense of its neighbours, rises up from the surface to which it remains attached by a stalk or peduncle, developes a firm protective capsule round itself, acquires a large germinal vesicle with included germinal spot—the nucleus and nucleolus respectively of the original endodermal cell—and having attained its full size becomes detached from the stalk and lies free in the chamber of the rachis. How the eggs get out ultimately we have been unable to determine with certainty; most probably their exit is effected through the mouths of the polypes higher up the rachis, whose body-cavities are in connection with the large chambers of the lower or ovarian end of the rachis.

The essential difference between *Virgularia* on the one hand, and *Funiculina* and *Pennatula* on the other, so far as their reproductive organs are concerned, lies in the fact that while in the latter two genera the reproductive elements, ova or spermatospheres, are developed within the polypes, in *Virgularia* they are formed independently of the polypes, and in a part of the rachis where the polypes are either altogether absent or at least very immature.

It will be remembered that in *Funiculina* we described and figured the occurrence of ova in the canal system of the rachis (Plate II., Fig. 10, *t*), and left it uncertain how these ova got into canals which, except at the points where they lie, are much too small to admit them. The condition of things in *Virgularia* renders it not improbable that these ova have originated and been developed in the position in which we find them within the canals.

All the four Oban specimens in which the lower end of the rachis is perfect, prove on examination to be females, so that we have had no opportunity of investigating the development and relations of the male organs. We regret this the more because the descriptions we possess of these organs are not in all respects satisfactory.

Young ova in the earlier stages of development are only found at the very bottom of the rachis, or, at any rate, only where the polypes are very immature; they are also far more abundant in the ventral than the dorsal half of the rachis, if, indeed, they are not confined to the former. Mature ova—*i.e.*, eggs which have reached their full size and become detached from their stalks, are found extending much higher up the rachis, and may occur in the body-cavities of fully-developed polypes.

If it is borne in mind that each leaf commences its existence at the bottom of the rachis, and is gradually forced upwards by the successive development of new leaves below it, it will be seen that each leaf in the early stages of its existence has fully-developed reproductive organs, but no organs for digestion of food or capture of prey; and that in the later stages of its life it loses its reproductive organs and develops prehensile and digestive organs. In other words, the two great functions of nutrition and reproduction, which are carried on simultaneously in the polypes of *Funiculina* and *Pennatula*, occupy in *Virgularia* different phases of the life-history of the polypes, and strangely enough the reproductive phase precedes the nutritive; the polypes develop reproductive organs and products while they are yet unable to catch or digest food for themselves, and by the time they have acquired organs for these latter purposes the reproductive organs have disappeared.

In presenting this separation of their life-history into two distinct chapters, as it were, the polypes of *Virgularia* are less primitive, and more specialised, than those of either of the other genera with which we have been dealing.

None of the ova that we have examined from the Oban specimens have even commenced to develop, so that we can give no account of the processes of development from our own observations. Dalyell, who kept *Virgularia* in captivity for some months, informs us* that during May and June he found numbers of eggs at the bottoms of the glasses in which he kept his specimens; that from these eggs larvæ in the form of free-swimming ciliated planulæ were developed, which after a time attached themselves by one end and produced tentacles, a stomach, and four septa. He kept these young specimens for a month without their undergoing any further change.

By means of fertilised ova and the free-swimming larvæ to which they give rise new colonies of *Virgularia* are started. Increase in size of the colony, when once started, is effected by the formation of leaves one below another, as already noticed. The actual process of formation

* Sir John Graham Dalyell: "Rare and Remarkable Animals of Scotland," vol. ii., p. 188, 1848.

of the polypes is easier to study in *Virgularia* than in the other genera, because by making a series of transverse sections through the lower end of the rachis at different levels all the successive stages of development can readily be obtained from a single specimen.

At the very bottom of the rachis there is no trace of polypes at all, and at this part the fleshy substance of the rachis, which is here of considerable thickness, is hollowed out to form the large lateral chambers already described.

A little higher up we get the first rudiments of the polypes. These appear as transverse rows of small pit-like depressions of the superficial layer of ectoderm which clothes the whole rachis (Fig. 6 *dr*). Each pit opens by its mouth on to the surface; its inner end, which is closed, projects somewhat into the lateral chambers of the rachis, as shown in the figure. Each of these pits will become the stomach of a polype, the mouth of the pit remaining as the mouth of the polype.

We have already said that the pits are arranged in transverse rows; each row is situated on one of the slightly marked transverse ridges which mark the commencing leaves at the bottom of the rachis; and in each row there are seven or eight polypes according to the number present in the fully developed leaves of the same individual. In each row, also, the polypes gradually increase in size from the dorsal to the ventral surface.

A little higher up in the rachis, *i.e.*, at a slightly later stage of development, we find the pits somewhat deeper; we find, also (Fig. 6), that the lateral chambers have become divided by radial partitions into smaller chambers, one for each pit, which become the body-cavities of the polypes. These body-cavities grow up round the pits, leaving them attached to what are now the body-walls of the polypes by the eight septa or mesenteries. Round the mouths of the pits a series of small buds begins to appear, the rudiments of the tentacles.

The constrictions separating the leaves from one another become more and more marked, so that the leaves gradually acquire independence of one another; the tentacles grow rapidly in size, and develop along their inner borders the pinnules; the walls of the pits, or the stomachs of the polypes, become thrown into the folds characteristic of the adult polypes, and the bottoms of the pits become perforated, thus placing the stomach-cavities] in communication with the body-cavities; and then the extension of the mesenteries to the bottom of the polype-cavities, and the thickening of their free edges to form the mesenterial filaments, are all that is necessary to complete the development of the polypes.

We shall only notice one other point: the great retractor muscles of the polypes appear at a very early stage, when the stomach cavities are mere pits and no traces of the tentacles have yet appeared. They are shown at about this period in Fig. 6, *p*. By studying the early stages carefully it can be seen that these muscles are portions of the great subcutaneous system of muscles which originally extended all round the rachis, and which persists comparatively unaltered on the dorsal and ventral surfaces (Fig. 6, *lm*), portions the direction of which has become changed by the pittings in of the surface which form the stomach-cavities of the polypes.

From the mode of formation of the body-cavities of the polypes out of parts of the canal system of the rachis, it is clear that the continuity between these two systems which we have seen persists in the adult is a primitive one, and not a secondary one acquired in the course of development.

5.—*Anatomy of the Zooids.*—

The zooids of *Virgularia* are simply arrested polypes, polypes which have stopped short at the stage of development represented in Fig. 6. They have no tentacles; their stomach-cavities are merely blind sacs, the walls of which are not thrown into folds; and, in fact, they resemble these rudimentary polypes in all points except in having no reproductive organs developed in connection with them.

6.—*Zoological Position and Affinities.*—

The position of *Virgularia* relatively to the other two genera is shown in the table on page 1 of this report. The generic characters, as stated by Kölliker,* are as follows:—

"Genus: *Virgularia*. Leaves small, attached to the rachis by wide bases, ending below in a long series of undeveloped leaves. Polype cells fused together along the greater part of their length, either in a single row, or else alternating so as to give the appearance of two rows. Tentacles cylindrical, with short pinnules. Reproductive organs, as a rule, contained within the rachis at its lower end, and only in a single species found in all the leaves. Zooids lateral, in single or multiple rows between each pair of leaves. Radial canals in two longitudinal ridges along the ventral side of the rachis. A terminal dilatation at the end of the stalk. Stems cylindrical. Calcareous spicules absent in the rachis, but present in some cases in the stalk in small numbers."

