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TRANSACTIONS
OF THE
NATURAL HISTORY SOCIETY
OF
NORTHUMBERLAND, DURHAM,
AND
NEWCASTLE-UPON-TYNE.

(New Series.)

VOL. I.



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ERRATUM.

By an oversight, the plates accompanying Miss M. V. Lebour's paper on Larval Trematodes (page 437) have been numbered from IX. to XIII. instead of from XI. to XV.

New Series

1904

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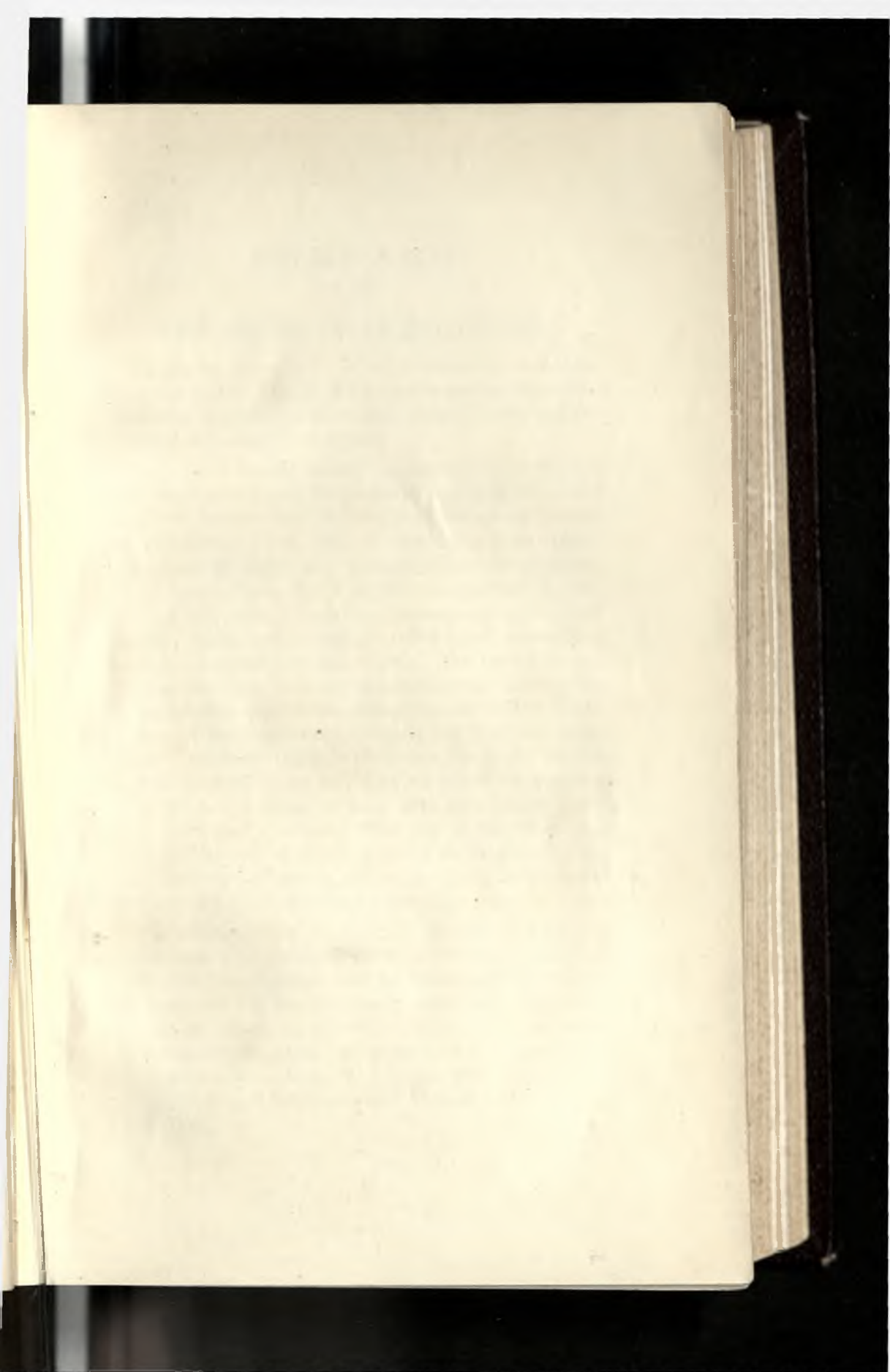
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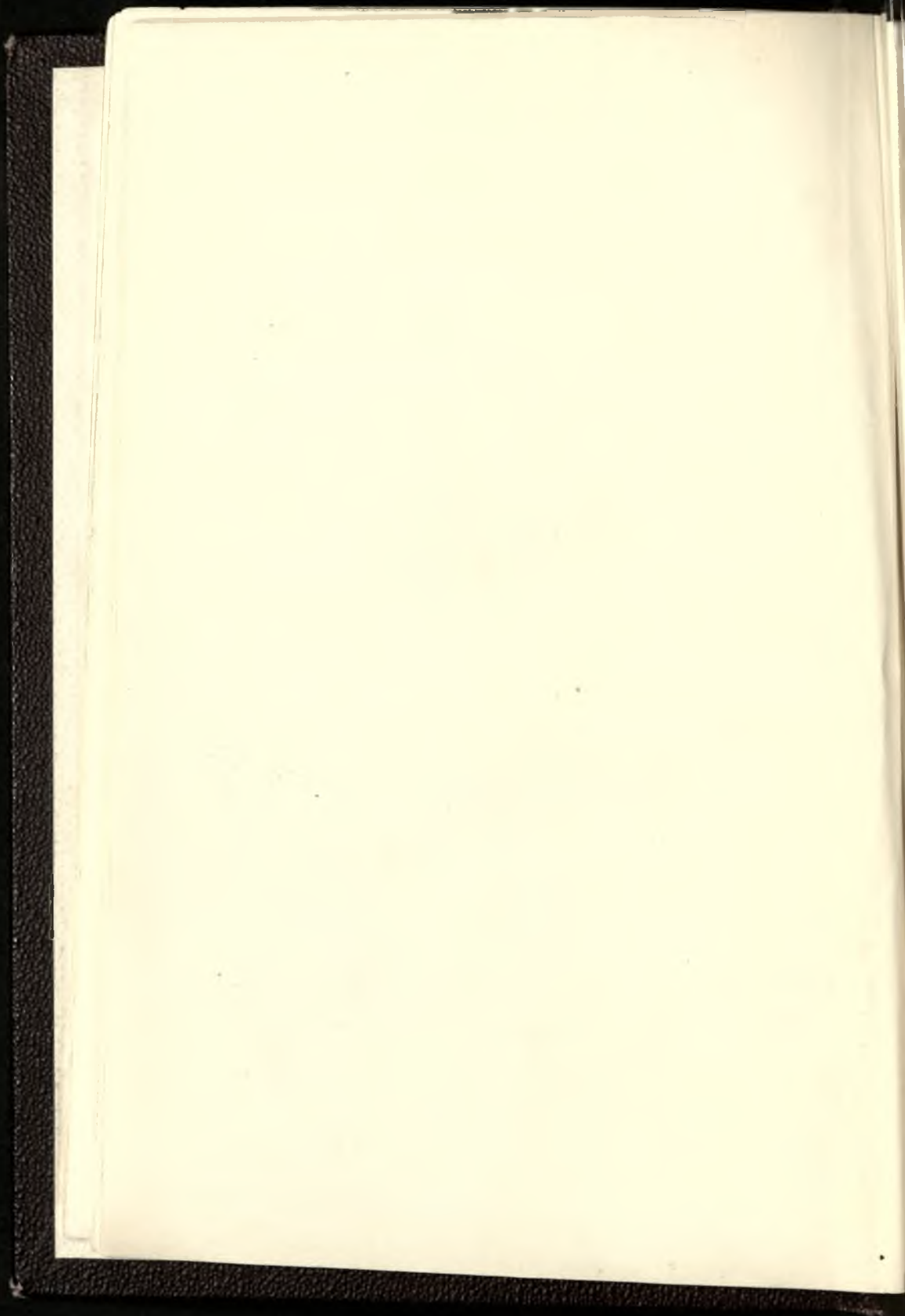
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PREFACE

TO THE

NEW SERIES OF TRANSACTIONS.

IN introducing a new series of the Transactions, it may be of service to notice briefly the several preceding series that have been published by the Natural History Society and the Tyneside Naturalists' Field Club.

The Natural History Society was founded as an offshoot from the Literary and Philosophical Society in 1829, and published between that date and 1838 two quarto volumes of transactions. The issue of transactions then ceased, though annual reports were regularly printed and published. The Tyneside Naturalists' Field Club, inaugurated in 1846, took up the work of publishing papers relating to local natural history, and issued six volumes of transactions covering the period from 1846 to 1864. The Field Club and the Natural History Society then agreed to unite in publishing a joint series under the title of the "Natural History Transactions of Northumberland, Durham, and Newcastle-upon-Tyne"; and from 1864 up to the present time (1903) this has formed the medium for publishing the papers and reports of both bodies. Fourteen volumes have been issued in this joint series, and a fifteenth, consisting of the second part (Microlepidoptera) of Mr. J. E. Robson's catalogue of the local butterflies and moths, still remains to be added as the first part of the present series is going to the press.

The occasion which has rendered desirable the starting of a new series is the recent decision of the Tyneside Naturalists' Field Club to amalgamate with the Natural History Society. In consequence of this, the auspices under which the transactions are issued are somewhat changed; and the series now entered upon bears once more the title of the earliest of its predecessors, namely, the "Transactions of the Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne."

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TRANSACTIONS
OF THE
NATURAL HISTORY SOCIETY
OF
NORTHUMBERLAND, DURHAM, AND NEWCASTLE-
UPON-TYNE.

Notes on Entomostraca found at the Roots of Laminariæ.

By GEORGE S. BRADY, M.D., LL.D., D.Sc., F.R.S.
(Plates 1 and 2).

READ FEBRUARY 24TH, 1903.

The much-branched and spreading roots or hold-fasts of *Laminariæ* afford shelter to many small animals, chiefly perhaps Crustaceans, but also Mollusca, Annelida, and other groups. On this account they supply an interesting hunting ground to the micro-zoologist. By hooking up the tangles with the stones to which they are attached, then detaching the roots and immersing them for a short time in a bucket full of sea water the animals are tempted out of their retreats, and may easily be collected by pouring off the water through a fine muslin net. In this way I have frequently made collections, and I propose now to give lists of the species which have been found in three different localities,—Holy Island (Northumberland), Gare Loch (Clyde), and Roker (Durham). These three habitats are distinguished opposite the names of the various species by the initials H, G, and R. Among these Laminarian gatherings I have met with no species quite new to science, though there are several new to our district and otherwise imperfectly known, respecting which I have given some notes and drawings. I have added also figures and description of a new Ostracod taken during the first "Stanley" expedition in 1901. But this is supplementary, and is not at all a Laminarian species.

Some observations on the early stages of growth of a very common Copepod—*Harpacticus chelifera*, O. F. Müller—have seemed to me worth brief notice and illustration. Very young

specimens of this species living among laminarian roots or the very darkly coloured fuci of tide-pools have a tendency themselves to become very dark in colour, or even quite black, this condition wearing off gradually as life advances. I think, however, that *H. chelifera* seldom or never under these conditions attains the size or vigour which characterises it when living in more open situations.

LIST OF SPECIES TAKEN AT THE ROOTS OF LAMINARIÆ.

COPEPODA.

- Longipedia coronata*, Claus, H
- Ectinosoma normani*, T. Scott, H
- Amymone rubra*, Boeck, H
- Stenhelia hispida*, Brady, H
- „ *herdmani*, A. Scott, H
- Laophonte horrida*, Norman, H
- „ *serrata* (?), Claus, H
- „ *lamellifera*, Claus, R
- „ *curticauda*, Boeck, H
- Cletodes longicauda*, Brady & Robertson, H
- „ *linearis*, Claus, H
- „ *similis*, T. Scott, H
- Pontopolites typicus*, T. Scott, H
- Dactylopus brevicornis*, Claus, H
- „ *platycheles*, Brady, R
- „ *tisboides*, Claus, H
- Thalestris rufoviolascens* (?), Claus, R
- „ *longimana*, Claus, H
- „ *forficuloides*, T. Scott, H
- „ *hibernica*, Brady and Robertson, H
- „ *rufocincta*, Norman, R
- Westwoodia nobilis*, Baird, R
- Harpacticus chelifera* (Müller), H
- „ *flexus*, Brady and Robertson, H
- Zaus spinatus*, Goodsir, H R
- Pelididium interruptum*, Goodsir, H
- Idya furcata*, Baird, H
- Scutellidium fasciatum*, Boeck, R
- Cyclopicera berniciensis*, Brady, H
- Asterocheres boeckii*, Brady, H
- Temora longicornis*, Müller, H
- Thorellia brunnea*, Boeck, H G
- Cyclops salinus*, Brady, H G

GENUS AMYMONE, Claus.

Amymone rubra, Boeck (Plate I., fig. 13).

1872. *Amymone rubra*, Boeck, Nye Slægter og Arter af Saltvands-Copepoder, p. 16.

I give here a figure drawn from one of a few specimens taken at Holy Island: these are identical with the species already figured and described by me in the Ray Society "Monograph of British Copepoda," under the name of *Amymone spherica*, Claus. This, however, seems to be a mistaken reference. I now think that the form in question is referable to *A. rubra*, Boeck, and not to *A. spherica*. In this opinion Prof. G. O. Sars, who has kindly examined my specimens, agrees. The points in which the Holy Island specimens do not correspond with *A. spherica* as described by Claus are, chiefly, the shape of the hinder part of the body and the size and proportions of the antennal joints.

GENUS STENHELIA, Boeck.

Stenhelia denticulata, I. C. Thompson.

1893. *Stenhelia denticulata*, Thompson. Revised Report on the Copepoda of Liverpool Bay (Trans. Liverpool Biological Society), p. 30. Plate XXX., figs. 1-11.

The large tooth on the under side of the second joint of the anterior antenna is very characteristic of this species, which has been figured and described by Mr. I. C. Thompson. My specimens were taken by the dredge three miles off Whitley in a depth of twenty fathoms: I have no note of the number. I think only one or two were recognised, but it is very likely that others escaped notice.

Stenhelia herdmani, A. Scott.

Stenhelia herdmani, A. Scott. Some new and rare Copepoda from Liverpool Bay (Trans. Liverpool Biological Society), vol. V., p. 60, Plate 1, figs 1-11.

A few specimens from washings of Laminaria roots at Holy Island. Mr. Scott kindly examined my mountings, and agrees with me in referring them to this species.

Harpacticus chelifer, O. F. Müller (Plate 2, figs 9-16).

I figure here some of the appendages of young specimens of *H. chelifer* found among roots of *Laminaria*. The young of this species grown under such conditions is generally extremely melanotic: this I have noticed in specimens taken at Holy Island and Gare-loch, as well as in those taken among fuci in tide-pools at North Sunderland, and I believe that the same tendency may at times be seen in the young of other species. The dark coloration disappears gradually with the growth of the individual, and is usually entirely lost—giving place to the normal pale brown or straw-colour—before the full growth is attained. I give in Plate II. examples of these conditions as seen in a very early and in a rather later stage of development.

GENUS PONTOPOLITES, T. Scott.**Pontopolites typicus**, T. Scott (Plate I., figs. 4-12).

Pontopolites typicus, Scott, Additions to the Fauna of the Firth of Forth (Twelfth Annual Report of the Fishery Board for Scotland), p. 251, Plate VIII., figs. 9-17.

This interesting species was described and figured by Mr. Scott from specimens taken off Musselburgh. But in some minor characters, chiefly connected with the setiferous armature of the limbs, my specimens appear to differ from the types: I therefore give drawings of some of the more important parts. I have not been able, with the most careful examination, to detect on the limbs any plumose hairs such as are represented in Mr. Scott's figures nor any ciliation at their joints: the setæ of the secondary branch of the posterior antennæ are considerably longer than those of the Scotch specimens. Mr. Scott describes and figures the fourth pair of feet as having a rudimentary inner branch similar to those of the second and third pairs: the Holy Island specimens, however, do not show this, but have no internal branch, unless the very minute spine indicated in fig. 10 be taken to represent one.

GENUS CYCLOPS.

Cyclops salinus, G. S. Brady (Plate I., figs. 1-3).

This species was described by me in Vol. XIII. of the "Natural History Transactions of Northumberland and Durham," from a single imperfect specimen taken at Alnmouth. Those here noticed—of which I give two amended figures—were got at Holy Island and at Gare Loch (Firth of Clyde). In each case only one example was found, so that this, like other marine forms of *Cyclops*, seems to exist in comparatively small numbers. Marine conditions do not appear favourable to the constitution of the genus.

It will be noticed that the jointing of the anterior antenna (fig. 2) is here much more distinct than in the Alnmouth specimen. I have been able also to figure the fifth foot (fig. 3) which, as to its terminal joint, much resembles *C. æquoreus*: the basal joint is, however, much larger than in that species.

OSTRACODA.

FAM. CYPRIDIDA.

GENUS ARGILLÆCIA.

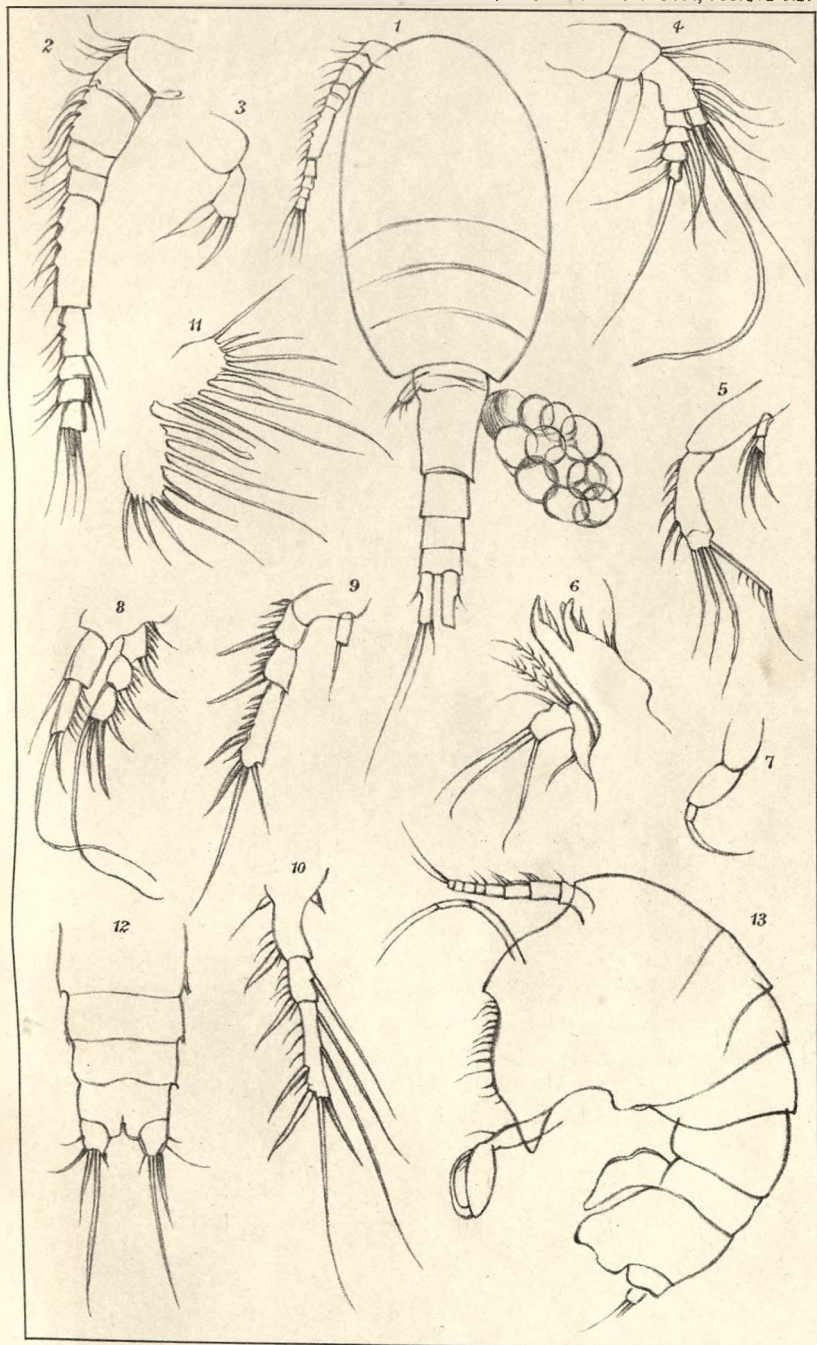
Argillœcia propinqua, sp. nov. (Plate II., figs. 1-8).

Shell elongated, subovate, greatest height in the middle, equal to more than one-third of the length; seen from the side, evenly rounded in front, posterior extremity obtusely pointed below the middle, dorsal margin evenly arched, steeply curved behind, ventral slightly sinuated about the middle; seen from above the outline is somewhat cuneate, the greatest width situated posteriorly and equal to the height, lateral margins moderately curved, converging rather abruptly at the front, which is obtusely pointed; posterior extremity broadly arcuate, right valve rather larger than the left, overlapping behind, but in front slightly overlapped by the opposite valve: surface of the shell quite smooth; colour dull white. Length .52 mm.

Anterior antennæ (fig. 3) six-jointed, short and stout, third joint equal in length to the combined fourth, fifth, and sixth, which are short and nearly equal: the third joint bears two very long and three short setæ, the fourth and fifth two long and one short, and the sixth five rather short ones; the two basal joints, which are much stouter than the rest, bear also a few short setæ: posterior antennæ (fig. 4) five-jointed, terminal joint armed with a few short claw-like setæ, third joint with two rather larger, curved setæ. First pair of maxillæ of the usual four-lobed type; second pair (fig. 5) small, palp indistinctly three-jointed and bearing a long terminal claw. First and second pairs of feet nearly alike, five-jointed, first pair with two rather stout terminal claws (fig. 6), second with two apical setæ, the smaller of which bears a few second barbules on the distal half of its posterior margin (fig. 7); the last joint of both limbs extremely small. Post abdominal rami (fig. 8) very small, bearing two small apical setæ and three rather larger lateral ones.

Hab.—One specimen only (a female) taken in depth of 59 fathoms, 29 miles east of Alnmouth.

As compared with *Argillæcia cylindrica*, the only recognised British species, the shell of *A. affinis* is somewhat larger and more evenly rounded in front, while the contour as seen dorsally, instead of being regularly oval with nearly equal pointed extremities, is nearly cuneate, being slightly tapered in front and broad behind. Neither can the species be referred to any of those described by G. W. Müller in his work on the Mediterranean Ostracoda. Sars describes the anterior antennæ as five-jointed, but in this species the thick basal portion is distinctly two-jointed, the more slender apical portion four-jointed.

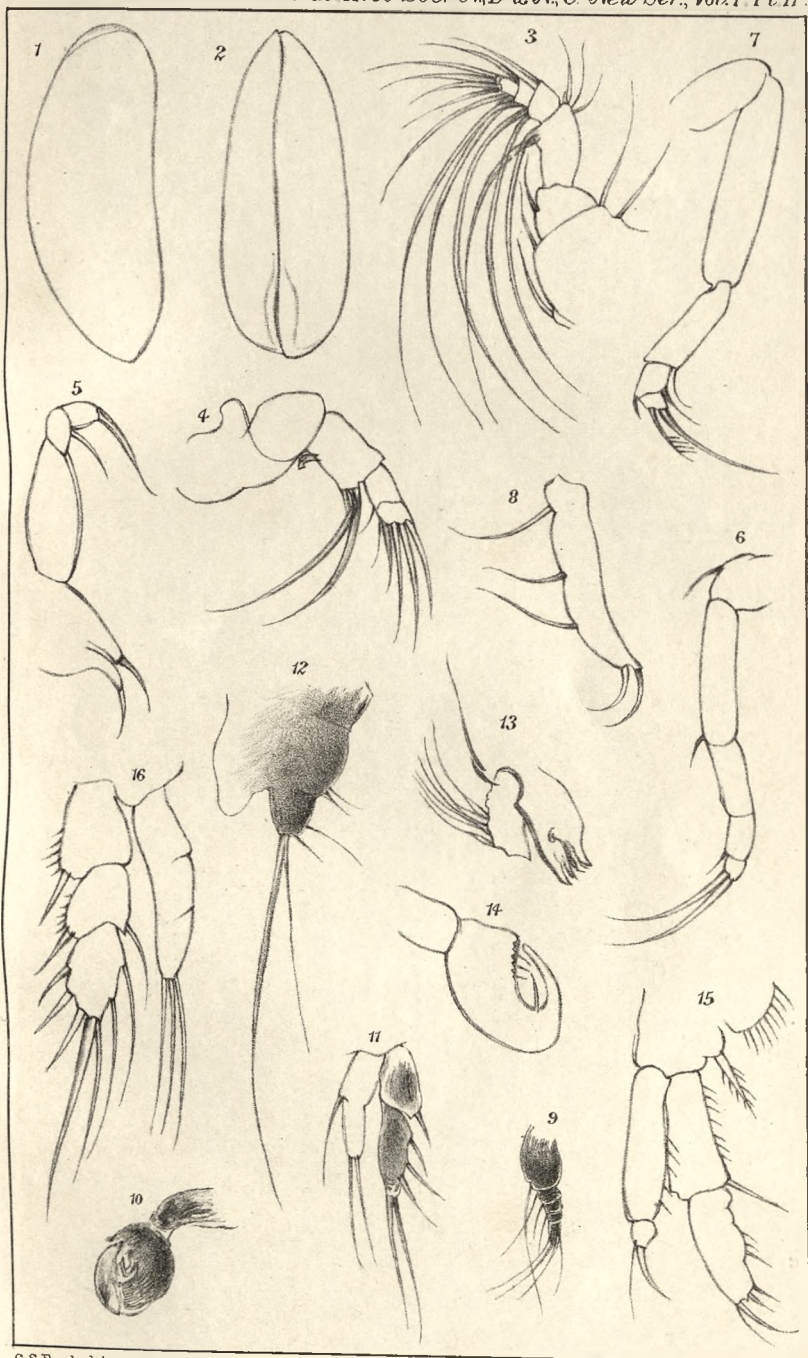


G. S. Brady del.

C. West & Sons lith.

Figs. 1-3 *CYCLOPS SALINUS*
 " 4-12 *PONTOPOLITES TYPICUS*
 13 *AMYMONE RUBRA*.





G. S. Brady del.

G. West & Sons lith.

Figs. 1-8 ARGILLECIA PROPINQUA
" 9-16 HARPACTICUS CHELIFER.

EXPLANATION OF PLATES.

PLATE 1.

CYCLOPS SALINUS.

- Fig. 1. Female $\times 140$.
 2. Anterior antenna of same $\times 300$.
 3. Posterior „ „ $\times 300$.

PONTOPOLITES TYPICUS. ♀

4. Anterior antenna } $\times 360$.
 5. Posterior „ }
 6. Mandible $\times 660$.
 7. Posterior footjaw $\times 360$.
 8. Foot of first pair }
 9. „ third pair } $\times 360$.
 10. „ fourth pair }
 11. Fifth pair of feet $\times 240$.
 12. Abdomen and tail $\times 120$.

AMYMONE RUBRA.

13. Female $\times 170$.

PLATE 2.

ARGILLÆCIA PROPINQUA.

- Fig. 1. Shell seen from right side $\times 84$.
 2. „ „ above $\times 84$.
 3. Anterior antenna } $\times 240$.
 4. Posterior antenna }
 5. Posterior maxilla $\times 440$.
 6. Foot of first pair } $\times 240$.
 7. „ second pair }
 8. Post-abdomen $\times 320$.

HARPACTICUS CHELIFER $\times 240$.

9. Anterior antenna }
 10. Posterior footjaw } Very early stage of development.
 11. Foot of first pair }
 12. Furca }
 13. Mandible }
 14. Posterior footjaw } Later stage.
 15. Foot of first pair }
 16. „ third pair }

ANCIENT EGYPT.

*Natural History, &c. History and Chronology. Architecture.
The Temple, as illustrated, mainly, by the ruins of Karnak.*

A lecture delivered before the Natural History Society on
January 20th, 1903, by R. C. CLEPHAN, F.S.A.

EGYPTOLOGY is a science, vast, and far-reaching; covering, as it does, a period of ancient history and experience of five thousand years or more; furnishing many parallels and valuable lessons for our guidance; and exhibiting so many springs of religious thought. It comes, perhaps, only second in human interest to natural science; and has points of contact with it, more especially in the intimate connection of Egyptian symbolism with objects in nature.

GEOLOGY.

The geological features of the country shortly summarized are as follows. The deposit left by the Nile varies in thickness, but may be said to average about 30 feet, and the land would appear to be gradually rising. This long oasis, so to speak, is bordered on either side by hills; which from Cairo southwards, nearly as far as Edfoo, are composed of nummulite or magnesian limestone: beyond is mostly "Nubian" sandstone, through which the beautiful rose granite of Syene crops up at Assouan. This granite is used in the construction of the Nile dam at the first cataract.

NATURAL HISTORY.

Among the domestic animals now in the country are the horse, camel, ass, buffalo, ox, sheep, goat, swine, the dog and cat, the turkey, goose, pigeon, and hen. The gazelle, oryx, ibex, and even wildfowl are shown on the many agricultural and pastoral scenes as being domesticated, but neither the camel, sheep, buffalo, nor hen is mentioned on the monuments, or in papyri; while the horse first appears on inscriptions after the campaigns of Thotmes I. in Asia, about B.C.

1,700. The pig was looked upon as an unclean animal in ancient times, and is to-day only kept in Egypt by Copts and Europeans. It appears in a picture of *Judgment by Osiris*, from the 17th chapter of the Book of the Dead (*peri-en-hru*, coming forth by day out of the nether world). A copy of the vignette is before you. The heart of the departed is being weighed, in the Hall of the Two Truths, by Anubis; while Toth, the recorder, notes down the deeds done in the body; and should the evil predominate, the soul is scourged from the judgment hall in the body of a pig; but punishment is not eternal. Osiris, as judge of the dead, is assisted by a sort of jury of forty-two good and evil genii. The Book of the Dead is the most ancient in the world. Sir J. Gardner Wilkinson copied a text in the 17th chapter from the sarcophagus of a queen of the eleventh dynasty, chiseled more than 5000 years ago. A portion of the book may be seen in the library of the Durham College of Science.

Among the wild animals still to be found in the country are the leopard, wolf, hyæna, jackal, lynx, and fox, the wild boar, antelope (*Bekhar-el-wahsh*), ibex, gazelle, the mufflon or maned sheep, the desert hare, coney, jerboa, and dormouse. Bats and ichneumon are very common; lizards, both land and water varieties, abound, but the crocodile is now seldom seen below the first cataract of the Nile; while the hippopotamus has long since been banished from Egypt. Turtles, chameleon, and frogs are numerous.

Among snakes is the horned viper (*Cerastes*), the asp of the monuments. Its quantity in hieroglyphic is that of a goddess.

The Nile valley is a great thoroughfare for birds, and there are about 350 species frequenting Egypt proper—aquatic birds are especially varied and numerous. The sacred ibis (*I. æthiopica*) is still to be found far up the Nile. The Egyptian goose (*Chenalopex ægyptiacus*) is mentioned on the monuments as early as the eleventh dynasty, about B.C. 4500. This bird in hieroglyphics represents the primeval

earth. The *Birds of Egypt*, by Captain Shelley, is a good work to consult on this head.

Among insects is the beetle (*Scarabæus sacer*), the grasshopper, and locust. Butterflies are far from numerous, but moths and Ephemeridæ are common. Scorpions and spiders swarm in some localities, while mosquitos and fleas are perfect pests.

The Nile abounds with fish—one of the most remarkable is the *Polypterus* (bisheer), which is, I believe, present in our district coal measures. I am given to understand that it only now exists in the river Nile, above the second cataract. It is too long a story to tell you of the great difficulties I experienced in securing a specimen for the museum.

The flora consists of some 1,300 species, most of which are indigenous, the desert species alone numbering about 250. The papyrus plant is now extinct in Egypt, but the lotus is found in ponds in the Delta, but never in the Nile itself: it is a water-lily.

The Natural History Society of Newcastle-upon-Tyne, among a wealth of natural objects, perhaps second in importance only to those gathered together in London, is in possession of a collection of Egyptian antiquities of much interest, which, though small, is of considerable value to the student: and besides these objects there is a valuable series of copies of inscriptions from the monuments; examples of hieroglyphic, hieratic, and demotic writings; pictures taken from the walls of temples and tombs, exhibiting many phases of the social life, industries, and customs of the people: with many other interesting memorials of ancient Egypt. The Society would be thankful to any of our fellow citizens, possessing Egyptian antiquities, who would in any way contribute towards rendering the collection more representative for the purposes of the student. Scarabæi, ushabti or funerary figures, and statuettes of the gods, would be especially valued.

The broadening influence of the study of Egyptology is so great that I would like to see it systematically pursued by

some of our own students, as well as by those of the College of Science, with which institution our Society is so intimately connected.

HISTORY.

The history of Ancient Egypt is written on its rocks and reeds with a fulness that we lack concerning times immensely nearer our own. The dry climate has tended to preserve the monuments with their inscriptions, and the character of the tombs, in which so many records have been preserved for thousands of years, has saved much that would otherwise have been lost.

What we have learnt of the ancient history of the narrow strip of alluvial soil we call Egypt—extending more especially from Wady Halfa to the Mediterranean, with its marvellous fertility perennially renewed by its tutelary genius the Nile, making a garden of what would otherwise have been mere rocks and sand—presents a somewhat confused picture of periods of rise, progress, culmination and decline, interspersed with dark ages and brilliant times of *renaissance*, following each other repeatedly; and with but one important break, occurring in the reign of a king of the xviiith dynasty, an almost unchanging system of religion. The rich land of Egypt was repeatedly invaded and subjugated; sometimes the invaders were driven out, and at others they became absorbed in the native population: for a few generations sufficed to impose the Egyptian language, customs, and invincible modes of thought on the ruder intruders.

To realize, in some measure, the great antiquity of this civilization, which stood already high when history begins, carry your minds back to the span of over eight centuries since the Norman Conquest, or to the interval of time, say, between the supposed days of the traditional Romulus, B.C. 750, and the reign of the Emperor Marcian, 453 A.D., when an inscription in the temple of Philae shows that the worship of Isis was still being practised, in spite of the edict of Theodosius promulgated some seventy years before; and then compare

them with a period going back from our own times perhaps 8,000 years.

The history of Egypt may not improperly be said to begin with Menes, probably the first king of the first dynasty to wear the *pschent*, or double crown, of united Egypt; but we know practically nothing about him. Eusebius states that Manetho makes mention in his book, written B.C. 286, that Menes altered the course of the Nile, and that he was killed by a hippopotamus while hunting. No contemporary monument of his reign has been found.

Who can tell what illustrious lines preceded him? That Ptah, Ra, Shu, Seb, Osiris, Set, and Horus really reigned in the flesh is probable enough; and that the civilization was old when Menes lived, who can doubt? For these traditional dynasties begin to loom fitfully through the mists of untold ages, as suggested by light thrown on the ancient myths by more recent discoveries, and in the finds of jewelry and examples of the *faïence* of very early times, exhibiting an amount of artistic skill which must involve an apprenticeship of many centuries. It is interesting to know Manetho's views, as culled from the archives of the temples, concerning pre-historic Egypt. Eusebius, quoting him, says, that the reigns of the gods and demi-gods extended over 24,900 years; while the "Servants of Hor" (Horus) are referred to in the Turin papyrus, about B.C. 1700, as the predecessors of that known as the first dynasty.

The great sphinx, with its somewhat Nubian cast of features, and its temple, are now believed to belong to pre-historic times!

What high destinies may yet be in store for the down-trodden inhabitants of this wonderful land, where nature is so bountiful. I have known the country well for many years, and the contrast between its condition when I first visited it and to-day is truly startling, in its material prosperity, the numbers and character of its population, as well as in the area of land under cultivation.

The English intervention in the affairs of Egypt has been wholly beneficent; it has rescued the country from the hands of the spoiler, and put a new heart into the people, beginning, let us hope, one more period of *renaissance*. Some of the works recently completed are on a truly pharaonic scale of magnitude and engineering skill. The new barrage, at the first cataract, is a mile and a quarter long, 130 feet high, with a capacity of something like 25,000,000 cubic feet. It is pierced by 180 sluices, through which 15,000 tons of water can pass in a second. Like the obelisk of Hatasoo, it is built of the rose granite of Syene, about a million tons having been used for the purpose. The upper strata of the river bed were of too friable a nature for a foundation, and in one place a depth of 140 feet had to be cut down to before the hard diorite was reached. A navigable canal, with three locks, has been constructed for the shipping. The work is a triumph of science over the forces of nature, and the seven lean years should now be a thing of the past in Egypt. I have been much interested in this work, more especially as I bore some part in the discussions and negotiations that took place with a view to the saving of the temple of Philae. The earlier plans prepared and approved of by the authorities would have submerged it, and the original height specified for the dam was reduced so as to preserve it.

A question will naturally occur to you as to the means by which the chronology of Ancient Egypt has been, to a great extent, determined. The most important source of information is Manetho's list, a record written in Greek, compiled from the archives of the temples about B.C. 286 by an Egyptian priest, under the auspices of Ptolemy Philadelphus. The original has been lost, and we have to rely mainly on a copy from a Byzantine source of the eighth century of our era. This, doubtless the descendant of many copies, gives the names of the kings incorrectly and illegibly, leaving gaps of names not filled in, and showing signs of manipulation and even of interpolation, for such things were unhappily rife during the most controversial periods of the early Christian church.

Any of you who have had much to do with documents that have passed through the hands of the copyist several times can readily conceive how a text of such antiquity would get mangled in the course of time, transcribed by so many generations of priests and monks, often both ignorant and careless. As an independent record this copy would have been possessed of little value; but information derived from the *Chronicon* of Eusebius, the writings of Josephus, Julius Africanus, *De Iside et Osiride*, attributed to Plutarch, and others who made extracts from Manetho's book, have afforded invaluable assistance in filling in and correcting the list. Then comes the Turin papyrus, written in hieratic early in the XVIIIth dynasty, about B.C. 1700, which, as far as it goes, gives a list of kings; the later ones, with their reigns in years, months, and even days. In the earlier portion of the list unfortunately the chronological element is wanting; and here again we have long and critical periods more or less illigible, which is not surprising considering that the papyrus was pasted together in minute pieces. These two lists may be described as the ground plan for all systems: and they have been filled in and corrected, so to speak, by monumental records, such as the roll of Thotmes III., now at Paris, and Sethi's List of Ancestors, which is still at Abydos. A photograph of part of it is now reproduced on the screen. These data have been supplemented by cartouches* from the monuments; names on scarabæi; inscriptions on the rocks; lists of hereditary architects; certain astronomical conjunctions; papyri; and information collected and handed down by Greek and Roman travellers in Egypt such as Herodotus, Diodorus, and Strabo. These, though often inaccurate and misleading, have yet afforded many clues and hints, which, taken with other evidence, have proved invaluable. The historic parallels in Jewish, Assyrian, and other records furnish us with approximate landmarks.

The period of time covered by the first dynasty to the

* The name of a king is placed within an elliptical frame called by Champolion a cartouche.

thirty-third inclusive, that is from Menes to Cleopatra, is so immense, humanly speaking, that it is perhaps convenient to divide it as follows, viz., the *Old Empire*, the *Middle Empire*, and the *Later Empire*. The period covered by the domination of the Roman emperors is sometimes classed as a dynasty, the thirty-fourth, which came to an end with Heraclius, during whose reign the Saracens, under Amer, made themselves masters of Egypt in the seventh century of our era (A.D. 640). The old canal, cut between the Pelusiatic branch of the Nile and the Red Sea, was used by Amer for the transportation of grain. This canal was an ancient one then. Sethi I. either cut or cleared it for navigation about B.C. 1460, and a reference to the work is inscribed on the walls of Karnak; but there is some reason to believe that the antiquity of this or another canal, bringing the Mediterranean into communication with the Red Sea, is very much greater still.

CHRONOLOGY.

It has been thought by some that several of the dynasties given by Manetho are contemporaneous, which, if true, would materially reduce the span of Egyptian chronology as more generally admitted. The oldest ten dynasties of United Egypt, classed as the *Old Empire*, are generally admitted to commence with Menes, about B.C. 5,000, and to end about B.C. 3,200. The step pyramid at Sakkarah is attributed by some Egyptologists to one of the kings of the first dynasty, but firmer ground is reached in the third when the name of Seneferoo appears on the monuments. During the fourth the pyramids of Geezeh were built. We have beautiful mementos of the fifth in the tomb of Tih. This very early period was the heyday of Egyptian art; and I should be glad to show examples in my collection to any students of Egyptology. The sixth dynasty would appear to have been a powerful one, but little is known concerning it; while the seventh, eighth, ninth, and tenth have left hardly a trace behind them. These were dark ages, probably of invasion from Asia, coupled with civil discord.

The *Middle Empire*, composed of dynasties XI. to XVIII. inclusive, carries the chronology up to, say, B.C. 1460. Egypt emerges from the comparatively unknown during the XIth, and that art flourished then is indicated by an inscription in the valley of Hammamat commemorating an expedition to Ophir; but whether this place was located in our present possessions in Africa, south of the Lower Zambesi, or was situated nearer the coast as a station for collecting the gold, is still a matter of conjecture. This inscription discloses the interesting fact that gold was being drawn from these regions 2,000 years before the days of Solomon and Hiram, king of Tyre. Among the museum collection of pictures is a representation of the return of a vessel laden with gold, apes, trees, &c., in the days of Queen Hatasoo, about B.C. 1600. Gold was, however, drawn from Egypt itself in ancient times, and there are still traces of old workings in the country. An English company has been formed quite recently to work these mines, but operations have not yet got beyond the experimental stage. It is stated that in one working the quartz was literally held together with gold, and that in two days £1,180 worth of specimen ore was obtained.

The XIIth dynasty was a brilliant one, and memorable for some remarkable achievements. Some remains at Karnak speak to a style of architecture less conventional and more beautiful than anything that succeeded it. The famous labyrinth was built, and the celebrated reservoir, Lake Moeris dug out, on whose bed is now the fruitful province of the Fayoom. This age was remarkable for the magnitude of its irrigation works. Dynasties XIII. to XVII. inclusive represent another long period of decadence and dark ages.

In the XVth dynasty, about B.C. 2200, we have the invasion of the *Hyksos* or *Shepherds* (*hyk* or *hak* a prince, and *sos* Shepherd), probably Hittites (*Kheta*), who established their dominion in Lower Egypt; the upper kingdom being governed by native *Haks* or princes under the *Hyksos* rulers. It is probable that Joseph governed Egypt under Apopi of the XVIIth dynasty, the last of the Shepherd Kings.

According to the *Sallier* papyrus in the British Museum, attempts were made by Ra-sekenen, a *Hak* of Upper Egypt, to free the country from this foreign yoke; and the *Hyksos* were conquered and driven out of the country by Aahmes, probably the pharaoh "who knew not Joseph." He established the powerful xviiith dynasty, under which Egypt attained the culminating point of power and glory. I regret that time will not allow me to dwell on the illustrious reigns of his more immediate successors, all of whom contributed so largely to the building and decoration of Karnak.

The next dynasty, the xixth, which begins the period classed as the *New Empire*, was founded by Rameses I. about B.C. 1500. He was followed by Sethi I.; Rameses the Great succeeded. These three illustrious monarchs built the great hall of columns at Karnak. Rameses II. was probably the pharaoh of the Oppression, while his successor Sethi (Meneptah) II. is thought to have reigned at the time of the Exodus. Rameses lived to a great age, and during his reign the final decadence of Egypt among the nations began.

The xxth dynasty was founded by Rameses III., the Rhampsinitus of Herodatus, who was the last of the famous warrior kings of Egypt. After him succeeded many Rameses, each more feeble and degenerate than the other, coming steadily under the domination of the priestly caste of Amen, which in the person of the high priest, Hir-hor, at length usurped the crown and founded the next dynasty, the xx^{ist}. During the reign of his son Piankh, whose daughter king Solomon demanded in marriage, Egypt was invaded by the Assyrians under Naromath (Nimrod), who conquered the country. Nimrod lies buried at Abydos; and his son, Sheshonk, the Shishak of the Bible, founded the xx^{iind} dynasty. Chronology now becomes more exact and reliable, for we have many historic parallels. Jeroboam, the son of Nebat, was a refugee at the Egyptian court, and he induced Sheshonk to move against Rehoboam. An inscription on the walls of Karnak, which differs in some respects from the account given in Holy Writ, commemorates this campaign,

giving a list of the conquered towns, among them Jerusalem (*Fudah Melek*). The Society possesses this cartouche, copied from the inscription at Karnak. A list of the golden vessels of the temple brought from Jerusalem also appears in the inscription. Much light is thrown on the rapid rise of the kingdom of Israel, and it was the death struggle between Assyria and Egypt that left David free to acquire, and Solomon to consolidate, the great empire of Israel, which extended nearly to the borders of Egypt. The ultimate triumph of the Assyrians enabled Sheshonk to turn his victorious arms against Rehoboam, whom he conquered. The rest of the kings of this dynasty would appear to have been little better than Assyrian satraps. The xxiiird. dynasty is obscure; and during the xxivth. the Ethiopians conquered Upper Egypt. Tirkakah, of the xxvth., is mentioned in the Bible as "the king of Ethiopia"; and he was defeated by Esarhaddon, the grandson of Sennacherib. Sardanapalus (Assurbanipal) divided the kingdom into provinces, setting a satrap over each. One of these, Psamatic, established the xxvth. dynasty. Necho, his successor, defeated Josiah, king of Judah, at Megiddo, but was in his turn overcome by Nebuchadnezzar. Another pharaoh, Hophra (Apries), went to the assistance of Zedekiah.

Cambyzes, the Persian, conquered Egypt about B.C. 528, and he founded the xxviiith. dynasty, but the country regained its independence about B.C. 406, under Amyrtæus, in whose reign Herodotus visited Egypt.

The next two dynasties saw the last of the kings of Egyptian blood. Nectanebo built what is known as the pavilion of the temple of Philæ, and during his reign Plato visited Egypt. This king kept the Persians at bay for some time, but the country was reconquered by them B.C. 340. Their occupation was but short, for after Alexander the Great had defeated Darius III. he marched into Egypt, was received by the people as a liberator, and assumed the rule of the country, founding Alexandria. Ptolemy, the son of Lagus, who first governed the kingdom as lieutenant to Philip

Aridæus, seized the crown on his demise, and founded the long and remarkable XXXIIIrd. dynasty.

The Græco-Egyptian dynasty covers a period of about 275 years. Letters flourished, and the celebrated library of Alexandria was founded. In the reign of Ptolemy Philadelphus, the Greek translation of the Old Testament, known as the Septuagint, was accomplished, and the *History of Egypt*, written by Manetho; and many beautiful temples were built. After B.C. 205 Egypt began to come under the influence of Rome. This dependence gradually strengthened, and on the suicides of Antony and Cleopatra, in B.C. 20, Egypt became a Roman province. The period from the accession of Augustus, B.C. 27, to 640 in our era, when the Saracens under Amer conquered the country, is one of great interest, and more especially so in regard to the history and development of the early Christian Church; but this subject is too complex and far-reaching to be even touched upon this evening.

ARCHITECTURE.

The architecture of ancient Egypt is stiff, monotonous, and conventional, rather than graceful; and while massive, colossal, and impressive, it lacks the beauty of outline and sense of proportion which eminently distinguishes that of Greece; and this is especially the case with all buildings of a later date than those of the XIIth. and XIIIth. dynasties. Probably there existed some priestly censorship in Egypt which would tend towards rigidity and conventionality. The forms of Græco-Egyptian times would appear to have been fettered and constrained by a politic regard for national types and prejudices, and it is not before the Roman domination that we get lighter and more graceful outlines in the palm-leaf and acanthus volutes. Egypt had no definite orders of architecture.

The Egyptian idea of building for all time comes nearer realization than is the case with the work of any other people. The office of temple architect was hereditary in Egypt.

THE TEMPLE.

The temple is not a church in the ordinary sense, that is, a place for public worship, for the people had no right to address the deity except through the intermediation of Pharaoh, who partook of the divine nature. Rather is it the pharaoh's propitiatory offering to the deity whom he looked upon as his own special ancestor and protector: and it is, to a great extent, his own personal monument. The inscriptions which cover the walls form, for the most part, invocations addressed to the deity, offerings to the gods, and an inflated account of the pharaoh's own martial achievements and campaigns. There are frequent repetitions, and one cannot resist the impression that many were cut more especially for decorative purposes.

A typical Egyptian temple may be described something as follows. It is surrounded by its *temenos*, or sun-dried brick enclosure, within which is a lake for the sacred ark to sail on, brought in procession, shoulder high, from the tabernacle. The lake is surrounded by massive stone quays, with flights of steps down to the water, and there is a grove of palm trees within the enclosure. Entrance is through a pylon, a great triumphal gateway, bearing the cartouche, or oval, with the divine name of the king inscribed, and figures of the pharaoh cut in colossal proportions. An avenue, or *dromos*, of sphinxes leads up to the entrance propylon, with sentinel colossi flanked by obelisks, and through it you enter a large open court with colonnades; thence into the hypostyle hall of assembly, or *pronaos*. Around the sanctuary, or *naos*, which is the very heart and crux of the building, the holy of holies, are the various offices for the temple service, such as rooms for receiving offerings, apartments for the priests for robing and disrobing, sacrificial chambers, the treasury, &c. The *naos* contains a tabernacle of grey granite, used as a receptacle for the sacred ark, and perhaps also for the veiled emblem of the deity—this, the first chamber built, is indeed a perfect temple in itself. The illustration on the screen is taken from the sanctuary of Edfoo. The temple itself is a beautiful

restoration, by the Lagidae, of a much earlier foundation, and the tabernacle before you probably belonged to the more ancient building. Only the pharaoh and the priests were permitted to enter the sanctuary. The public were not admitted to view the processions beyond the hypethral court, but on certain occasions the members of the upper classes were allowed in the *pronaos* or hall of columns, beyond which all was sacred seclusion. The bright sunshine in the hypethral court is followed in the *pronaos* by a dim religious light, while in the sanctuary almost darkness reigns. There are no dwelling rooms for the priests. The columns are inscribed with figures, in *intaglio*, of the pharaoh, and of the vast pantheon of demi-gods; while the whole temple is vivid with the brightest colouring, every inscription being painted. Crypts are present in some of the later temples, and these also are covered with inscriptions; indeed, almost every inch of space of the entire building, both inside and out, is so treated. There is a somewhat crude drawing of such a temple in the museum collection, and you have a representation of the Temple of Edfoo before you.

The edict of Theodosius, 379 A.D., by which all pagan religions were abolished, soon made itself felt on the monuments of Egypt, which were afterwards offered up to the moloch of Christian fanaticism, and everywhere cruelly damaged to an extent that is most distressing to us now. The early Christians converted portions of the temples into churches, plastering over the inscriptions on the walls with stucco, which has now mostly peeled off, leaving the old pictures comparatively uninjured.

It is, of course, impossible to give anything like an adequate description of more than one temple this evening. That of Karnak is the most extensive and complex, being not one temple, but an agglomeration of many, built over a period of three thousand years; and it is for this reason that I have chosen it for exposition to you this evening.

THE GREAT TEMPLE OF KARNAK.

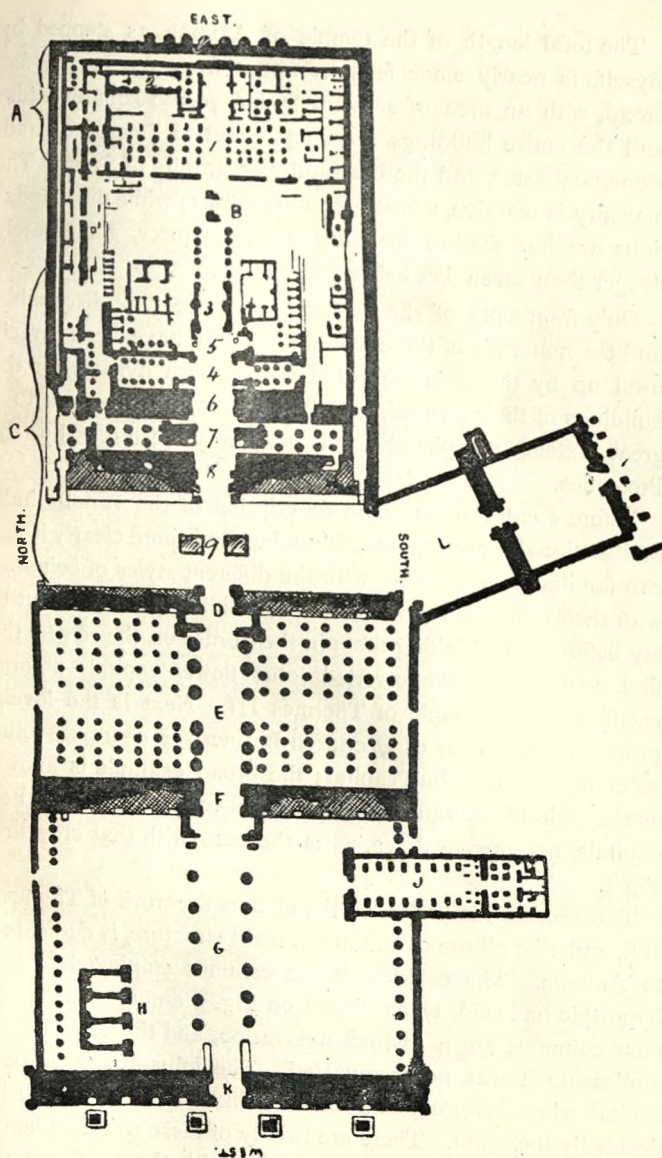
This temple, of which the ground plan is before you, differs from all others in the enormous period of time its erection covers, and in the number of kings who have contributed to its complex network of buildings, which were erected without any uniform plan, though presenting a harmonized whole; it grew up gradually.

The general scheme of dedication is to the Theban trinity of Ammon, Maut, and Khons, a perfect temple to each of the three persons, but still one homogeneous temple. The grand temple is dedicated to the supreme being, Ammon or Amen; and there is one towards the south, with Maut, the universal mother, for its patroness; while Khons, the son, is represented in a small temple, jutting out from the Bubastite Court of the temple of Ammon. The ground-plan will give you an idea of the general scheme of the Great Temple, with that of Khons; but the Temple of Maut, which is connected with that of Ammon by an avenue of four propylae, is too distant to be given on the scale, and is, in fact, in a ruinous condition. The first time I saw it was by moonlight, and the weird effect produced by numerous colossal statues of the goddess Maut or Mut among the ruins was very striking.

The Temple of Ammon.

Fergusson, in his *History of Architecture*, describes this "as the noblest effort of architectural magnificence ever produced by the hand of man," and he by no means overstates its grandeur; impressive as it is, not only for the beauty and majesty of what remains, but also in the sad picture of desolation it presents to-day: at once a marvel and a regret. The sacrilegious hand of man has wrought even more mischief than time itself, but the great earthquake of B.C. 27 is responsible for a great deal of the structural injury.

The oldest cartouche found among the ruins, is that of Osertasen I., XIth. dynasty, about B.C. 3,000, and the latest is that of Ptolemy Alexander II., B.C. 81, thus covering a period of nearly three thousand years.



GROUND PLAN OF THE TEMPLE OF KARNAK.

The inscriptions refer to the campaigns in Upper Ruten (Palestine); among the towns taken Megiddo, Carmel, Kishon, Damascus, Astoroth, Laish, and Joppa are mentioned, showing that these places were all in existence three centuries before the reputed date of the Exodus. The hall is 140 feet long by 55 feet wide, and still roofed over with the usual stone slabs. It is surrounded by a number of small chambers. The architectural effect is hard and unpleasing. Just beyond stand seven sixteen-sided columns of a chaste and lovely form, much resembling Doric—they are of the reign of Osertasen I. of the xiith dynasty, about B.C. 3000; and near them are four singularly beautiful columns of the lotus-bud type, presenting the effect of a lot of plants bound round together towards the necks, clearly indicating the artist's model; the shafts are slightly bulbous. The picture before you gives a side view of the hypostyle hall of Thotmes III., and shows both the proto-Doric and lotus-bud columns *in situ*. These harmonious forms doubtless exhibit the style of building in vogue some 5,000 years ago, which was afterwards followed by much more conventionality and stiffness of outline, as you will observe when the Great Hall of Columns comes under review. On the left angle of this section is a chamber known as the hall of ancestors, from which was removed to Paris the chronological tablet referred to under a previous heading.

Acquisitive tourists, dealers in antiquities, and even savants, have been very destructive among the monuments; and, in the process of hacking out historical records, they have wrought much damage to the surrounding inscriptions. Many of the reliefs in this wall are of the highest importance in the world's history.

One word as to the illustrious builder, the great Thotmes III., Thot or Toth's child (presumably the legendary Sesostris, or possibly he may have been Rameses the Great). Thotmes reigned 54 years, and we find his cartouche more widespread than any other; he conducted fourteen campaigns, and penetrated into the very heart of Asia. With the Egyptian fleet

he conquered Crete, Cyprus, Italy, and the coast portions of Greece and Asia-Minor. Thotmes III. was the greatest figure in Egyptian history, and it was during his long and glorious reign that the country attained the zenith of its power and splendour. We have a lasting memorial of this mighty monarch in our midst in the obelisk on the Thames Embankment, popularly known as Cleopatra's needle, which, however, was erected fifteen hundred years before the days of Queen Cleopatra, the last of the Ptolemies. Rameses II. appropriated the side left blank for his own inscription.

The hypethral court marked B divides the next mass of buildings from those under A, but owing to the almost hopelessly ruinous condition of the greater portion it is most difficult to define the several halls, chambers, and even pylons. The ancient sanctuary of Osertasen I. probably stood here, as the base of a fallen column bears the legend *Ra-Kheper-Ka*. This is the divine name of the king—*Ra*, the sun; *Kheper*, the earth, vivified by *Ra*; and *Ka* is the double, something perhaps between the soul and the shadow. The nucleus of the next group is the sanctuary, numbered 3, built of the lovely rose granite of Syene, one of the roofing stones of which is inscribed with the name of Thotmes III., who provided two golden doors. It was sorely battered by Sardanapalus or Cambyeses, perhaps both, but was handsomely restored by Philip Aridæus, B.C. 330. The reliefs are of great beauty and much interest, but I cannot dwell on them. They were never completed; and a red outline drawn for the guidance of the sculptors may still be observed here and there. The sanctuary is surrounded by a covered corridor and the usual chambers. In one of these stood formerly a list of the countries and towns paying tribute to Egypt, with the amount of assessment for each; Babylon, Nineveh, and Tyre are all mentioned. The *pronaos*, numbered 4, is a mass of ruins. The inscriptions to be seen largely consist of representations of the warlike achievements of Thotmes III. Passing from this hall through the vestibule of the pylon we come to the processional hall, numbered 7, which is surrounded by a peristyle

of Osiride figures of gigantic proportions. These represent Thotmes I., with the insignia and attributes of Osiris; and this pharaoh built most of the section. Fronting the pylon of Thotmes I., numbered 8, are two obelisks of rose granite, one of them, standing in perfect condition, bears the legend of Queen Hatasoo, and the fallen one that of her father Thotmes I. The one remaining upright has stood there for 3,500 years, still it is 1,200 years younger than the one at Heliopolis, and that is almost equally perfect. The obelisk of Hatasoo is the largest now left to us, being 108 feet high by $8\frac{1}{2}$ feet square at the base. An inscription on the plinth informs us that but seven months were employed to cut it from its native granite, to transport, erect, and inscribe it, and that the apex was sheathed with pure gold, taken from the kings of all lands. It stands in position with absolute accuracy and precision; and its perfect condition, like a coin fresh from the mint, seems but to accentuate the ruin around.

Two other obelisks formerly stood in the court beyond; here, again, one is upright and its fellow lies low. The one still erect is smaller than that of Hatasoo—it bears the legend of Thotmes I. This form of monument is purely Egyptian.

This court divides the temple into two nearly equal portions, and from it, running diagonally towards the south, is a grand avenue of four pylae (marked L.) leading to and connecting the court with the ruined temple dedicated to Maut, the mother.

To superficial observers the general aspect of the temple east of court seven is simply chaotic, presenting a scene of utter desolation; among the debris lie fallen obelisks, huge masses of masonry, broken statues, and ruined pylons; the single obelisk, still perfect as it left the hands of the sculptor more than 3,600 years ago, looking serenely on it all.

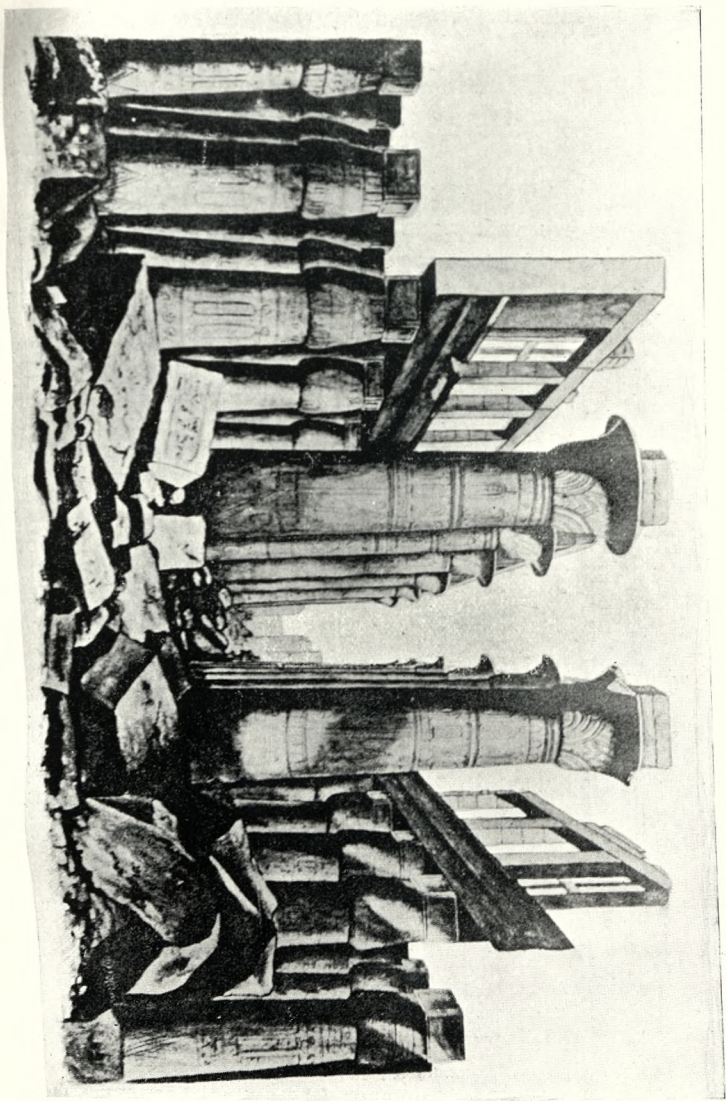
The propylon D, constituting the east end of the grand hall, was erected by Amenhotep III., and formed the temple façade in his day. It marks the limit of the buildings of the *Middle Empire*, and is now in ruins.

The great hall of columns, lettered E on the ground plan, is the most marvellous embodiment of architectural impressiveness that ever emanated from human intelligence, and is justly regarded as the masterpiece of all ages, alike wonderful in its realization of the ideas of space, immensity, and distance, as for the feelings of awe, reverence, and bewilderment that it inspires; the hall is the forest turned into stone, and the roof glistening with stars the heavens above. This, as it stands before you, is, I believe, the greatest hall ever built, rising some 80 feet above the ground; and the colossal character of the details is most striking. It measures about 170 feet by 338 feet inside measurement, with an area of more than 6,000 square yards. Of the fourteen gigantic columns that formed the nave, twelve only are now visible, the other two having been built into the pylon; they measure about 69 feet in height by 32 feet in circumference, requiring six men, with outstretched arms, to span one of them. The capitals, which are of the lotus-flower variety, are about 12 feet high, and the total size of the pillar is something like that of the Column of Trajan—the shafts are slightly bulbous, a characteristic of native Egyptian architecture after the *renaissance* beginning with the xviii. dynasty. The architraves connecting them are estimated to weigh about 60 tons each. The columns, 122 in number, forming the aisles, though still enormous, are shorter, being about 43 feet high, the shafts 33 feet, while the girth is about $27\frac{1}{2}$ feet. The capitals are of the lotus-bud type. Many of the columns in the hall have dry joints, and are kept in position merely by the superincumbent weight—they are not solid, two-thirds of their diameter being filled in with cement. The reliefs are in *intaglio*, in which the engraved subject is sunk beneath the surface, being thus distinguished from a cameo, which is engraved in relief.

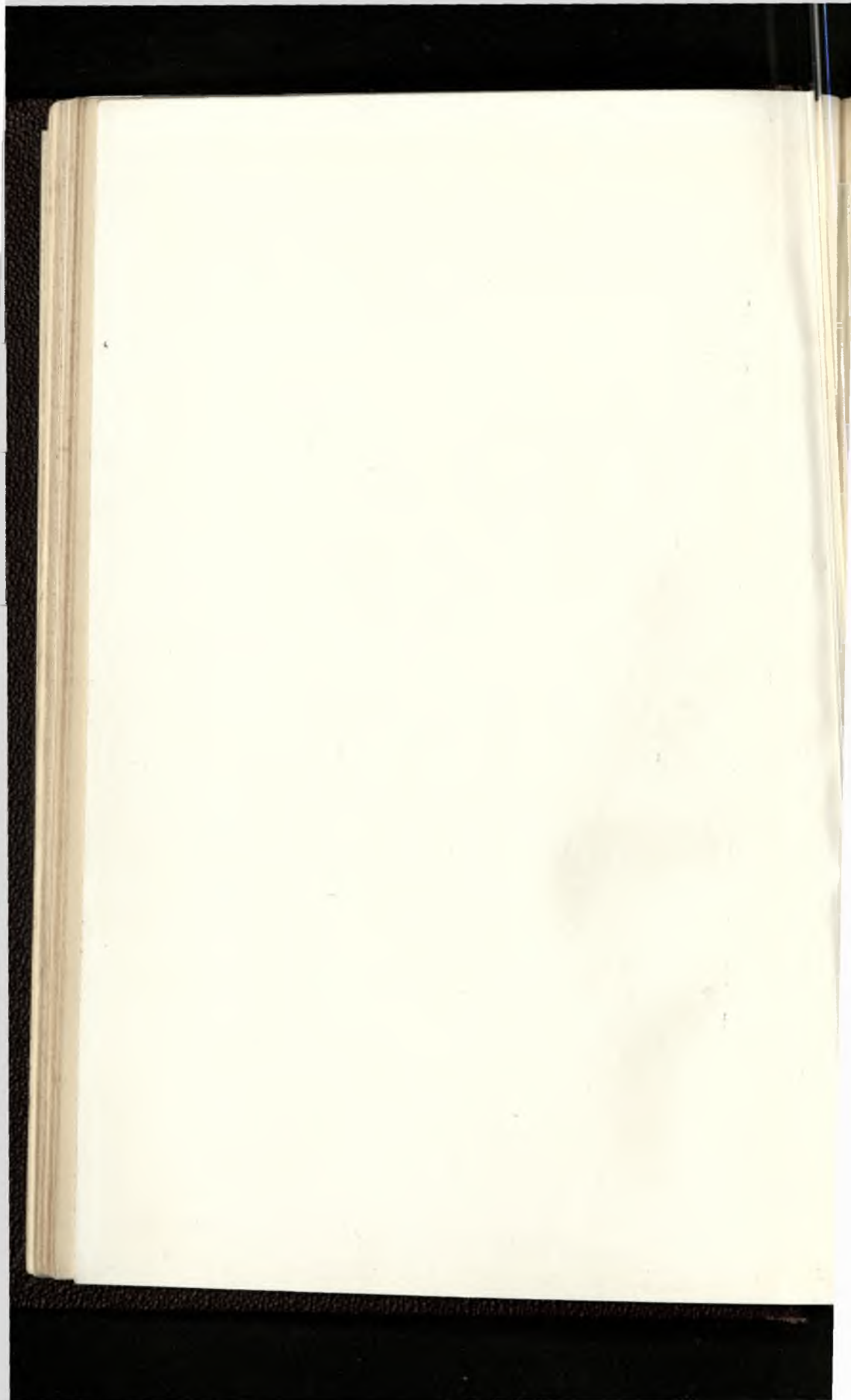
The nave, of course, projects above the aisles, with clere-story of mullioned windows, admitting but a dim religious light, soft enough to tone down the effect of the somewhat crude pigments employed in the decorations, some of which

Trans. Nat. Hist. Soc. N., D., & Nc., New Ser., Vol. I.

To face p. 30.



THE GREAT HALL OF COLUMNS, KARNAK.
From a drawing by Mrs. R. C. Clephan.



are cut in full, and others in half relief. The hall was roofed in with stone slabs, some of which are still *in situ*, and the lintel stones of the doorway are about 40 feet long.

Most of the decorations are the work of Rameses II. The pictures consist mainly of groups of figures of the deities, the centre of which is usually Pharaoh, the son of the sun, presenting offerings. Most of the later kings have inscribed their cartouches in every available place.

This noble hall is in danger of a gradual collapse, as the bases of the pillars are being gradually undermined by corrosion caused by the action of the nitre-charged sand and by the infiltration of water from the Nile. Some of the columns have fallen, and others seem about to fall.

No language can express the grandeur of this building ; but I have endeavoured to give you some idea of its present condition in the drawing on the screen, which is from the pencil of Mrs. Clephan.

Sethi I., whose portrait from the monuments is before you, and under whose auspices the greater portion of this hall was built, was a great ruler and truly remarkable man ; some references to his warlike achievements are inscribed on the temple walls. The style and finish of the work of his reign is much superior to that executed by the architects and artists under his son Rameses II. His tomb is perhaps, after the great pyramid, the most remarkable in the world ; the sarcophagus lies in Sir John Soane's museum in London, while his mummy is at Cairo. A photograph of it, with the sweet placid face, is here reproduced.*

The inscriptions on the outer walls are of great historic value. On the north side is a representation of Sethi's campaigns against the Shasu (Bedouins), Remenu (Armenians), Kheta (Hittites or Syrians), Ruten (Assyrians), Upper Ruten (Palestine), and the types of the different Asiatic nations are very distinctive and characteristic. An assault on a fortress is represented, of which inscription there is a copy in the museum, and a picture is given of the felling and trans-

* *I.e.*, on the screen, but not with the text as here printed.

portation of cedars of Lebanon. Here also is a picture of the canal already referred to as dividing Egypt from Africa. The figure of a crocodile shows that the water was supplied from the Nile. This canal united the Mediterranean, "the great circle of green water," with the Red Sea.

Robert Stephenson must have known little of the ancient history of Egypt, for he reported to the English Government that the Suez Canal could be made easily enough, but that it was impossible to keep it clear of sand, and therefore impracticable.

On the east side of the wall facing south is a copy of the famous epic by Pentaur, poet laureate to Rameses the Great; it describes in detail the warlike heroism and valliant deeds of the king, couched in very inflated language. To the left is a tablet inscribed with the terms of the treaty of peace with the Kheta (Hittites).

During this campaign, and many others preceding it, immense droves of prisoners were brought to Egypt, and these, who were located in the Delta, constituted the slaves who built the temples. They were presided over and regulated by a special Minister of State, and it was from among these people that the outswarm called the Exodus took place.

Rameses the Great is a picturesque figure in the world's history. The great son of a greater sire, who died leaving the empire with its frontiers extended, glorious and rich, his adventurous and vainglorious spirit found natural vent in warfare and architectural work on a stupendous scale. Many were the campaigns of his eventful reign, and he was the most prolific builder of all time.

Most of his temples lack purity of style, though some of them, like the great *Speos* at Abu Simbel, in Nubia, exhibit a daring spirit of innovation. Architecture and art also began to exhibit signs of decadence during the long reign of this mighty pharaoh, which continued to deepen with rare intervals of *renaissance* until the Ptolemies brought Greek influences to bear on both. This is probably the Pharaoh of the Oppression, at whose court Moses is said to have been educated. There

is a pronounced Semitic strain in Rameses, which shows itself, I think, in his caste of features, as well as in the introduction of Asiatic customs into the country during his reign, such as the employment of mercenaries in warfare, and the practice of polygamy. Here is his portrait as a young man drawn from the monuments by Mrs. Clephan, and here is his mummy, which bears a distinct likeness to the numerous statues of his prime. Possessed of great bodily strength, tall stature, and physical beauty, he is said to have lived to be nearly a centenarian. He must have had many wives and concubines to account for the 119 children he acknowledged.

The last group of inscriptions is on the southern end of the same wall; they describe the campaigns of Shishac against Palestine, and here is the list of 150 towns taken. He sacked Jerusalem, bringing the treasures of Solomon's temple to Karnak.

Propylon F, forming the western end of the great hall of columns, was built by Rameses I., the father of Sethi, and it then formed the temple façade.

The Bubastite Court, as it was named by Champolion, beyond, measures 275 feet by 228 feet, and in the north-west corner stands the small temple of Sethi II. (Menepthah), marked H; it is a heap of ruins. Cutting the southern wall is the temple of Rameses III., lettered J, which king also erected what may be described as the cloisters of this court.

The colonnade in the centre, G, is the work of the Ethiopian ruler Tirkakah or Tarharka, B.C. 700. Originally there were twelve huge columns with lotus-flower or bell capitals, but only one remains standing. This column, though symmetrical in form, is of inferior and somewhat slipshod construction as compared with those forming the nave of the great hall of columns, of which this colonnade is a continuation. The shaft consists of 36 courses of stone, the height is about 70 feet, and the greatest breadth of the capital 16 feet. The conception is ambitious but the realization abortive, for, when completed, it was found impossible to roof the colonnade over, and so it remained a palpable monument of failure.

The side temple of Rameses III. (J), dedicated to Khons, is very beautiful, and may be regarded as a typical Egyptian structure of the kind, conforming in its general arrangements to the sketch of such a structure already given you. The builder, Rameses III., was a great and capable ruler, who found the kingdom sadly afflicted by civil war, and pressed on all sides by numerous and powerful foes from without. He left it, however, in a contented and prosperous state: an inscription informs us that when he reigned "the weakest woman could go about anywhere without fear of molestation." He united in one person the valour of David and the luxury of Solomon.

The entrance pylon (K), principally the work of Ptolemy Euergetes I., was never finished. It is of great size, being about 370 feet long, and the standing wing is 140 feet high. Huge colossi guard the entrance.

I have said enough this evening to give you some idea of this mighty fane, as a whole the most remarkable structure of all time. Imagine it as it was in the days of the great Rameses, encircled by its *temenos*, within which were the sacred grove and lake; the pylons with their streamers, colossi at the portals flanked by obelisks. The temples enriched with hundreds of statues; the walls glowing with the delicious tints of the turquoise and lapis-lazuli; ceilings studded with stars; gilded figures of Noot the heavens; a huge scarabæus with outspread wings; golden doors, and strange mechanical contrivances. Conceive it then, with its hypethral courts crowded with the citizens of Thebes; stately processions of priests, headed by the pharaoh, passing through bearing the ark on their way to the sacred lake. Picture all the rich surroundings which must have existed to feed such magnificence—look at it now, a ruin, a refuge-place for bats and jackals, a pic-nic place for tourists. What a lesson on the mutability of human greatness.

On the Fishes of the North-East Coast. By ALEXANDER
MEEK, M.Sc.

To prevent any misapprehension which may arise from the title of this paper, I must explain at once that my intention is simply to bring together the additions to our local fish-fauna which I have been able to make at the Marine Laboratory, Cullercoats, and which have been recorded in the annual reports presented to the Northumberland Sea Fisheries Committee. I also take the opportunity to add localities in the case of the rarer fishes to those given by the late curator of the Hancock Museum in his excellent catalogue of the fishes of Northumberland and Durham,[†] and to make corrections where necessary in the light of recent enquiries. As this catalogue is already well known to the members of the Natural History Society, it will make reference easy if I follow the classification adopted by Mr. Howse. I have marked (*) the fishes not included in Mr. Howse's list, or of which he had not local records.

RED MULLET. *Mullus barbatus*, Linn.

The red mullet is landed not infrequently at North Shields by trawlers from the local fishing grounds. The specimen in the Laboratory collections was captured on 10th March, 1903, seven miles off Blyth.

BLACK SEA BREAM. *Cantharus lineatus*, Fleming.

Mr. Holmes, fish merchant, Berwick, informed me that he had a specimen which was caught a few years ago inside the piers at Berwick.

GREATER WEEVER. *Trachinus draco*, Linn.

Though not so common as the Lesser Weever, this species appears to be generally distributed in the district. I have specimens from various Northumberland localities.

[†] Natural History Transactions, vol. 10, pp. 327-390. Additions to the Catalogue, vol. 11, pp. 350-356.

SAPPHIRINE GURNARD. *Trigla hirundo*, Linn.

A small number were captured at Blyth and Cambois Bays in 1902, and one in 1903, which from its size appeared to represent a year's growth in advance of those of the previous year.

*SEA SNAIL. *Liparis vulgaris*, Fleming.

*MONTAGU'S SUCKER. *Liparis montagui*, Donovan.

Mr. Howse had not been able to obtain specimens of these. The latter is the more common at Cullercoats and elsewhere in our district.

*SHANNY. *Blennius pholis*, Linn.

Mr. Howse did not have a local record of the Shanny. It is very common however, and generally distributed in rock-pools and under stones between tide-marks.

VIVIPAROUS BLENNY. *Zoarces viviparus*, Linn.

This species is also common in the same localities as the preceding.

*SHARP-TAILED LUMPENUS. *Lumpenus lampetrisformis*, Walb.

One specimen of this interesting northern fish was captured living by the Laboratory fisherman, Mr. John Taylor, at Cullercoats, at extreme low water mark, on 12th February, 1903. As this is the first time it has been definitely recorded for England, the following particulars are given. The length is 10·4-in., the head 1-in., the vent $3\frac{1}{4}$ -in. from the anterior end. The colour when fresh was light green, with patches of darker green, the dorsal fin white with two or three black spots on the rays, which together formed oblique bands sloping from above, downwards, and backwards; the caudal fin also with black spots. The body compressed and band-shaped, the height being not quite $\frac{1}{2}$ -in. The fin formula is: D. 72 spines, A. 1 spine and 48 rays, C. 12 rays, P. 14, V. 1 spine and 3 long rays.

It was first recorded for Britain by Dr. Day, in 1884, from a specimen got by Professor McIntosh, 15 miles off St. Abb's

Head, in 40 fathoms, and since then it has been obtained in the Firth of Forth during the trawling experiments of the Scottish Fishery Board; in the Firth of Clyde (Günther, and also T. Scott and A. Brown); and in the Moray Firth by G. Sim, Aberdeen. Holt obtained a specimen from 240 miles E. $\frac{1}{2}$ N. of the Spurn Light-vessel in 1892, and stated that "Dr. Günther informs me that he has seen a specimen said to have been taken on the coast of Norfolk."

FIVE-BEARDED ROCKLING. *Motella mustella*, Linn.

Common in the rock-pools at Cullercoats and generally on the coast.

*FOUR-BEARDED ROCKLING. *Motella cimbria*, Linn.

Common in about 30 fathoms.

WITCH. *Pleuronectes cynoglossus*, Linn.

Common in deep water, and landed regularly at North Shields from the nearer fishing grounds.

*THICKBACK. *Solea variegata*, Donovan.