Of the nine species of this genus distinguished by Kölliker the descriptions of five are based on the examination of single specimens only; and of the remaining four there is no doubt whatever that the one to which the Oban specimens are to be referred is the typical species of the genus, *V. mirabilis*, the definition of which is as follows:—

V. mirabilis.† "Whole colony up to fourteen inches in length; feather two and a half to three times the length of the stalk; leaves half-moon shaped, smooth, placed laterally but slightly obliquely, the ventral border being higher than the dorsal, overlapping one another only slightly or not at all, attached by wide bases. Polypes six to nine in each leaf, their cavities distinctly separated from one another. Zooids lateral, in one or two rows. Reproductive organs only developed

* Kölliker, "Alcyonarien," p. 182-3. † *Ibid.*, p. 190.

in the lowermost leaves. Radial canals well developed along the whole length of the rachis."

The species is a common but very variable one, different specimens differing greatly from one another in the pitch of the leaves—*i.e.*, their distance apart—in the shape of the leaves, and in their breadth of attachment to the rachis. In these points the seven Oban specimens present a good deal of variety among themselves.

7.—*Habits.*—

1. *The Natural Position of Virgularia.* We have already, when speaking of *Funiculina* and *Pennatula*, referred in anticipation to *Virgularia* as affording positive proof of the erect position being the natural one. It is apparently a very simple point to determine; and yet, so far as we can find out, only two, or at most three, observers have recorded from actual observation the fact that *Virgularia* does live planted erect in the sea bottom.

Rumph* in his work, to which we have already alluded, describes both *V. Rumphii* and *V. juncea* as living erect with the stalk planted in the mud and the rachis projecting up into the water. He speaks of having pulled out hundreds, so that there can be no possibility of mistake.

Darwin, in his "Naturalist's Voyage Round the World," also gives us direct evidence on the point from observations made at Bahia Blanca, on the south-east coast of South America, in lat. 39° S. He says :†—"I will only mention one other animal, a zoophyte (I believe *Virgularia Patagonica* ‡), a kind of sea-pen. It consists of a thin, straight, fleshy stem with alternate rows of polypi on each side, and surrounding an elastic stony axis, varying in length from eight inches to two feet. The stem at one extremity is truncate, but the other is terminated by a vermiform fleshy appendage. The stony axis which gives strength to the stem may be traced at this extremity into a mere vessel filled with granular matter. At low water hundreds of these zoophytes might be seen projecting like stubble, with the truncate end upwards, a few inches above the surface of the muddy sand. When touched or pulled they suddenly drew themselves in with force, so as nearly or quite to disappear. By this action the highly elastic axis must be bent at the lower extremity, where it is naturally slightly curved; and I imagine it is by this elasticity alone that the zoophyte is enabled to rise again through the mud."

A little further on he says :—"It is always interesting to discover the foundation of the strange tales of the old voyagers, and I have no doubt but that the habits of the *Virgularia* explain one such case. Captain Lancaster, in his voyage in 1601, narrates that on the sea sands of the island of Sombrero in the East Indies he found a small twig

* Rumph. "T'Amboin 'sche Rariteitkamer," p. 64, 1741.
† Darwin: "Naturalist's Voyage round the World," p. 99, 1845.
‡ Since renamed by Kölliker *Stylatula Darwinii.* *Vide* "Kölliker: Alcyonarien, p. 227.

growing up like a young tree, and on offering to pluck it up it shrinks down to the ground, and sinks unless held very hard. On being plucked up a great worm is found to be its root, and as the tree groweth in greatness so doth the worm diminish; and as soon as the worm is entirely turned into a tree it rooteth in the earth, and so becomes great. This transformation is one of the strangest wonders that I saw in all my travels; for if this tree is plucked up while young, and the leaves and bark stripped off, it becomes a hard stone when dry, much like white coral: thus is this worm twice transformed into different natures. Of these we gathered and brought home many."

These accounts are of great importance, as they prove beyond all possibility of doubt that the erect position is the normal one for *Virgularia*, and if so, it follows with almost absolute certainty that the same must be the case with other allied and similarly constituted genera.

2.—*On the Power of Retraction.*—This, also, is a point of very considerable interest and importance. It will be noticed that both Darwin himself and Captain Lancaster, in the accounts quoted above, state that *Virgularia* has the power of retracting suddenly into the sand when disturbed "so as nearly or quite to disappear." Rumph says exactly the same of *V. juncea*, which he describes as burying itself at low water so far in the sand that only a bit of three or four fingers' breadth projects.

We do not yet know whether *V. mirabilis* also possesses this power of retracting partially or completely into the mud when disturbed, but from analogy it would appear by no means improbable that it does so. The possession of this retractile power is clearly very advantageous for the sake of protection, and it will be an interesting point for future observation to determine whether this power is in any way a compensation for the loss of the more usual means of defence—*i.e.*, thread-cells. We have but little evidence on this point as yet. Rumph distinctly states that *V. juncea* does not sting, but does retract forcibly when disturbed: while *V. Rumphii*, which possess very marked stinging powers, is not mentioned as retracting.

Supposing, which seems probable, that *V. mirabilis* possesses this power of retracting partially into the mud, it would help to explain why the lower halves of the rachis escape, although the tops are so constantly eaten off.

Concerning the mechanism of retraction it is difficult to form any precise idea. From the descriptions it would appear to be a muscular action effected probably by the powerful muscular system of the stalk and rachis.

Some experiments made by Dalyell show well the efficiency of these muscles. He found that in living specimens the muscles of the rachis frequently cause the fleshy part to twist itself in a spiral manner round the stem, and then straighten out again. "A section, six or eight inches long, standing inclined in a narrow jar, will be found to have arranged itself in a single volute throughout, or into two, three, or four between night and morning. The whole can relax again into a straight line by their obliteration." *

Kölliker† suggests that the boring into the sand is effected by peristaltic waves of dilatation and contraction passing down the stalk and rachis: the dilated parts acting as fulcra by completely filling up the hole in which the stalk is planted, and so fixing it at one point, while the wave of contraction, passing down below this fixed point, would drive the end of the stalk deeper into the mud. The fixed point would then relax, the terminal vesicle would dilate to act as a fulcrum, and the longitudinal muscles would pull the whole colony down. It is, however, not easy to see how a rapid retraction could be effected in this manner.

3.—*Supposed Nocturnal Habits.*—According to Dalyell, *Virgularia* when in captivity "remains contracted during the greater part of the day, and the organs are seldom displayed before five or six in the afternoon." On this point we would refer to the observations made when considering the same statement concerning *Pennatula.* We have there suggested that *Pennatula* appears to be "nocturnal" when brought to the surface, simply because the amount of light it receives in broad daylight is vastly in excess of what it receives normally at the sea bottom, and that it is only towards evening that it is placed under what to it are normal conditions as to amount of light.

8.—*Geographical distribution.*—

V. mirabilis has been taken at a number of localities in different parts of Europe. Like the Pennatulida generally it appears to be very local, but to occur in large numbers where it is found at all.

It has been recorded from several places on the coast of Norway and Denmark; from Belfast Lough, Gairloch, Oban, the island of Inchkeith, near to Edinburgh, the Hebrides, and other Scotch localities.

In 1879 the Birmingham Natural History Society added a new locality to the list by dredging a single specimen off Falmouth; and we may cite also, on Mr. Darbishire's authority, the stomachs of haddock off Scarborough, as a place where *Virgularia* has been found. The uncertainty whether these last specimens had been found by the haddock near where they were caught, or had been brought from some other locality, prevents our adding Scarborough definitely to the list until the point has been determined.

General Observations on Funiculina, Pennatula, and Virgularia.—

All three genera are colonial forms, consisting of a number of individual animals—the polypes—living organically connected together, and to a greater or less extent dependent on one another. In all three cases the colonies increase in size by the addition of new individuals by the process of budding or gemmation, whilst new colonies are

* Dalyell: *op. cit.*, p. 185.

† Kölliker: *op. cit.*, p. 205.

started by means of eggs, which, when fertilised, give rise to free swimming embryos, capable of passing from place to place.