I recorded the capture of an example of this species in my report for 1897, and I have since had my determination confirmed by Cunningham. The specimen was captured 45 miles N.E. of the Tyne. It is very rare in the North Sea, and this is the only record I know of for the east coast of England.

MEGRIM. *Lepidorhombus megastoma*, Donovan.

Rare on the east coast of England.

SAURY OR SKIPPER. *Scombresox saurus*, Walb.

A specimen was sent from Beadnell in November, 1901, by Mr. Douglas.

SHAD. *Clupea alosa*, Linn.

Captured in trawl and in herring nets occasionally. A specimen from Mr. Douglas, Beadnell.

SUN-FISH. *Orthogoriscus mola*, Linn.

A small specimen was captured by Mr. Crisp, St. Mary's Island, in his salmon nets in July, 1903, and he kindly presented it to me. It had the following measurements:—Length, 20-in.; height in front of median fins, $13\frac{1}{4}$ -in.; and from tip of dorsal to tip of anal fin, 30-in.

TOPE. *Galeus vulgaris*, Flem.

Sometimes caught by trawlers on the near fishing grounds.

THRASHER. *Alopias vulpes*, Gmel.

On the 31st July, 1902, a large male measuring, the body 7-ft. 9-in., and the upper lobe of the tail 7-ft. 9-in., or 15-ft. 6-in. altogether, was captured off Cullercoats in the salmon nets. It was described by Mr. W. H. Young, F.Z.S., in the report to the Northumberland Sea Fisheries Committee for 1902. Another specimen was reported to have been captured this year (1903) at Seaton Sluice, but no particulars could be obtained with regard to it.

*SHAGREEN SKATE. *Raia fullonica*, Linn.

Fairly common.

*HOMELYN. *Raia maculata*, Montagu.

Rare.

*CUCKOO RAY. *Raia circularis*, Couch.

Rare. Our specimen was caught ten miles off the Coquet on 6th October, 1903.

THORNBACK. *Raia clavata*, Linn.

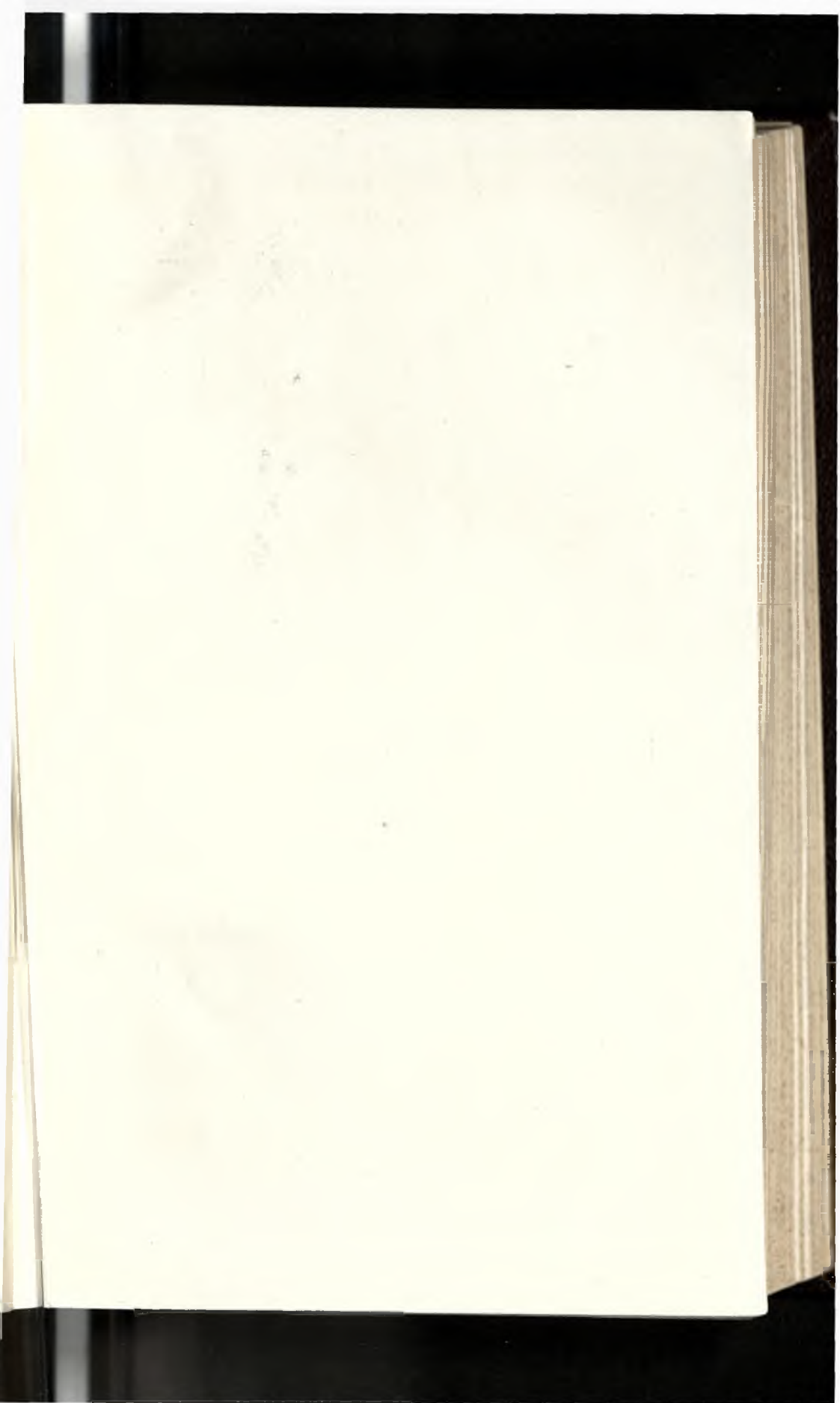
Common.

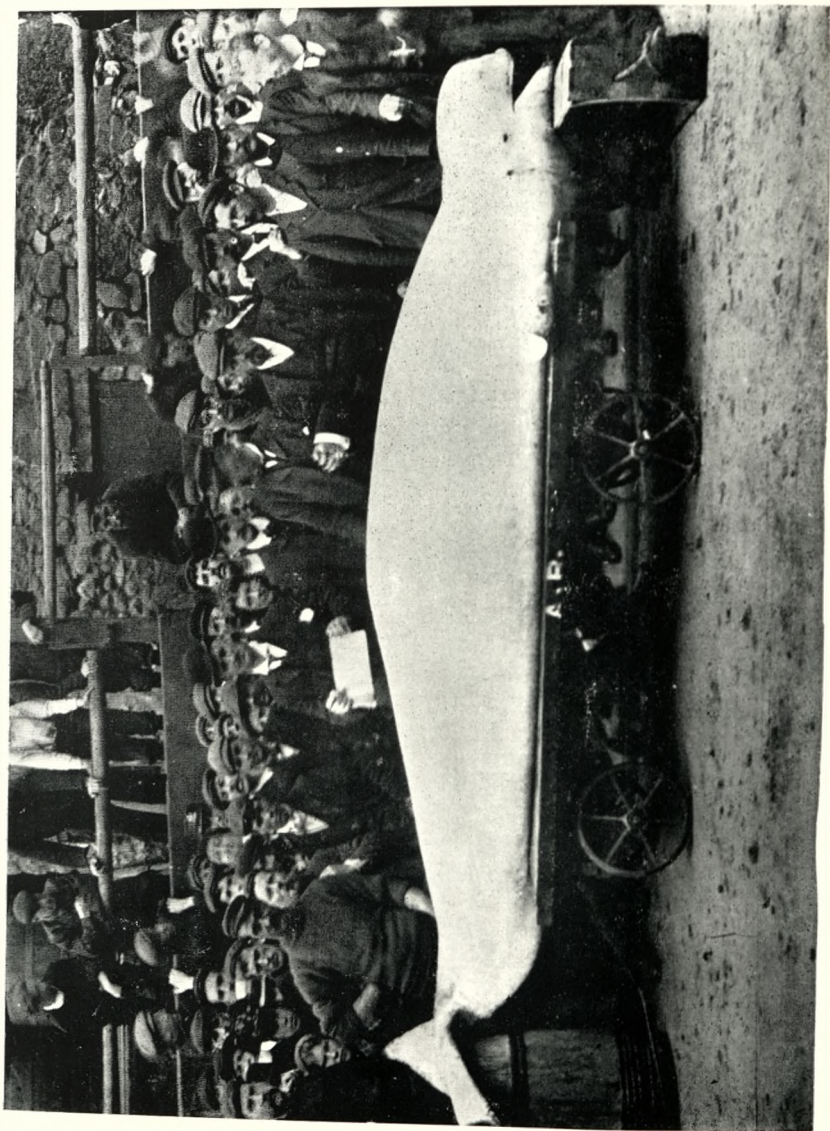
STARRY RAY. *Raia radiata*, Donovan.

Very common. Called at Shields "Jenny Hanover."

*STING RAY. *Trygon pastinaca*, Linn.

A specimen from six miles off Cresswell, December, 1897, and another handed into the Laboratory at Cullercoats.





PHOTOGRAPH OF BELUGA CAUGHT AT THE MOUTH OF THE TYNE,
JUNE 10TH, 1903.
Length of 1 foot is given by the piece of white paper held up behind the animal.

MISCELLANEA.

Note on the Beluga caught at the mouth of the Tyne.

BY ALEXANDER MEEK, M.Sc., F.Z.S.

The capture of a White Whale or Beluga, *Delphinapterus leucas*, Pall., in our district is an event of some importance, seeing that the species has not hitherto been recorded south of the Forth. The Forth specimen was obtained in 1815, but further north in Scotland and on the west coast the Beluga has been stranded or captured pretty frequently. The local specimen was captured at the South Shields sands on the morning of June 10th, 1903, in the nets of the salmon fishermen. The whale was observed by the fishermen after he had approached close to the shore, and they at once made the attempt to surround him with their nets. Three nets were brought into use, and he was ultimately entangled in one of them. Two ropes were fastened to his tail, but he was able to tow the two boats some four miles to sea before he was exhausted. The carcase was landed at the Fish Quay, North Shields, and sold to Messrs. Relph and Hall. It is gratifying to be able to say that these gentlemen, with a public spirited generosity which happily is not rare on Tyneside, have presented the skeleton to the Hancock Museum.

The thanks of the Society are due also to Mr. W. H. Young, F.Z.S., who, recognising the importance of the capture, put himself to a great deal of trouble to obtain the photograph which is here reproduced, and to Mr. Robinson by whom the photograph was taken.

Mr. E. P. Witten, B.Sc., obtained the following measurements :—Length, 14 feet 2 inches; girth, 7 feet 8 inches; the gape measured 12 inches; and the eye, which had a longitudinal diameter of 1 inch, was placed about 4 inches behind the angle of the mouth.

My absence from home at the time prevented me seeing the specimen until the second morning after its capture, and by that time the skin had been removed and the dissection

completed. I was able, however, to confirm the determination which had been made by my co-workers at the Cullercoats Laboratory that it was a full-grown male example, and to make arrangements for the conveyance of the skeleton to the Museum. It was then possible to see that there were eight teeth in each jaw, or thirty-two altogether.

The fishermen at different parts of the north-east coast have reported that another White Whale was seen on several occasions during the summer.

The Condor's Sense of Smell.—I was recently dissecting a rabbit in my room at the back of the museum. I was working at an open window about ten yards from the condor's cage, but far enough back for the dissection to be quite out of the bird's sight. I first spent a considerable time in taking out the rabbit's brain, and while this was going on the condor remained quietly basking in the sun. But when I opened the abdominal cavity and allowed the characteristic, but by no means powerful odour of the warm viscera to escape, the condor immediately became intensely excited. It ran to and fro, repeatedly stretched its neck through the bars towards the window, and then executed a series of vigorous flights across the cage from one of its perching-stumps to the other, a demonstration of excitement which is very unusual with it, and which I have never at any other time seen performed with so much enthusiasm. It continued to exhibit similar signs of excitement for half an hour or so, until, in fact, I had shut the window and left the building.

Experiments have been described which were held clearly to demonstrate that the condor as a species is without any serviceable sense of smell. It was impossible, however, to witness the behaviour of the museum condor on this occasion, and to doubt that the bird had at once caught the odour of the rabbit's viscera; and under the circumstances this must imply the possession of a sense of smell of very considerable acuteness.—*E. Leonard Gill.*

NATURAL HISTORY SOCIETY
OF
NORTHUMBERLAND, DURHAM, AND NEWCASTLE-
UPON-TYNE.

REPORT OF THE COMMITTEE
FOR 1902-1903.

It is with pleasure that the Committee are able to report several encouraging features in the year's work of the Society. In the first place there is a substantial increase in the membership to be recorded. One hundred and eleven new members have joined the Society during the course of the year, and this, with a loss of fifteen through death and resignation, leaves the present membership at 327, as against 231 at the close of the last year. The Committee wish to express their indebtedness to Mr. N. H. Martin, to whose energy as joint Hon. Secretary of the Society this gratifying increase is mainly due.

During the past year also a considerable development has taken place in connection with the evening meetings, which form such an important department of the Society's work. These have been more prominently brought before the public, and during the past session have taken rather more definitely than before the form of lectures. They have been held in the library of the museum, and on several occasions this room proved inadequate to accommodate the audiences which assembled. As before, the meetings have been open to the public on payment of the usual museum entrance fee; and their attractiveness and success have been largely added to by the use of the excellently fitted lecture lantern presented by Mr. Martin. Abstracts of the lectures, in some cases kindly furnished by the lecturers themselves, will appear in the Transactions: a list of the subjects taken is given below.

The Society is greatly indebted to the gentlemen who have given their time to the preparation and delivery of this very successful series of lectures.

Nov. 11th.—Prof. M. C. Potter, M.A., F.I.S. : “The Life and Death of Trees” ; chair taken by Mr. W. M. Pybus.

Dec. 16th.—Mr. E. P. Witten, B.Sc. : “Deep Sea Life” ; chair taken by Mr. W. M. Pybus.

Jan. 20th.—Mr. R. C. Clephan, F.S.A. : “Ancient Egypt” ; chair taken by the Rev. Principal Gurney, M.A., D.C.L.

Feb. 10th.—Mr. J. Bidgood, B.Sc. : “Orchids” ; chair taken by Prof. M. C. Potter, M.A.

Feb. 24th.—Mr. D. Rosie : “Lepidoptera Larvæ” ; chair taken by Lieut.-Col. C. H. E. Adamson, C.I.E.

March 10th.—Dr. A. Randell Jackson, M.Sc. : “Spiders” ; chair taken by Prof. Sir. G. H. Philipson, M.D., D.C.L.

April 23rd.—Mr. C. E. Stuart, B.Sc. : “A Piece of Coal” ; chair taken by Prof. H. Louis, M.A., A.R.S.M.

Two lectures intended specially for young people were arranged to take place during the winter holidays. This was an experiment which had not been tried before, and which met with decided success. The lectures were as follows :—

Jan. 2nd.—Prof. G. S. Brady, M.D., F.R.S., on “The Life of a Butterfly” ; the chair taken by Mr. N. H. Martin, F.R.S.E.

Jan. 9th.—Prof. G. A. Lebour, M.A., on “The Cliffs and Sands of Tynemouth” ; the chair taken by Mr. Hugh Richardson, M.A.

The Society owes much gratitude to the two Professors for the services so kindly given on these occasions. Both lectures were illustrated by the lantern.

Another experiment has been tried, that, namely, of opening the museum in the evening once in each winter month. On these evenings the Curator has given a short “museum talk” on some part of the collections. The attendances have fluctuated considerably, and the experiment can hardly yet be pronounced successful ; but it is hoped that as it becomes better known it may meet with sufficient support to justify its continuance. A list of the subjects dealt with in the series

of "museum talks" will be found as an appendix to the Curator's report on museum work.

As was stated in the last year's report, notice had been received from the Tyneside Naturalists' Field Club of their intention to terminate their agreement with the Society. Your Committee are glad to be able to report that this intention was not carried out, but that on the other hand the Field Club has given its consent to a scheme of amalgamation which now only requires the approval of the members of the Natural History Society, to whom it is to be submitted at the present Annual Meeting. The main points of the scheme, which has already been accepted by the two Committees and by a general meeting of the Field Club members, are as follows: The Natural History Society to take over the assets and liabilities of the Field Club, and to receive the present members of the Club as members of the Society at the same subscription (five shillings) as they have formerly paid as members of the Club, this subscription, however, not entitling them to any share in the property of the Society; the Natural History Society also to continue to hold the field meetings organized in the past by the Field Club.

Pending the final settlement of the amalgamation, a series of field meetings has been arranged for the present summer by a provisional committee. As the field meetings under the new auspices are open to a much larger number of members, it was hoped that a considerable improvement in the attendances would result. This hope has so far, however, in most cases been disappointed. A record of the meetings will appear in the Transactions.

The change of relationship with the Field Club is being made the occasion of entering upon a new series of Transactions. The first part of the new series is now in the printers' hands; but there still remains another volume, comprising the second part (Microlepidoptera) of Mr. J. E. Robson's catalogue of the local butterflies and moths, to conclude the old series.

As a further consequence of the projected amalgamation and the resulting modification in the constitution of the Society some alteration of the rules will be required. Apart from this, moreover, it has been evident for some time that the existing rules, last revised in 1877, were becoming inapplicable to the recent developments of the Society's work; and your Committee have therefore thought it desirable that a new set of rules should be drawn up. This has been done; and the proposed rules, as adopted by your Committee for recommendation to the members, will be brought before the Annual Meeting for approval. With this view, copies of the rules so adopted are sent out with this report.

A list of members is also circulated with the report; it includes the names of those who will be introduced on the terms of the proposed amalgamation of the Field Club. The Secretaries will be glad to be informed of any inaccuracies in the list.

Another matter which was referred to in the last report, namely, the proposal to co-operate more closely with the Durham College of Science in the teaching of natural history subjects, has again received much consideration, and a suggestion to erect a block of laboratories in connection with the museum for the teaching of botany, geology, and zoology has been fully discussed and approved by a majority of your Committee. It is understood, however, that the College authorities have now definitely abandoned the scheme, finding it more practicable to make provision for the natural history class rooms and laboratories in the new buildings about to be added to the College. In the interests of natural history, both local and general, as well as in the interest of a much extended sphere of usefulness for our Society, the failure of this scheme is to be regretted; but it is hoped that owing to the discussions which have taken place on the subject, a cordial and active co-operation for the spread of natural history between the College and our Society will have been created.

The number of competitors for the Hancock Prize has for

several years past been unsatisfactorily small. An effort was made last autumn, through the distribution of notices to libraries and other institutions in the two counties, to make the competition more widely known; and doubtless in consequence of this a considerably larger number of essays were sent in. The task of examining these was again kindly undertaken by the Rev. Canon Tristram and the Rev. Canon Norman; and on their recommendation the prize was awarded to the Rev. W. J. Wingate for his essay on "A Ramble up Burnhope." A second prize, offered by Mr. R. C. Clephan, was awarded to Mr. John Greenwell for an essay entitled, "A Walk up the Bedburn."

Several donations of importance have been made to the Society and its museum during the year. Mr. N. H. Martin's gift of a lecture lantern has already been mentioned. Colonel Adamson has deposited part of his well known collection of Burmese butterflies in the museum, and will make the remainder over to the Society's care as soon as they are finally arranged in the cabinets. Mr. John Daglish has procured for the museum a carefully selected set of typical coals, accompanied by their analyses; Mr. G. E. Crawhall has presented a large and well mounted specimen of the Badger from the Tyne valley; and Mr. Harold Cookson has placed on loan in the museum a fine set of heads of big game collected by himself in the Upper Nile. One of the latest accessions is the skeleton of a White Whale captured this summer in the mouth of the Tyne, and presented, largely through the instrumentality of Mr. Meek, by Mr. G. Relph, of Newcastle. This is the first recorded occurrence of the White Whale south of the Forth. Many other interesting donations have been received, and will be found acknowledged in the detailed list given later.

Your Committee have, on behalf of the Society, offered to the President their hearty congratulations on the honour conferred upon him by His Majesty the King, and have expressed the gratification which all will feel in having once more the name of Lord Armstrong as that of their President.

The Society, in common with many other institutions and interests in the district, has suffered a great loss in the death of the late C. W. Mitchell, Esq., who was a member of the Committee, and a generous supporter of the Society. Another loss by death is that of the late G. P. Bulman, a keen naturalist, who had a wide knowledge of marine zoology, and took a deep interest in some of the philosophical problems connected with the science.

The names of the new members elected during the year will be found in the complete List of Members, where the date of election is now given.

CURATOR'S REPORT ON MUSEUM WORK,
1902-1903.

The following is a brief account of the progress made in the museum during the year, irrespective of routine and minor pieces of work, which naturally occupy a large amount of time.

In the geology department the re-naming and labelling of the Permian fossils has been proceeded with, but is not yet completed; the fine series of Permian fishes has been brought together into proper order; and the Hutton and Atthey collections have been re-arranged, and are now seen to better advantage. A small but interesting set of the commercially valuable ores and minerals of Newfoundland, presented by Mr. J. J. Oxley, has been labelled and displayed in the mineral corridor. Some advance has also been made with the series of index cases, which are intended to furnish a clear and short summary of the 'geological record' of life on the earth.

A great improvement has been effected amongst the birds' eggs and nests in the museum, and a large share of the work involved in this has been done by Mr. S. Graham. The arranging of the Raine collection of eggs, alluded to in last year's report, has been completed. The exhibited series of

British birds' eggs has been fitted up entirely afresh, the numerous faded eggs being replaced by others from the cabinet of the late Jos. Watson; the eggs are brought up close to the glass on false bottoms, and are now protected from the light by American cloth covers. In a companion case a set of British birds' nests is also being fitted up, and promises to form an attractive collection.

The library has received a good deal of attention. The books on the shelves have been roughly classified and rearranged, and the volumes, about five hundred in number, from the libraries of the late Dr. Thos. Pigg and the late T. J. Bold, have been catalogued and inserted. The sets of transactions received in exchange from other scientific bodies had long ago outgrown the accommodation available for them in the library, and were scattered irregularly in various store cupboards in the museum. They have now been brought together, sorted out, and redistributed in a systematic manner.

William Voutt, who now spends the greater part of his time working in the museum, has, in addition to helping me in a variety of ways, been engaged in fitting false bottoms into cases, making glass-topped boxes for the birds' nests, going through the Hancock collection of bird skins, and painting desk-cases in the zoology room; and he has now nearly finished a lengthy and much needed piece of work in the scraping, cleaning, and painting of the cases on the bird room gallery.

A range of new upright top-cases has been fitted above two of the rows of desk-cases in the zoology room. These give accommodation for the exhibition of spirit specimens and many objects which could not be shown in the desk-cases, and will greatly facilitate the improvements in the invertebrate collections which I hope soon to undertake. Mention was made in the last report of Mr. R. C. Clephan's gift of a set of diagrams illustrating Egyptian archæology. Twenty-five of these have now been framed and put up in the ethnology corridor, where they not only form a valuable addition to the collection, but also greatly add to the general

attractiveness of the room. The fine set of antelope and other heads lent by Mr. Harold Cookson have been put on view on the wall of the west corridor.

During the year I have had some temporary help in the museum from Mr. G. R. Brook, now zoological assistant in the Cardiff Museum, his stay resulting in a number of beautifully finished osteological and anatomical preparations. I have also again to thank several of the honorary curators for practical assistance. Mr. Graham's extensive and detailed work upon the eggs and nests has been referred to; Mr. R. C. Clephan has made out the text of labels for the Egyptian diagrams; and Mr. John Daglish has given me useful advice regarding the set of coal samples which he has obtained for the museum.

E. LEONARD GILL.

APPENDIX.

SUBJECTS OF "MUSEUM TALKS."

Dec. 2nd.—The Age of Reptiles.

Jan. 6th.—Arms and Legs.

Feb. 3rd.—Exhibition with the lantern of a series of Photographs of Bird Life, lent by Mr. Harold Cookson.

April 7th.—The Pearly Nautilus.

May 5th.—The Summer Migrants.

DONATIONS TO THE MUSEUM

FOR THE YEAR ENDING JUNE 30TH, 1903.

- DR. GEORGE ABBOTT.—Oolitic Magnesian Limestone, Roker Cliff; "pseudo-organic" concretion, Fulwell.
- LIEUT.-COL. C. H. E. ADAMSON, C.I.E.—The donor's collection of Burmese Butterflies (first cabinet, containing Nymphalidæ and Riordinidæ, now in museum); chief's head-dress, and sword with sheath, Kachin tribe, frontier of Burmah and China.
- MISS C. T. ADAMSON.—Grey Hen assuming plumage of the cock, shot at Wallington, Sept. 3, 1837.
- T. H. ARCHER-HIND (per Jos. Oswald).—Teath of *Ichthyosaurus* and other fossils from Cambridge Coprolite Beds and Carboniferous Limestone.
- JNO. BARKER.—Fossils from the Great Limestone, Frosterley Quarry, Weardale.
- G. R. BROOK.—Several skulls and other specimens used by the donor in making preparations for the museum.
- JAS. CAYGILL.—Geological specimens from the Consett district; including block of vein-stuff, fossil plants and *Anthracosia*, and pieces of slickensided coal.
- LEWIS J. COLE.—Early bicycle, with wooden wheels and iron tyres, built for the donor about 1866.
- HAROLD COOKSON.—On loan; twenty-seven heads of big game collected on the White Nile, including Abyssinian Buffalo, Roan Antelope, Waterbuck, Tiang Hartebeeste, and other antelopes.
- GEO. E. CRAWHALL.—Badger male, 31½lbs. weight, killed at Haydon Bridge, Oct. 16, 1896, well mounted and cased; Golden Plover, male, Haydon Bridge, Feb. 26, 1903, already showing much black on breast.
- JOHN DAGLISH.—Set of samples of typical coals of England and Wales, with analyses obtained for the museum by Mr. Daglish through the respective colliery companies; also sample of crude petroleum, Parkgate seam, Manvers Main Colliery, South Yorkshire.
- CHAS. DAVISON.—Collection of Foraminifera, mounted and unmounted; and a large series of samples of foraminiferal oozes from the "Porcupine" dredgings, 1869.

- A. H. DICKINSON.—Egg of Secretary Bird, and cake of native tobacco, both from South Africa.
- MRS. DINNING.—Boxes of fossil fish-remains from Coal Measures and Permian, left partially developed by the late Wm. Dinning; a Mole Cricket from France; three nests of Trap-door Spider from San Remo, Italy.
- C. E. FLEMING.—Snake ("Yellow Mambe") killed in Charlestown, South Africa.
- EDWARD GARNETT.—Fossil plants from Old Red Sandstone, Kiltorcan, Ireland; Graptolites and other fossils from coast of Co. Waterford; Oldhamia from Bray Head.
- SAMUEL GRAHAM.—A number of nests and eggs of British birds contributed to the new sets in the bird-room.
- W. B. VAN HAANSBERGEN.—White variety of Mole tinged with orange, and Stoat in transition to the white state; both taken at Woodlands, Consett, end of January, 1903.
- MANCHESTER MUSEUM (Owens College)—Received in exchange: Cambrian and Carboniferous fossils, forty specimens.
- N. H. MARTIN, F.L.S., F.R.S.E.—Oxy-hydrogen lecture-lantern (Stroud and Rendall), with mirror, prism, etc., for erecting, projection microscope, screen, and stand.
- ALEX. MEEK, M.Sc.—Bag of material (Sertularians, Polyzoa, etc.) obtained from trawlers.
- MAJOR GEO. NOBLE.—Tanned Skin of a Boa Constrictor.
- ROBT. PEART.—Two good specimens of Pectolite from cavities in Whinsill, Burtreeford Quarry, Wearhead.
- MESSRS. PHILLIPS & Co.—Rabbit Fish (*Chimara*) from the North Sea.
- CAPT. H. A. PRATT, R.A.—Shells of *Pandora rostrata* from Weymouth; hollow stone from the R. Blyth; a number of Carboniferous and other fossils.
- G. RELPH.—Skeleton of White Whale (*Beluga leucas*), captured in the Tyne at North Shields, June 9, 1903. (Obtained largely through Mr. Alex. Meek).
- CHAS. ROBSON.—Complete collection of local bees and wasps, to replace exhibited collection given previously by the same donor,

- ERNEST SCOTT.—Father Lasher (*Cottus bubalis*) from Northumberland coast; nineteen skins of striking South African birds from near Johannesburg; Horned Lizard (*Phrynosoma*) from California.
- H. S. THOMPSON.—Marten (*Mustela martes*) taken in Dipton Wood, Hexhamshire, "about fifty years ago."
- ARTHUR TROBRIDGE.—Set of copper ores from Chile, chiefly from the Desert of Atacama, including unusually fine specimens of atacamite and native copper sulphate.
- J. W. TURNBULL.—Nest of Greater Spotted Woodpecker in trunk of beech, Riding Mill, 1901; nest of Carrion Crow, unusually well made, Riding Mill, 1903
- F. WINTER, F.R.M.S.—Several Cretaceous fossils, microscopic section of Coal Measure fish tooth, and other geological specimens; two abnormally small hen's eggs.
- JOS. WRIGHT, JUN.—Early bicycle, with wooden wheels and steel spring backbone.
-

ADDITIONS TO THE LIBRARY
BY DONATION AND EXCHANGE,
FROM JULY 1ST, 1902, TO JUNE 30TH, 1903.

BRITISH SOCIETIES AND INSTITUTIONS.

Bristol:—*Museum and Reference Library.*

Report of Museum Committee, 1901-02.

Cambridge University:—*Philosophical Society.*

Proceedings, vol. 11, parts 6, 7; vol. 12, parts 1, 2.

Cardiff:—*Naturalists' Society.*

Report and Transactions, vols. 34, 35.

Dublin:—*Royal Dublin Society.*

Transactions, vol. 7, parts 14-16; vol. 8, part 1.

Proceedings, vol. 9, part 5.

Economic Proceedings, vol. 1, part 3.

Edinburgh:—*Royal Scottish Geographical Society.*

Scottish Geographical Magazine, vol. 19, no. 6.

Gateshead:—*Gateshead Teachers' Natural History Society
and Field Club.*

Annual Report, 1902-03.

Hastings:—*Hastings and St. Leonards Natural History Society.*

9th Annual Report.

Glasgow:—*Corporation Museums and Galleries.*

Report for 1902.

Leeds:—*Philosophical and Literary Society.*

82nd Annual Report, 1901-02.

Liverpool:—*Literary and Philosophical Society.*

Proceedings, vol. 56.

Liverpool:—*Naturalists' Field Club.*

Proceedings, 1902,

London:—British Association for the Advancement of Science.

Report of 72nd Meeting, Belfast, 1902.

Report of Corresponding Societies Committee for 1902.

London:—British Museum (Natural History), South Kensington.

"Southern Cross" Report.

Handbook of Instructions for Collectors.

Guide to Coral Gallery.

Set of 40 plates illustrating Westwood's Catalogue of the Phasmidæ.

London:—Quekett Microscopical Club.

Journal, ser. 2, vol. 8, nos. 51, 52.

London:—Zoological Society.

Proceedings, 1902, vol. 1, part 2; vol. 2, parts 1, 2.

Transactions, vol. 16, parts 5-8.

Index to Proceedings, 1891-1900.

Catalogue of Library, 1902.

List of Fellows, 1902.

Manchester:—Literary and Philosophical Society.

Memoirs and Proceedings, vol. 46, part 6; vol. 47, parts 1-4.

Manchester:—Manchester Museum, Owens College.

Report for 1901-02.

Newcastle-on-Tyne:—Institute of Mining and Mechanical Engineers.

Transactions, vol. 50, part 7; vol. 51, parts 3-5; vol. 52, parts 1-4; vol. 53, part 1.

Annual Report, 1901-02.

Northampton:—Northamptonshire Natural History Society and Field Club.

Journal, vol. 11, nos. 89-92.

Norwich:—Norfolk and Norwich Naturalists' Society.

Transactions, vol. 7, part 3.

Norwich:—Castle Museum.

Report of Committee for 1902.

Plymouth:—Borough Museum and Art Gallery.

3rd and 4th Annual Reports, 1901-03.

Southport:—Society of Natural Science.

Reports, 1st to 7th, 1890-1902.

Stone, Staffs.:—North Staffordshire Field Club.

Annual Report and Transactions, vol. 37.

COLONIAL SOCIETIES AND INSTITUTIONS.

Cape Town:—South African Museum.

Annals, vol. 2, parts 9-11; vol. 3, part 1.

Halifax, Nova Scotia:—Nova Scotian Institute of Science.

Proceedings and Transactions, vol. 10, parts 3, 4.

Montreal:—Natural History Society.

Canadian Record of Science, vol. 8, no. 8.

Ottawa:—Geological Survey of Canada.

Contributions to Canadian Palæontology, vol. 3, part 2.

Catalogue of Canadian Plants, part 7.

Geological Map of Canada, western sheet, no. 783.

Ottawa:—Department of the Interior.

Political Map of Manitoba.

Sydney, N.S.W.:—Royal Society.

Journal and Proceedings, vol. 35.

Sydney, N.S.W.:—Australian Museum.

Report of Trustees for 1901.

Records, vol. 4, nos. 6, 7; vol. 5, no. 1.

AMERICAN SOCIETIES AND INSTITUTIONS.

UNITED STATES OF AMERICA.

Boston:—American Academy of Arts and Sciences.

Proceedings, vol. 37, nos. 17-23; vol. 38, nos. 1-19.

Memoirs, vol. 12, no. 5.

Brooklyn:—Brooklyn Institute of Arts and Sciences.

Science Bulletin, vol. 1, nos. 2, 3.

Cambridge:—Museum of Comparative Zoology, Harvard College.

Bulletin, vol. 39, nos. 4, 5; vol. 40, nos. 3-6; vol. 41, no. 1.

Bulletin, Geological Series, vol. 5, nos. 7, 8; vol. 6, no. 1.

Memoirs, vol. 26, no. 4; vol. 27, no. 2; vol. 28, in four parts.

Annual Report of the Curator, 1901-02.

Chicago:—Academy of Sciences.

Bulletin, vol. 2, no. 3.

Bulletin of the Natural History Survey, no. 4, part 1.

Cincinnati, Ohio:—Lloyd Library.

Bulletin, nos. 1-5.

Mycological Notes, nos. 5-9.

Minneapolis, Minn.:—Geological and Natural History Survey.

Minnesota Botanical Studies, 3rd series, part 1.

Philadelphia:—Academy of Natural Sciences.

Proceedings, vol. 53, part 3; vol. 54, parts 1-3.

Philadelphia:—American Philosophical Society.

Proceedings, vol. 41, nos. 168-171.

Transactions, vol. 20, part 3.

Springfield, Mass.:—City Library Association.

Annual Reports of the Museum of Natural History, 1901, 1902.

St. Louis:—Academy of Science.

Transactions, vol. 11, nos. 6-11; vol. 12, nos. 1-3.

Washington:—Smithsonian Institution.

Annual Report for 1901.

Miscellaneous Collections, nos. 1174, 1259, 1312-14.

Washington:—Smithsonian Institution: Bureau of Ethnology.

19th Annual Report.

Bulletin 26, 27.

Washington:—Smithsonian Institution, U.S. National Museum.

Report of U.S. National Museum, 1899-1900.

Bulletin, nos. 50-52; no. 39, parts H-O.

Proceedings, vols. 23, 24.

Washington:—United States Geological Survey.

21st Annual Report, parts 5, 7.

22nd and 23rd Annual Reports.

Monographs, 41-43.

Bulletins, 177-190, 192-194.

Mineral Resources of the U.S., 1900.

Professional Papers, nos. 1-8.

Reconnaisances in Alaska in 1900.

Geology, etc., Copper River District, Alaska.

Washington:—Department of Agriculture.

North American Fauna, no. 22.

Annual Reports, 1901-02.

Annual Report of Alaska Agricultural Experiment Station, 1901.

Reprint.—Webber, Environment and Plant Varieties.

Farmer's Bulletin, no. 162.

OTHER AMERICAN STATES.

Mexico:—*Instituto Geologico.*

Boletin, num. 16.

Mexico:—*Sociedad Cientifica "Antonio Alzate."*

Memorias y Revista, tomo 13, n. 5, 6; tomo 18, n. 1, 2; tomo 19, n. 1.

Montevideo, Uruguay:—*Museo Nacional.*

Anales, tomo 4, part 1.

EUROPEAN SOCIETIES AND INSTITUTIONS.

Bergen:—*Bergens Museum.*

Aarbog, 1902, parts 1-3.

Aarsberetning, 1902.

Crustacea of Norway (G. O. Sars), vol. 4, parts 7-14.

Bruxelles:—*Société Royale Malacologique de Belgique.*

Annales, tome 36.

Copenhagen:—*Naturhistoriske Forening.*

Videnskabelige Meddelelser, 1902.

Dresden:—*Naturwissenschaftliche Gesellschaft "Isis."*

Sitzungsberichte and Abhandlungen, 1902, erstes Heft.

Kiew:—*Société des Naturalistes de Kiew.*

Mémoires, tome 17, livr. 2.

Marseilles:—*Faculté des Sciences.*

Annales, tome 12.

Paris:—*Muséum d'Histoire Naturelle.*

Bulletin, 1901, nos. 7, 8; 1902, nos. 1-8.

Stockholm:—*Kongliga Svenska Vetenskaps-Akademien.*

Handlingar, Bd. 35.

Bihang, Bd. 27.

Oefversigt, vols. 58, 59.

Upsala:—*Geological Institution, University of Upsala.*

Bulletin, vol. 5, part 2.

Vienna:—*K. k. zoologisch-botanische Gesellschaft.*

Verhandlungen, Bd. 52.

MISCELLANEOUS.

Third Annual Report of the Zoological Gardens, Ghizeh, Cairo.

Presented by the Director.

"Los Carbones de Teruel," by Antonio Gascon and Emiliano de la Cruz y Diaz.

Presented by Señor de la Cruz.

Calendar of the Durham College of Science for 1902-03.

Presented by the College.

"British Petrology," by J. H. Teall.

Presented by Jas. B. Harris.

Memoirs of the Bernice Pauahi Bishop Museum, Honolulu, vol. 1, no. 5 :

"Additional Notes on Hawaiian Feather Work" (including figures and descriptions of examples in the Hancock Museum), by Wm. T. Brigham, A.M.

Presented by the Author.

Fourteen reprints of papers by Charles Janet (Paris).

Presented by the Author.

Report of Northumberland Sea Fisheries Committee on Scientific Investigations for 1902.

Presented by Alex. Meek, M.Sc.

"Resources Végétales des Colonies Françaises," by Gustave Niederlein.

Presented by the Author.

A further selection from the library of the late Dr. Thos. Pigg ; about fifty volumes, mainly archæological.

Presented by Miss W. Ridley Pigg.

"Charles St. John's Note Books," edited by the donor, Edinburgh, 1901.

Presented by Admiral H. C. St. John.

Reprint, "The Vascular Branches of Stigmarian Rootlets," by Professor F. E. Weiss, D.Sc.

Presented by the Author.

"Races of Mankind" (Brown), complete in 40 parts ; "European Butterflies and Moths" (Kirby), incomplete.

Presented by Jos. Wright.

"Nature," July 1st, 1902, to June 30th, 1903.

Presented by the Publishers.

"Museums Journal," July, 1902, to June, 1903.

From the Museums Association.

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TREASURER'S REPORT.

Accounts amounting to £166 10s. were outstanding on June 30th, 1903.
On the same date the arrears of Subscriptions were: Members', £9 9s.; Associates', £5.

Examined with the books and vouchers and found correct.

SAM. GRAHAM, HON. AUDITOR.

LIST OF INVESTMENTS.

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The following is a list of the Investments held by the Society at 30th June, 1903:—

A. H. DICKINSON,
HON. TREASURER.

SAM. GRAHAM,

HON. AUDITOR.

NATURAL HISTORY SOCIETY OF NORTHUMBER- LAND, DURHAM, AND NEWCASTLE-UPON-TYNE

OFFICERS, 1903-1904.

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The Right Hon. Lord Armstrong, M.A., D.C.L.

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Viscount Ridley.	Prof. G. S. Brady, M.D., F.R.S.
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Prof. M. C. Potter, M.A. | N. H. Martin, F.R.S.E.

HON. TREASURER.

A. H. Dickinson.

HON. AUDITOR.

Samuel Graham.

ABSTRACTS OF LECTURES
DELIVERED AT THE EVENING MEETINGS OF THE
SOCIETY, WINTER SESSION 1902-1903.

November 11th.—The Life and Death of Trees.

BY PROF. M. C. POTTER, M.A., F.L.S.

In this lecture the growth of a tree stem was first traced step by step from its emergence from the seed up to the condition found in the fully formed timber. The formation and coalescence of the vascular bundles, the way in which the successive rings of woody tissue are added, the arising of branches, and other points in the economy of the tree were described and illustrated with the help of diagrams and photographs shown with the lantern. The second part of the lecture was devoted to exhibiting some of the ways in which the life of the tree is brought to an end, with reference more especially to the different types of fungoid growths which often play such an important and destructive part in the process. The struggle that takes place between the tree on the one hand trying to heal over its wound, and the fungus on the other forcing its fibres more widely and deeply into the substance of the wood, was brought strikingly before the audience in a series of photographs of trees attacked by various of these parasites. Many of the photographs were taken in the neighbourhood of Newcastle.

December 16th.—Deep Sea Life.

BY E. P. WITTEN, B.Sc.

The last century has witnessed remarkable advancement in the progress of natural research and in our grasp of biological problems, but in no branch so much as in marine zoology. Little over a generation ago, though forms inhabiting the coast regions had been carefully observed, the deeper

waters were entirely neglected as being beyond the scope of investigation. Shortly after, however, the question as to whether life could exist on the deep sea bottom was accidentally, though definitely answered on several occasions, notably when the broken end of the Atlantic cable was dragged up encrusted with organisms. In 1873 the "Challenger," with a large scientific staff, under the guidance of Sir Wyville Thompson, was equipped by the British Government to explore the deeper waters with a view to scientific discovery. The results contained in the 36 vols. of the "Challenger" report, though in view of recent discovery not quite up to date, show what a tremendous field for research has been opened up. Subsequent expeditions have been undertaken by the "Porcupine" and "Albatross," and the work is at present being carried on by the United States Fisheries Investigation and the Indian Marine Survey.

As is well known $\frac{1}{4}$ th of the earth's surface is under water. At places the depth of water is 4,700 fathoms—almost five miles—while the average depth is 1,877 fathoms. There are a few mountain ranges on the sea-bed, and several isolated peaks rising towards the surface. The sides of the ocean basin are not steep, being inclined at about 4° , except from oceanic islands, and at the Bermudas where the slope is about 20° to a depth of 2,000 fathoms.

The physical conditions of the deep-sea bed are necessarily exceptional. The deeper the sounding taken the nearer does the temperature approach 4°C . Sunlight never penetrates lower than 100 fathoms, and blind Isopods are found at 55 fathoms in the Lake of Geneva. With this decrease of light and heat there is a tremendous increase in pressure, being as much as one ton per square inch per 1,000 fathoms, or 166 atmospheres. There is a slight current from the poles along the bottom towards the equator, but it is so slow as to be imperceptible to animal life. The surface of the sea-bed is perfectly even, any crevices being levelled up by the deposition of oozes, either pteropod, foraminiferal, or radiolarian, according to depth. At extreme depths it is merely a red clay. To

sum up, the conditions under which life here exists are absolutely monotonous and invariable.

Under such conditions we expect to meet new forms, but are taken aback to find at the same time species closely allied to inshore forms (*e.g.*, *Actinia mesembryanthemum*—shore, *A. abyssorum*—1,350 fathoms). All invertebrate groups, with the exception of Planarians, Rotifers, Tardigrades, and Infusorians, are represented below 1,000 fathoms. Many genera and species have a wide range of depth, *e.g.*:—

Terebratula vitrea, 5 to 1,456 fathoms.

Antedon, coast to 2,900 fathoms (Carpenter).

Amphiura, 2 to 2,650 fathoms (Lyman).

Balanoglossus, coast to 2,500 fathoms (Ehlers).

Lumbriconereis fragilis, coast to 1,780 fathoms (McIntosh).

Dentalium, coast to 2,600 fathoms (Watson).

Peneid and Caridid Shrimps to all depths.

Bathysactis symmetrica, 30 to 2,900 fathoms.

Only typical deep-sea forms are closely confined. At the same time the geographical range is unrestricted owing to the even condition of the sea-bed. Thus some forms are found universally, *e.g.*, the hydroid, *Cryptohelia*. Agassiz has found off the American coast most of the species dredged by the "Challenger" throughout her voyage. There is a close connection between deep and surface forms. We find surface Rhizopods, Hydroids, Bryozoa, and Barnacles with corresponding forms below. Some even live at the surface when young, and descend later *e.g.* *Himantolophus*, a fish of the angler type.

Turning to true characteristic deep-sea forms we find great morphological changes resulting from the peculiar physical conditions of life. In the absence of sunlight phosphorescent organs are highly developed. They may be merely iridescent patches as in some Alcyonarians, or they may be much differentiated as in the fishes, where they consist generally of rows of luminous spots, and reach their summit of development in *Ipynops*, where they form two lantern-like

patches on the top of the head. Many have phosphorescent spots on the end and at the base of the tentacles, acting as lures for their prey.

The effect on the eyes is different in different forms. In some they are completely atrophied, while in others they are enormously developed as if to make the most of their self-generated light. Sometimes we find eyes in the young, which atrophy later, *e.g.* in *Himantolophus* and many blind crustacea. The sense of touch is well developed either through the medium of long hairs, limbs, or rays. There is probably also some delicate sense of pressure which might be utilised to make the creature aware of the approach of danger. The effect on their colour is peculiar, it being in some cases intensified and in others diminished. As regards size some forms are dwarfed, but monsters are met with (*e.g.*, *Pycnogons* 2-ft. long; *Isopods* 11-in. long).

Vegetable matter cannot grow in the darkness, but much is carried down by rivers and currents. This furnishes food to many forms, being well preserved owing to the absence of bacteria. Living forms occur in greatest abundance between 200 and 400 fathoms. Here are found the noted *Pentacrinus* forests, red in their natural state. The lower one goes, the less variety is met with, till in the abysses only *Rhizopods* are supposed to exist. Migration will probably be dependent on the food supply.

The greatest regret is felt at the absence of ancient forms such as *Dipnoi*, *Ganoids*, *Lampreys*, *Trilobites*, *Graptolites*, and *Belemnites*, whereas we get such ancient forms as *Lingula*, *Amphioxus*, and *Limulus* in shallow waters. No connecting links are found which might consolidate the zoological tree, as *e.g.*, to connect *Brachiopoda* or *Bryozoa* to the main groups. Either the deeps have been devoid of life at geological epochs, or we need the light of further research to guide our conclusions.

January 20th.—Ancient Egypt.

BY R. C. CLEPHAN, F.S.A.

Printed *in extenso* in the present volume, pp. 10-34.*February 10th.—Orchids.*

BY J. BIDGOOD, B.Sc.

The orchids are the most numerous amongst monocotyledons, it being computed that there are over 8,000 species, of which 36 are reputed as native in the British Islands. Most of them grow in the warmer and moister portions of the world, although one, *Calypso boreale*, has been found as far north as latitude 68°. Their structure is unique. The floral envelope consists of two whorls of three segments each, one of the three being always different, and sometimes very different from the other two. The ovary is single celled, or imperfectly three-celled, and the stamens are sessile on a prolongation of the ovary.

Some are terrestrial, their mode of nutrition being that of most other green plants; a few are terrestrial, green, but saprophytic, whilst a few are not green and wholly saprophytic. Most of the exotic species are epiphytes, growing on living plants, but not feeding on them. We have but one epiphyte, *Malaxis paludosa*, a bog plant. The epiphytes are provided with clasping roots to hold them in position, and aerial roots which absorb water and other substances from the air. They have always thickened stems known as pseudobulbs, and both aerial woolly roots and pseudobulbs are useful in tiding them over the hot dry seasons which they must experience in their native homes.

They are usually cross-fertilised, the structure of the flowers frequently preventing self-fertilisation, although quite a large number are regularly self-fertilised. The agents of pollination are usually flying insects, although birds, snails, slugs, and other crawlers carry out the process in many instances, being led to visit the flowers by their bright colours, perfume, and nectar which is produced in nearly all of them.

Exotic orchids cultivated in our glass houses have to undergo somewhat different treatment from that which they experience at home. It is impossible to exactly imitate the climatic conditions of their habitats, and long experience has shewn that it is best for us to keep them growing in our dry season—the summer—and flower them during the winter or early spring months.

The chief kind grown here are the *Odontoglossums* from the eastern slopes of the Andes mountains. Of these there are many beautiful species which are annually removed from their native forest trees in hundreds of thousands and sent to Europe. The *Oncidiums*, which are also American, being found from Mexico to Brazil, are very like the *Odontoglossums*, but will not cross with them. *Masdevalias* from the same regions, as well as *Cattleyas* and *Lelias* from lower altitudes. *Cypripediums* are general favourites. We have one native species, and others very closely allied grow in the cooler portions of North America. But most of the *Cypripediums* are Old World plants, being found chiefly in Asia and not west of India. They are represented in South America by the *Selenipediums*, which are characterised among orchids by having an imperfectly divided ovary. *Dendrobiums* from India to Australia are very beautiful, and *Calanthes*, which are both Old and New World plants, are terrestrials which are deservedly admired. The Madagascar orchids of the genus *Phaius*, and *Phalænopsis* from Eastern Asia, are very beautiful. Much has been done in cross-fertilising orchids. Bigeneric crosses are well known, and in one instance as many as four genera have been combined in one plant.

February 24th.—Lepidoptera Larvæ.

By. D. ROSIE.

The object of this lecture was to give a sketch of the general life of the lepidopterous larva from the egg to the pupa, touching on points of particular interest in the larval economy, and illustrating the whole with a large number of

carefully coloured lantern slides. Several cases of preserved and mounted larvæ were also exhibited. The eggs, the hatching, and the structure of the caterpillar were first briefly described; then its feeding, growth, and moults were dealt with. Figures were quoted to show the enormous bulk of food consumed in preparation for the subsequent period of fasting and activity; and some instances of special changes at the moults (*e.g.*, in the white admiral and the swallow-tail) were depicted. Protective mimicry was illustrated particularly by examples from among the geometer larvæ. As cases of more active defence the larvæ of the puss-moth family and of the swallow-tail were taken. The attacks of ichneumon and other parasites, different methods of hibernation, and various other factors in the life of the caterpillar were spoken of; and an account was given of the general characteristics of the larva in some of the principal families of the lepidoptera.

March 10th.—Spiders.

BY DR. A. RANDALL JACKSON, M.Sc.

The lecturer gave a general account of the spiders, dwelling particularly on such features as are especially characteristic of the order, *e.g.*, their various methods of web-spinning, hunting, courtship, and breeding, and the points of structure connected with their habits. He then surveyed some of the chief families of spiders and their special forms, habitats, and modes of life. The lecture was illustrated by lantern slides, and by microscopic mountings shown on the screen by means of the projection microscope.

April 23rd.—Coal.

BY C. E. STUART, B.Sc.

After an introduction dealing with the general nature and character of coal, and showing its vegetable origin from the fossil remains composing it or found in it, the theories advanced to explain the deposit of coal in beds were reviewed.

Of these, that held by Lyall, Dawson, Delabèche, and other geologists, was that the coal-beds are the product of the decay of the vegetation of the period on the spot where it lived and grew, whether on dry land, or on marshy or submerged ground as is more probable.

Grand' Eury modified this theory by supposing that a great deal of coal was deposited not where its materials grew, but in water of various depths near at hand; as one might conceive of the trees from the edges of a great fresh or brackish water lake to fall into that lake and becoming waterlogged, sink, and cover the bottom.

The most recent theory, the delta theory of Fayol, last received attention. This assumes that the trees and plants composing the coal grew in forests by the sides of streams, which in time of flood bore them down in their waters to lakes or to the sea, where they were deposited as they became waterlogged, and covered up later on by the mud and sand of the advancing delta. Fayol set up this theory on the evidence of the occurrence of coal in the basin of Commentry in central France; and the facts as established in this and other cases warrant his deductions, but the universality of this delta formation as advocated by its author cannot be conceded in the face of the manner of occurrence of coal in the coalfields of Newcastle and elsewhere.

In the second portion of the lecture were discussed the methods by which wood is transformed into coal. The suggestion of the filling up of the pores of wood with bitumen injected into them was shown to be untenable. The purely physical theory that heat, pressure and chemical action are, with sufficient time limit, in themselves capable of producing the observed changes, was by the instances in which greatly altered products are sometimes found in younger rocks than others less altered shown to be not always applicable. Renault's theory of "The Bacterial Origin of Coal" was then explained. As at the present time bacteria and fungi are the causes of the decomposition and decay of wood, so in coal-

measure times, organisms of the same class may have contributed to the conversion of wood into coal. Bacteria, fungi, and algæ are by the microscope found to occur frequently in coal, and Renault regards bacteria as capable of producing all the necessary chemical changes.

The concluding part of the lecture dealt with some of the plant remains found in coal and in the coal-measures, special reference being made to the aid which the microscope has given to the discovery of the structure and relationship of the interesting plants (1) *Sphenophyllum*, forming a link between the horsetails and the lycopods, and (2) *Lyginodendron*, forming a link between the ferns and the cycads.

The lecture was illustrated with a number of lantern slides, some of which were kindly lent by Prof. Lebour.

REPORT OF FIELD MEETINGS, 1903.

In view of the amalgamation of the Tyneside Naturalists' Field Club, the arranging of the field meetings was this year taken over by the Natural History Society. Four meetings were held in place of the usual six, the half-day meetings at the beginning and end of the session being omitted—the first because the necessary arrangements could not be made in time, the last because no one attended it. Reports of the other four meetings are given below. That of the day at Howick and Dunstanborough is kindly furnished by Mr. C. E. Stuart, B.Sc.; and the Rev. W. J. Wingate has supplied the account of the day at Stanhope.

THE FIRST MEETING took place on June 12th, and had been planned as a visit to the Farne Islands. A party of ten travelled by an early train to Seahouses, and were disappointed to find that it was impossible to carry out the object of the expedition. A strong east wind had been blowing on the previous day, and though the day of the visit was beautifully fine and still, the sea had not had time to settle sufficiently to allow of landing on the islands. Determining, however, to make the best of the circumstances and of the delightful weather, the party devoted the day to a walk up the coast to Bamborough and Holy Island. There was a stream to be waded at the mouth of Budle Bay, and as thenceforward most of the walking was over smooth, wet sand, barefooted marching was largely resorted to. On this part of the journey a striking mirage was visible. The heat of the sun on the wet sand, combined with the absence of wind, had given rise to a layer of warm air with a reflecting surface at a height of about three or four feet. Owing to this, Holy Island appeared as if cut up into several smaller islands reflected in very still water; and by stooping it was possible

to cut off the base of the island from view until only the highest points could be seen above the reflecting layer. On Holy Island a belated luncheon was taken, and the party subsequently crossed to the mainland in a coble, the tide being up and crossing on foot therefore impossible. Then, in the early evening, a further walk was taken, through the low-lying fields to Goswick station. Here the return train was caught, and brought the party back to Newcastle at 8 p.m. Most of the birds which breed on or near the coast were seen during the course of the day; a pair of Stonechats near Seahouses, the hundreds of clamorous Redshanks in the Goswick meadows, and nests of the Ringed Plover and Reed Bunting aroused particular interest.

THE SECOND MEETING was fixed for July 9th at Barnard Castle. Mr. Ernest Lingford had kindly consented to act as guide, and was prepared to lead the party through Barnard Castle Woods to Cotherstone, Fairy Cupboards and Osmund Glen; but as the party proved to consist of a single member, it is understood that the programme was not strictly followed. The weather was perfect, and an extremely pleasant day was spent.

THE THIRD MEETING.—Delightful weather favoured those members of the Natural History Society and their friends who left Newcastle on August 21st for the excursion to Howick and Dunstanborough. On leaving the train at Little Mill, the party, increased by the addition of some members from Embleton, walked through the pleasant shady lanes towards Howick Hall, where they were delighted to receive an intimation that Earl Grey had thrown the hall and grounds open for their inspection. The noble earl, a vice-president of the Natural History Society, honoured the Society by himself conducting the party through the reception rooms of the stately mansion, and thence through the pleasure and flower gardens. The visitors, in view of the close proximity of the gardens to the bleak north-east coast, marvelled at the luxuriance of vegetation and the wealth of flowers so late in

the season. Myrtle flourished in the open air, and a variety of roses and rare blossoms bore witness to the mildness of the climate, and to the taste and care of the Countess Grey. On leaving the grounds, the party were set on their way by his lordship, whose interest in the welfare of his workers was evidenced by grounds set apart for recreation and by the flourishing schools and co-operative store visited on the road. After thanking Earl Grey for his courtesy and kindness, the party proceeded to the look-out house, and then down the cliff for an inspection and explanation of the interesting geological features of the coast, the latter under the pleasant and efficient guidance of Mr. D. Woolacott, M.Sc., F.G.S., of the Armstrong College of Science. An hour's walk and climb brought lunch time, and after a rest and refreshment, the party walked on to Craster, which little village was very busy with the packing of herrings, but fairly clean notwithstanding. Proceeding northwards, the track lay along the strike of the Whin sill, which for more than a mile presents the curious feature of emerging at a gentle slope directly out of the sea, and ending in an almost perpendicular cliff facing inland. The explanation of the striking and remarkable appearance thus caused, and an animated search for the local "diamonds" (so-called) in the basaltic rock, occupied the time till Dunstanborough Castle was reached, from which commanding spot the view extended across the country to the Cheviots and to Bamborough. A short walk inland to Embleton concluded the business of the expedition, though its members did not return until after a substantial dinner in the village.

A description of the geological features of the coast from Howick to Dunstanborough was kindly written by Professor Lebour for use at this meeting, and was read to the members on the spot. As many will be glad to have it in a permanent form for use on other occasions, it is here appended.

HOWICK TO CULLERNOSE POINT.

The beds seen along this portion of the coast belong to that upper division of the Carboniferous Limestone or Bernician

series which comprises the "Six-Yard" and "Four-Fathom" limestones, the former being the lower. As far as Salter's Gate nearly the coast exhibits quite a number of interesting faults, some of them intersecting in such a way as to form so-called "trough" vaults. In consequence of these dislocations the bedding is disturbed in a highly complicated manner. From Salter's Gate to just south of Cullernose a gentle undulation alone varies the general dip which is here northerly. Besides the limestones mentioned, shales and sandstones are the chief rocks so far. The cliff is capped by boulder clay, containing boulders of many varieties of rock, both local and from a distance, and at about 50 feet from the beach and overlying the boulder clay is a thin layer of stratified shingle (1 to 2 feet thick only) which should be searched for shells, as it is supposed by Professor Garwood to be a raised beach, and indeed it very well may be. Before reaching the outcrop of the "Four-Fathom" limestone a small basaltic dyke may be seen just reaching high-water mark. This dyke is interesting as showing its upward termination within the bed of sandstone which underlies the limestone. The "Four-Fathom" limestone (with its associated shales) is particularly well exposed, and yields many excellent fossils. It is soon, however, cut off by a fault which has been filled in with basalt, thus forming another dyke very near to, but not actually seen in contact with the Great Whin Sill which forms the main and most striking feature of the Point. In the whin sill, which is here finely columnar, huge fragments of some of the underlying strata are seen caught up by the igneous intrusive mass, and by it baked and altered so as to exhibit quite a new set of minerals when examined in thin slices under the microscope. Garnets have been found there.

CULLERNOSE POINT TO DUNSTANBOROUGH.

The coast from Cullernose Point to Castle Point is entirely formed by the Great Whin Sill. At the last-named headland, and at Gull Crag round the corner, the base of the whin sill is splendidly shown, baked shales of considerable thickness

lying immediately beneath it. On the rocky shore close by the "Four-Fathom" limestone is again seen, but in this case much folded and bent owing to its disturbance by the whinstone intrusion. A curious fold here is well known as the "Saddle Rock," or sometimes as the "Grey Mare Rock." The so-called Dunstanborough diamonds are not rare in the whinstone hereabouts. They as well as the amethysts which accompany them are, of course, merely good quartz crystals formed in vuggy cavities in the stone.

The best description of this bit of coast is, I think, Professor Garwood's in Vol. II. of the "History of Northumberland."

THE FOURTH MEETING took place at Stanhope on Sept. 8th. Only two members arrived by the morning train, and decided to take their own way instead of following the programme. The morning was devoted to Parson's Byre Quarry. Here it was found that the glacier floor, with its fine example of smoothed and striated rock, had been nearly entirely quarried away. In the quarry itself the water channels, vertical and horizontal, and the various posts of the limestone were examined with much interest. Several good fossil shells were obtained, and a large *Orthoceras* was noted, too heavy for removal. The afternoon was spent in Stanhope Dene, where another member turned up. Nothing was observed here that calls for record.

RULES

OF THE

NATURAL HISTORY SOCIETY

OF

NORTHUMBERLAND, DURHAM, AND NEWCASTLE-UPON-TYNE.

ADOPTED AT THE ANNUAL MEETING HELD ON THE
14TH DAY OF OCTOBER, 1903.

OBJECTS.

1. The objects of the Society shall be the cultivation of the Science of Natural History in all its branches and especially the investigation of the Geology, Botany, Zoology, and Meteorology of the counties of Northumberland and Durham; the encouragement of the systematic study of Natural History; the protection of the rarer species of plants and animals which are indigenous to the district; the maintenance of the Hancock Museum and its collections; and correspondence and co-operation with any scientific society or association with similar objects.

CONSTITUTION.

2. The Society shall consist of ordinary members, honorary members, and associates.

3. Ordinary members shall be the present members of the Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne, the members of the Tyneside Naturalists' Field Club who were members of the latter body on 1st January, 1903, and others who may hereafter be elected in manner hereinafter provided. Ordinary members shall pay an annual subscription of One Guinea, except those members who now join the Society as members of the Tyneside Naturalists' Field Club for whom the subscription shall be five shillings, but such members shall have no share or interest

in the property of the Society. The property of the Society shall belong to, and the control of its affairs, and the election of honorary members be solely vested in the ordinary members save as aforesaid.

4. Honorary members shall be such persons non-resident in the counties of Northumberland and Durham as have rendered services to the Society or who are eminently distinguished as authors or explorers in the realms of Natural Science. The number of honorary members shall be limited to 50.

5. Associate members shall be persons under the age of 21 years, the children of members or such persons interested in any branch of Natural History who in the opinion of the Council are unable to pay the subscription of an ordinary member. The subscription of an associate shall be five shillings per annum.

ELECTION OF MEMBERS.

6. Every person desirous of becoming an ordinary member of the Society must be recommended in writing by three ordinary members, of whom two shall be personally acquainted with him. On being so recommended he shall be declared to be elected by the votes of the majority of the ordinary members present either at a council meeting, an ordinary meeting, or the annual meeting of the Society.

7. Honorary members shall be proposed by three ordinary members, and voted for at the next ordinary or annual meeting.

8. Every person proposed for election as an associate under Rule 5 must be recommended in writing by two ordinary members, one of whom must certify to his personal knowledge of the candidate and of his complying with the conditions of such rule.

9. Any person recommended under Rule 8 shall be declared to be elected by the votes of the majority of members present either at a council meeting, an ordinary meeting, or a special meeting of the Society.

10. Any member or associate proposing to resign shall notify the same in writing to the secretaries previous to the day on which his subscription becomes due.

11. All subscriptions shall be paid to the treasurer, and shall be due in advance on the 1st day of August in each year. Members or associates elected on or after the 1st of January in any year shall pay one half of the annual subscription in respect of the current year.

12. If any member or associate do not pay his subscription for one year after its becoming due, and further neglect to pay it for three months after notice shall have been sent him of this rule, he shall cease to be a member or associate and shall not be qualified for re-election until his subscription in arrear shall have been paid.

13. The Council shall have power at any time to call upon any associate elected under Rule 9 to allow himself to be nominated for the ordinary membership of the Society, failing which he shall cease to be an associate of the Society at the end of the current financial year of the Society.

MEETINGS.

14. The annual meeting of the Society shall be held in the Society's rooms on the first Wednesday in July, at three o'clock in the afternoon, or on such other day and at such other hour as shall at any time be appointed by the Council, and at such meeting a report of the proceedings and an abstract of the accounts of the past financial year shall be presented by the Council.

15. Ordinary meetings shall be held at such times and under such regulations as shall from time to time be appointed by the Council.

16. Special meetings shall be held at such times as shall be appointed by the Council, either at their discretion or at the request in writing of five ordinary members, addressed to the secretaries fourteen days previously; and such business only shall be transacted at the special meetings as shall have been specially announced.

17. No motions, save such as relate to the ordinary routine business of the meeting, shall be adopted at any meeting, unless notice in writing of such motion has been given at a previous meeting, or sent to the secretaries not later than ten days before the date of such meeting.

18. Seven days' notice of every annual or special meeting, stating the business to be brought before the meeting, shall be sent to each ordinary member at his usual or last known place of abode or business.

19. No alteration shall be made in the laws of the Society except at an annual meeting, and every alteration to be then proposed shall be announced by notice in writing at a previous ordinary or special meeting and inserted in its minutes, or notified in writing to the Council not later than one month before the date of the annual meeting, or in any other manner the Council may think proper.

Notice of any amendment to any such alteration shall be sent to the secretaries not later than three days before the annual meeting; but alterations or amendments which in the opinion of the chairman of the meeting do not affect the principle of any law or are merely consequential upon other alterations or amendments may be made without notice.

20. Every question which shall come before any meeting of the Society shall be decided by the votes of the majority of the ordinary members then present and voting. In case a meeting shall be equally divided on any question, the chairman of such meeting shall have a second or casting vote.

OFFICERS.

21. At each annual meeting a president, four or more vice-presidents, a treasurer, and two secretaries, shall be elected, and with twelve ordinary members to be elected at the same meeting, shall form the Council for the year ensuing. Four of the twelve shall be ineligible for re-election for the ensuing year. The four to retire in the years 1904 and 1905 shall be selected by lot, but in subsequent years they shall retire by rotation,

22. Any ordinary member may nominate any ordinary member or members to fill the respective offices. Every nomination must be signed by the person nominating and sent to the secretaries 10 days before the date of the annual meeting. Not more than three members at one time who are such by virtue of their former connection with the Tyneside Naturalists' Field Club shall be eligible for election to the Council. The secretaries shall cause a list of the nominations, together with a voting paper, to be sent to each ordinary member with the notice convening the annual meeting. If the number of persons nominated for any office is less than the number to be elected to that office then the election shall be from the ordinary members generally. The election shall be conducted at the annual meeting in such manner as the chairman shall direct, and the declaration by the chairman at the meeting as to the result of the election shall be final and conclusive.

23. In case the treasurer, the secretaries, or four of the twelve shall, during his or their year of office die or resign, or become incapable to act, the vacancy so occasioned may be filled up by the Council or not, at their option.

24. The secretaries shall regularly record the proceedings of all meetings of the Society, and of the Council, and they shall, under the Council's direction, conduct the Society's correspondence and prepare the annual report, and shall also superintend the printing of such reports and the other papers of the Society.

25. The funds of the Society shall be deposited in the hands of the treasurer, and shall be disbursed by him according to the direction of the Council.

26. The expenditure of the funds of the Society, the enforcing of its laws, and the general management and conduct of its affairs, shall be confided to the Council; they shall have the appointment of all necessary paid officers and servants; and they shall have power to make regulations, from time to time, for the guidance of such officers and servants.

27. Meetings of the Council shall be convened by the secretaries monthly or whenever they shall deem it requisite, or shall receive a requisition of three members of the Council for that purpose. At all meetings of the Council three shall be a quorum.

28. The record of the Council's proceedings shall, at all times, be open to the inspection of the ordinary members of the Society.

29. The Council for the year at their first meeting, and from time to time afterwards when a further appointment may seem to them requisite, may appoint curators, to whom shall be entrusted the making of the minor arrangements of the museum and building and the care of the specimens; and the proceedings of such curators shall be subject to the revision and control of the Council.

30. The Council may appoint a house committee out of their own members, to whom shall be entrusted the minor arrangements of the collections and museum building and the examination of accounts.

31. The Council shall also have power from time to time to delegate to a committee any portion of their work excepting the expenditure of the funds of the Society and the election of members. Any such committee shall consist of not less than four or more than eight members, of whom at least one-half shall be members of the Council and the remainder ordinary members of the Society.

32. The proceedings of all committees shall be subject to the revision and control of the Council.

33. Each committee shall be empowered to elect its own chairman and secretary or secretaries.

34. Auditors shall be appointed at the annual meeting each year; and their examination of the accounts shall be completed, and a statement thereof, as audited, shall be printed and distributed with the notice of the annual meeting, one week at least before such meeting.

35. The Society shall not make any dividend, gift, division, or bonus, in money, unto or between any of its members.

PROPERTY OF THE SOCIETY.

36. The property of the Society, both real and personal, shall be vested in trustees to be chosen out of the ordinary members. The number of such trustees shall not be more than fifteen nor less than three.

37. When the present trustees of the Society, or any of them, or any future trustees to be appointed as after mentioned, shall happen to die, or shall be desirous of being discharged of and from, or shall refuse or decline to act in the trusts in them reposed, then, and in such case, and so often as it shall happen that by such means such trustees shall be reduced under the number of five, it shall and may be lawful to and for the ordinary members of the Society, from time to time at a meeting to be called for that purpose, of which a month's notice shall be given at a previous general meeting, to elect, nominate, substitute, or appoint any other persons to be trustees, in the stead or place of the trustees so dying or desiring to be discharged or refusing or declining to act; and when so often as any new trustee shall be nominated and appointed, all the trust property, as well real as personal, shall be thereupon, with all convenient speed, conveyed and assured, assigned and transferred, in such sort and manner, and so as that the same shall and may be legally and effectually vested in the surviving or continuing trustees or trustee of the same trust estates and such new trustees, jointly, or if there shall be no such continuing trustee, then wholly in such new trustees, in trust for the said Natural History Society, and to be held and applied according to the rules or regulations and laws for the time being of the said Society, and the recital in the deed or deeds of conveyance or assignment of the trust property, of the appointment of new trustees by the Society, shall, in all respects, and to all intents and purposes, be considered as evidence of the resolution and appointment, and of the same having been regularly made.

38. It shall and may be lawful to and for the trustees for the time being, at any time or times hereafter, by the direction of a majority of the members of the Society then present, at a

meeting to be held for the purpose of considering of the expediency of any sale, exchange, or mortgage, (of which notice shall be given at a previous general meeting), to sell, exchange, mortgage, or otherwise dispose of any part of the real property now belonging or hereafter to belong to the Society, in such manner as by a resolution of the Society for that purpose shall be ordered and entered in their minutes, and a recital of such resolution in the conveyance of such property shall be evidence of its having been regularly and properly made, and the receipts or receipt of the trustees for the time being for the money, for which any part of such property may be sold or mortgaged, or for any money to be received for equality of change or otherwise, shall be sufficient discharges to the person or persons paying the same respectively for the money for which the same shall be so given, or for so much thereof as in such receipts or receipt shall be acknowledged to be received, and the person or persons paying the same respectively, and taking such receipts or receipt as aforesaid, shall not afterwards be answerable or accountable for the loss, misapplication, or non-application, or be in anywise obliged to see to the application thereof, or of any part thereof respectively, and such person or persons shall be free from all obligation of ascertaining the existence of the resolution, or of its having been duly made.

39. It shall not be in the power of any member or members of the Society to dissolve the same, or to sell, give, assign, change, or dispose of his or their share or respective shares or interest therein, or the property belonging thereto. And on the decease or secession of any member, or on the erasure of his name from the list of members in the books of the treasurer of the Society, agreeably to the established laws thereof, his share or interest in the Society, and of and in the property belonging thereto, shall immediately thenceforth cease and determine.

40. The Council shall have the power of lending to or exchanging specimens with other institutions or individuals, in such manner as they may judge conducive to the interests of the Society and of science; such specimens excepted as shall have been presented under express stipulation to the contrary.

LIST OF MEMBERS
OF THE
NATURAL HISTORY SOCIETY
OF
NORTHUMBERLAND, DURHAM, AND NEWCASTLE-ON-TYNE.

REVISED TO JANUARY, 1904.

*** Except where otherwise stated, the addresses given are in Newcastle-on-Tyne.

*** The letters F.C. in place of the date of election indicate that the member joined the Society in 1903 as a former member of the Tyneside Naturalists' Field Club under Rule 3.

	ELECTED.
Adamson, Lt. Col. C. H. E., J.P., C.I.E. (<i>V.-P.</i>), Crag Hall, North Jesmond	1896
Adamson, Miss C. T., Crag Hall, North Jesmond	1903
Adamson, Lawrence W., J.P., LL.D., Eslington Lodge	1902
Adamson, Horatio, 99, Howard Street, North Shields	F.C.
Adamson, Richard, Winlaton, Blaydon-on-Tyne	F.C.
Addison, John, 17, North Bridge Street, Sunderland	F.C.
Allan, Edward, Osborne Villas	1903
Amyot, W. H., Fenwick Terrace, Jesmond Gardens	1884
Anderson, W. L., Queen Square	1886
Angus, Lt. Col. W. M., J.P., Framlington House, Newcastle	1884
Angus, Jos. G., The Cedars, Osborne Road	1902
Angus, H. P., " "	1902
Angus, W. H., Stockbridge, Newcastle	1902
Archer, Mark, Farnacres, Ravensworth, Gateshead	1903
Armstrong, J. H., Broomley Grange, Stocksfield	1890
Armstrong, T. J., 14, Hawthorn Terrace	1887
Armstrong, The Right Hon. Lord, J.P., M.A., D.C.L. (<i>President</i>), Cragside, Rothbury	1889
Armstrong, Lady, Cragside, Rothbury	1889
Armstrong, C. F., Peel Tower, Corbridge-on-Tyne	1902
Armstrong, W., Wingate, Co. Durham	1903
Armstrong, W., jun., Wingate	1903
Armstrong, J. F., Dr., 46, Charlotte Street, South Shields	F.C.