Of the three forms, *Funiculina* is the most primitive, and was therefore very properly taken first. Its more primitive nature is shown in the irregular arrangement of the polypes; in their independent insertion into the rachis; in the comparatively slight difference between the two kinds of individuals—polypes and zooids—comprising the colony, for these must be supposed to be primitively and fundamentally equivalent to one another; and also in the small length of stalk—*i.e.*, of the part of the colony devoid of polypes. A colony being merely an aggregation of similar individuals, which, instead of becoming detached and leading isolated and separate lives, remain organically connected together, it is clear that the simplest or most primitive form of colony will be that in which the polypes or individual animals are most completely independent of one another, and in which the differences between one polype and another are the least strongly marked, since all are fundamentally alike, and equivalent to one another.

Pennatula is in all these respects a far less primitive form than *Funiculina*. This is shown by the fusion of the polypes into leaves, clearly a secondary feature that could only have been acquired subsequently to the habit of forming colonies; by the very great difference in size between the component polypes of a leaf; by the great anatomical differences between the polypes and zooids; and by the great relative length of the stalk—*i.e.*, of the part of the colony devoted to purely colonial purposes.

Virgularia, though at first sight presenting a closer resemblance to *Funiculina* than does *Pennatula*, is in reality the most modified, the least primitive of the three genera, and has, therefore, very properly been considered last in this report. This is especially shown by the restriction of the reproductive organs to the imperfectly developed polypes, and the consequent division of the life-history of the polype into two physiologically and anatomically distinct portions—reproductive and nutritive. That the reproductive function should be thrown on the immature instead of the adult individuals is a very remarkable specialisation.

Again the modified character of *Virgularia* is shown by the great difference between polypes and zooids; by the simultaneous instead of the successive development of the polypes of each leaf, a point already explained; and lastly, by the development of the very remarkable system of vessels we have called radial vessels, which, whatever their function may ultimately prove to be, are structures not present in the other two genera, and the possession of which stamps *Virgularia* as a more highly specialised form than these.

In concluding our report, which various circumstances have combined to render much more lengthy than we had anticipated when commencing it, we desire to record our indebtedness to the members of the Birmingham Natural History Society for the opportunity they

have afforded us of studying these rare and interesting forms; and for their liberality in placing the specimens at our disposal, and in enabling us to illustrate our report in a manner that cannot fail to greatly enhance its value.

We have been compelled to leave many points undetermined, but have in all such cases clearly indicated the nature of these points, and the difficulties by which we were baffled; and we have done this in the hope that we may thereby direct attention to the important work yet to be effected, and may facilitate in some measure the work of the Society in its future dredging excursions.

FUNGI OF THE NEIGHBOURHOOD OF BIRMINGHAM.

FIRST LIST, 1881-82.

(Continued from page 252.)

GASTROMYCETES *(Myxogastribus exclusis.)* *

Phallus impudicus, Linn. Sutton Park, common. Sept., Oct.
Lycoperdon gemmatum, Fr. Hams Hall. Sept., Oct.
L. pyriforme, Schäff. Common; Sutton Park; Olton; Barnt Green; Driffold Lane, etc. Aug.—Nov.
Scleroderma vulgare, Fr. Olton; Sutton Park (abundant). July—Nov.
S. verrucosum, Pers. Sparkhill. My specimens were smooth, pinkish, subterranean, but Mr. Phillips informs me that they are only the early stage of this species; spores bright violet Oct.
Cyathus vernicosus, DC. Aston; Sutton; on wood. Sept., Oct.
Crucibulum vulgare, Tul. Perry Barr, amongst grass. Jan.
Sphærobolus stellatus, Tode. Great Barr; Sutton. Aug.—Nov.

CONIOMYCETES.

Melanconium bicolor, Nees. Edgbaston; Sutton. April- July.
Stegonosporium cellulosum, Corda. Sparkhill, on beech. Oct.
Torula herbarum, Link. Common everywhere. Autumn.
T. sporendonema, B. and Br. Sutton, on pigeon's dung. Oct., Nov.
Bispora monilioides, Corda. Driffold Lane, Sutton. April.
Sporochisma mirabile, B. and Br. Driffold Lane, Sutton. April.
Sporidesmium lepraria, B. and Br. Driffold Lane, Sutton. July—Sept.
Puccinia graminis, Pers. II., III.† Common, on grasses. II., Summer; III., Autumn.
P. polygonorum, Link. II., III. Driffold Lane, Sutton. Sept., Oct.
P. menthæ, Pers. II. Common, on garden mint. July—Oct.
P. compositarum, Sch. II., III. Common, on Lapsana, etc. July—Nov.
P. variabilis, Grev. III. On dandelion, Water Orton. Sept.
P. galiorum, Link. III. Clent Hills, *W. H. Wilkinson.* Aug.
P. umbelliferarum, DC. II., III. Driffold Lane, Sutton. On *Æthusa cynapium.* Oct.
P. lychnidearum, Link. II., III. Hams Hall. Sept.

* For naming some species of these and the following groups, I am indebted to the kindness of Messrs. C. B. Plowright and W. Phillips.

† As there is no book yet published in English, in which the leaf-fungi are arranged according to modern ideas, I have chiefly followed the arrangement of the Handbook.

Puccinia fabæ, Link. See *Uromyces fabæ.*
P. malvacearum, Corda, II., III. On Malva and Althæa, Hall Green; Barnt Green, etc. May—Aug.
Ustilago carbo, Tul. Common, on corn. Autumn.
Urocystis pompholygodes, Schl. Alvechurch; Sutton. May—July.
Uromyces ficariæ, Lev. King's Norton. April.
U. fabæ, Fckl. Sutton, etc. Aug.—Oct.
U. apiculatus, Lev. Hams Hall. On Trifolium. Aug., Sept.
Coleosporium tussilaginis, Lev. Abundant everywhere. July—Nov.
C. campanulæ, Lev. Solihull. Oct.
C. rhinanthacearum, Lev. Harborne, on Bartsia. Aug., Sept.
C. senecionis, Fr. Very common, Sutton, etc. July—Oct.
Melampsora euphorbiæ, Cast. Very common, Sutton, etc. Aug.—Nov.
Lecythea saliceti, Lev. Clent Hills, *W. H. Wilkinson.* Aug.
Œcidium ranunculacearum, DC. Alvechurch. May.
Œ. urticæ, DC. Common everywhere. May—Aug.
Œ. tussilaginis, Pers. Abundant everywhere. May—Oct.
Œ. depauperans, Vize. Perry Barr. July—Sept.

HYPHOMYCETES.

Isaria farinosa, Fr.* Sutton Park. Sept., Oct.
Anthina flammea, Fr. Sutton, amongst moss. Oct.
Ceratium hydnoides, A. and S. Driffold Lane, Sutton. Autumn.
S. vulgare, Tode. Driffold Lane, Sutton. June.
Tubercularia vulgaris, Tode.* Abundant everywhere. Autumn.
Epicoccum neglectum, Desm. Sparkhill; Harborne. Sept., Oct.
Ægerita candida, Pers. Water Orton; Sparkhill. Sept., Oct.
Sporocybe byssoides, Fr. Driffold Lane, Sutton. June—Nov.
Helminthosporium obovatum, Berk. Driffold Lane, Sutton. July.
Macrosporium cheiranthi, Fr. Witton; Driffold Lane. July—Sept.
M. sarcinula, Berk. On grass leaves, Harborne.* Aug.
Cladosporium herbarum, Link.* Common everywhere. Autumn.
C. epiphyllum, Nees. On oak leaves, Harborne. July.
Aspergillus glaucus, Link. Very common. At all times.
Nematogonum aurantiacum, Desm. On dead elm bark, Driffold Lane, Sutton. Sept., Oct.
Peronospora infestans, Mont. Too common. July, August.
P. obliqua, Cooke. On dock leaves, everywhere. May—Oct.
Cystopus cubicus, Str. On salsify, Hall Green. July.
Polyactis vulgaris, Link. On dead leaves, Barnt Green. May.
P. cana, Berk. Edgbaston; Hampton. April—Aug.
P. fascicularis, Corda. Sutton; Harborne; Perry Barr. April—Oct.
Penicillium crustaceum, Fr. Abundant everywhere. At all times.
Oidium chartarum, Link. Driffold Lane, Sutton. April.
O. fulvum, Link. Driffold Lane, Sutton; on dead wood. Feb
Stysanus stemonitis, Corda. On an old oak post, Great Barr. Oct.
Dactylium roseum, Berk. On bark; Sparkhill; Great Barr. Oct.
Sporotrichum sulphureum, Grev. In a cellar; Driffold Lane, Sutton. April.
Sepedonium chrysospermum, Link. On decaying Boleti, Sutton Park. Sept.
Trichoderma viride, Pers. Driffold Lane, Sutton; Sparkhill. Feb.—Nov.