	ELECTED.
Arnott, James, 9, Eslington Terrace	1903
Askwith, R., Witton Hall, Witton-le-Wear	1902
Atkinson, John, 10, Fernwood Road	1884
Atkinson, Geo. A., 21, Windsor Terrace	1899
Backhouse, T. W., West Hendon House, Sunderland	F.C.
Bailes, Thos., Fenwick Terrace, Jesmond Gardens	1884
Bainbridge, A. E., Lynwood, Jesmond Park West	1903
Bainbridge, Geo. B., Espley Hall, Morpeth	1884
Bainbridge, Thos. H., J.P., Holmwood, Clayton Road	1884
Barnes, Mrs., Whitburn, Sunderland	1888
Barnard, The Right Hon. Lord, Raby Castle, Darlington	1903
Bates, S. Fred., 20, Collingwood Street	F.C.
Beck, W. E., Slate Works, Gallowgate	1889
Bedson, Prof. P. P., M.A., D.Sc., F.C.S., Durham College of Science	1888
Beatley, Wm. C., M.D., 4, St. Mary's Terrace	1902
Bell, Sir Lowthian, Bart., LL.D., F.R.S. (<i>V.-P.</i>), Rownton Grange, Northallerton	1833
Bell, Alderman Thomas, J.P., 23, Windsor Terrace	1884
Bell, John G., 49, Osborne Road	1899
Bell, John F., Northend, Durham	1903
Bell, Thos. Jas., Cleadon	1903
Bell, C. L., Woolsington, Newcastle	1903
Bell, J. R., 4, Tankerville Terrace	F.C.
Belt, Thomas, Bigg Market	F.C.
Benson, Harry, Denehurst, Jesmond Park East	1896
Benson, T. W., Allerwash, Fourstones, Hexham	1877
Benson, J. G., 12, Grey Street	F.C.
Berkley, Cuth., Highfield House, Durham	1877
Bidgood, John, B.Sc., Saltwell View, Gateshead	1902
Black, Wm., 1, Lovaine Place	1888
Blair, Ernest, Thorney Terrace, South Shields	F.C.
Blair, Robert, Russell Street, South Shields	F.C.
Blayney, R. O., 12, North Terrace	1903
Bolam, George, Berwick-on-Tweed	F.C.
Bone, W. J., 61, Linskill Terrace, North Shields	F.C.
Bowden, Thos., J.P., 42, Mosley Street	1888
Bowler, Fred. Austin, 56, Jesmond Road	1903
Bowman, John, 11, Victoria Square	1903
Brady, Prof. G. S., M.D., LL.D., F.R.S. (<i>V.-P.</i>), Mowbray Villas, Sunderland	1892
Bramwell, T. Y., North Shields	1902

Brewis, G. R., Ellesmere Villa, Granville Road	ELECTED. 1889
Brooks, Miss, 14, Lovaine Place	
Bromley, Rev. Alfred, Argyle Square, Sunderland	F.C.
Browell, E. J. J., J.P. (<i>V.-P.</i>), East Boldon House, by Newcastle-on-Tyne	1877
Browne, Sir Benj. C., J.P., D.C.L., Westacres, Benwell	1876
Brown Rev. J. J., M.A., Coniscliff Vicarage, Darlington	F.C.
Brown, M. Walton, 10, Lambton Road	F.C.
Brown, Rev. W. McLean, 22, Hawthorn Road, Gosforth	F.C.
Bruce, J. M., 83, Osborne Road	1902
Bruce, Sir Gainsford, Yewhurst, Bromley, Kent	F.C.
Burdon, Col. Rowland, Castle Eden, Co. Durham	1903
Burnup, John, Brantwood, Gosforth	1884
Burnup, Edwin, 2, Wentworth Place	F.C.
Burt, Thos., M.P., 20, Burdon Terrace	1885
Cackett, Jas. T., 113, Osborne Road	1901
Carmichael, Dr. D., Gosforth	F.C.
Carter, G. J., Riding Mill-on-Tyne	1902
Challoner, John D., 15, Framlington Place	1898
Charlton, John, 6, William Street, Albert Gate, London, S.W.	1903
Charlton, Richard, 20, Claremont Place	F.C.
Clark, Isaac, Blaydon-on-Tyne	F.C.
Clark, Isaac, jun., Dene House, Blaydon-on-Tyne	F.C.
Clarke, Henry, 24, Dockwray Square, North Shields	F.C.
Clay, Bertram, 14, Windsor Terrace	1899
Clay, Mrs., " "	1894
Clephan, Robt. C., F.S.A., Marine House, Tynemouth	1887
Cobb, Joseph, Station Street, Sunderland	F.C.
Cochrane, Cecil A., Oakfield House, Gosforth	1903
Cooke, R. W., 15, Claremont Place	1884
Cooke, Thos., J.P., 24, Grainger Street West	1889
Cookson, Norman C., (<i>V.-P.</i>), Oakwood, Wylam-on-Tyne	1874
Cookson, Harold " "	1896
Cookson, Clive " "	1903
Corder, Alex., 21, Fawcett Street, Sunderland	F.C.
Corder, Francis, Princess Street, Sunderland	F.C.
Cowell, Counc. Wm., J.P., 10, Brandling Place	1902
Cowen, Mrs., Blaydon Burn House, Blaydon-on-Tyne	1896
Cowen, Joseph, Stella Hall, Blaydon-on-Tyne	F.C.
Cox, J. H., 33, Fawcett Street, Sunderland	F.C.
Crawford, Thos., 10, Haldane Terrace	1884
Crawhall, Geo. E. (<i>V.-P.</i>), 38, Eldon Street	1883

	ELECTED.
Crawhall, Rev. Thos. E., M.A., The Vicarage, North Shields	1899
Cruddas, W. D., J.P. (<i>V.-P.</i>), Haughton Castle, Humshaugh	1864
Cruz y Diaz, Emiliano de la, Ribas, Provincia de Gerona, Spain	1902
Currie, Archibald, 48, Jesmond Road	1893
Daglish, John (<i>V.-P.</i>), Rothley Crag, Cambo, Northumberland	1887
Dale, Chas. W. M., North Eastern Bank, Grey Street	1895
Dalglish, Dr., Eye Infirmary, Sunderland	F.C.
Dees, R. R. (<i>V.-P.</i>), The Hall, Wallsend	1850
Dent, John, 5, Osborne Villas	1885
Devy, Dr. Thomas V., Wolsingham	F.C.
Dickinson, A. H., Dean Street (<i>Hon. Treasurer</i>)	1884
Dickinson, John, Park House, Sunderland	1885
Dick, James, 11, Osborne Avenue	1903
Dillon, Malcolm, 17, Victoria Square	1903
Dinning, Mrs., 43, Eldon Street	1894
Dodds, Edwin, Home House, Low Fell, Gateshead	1884
Dodds, Bryan Mawson, Home House, Low Fell, Gateshead	1900
Dodd, D. Mainland, 3, Fenham Terrace	1902
Dodd, Matthew Hy., 41, Devonshire Place	F.C.
Drewett, D. O. (<i>V.-P.</i>), Riding Mill-on-Tyne	1863
Drummond, D., M.D., Saville Place	1902
Drummond, James, Harrogate, Yorkshire	F.C.
Dunn, N., Shillbottle Colliery, Lesbury	1902
Dunn, Septimus, Tynemouth	F.C.
Durham, The Right Hon., The Earl of, Lambton Castle, Fence Houses, Co. Durham	1903
Durham, The Right Revd., The Lord Bishop of, Auckland Castle, Co. Durham	1902
East, John G., 5, St. George's Terrace	1901
Eastcott, H. Russell, Endsleigh, Gateshead	1903
Easten, J. W., Pilgrim Street	1903
Elphick, Geo., M.R.C.V.S., 1, Brandling Park	1894
Eltringham, Harry, Eastgarth, Westoe, South Shields	1902
Embleton, Miss A., 10, Elmfield Villas, Gosforth	
Emley, Fred., Ravenshill, Saltwell, Gateshead	1889
Ericsson, Axel F., Mayfield, Fernwood Road	1896
Faber, J. V., Shotley Bridge, Co. Durham	1885
Fenwick, J. C. J., M.D., Long Framlington, Morpeth	1896
Ferguson, John, Denecroft, Jesmond	1885
Finlay, Rev. W., Seaton Burn	F.C.
Forster, Jas. S., 9, St. Mary's Place	1875

	ELECTED.
Forster, John J., J.P., Oakfield Ryton-on-Tyne	1884
Forster, W. E., 3, Eldon Square	1903
Forster, Fred. E., 32, Grainger Street	1901
Fortt, R. G. (Finney & Co.), Mosley Street	F.C.
Fowkes, W. H., Farningham House, Whitley	F.C.
Francis, Wm., 20, Collingwood Street	1894
Gascoigne, F., 27, Eldon Street	1890
Gibb, C. J., M.D., Sandyford Park	1862
Gibson T. G., J.P., Lesbury, Northumberland	1880
Gibson, Wm., 3, Windsor Terrace	1877
Gilchrist, Prof. D. A. B.Sc., Durham College of Science	1902
Gillespie, Thomas, Winton House, Morpeth	1902
Gillies, Alex., 9, Ravensworth Terrace, Gateshead	1903
Glendenning, Wm., 6, Collingwood Terrace	1904
Goodger, Chas. W. S., Percy Gardens, Tynemouth	1898
Grace, W. P., Fellside House, Whickham	1881
Gracie, John L., 11, Sydenham Terrace	1896
Graham, Samuel, 107, High Park Road	1885
Graham, John, Findon Cottage, Sacriston, Durham	F.C.
Greene, C. R., North Seaton Hall, Morpeth	1903
Greenwell, F. J., His Honour Judge, Greenwell Ford, Lanchester	1902
Greenwell, Winship, Bothal, Morpeth	F.C.
Grey, Right Hon. Earl, Howick, Lesbury, Northumberland	1903
Gurney, Rev. Principal H. P., D.C.L. (V.-P.), Durham College of Science	1894
Hadaway, George, 21, Washington Terrace, North Shields	F.C.
Hadcock, Major A. C., 9, Archbold Terrace	1901
Hall, James, Priors Terrace, Tynemouth	1884
Hall, Wilfred, Tynemouth	1903
Hancock, John, 11, Eldon Street	1896
Hand, T. W., Public Library, Leeds	F.C.
Harris, Jas. B., Osborne Road	1899
Harrison, A. P., 9, Osborne Terrace	1884
Harrison, Chas., Beacon Grange, Hexham	1886
Harrison, Rev. A. J. B.D., Magdalene Lodge	1899
Harrison, Wm., Haldane Villa	1882
Hardcastle, Nich., M.R.C.S., 5, Sydenham Terrace	1902
Harkus, George, 9, East Parade	F.C.
Haswell, F. R., 77, Tyne Street, North Shields	F.C.
Haggie, R. Hood, Blythswood North, Osborne Road	1902
Havelock, M., Riding Mill-on-Tyne	1862

	ELECTED.
Hedley, Armorer, Mayfield, Gosforth	1885
Hedley, J. R., Park Head, Jesmond Dene	1902
Henderson, G. E., Framlington Place	1886
Henderson, W. F., Moorfield, Claremont	1884
Heslop, R. O., M.A., F.S.A., J.P., 16, Eskdale Terrace, Jesmond	1903
Hick, Rev. J. M., M.A., The Vicarage, Trimdon Grange	F.C.
Hoare, R. B., Orde House, Morpeth	1903
Hobbs, A. H., M.D., 24, Ellison Place	1903
Hodgkin, Thos., J.P., D.C.L., The Bank, Collingwood Street	1884
Hodgkin, T. E., B.A., " "	1903
Hodgson, William, Westholme, Darlington	F.C.
Holmes, W. H., Wellburn, Jesmond	1890
Holmes, Stephen, Broomfield, Jesmond	1903
Hopgood, Dr. J. F., Olive House, Tunstall Road, Sunderland	F.C.
Howden, Prof. R., M.A., F.R.S.E., 24, Burdon Terrace	1903
Hume, G. H., M.D., Ellison Place	1884
Hudson, Lee, 10, Kensington Terrace	1902
Hull, Rev. J. E., M.A., Haltwhistle	F.C.
Humble, Mrs., Ashburn, Scarborough	F.C.
Hunter, Andrew, 5, Higham Place	1903
Hunter, Edward, Wentworth, Gosforth	1902
Hunter, G. B., The Willows, Clayton Road	1902
Hurman, F. K., Ryton-on-Tyne	1902
Hutton, John, Eden Vale, Castle Eden	1884
Hutchinson, Henry, 2, Henderson Street, Darlington	F.C.
Hutchinson, William, Roseworth Villas, Gosforth	F.C.
Hutton, J. B., Kildale, Clayton Road, Jesmond	F.C.
Hutton, T. G. (North Hetton Coal Co.), John Street, Sunderland	F.C.
Innes-Hopkins, Major C. H., The Tower, Ryton-on-Tyne	1903
Irving, George, West Fell, Corbridge-on-Tyne	1887
Jackson, Joseph, 25, Leazes Terrace	1888
Jackson, A. Randell, M.B., M.Sc., The Laburnums, Hexham	1903
Jenkins, Geo., 6, Kensington Terrace	1896
Jobling, Thomas, Holmwood House, Winlaton-on-Tyne	F.C.
Johnson, Rev. W., Primitive Methodist College, Alexandra Road South, Manchester	F.C.
Joicey, Sir James, Bart., M.P. (V.-P.), Longhirst Hall, Morpeth	1888
Joicey, Mrs., Whinney House, Gateshead	1903
Jones, Thomas, Durham	F.C.
Kelly, Bruce, 103, Osborne Road	1902
Kirk, William, Norton Hall, Stockton	1903

	ELECTED.
Kitchen, G. W., The Very Rev. Dean, D.D., The Deanery, Durham	1902
Knothe, Rudolph, Jesmond High Terrace	1884
Knowles, W. H., F.S.A., 37, Grainger Street	1893
Laidlaw, P. O., Stonecroft, Fourstones, R.S.O.	1892
Laidler, G. G., 13, Eslington Terrace	1884
Laing, Alex., 12, Sydenham Terrace	1896
Lamb, Edmund G., M.A., Borden Wood, Liphook, Hants	1891
Lamb, John, 9, Windsor Crescent	1884
Lamb, Robt. O., Hayton, How Mill, Carlisle	1887
Lambert, Miss M., 3, Lovaine Row	1884
Lambert, Col. M. H., Pelaw House, Chester-le-Street	1903
Lambert, Thos., jun., Beverley Terrace, Cullercoats	1902
Lambton, Ralph E., 3, St. Thomas' Place	1898
Lawson, Thomas, Town Hall	1896
Lawson, Wilfred, 1, Durham Street	F.C.
Laycock, J. F., Wiseton, Bawtry, Notts	1889
Leach, C. C., Seghill	1903
Leathart, T. H., Bracken Dene, Gateshead	1904
Limont, Jas., M.D., Queen Square	1902
Logan, S. C., M.A., Royal Grammar School	1898
Logan, Jas., Bank House, Newbiggin-by-the-Sea	1902
Lord, Sir Riley, J.P., Highfield Hall, Gosforth	1887
Louis, Prof. Henry, M.A., A.R.S.M., 11, Windsor Terrace	1902
Lovibond, J. Locke, West Jesmond House	1903
Lyle, J. Ranken, M.D., Saville Row	1902
Macdonald, Archd. E., 48, Lovaine Place	1896
Mackey, Matthew, 8, Milton Street, Shieldfield, Newcastle	F.C.
Maling, John Ford, Snows Green House, Shotley Bridge	1903
Maling, E. A., John Street, Sunderland	F.C.
Mallet, E. A., West Croft, Hexham	F.C.
Marshall, Frank, Claremont House	1887
Marster, Rev. Reg., Harton	F.C.
Martin, N. H., J.P., F.R.S.E., F.L.S., F.C.S. (<i>Hon. Secretary</i>), Ravenswood, Low Fell, Gateshead	1882
Mawson, Mrs., Ashfield, Gateshead	
May, George, Simonside Hall, South Shields	1902
McAllum, Hugh Kirk, Manor House, Riding Mill	1903
McDowall, T. W., M.D., County Asylum, Morpeth	1896
McIntyre, John, 3, Abbotsford Terrace	1883
McLean Geo. W., 3, Jesmond Villas	1896

	ELECTED.
McPherson, John E., Benwell Grange	1896
Meek, Alex., M.Sc., F.Z.S., Durham College of Science	1895
Mein, M. M., 49, Percy Gardens, Tynemouth	1902
Middleton, Sir Arthur, Bart. (V.-P.), Belsay, Newcastle	1884
Middleton, H. N., Dissington Hall, Newcastle	1884
Milburn, J. D., Barnhill, Acklington	1884
Milburn, C. J., Bingfield House, Corbridge	F.C.
Miller, James, 46, Jesmond Road	1897
Mitcalfe, J. Stanley, 60, Percy Park, Tynemouth	F.C.
Moncrieff, J. M., The Hawthorns, Gosforth	1902
Motum, Hill, Scawby House, Grainger Park Road	1884
Moore, Joseph M., Harton Hall, South Shields	1889
Moult, John, Underhill, Low Fell, Gateshead	F.C.
Murray, Prof. G. R., M.D., Ellison Place	1894
Newall, F. S., Castle Hill, Wylam-on-Tyne	1896
Newall, Mrs., 2, Lowndes Street, London, S.W.	1896
Newcastle, The Right Rev., the Lord Bishop of, Benwell Tower	1903
Newcombe, W. Lister, F.R.I.B.A., Earlsmede, Gosforth	1902
Newton, Edward, Thirston House, Felton	1889
Newton, Robt., Brookfield, Gosforth	1897
Nisbett, E. T., 4, Summerhill Grove	1902
Noble, Sir Andrew, Bart., K.C.B., F.R.S., F.R.A.S., F.L.S. (V.-P.), Jesmond Dene House	1860
Noble, Benjamin, Westmorland House, Low Fell, Gateshead	1902
Noble, Captain George, 47, South Street, Park Lane, London	1877
Noble, Philip E., Walton Hall, Morpeth	1903
Noble, S. W. A., 69, Eaton Place, London, S.W.	1887
Noble, Miss, Jesmond Dene House	1887
Northbourne, The Right Hon. Lord, Betteshanger, Dover	
Northumberland, His Grace the Duke of, K.G., D.C.L., F.R.S. (V.-P.), Alnwick Castle	
Oliver, Prof. Thos., M.D., F.R.C.P., Ellison Place	1889
Palmer, Henry, Medomsley, Co. Durham	1903
Parrington, M. W., Hill House, Monkwearmouth	1902
Page, F., M.D., J.P., 1, Saville Place	1903
Parsons, Hon. C. A., F.R.S., M. Inst. C.E., Holeyn Hall, Wylam-on-Tyne	1903
Park, A. B., Bigg Market	F.C.
Parkinson, W. A. Hope, Oakfield, Low Fell	1904
Pattinson, H. L., 7, Windsor Crescent	1892
Pattinson, John, F.I.C., F.C.S., Shipcote House, Gateshead	1871
Payne, J. B., 15, Mosley Street	1898

Peart, Dr. R. S., Cleveland Villas, North Shields	ELECTED. F.C.
Pemberton, G. W. S., 9, Nixon Street	F.C.
Perkins, Chas., Carham Hall, Coldstream, N.B.	1889
Pease, J. Beaumont, Pendower, Benwell	1903
Peverley, R. B., 90, St. George's Terrace, Jesmond	F.C.
Philipson, Sir Geo. H., J.P., M.D., D.C.L., F.R.C.P. (<i>V.-P.</i>), Eldon Square	1863
Philipson, Jos. A., 10, Windsor Crescent	1884
Philipson, William, Victoria Square	1884
Pickard, Alfred, High Street, Wolsingham, Weardale	F.C.
Pickering, Thomas, Tyneholme, Osborne Road	1902
Potter, Prof. M. C., M.A., F.L.S. (<i>Hon. Secretary</i>), Durham College of Science	1889
Potts, Joseph, 13, Windsor Terrace	1888
Potts, Edward, 15, Hunter Terrace, Sunderland	F.C.
Pumphrey, Bernard, 115, Osborne Road	1902
Pumphrey, Thos., 6, Summerhill Grove	1868
Pybus, W. M., Post Office Chambers	1884
Pybus, Robert, Ravenswood, Benwell	1902
Rankin, Charles, St. George's Square, Sunderland	F.C.
Ravensworth, The Right Hon., The Earl of, Ravensworth Castle, Co. Durham	1903
Redpath, Robert, Linden Terrace	F.C.
Reid, W. B., Cross House, Upper Claremont	1882
Rennoldson, W. L., 15, Windsor Terrace	1903
Renwick, George, J.P., M.P., Springhill, Morpeth	1902
Rich, F. W., 6, Jesmond Gardens	1886
Rich, Roland " "	1903
Richardson, Henry, Lit. and Phil. Society	1901
Richardson, Mrs. James, South Ashfield, Newcastle	1892
Richardson, James A. " "	1897
Richardson, John H., Kensington Terrace	1881
Richardson, Lawrence, The Gables, Elswick Road	1903
Richardson, Lewis F., B.A., The Gables, Elswick Road	1899
Richardson, Miss S. A., Maiden Cross, Hexham	1881
Ridley, Right Hon. Viscount (<i>V.-P.</i>), Blagdon, Cramlington	1877
Ridley, S. J., 13, Victoria Square	1902
Richardson, W. G., M.D., 19, Saville Row	1903
Richardson, Geo. Beigh, Hindley Hall, Stocksfield-on-Tyne	1903
Ritson, U. A., J.P., Jesmond Gardens	1887
Ritson, W. A., J.P., 31, Osborne Road	1902

	ELECTED.
Robson, John S., Sunnillaw, Claremont Gardens	1887
Robson, Robt., 13, Framlington Place	1884
Robson, C. E., Priorsdale, Clayton Road, Jesmond	F.C.
Robson, W. H., 25, Lawton Street	F.C.
Robson, J. W., 9, Tankerville Terrace	1903
Robson, Stephen E., Woodside, Sunderland	F.C.
Robinson, J. D., Beaconsfield, Coatsworth Road, Gateshead	1897
Robinson, Rev. F. G. J., M.A., The Rectory, Castle Eden	F.C.
Rogerson, John E., Oswald House, Durham	1880
Rose, Hugh, Briardene, Jesmond	1884
Routledge, Chas. L., 62, Jesmond Road	1903
Rowell, J. H., Southdene Tower, Saltwell, Gateshead	1902
Rutherford, J. V. W., M.D., Briarwood, Jesmond	1902
Ryott, W. H., 8, Windsor Terrace	1884
Sanderson, Ald. Thos. B., J.P., Woodslea, Clayton Road	1888
Sanderson, W. J., J.P., Heathdale, Gosforth	1889
Sclater, James, 7, Eslington Terrace	1902
Scorfield, E. S., 5, Osborne Terrace	1887
Scott, John D., 4, Osborne Terrace	1883
Scott, Ernest, West Quarter, Hexham	1901
Scott, Major Harvey, Benwell	1902
Sharp-Naters, John G., Stelling Hall, Stocksfield-on-Tyne	1883
Sharp, Wm., Blythswood South, Osborne Road	1883
Shortt, Chas. Septimus, 9, Grainger Street West	1901
Simpson, Benjamin F., Moorside, Moor Road, Gosforth	1903
Simpson, J. B., Bradley Hall, Wylam-on-Tyne	1903
Simpson, Thos., The Crofts, Hepscott, Morpeth	1888
Sisson, George, Washington Chemical Co., Washington	1899
Sisson, J. Arnott, Hill Croft, Low Fell, Gateshead	1902
Smart, G. S., Corchester, Corbridge-on-Tyne	1902
Smith, George, Grove Villa, South Gosforth	1884
Smith, H. Crawford, High Cross House, Benwell	1902
Snowball, F. J., Seaton Burn House, Dudley, Northumberland	1896
Spain, Geo., Victoria Square	1884
Spence, C. J., South Preston Lodge, North Shields	1891
Spence, R. F., Backworth	F.C.
Straker, F., Angerton Hall, Morpeth	1888
Strachen, R. A., 16, Ivy Road, Gosforth	F.C.
Straker, Jos. H., Howden Dene, Corbridge	1885
Straker, John C., The Leazes, Hexham	1903
Stephens, Richd., 15, Tankerville Terrace	1903
Stephens, Rev. T., Horsley Vicarage, Otterburn	F.C.

Stephenson, James, 53, Jefferson Street	ELECTED. F.C.
Stephenson, P. C., Ingleside, Low Fell, Gateshead	1902
Storey, Samuel, "Echo" Office, Sunderland	F.C.
Stuart, Chas. E., B.Sc., North Avenue, Gosforth	1891
Sutherland, James, 6, Sydenham Terrace	1884
Sutherland, Miss Jane, The Hawthorns, Osborne Road	1886
Swan, Col. H. F., J.P., North Jesmond	1875
Swan, J. C., J.P., 3, Osborne Terrace	1883
Swan, J. W., LL.D., F.R.S. (<i>V.-P.</i>), 58, Holland Park, London	1867
Swanston, William, 15, Victoria Square	1902
Swinburne, Sir John, Bart. (<i>V.-P.</i>), Capheaton	1864
Tate, Thomas, Allerburn, Alnwick	1903
Tate, R. M., 2, Percy Gardens, Tynemouth	F.C.
Taylor, Thomas, Chipchase Castle, Wark-on-Tyne	1903
Taylor, R. W., Collingwood Terrace	1902
Temperley, H., 2, Lambton Road	1902
Temperley, Nicholas, 4, Carlton Terrace, Low Fell, Gateshead	1885
Temperley, W. A., 1, Osborne Avenue	1904
Thompson, Miss Jessica, The Cottage, Whickham	1889
Thompson, Miss Mabel " "	1889
Thompson, Mrs. G., " "	F.C.
Thompson, Thos. (<i>V.-P.</i>), Winlaton House, Winlaton	1862
Tranah, Arthur, 4, Eldon Place	F.C.
Trechmann, Chas. O., Ph.D., F.G.S., Hudworth Tower, Castle Eden	1898
Tristram, Rev. Canon, LL.D., F.R.S., The College, Durham	F.C.
Turnbull, J. W., Riding Mill-on-Tyne	F.C.
Ufford, J. M., 20, Lancaster Street	F.C.
Walker, Rev. Canon, M.A., Whalton Rectory, Northumberland	1896
Walker, John D., J.P. (Messrs. Arnott, Swan, & Walker), Pilgrim Street	1888
Watson, Henry B., Millfield House, Eldon Street	1884
Watson, Robt. Spence, LL.D., Bensham Grove, Gateshead	1869
Watson, Thos. C., Glenbrae, Jesmond Park West	1886
Watts, Rev. A., F.G.S., The Rectory, Witton Gilbert	F.C.
Weeks, John G., Bedlington Colliery	1889
Welford, Richard, M.A., Gosforth	1886
White, Conrad, 3, Kensington Terrace	1902
White, W. H., The Cottage, Killingworth	F.C.
Williams, Ethel, M.D., Ellison Place	1903
Wilson, John, 74, Jesmond Road	1887

	ELECTED.
Willson, W. De Lancy, J.P., Enfield, Gateshead	1902
Wingate, Rev. W. J., St. Peter's Vicarage, Bishop Auckland	1901
Winter, Frank, F.R.M.S., 12, Sanderson Road	1902
Winter, Mrs. C. I., Elysium Place, Bensham, Gateshead	F.C.
Wood, Sir Lindsay, Bart. (V.-P.), The Hermitage, Chester-le-Street	1875
Wood, J., Coxhoe Hall, Coxhoe, Durham	1903
Wood, James Scott. Woods Buildings, Walker Gate	F.C.
Woods, Jas. E., J.P., Swarland Park, Felton	1896
Woolacott, D., M.Sc., 1, Nelson Street, Sunderland	F.C.
Wormald, C. F., Mayfield Villa, Low Fell, Gateshead	1902
Worsdell, Wilson, Greensfield House, Gateshead	1903
Youll, John G., South Broomfield, Jesmond	1884
Young, W. H., Higher Grade School, Gateshead	1901

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Richardson, Wm., 27, Addison Street, Heaton.
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Sturge, Miss Elfrida, Maiden Cross, Hexham.
Woodcock, Alfred, 12, First Avenue, Heaton.

A RAMBLE UP BURNHOPE.*

BY THE REV. W. J. WINGATE.

Since boyhood all the works of nature have given me the greatest delight, and my country rambles generally consist of a constant series of stoppages, to pick up and examine the curious and beautiful objects which present themselves almost at every step. Though master of no special class or family, I am usually most on the look out for Two-winged Flies. But when I planned a ramble up Burnhope the order was rather rocks, mosses, flies, than flies, mosses, rocks; for its object was to examine a very interesting spot, where, in the geological map, a small red mark shows the presence of whinstone, among signs of great displacement of the strata.

Burnhope is the more southerly of the two great glens, which unite at Wearhead to form Weardale, Killhope being the more northerly; and their respective burns, uniting in a circular pool a few yards above the bridge at Wearhead, form the commencement of the river Wear.

It was a bright sunny morning early in August, and as I left the station at Wearhead my spirits rose at the prospect of a glorious day among the hills. All the way up in the train I had been noting various points of geological interest, the first appearance of the Great Limestone a little below Frosterly, the extensive quarries in the same lime at Stanhope, the whinstone quarry in the Little Whin Sill just beyond, and other features observed in former rambles. And now, after rising some 700 feet, I found myself geologically far below where I had started. The train had been travelling over the upturned edges of the lower Carboniferous formations, and going down as it went up, so that as I stood on Wearhead Bridge I was on the Six-fathom or Brig-end Hazle, that is, the thick bed of sandstone below the Three-yard Limestone, the fifth downward in the well marked limes of Weardale.

* The Hancock Prize Essay for 1902.

Passing through the stile on the left, just before the bridge, the path led along the right bank of the stream to a rustic foot-bridge, below which the water tumbles prettily over ledges of the same sandstone, which here, I observed, was a compact whitish-grey rock with largish particles of mica scattered about in it.

Perhaps I should here say that on such rambles I go prepared. A jacket with the inside lining turned into capacious side-pockets; a strong insect-net with a small detachable bag, so that flies may be carried home alive for examination; a small case to contain these bags round one shoulder, and a hand-camera round the other; a number of sheets of butter-paper for mosses; a hammer, a small chisel, and a compass with clinometer-pendulum; the whole weighing about six or seven pounds.

I stood on the bridge for a minute or two to have a look at the lie of the land. Some fine old plane trees, and the ruins of an old farmhouse, suggested the existence of a garden run wild, with its luxurious growth of nettles and docks and brambles, generally a grand hunting-ground for flies. Up the stream was a pretty vista of little foaming falls, and rocky banks with scattered larches and willows, a likely place for mosses and ferns. Away beyond was a high scar, evidently giving a good section of the rock formations, and in the background rose Burnhope Seat, and the other hills of the watershed between the Wear and the Tees.

A visit to the deserted garden proved disappointing, but further on the bank was covered with geraniums and hawk-weeds, and there were numerous flies, principally Syrphidæ and Anthomyidæ, hovering in front of the opened blooms or nestling in their bosom. There was a fairly large fly, with a broad abdomen brightly banded with yellow (*Syrphus ribesii*, L.), and another with a narrower abdomen, each segment of which bears a double yellow band (*S. balteatus*, Deg.), a very pretty fly and a splendid hoverer. There were also one or two members of the genus *Platycheirus*, whose males have the joints of the fore-feet so curiously enlarged,

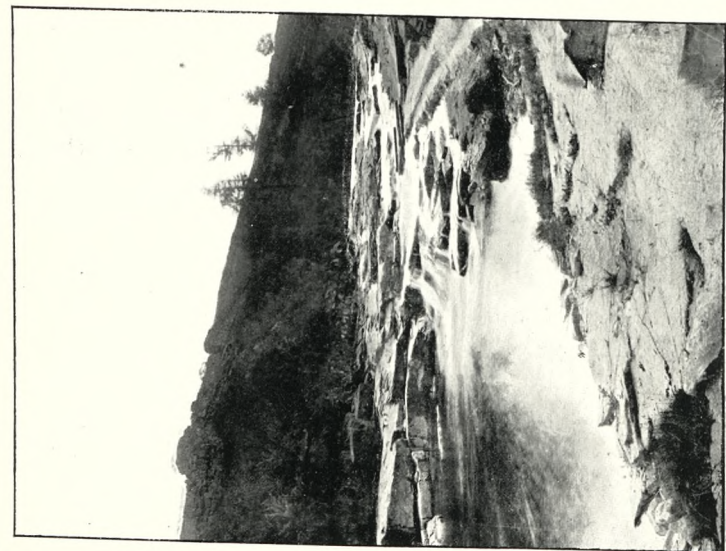
and with them, the almost exactly similar *Melanostoma*, whose males have normal fore-feet. How is it that two flies, otherwise so similar in appearance and habits, should have these joints so different? I suppose there must be some advantage to the male *Platycheirus* in the dilated fore-feet or they would not have been developed. But what can their purpose be is a question that suggests itself to me every time I look through the lens at their pretty little paws. Buzzing in front of the flowers were some large bee-like flies belonging to the genus *Eristalis*, all of whose members are wonderful hoverers. It is this habit of almost constantly hovering which has given to the members of this family of the *Syrphidæ* their English name of hoverer flies. I watched them as they poised apparently without motion in front of the opened flowers, some silently, some emitting a loud hum. How is that motionless poise maintained? And why are some species silent, while others hum? Is the humming due to vibration of the wings alone, or is it otherwise produced? If the former, why is it not always emitted? And why do some species hum while hovering, but, apparently, are silent while flying? An *Eristalis* was hovering in front of a flower; in a moment it was gone, and the humming had stopped. But only for a moment; there it is again, a yard or two away, and hovering and humming as before. It seems to hum when it hovers, but to be silent when it makes its darting flight. Yet if, on the one hand, the hovering be due to the wings vibrating at such a speed as to produce equilibrium; and if the sudden darting flight be due to increased rapidity with an altered angle; and if, on the other hand, the hum be solely due to wing vibration, then we would expect, not cessation of sound during flight, but alteration of pitch. But perhaps the flight is due not to increased rapidity of wing vibration, but to a more powerful wing-stroke, by which the point of the wing is carried through a much larger arc in flying than in hovering, while the rapidity of the wing-strokes may really be reduced. But is the humming due to wing-vibration? Certainly many flies produce sound otherwise than with the wings. A quick

stroke of the net secured an *Eristalis*, which uttered its little pitiful cry for release. Often has that cry made me inclined to let my captive go, although I wanted it as a specimen. My net-bags are closed with a circular piece of celluloid, against which I gently pressed the under side of the fly, so as to look into its mouth. All motion of the wings was prevented by the closely pressed folds of the net, yet the fly continued to emit its little cry at intervals. On looking into its mouth with the pocket lens I could clearly see something, it might be the end of the palpi, vibrating rapidly whenever the cry was repeated. It seemed to suggest that the sound was the result of vibration, set up by expressed air, as in mammals. But where does the air come from? Flies have no air-bags communicating with the mouth, like the lungs of beasts.

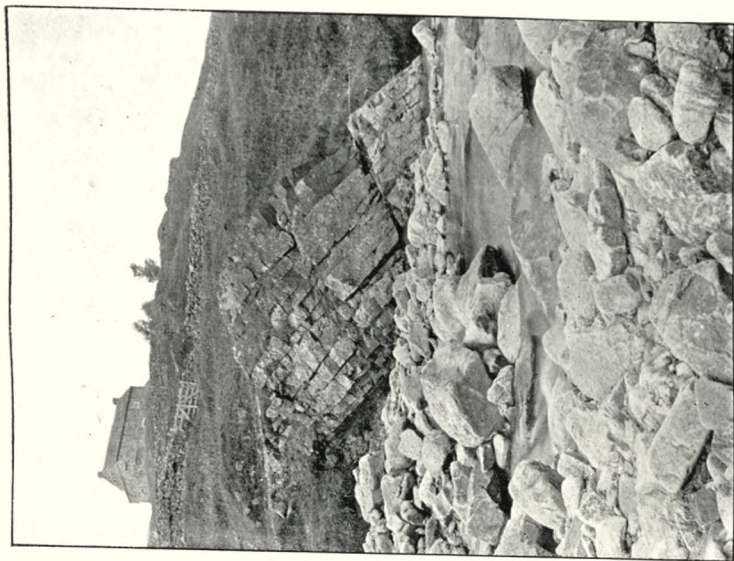
But I will never get to my destination up the dale if I stop to solve these fly problems here. So, forward.

However I had soon to stop again. Just above the flowery bank the sides of the stream became more rocky, and on its shady southern bank they were almost precipitous, the sandstone all broken up into shelves and cracks, in whose nooks and crannies there flourished a rich growth of mosses and ferns. There was that common but beautiful moss, *Mnium undulatum*, Hed., which long ago I used to pounce upon as a prize, in a district where the Filmy Fern (*Hymenophyllum Tunbrigense*, L.) was to be found, though not at all common. At first sight there is a strong resemblance between the two, but it is only at first sight, and to a very inexperienced eye.

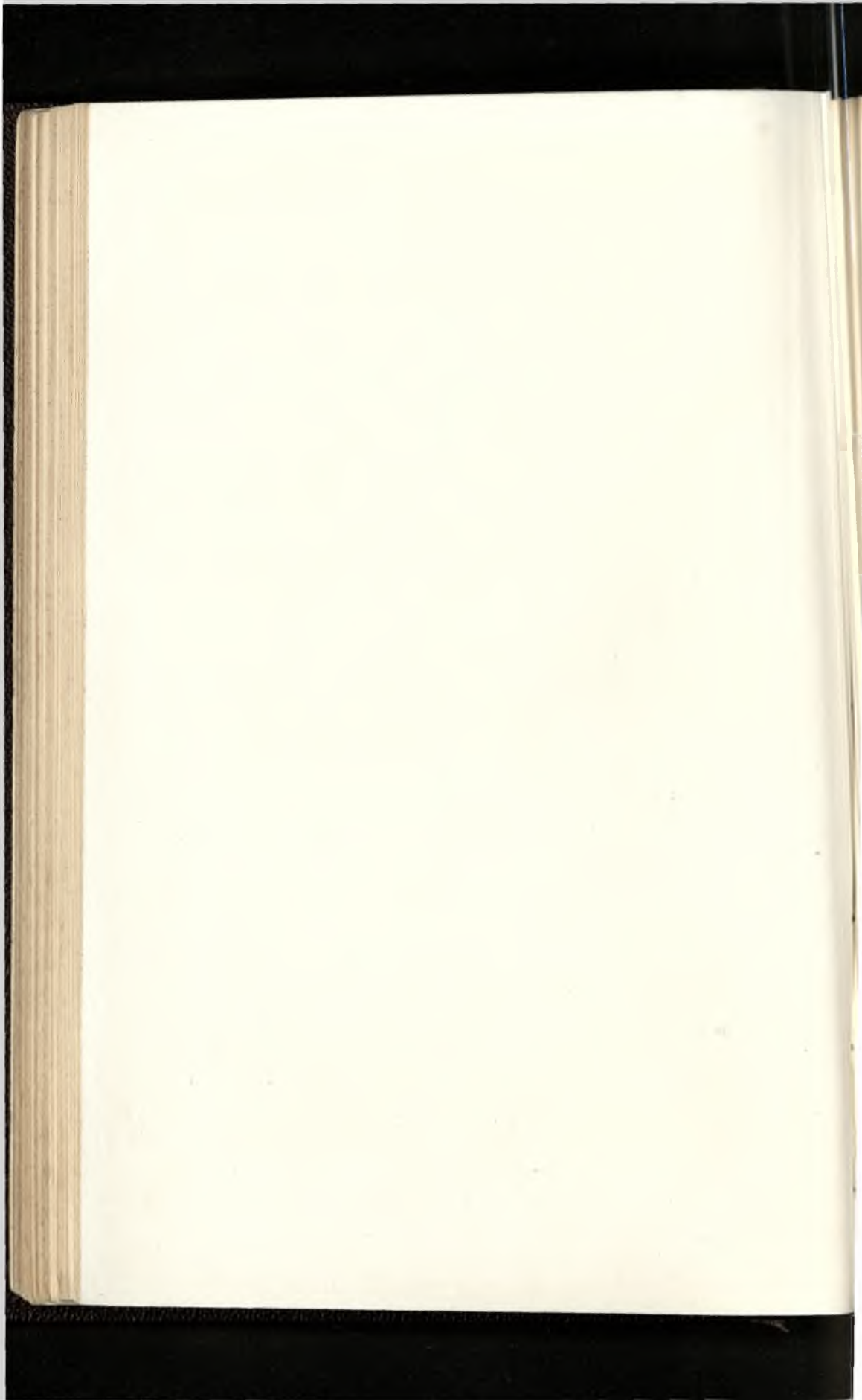
Two other *Mniums* were growing near. Hunting about among the clefts I came upon a darkish-green moss, with very distinct roundish leaves, which I knew to be *M. punctatum*, Hed., and I was pleased to find a number of the long-stalked capsules still remaining, some indeed quite green. A few feet away was quite a cushion of the starry heads of the male plants, with their brown chaffy centres surrounded with their four red-veined leaves. And near the edge of the stream, on the moist banks, were dense cushions of *M. hornum*, L., its leaves erect and pointed, and with doubly serrated edges.



THE HORSE POOL, WEARHEAD.



SANDSTONE ROCKS BELOW SPRINGWELLS.



At a place where the rocks were wet was another very beautiful moss, *Fissidens adiantoides*, Hed., also with old fruit stalks still adhering. A struggle for existence was going on between it and a liverwort, but I could not make up my mind which was the aggressor. Certainly the moss had the best of it so far. On the trunk of a tree, projecting over the stream, was a thick curly mass of *Eurhynchium myosuroides*, L., a pretty so-called tree-moss, with round incurved branches. Among the grass round the trees was that favourite moss, *Hylocomium triquetrum*, L., well known, at least in a dried state, and the beautiful *Thuidium tamariscinum*, Hed., and a number of other pleurocarpal, or side-fruited mosses. Besides these, *Dicranum scoparium*, Hed., was there, in its great silky cushions, with its leaves so gracefully turned to one side, and a *Bartramia*, I think *Æderi*, covered with its small round fruit, and the beautiful pale green cushions of *Philonites fontana*, Brid., in the wet boggy places.

And then the ferns:—the Common Polypody (*Polypodium vulgare*, L.) was looking over the tops of the rocky banks; here and there in fissures and rocky holes was *Asplenium viride*, Huds., generally not at all common, but here decidedly more frequent than its usually more common relative, *A. trichomanes*, L., and on the larger ledges, where earth had collected, were numerous fine patches of the Bladder Fern, *Cystopteris fragilis*, Bernd.

I could have spent hours in examining and collecting these beautiful forms. But time was passing, and I could only wrap up a few specimens in the butter-paper and pass on up the stream.

But, hold on! What are these flies resting on the rocks, at the very edge of the purling stream, or apparently walking up its rippling surface? I knew them in a moment, small as they were, with their shining metallic bodies, to be members of the numerous family of the Dolichopodidæ, and probably of a species I did not possess. It is no easy task to catch them without drenching the net, which in their case, however, is not of so much consequence as in others, for they seem to

be quite waterproof. With a little patience one or two were secured and transferred to the pocket bottle, and home examination showed them to be *Hercostomus nigripennis*, *Flu.*, new to me, though said to be common.

A little higher up, where the rocky banks cease for a space, the stream forms a pretty little fall over the ledges of the upper layers of the Six-fathom Hazle, just below which a tiny rivulet comes in from the north-west. A little way up it is crossed by the footpath to Burnhope, and there, its long straggling stems waving in the water, I was delighted to find for the first time a water-moss, *Fontinalis antipiretica*, *L.* It was too wet even for butter-paper, so squeezing it as dry as possible, I carried it in my hand, until it was sufficiently dry for transference to the pocket.

The stream now ran between grassy banks. The mosses and ferns had disappeared, and there were few flies about. But the rocks came in to fill up the gap, for at the next little fall limestone put in its appearance, which I knew must be the Three-yard Limestone immediately overlying the Brig-end Hazle.

Above this the dip of the strata and the fall of the stream just about correspond for some distance, and the water has worn numerous narrow channels in the cracks of the limestone, to which, when the stream is low, the water is confined, leaving a fine dry pavement up which I bent my way. Things began to look lively again in the fly line. A number of willows fringed either bank, and soon a bag or two of buzzing flies, with, doubtless, a few bees and Ichneumons, were transferred to the case for home examination.

A bank now rose steeply on the left, thickly covered with bushy hazles and alders, with little open bits, in which tall rank grasses and Umbelliferæ were growing. Very prominent were the solitary heads of the Melancholly Thistle (*Carduus heterophyllus*, *L.*), which here was common. Flies were abundant, and near the water an old friend, or rather an old pest, the common Horse-fly (*Haematopota pluvialis*, *L.*), put in her appearance. It is strange that the bloodsucking females

always seem so much more abundant than the males. I spent some time catching them in search of males, but without success.

Here I was much interested in the capture of a *Volucella* (*V. bombylans*, *L.*, var. *haemorrhoidalis*, *Ztt.*). Though I believe common in many places, it is not very common in this district, and this was the first of this light coloured variety that I had taken. I was especially interested in this species, because it supplies such a good instance of mimicry, and such a puzzling one. It occurs in two well marked varieties, the dark *Bombylans* variety, which I had taken further down Weardale, and this lighter one. The former mimics the black and red bee, *Bombus lapidarius*, *L.*, which it strongly resembles; the latter, which I had just caught, mimics the brownish grey bee, *B. agrorum*, *Fab.*, and it is so like the bee that I had almost passed it over had not an unbee-like set of the wings caused me to look more closely. Both varieties frequent, indiscriminately, the nests of both bees for the purpose of laying their eggs, that their young may feed on the food laid up by the bee for its own offspring, and possibly on that offspring itself, or, perhaps— and I think this is more likely considering the usually scavenger office of most fly-larvæ—on the dead bee-larvæ. It is easy to understand how the fly would be protected by its likeness to one or other species of bee, and if the fly had developed into two species, each keeping to its own host, there would have been no difficulty. But the light fly, as well as the dark one, goes into the home of the dark bee, to which it has no resemblance, and *vice-versa*. Where is its protection? And besides, another *Volucella* (*pellucens*, *L.*), several of which were darting about, frequents the nests of wasps which it does not resemble in the slightest degree.

But such thoughts had soon to give place to other objects of interest. Crossing a fence out of the woody slope I found myself at the foot of a precipice of shale, surmounted by great massive blocks of sandstone, which, the map told me, was the Nattrass Gill Hazle. The shales were soft and had

crumbled away, leaving the sandstone strata unsupported, and large blocks had slid down the talus of shale on to the edge of the burn. I could find no trace of fossils in the shales, but there were numerous nodules, showing rings of the bright yellow particles of the sulphuret of iron. Among the debris were many rounded and somewhat flattened stones, scratched all over with unmistakeable glacial striæ. They certainly had not come from the shale. Evidently there was a deposit of boulder clay on the bank above the sandstone, out of which these striated stones had fallen. And as my eye travelled to the hills around, my thoughts travelled backwards some hundreds of thousands of years, and I seemed to rise above those hills, and to be standing on a vast undulating field of ice which stretched far as the eye could reach. And then the wide expanse seemed to be melting away, and black lines, the tops of the hills, showed themselves radiating away from the central icefield. And then the ice-streams seemed to melt away from the coast, and gradually up the valleys, leaving behind them a great sheet of debris constantly diminishing in thickness as the length of the glacier decreased, and therefore the length of the gathering area for the moraine—the rubbish tip at the end of the glacier.

The right bank of the burn was rough and dirty, so I made my way through the fields towards Burnhope, a group of two or three houses near the three-arched bridge, that carries the road from Burtreeford across the stream.

Two splendid black-faced rams, with great curling horns and long shaggy fleeces, were in the field. I approached them with caution, for they are sometimes dangerous customers, and I had no fancy for making a close acquaintance with their formidable prongs. A shout from the hillside, "They're quite quiet," reassured me, and I could admire their fine proportions in peace, and even get a poor snap at them with the camera.

Crossing the main road, a cart track led up the left bank. Here the bed of the burn was broad and filled with large stones, but no rock was showing. So I passed on and soon

came to plenty of signs of former energy. A farm, called Holm House, appeared on a small patch of alluvium on the left bank, and opposite it, and above it, the rocks were showing in a very disturbed state, both in the stream and on the bank. Below the bridge, where the rocks had last showed themselves, they had been dipping very gently towards the east, at an angle of about six or seven degrees—less than the dip of the stream, which was running into the lower strata as it descended. In ascending the burn, as I had been doing, I had been gradually passing upwards from the Six-fathom Sandstone to the Three-yard Limestone, and into the overlying shales and sandstones, and, barring faults, I might have expected soon to have seen the Four-fathom Limestone putting in an appearance on the stream. I saw from the map that I was nearing the 1,250-feet contour line, along which here the Four-fathom Lime seemed pretty nearly to run. But I also saw that no Four-fathom Lime would be met with in the stream until I had climbed nearly to the burn's source, and reached an altitude of about 1,800 feet. Evidently I was close to a great fault, and doubtless the disturbance in the rocks ahead was due to this great upheaval, or depression—which, I could not say. And certainly there was no lack of signs of disturbance. Soon I was busy with clinometer, compass, and notebook. A sandstone on the left dipped at a considerable angle, about 43 degrees, to the north-east. A limestone in the bed of the stream was lying at all angles, and crossed in all directions by veins of calcareous spar. At one point it dipped 40 degrees N.E., a few yards west it was 82 degrees, a few feet further it was perpendicular; not far off, on the left bank, it seemed to be completely inverted, and to be dipping at about 55 degrees to the west, but only on very short exposed portions. Not only that, but it seemed to be twisted horizontally, for I noticed at one place that the bearing of the strata, that is, the line at right angles to the plane of the dip, was bent round from N.N.W. to N.N.E. Continuing up the stream the strata seemed gradually to resume their normal dip. At a little foot-bridge, below a house called Springwells, the

eastward dip was 45 degrees ; a little higher, opposite the foot of a small stream which comes in from the south, the dip is about 37 degrees E.N.E. (as shown in the photograph of "Sandstone Rocks below Springwells.") The lower beds with thinner layers, directly beneath the gate, are of a yellow-grey sandstone, very compact, the overlying broader beds, those on the right, are of a dark blue sandstone, also very compact and hard. Higher still the beds dip at only 10 degrees E.N.E., having almost resumed their normal angle, but it is a tangled piece of rock-work, and I could not read the story. Numerous pieces of spar lying about suggested the probability of a lead-bearing vein in the neighbourhood, and an old hush on the opposite hillside indicated its position. A "hush" is where the soil has been washed away by the miners of former days to lay bare the rock surface along the line of a lead-bearing vein. They used to form a water-dam up on the side of the hill, and then making a small channel downwards, were able to guide the water in any desired direction. They then gradually increased the flow, till a deep channel was worn down to the rock, exposing the vein. After that the vein was dealt with, and its surface loosened, while the water was collecting in the dam above. Then the sluice was opened, and the loose pieces, sometimes of great size, were washed down into the valley below, whence they could be carted to the lead-mill. This being repeated again and again, a great gash was worn in the hill-side, the slopes of which are now covered with short grass and moss.

But it was the burn referred to above, the Limekiln Syke, in which the whinstone was said to show itself, so thither I retraced my steps. A coarse limestone, given but not named in the map, showed itself at the foot of the syke. Then sandstones and shales, and then another limestone, the Tyne-bottom, apparently full of shells broken into small fragments, and with signs of iron in the shape of glistening grains of pyrites. Then more sandstone and shale, and then what looked like what is locally called a "Pencil Bed," or "Whet-

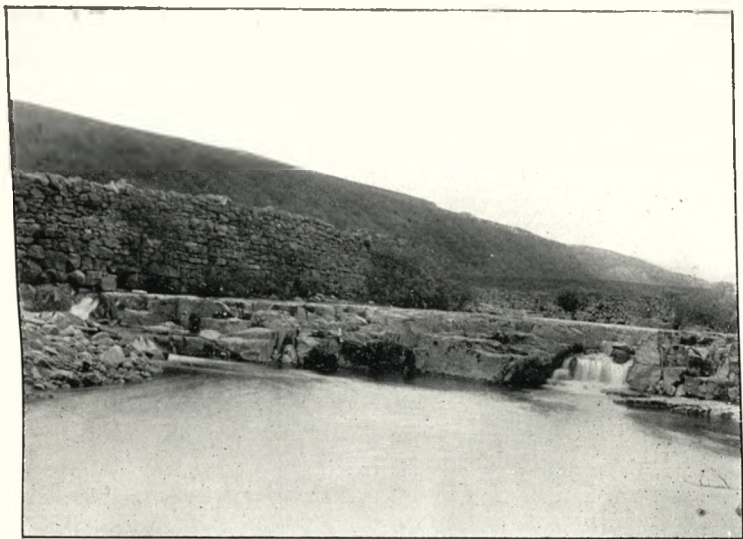
stone," that is, a shale metamorphosed by contact with the whin, when the latter was intruded in a molten state. I thought surely there must be whin here, but though I searched high and low I could find none, only some fine-grained dark blue crystalline sandstone, very like whin, and coming out below the light grey beds of what I took to be metamorphosed shale. At first I took it to be whin, but it seemed to be distinctly stratified, and several experts, to whom I have since showed a specimen, declare it not to be whin. Thus my whinstone search ended in failure.

As I had now got further up the hillside among the heather, I turned again, for a little, to the flies and the mosses. A very beautiful member of the Syrphidæ (*Sericomyia borealis*, *Fln.*), with the abdomen brightly striped with yellow, was humming about, and a little patience and cautious stalking resulted in the capture of two or three specimens. I was more anxious to find another species of the same genus, very like *Borealis*, but with the abdominal stripes narrower and whiter, *S. lapponica*, *L.*, but though I sometimes thought I had got one, it always turned out to be *Borealis*. Then there were a number of "Daddies" about among the heather, and I am very fond of daddies, notwithstanding their annoying propensity of losing their legs. One especially attracted my attention, a little brown fly, about the size of the well known Winter Gnat (*Trichocera hiemalis*, *Deg.*), but with beautifully spotted wings, and their venation also quite peculiar. I had never seen it before, and only succeeded in capturing two males. It turned out to be *Idioptera pulchella*, *Mg.*, one of the Limnobiidæ.

The mosses also were quite different from those on the wooded rocks further down the glen, and they too came in for a little attention. A grey shaggy, or as we would say in Scotland, touzie looking moss, with olive green leaves, produced into long white hair-like points, which gave to it its hoary aspect, was growing on the rocks, where they buried themselves beneath the grass and heather. I knew it to be *Racomitrium languinosum*, *Brid.*, a common moorland moss,

but I greatly admire its shades of olive green. Then the Sphagnums are always interesting, although I would not pretend to name them with certainty. Some in closely set compact cushions of a pale greenish white and pink with pointed toothed leaves, probably one of the numerous varieties of *S. acutifolium*, Ehr. How beautiful were their starry rosettes! And how wonderful the arrangement of their cells even under the pocket lens! Another of sturdier habit, with hood-shaped leaves, I took to be *S. cymbifolium*, Ehr. There were others, possibly varieties or different species, which it would take an expert to determine. I put a few specimens in butter-paper, and, like the stones in Jordan, "there they are unto this day." But that is the beauty of mosses. You can treat them with almost any amount of neglect, but soak them in water for a few minutes and they are all right again, and in good condition for examination.

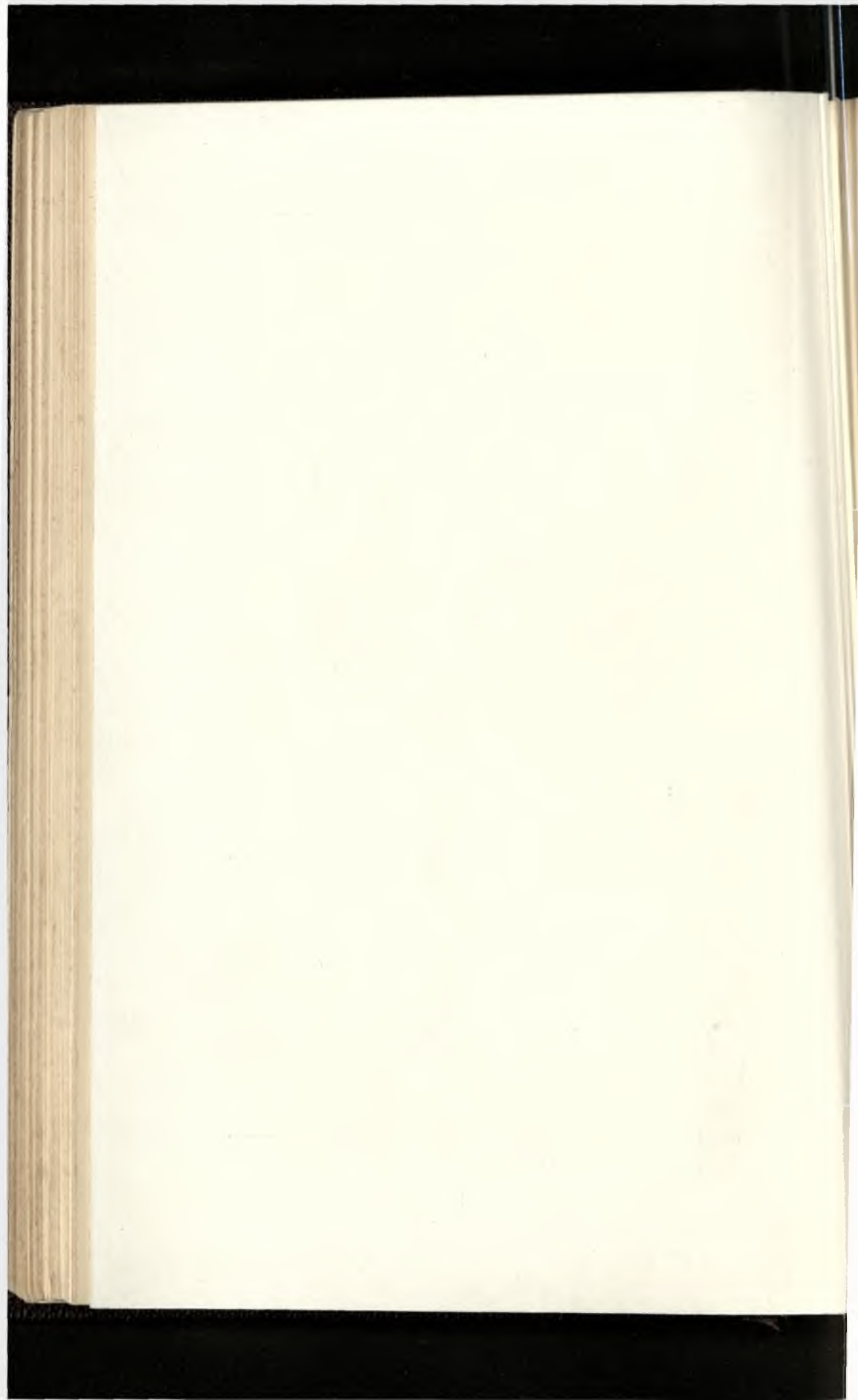
But mosses and flies occupied a secondary place with me that day. They only received cursory attention, the great fault was the attraction. And as there was some time to spare, and the map showed two other places on the northern trend of the fault where the disturbed strata were visible, and which might be visited by a detour on the way back, I determined to examine them. So retracing my steps down the burn, I took another look at the disturbed rocks, and carrying my eye away towards the next point for examination I got an idea of the lie of the fault. Arrived at Burnhope, I turned up the main road past the little Primitive Chapel, and on until I reached the place where the Black Cleugh runs below the road on the Four-fathom Limestone. Turning up the little stream I came to a small farmhouse, and was furiously assailed by a collie dog, whose owner soon came to my rescue. I found him to be an intelligent man taking a considerable interest in the local rocks, who, when he knew my errand, willingly acted as my guide. Here I found the same evidence of disturbance as in Burnhope. Soon a limestone appeared dipping at a considerable angle. Instead of showing the massive thickness of the Great Limestone, which



THE THREE-YARD LIMESTONE IN THE BED OF THE WEAR.



FAULTED BEDS REPRESENTED BY MEANS OF CARDS.



is the one above the Four-fathom, it showed the few feet of the Three-yard, the limestone below. This was followed, sandstones and shales intervening, by another rather thin lime, the Five-yard; then by a thicker bed, the Scar Limestone; and then by two very thin ones, the Cockleshell and the Singlepost Limestones. All these were thrown up at a high angle, much greater than the fall of the stream, rapid though that was, so that as I climbed upward on their upturned edges I came upon the formations in descending order. The apex of the upheaval, or what looked like the apex, was a little beyond the Singlepost Limestone, where my guide pointed out what he called "the pencil bed," indicating that the whin, though invisible, was not far off. Beyond it the same limes appeared, but in the reverse order, and only slightly inclining, so that now I was climbing up through the strata as I ascended the burn.

It was an intensely interesting spot. I thought of the great mass of superimposed strata lying at first horizontally as deposited. Then of its being gradually tilted upwards to the west by pressure from below. Then the pressure from beneath increases, or perhaps is greatly diminished, thus withdrawing support, and a great crack is started right through the different layers, and, perhaps very slowly, as on a small scale may often be seen in the wall of a settling house, extending north and south for miles. Then a great area of upheaval, again perhaps very gradual, away to the west of the crack, by which the whole mass on that side of the fissure is lifted some five or six hundred feet upwards. But at the edge nearest to the fissure there was extra resistance to the upheaving process on account of friction against the unmoved strata on the other side of the crack. This friction would be very great if the crack was a little off the perpendicular, hading, as the miners say, to the eastwards, and presenting a hanging side towards the rising beds. This would result in a retardation of the layers in the part next to the crack, which, for some distance, would be bent downward, so as to lie at a very steep angle.

When I got home I illustrated it to myself with two packs of cards. One pack, held at the edge of the table, represented the undisturbed strata, with the ends of the cards slightly sloping to represent the hanging side of the crack. Half of the other pack, pressed against the lower half of the first pack, represented the lower beds on the other side of the crack before their upheaval. Holding the half pack about the middle, I slowly raised it till it assumed the position shown in the photograph. This gave me an exact illustration, a working model, in fact, of what I conceived had taken place along the line of the fault.

There was still time to go round by Burtree Ford on my way to the station. So returning to the road, not down the rugged bed of the stream (I had had enough of that) but by the moor edge, a ten minutes walk took me to the bridge above the fall. As I would be able to have a good look at the fall on my way back, I did not stop then, but only noting the almost horizontal lie of the posts of the Four-fathom Limestone, which shows at the top of the fall, I took the foot-path that leads up the right bank of the Killhope burn. For some twenty or thirty yards or more the bed of the stream is filled with chippings from the whinstone quarry above, and no rock was visible. But soon the same formations began to show themselves as in the Black Cleugh and in Burnhope. Looking up the stream, shelf after shelf of steeply dipping strata showed up their jagged points on either side of the burn, whose waters had worn a lower channel, and rushed in a series of tiny rapids down the steep upper faces of the different layers of the limestones and the harder sandstones. The positions of the shales and softer sandstones were represented by lower troughs, partly filled up with quarry chippings.

The beds came in the same order as in the Black Cleugh. The Three-yard Lime showed first, then the Five-yard, the Scar, the Cockleshell, and the Singlepost. But here the burn had worn more deeply into the strata, down to the intrusive mass of whin, which here showed itself under a bed of hard quartzite of a slightly bluish grey colour. The difference

between the laminated strata of the metamorphic sandstone and the massive blocks of the cracked whin was very marked.

Just below the Scar Limestone in the bed of the stream (below, I mean, in geological order, just above it streamwards) was a dark blue sandstone, very hard and close grained, and showing small reddish specks, hence called locally the Copper Hazle. It seemed to me very like the dark blue crystalline sandstone which I had seen in the Limekiln Syke coming out below the whetstone bed. A little higher up the stream than the whinstone another limestone appeared, the Tynebottom. It seemed to come out below the whin, and still higher up the whin again appeared in great masses in the burn, and for a considerable distance was succeeded by sandstones and shales with only a slight eastward dip. So that apparently the same disturbances had taken place here as in the other burns, only that the Killhope stream had worn itself down into lower layers than in the Black Cleugh, and tapped the Tynebottom Limestone below the whin.

The limestone which comes out below the whin in the Killhope burn is regarded by many local geologists as the Jew Limestone, because they take for granted that the whin is an overflow, and must always keep the same horizon. And because it is generally found below the Tynebottom and above the Jew Limestones, the first lime above the whin is identified with the Tynebottom, and the lime below with the Jew. It is thus marked on the Ordnance Survey sections of local mines, which are no doubt copied from local plans.

Before setting out on this ramble I had got the loan of the geological maps of the district and the sheet of mine sections. And I had been much interested, and somewhat puzzled, in their examination, especially in the deeper sections of the Burtree Pasture and Slitt mines, the only ones reaching down to the whinstone. Either the whin was in a different position in each mine or a large number of beds, including a limestone, had disappeared in the Burtree mine.

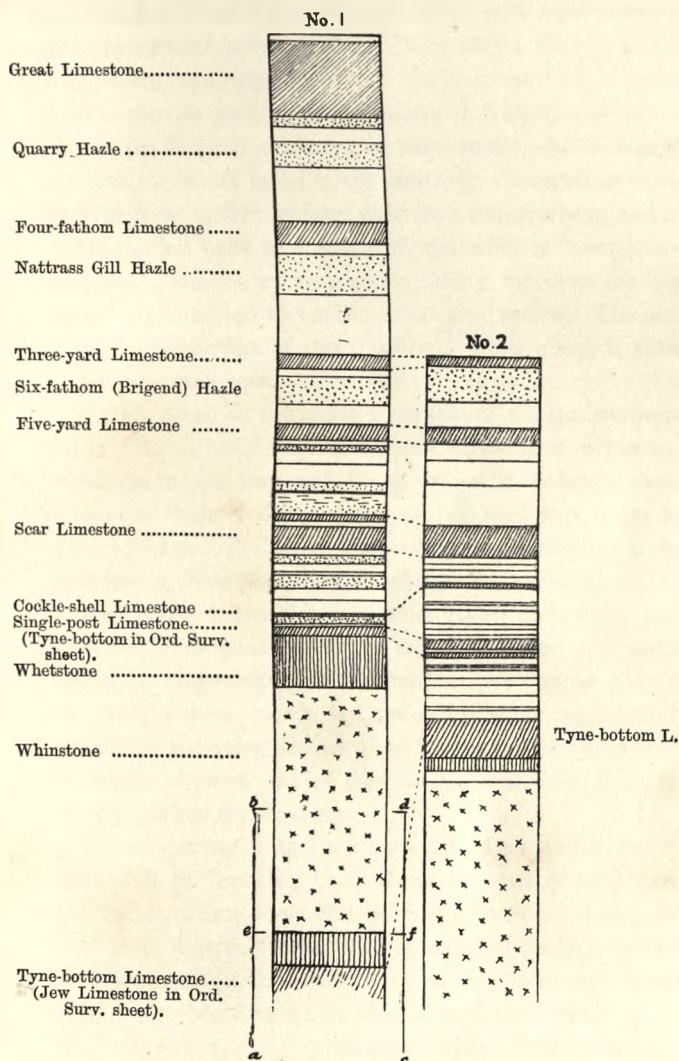
Now the position of the whin at the quarry in Killhope seemed to me exactly to correspond to its place in the

ordnance survey section of the Burtree Pasture mine (No. 13 in sheet No. 63). There, it is shown in great thickness, below a thin limestone, erroneously, I think, named the Tynebottom in the section, but really the Singlepost, and above a thick limestone, the Tynebottom, erroneously named the Jew on the sheet.

In the section of the Slitt mine (No. 12 on the same sheet) the whin appears in quite a different horizon, namely, below a thick limestone, the Tynebottom.

The Burtree Pasture mine is rather more than half a mile north-east of Burtree Ford, and the Slitt mine is near Westgate, three and a half miles east-south-east of the Burtree Pasture mine.

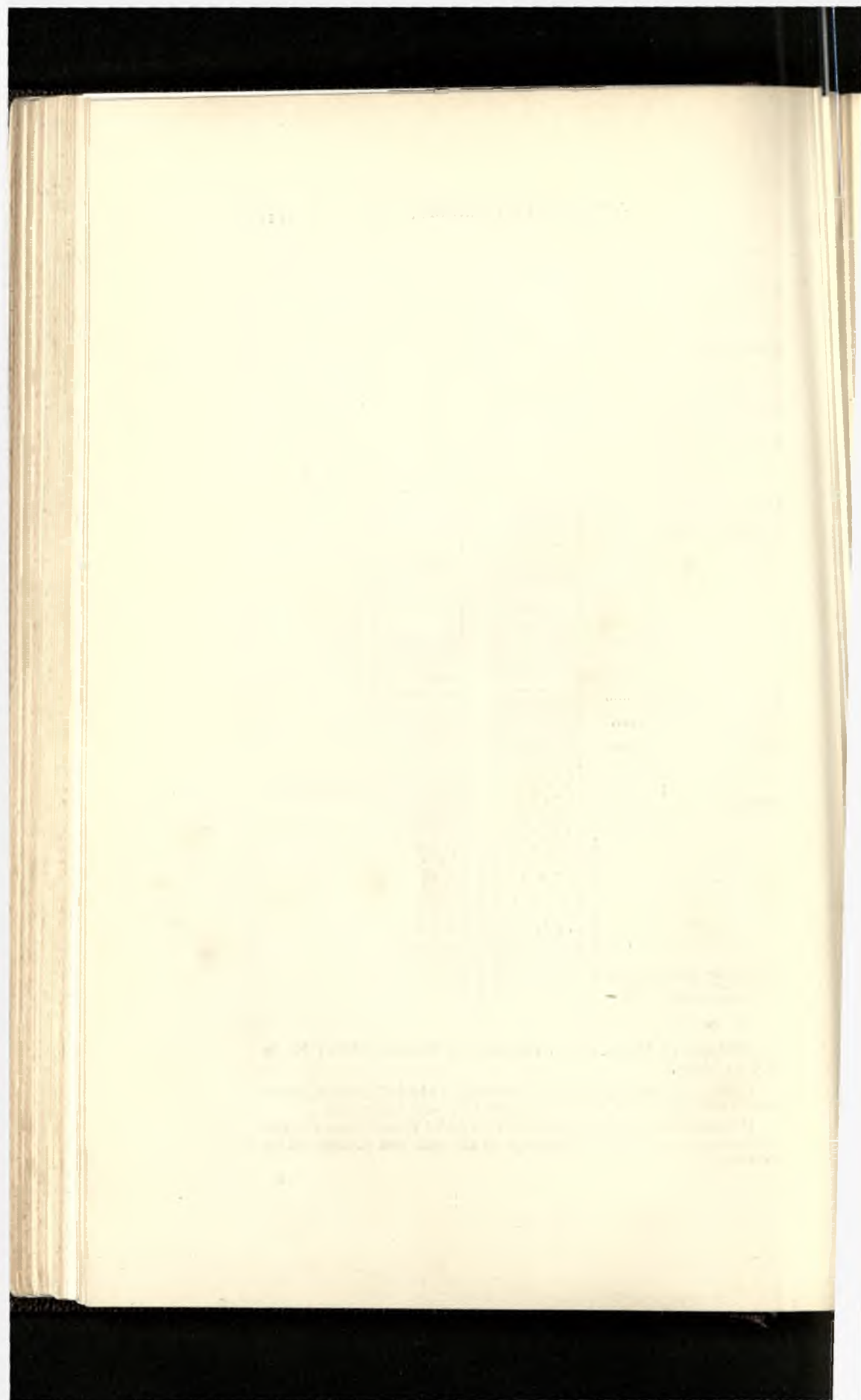
Now if the sections of these two mines be placed side by side there is a wonderfully close agreement all the way down from the Nattrass Gill Hazle, the surface formation at the Slitt, to the Cockleshell Limestone. But then there occurs a great discrepancy. Whereas, in the Burtree Pasture section, there are but two thin sandstones and one shale, only a few feet thick altogether between the Cockleshell and the Tynebottom Limes; in the Slitt section there are eight beds of sandstone, eight beds of shale, and two of limestone between the Cockleshell and the Tynebottom, somewhere about a hundred feet in thickness. The Burtree Pasture mine is carried down from the Firestone Sill, through the whin into a limestone below, the Slitt mine is carried from the Nattrass Gill Hazle into the whin, but not through it. Fold a tracing of Burtree Pasture mine so as to bring the two whetstone beds together, blotting out the whin, and lay it alongside of the Slitt mine section, and it will be at once evident that what is called the Tynebottom limestone in the Burtree section corresponds with the unnamed twin limes of the Slitt section, that the underlying shales and sandstones of that section are represented by the whetstone of the other, and that the so-called Jew limestone of the Burtree section is really the Tynebottom. And therefore the whin somewhere between the two mines has changed its horizon, and has burst up through the Tynebottom



Sections of Strata.—No. 1 in Burtree Pasture Mine; No. 2 in Slitt Mine.

Limestones obliquely shaded, sandstones ("hazles") dotted, whetstone vertically shaded, whinstone marked by scattered crosses.

If the paper be cut along *ab* and *cd*, then folded upwards across *bd* and backwards across *af*, the relationships of the beds (see p. 110) will be evident.



Lime and part of the overlying shales and sandstones, and then penetrated between those beds above the Tynebottom Limestone, converting them into the metamorphic whetstone. This is also its position at the quarry in Killhope, on the other side of the fault, as observed on this ramble, and it tended to confirm me in my belief in the intrusive character of the whin in Weardale, and of its later date than the overlying beds.

On the left bank of the stream the whin is being quarried, and the manager, in very kindly taking me over the quarry, called my attention to various interesting points. The peculiar step-like formation of the trap-rock, from which it takes its name, was well seen.

At one place on the south-west side of the quarry there is a large "pencil bed," with whinstone above and below it, as if, when the molten lava was being forced in between the beds, a mass of shale had become detached and slipped in among the hot pasty whin, and so become metamorphosed by the heat into a detached mass of whetstone. Passing a heap of broken stone I was fortunate enough to pick up a piece of Pectolite, a mineral which is a silicate of lime and soda, and occurs in trap-rocks. The manager afterwards gave me a better specimen, which is pure silky white, and beautifully shows the radiating masses of crystals, small detached portions of which showed, under the pocket lens, like little bits of closely packed thistle down.

It was getting near train time, and I wanted to get a sand at the fall, so hurrying back along the quarry road I crossed the bridge, where some fine old plane trees overhang the few houses at Burtree Ford. Taking the path which goes down to Wearhead on the south side of the burn, and crossing a field, I clambered down to the bed of the stream below the fall. It was a most picturesque spot. The dashing water tumbling clean over the almost horizontal limestone ledges above on to the sandstone below, the bridge spanning the stream over the fall, the old houses on the right, the moss-covered rocks, the graceful ferns and waving grasses on the ledges, the yellow compositæ of various kinds, the tall stiff

heads of the umbelliferæ, the purple wood geranium and scabious, and the overhanging trees, their branches almost touching the water, made altogether a very pretty picture. Another little cascade, formed by the spent waters from a mill-wheel, tumbled from the bank on the right, and the stream of the Killhope burn, after its twenty or thirty feet plunge, flowed quietly at my feet, amid slabs of sandstone fallen from the rocks above. It was rather late in the day, and I feared my snap would turn out a failure, as indeed it did, but I hurried to the station, well pleased with my ramble. Though I had not found the whin I went for, I had learned much of the geology of the district, and I had my pockets well stuffed with mosses, and my case with several bags of buzzing flies, in whose examination and identification I anticipated many hours of interesting work at home.

ANCIENT EGYPT.

PART II.

Monuments, Forms of Writing, and System of Religion.

A lecture delivered before the Natural History Society on November 18th, 1903, by ROBERT COLTMAN CLEPHAN, F.S.A., F.S.A. Scot.

In a previous lecture I dealt with the natural history of Ancient Egypt, its chronology, history, and architecture; describing the salient features of the temples, their form, scope, and significance, as illustrated mainly by the ruins of Karnak. This evening I shall endeavour to give you some idea of the monuments generally; the forms of writing; and the system of religion, with its complicated and symbolic ritual.

THE MONUMENTS.

This heading covers so wide a field that I was in some doubt as to how to deal with it most effectively this evening. I shall aim at giving you a general idea of the leading types of monuments, selecting, as much as possible, the most salient and representative examples of each variety.

The Temple of the Sphinx. The building at Geezeh known as the Temple of the Sphinx, lying some fifty yards south of the Great Sphinx, is probably of prehistoric origin, that is to say, it was built before the reign of Menes, the founder of the first dynasty of United Egypt known to history; and besides the great interest attaching to it as a building of such immense antiquity, it possesses very remarkable features of its own. The great hall is shaped like the letter T; sixteen square monolithic columns, 16 feet high, support the roof, ten forming a nave, and six running singly along the centre of the transept. Admittance is through a long passage, and there are no windows, so that all light from the sun is excluded. This

temple differs from all others in Egypt in the entire absence of inscriptions or reliefs of any kind. Perhaps its most noteworthy feature is the immense blocks of alabaster and rose granite, laid together with marvellous accuracy and precision, putting the best Roman masonry to shame. Such work as this would indicate an apprenticeship of many ages to the builder's craft. The building presents some of the conditions of a mastaba, and there are niches for the reception of sarcophagi.

Until recently but very little was known of Menes, the founder of the first historic dynasty of ancient Egypt, beyond the mention of him by Manetho, and of his name heading all the lists of ancestors, with the exception of the one taken from Karnak, which begins with Seneferoo; but he now steps forth from the obscurity of tradition into an historic personage. Prof. W. M. Flinders Petrie, in a letter to the *Times* written comparatively recently, states that an excavation at Abydos, going down to a depth of 20 feet, has brought to light no less than ten successive temples, ranging from B.C. 5,000 to B.C. 500; and he remarks that for the first time it is possible to see the change from age to age through the whole of Egyptian history, and that the most striking change is seen about the time of the IVth dynasty, when the temple, as an institution, was abolished, and only a great hearth of burnt offerings is found, full of votive clay substitutes for sacrifices. This exactly agrees with the statement of Herodotus that Cheops had closed the temples and forbidden sacrifices; and it also accounts for the long break in temple building as far as we can judge from the absence of remains. An ivory statuette of Cheops was found, which is now in the Cairo Museum. Among the discoveries of the first dynasty, and of Menes its founder, we have part of a large globular vase, of green glaze, with the king's name in purple; thus polychromic glazing is taken back thousands of years before it was previously known to exist. In the highest art of delicate ivory carving are several pieces of this age, especially the figure of an aged king, which for its subtilty and character

stands in the front rank of such work and is comparable to the finest carvings of Greece and Italy. We must now reckon the earliest monarchy as the equal of any later age in such technical and fine art. An ivory carving of a bear extends the fauna of ancient Egypt. Examples of iron occur during the Vth. and VIth. dynasties, thus disposing of an impression that the use of this metal was unknown in Egypt until an age comparatively recent. It seems to me that the oft repeated assertion that Menes founded the first settled monarchy is made on inadequate grounds and is open to considerable question, for we simply know nothing of what dynasties may have preceded him, beyond the dynasty of the ten kings of This or Thinis. Bear in mind that the civilization of his reign was a high one, as represented by what we now know and may safely infer: one requiring the apprenticeship of ages to build up, far indeed from an age of barbarism. It would seem that diggings at Abydos below the age of Menes might conceivably yield some very surprising results.

Tombs.

The character of the tombs of Ancient Egypt is closely bound up with the religion and ritual of the country, but I will deal with this aspect of the subject at some length later this evening under the heading of religion; suffice it, for the moment, to point out that the grand idea that influenced and inspired the ancient Egyptian architect was to devise means for the preservation of the mummy as a tenement for the spirit to revisit.

Egyptian catacombs are usually situated on the borders of the desert; or the tombs were excavated in a mountain side, far away from the dwellings of men.

Mastabas.

Probably the most ancient kind of Egyptian tomb, in the sense of a mausoleum, is the mastaba, the Arabic word for a bench or platform, in form something like a truncated pyramid. They vary very much in size; and the four faces

of the structure are intended to be set to the four cardinal points, the longer axis being from north to south. The angle of a mastaba is 75° , as against 50° to 55° in the case of the pyramid. These monuments, which have usually two doors, one for the living and the other for the dead, contain a chapel and a sepulchral vault.

The necropolis of Sakkarah contains numerous mastabas of the Ancient Empire, and I will touch lightly on one of them, taking that of Tih, who lived during the Vth. dynasty, about B.C. 4,000. He held high priestly and civil rank, and was married to a daughter of Pharaoh. Like all tombs of the Ancient Empire, there is nothing funereal about the decorations of Tih's mausoleum, and the colours and delicacy of outline have been wonderfully preserved; they are characterised by a simple dignity, and depict sweet pastoral scenes, the pleasures of the chase, and many phases of Egyptian daily life and work. Tih is seen with his wife and sons superintending the work of the farm.

These inscriptions clearly reveal the ideal of the Egyptians of that period as to a future life—their hope being to live and labour as when on earth.

The Pyramids.

The remains of a large number of these structures have been discovered over the pyramid area in Egypt proper; and they occur in groups.

Endless speculations, more or less ingenious and far-fetched, have been indulged in as to the object and meaning of this singular form of monument, and savants have evolved all sorts of theories concerning them; some, that they were astronomical observatories, or warehouses for the storage of grain, having been built for hoarding up the surplusses of bounteous years, to be applied in supplementing the yield of lean years; while others saw in them standards of measurement; but whatever collateral objects the builders may possibly have had in view, the primary and principal one was clearly

to provide an enduring, inaccessible, and inviolable resting-place for the mummy; an outer sarcophagus, in fact, hermetically sealed. The real granaries were very large and built of bricks, with only two doors, one at the top, the other at the base, for warehousing and delivery respectively. The elaborate character of the great pyramid, with its extensive ramifications, has lent colour to the idea of a more abstruse meaning than that of a tomb, but even that remarkable structure would appear to have the same significance as all the others, though differing in size and complexity of construction. The fact that this form of monument has been found only in necropoli is perhaps sufficient to determine its use and purpose; furthermore it is known that a pyramid was built for each pharaoh up to the end of the sixth dynasty. The principle underlying the construction of the pyramids is as a rule tolerably identical, though differing greatly as to dimensions. A mass of masonry, nearly cubic in form, is raised on a small rocky eminence, selected for the purpose, if possible, with a raised mass of rock in the centre for a core. First a slanting shaft and mortuary chamber were hewn in the living rock, then a cubical mass of masonry was built over it, and added to until the desired size had been attained. An entrance passage to the mortuary chamber is continued as the structure advances towards completion, to be cunningly and hermetically sealed after the mummy had been placed in its sarcophagus. Other chambers were constructed in the body of the pyramid, with passages leading upwards and downwards. When enough had been built the sides were filled in, and the structure faced with cement.

These sepulchres were usually built during the lifetime of the monarchs for whom they were raised; and it is often imagined that a big pyramid was indicative of a long reign, but this is not so, for the plan was laid down by the hereditary architect in the first instance. Like mastabas, pyramids are intended to have their four faces towards the four cardinal points, but the orientation is often far from being exact, and this fact rather does away with the theory of any scientific

object being intended. Each pyramid had a chapel built outside the structure, and in it the relations met at certain seasons to pay their respects to the dead. As far as has been ascertained from examples standing, the pyramid age commenced with the first dynasty, possibly even earlier, and may be said to have ended in Egypt proper with the twelfth, when a pyramid was erected by Amenhotep III., thus covering a period of something like 2,000 years. There are, however, some late pyramids at Meroe and Gebel Barkal in the Soodan, built by the Ethiopians. They are very numerous, and are more vertical than those of Egypt. I shall only have time this evening to give you a short account of three or four pyramids, but I will choose for exposition those that are among the most distinctive.

Manetho, *Mer-en-Tehuti*, Beloved of Toth, a learned Greek who summarized the chronology of Egypt from the temple records by order of Ptolemy Philadelphus, B.C. 286, states that the first pyramid known to have been built was for Ouenephis, a king of the first dynasty; and the step pyramid of Sakkarah, standing out, as it does, in the centre of the Abooseer group, a necropolis mentioned by Manetho, is thought to be that monument, and is thus probably nearly 7,000 years old. In it are a number of chambers which have been lined out with bluish green slabs like Dutch tiles, and there are everywhere evidences of a considerable degree of artistic refinement. There are four entrances, and the passages are so intricate as to form a perfect labyrinth. The height is 197 feet. Then comes, in point of antiquity, a pyramid attributed to Seneferoo, a king of the third dynasty, at Meydoom, which Mariette considers to be but the nucleus of a much larger building. It is about 230 feet high from the foot of the mound on which it stands—the mound itself rising about 120 feet from the ground level. Built of an orange coloured stone, it resembles somewhat in appearance the donjon of a Norman castle. It has never been opened. At Sakkarah you have the truncated pyramid of Ooonas, a king of the fifth dynasty, whose oval ring or *cartouche* was

found inscribed in the doorway. It is described in the hieroglyphics as *Nefer Setu*, the most beautiful place; and I remember most vividly the simple grandeur of its frescoes and hieroglyphs, more natural and beautiful than those of later ages. An interesting example of the drawing of this period may be seen in one of the museum galleries, among the valuable series of ancient Egyptian illustrations from the monuments. This pyramid is one of the smallest of the group, being only about 60 feet high. A sarcophagus of black diorite was found containing some fragments of the mummy of Ooonas. The walls of two of the chambers are inscribed with texts.