W. B. Grove, B.A.

(To be continued.)

* These and others are only forms of fungi recorded elsewhere.

Erratum.—Since pl. 84 of the "Illustrations of British Fungi" is now declared to be *Ag. inversus*, Scop., and not *Ag. flaccidus*, Sow., the record of the latter species on p. 234 must be transferred accordingly to the former.

ON THE BREEDING OF THE GREAT CRESTED GREBE (*PODICEPS CRISTATUS*—Linn.) IN NORTH OXFORDSHIRE.*

BY OLIVER V. APLIN.

Early in August last (1882), in company with Mr. H. Holbech, of Farnborough Hall, I paid a visit to Clattercut Reservoir—an extensive piece of water situated in the northern part of this county, not far from its Warwickshire boundary—for the purpose of examining the Great Crested Grebes which he had reported as breeding there.

This reservoir forms, so to speak, the extremity of a little vale running down to the Cherwell Valley. The ground slopes down to it, therefore, on three sides, and, as it is enclosed on these three sides with large hedges, and is furnished with reed beds along the banks, especially at the upper end, it forms a favourite resort for our water birds. Moreover, as it is preserved by the tenant of the adjoining lands, it adds security to its other qualifications.

Approaching quietly from behind the hedge bordering the upper end we cautiously pushed through a gap, and from the shelter of the reeds and tall herbage eagerly scanned the water. We were at once rewarded by seeing a fine adult example of the object of our search fly out from among some coots and pitch again farther out on the pool. With the help of a glass we made out two pairs of old birds, and two half-grown young accompanying one pair. On a subsequent visit, after long and patient waiting, I succeeded in making out two more young, nearly full-grown and quite independent of the old ones. When the birds were feeding it was seldom that the whole number could be seen at once, as one or two were nearly always beneath the surface. I found that on an average they stayed under water while one could count seventy or eighty. They would frequently swim along for some distance with the bill and face submerged, the neck being stretched out along the surface of the water. Doubtless they were in search of the small fry of fish. The smaller pair of young kept closely with the old ones, and were frequently fed by them, although able, apparently, to fish for themselves. When undisturbed, the birds carry the neck bent, the head drawn back, and the crest and ruffs depressed ; but on the least alarm the neck is stretched to its full height, and the crest and ruffs are erected, giving the bird an extremely watchful look. One remarkably fine adult male swam quite close in to our place of concealment, and when at length he did catch sight of us he was a picture indeed ; the shining white of his breast and neck, the glossy black crest, and rufous tints of the ruffs showed up beautifully in the sunlight against the water. After favouring us with a decided stare, he turned and swam rapidly out to a safer distance. It has been,

* Read before the Oxfordshire Natural History Society, at a meeting held in the University Museum, 20th October, 1882.

I believe, a general opinion that this species is, to say the least, extremely unwilling to take wing: our observations, however, do not at all accord with this idea, the old birds several times rising and flying for some little distance. Their feet, indeed, generally dipped the water, and a good deal of wing-flapping seemed necessary; but still they proceeded at a fair pace.

Mr. Holbech tells me that he saw three young there in July, 1880, and, from the fact of two pairs having nested there this season, I am in hopes that this fine species may become thoroughly established in the locality.

The brothers A. and H. Matthews, who wrote from Weston-on-the-Green an account of "The Birds of Oxfordshire and its Neighbourhood," published in the "Zoologist" for 1849-50, p. 2,623, state simply that the species "is sometimes found in this neighbourhood." Although I have several notes of the occurrence of these birds in North Oxon and parts of the adjoining counties during the last few years, and Mr. Everard im Thurn (who collected for a short time in the district), informs me that he has twice obtained the mature birds, I have been unable to find any other record of their breeding with us.

The specimen on the table (exhibited by Mr. Fremantle, of Balliol College) is labelled Winslow, Bucks, August, 1878. It is, I would suggest, just commencing its second year. In the spring following it would have partially developed the crest and ruffs of the more mature bird, and in the spring of its third year would probably have attained the full breeding dress of the adult, an example of which will be found in one of the cases devoted to the collection of British birds here.

Reviews.

The British Moss Flora. By R. Braithwaite, M.D., F.L.S. Part V., 4s. Fam. VII.—Dicranaceæ.

This part fully sustains the high reputation of the author for fulness of description and fidelity of delineation. Descriptions are given of the various species belonging to the genera Seligeria, Brachydontium, Blindia, Didymodon, Dicrano-Weissia, and part of Dicranum; and it contains four 8vo. plates giving faithful illustrations of twenty-seven of the species described. The nomenclature is not always that to which British botanists have been accustomed, but the full and complete synonymy of each species renders such alterations a matter of no inconvenience to the student. J. E. B.

British Museum—(Natural History).—An illustrated Guide to the Exhibition Galleries of the department of Geology and Palæontology in the British Museum of Natural History, South Kensington, has just been printed by order of the Trustees. The work, which has been prepared by Dr. Henry Woodward, Keeper of the Department, contains pictures of the *Mastodon*, Irish Elk, Musk Ox, *Glyptodon*, *Dinornis*, *Ichthyosaurus*, and other prominent fossil animals; and it gives a brief account of some of the characteristic genera represented in the cases of the Museum. Thus, in reference to the Beaver, the following remarks are made on p. 14 :—"The Beaver is not only widely spread at present, but its fossil remains prove it to have had an equally wide distribution in the past. It was once abundant in this country, as, for instance, in the valley of the Lea, near London, and in the Cambridgeshire Fens. It is still found living in some of the rivers of Russia, and also in those of North America. A far larger species of beaver, called *Trogontherium*, once inhabited Norfolk, where its remains have been found in the Cromer Forest-bed. A still more gigantic form, the *Castoroides Ohioensis*, is represented by a cast of the skull and lower jaw, from the Post-Tertiary of North America." Again (on p. 51) we are informed that "In Wall-cases 5 and 6 are placed the curious shells called *Hippurites*, allied to the existing Chamas. They probably lived clustered in coral-reefs, like their modern representatives. They are seldom met with in the Cretaceous rocks of this country, but the 'Hippurite Limestone' is largely developed on the Continent, in France, Spain, and Italy; it also occurs in the East and West Indies." Such a Guide must add largely to the educational value of the Museum. Its price is threepence.

METEOROLOGY OF THE MIDLANDS.

BY CLEMENT L. WRAGGE, F.R.G.S., F.M.S., ETC.

THE WEATHER OF OCTOBER, 1882.