The Great Pyramid. The Geezeh group of pyramids consists of nine, of which this is the greatest. It was built for the mummy of Cheops, the Shoofoo of the hieroglyphics and the Suphis of Manetho, the second king of the fourth dynasty, who reigned about B.C. 4,200; and his *cartouche* is found inscribed throughout the monument. The drawing before you is a copy of a fresco of this period, that of prince Mer-Ab, a son of the builder of the pyramid. It is numbered 8 in the museum series. An ancient writer states that the causeway along which the stone for the pyramid was brought took ten years to build, and a gang of 100,000 men was employed in the work. This gang was changed every three months, thus four million men were employed in its construction alone; and it took seven millions more to build the pyramid itself. (Note Birch's *Egypt*, p. 35). At first sight one's preconceived ideas as to the size of this mighty monument seem scarcely realised, but when one observes the great masses of hewn stone, tier upon tier, one begins to comprehend what a mighty mass of masonry it represents, and is struck with wonder at the sight. The original height was 481 feet, and breadth 755 feet, but these dimensions have become reduced to 455 feet and 750 feet respectively, the outer stones having been quarried away for the building of the Mosques of Cairo; it is now about 50 feet higher than St. Paul's Cathedral. The present area of the

structure is said to be about that of Lincoln's Inn Fields. Herodotus, who visited Egypt in B.C. 465, states that the stones used in the construction of the pyramid were raised from the ground by means of machines made of short pieces of wood, each stone being lifted one tier at a time; while Diodorus Siculus, who was in Egypt B.C. 65, says that the pyramid was 20 years in building, and that 260,000 men were employed in the work. Magnesian limestone from Toorah, and the nummulite limestone from the neighbourhood were both used. Strabo, who examined the pyramid in B.C. 29, considered the latter stones to be fossil lentils (*lenticularis*) and barley! Some years ago I presented a piece of this limestone, which I took from the pyramid, to the Society. Some of the blocks are five feet in height by more than eight feet long, with an outside angle of 51° , so you may imagine that the ascent was by no means an easy one. I made it, however, with the assistance of three lusty Arabs, two, each holding an arm, and the third pushing behind. The view from the top, which is 30 feet square in its present condition, is very remarkable and extensive, by reason of the clear pure air, and the flat nature of the surrounding country. All the groups of pyramids in Egypt proper may be distinguished from it, and the appearance of Cairo with its minarets is very striking; the Great Sphinx lies immediately below you, and the desert behind. This pyramid was classed by the Greeks as among the seven wonders of the world. The entrance to the passage leading to the sepulchral chamber was most cunningly hidden. It was found about midway across the north face, some 48 feet from the base. When the entrance block had been removed an inclined plane was revealed 376 feet long, 41 inches in width, by 47 inches in height. The passage proved to be a *cul-de-sac*, but a block of granite was discovered in the wall among the limestone; and cutting through the latter, so as to get round the harder stone, an ascending gallery was reached, which branches off in two directions. One of these branches ends in a room popularly known as the Queen's Chamber, the other leads to the King's

Chamber, the entrance to which was closed by a granite slab. This chamber is 19 feet high, 34 feet long, and 17 feet in width ; it is lined with granite, and above it are five rooms, the object of which is not apparent.

The second pyramid of Geezeh is but little short of the great pyramid in height. I cannot dwell on it this evening.

The Tombs of the Kings are about three miles and a half from Luxor. Crossing the Nile, and passing the Temple of Koorneh, built by Sethi I., you enter, by an old road of the pharaohs, a long valley or gorge called by the Arabs Bab-el-Molook (gates to the kings), which might well be termed the valley of the shadow of death. A more dismal picture of desolation can scarcely be imagined—bare rocks on every side, fiercely reflecting the scorching rays of the sun, and not a particle of vegetation to be seen. The tombs of this valley, which contains those of the kings of the XVIIIth. and XIXth. dynasties, differ very much in size, which would appear, as in the case of the pyramids, to have depended greatly on the financial resources that each particular pharaoh had at his disposal for his catacomb, and also the length of his reign, during the course of which it was constructed. The tombs of the XVIIIth. dynasty are differently arranged to those of the XIXth. and XXth. Immediately after the mummy had been placed in its sarcophagus the entrance was closed and cunningly levelled up, so as to conceal the catacomb from possible violation ; such precautions were very necessary, for spoliation of tombs was rife at all periods, and one not unfrequently finds mention of statutes on this subject among the legal records of Ancient Egypt.

There is a marked change in the principle underlying the texts and figures in these tombs as compared with those of the pyramids, where the effect produced is that of the defunct being at home, surrounded by his family, dependents and household gods, and leading a pastoral life ; scenes as little funereal as possible, the ruling ideal of a future life being evidently to continue in heaven a similar life to that enjoyed

on earth; while in the tombs of the XVIIIth. dynasty and later the principle is constantly affirmed that the departed must earn the joys of immortality by good works in this world, in default of which punishment would inevitably follow, and the deities of the nether world are everywhere in evidence. Here one misses those delightful and instructive scenes of labour in the fields, interspersed with the relaxations of the chase. There are several of these scenes, copied from the monuments, among the Society's collection of drawings already referred to.

The tombs differ much in interest as well as in size. I shall only have time this evening to touch on one of them, selecting that of Sethi I., a king of the XIXth. dynasty, a remarkable man, who was one of the greatest figures in Egyptian history. The design and execution of the inscriptions, which cover the walls and ceilings, are in the best and purest style, marking one of the culminating periods of Egyptian art; soon after this time another epoch of decadence commenced. The tomb is lined throughout with hewn stones. On entering you observe a staircase, 24 feet in perpendicular depth, leading into a passage; then a second staircase descends further 25 feet, and at the end of another passage you enter an antechamber and pass through two halls, the roofs of which are supported on columns. Descending another flight of steps, and passing through another antechamber, you enter a grand columnar hall, 27 feet square, communicating on either side with small chambers. In this hall the hiding-place of the sarcophagus was found, but from it the tomb still continues for some distance. The alabaster sarcophagus was empty when discovered, and it is now one of the treasures of Sir John Soan's Museum in London. Sethi's mummy was found in a pit at Der el-Bahari, placed there with other mummies for safety against tomb riflers; and it is now in the museum at Geezeh.

The painted sculptures in the tomb are wonderfully fresh, bold in design, carefully executed, and of great accuracy and finish. The reliefs are of great extent, and would take years

to decipher; they are often enigmatical and difficult of interpretation. Each part of the tomb has its own special theme of decoration, and the general scheme is common to all the tombs, varying only in quantity and in the manner of execution. There is a long hymn to Ra, in Amenti or the lower world, in which his name is glorified in 74 forms, with the legend "Praise be to Ra, the Almighty"; the king is justified in the 125th chapter of the *Book of the Dead*, and he enters into the most holy place. The gods of the dead are everywhere present, guiding and introducing the king into everlasting life, into which he enters when the obstacles of evil have been overcome, and he dwells among the stars as a god. The deeds done in the body are freely depicted, and the king's descent into Amenti is shown. In the first hall the nations of the world are differentiated in the colours red, black, and white. The inscriptions in the second hall mostly concern the ritual of the dead. A scheme of astronomy is represented on the ceiling of the golden chamber, and an interesting feature is some large free-hand pencilled drawings, corrected by the hand of the master artist for the chisel, and left unfinished on the death of the king. The inscriptions on the sarcophagus would seem to be an epitome of those on the walls of the tomb generally. When the catacomb was opened by Belzoni early in the last century the colours of the decorations were all fresh as when painted; but, like most of the monuments of Egypt, they have suffered greatly at the hands of the tourist, and even savants have not been ashamed to deface long spaces in order to carry away some particular piece of inscription. These tombs, like the pyramids, impress one with the utter futility of the extraordinary and elaborate precautions that were taken to preserve "the tenement of clay" for future use, for most of them have been violated and plundered by Egyptians, Assyrians, Persians, Greeks, Arabs, tourists, and, sad to say, by Egyptologists also.

Obelisks.

This very ancient form of monument is supposed by some to be an emblem of Amen, as representing a ray of the sun,

typifying generative power; and it is among the hieroglyphic signs. These monolithic columns are quadrilateral in form, the sides inclining slightly towards each other; they have slightly convex faces. The pillar tapers gently upwards, and the apex, sometimes sheathed with gold, forms a pyramidion. There are, however, examples with a rounded top, as instanced the one in the Fayoom. The proportion of the thickness to the height is nearly the same in all, being about one-tenth, and the top is never less than half the thickness of the bottom. Pedestals are usually of a single block.

An obelisk was usually placed in front of each colossal statue of the founder of a temple before which it stood, and the two guarded the portal of the pylon on either side. The pylon is the temple façade, though in the case of Karnak, where other temples have been added beyond, this is not apparent to the casual observer. Obelisks were thus usually in couples, although no couple is to be found still standing together erect; but where there is one upright a careful search will generally reveal traces of a fallen fellow. I believe, however, that they were always of unequal height. Small ones have been found as far back as the times of the fourth dynasty, that is, the period of the erection of the great pyramid at Geezeh.

The most ancient obelisk now standing *in situ* is that at Heliopolis, the ancient Oxford of Egypt, from which city two others were removed by the Roman Emperor Augustus Cæsar, and these were still to be seen up to some twenty years ago at Alexandria, the capital of the Ptolemies, where they were known as Cleopatra's needles; but it is improbable that any of the queens of the name had anything to do with them. These obelisks were erected before the imperial palace, the Cæsarium, soon after the death of the last Cleopatra. The largest was transported to England in 1877, and now stands on the Thames Embankment; the other found its way some years later to New York. Both these monuments spring from the reign of Thotmes III. of the XVIIIth dynasty. The tallest obelisk now standing, the one at Karnak, is about 109 feet in

height, and estimated to weigh 580 tons. It was erected, with another that has fallen, by Queen Hatasoo of the glorious XVIIIth dynasty, and it bears an inscription, in *intaglio*, testifying to the fact that it and its fellow were cut from their native rock at Assouan, brought down the Nile to Karnak, were placed in position with absolute accuracy and precision, inscribed and decorated, all within the space of seven months—a feat that would be considered remarkable to-day. An inscription states that the legend on the standing obelisk was inlaid with gold. Another of these monuments is still standing at Karnak, inscribed with the legend of Thotmes I.; its fellow also lies low. One of the two Luxor obelisks was taken to Paris, the other is still *in situ*, and one from Thebes went to Rome. One, formerly at Karnak, is said to have been 162 feet high. There is a small obelisk, cut in sandstone, still standing at Philae.

The obelisk on the screen, still erect in the midst of the site of the city of Heliopolis, near Cairo, the only object, beyond a few mounds, left to mark the place, was erected by Osertasen I., the second king of the XIIth dynasty, nearly fifty centuries ago. Each face, which measures over six feet across in its broadest part, is inscribed with the *cartouche* of the pharaoh, and its dedication is to the Hor of the Sun. Its fellow was still erect as late as the seventh century of our era.

The heights of the standing obelisks are as follows :—

Karnak	109 feet
St. John's, Lateran, Rome	106 „
St. Peter's, Rome	83 „
Paris	75 „
London	68½ „
New York	67 „
Heliopolis	66½ „

but this list does not include all.

The method by which obelisks were quarried is shown by an unfinished specimen still in the quarries near Assouan, which has been cut clear on three sides, while the fourth is still attached to its native rock; and how the final detachment

was to be accomplished is shown by a deep groove cut along the rock face, in which are a series of holes for the reception of wedges. Place the wedges in position and fill the groove up with water, the swelling of the wedges all along the line simultaneously, so to speak, would soon split the rock and free the rough pillar from its native granite ready for further manipulation. The same method was adopted by the Romans at Limestone Bank, Northumberland, along the Roman Wall, for breaking huge blocks of whinstone asunder—the wedge holes are still discernible.

Colossi.

Colossi, which are monoliths, and cut from granite, limestone, sandstone, and even hard green diorite and pudding stone, usually represent the reigning pharaoh, and formed part of the accessory decoration of a temple. They mount guard at the entrances, ready as it were to confront an enemy.

The Great Sphinx is hewn in the living rock, with added stonework where necessary for its contour. It is possibly the oldest monument not only in Egypt but in the world, for it was probably standing before the birth of Menes, the first king of the first historic dynasty of United Egypt, modelled during the period covered by the legendary "servants of Hor," and it is possibly a representation of a king of one of those long forgotten dynasties which ruled over a people highly advanced in the paths of civilization, refinement, and science, and with a long and cultured past. An inscription, found by Mariette at Geezeh, shows that the Sphinx was standing in the reign of Cheops, the builder of the great pyramid.*

The name of the monument in hieroglyphics is *Hor-em-Khoo*, *Hermachis Khefvera Tmu*, the rising sun, or Horus on the horizon; and the Arabs call it the Father of Terror. The head-dress, probably the royal crown of Lower Egypt, that is, assuming that there was no United Egypt before Menes, has disappeared, and so also has the beard, pieces of which are

* Some doubt has been recently thrown on this stele; and there are authorities disposed to assign the monument to about the close of the Ancient Empire.

now in the British Museum. The face, which was originally coloured red, and covered with polished stone, bears an Ethiopian aspect, and is, even in its present condition, characterized by great power and subtility, and a remarkable serenity of expression—it is much mutilated, and the fanatical followers of Mahomet have battered off the nose. It stands to-day a monument of change and decay. The form of the body is that of a lion 140 feet long; the human head measures 30 feet from the forehead to the chin, and the face is 14 feet across; the front paws are 50 feet in length, and between them is a narrow way to an altar, built in front of the figure.

The Statue of Khafra. I would like to mention this statue here, but not being colossal, though large, it hardly belongs under this heading. It stands now in the museum at Geezeh, and is sculptured in hard green diorite, a stone most difficult to work. This statue bears an expression of serene majesty and power, and in this respect may be said to rival even the Jupiter of Phidias. Khafra sits a king of men, almost a god. He was the builder of the second largest pyramid of Geezeh, and reigned at Memphis some 6,000 years ago, and his epoch was characterized by great excellence in sculpture, with a freedom from the conventionality that somewhat mars so many of the later examples of Egyptian works of art.

The Colossi of Thebes, two gigantic statues seated on cubical thrones, are before you—monoliths of a yellowish-brown conglomerate or pudding-stone, a material very difficult to work, 52 feet high without their pedestals, which rise 13 feet. They were erected by Amenhotep III., of the XVIIIth dynasty, and both represent himself. They stood sentinel before his temple, the Amenophium, which, like the city of Heliopolis, has entirely disappeared. Originally the figures wore the *pshent* or double crown of United Egypt. The dimensions are approximately as follows, viz., shins $19\frac{1}{2}$ feet long, each foot $10\frac{1}{2}$ feet, breadth of shoulders $19\frac{3}{4}$ feet, length of index finger $4\frac{1}{2}$ feet, arm from tip of the fingers to elbow $15\frac{1}{2}$ feet. The weight of each, including pedestal, has been estimated at about

1,200 tons, but I fancy that this must be an exaggeration. The northern statue is called the vocal Memnon, because, after having been damaged by the earthquake of B.C. 27, it emitted a curious musical sound, something like the human voice, when struck by the first rays of the sun at daybreak. Strabo records having heard it when in Egypt with Ælius Gallus. The reason for this sound lay probably in some form of expansion, but the vibration ceased after the statue had been restored by Septimus Severus. Leaning against the throne are two female figures representing the mother and wife of Pharaoh. Miss Martineau says of them:—"There they sat, together yet apart, in the midst of the plain—serene and vigilant, still keeping their untired watch over the lapse of ages and the eclipse of Egypt. I can never believe that anything so majestic as this pair has ever been conceived by the imagination of art. Nothing, even in nature, affected me so inexpressibly. The expression of sublime tranquility which they convey from distant points is confirmed on a nearer approach."

A gigantic statue of Rameses II., seated on his throne, stood before the pylon of the Rameseum or Memnonium, a temple built by Rameses II., that remarkable ruler of men; but it now lies in mutilated fragments on the ground. It was over 57 feet in height, and is estimated to weigh something like a thousand tons; the length of the index finger is nearly three feet and a half. I believe that the largest of the monoliths at Stonhenge is estimated to weigh about eighteen tons, and a comparison with that will give some of you an idea of the stupendous size this statue was before its demolition. The material is the rose granite of Syene. A bit of an ear lay on the ground when I was there which I am sure would take three men to lift. This colossus is significant of the wonderful mechanical resources of the ancient Egyptians. How could such a mass of granite be cut, brought down the Nile some 150 miles, chiselled and placed high up at the head of the temple steps? It seems to one that such a feat would not be easy of accomplishment to-day with all our appliances,

This statue bears the marks of having been broken in pieces by damped wooden wedges, the process already referred to as having been used in the detachment of obelisks. We may attribute its destruction to the fanaticism of the early Christians, who wantonly laid waste everything in the temples within their reach.

FORMS OF WRITING.

Articulate language was in all probability itself preceded by symbolic or picture writing, which would naturally take the forms of objects in nature and of those in common use, more especially in its earlier stages. The origin of Egyptian hieroglyphs, literally sacred sculptures, was pictorial, like the writing of the Chinese; and like that of Babylonia, which degenerated from the picture writing of the Accadians into the cuneiform or wedge-shaped characters.

The Ancient Egyptians were assisted in every sentence by a "determinative," which summary, however, was but sparingly used during the earlier dynasties. As far as is known, or at all events as far as we can go back, pure hieroglyphics were employed mainly on the monuments.

The oldest descriptions found up to recently date from about B.C. 4,500, and they contain some alphabetic characters. These inscriptions occur on the stelae of SHERA, which are preserved at Geezeh and Oxford. Last year Petrie found the polychromic vase at Abydos, already mentioned under the heading "The Monuments" with the name of Menes upon it; this carrying back the art of writing to the beginning of the first known dynasty some seventy centuries ago—how long it took to reach this stage we know not, but it would appear to have been already then very far removed from infancy, and is suggestive of a long long past, for the first signs must have been purely symbolic, and in the earliest inscriptions yet found there is already something more. Now that grammars have been prepared for the use of students, the work of study has become less laborious, and indeed the hieroglyphic form of caligraphy is hardly more difficult to read, word for word,

than any other kind of writing, and certainly much less so than that of the Chinese.

It is interesting to follow its degeneration into more flowing forms, providing the key to the evolution of our present system of writing; still it continued to hold its position as a monumental language until the third century of our era, soon after which all knowledge of it practically died out until brought to light again at the beginning of the last century. It is thought by some to be the mother of Phoenician, and from the language of that enterprising people many of the alphabets of Europe and Asia are said to be derived. The progress made in the translation of the three stages of ancient Egyptian handwritings, viz., hieroglyphic, hieratic, and demotic, since the times of Thomas Young, Jean François Champollion, Silvestre de Sacy, and even the Swede Akerblad, has, of course, been very great, but the rendering of all of them still leaves much to be desired; indeed our knowledge is still insufficient for accurate translation, and the reading of any other than simple texts must be speculative to a great extent so long as the idioms remain unmastered; the great difficulty lying in the gradual change in the language, constantly growing as it was, and extending over such a vast period of time, and also to the loss of the myths essential to a clear understanding of the meaning of the texts—take the evolution of any modern language and this must be seen. The alphabet consists of 24 letters, but there are several different forms of some of them. The hieroglyphics include syllabic and symbolic quantities or signs, and grammatical inflections are present. The earliest inscriptions express ideas in the abstract, quite apart from a mere representation of tangible objects. Poems and even ballads appear in many inscriptions. Upwards of 3,000 signs have been identified. The illustration of hieroglyphic writing before you is one of the series of copies of inscriptions in the possession of the Society (No. 4).

Hieratic is a more cursive rendering of hieroglyphic forms, which are subjected to a system of abbreviation. Here is an

example of this form in the museum series. The oldest example of this form of writing extant, which may be said to bear the same relationship to the older form, to some extent at least, as our writing does to print, is the Prisse papyrus (maxims of Ptah Hotep), written about B.C. 3,000, and there are some inscriptions on the rocks at Assuan of about the same time showing that hieratic was then used for common purposes. The translation of this form of writing even now is only determined through hieroglyphic forms.

Demotic or enchorial writing came into vogue about B.C. 900. The translation before you is the demotic portion of the inscription on the Rosetta stone. It was wanted for commercial and general purposes, hieratic being too cumbersome for daily life, and it represented a still further marked decadence from hieroglyphic signs, in the direction of a flowing hand, preserving but little of the original forms. It practically survived in Coptic, into which language the Egyptian eventually became merged, and the derivation from the older language is easily traceable. Coptic was used in translations of the bible, but the Egyptian scribes were compelled by the Ptolemaic government to employ the Greek alphabet to write down the Egyptian words, and six demotic letters, forms of "sh," "f," "x," "c," and "g" were added to supply sounds which were absent in the Greek language. Coptic has a grammar and lexicon, but none for any of the three older forms has been discovered. Hieratic and demotic were in use as late as the fourth century of our era. The key to the hieroglyphics was not discovered until early in the 19th century, and then greatly by the aid of the Rosetta stone, an inscribed tablet found near the end of the previous century by a French officer, and now in the British Museum. It is a decree of the priests of Memphis conferring divine honours on Ptolemy Epiphanes, B.C. 198. The Rosetta stone is of black basalt, 3-ft. 2-in. long by 2-ft. 5-in. wide. A cast of the inscription was taken by the Society of Antiquaries of London in 1802, and impressions distributed among scholars. A piece of the tablet with part of the inscription is broken off. Many

attempts were made during the 17th and 18th centuries to translate the ancient writings, but generally with absurd results, and it was reserved to Dr. Thomas Young to find a key or rather clue, which, though very partial, still achieved enough to make further progress comparatively easy. He made the initial discovery that the characters inscribed on an oval ring or *cartouche* represented a royal name.

Champollion is often credited with the finding of a key, but Young would seem to have been the first to lift a corner of the veil, and he sent a copy of his translation of the inscription on the Rosetta stone to the French savant, who sometime afterwards issued a version in his own name, and with but a slight acknowledgment of the labours of Dr. Young. Champollion, however, definitely settled the phonetic values of several hieroglyphs, and saw the importance of seeking the aid of Coptic, a language which he had thoroughly mastered. The history of the decipherment of the hieroglyphics is a long one, but I must confine my remarks this evening mainly to the initial discoveries. Several letters were established by comparing the three paragraphs on the tablet, which is inscribed with trilingual texts, written in hieroglyphic, demotic, and Greek characters; and the Greek version of the text served as a translation of the other two writings, at least of the demotic, which section is entire, and of the hieroglyphic part of the inscription left on the stone, for it is a piece of the latter that has been broken off. In 1866 another stone was found with the inscription complete. The word *Ptolemaos* occurs several times in the paragraph written in Greek on the Rosetta stone, and on the small obelisk at Philae, from which Champollion obtained a few more alphabetic signs to add to those yielded by the Rosetta stone. First the letters P, T, O, L were traced through the other two writings, and a comparison of the *cartouche* of Ptolemy with that of Cleopatra, in which these letters also appear, definitely established them both in hieroglyphic and demotic; and with such a beginning you will readily understand that the discovery of the whole alphabet was merely a matter of time, comparison, and industry.

Progress was accelerated by the finding of another trilingual and several bilingual tablets. The "determinatives" helped greatly to such a knowledge as we now possess, leaving, however, still much to be desired.

An Egyptian scribe wrote principally on papyrus, a material made from the substance in the stalks of the plant of that name, cut in thin slices, which were gummed one over the other and pressed flat. The largest papyrus yet found measures over 135 feet in length. The pen was a reed, and the inks were made from vegetable colours. Linen, leather, wood, and potsherds were also written on besides stone. The scribe generally belonged to the priestly caste.

RELIGION.

The Egyptians were the most religious people among the ancients; but, after wading through the confused and apparently contradictory material available, it is most difficult to form any very clear idea as to whether that religion was pantheistic, or a monotheism, a trinity in unity; and this is greatly owing to palpable inconsistencies between the monumental inscriptions and the other sacred writings, as well as to a want of a fuller knowledge of the esoteric myths and legends, so many of which seem hopelessly lost. Besides, we are dealing with a period of time of more, probably much more, than fifty centuries, over which naturally changes and modifications took place, but in such a manner as to make them most difficult to trace and differentiate; for the forms, as far as is known, remained with but little alteration. One salient feature in the gradual process of evolution stands out very clearly, and that lies in the modification of the ideas concerning a retributive punishment, in Amenti, for wrongdoing on earth, which became very much more pronounced as time went on. The religion of the ancient Egyptians, like that of other peoples, began doubtless with the legends of ancestors, of heroes, around whose memory the myths would soon cluster and crystalize. Pantheism, polytheism, monotheism, and trinity in unity seemingly interweave and

alternate in a perfectly bewildering manner—here is indeed a wide field for the controversialist.

The multiplication of gods with similar attributes presents a very serious difficulty in the way of any satisfactory elucidation of the problem; and the more so, as some of the deities were in a sense competitive. Before you is a representation, copied from the monuments, of some of the deities:—Osiris; a form of Isis; Neith; Ptah; Ammon-Ra; Sebeck; Horus and Anubis. The illumination is numbered 12 in the series of drawings belonging to the Society. This varied pantheon is in part an inheritance from the times when Egypt was divided into separate states, and after the country had become united certain divinities continued to enjoy a local predominance as the religious governors of each nome, and they were venerated by all Egypt. The king is an incarnation of the deity.

I have tried to formulate something tangible out of this chaos, which, however, is perhaps more apparent than real. To judge from the monumental inscriptions only, the religion was pantheistic; but the other sacred writings as a whole point decidedly to a form of monotheism, a unity, or a trinity in unity. The system changed less over the vast period from Menes to Theodosius, over 5,000 years, than many scholars imagine, and this alone would point to its having been a prehistoric system, that is of an origin pre-Menes.

There is no record of any but one distinctly important break during the long course of Egyptian theology known to us, and this occurred probably in the reign of Amenhotep IV., a king of the XVIIIth dynasty, who assumed the name of Khoo-en-aten (the sunshine); his mother is thought to have been a Semitic princess. The king removed the capital to el el-Amarna. The old religion was overthrown, and a worship of Aten, the sun's disc, instituted in its place; but on the accession of Horemheb, another king of the same dynasty, the old form of religion was reverted to. It would appear that some change had also taken place during the twelfth dynasty, at all events in the nomenclature of the gods, for

Petrie, when excavating at Abydos, found that Osiris was not the original dominant deity there, since the jackal god, Upuaut, and then the god of the west, Khentamenti, occupied that position; but Osiris is mentioned on the sarcophagus of Menkaora, of the fourth dynasty, over a thousand years earlier than the period represented in the twelfth dynasty.

The monuments present a vast pantheon, but to quote an ancient writer, Porphyry :—"All living creatures in their degree partook of the divine essence, and under the semblance of animals the Egyptians worshipped the universal power in the various forms of living nature." Jamblichus, writing towards the end of the third century, states that the Egyptians believed in one God, the author of his own being, without beginning or end. Eusebius was of opinion that the Egyptians looked upon the universe as God, composed of several deities, constituting his different attributes or elements.

The deities would appear to represent fixed principles in nature, such as the heavenly bodies and their courses, light and darkness; and each forms part of a great whole. Ammon of Thebes, the supreme being, for instance, represents the hidden life-giving force of nature, and he is clothed with the attributes of creation. It is symbolism and imagery on a vast scale, and certainly far from resembles the mythologies of Ancient Greece and Rome, which nations partly adopted some of the Egyptian forms after the spirit had fled and been forgotten. All the gods of Egypt seem to be merely modifications of the attributes of one great eternal being, personified under positive forms.

It is often supposed that there existed one system for the initiated and another for the vulgar. To some extent, I suppose, this is always so, and it may perhaps be partly accounted for in the case of Egypt by the apparent, nay real inconsistencies between the monumental inscriptions and the other esoteric writings; besides, foundations of belief have never been rightly appreciated or understood by the uneducated masses of any period or country. The vulgar

naturally desire some more visible sign than that required by the initiated, indeed, there is every reason to believe that the Egyptian priests fired the imagination of the masses by meretricious manifestations, which were popularly regarded as miraculous. To the ignorant and illiterate Egyptians the system was a pantheism, and to them the universe itself was God, natural objects, such as the sun on the horizon, being each represented by a special incarnation or deity; while to the initiated, who enjoyed "the wisdom of the Egyptians," it presented a unity of godhead, or a triad, a trinity in unity, with ministers and intercessors, all bowing to one great controlling power.

The principle of eternity is established in the triad myth; the god being, at one and the same time, father and son. The supreme being, maker of heaven and earth, was worshipped under many names and aspects, all of which had a local origin, but meaning the same creative and controlling deity. Judgment by Osiris in Amenti, punishment for wrongdoing, but not eternal, justification by works, and a glorious immortality, are all principles clearly defined. The phrase "justified by Osiris" occurs on some of the mummy-cases.

There are several Egyptian triads or trinities, a foreshadowing of the great Christian dogma; for example, Ammon, Maut, and Khonsu, at Thebes; Horus, Tasentnefert, and their son Pinebtati at Ombos; and Isis, Osiris, and Horus at Abydos; each triad having a local origin. But the spirit of the dogma is the same in all, namely, a controlling first cause, as typified by the sun under various names and aspects, representing creative force and initiative government; Pasht or Bast, Sekket, Isis or Hathor, Maut, typifying maternity, fecundity, as the earth bringing forth; whilst the son, under various names, is an incarnation of the principles of offspring and continuity. The father is the author of his own being, at once his own father and his own son, thus conveying the idea of neither beginning nor end, eternity, and immortality. An immaculate conception is claimed for Horus, as for Krishna and Buddha and many other deities; all having possibly the

same origin in a solar myth, the sun setting in the constellation of Virgo. A small chapel called *Mamesi* by Champollion, a dwelling of the mother of God, is attached to all the temples in which a triad is worshipped, and here the inscriptions deal with the mystical conception of Horus, the third person in the trinity of Abydos and of Dendera, the accouchment of Isis, and the boyhood of the god Hermachis, or Horus on the horizon. The resurrection is typified in the rising again of Osiris. The details of the great Osirian myth are too long and complex to permit of any fuller elucidation this evening.

Ptah of Memphis, the "lord of truth," in the earlier religious forms, and later Ammon of Thebes, represents the creative force of nature. The egg of Kheper, the beetle, *Scarabæus sacer*, typifies the earth, which is fashioned by Ptah, and vivified by Ra, the self-begotten; or the Amen Ra of the Middle Empire, the daily renewer of life. On incubation the egg divides into Noot, the heavens; Seb, the earth; and Amenti, the lower regions. Ra rises in the morning as Hermachis, the rising sun, as represented in the Great Sphinx; is himself, as the sun's disc, at noon, and dies as Tum or Tmu, the setting sun, at night, thus typifying birth, life, death, and resurrection—in one word humanity. The sun is born again as a child every morning, is drawn as a chariot by the stars through space, and then sets to illumine the under world. Man, therefore, only seems to die, preparatory to eternal life, when he eventually becomes merged in Osiris, from whom, and in whose image, he sprang. The unjust are tormented in Amenti, and their souls transmigrate for a span through the bodies of animals. Ptah is symbolized by Apis, the bull, an emblem of productive force. In one of the chapters of the *Book of the Dead* the soul is represented as being scourged from the judgment hall, on the day of judgment, in the body of a pig; it is not punished eternally, but eventually becomes reunited in Osiris.

Osiris was the soul of the world, as the world was conceived in the womb of Isis; and as each soul emanated from Osiris,

so it returned again to his bosom. In Typhon, the serpent, and in Set we have the principle of evil. Set is but another name for Satan. Thus the Egyptians believed in a soul and in a future life, hence their anxious care to preserve the "tenement of clay" by embalmment for use after death by the soul, and the elaborate precautions taken for the safety of the mummy. After death comes judgment, when the heart is weighed by Anubis; while Toth, the recorder, notes down the good and evil deeds done in the body. Osiris, son of Noot, the heavens, as Judge of the Dead, described in the seventeenth chapter, has a sort of jury composed of 42 minor divinities, the same number as the sins specified in one of the papyrus rolls found. Before you is the illumination, numbered 1 in the series belonging to the Society. Should the verdict given in the hall of the two truths be adverse, the soul is consigned to punishment, but only for a span, when it comes up again for judgment. From this it is clear that the Egyptians did not believe in eternal punishment. If the heart weigh true the soul comes forth as a god, when the elected enjoy eternal bliss, but only after some period of purgatorial probation. In the papyrus of Neb-ket is a picture of the soul's return, down a ladder from heaven to the earth, to visit the mummy; and on an inscription in one of the pyramids allusion is made to a ladder reaching from earth to heaven.

So great was the anxiety to preserve the bodily tenement for the soul, that the idea of the *ka*, the double or ghost of the deceased, was conceived; but exactly in what sense is obscure—the shadow conveys the best idea to my mind: some call it the genius. Besides the body man is composed of the *ka*, the soul *ba*, and an intelligence *xu*. With a mummy are one or more figures representing the *ka*, built into the walls of the tomb or otherwise distributed, so that the soul had always something to fly to in the event of the destruction of the mummy, accidental or otherwise.

The idea of "like unto like" is carried out literally; the mummy being provided with real bread, while the food for

the *ka* is fashioned in clay; this idea is further developed in the false door to the tomb for the *ka* instead of the real one. Professor Maspero thinks that this door, by a process of dwindling the expansion of the inscription, developed into the stele. The double name of a pharaoh is one for the person and the other for the *ka*.

The body was prepared for embalmment by the removal of the viscera, which were put into Canopic vases, and the brain was drawn out through the nose. The body was then filled with spices and aromatic drugs, washed, bandaged, and steeped in natron. There were other and cheaper methods of embalmment for the poorer people. The illumination before you is numbered 16 in the Society's series.

The Egyptian faith is often spoken of as pantheistic, and justly so in regard to the long roll of divinities inscribed on the temple walls; but it must be borne in mind that the sun was not looked upon as a god, but as a symbol, or a visible manifestation of the deity. In fact this symbolism or imagery is really more monumental than esoteric; for searching the spirit of hieratic literature, of which there is great store, there is comparatively little mention of any save the great creator of the universe and first cause, illustrated by pantheistic imagery in the form of assistant principles or deities, as we have, to some extent, in the Old Testament and Revelation.

The *Book of the Dead*, *peri-en-hru* (coming forth by day out of the nether world), descriptive of the trials of the soul after death, is by far the most important, from a religious point of view, of the many papyri that have come down to us, and we have examples of it in great numbers. It is the most ancient book in the world. This record has been preserved inscribed on papyrus rolls, mummy wrappings, ushabti, statues, walls of tombs, and on scarabæi. Probably handed down orally from remote ages, it was committed to writing at a very early period. Sir J. Gardner Wilkinson copied a text in the seventeenth chapter from the sarcophagus of a queen of the eleventh dynasty, about B.C. 3,000, and it seems

probable that some of the passages were as obscure to the Egyptians living at that early time as to ourselves. The papyrus at Turin contains 165 chapters. The very great age of even the latest copy of this remarkable record becomes apparent when we consider that there is probably no Hebrew manuscript of the Old Testament older than the eighth or ninth century of our era.

I will proceed to give you a few extracts from this ancient book :—

“I go on the way, where I wash my head in the lake of the justified. I reach this land of the glorified, and enter through the glorious gate. Doing that which is right and hating that which is wrong, I was bread to the hungry and water to the thirsty, clothes to the naked, a refuge to him that was in want; and that which I did to him, the great God has done to me. God has inclined his countenance to me.”

“Oh ! my God and Lord, who hast made me and formed me, give me an eye to see, and an ear to hear thy glory.”

“There hath not been found any wickedness in him, he hath not harmed any man by his words, and he uttered not evil reports while he was upon earth.”

The Turin tablet of Beka is another most instructive ancient record. A passage runs :—

“I was just and true, without malice—placing God in my heart, and quick in discerning his will. I have come to the city of those that dwell in eternity.”

A papyrus roll in the British Museum says :—

“The great God, Lord of heaven and earth, who made all things that are.”

And another in the Leyden Museum speaks of

“the one in one.”

The following translation of an ancient Egyptian hymn is far more instructive than any abstract theories derived from the vast monumental pantheon of Ancient Egypt :—

"God is one and alone, and there is none other with Him
God is the one who made all things.
God is a Spirit, a hidden Spirit, the divine Spirit.
God is from the beginning, and has existed from the beginning.
He existed when as yet nothing existed, and whatever is, he made it
after He was.
He is everlasting without end, and will exist for ever.
God is truth, He is life, He blows the breath of life into men's
nostrils.
God begets, but He is not begotten.
God is the creator of heaven and earth, the deep, the waters, and the
mountains, and makes firm the earth beneath.
God is compassionate to them that fear Him, and hears those who
cry unto Him; He protects the weak against the strong; He
rewards those who serve Him, and protects those who follow
Him.
To obey is to love God, but to disobey is to hate him."

Most of this hymn startlingly resembles parts of Holy Writ.

Surely an elevation of thought and high code of morals, as
set forth in the foregoing extracts, can only ignorantly or
thoughtlessly be set down as idolatry and fetishism.

Eternal process moving on
From state to state the Spirit walks;
And these are but the shattered stalks,
Or ruin'd chrysalis of one.

Thy voice is on the rolling air;
I hear thee when the waters run;
Thou standest in the rising sun,
And in the setting thou art fair.

ON THE MIGRATIONS AND THE GROWTH OF PLAICE.

BY ALEXANDER MEEK, M.Sc., F.Z.S.

In 1893 Dr. T. W. Fulton* published the results of experiments made under the auspices of the Fishery Board for Scotland with a view to determining the migrations and rate of growth of plaice and other fishes. His conclusions with reference to plaice were:—1. That plaice tend to remain within the inshore waters during the period of immaturity; 2. That while they may travel 20 miles in about a year or so, their movement is as a rule slow; 3. That in the areas investigated their movement is in a definite direction, namely, inwards along the south shore of the Firth of Forth in a westerly direction, then outwards and eastwards along the northern shore, and that this general direction is continued round St. Andrew's Bay towards the north." During the years 1889 to 1892 the large number of 1,250 plaice were labelled and liberated, and of these 103 were recaptured, or 8·2 per cent. The author considered however that this proportion was more than probably too small, for the first batch of labels proved to be unsatisfactory. An examination of the details of the experiment bears out the general conclusions. A certain number certainly went to the south, and in the Firth in the opposite or other directions, but the general tendency was to go out of the Firth to the north along the coast of Fife, and from the coast of Fife to the Tay, and to the north of the Tay. Several found their way to the deeper water off the Forth and off the Tay.

In the same year, 1893, Dr. C. G. Joh. Petersen† made experiments in labelling plaice, and arrived at a method which has been adopted with some modification by subsequent experimentalists. He marked and liberated about 1,000

* 11th Ann. Rep. S.F.B.

† Rep. of Danish Biolog. Stat. 1893,

fishes in the Limfjord, and recovered 51, but believed that the proportion would have been increased if the fishermen had been more interested, and also that many of the labels had been lost. They were immature plaice, and were caught again in the Limfjord. The results therefore did not show anything definite with regard to migration. The plaice made good progress in growth, however, and recently attempts have been made to transplant plaice from the North Sea into the fjord.