The same general report from our stations;—a month of atmospheric disturbance, dull and gloomy, with constant rain and some fog. At Orleton the rainfall was more than double the average, and at Henley-in-Arden the fall was "the greatest registered, with the exception of 1875." The highest reading of the barometer took place on the 5th, and was 30·555, the lowest occurred on the 24th, and was about 29·072 (corrected and reduced mean values for Central England). The great storm and barometric depression that came up suddenly from the Bay of Biscay on the early morning of the 24th, and succeeding floods, will long be remembered. The "greatest fall" occurred generally at this time, accompanied at some stations by hail and heavy snow. At Spondon the snow was "sufficient to break down laburnum trees." Mean temperature was about 48·9, amount of cloud 7·5 (scale 0 to 10) and relative humidity 92%, these being means for the Midland District deduced from values furnished by geographically selected stations. North-easterly and southerly winds were frequent. The absolute maximum temperature (reported) in sun's rays was 117·9, and took place on the 1st at Hodsock; absolute mininum on grass 22·1, on 26th, at Oxford. Bright sunshine 74·7 hours at Hodsock, 61·5 at Strelley, or 19% of possible duration, 70· at Oxford, and 67·7 hours at Blackpool. The mean temperature of the soil at a depth of 1ft. was 51·6 at Hodsock, 49·6 at Strelley, and 53·5 at Cardiff. The mean amount of ozone was 1·0 at Oxford, 3·9 at Cheltenham, 4·8 at Carmarthen, and 4·2 at Blackpool (scale 0 to 10). Mean sea temperature at Scarborough 53·9, or 2·5 degrees above previous 5 years' average. Displays of aurora on 2nd and 14th. Lightning on 8th, 20th, and 22nd. Lunar halo on 20th and 24th. Heavy snow fell on Ben Nevis during the last part of the month, and the work of observing on the mountain was carried on with much difficulty. The great comet was well observed throughout the country.

STATION.	OBSERVER.	RAINFALL. Total for M. In.	Greatest fall in 24 hours. In.	Date.	No. of rainy days.	SHADE TEMP. Absolute Maximum. Deg.	Date.	Absolute Minimum. Deg.	Date.
OUTPOST STATIONS.									
Ben Nevis (a)	C. L. Wragge, Esq., F.M.S.	6·41	·93	2	27	48·8	4	22·0	29
Fort William (a)	C. L. Wragge, Esq., F.M.S.	3·25	·62	2	21	67·1	1	29·4	26
Spital Cemetery, Carlisle	I. Cartmell, Esq., F.M.S.	2·76	·50	15	22	68·8	2	29·2	26
Scarborough (a)	W. C. Hughes, Esq., F.M.S.	4·70	1·32	24	24	67·3	1	36·9	26
Blackpool (a)—South Shore	C. T. Ward, Esq., B.A., F.M.S.	4·00	·76	22	20	66·1	1	32·2	26
Llandudno (a)	J. Nicol, Esq., M.D.	2·64	·88	14	20	71·2	1	38·4	26
Lowestoft (a)	H. E. Miller, Esq., F.M.S.	4·92	·93	28	19	66·9	1	35·6	30
Carmarthen (a)	G. J. Hearder, Esq., M.D.	8·17	1·36		24	65·1	1	33·0	25
Cardiff (a)	W. Adams, Esq., C.E.	8·33	1·64	24	23	64·4	1	33·2	26
Altarnun, near Launceston (c)	Rev. J. Power, F.M.S.	7·85	1·25	24	21	63·0	1,2,3,6,18	32·0	26, 27
Sidmouth (a)	W. T. Radford, Esq., M.D.	7·39	1·57	23	28	64·0	1	36·2	26
Guernsey (a)	F. C. Carey, Esq., M.D.	6·71	·89	28	24	67·6	1	42·4	30
Les Ruettes Brayes, Guernsey (a)	A. Collenette, Esq., F.M.S.	7·20	·89	23	26	66·3	1	40·3	30
MIDLAND STATIONS.									
HEREFORDSHIRE.									
Burghill (a)	S. A. Chapman, Esq., M.D.	4·45	·94	24	24	65·3	1	27·5	26
SHROPSHIRE.									
Woolstaston	Rev. E. D. Carr	5·46	·72	24	26	62·5	1	36·0	27
Stokesay (a)	M. D. La Touche	5·39	·64	24	24	64·5	1	28·1	26
More Rectory	Rev. A. S. Male	5·36	·59	24	26	65·0	1	27·0	29
Dowles, near Bewdley	J. M. Downing, Esq.	5·94	1·61	24	23	72·0	6	27·0	24
WORCESTERSHIRE.									
Orleton, near Tenbury (a)	T. H. Davis, Esq., F.M.S.	5·76	·90	24	28	66·8	1	26·7	26
West Malvern	A. H. Hartland, Esq.	4·94	1·56	24	18	64·5	1	32·0	23
Evesham	T. J. Slatter, Esq., F.G.S.	6·28	1·26	24	27	66·0	1	30·5	26
Pedmore	E. B. Marten, Esq.	5·79	1·50	24	26	67·0	1	30·0	24
Stourbridge	J. Jefferies, Esq.	5·66	1·41	24	26	69·0	4	28·0	25
STAFFORDSHIRE.									
Rowley Regis	C. Beale, Esq.	4·99	1·20s	24	25	63·0	1	31·0	24
Dennis, Stourbridge (a)	C. Webb, Esq.	5·22	1·20s	24	20	66·0	1	26·0	26
Kinver	Rev. W. H. Bolton	5·76	1·45	24	24	65·0	1	31·0	24, 25
Walsall	N. E. Best, Esq.	7·21	1·76	24	29	63·0	1	31·0	24
Lichfield	J. P. Roberts, Esq.	5·56	1·66	24	23	66·0	2	27·0	25
Burton-on-Trent (c)	C. U. Tripp, Esq., F.M.S.	5·27	1·39	24	27	68·0	1	27·0	26
Wrottesley (a)	E. Simpson, Esq.	5·80	1·32s	24	21	64·8	1	30·9	26
Barlaston (a)	W. Scott, Esq., F.M.S.	5·03	·44	11-21	19	64·3	1	32·2	25
Tean (c)	Rev. E. T. Ryves, F.M.S.	5·26	1·17	24	25	68·0	2	24·0	26
Heath House, Cheadle (a)	J. C. Philips, Esq., F.M.S.	5·37	1·07s	24	25	64·2	1	27·9	26
Oakamoor, Churnet Valley (a)	Mr. Williams	5·68	1·24	24	24	65·5	1	26·0	26
Beacon Stoop, Weaver Hills (a)	Mr. James Hall	68·7	—	—	—	61·1	—	37·0	—
Alstonfield	Rev. W. H. Purchas	6·32	·80	11	24	62·7	1	20·3	26
DERBYSHIRE.									
Stony Middleton	Rev. U. Smith	5·64	1·21	4	22	59·0	2	29·0	25
Fernslope, Belper	F. J. Jackson, Esq.	6·36	1·51	24	27	66·0	1	31·0	26
Spondon	J. T. Barber, Esq.	5·61	1·46	24	24				
NOTTINGHAMSHIRE.									
Park Hill, Nottingham (a)	H. F. Johnson, Esq.	5·43	1·51	24	24				
Hodsock Priory, Worksop (a)	H. Mellish, Esq., F.M.S.	4·93	1·66	24	24	68·1	1	28·2	26
Strelley (a)	S. L. K. Edge, Esq.	5·36	1·15	24	24	64·9	1	29·1	26
Tuxford	J. N. Dufty, Esq., F.G.S.	5·48	1·72	24	21	66·0	1	29·0	26
RUTLANDSHIRE.									
Uppingham	Rev. G. H. Mullins, M.A., F.M.S.	5·53	1·48s	24	24	66·7	1	32·5	24
LEICESTERSHIRE.									
Loughborough (a)	W. Berridge, Esq., F.M.S.	5·22	1·31	24	21	67·4	1	29·8	26
Syston	J. Hames, Esq.	5·06	1·31	24	24	65·0	1	32·0	26
Town Museum, Leicester	J. C. Smith, Esq.	5·56	1·28	24	15	67·4	1	0·2	26
Ashby Magna	Mr. T. Carter	5·55	1·16	24	24	64·0	1	31·0	26
Waltham-le-Wold	Edwin Ball, Esq.	5·40	1·27s	24	24	67·0	1	32·0	25, 26
Coston Rectory, Melton (a)	Rev. A. M. Rendell	5·11	1·30	24	26	67·0	1	27·3	26
WARWICKSHIRE.									
St. Mary's College, Oscott (a)	W. Middleton, Esq.	5·89	1·74	24	27	65·3	1	31·4	26
Henley-in-Arden	T. H. G. Newton, Esq.	6·55	1·45s	24	22	66·5	1	24·0	26
Kenilworth (a)	F. Slade, Esq., C.E., F.M.S.	5·74	1·32	24	22	66·8	1	26·0	26
Rugby School (c)	Rev. T. N. Hutchinson	5·62	1·44	24	24	65·0	1	30·0	26
NORTHAMPTONSHIRE.									
Pitsford, Northampton	C. A. Markham, Esq.	5·80	1·35	24	28	67·0	1	27·0	26
Towcester	J. Webb, Esq.	6·18	1·20	24	25				
Kettering	J. Wallis, Esq.	5·10	·95	24	25	67·0	2	31·0	26
BEDFORDSHIRE.									
Bedford (a)	H. J. Sheppard, Esq.	4·81	·86	24	22	69·0	1	29·5	26
OXFORDSHIRE									
Radcliffe Observatory, Ox. (a)	The Staff	5·76	1·46	23	20	67·2	1	31·8	26
WILTSHIRE.									
Marlborough (a)	Rev. T. A. Preston, F.M.S.	6·74	1·83	23	25	66·0	1	28·3	26
GLOUCESTERSHIRE.									
Cheltenham (a)	R. Tyrer, Esq., B.A., F.M.S.	5·83	1·11	23	26	67·0	1	30·5	26

(a) At these Stations Stevenson's Thermometer Screen is in use, and the values may be regarded as strictly intercomparable. (c) Glaisher's pattern of Thermometer Screen employed at these stations.

Correspondence, etc.

New British Pilobolus.—In September last I had the pleasure of finding a Pilobolus on cow dung at Water Orton, which at first I confounded with *P. crystallinus*. I have since discovered that it is not that species, but *P. Klenii*, Van Tieghem, which has not hitherto, I believe, been recorded for Britain. A description, with figures, will be published in a future number.—W. B. Grove, B.A.

Beavers.—In connection with a statement in regard to the continued existence of beavers in the course of the Middle Elbe, I can state that they still exist in the following places:—(1.) Near Klieken, in the circle of Coswig, Duchy of Anhalt, both on the property of Baron Lattorf, and also on that of His Serene Highness the Duke of Anhalt; (2) at Walter Niemberg, at the junction of the brook Nuthe with the river Elbe; and (3) they are found also in some numbers in the extensive forests on the banks of the Oder and Vistula. As a boy, I myself have kept a tame beaver, and up to the year 1848 they were by no means rare in the localities cited. The first or second of these localities is the one referred to by the correspondent on page 142.—G. T. C. Schwarz, Ph.D.

Late Nesting of House Martin.—On October 17th House Martins, *Chelidon urbica* (Linn.), were still feeding their young in a nest at Bodicote. I noticed one or two birds flying about over Oxford from the 20th to the 23rd, and on the morning of the 25th a pair were hawking over Bodicote village, chiefly on the south side of a house, remnants of the snow storm of the previous day still covering the ground in places. It is curious to note that although a few martins generally hang about their breeding places for some days after the Swallows have departed, yet when a very late straggler of the tribe does appear—as they have occasionally been known to do, even up to Christmas—it is almost always of the latter species.—Oliver V. Aplin, Banbury, Oxon, November, 1882.

Dicranum montanum in Bedfordshire.—When moss hunting in Aspley Woods last August, a patch of *Dicranum scoparium* growing on an oak tree attracted my attention, and as it looked in fine condition a gathering of it was made. About three weeks after a portion of this and some other duplicates were sent to Mr. Boswell for his criticism and identification. A reply was shortly after received to the effect that the packet labelled *Dicranum scoparium* was that plant and another, probably *montanum*, and if really so, it was a most interesting find. An examination of the remainder of the packet resulted in the detection of sufficient for identification, and for a duplicate to be sent to Dr. F. A. Lees for the Botanical Record Club. This, however, was scarcely sufficient to satisfy my wishes, so an early opportunity was taken to revisit Aspley Woods, fifteen miles distant. This was not very difficult, although out of the railway track—thanks to facilities for "cycling" on three wheels. Fortunately, the exact tree was easily remembered, as it grows in a moist spot, close by "Merry Maid Pond," in which Bog-mosses and Sedges flourish. A careful search soon revealed the presence of *Dicranum montanum* on that, and also on two other oak trees close by.

In no case was there any large quantity, and for obvious reasons not much was gathered. Upon comparison with some fine specimens of this moss sent me previously by Mr. Bagnall, there was no doubt as to its identity, but the Bedfordshire specimens, so far as observed, are more diminutive than those received from Warwickshire. —J. Saunders, Luton.

[I have carefully examined specimens of the Aspley Wood moss, sent me by Mr. J. Saunders, and agree with Mr. Boswell's opinion that it is *Dicranum montanum*. This is an interesting find, and confirms my opinion that the moss will be found to have a larger area of distribution if sought for on the roots of oaks and alders than has been anticipated. Hitherto the plant has only been recorded from three of Watson's provinces, viz., 3, 5, and 15. To this record we must add province 4, sub-province 12, West Ouse. The Warwickshire habitats belong to both "Mid Severn" and "West Trent."—J. E. Bagnall.]

Galena in the Lower Keuper Sandstone.—While examining, in the spring, the cuttings for the Charnwood Forest Railway, now in course of construction along the northern border of the Forest, I was rather startled at one spot to find Galena in large quantities in Lower Keuper Sandstone. About a mile and a quarter south-west of Sheepshed the bed of the long-deserted Charnwood Canal passes through a deep cutting in the coarse red sandstone which there forms the base of the Keuper. It was in the section here exposed, and just underneath the bridge which carries the road from Sheepshed to Blackbrook, that the Galena occurred. The ore was contained in pebbles and rolled lumps of impure limestone of the Carboniferous type, and not unlike that worked years ago at Dimminsdale, in South Derbyshire, six or seven miles to the north-west. The Galena was present in considerable quantity, and in the samples I was able to bring away formed fifty to sixty per cent. of the mass. The calcareous matrix of the pebbles presented a somewhat spongy texture on account of the percolation of acidulated water. The limestone pebbles seemed to occur at only one spot, so far as I could make out. On the west side of the bridge, a large hole by which the lead ore appeared to have been extracted was now bricked up. The impression that the spot had been worked for lead was confirmed by a native of this part, who happened to be passing by at the time of my visit, and who informed me that he could remember, many years ago, a large quantity of lead being got out here. Be that as it may, of the occurrence of pebbles of Carboniferous limestone in the Lower Keuper Sandstone there could be no doubt. There was little or nothing in the section to indicate the direction of the currents that brought the Keuper sediment. About a mile farther east, however, I noticed a bed of sandstone in the Keuper at a higher horizon, which could be traced for half a mile or more, steadily tailing away in an easterly direction. The occurrence of inliers of Carboniferous Limestone at Grace Dieu, Osgathorpe, Barrow Hill, Breedon Cloud, and Breedon Hill, which evidently formed islands during Lower Keuper times, suggests the probability that other bosses exist still farther east, but which are now buried beneath the pall of Keuper marl. It was probably from one of these supposed concealed bosses of limestone that the pebbles found in the Keuper were derived. My examination of the spot, I may add, was cut short by a storm of wind and rain, and another opportunity never came. Hence this imperfect record. The ground is now occupied by the railway.—J. Shipman, Nottingham.

Questions and Answers.

BURNISHERS.—I am informed that great numbers of these stones have been and still could be, if required, picked from the surface soil, and in some cases from as much as ten to fifteen feet in depth below it in the neighbourhood of Measham, Willesley, Donisthorpe, Overseile, etc., in South Derbyshire, and North-west Leicestershire. Can any of our readers furnish some description of these valuable rocks, or more correctly fragments and pebbles of rocks, stating size, colour, weight, derivation, distribution, use, etc., of them, and whether fossiliferous or not? I have reason to think that the study of these burnishers will at any rate be of interest if not of service to some of us.—W. S. GRESLEY, F.G.S., 27th October, 1882.

[The stones to which Mr. Gresley refers as "burnishers" are, I suppose, the *agates* which occur in the Bunter conglomerate and in the drift (derived from the Bunter) of the Midland counties. These agates consist of silica, coloured usually by a litttle oxide of iron, and they were formed by water (containing silica in solution) trickling through rocks and filling up cavities in its course. The beautiful markings seen in polished sections of agates represent the various layers of deposition, the outermost being the first formed, as a lining to the cavity through which the water passed. Many splendid specimens, illustrating the mode of formation of agates may be seen in the Jermyn Street Geological Museum, London; they are, of course, unfossiliferous. Professor Ruskin wrote some papers on agates, magnificently illustrated, for the "Geological Magazine" about ten or twelve years ago, and he has lately reproduced these in his publication entitled "Deucalion." As to the rocks whose disintegration yielded the agates, my opinion is that they formed a ridge running roughly east and west across the midlands—the southern coast line of the Triassic sea, in fact. This question I have lately dealt with in some detail in a paper published in Vol. III. of the Transactions of the Birmingham Philosophical Society, entitled "On the Quartzite Pebbles contained in the Drift and in the Triassic Strata of England; and on their Derivation from an ancient land barrier in Central England."—W. JEROME HARRISON, Birmingham, Nov. 13th, 1882.]

Reports of Societies.

BIRMINGHAM NATURAL HISTORY AND MICROSCOPICAL SOCIETY.—GENERAL MEETING—October 31st.—Mr. J. E. Bagnall exhibited the following plants:—*Œnanthe Lachenalii*, new to Warwickshire, from near Stratford; *Rubus emersistylus*, Haywoods (rare); *Potamogeton densus*, Napton-on-the-Hill (rare); *Carex ericetorum*, grown from roots obtained from the only British station; *Eriophorum gracile*, and *Utricularia intermedia*, from the New Forest, collected by Mr. Bolton King; *Artemisia Norvegica*, from the only European station, and *Myricaria Germanica*, both from Norway, collected by Mr. J. B. Stone; *Dicranum fuscescens*, a moss new to Warwickshire, from Maxtoke; a number of lichens, and the following fungi:—*Russula Queletii*, *Leptonia lampropus*, *Hydnum scrobiculatum*, and *Hygrophorus hypothejus*, all new to Warwickshire; and others, including a few species from the New Forest, collected by Mr. M. C. Cooke. Mr. Morley exhibited *Polystichum angulare proliferum*; and Mr. Wilkinson *Dædalea quercina*, from Clent, and *Peziza*

aurantia, from Solihull. Mr. W. B. Grove exhibited the fungi—*Collybia butyracea* and *Clitocybe phyllophila*, from Water Orton; *Pluteus cervinus*, from Solihull; and *Hygrophorus coccineus*, *H. pratensis*, and *H. hypothejus* (the last species new to Warwickshire), from Curdworth. Mr. Grove also read a note on an interesting fungus, *Pilobolus Klenii*, Van Tieg., in which its life-history and structure were described. Mr. Morley then opened the discussion on the question, "Is Fertilisation necessary to the indefinite Perpetuation of a Species," in which he took the negative side, quoting instances of the many plants which are known to reproduce themselves by bulbils, or cuttings, without the production of true seed. He especially referred to *Saxifraga cernua*, which grows upon Ben Lawers, and has never been known to produce a perfect flower, nor consequently any seed, in that locality. Mr. Grove, who took the opposite side, quoted Herbert Spencer's theory of Genesis, of which the following is an outline:—"Life essentially depends upon a capacity for change. Every homogeneous mass, unacted upon by outside forces, is incapable of change, *i.e.*, is dead. Every mass of heterogeneous units tends continually to homogeneousness. The physiological units of which an individual is composed have a certain amount of similarity. Another individual, derived from this by agamogenesis, that by a sexual multiplication, has a still greater tendency to or a greater probability of homogeneousness. If this process is continued the ultimate descendants tend towards a completely homogeneous state. But life depends upon the action and reaction of heterogeneous units upon one another, and therefore an approach to homogeneousness is accompanied by weakened vitality, and complete homogeneousness is death. To avert this end gamogenesis intervenes; the union of a sperm-cell and a germ-cell from different parts produces a germ which contains within it the necessary heterogeneity, and which therefore has a greater vitality and renewed chance of life. This was illustrated in many ways, especially by Darwin's great law of cross-fertilisation; and, finally, it was pointed out that gamogenesis only delays the evil day of final extinction, which the theory indicates as the doom of every species. Agamogenesis may reproduce the species for an indefinite time in some of the lower forms, but certainly in none of the higher plants or animals. Mr. Southall pointed out the additional proof which was furnished by the fact that all the cultivated varieties of apple, rose, potato, &c., are dying out, being reproduced agamogenetically, and new varieties which are produced from seed are taking their place; but Mr. Morley replied that in his opinion this merely arose from the vanished sorts having passed out of fashion, and hence not being taken care of as they required. The question under discussion was finally answered in the affirmative by a majority of those present.
BIOLOGICAL SECTION.—November 7th.—Mr. J. E. Bagnall exhibited:—Mosses—*Tortula mucronata*, *T. latifolia*, *Anomodon viticulosus* (all rare), and *Orthotrichum rivulare* (new to Warwickshire), from Preston Bagot; Fungi—*Scleroderma geaster* (new to Warwickshire), *Craterellus cornucopioides* (rare), *Sphærobolus stellatus* and *Clitocybe fragrans*, from New Park, Middleton; and other fungi from Mr. M. C. Cooke. Mr. W. B. Grove exhibited *Polyporus annosus*, from Sutton: and *Lepiota carcharias*, from Water Orton; also, on behalf of Mr. W. H. Wilkinson, *Geoglossum glabrum*, from Sutton Park. Mr. W. G. Blatch exhibited *Myrmecoxenus vaporariorum*, a very rare beetle, found near Birmingham, and new to the district; also some fire flies, *Lampyris splendidula*, from Switzerland, on behalf of Mr. C. Pumphrey. Mr. W. Phillips, F.L.S., read a paper "On the Breaking of the Shropshire Meres," the subject of which was the phenomenon which has been observed for many years in a small group of lakes near Ellesmere, in Shropshire. The title given to this appearance by the country people of the neighbourhood, "The Breaking of the Meres," is misleading, inasmuch as the effect is due only to the excessive growth of a few species of minute algæ. These accumulate in enormous quantity, forming a dark verdigris-green scum on and near the surface of the water. The species to which it is chiefly due are *Rivularia articulata*, *Anabæna flos-aquæ*, *Cylindrospermum Ralfsii*, and *Aphanizomenon flos-aquæ*. The phenomenon probably occurs in many lakes, but it has been chiefly observed in Ellesmere, Kettle-

mere, Boldmere, Newtonmere, and other meres in Shropshire, to which the local name "breaking" is apparently confined. Mr. Phillips referred to instances of similar occurrences in other countries, and mentioned that during the continuance of this excessive growth fishing was entirely stopped; the fish became "sick," probably from the algæ blocking up their gills, and thus impeding their respiration. Mr. Phillips also exhibited two remarkable objects occasionally found in the same lakes; one was what are there called "hedgehogs," large round masses composed of larch leaves agglomerated together in some mysterious and wonderful way, probably by the constant rolling of the water, in the same way as a rolled snowball increases, although in this case the means by which the leaves were held together was not obvious; the other was the hard round stony masses of *Conferva ægagropila*, which were formed of a compact mass of the filaments of that alga, growing radially from a central point. Mr. A. W. Wills referred to the analogous case observed by him of the development of *Hydrodictyon utriculatum* in Blackroot Pool in great quantity about eight years ago, since which time he had never seen a single frond in that habitat. Mr. J. Miller mentioned that he had observed the same thing to take place in a small lake near Diss, Norfolk, where it was called "sickening." Mr. R. M. Lloyd stated that a similar thing occurred at times in the summit reservoirs of the Birmingham Corporation, and Mr. Wills that the Leicester filter-beds were sometimes checked and rendered useless by the growth of enormous quantities of some species of Diatoms in the water. November 13th.—THE ANNUAL SOIREE was held in the Town Hall. The chief feature of the display was, as usual, the show of microscopes, of which there were over sixty, arranged on the floor of the Hall. They were placed so as to lead the visitors successively through the whole of the Animal and Vegetable Kingdoms, except that objects of Pond Life were shown at a separate table, and not in their place in the series. The galleries were occupied by miscellaneous exhibits, including Geological specimens by Messrs. W. J. Harrison, C. A. Matley, C. Mantell, and F. A. Walton; a collection of the Fungi of the neighbourhood, by Messrs. J. E. Bagnall and W. B. Grove; British Molluscs, by Messrs. W. H. Boland and J. Madison; British Birds and Birds' Eggs, by Messrs. R. W. Chase, R. F. Felton, H. C. Grove, John Grubb, and J. Hiam. One of the most striking exhibits was a collection of Blaschka's Glass Models of Marine and Terrestrial Organisms, which, from their gelatinous or fragile nature it is impossible to preserve by ordinary methods; lent by the Mason College, under the care of Professor Bridge. There were also a few collections of drawings, etc., especially twenty Pencil Drawings of Scenes and Antiquities in England and Wales, by Mr. W. Willis, lent by Mr. G. Tangye. GENERAL MEETING.—November 21st.—Mr. R. W. Chase exhibited a very rare bird, *Ruticilla tithys*, the Black Redstart, from near Brighton; also, *Ruticilla phœnicina*, the Common Redstart, from this neighbourhood for the sake of comparison. Mr. J. Levick exhibited forty-eight very beautiful and accurate water-colour drawings of microscopic objects, the work of Mr. E. T. Draper, F.R.S. These represented many plants and animals, &c., familiar to microscopical students, and were much admired. Mr. W. B. Grove exhibited the following fungi:—*Melanconis stilbostoma*, on birch bark, from Edgbaston; *Nematogonum aurantiacum* and *Peziza calycina*, from Sutton Park: *Polyactis fascicularis*, *Trichoderma viride*, *Polyporus obducens*, *Stilbum nigrum*, *Peziza cinerea*, and *Helotium pallescens*, from Sutton. Mr. W. G. Blatch read the first part of some remarks upon the Entomology of the Midlands, in which he advocated the publication by the Society of lists of all kinds of the Fauna and Flora of the district, and presented the first instalment of a list of the Coleoptera, including the Hydrodephaga, the Geodephaga, and Palpicornia. Mr. Grove, while allowing the uses and advantages of such lists, remarked upon the impossibility of procuring them to order. Every list, if it should have the slightest value, must be the spontaneous work of some enthusiastic local observer who devotes his whole spare time to the pursuit. Messrs. R. W. Chase, J. Morley, J. Levick and others also made a few remarks, especially upon the richness of the field which the Midlands offer for such research. Mr. Blatch and Mr. Chase then renewed the offers which they had previously made to the Society to furnish as complete collections as possible of the Coleoptera and Birds of the Midlands respectively, if the Society would provide proper cabinets for storing them.

NORWICH GEOLOGICAL SOCIETY.—At the anniversary meeting of this Society, held on November 7th, the President (Mr. William Whitaker, B.A., F.G.S.), read a very interesting address "On things in general and Red Chalk in particular." After referring to recent publications on the Geology of Norfolk, he turned his attention to the literature of the Red Chalk, noticing the many opinions expressed about its age and relations. The stratigraphical evidence seemed to him to favour the view that the Red Chalk was the basement bed of the White Chalk; but the palæontological evidence seemed to put a veto on this, unless we can explain the occurrence of the many Gault forms, either by derivation (of which we have no evidence), or by local survival to later times; and he believed that something of this sort may have occurred; at all events, he had found numbers of specimens of the *Belemnites minimus* in the Chalk Marl of Norfolk.

OXFORDSHIRE NATURAL HISTORY SOCIETY—October 27th.—A meeting was held in the University Museum. Professor Westwood. M.A., F.L.S., presided, and contributed some magnificent water-colour paintings of Natural History subjects, made by a Scotch lady, one a picture of a large Atlas Moth on a branch of a species of Hibiscus being specially admired. The Professor also exhibited and described a series of insects whose depredations on vegetable life do much damage; one of the species *Heracliaria*, whose life-history Professor Westwood had traced out, attacking the seeds of parsnips, others the vine, cabbage, asparagus, &c. Mr. T. F. Fremantle, of Balliol College, exhibited a specimen of the Great-crested Grebe, caught near Winslow, Bucks, which it was suggested came from a reservoir near Tring, a well-known breeding place of that species. Mr. Macpherson exhibited in the flesh a male Goshawk *(Astur palumbarius)*, netted near Horspath on October 12th. He also showed, by permission of Mr. Darby, a pair of Hobbies *(Falco subbuteo)*, shot near Cumnor in June last, together with their nest and eggs. He exhibited a living Chaffinch with a tendency to albinism, and commented upon its general development. He read a note from Mr. S. Salter, jun., late of Egrove, on the Lesser Redpoll, a nest of which was obtained near Oxford in May, 1882. Mr. Macpherson made a few remarks on the Goldfinch, expressing a hope that the close season for this charming species might be extended, in order to recruit its numbers, upwards of 300 Goldfinches, netted near Oxford during the last eight weeks by only three of the local bird-catchers, giving some idea of the war waged against the Goldfinch throughout the greater part of England. He then read a paper on "Birds Observed on the Western Coast of Scotland and the East Coast of England," in the course of which he sketched an outline of the main features of Hebridean bird life, laying some stress on the remarkable tameness of some small birds, especially of the Twite, in certain localities; on the breeding of the Goldfinch in Sleat: on the Raven, Hooded Crow, and Chough; on the Peregrine Falcon and White-tailed Eagle; on the Sheldrake and Redbreasted Merganser (of which several pairs bred on islands in Loch Dunvegan during the late season); the Manx Shearwater and the nesting habits of the Black Guillemot were also discussed, after which Mr. Macpherson read his autumn notes on the birds of Aldborough, where he had observed a great migration of Sand Martins, together with a few House Swallows, as early as the 6th of September, between six and seven a.m., upon the coast. Mr. Macpherson met with the Grey Phalerope, Great Skua, Lesser Tern, Sanderling, Green Sandpiper, Knot, and the Bartailed Godwit in summer plumage, Scoter Duck, and Pygmy Curlews, together with other marsh-loving species: and exhibited skins of the Pygmy Curlew, Lesser Tern, and others of the foregoing, together with those of the Golden Plover, both in transitional and winter dress, the Ringed Plover, Dunlin. &c. Mr. O. V. Aplin read a note on the nesting of the Great Crested Grebe (*Podiceps cristatus*) in Oxfordshire, for which see page 275.

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