The staff of the Plymouth Laboratory have, in addition to the extensive experiments made in conjunction with the other North Sea powers, taken the opportunity of the trawling experiments on the coast of Devon to mark and liberate a number of plaice. The results have been published by Mr. Garstang†. During 1901 and 1902 420 plaice were labelled, and 121 were recovered, or 29 per cent. Mr. Garstang gathers from the experiment :—1. Plaice below 8 inches in length are practically confined to the inshore waters of the bays at all seasons of the year. 2. On attaining a length of 8 inches the plaice in Teignmouth Bay and Torbay tend to emigrate in summer into Start Bay, and in winter over the offshore grounds. He saw reason for stating that the larger plaice migrated to the offshore grounds in November and December, and returned in March and April. The district thus appears to be self-contained, but were we to look for an indication of a general movement in a definite direction, such as resulted in the case of the Scotch experiments, we would be justified in saying that if it does occur it is an up-channel one.

The opportunity was taken last year at the Northumberland trawling experiments to label and liberate a number of the plaice and a few other flat fish, and a preliminary report on the results was published*. The label used was the modified form of the Petersen label adopted in the international investigations. About 200 of the fish were marked with labels sent from the Lowestoft Laboratory, the remainder with smaller

† Jour. Mar. Biol. Assoc., Dec., 1903.

* 1903, Rep. to Northd. Sea Fish. Comm. on Scientific Investigations.

but similar labels which we got made. Each label consisted of an oval numbered brass disc, a bone button, and a short piece of silver wire. The latter was passed through the fish in the interspinous region next the dorsal, or in some cases the ventral (anal) fin, and bent to secure the button below and the disc above.

Altogether 483 fishes were thus marked and returned to the sea, after being carefully measured and in many cases weighed. The results up to July 20th are given in the accompanying table (see pages 147 and 148).

MIGRATION.—The plaice were caught and liberated in the inshore waters of the Northumberland coast, at the various trawling stations from Goswick Bay in the north to Blyth Bay in the south. They were all immature, measuring from about 7 to about 11-in. in length. With the exception of two, the fish recovered have been captured also in the inshore waters of Northumberland, and in almost every case in the same bay where they were set free. Those recovered have been caught by the line and in trout nets, and I have therefore to thank the fishermen for their kind co-operation in carrying out the experiment. It is rather remarkable that although it was not uncommon to catch the plaice which had just been marked in the trawl when the latter was passing over the same ground again during the course of one experiment, only one of the re-captured fish was caught by the trawl when the bay was subsequently revisited. This plaice was got in Druridge Bay this year, and after being measured was again put back into the sea.

The immature plaice of the inshore waters may then be said to be for the most part non-migratory. It is quite possible that much colder weather than prevailed last winter might have caused a migration into deeper water, and in such a case a return migration might have shown a general tendency in a definite direction such as resulted from Fulton's experiments. But last winter at all events the great majority of the plaice remained in the inshore waters, and did not migrate as a rule from the bays. The rocks and the rough

Number	Date.	Size.	Weight.	Where Liberated.	Where Captured.	Date.	Size (Length)	Increase.	Sex.	Migration.
892	1903 June 26	Inches. $8\frac{1}{2} \times 5\frac{1}{2}$	Ozs. 5	Goswick Bay	Skate Roads	1904 April 5.	Inches. $11\frac{1}{2}$	$2\frac{1}{2}$ in 284 days	m	4 miles south
895	"	$10\frac{1}{2} \times 5\frac{1}{2}$	8	"	St. Andrew's Bay	1903 Nov. 5.	$11\frac{1}{2}$	$\frac{1}{2}$ in 182 "	f	42 " north-west
896	"	$8\frac{1}{2} \times 4\frac{1}{2}$	5	"	Goswick Bay	1904 April 11.	$10\frac{1}{2}$	$1\frac{1}{2}$ in 290 "	f	0 north-west
898	"	$10\frac{1}{2} \times 6\frac{1}{2}$	10	"	7.8 miles E. of Isle of May	May 27.	$12\frac{1}{2}$	$1\frac{1}{2}$ in 336 "	m	35 " south
810	"	$10\frac{1}{2} \times 6\frac{1}{2}$	9	"	Skate Roads	March 18.	...	...	...	0
816	"	$8 \times 4\frac{1}{2}$	3	"	Goswick Bay	...	...	...	...	0
818	"	$10\frac{1}{2} \times 6\frac{1}{2}$	...	"	Skate Roads	April 8.	$12\frac{1}{2}$	$1\frac{1}{2}$ in 288 "	m	1 mile south
890	July 1	$8\frac{1}{2} \times 5\frac{1}{2}$	...	Alnmouth Bay	Amble Harbour	April 21.	$9\frac{1}{2}$	$\frac{1}{2}$ in 235 "	f	1 " east [Dab]
843	"	$8\frac{1}{2} \times 4\frac{1}{2}$	...	"	N. of Coquet Island	April 22.	$8\frac{1}{2}$	0 in 296 "	...	5 miles north
878	July 15	$9\frac{1}{2} \times 4\frac{1}{2}$	31	Druridge Bay	Amble Harbour	March 24.	$9\frac{1}{2}$	$\frac{1}{2}$ in 360 "	m	0
883	"	$7\frac{1}{2} \times 4\frac{1}{2}$	2	"	Druridge Bay	July 9.	9	$1\frac{1}{2}$ in 360 "	f	5 " south
890	July 23	$9\frac{1}{2} \times 6$	6	Blyth Bay	Druridge Bay	April 8.	$10\frac{1}{2}$	$1\frac{1}{2}$ in 279 "	m	1 mile north
881	"	$8\frac{1}{2} \times 5\frac{1}{2}$	4	"	Oullercoats	April 27.	$10\frac{1}{2}$	$\frac{1}{2}$ in 345 "	m	1 " north
892	"	$8\frac{1}{2} \times 5\frac{1}{2}$	3	"	Blyth Bay	March 24.	$9\frac{1}{2}$	1 in 366 "	m	0
893	"	$8\frac{1}{2} \times 5\frac{1}{2}$	4	"	Blyth Bay	April 14.	$9\frac{1}{2}$	$\frac{1}{2}$ in 245 "	f	1 " north
895	"	$9\frac{1}{2} \times 5\frac{1}{2}$	6	"	Blyth Harbour	March 24.	$10\frac{1}{2}$	...	...	1 " south
913	"	$7\frac{1}{2} \times 4\frac{1}{2}$	3	"	Seaton Sluice	1903 Aug. 6.	...	...	...	1 " north
925	"	$8\frac{1}{2} \times 5\frac{1}{2}$	4	"	Blyth Harbour	1904 April 7.	10	$1\frac{1}{2}$ in 259 "	f	2 miles south
927	"	$10 \times 5\frac{1}{2}$	6	"	St. Mary's Island	May 26.	11	1 in 308 "	...	...
929	"	$8 \times 4\frac{1}{2}$	3	"	{ Between Hartley and } Seaton Sluice	1903 Aug. 30.	...	...	...	1 " south
930	"	$9\frac{1}{2} \times 5\frac{1}{2}$	5	"	Blyth Harbour	1904 March 5.	9	0 in 226 "	f	1 mile north
932	"	$7\frac{1}{2} \times 4\frac{1}{2}$	3	"	Seaton Sluice	1903 Aug. 21.	...	...	...	1 " south
933	"	$9\frac{1}{2} \times 5\frac{1}{2}$	4	"	Blyth Bay	Aug. 21.	...	...	...	0
954	"	$9\frac{1}{2} \times 5\frac{1}{2}$	6	"	Blyth Harbour	1904 Feb. 16.	...	...	...	1 mile south
956	"	$9 \times 5\frac{1}{2}$	5	"	"	March 5.	$8\frac{1}{2}$	$\frac{1}{2}$ in 226 "	m	1 " north

Number	Date.	Size.	Weight.	Where Liberated.	Where Captured.	Date.	Size (Length)	Increase.	Sex.	Migration.
		Inches.	Oz.				Inches.			
900	1903 Aug. 4.	8 $\frac{1}{2}$ x 4 $\frac{1}{2}$	...	Skate Roads	Parton Steel Skate Roads	1904 ¹ April 9.	8 $\frac{1}{2}$	0 in 249 days	m	1-2 miles north
975	" "	8 $\frac{1}{2}$ x 4 $\frac{1}{2}$	...	"	"	April 23.	10 $\frac{1}{2}$	7 $\frac{1}{2}$ in 263 "	m	0
976	" "	8 $\frac{1}{2}$ x 5 $\frac{1}{2}$	...	"	"	April 25.	10 $\frac{1}{2}$	7 $\frac{1}{2}$ in 263 "	f	0
983	" "	10 $\frac{1}{2}$ x 5 $\frac{1}{2}$	...	"	"	May 27.	13	12 $\frac{1}{2}$ in 297 "	f	0
991	" "	8 $\frac{1}{2}$ x 5 $\frac{1}{2}$	...	"	"	March 10.	10	9 $\frac{1}{2}$ in 219 "	f	0
994	" "	8 $\frac{1}{2}$ x 5	...	"	"	May 2.	9 $\frac{1}{2}$	10 $\frac{1}{2}$ in 272 "	f	0
995	" "	10 $\frac{1}{2}$ x 6 $\frac{1}{2}$	...	"	"	April 9.	...	...	...	...
998	" "	10 $\frac{1}{2}$ x 6 $\frac{1}{2}$	...	"	"	March 12.	11 $\frac{1}{2}$	1 in 221 "	m	0
23	Aug. 12.	11 $\frac{1}{2}$ x 6 $\frac{1}{2}$	10	Druridge Bay	Druridge Bay	April 15.	12 $\frac{1}{2}$	1 in 247 "	f	0
139	Sept. 2.	9 $\frac{1}{2}$ x 6 $\frac{1}{2}$	...	Blyth Bay	Hartley "	May 8.	10 $\frac{1}{2}$	10 $\frac{1}{2}$ in 244 "	m	1 mile south
162	" "	10 $\frac{1}{2}$ x 6 $\frac{1}{2}$	...	"	Blyth Harbour	March 5.	...	...	...	1 "
184	" "	10 $\frac{1}{2}$ x 6 $\frac{1}{2}$	...	"	Blyth Bay	April 1.	11 $\frac{1}{2}$	in 212 "	m	0
187	" "	8 $\frac{1}{2}$ x 4 $\frac{1}{2}$	...	"	"	May 3.	8 $\frac{1}{2}$	in 244 "	m	0
188	" "	9 $\frac{1}{2}$ x 6	...	"	Blyth Harbour	March 22.	10	in 202 "	m	1 " north
201	Sept. 9.	9 $\frac{1}{2}$ x 5 $\frac{1}{2}$	...	Druridge Bay	Druridge Bay	April 27.	9 $\frac{1}{2}$	13 in 231 "	m	0
205	" "	8 $\frac{1}{2}$ x 5 $\frac{1}{2}$	...	"	"	1903 Oct. 23.	8 $\frac{1}{2}$	1 $\frac{1}{2}$ in 44 "	m	0
208	" "	7 $\frac{1}{2}$ x 4 $\frac{1}{2}$	...	"	"	1904 May 23.	7 $\frac{1}{2}$	0 in 290 "	f	0
216	" "	9 $\frac{1}{2}$ x 5 $\frac{1}{2}$	...	"	"	June 6.	10 $\frac{1}{2}$	10 $\frac{1}{2}$ in 271 "	f	0
217	" "	10 $\frac{1}{2}$ x 6 $\frac{1}{2}$	...	"	300 yds. S. of Bondicar	May 19.	10 $\frac{1}{2}$	0 in 253 "	m	2 miles north
225	" "	9 $\frac{1}{2}$ x 5 $\frac{1}{2}$	...	"	Druridge Bay	March 23.	9 $\frac{1}{2}$	0 in 196 "	f	0
231	" "	9 $\frac{1}{2}$ x 5 $\frac{1}{2}$	...	"	"	April 20.	9 $\frac{1}{2}$	0 in 224 "	m	0
235	" "	7 $\frac{1}{2}$ x 4 $\frac{1}{2}$	...	"	"	July 6.	8 $\frac{1}{2}$	1 $\frac{1}{2}$ in 301 "	...	0
247	" "	8 $\frac{1}{2}$ x 5 $\frac{1}{2}$	...	"	"	June 22.	9 $\frac{1}{2}$	in 287 "	f	0
251	" "	9 x 5 $\frac{1}{2}$	...	"	"	June 14.	9 $\frac{1}{2}$	in 279 "	m	0
254	" "	10 $\frac{1}{2}$ x 6 $\frac{1}{2}$	...	"	"	April 23.	11 $\frac{1}{2}$	in 232 "	m	0
260	" "	10 x 6 $\frac{1}{2}$	...	"	"	April ?	10 $\frac{1}{2}$	in 230 "	m	0
261	" "	9 x 5 $\frac{1}{2}$	...	"	"	April 20.	9 $\frac{1}{2}$	in 224 "	m	0
279	" "	10 x 5 $\frac{1}{2}$	...	"	"	1903 Oct. 1.	...	...	...	0

ground which limit the bays may therefore be considered to act as barriers to migration.

Of the 52 plaice recovered, only two made conspicuous migrations, and only seven may be said to have left the bays where they were liberated. The two just mentioned were liberated in Goswick Bay to the north of Holy Island on June 26th. One found its way to St. Andrew's Bay, where it was captured on November 5th, and the other was caught on May 27th this year seven to eight miles east of May Island. On the same day at 6.15 a.m. 14 other plaice were marked and liberated at Goswick Bay, and these were all taken from Skate Roads, south of Holy Island. Six were recovered, the two just mentioned, two at Goswick Bay. and two at Skate Roads. The latter are the only ones we have record of which offer us a hint at the homing instinct. As will be evident, however, the position is very equally divided—two remaining where they were placed, two migrating to considerable distances to the north, and two returning home, it must be said, over or around an extensive area of rocky and rough bottom.

If note may be taken of the smaller migrations it may be said that the majority inclined to go north, but we cannot overlook the fact that a certain number found their way to the south. And these results would lead us to suppose therefore that the attractions of the food supply lead to small migrations of the immature fish, but there is no evidence to prove that a definite migration of plaice occurs in the inshore waters of Northumberland. It is to be presumed therefore that the majority simply migrate outwards to the deeper water as they become mature.

A consideration of the two which migrated so far into Scotch waters suggests in the first place that if such a migration is at all general it is not necessary for the immature plaice to go up the Forth to get to the north side; and shows in the second that it is only in the case of an approach to the locality which was the scene of the Scotch experiments that we get results strongly confirmatory of these.

The following synopsis gives the returns for the various regions :—

PLAICE.

Date.	Place.	Number Liberated.	Number Recovered.
June 26.....	Skate Roads.....	2	1
„ 26.....	Goswick Bay	16	6
July 1.....	Alnmouth Bay	22	1
„ 9.....	Cambois Bay	4	0
„ 15.....	Druridge Bay	34	2
„ 23.....	Blyth Bay.....	67	14
Aug. 4.....	Skate Roads.....	43	8
„ 12.....	Druridge Bay	40	1
„ 19.....	Alnmouth Bay	63	0
„ 26.....	Cambois Bay	40	0
Sept. 2.....	Blyth Bay.....	57	5
„ 9.....	Druridge Bay	84	14

DAB.

Date.	Place.	Number Liberated.	Number Recovered.
July 1	Alnmouth Bay	8	1
„ 9	Cambois Bay	1	0

SOLE.

Date.	Place.	Number Liberated.	Number Recovered.
July 9	Cambois Bay	1	0

TURBOT.

Date.	Place.	Number Liberated.	Number Recovered.
July 15.....	Druridge Bay	1	0

We have so far recovered 52 of the plaice, or 11 per cent. This is a large number, but it will be seen that it would have been still greater if the proportion returned from some of the bays had not been so disappointing. In the case of Cambois Bay we marked 44 plaice, and did not recover one. Eighty-five were liberated in Alnmouth Bay, and only one was returned to us. On the other hand Skate Roads yielded 20 per cent., Blyth Bay 15 per cent., and Druridge Bay 11 per cent.

GROWTH.—Attempts have frequently been made to state the rate of growth for plaice, and the want of conformity in the conclusions is no doubt due to the fact that there is a considerable degree of variation brought about for the most part by the long spawning period. The produce each year thus varies greatly in size, and during growth they are to some extent unequally affected by the successive seasons of acceleration and retardation. The various regions in which plaice occur are not equal either with regard to temperature and food. The variations in the seasons also leave more or less an impress on growth.

The most important recent work on the subject has been done by Fulton and Apstein, and notwithstanding that the research was made in the one case on Scotch plaice, and in the other on the plaice of the Baltic, the conclusions are very much in accord.

During the last six years I have carefully measured the fish caught in the first haul at our trawling experiments, and in my last report I brought together the results so far as they related to the growth of the plaice. The experiment in migration now under consideration serves to confirm the determinations arrived at by an analysis of the plaice caught by the trawl. I do not propose to give now, however, the details in figures, nor the graphic consideration of these, which have led to the conclusions given in the following table:—

PLAICE.

Age.	Average Length.	Gain.	Average Weight.	Gain.	Proportional Rate of Growth in Weight.
Years.	Inches.	Inches.	Ounces.	Ounces.	
1	3.9	...	0.4	...	...
2	7.9	4.0	3	2.6	650
3	10.8	2.9	8	5	167
4	13	2.2	14.5	6.5	81
5	15	2	22.5	8	55
6	16.8	1.8	31.5	9	40
7	18.4	1.6	40	8.5	27
8	19.4	1	47	7	18
9	20.2	0.8	53	6	13
10	20.8	0.6	57	4	8

The earlier stages were determined from a consideration of a graphic analysis of the first haul, and of the results of the migration experiment. I have ventured in bringing the results together to continue the curve, so as to be able to state approximately the growth of the larger forms. The range of variation for the Northumberland plaice may be said to be at least two inches on each side of the line given as the mean rate of growth.

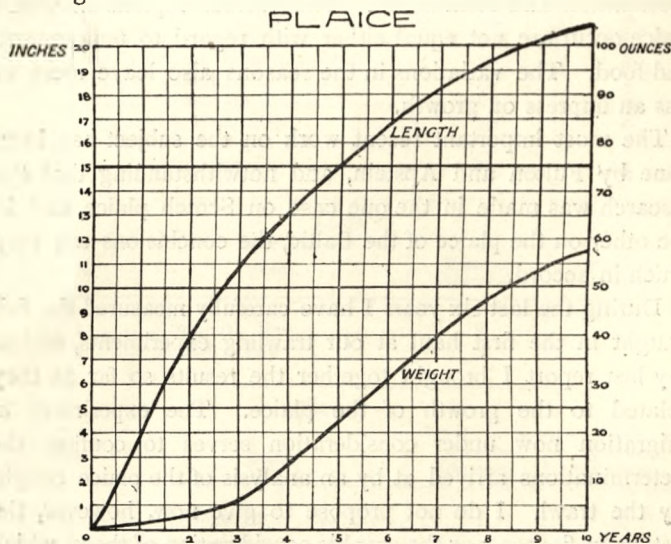


Fig. 1.—Diagram showing approximate average growth of plaice.

The season during which the trawling experiments are made is not a convenient one for an enquiry into the size at which maturity is reached, but each year I have examined a certain number of the plaice captured, and the smallest female which was noted to be mature was one of $14\frac{3}{4}$ in., but practically all above 16-in. were either mature or had from all appearances spawned. It is still more difficult to determine during the summer if the males are mature, but all above 14-in. appeared to be mature. It may be said then that the sexes reach maturity at 4 to 5 years. Fulton's conclusion that the males attain maturity at four and the females at five is evidently therefore very nearly if not quite accurate.

On the Northumberland coast, therefore, the small plaice of the sandy pools gradually pass out to the immediate slightly deeper waters of the bays, where they spend the immature phases of their lives, and do not migrate, so far as we can see, far along the coast. Approaching maturity impels them when 4 to 5 years old to migrate into the deeper extra-territorial waters, and even there they appear to have the tendency to migrate into deeper and deeper water as they become older and larger. This in itself would serve to correct to some extent the general southerly and westerly movements of the ova and larvæ. Some of the mature plaice certainly do find their way back to the same or other inshore waters, impelled more than probably by recollections of sandeels, but such a return cannot be said to be more than rare.

But we look to the international researches to show if there is a distinct or even a general relationship between size and depth, and if this may be looked upon as the only impulse which tends to move the plaice in a definite direction in the North Sea.

POPULATION.—Following a method which has been adopted before in the case of such experiments, a calculation may be offered to give an indication of the number of the resident population of plaice of from 2 to 4 years old. We marked 472, and we recovered from the catches of fishermen in the district 50. This is, allowing slightly for loss, one-ninth part, and may be taken therefore to represent approximately the catching power of the inshore fishermen. As near as we can gather the fishermen caught in the inshore waters for the year ending June 30th, 1904, 440 cwts. of plaice. The population of plaice of the inshore waters from about 7 to 14-in. long may be said to be therefore 3,960, or say 4,000 cwts. If the average weight of the fish be, say $\frac{1}{2}$ -lb., the population in numbers is about 900,000. Considering the large proportion obtained from some of the districts this number will probably be found to err by being too large rather than too small*.

* If our figure underrates the catching power of the fishermen, it is also true that many more plaice are caught than are sent to market or used for crab bait; and as a matter of fact our labelled fish were sometimes caught by others than professed fishermen.

PATHOLOGY.—Several plaice were marked which were abnormal as to colour, and one of these, No. 818, was recaptured and forwarded to me. When caught it had a rectangular white patch with a central spot of pigment on the upper side near the ventral fin, and the label was attached near the edge of the spot to mark its position. When it was sent to me, after a free period of 288 days, it still presented the patch and the central spot, so far as I could see, unchanged either in area or appearance. It was a male, and its abnormal colour did not have any effect upon its rate of growth.



ABNORMALLY COLOURED PLAICE, No. 818. (See p. 154).

CATALOGUE OF BUTTERFLIES COLLECTED IN BURMAH

By LT.-COL. C. H. E. ADAMSON, C.I.E.,
UP TO THE END OF 1895, AND PRESENTED BY HIM TO THE
MUSEUM OF THE NATURAL HISTORY SOCIETY OF
NORTHUMBERLAND, DURHAM, AND
NEWCASTLE-UPON-TYNE.

REMARKS.

THE following Catalogue is the result of some twenty-eight years residence in various parts of Burmah ending in 1895. During this time I visited almost every part of Upper and Lower Burmah, and for the last twenty years of these I occupied much of my spare time in making a collection of Burmese Butterflies. Nearly every specimen in my collection has been caught by myself, and so there can be no doubt as to the correct identification of localities.

Of the species enumerated in the Catalogue there are not more than half a dozen which I have not personally captured. As to the arrangement, I have generally followed that adopted by Mr. Moore in his "*Lepidoptera Indica*" in so far as his book has been published.

Burmah, with regard to insect life, may be properly divided into three zones—the Lower, the Central, and the Upper. The Lower Zone comprises the deltas of the Irrawaddy, Salween, and Sittang rivers, and includes what was generally known as British Burmah previous to 1886, with the exception of Arracan. The Central Zone includes the dry plains which lie in the valleys of the Irrawaddy and Chindwin rivers; and extends roughly from the twentieth degree of north latitude to the Tropic of Cancer. The Upper Zone includes Arracan and all the northern portion of Upper Burmah, as well as the hilly country between Arracan and the Irrawaddy Valley. The fauna of the Central Zone is different in many ways from

the other two; and many species which are common to the Lower and Upper Zones are not met with in the Central Zone, and *vice versa*. The reason of this is not far to seek, as the Central Zone is the one of scanty rainfall and excessive heat; while in the other zones the rain is heavy and the vegetation in consequence is rank and abundant.

The district under consideration extends from 10° to 25° N. Lat., that is from the Malay peninsula on the south to Assam on the north; and is most interesting as showing many forms of Butterflies intermediate between those described from Indian species and those from the Malay peninsula.

My thanks are due to the late Mr. de Nicéville, Mr. Moore, and Mr. Elwes for their kindness in naming for me many of my specimens, but I cannot always agree with Mr. Moore in recognizing so many species as he does. Although I have followed Mr. Moore's nomenclature as far as I am able to do so, yet I have in a few instances included one or two of his species under one name where I have been quite unable to find any constant variation by which to distinguish his species or local varieties.

C. H. E. ADAMSON.

CATALOGUE.—PART I.

NYMPHALIDÆ,

RIODINIDÆ, AND PAPILIONIDÆ.

FAM. NYMPHALIDÆ.

SUB-FAM. EUPLCEINÆ.

1. HESTIA AGAMARSCHANA, Felder.

I have about a dozen specimens taken on the Arracan coast which were named by Mr. de Nicéville. All of these are larger than Felder's figure. In some of them the marginal

black spots coalesce and form a black margin to both wings. In none of them are the spots so small and separated as in the figure referred to; though in size and shape they vary considerably. The shape of the hind-wing in some specimens is much less ovate than in others. Two specimens lately sent to me, which were taken in November, 1893, in Tavoy, approach much nearer in all respects to Felder's figure than the Arracan specimens. *H. Cadelli*, from the Andaman Isles, is, in my opinion, only a variety of this species; as some of my specimens agree far more closely with Mr. de Nicéville's figure of *H. Cadelli*, than with Felder's figure of *H. Agamarschana*. Whatever my species may be it is a very variable one. The males are furnished with a double set of caudal appendages.

2. *HESTIA HADENI*, Wood-Mason and de Nicéville.

A very distinct and local species. Confined, so far as I am aware, to the Bassein district.

3. *DANAIS (RADENA) VULGARIS*, Butler.

Not uncommon in Rangoon and Moulmain districts.

4. *D. (TIRUMALA) LIMNIACE*, Cramer.

Very common throughout Burmah. Caudal appendages light brown.

5. *D. (TIRUMALA) GAUTAMA*, Moore.

Males common near Akyab in September, October, and November; the females fly later in the season. This is a very local insect, but I have caught it near Moulmain.

6. *D. (TIRUMALA) SEPTENTRIONIS*, Butler.

Throughout Burmah, but less common in the central dry zone than *D. limniace*, Cramer. Caudal appendages light brown.

7. *D. (LIMNAS) CHRYSIPPUS*, Linnæus.

Very common in the dryer parts of Burmah, less common in the moist regions. Caudal appendages of male fuscous. In November, 1893, I caught a single specimen in Upper Burmah in which the black markings on the disc and near the

apex of the forewing are absent, being replaced by whitish; the whole of the tawny markings also being very pale. This specimen is, I believe, unique.

8. *D. (SALATURA) GENUTIA*, Cramer.

Very common at all times throughout Burmah.

9. *D. (SALATURA) HEGESIPPUS*, Cramer.

Taken in Akyab and Rangoon divisions. Local, but common where it occurs.

10. *D. (PARANTICA) MELANOIDES*, Moore.

Throughout Burmah, but scarce in the extreme north. Caudal appendages of the male sooty-black.

11. *D. (PARANTICA) AGLEOIDES*, Felder.

Throughout Burmah during the rainy season except in the central plains. Also in Arracan and in the Shan Hills from November till March. Caudal appendages of the male sooty-black.

12. *D. (CADUGA) TYTIA*, Gray.

Arracan Hills and Upper Tenasserim.

Not common, December till March. In March, however, I found it frequently in the Chin Hills, north-east of Bhamo.

13. *D. (CADUGA) MELANEUS*, Cramer.

Moulmain district, Arracan Hill Tracts, and Bhamo district.

Not uncommon about Moulmain. In one specimen, caught near the Jade Mines in the Bhamo district in January, the submarginal row of white spots on the upper side of the hindwings is almost obsolete as in *D. tytia*, Gray. The outer margin of the fore-wing is also as concave as in that species.

14. *EUPLOEA (MENAMA) MODESTA*, Butler.

Uncommon in Moulmain. I have not found this insect further north than Moulmain. June till September.

15. *E. (TRONGA) BREMERI*, Felder.

Commonly met with on the Tavoy coast in September. Scarce at Moulmain, where I took one male and one female in June.

16. *E. (CRASTIA) CORE*, Cramer.

I have taken two specimens of this insect on the Arracan coast near the Chittagong frontier.

17. *E. (CRASTIA) GODARTII*, Lucas.

This is the commonest *Euplua* in Burmah, being found alike in the moist plains and forests in the south, in the dry plains of Central Burmah, and in the dense, hilly jungles of the north. It is most plentiful in September and October, when a fresh brood appears. I have bred it from caterpillars found feeding on orange trees.

18. *E. (CRASTIA) LAYARDI*, Druce.

Common in Arracan. The violet gloss on the fore-wings varies considerably. In most specimens it is absent, but in some it was quite apparent in fresh specimens.

19. *E. (PENOA) DOUBLEDAYI*, Felder.

Found in Arracan, Tenasserim, and Tavoy. This is a local insect. It does not extend far inland. It is very conspicuous when flying, and is easily distinguishable from all other *Euplæas*. I have seen numbers flying across the rivers and creeks in Arracan when travelling by boats or steamers. It is more generally known under the name of *E. aleathœ*, Godart, a species lately shewn to inhabit Java only. Caudal appendages of male bright yellow.

20. *E. (PENOA) LIMBORGII*, Moore.

I have met with this insect only in the Tenasserim and Moulmain districts. In some males there is a trace of a marginal series of spots on the fore-wing. Caudal appendages of male bright yellow.

21. *E. (PENOA) DEIONE*, Westwood.

This insect replaces *E. limborgii*, Moore, in the north of Burmah. I have caught it frequently in the Arracan Hill Tracts in the dry season, also in the Bhamo and Upper Chindwin districts. I have caught males and females *in coitu*. In a specimen (male) taken at Kalôwa on the Upper Chindwin in February there are marginal and submarginal

spots on the upper side of the hind-wing, thus shewing an approach to *E. limborgii*. Caudal appendages of male bright yellow.

22. *E. (TREPSICHROIS) LINNÆI*, Moore.

Common throughout Burmah. Caudal appendages of male bright yellow.

23. *E. CASTELNAUI*, Felder.

Captured near Rangoon and Moulmain. This is a rare insect in Burmah. Females appear to be more plentiful than males. In two males taken near Rangoon in September, the greater portion of the discal area, including the cell, is of a whitish colour. The males of this species are distinguished from all other *Eupleas* that I am acquainted with by having four caudal appendages, as in the genus *Hestia*, instead of two. The caudal appendages are of a sooty-brown colour.

24. *E. (DANISEPA) DIOCLETIANUS*, Fabricius.

A common species both in Upper and Lower Burmah. Caudal appendages of male are of a fawn colour. Generally known as *E. rhadamanthus*, but the name is a synonym.

25. *E. (SALPINX) LEUCOGONYS*, Butler.

This rare butterfly was common for a few days in June, 1879, in Salween Park, near Moulmain. I have not since procured it. Caudal appendages of male sooty-brown.

26. *E. (PADEMMMA) KLUGII*, Moore.

Under this name I include the following species and varieties named by Mr. Moore in his "Lepidoptera Indica," specimens of each having been kindly named for me by him :—*Pademmma imperialis*, *P. augusta*, *P. regalis*, *P. macclellandi*, *P. masoni*, *P. pembertoni*, and *P. crassa*. I have a large series of these insects from every part of Burmah, and I find it impossible to separate the species and varieties kept distinct by Mr. Moore. I can pick out typical specimens of many named varieties, but intermediate forms occur commonly at the same times and places.

Few specimens are precisely similar. These insects are among the commonest in the wooded hills and plains of

Lower Burmah. The form corresponding to *Klugii* is the most common in Arracan and Northern Burmah. The fresh brood commences to fly about March, and during April and May individuals are the most abundant and in the best order. They are then generally to be found in the wooded glades. They continue on the wing throughout the year, but during the cold weather, at which time only more or less worn specimens can be procured, they appear to leave the wooded glades and to frequent the sandy beds of streams and rivers.

I agree generally with the conclusions arrived at by the late Mr. de Nicéville in his interesting paper on this species published in the Journal of the Asiatic Society, Bengal, Vol. LXI, part 2, page 237 (1892). As a rule specimens caught in the south have less of the blue gloss than those caught in the north of Burmah. This rule is, however, not universal, as the most brilliant blue male specimen which I possess was caught in Tavoy and has been identified by Mr. Moore as *P. regalis*. The caudal appendages of the males of this species are light brown changing to pale yellow at the tips.

27. *E. (ISAMIA) ROGENHOFERI*, Felder.

Not uncommon in the Arracan Hill Tracts from March till June. I have taken the form named *E. irawada*, Moore, only near Rangoon.

28. *E. (ISAMIA) MARGARITA*, Butler.

I caught about twenty specimens of this insect in the month of June, 1880, at Moulmain. I have never caught another. I am of opinion that this is only a southern variety of *E. rogenhoferi*, of which the variety *E. irawada* is the connecting link.

29. *E. (STICTOPLÆA) HARRISII*, Felder.

In Burmah this insect is confined to the south, my specimens having been all captured in Moulmain and Tavoy districts. Caudal appendages of male light brown.

30. *E. (STICTOPLÆA) CROWLEYI*, Moore.

I have one specimen of this insect which was caught near

Moulmain in July. Probably only a variety of the preceding species.

31. *E. (STICTOPLÆA) BINOTATA*, Butler.

This is a northern insect, and is connected to *E. harrisii* by *E. crowleyi*. It is not uncommon in the Arracan Hill Tracts, and in the Bhamo and Upper Chindwin districts. Caudal appendages light brown.

32. *E. (STICTOPLÆA) PYGMÆA*, Moore.

I have one female taken at Bhamo in May, which has been named by Mr. Moore. It certainly seems to be quite distinct, being less than two-thirds the size of any of my female specimens of *E. binotata*, and it is altogether a narrower insect. It was originally described from Assam, and is given by Mr. de Nicéville as a synonym of *E. harrisii* in his paper on the group in Proc. Asiat. Soc., Bengal, 1892, p. 158.

SUB-FAM. SATYRINÆ.

33. *EUPLEAMIMA DIADEMOIDES*, Moore.

Upper Tenasserim. Of this insect I have only caught a few specimens in October, 1880, in the hilly country south-west of Moulmain, and one in April in the same district.

34. *ANAEBIS HIMACHALA*, Moore.

Arracan and Upper Burmah. Not uncommon in the northern portions of Burmah from November till February.

35. *MYCALESIS (VIRAPA) ANAXIAS*, Hewitson.

A few specimens of both the wet and dry season forms from Tenasserim.

36. *M. (VIRAPA) ADAMSONI*, Watson.

The four specimens in my collection were taken in the neighbourhood of Bhamo. The insect was described, figured, and named after me, by my friend the late Col. E. Y. Watson in the Journal of the Bombay Natural History Society, Vol. X., page 640. Two males and one female are of the dry season form, and were taken in February and April, and one, a wet season male, was taken about September. In my dry weather

specimens the four upper ocelli are less conspicuous than in Watson's figure.

37. *M. (SAMUNDRA) ANAXIOIDES*, Marshall and de Nicéville.

Two males caught flying together on a stream, on the road between Myawaddee and Kaukarit, in Upper Tenasserim, in February. One is the dry weather form, and one is apparently a form intermediate between the wet and dry season forms.

38. *M. (GARERIS) SANTANA*, Moore.

The dry season form only has been caught by me in Tenasserim. Rare.

39. *M. (SADARGA) CHARAKA*, Moore.

The wet season form was abundant at one spot in November, 1887, near Bhamo. I have since taken the dry season form on occasions in the Upper Chindwin district.

40. *M. (ORSOTRIÆNA) MEDUS*, Fabricius.

Both wet and dry season forms are common in Burmah. In the dry season form the white bar on the under side is often obsolete.

41. *M. (CALYSISME) PERSEUS*, Fabricius.

Both wet and dry season forms of this butterfly are very common throughout Burmah.

NOTE.—I am not satisfied with Mr. Moore's discrimination of the species of *Calysisme* by means of the "position, size, and colour of the glandular patches in the males." These patches appear to me to change in colour from pale yellow through all shades of brown to black, and to vary in size in different individuals of the same so-called species. In one specimen in my collection which cannot be separated from this genus the patch of scales on the underside of the fore-wing is absent altogether. The identity or otherwise of these species? can only be determined by a very extensive system of breeding under a variety of conditions of climate. So far as breeding, which is only in its infancy, is concerned, its tendency has been to diminish the number of species. The females of the various species or forms of *Calysisme* cannot be even approximately determined in our present absence of knowledge; and, as specimens of different forms of these insects are found often inhabiting the same localities at the same season, I am of the opinion that we have not yet sufficient materials for forming any correct conclusion as to the identity or otherwise of the species? discriminated by Mr. Moore.

42. M. (CALYSISME) VISALA, Moore.

The dry season form is not uncommon in the moister parts of Upper and Lower Burmah. It is the commonest species in Burmah, and perhaps shows the greatest variation in the dry season forms.

43. M. (CALYSISME) PERSEOIDES, Moore.

I have taken this insect not uncommonly at Sagaing, Yeu, and other places in Upper Burmah.

44. M. (CALYSISME) POLYDECTA, Cramer.

I am unable to separate this from *C. mineus*, as defined by Mr. Moore in his "Lepidoptera Indica." It is common throughout Burmah.

45. M. (CALYSISME) INTERMEDIA, Moore.

I have specimens from Upper Burmah corresponding with the description of this species (?)

46. M. (CALYSISME)? New species.

This insect was caught by me near Bhamo in May, 1887. It is doubtful whether it should not form the type of a new sub-genus, as the patch of scales on the under side of the fore-wing, which is one of the distinguishing marks of Mr. Moore's genus *Calysisme*, is altogether absent. Otherwise the insect is undistinguishable from the wet weather brood of *C. polydecta*, Cramer. I have shown the insect to Mr. Moore, who is unable to name it. If the absence or presence of these scales is sufficient, as is now believed, to constitute a species or even a sub-genus, then this insect is undoubtedly entitled to at least specific rank.

47. M. (CULAPA) MNASICLES, Hewitson.

This insect was plentiful at Phapoon, on the Salween River, in November, 1878. I have also found it at Bhamo and in Tavoy.

48. M. (SAMANTA) MALSARA, Moore.

The wet season form of this insect is very common in the neighbourhood of Bhamo during the rains. In February and

March the forms similar to those described under the names of *S. lepcha* and *S. rudis* are both found. I believe them to be varieties of the same species.

49. *M. (MYRTILUS) MYSTES*, de Nicéville.

I have taken both wet and dry season forms of this insect in the northern parts of Upper Burmah.

50. *CÆLITES BINGHAMI*, Moore.

Upper Tenasserim. Caught in April and October in thick, moist, rattan jungle. The type specimen named by Mr. Moore is in my collection.

51. *C. ADAMSONI*, Moore.

I caught several specimens of this hitherto unnamed insect in September and October, 1888, on the banks of the Sinkan Choung, in Bhamo district. It is a shade-loving insect, and frequents damp and dark jungles. The type specimen is in my collection.

52. *NEMETIS MINERVA*, Fabricius.

Sparsely spread throughout Burmah. June to August. Males and females appear in about the same proportion and are similar in their habits.

53. *DEBIS KANSA*, Moore.

Five males and one female from the Upper Chindwin, taken in February.

54. *D. MEKARA*, Moore.

Throughout Burmah, but not plentiful. June to August.

55. *D. CHANDICA*, Moore.

One male from the Arracan Hills. Several males and females from the Upper Chindwin.

56. *D. VINDHYA*, Felder.

Evergreen forests in Upper and Lower Burmah during the cold season.

57. *LETHE EUROPA*, Fabricius.

Common.

58. *L. DYRTA*, Felder.

Caught commonly during the rains at Bhamo. If the female of this species has a white discal bar I have never seen a female in Burmah. All I have caught or seen, without exception, must be males.

59. *L. ROHRIA*, Fabricius.

Common in Lower Burmah in the dry season; not so common during the rains.

60. *TANSIMA VERMA*, Kollar.

Caught in the Taoo hills in Tenasserim in October, and in the hills north-east of Bhamo in March.

61. *BLANAIDA BHADRA*, Moore.

One specimen only taken in bamboo forest in April, 1883, (3,000 feet) in the Arracan Hills.

62. *YPHIMA BALDUS*, Fabricius.

Very common throughout Burmah at all seasons of the year.

NOTE.—I see no good reason for changing the well known generic name of *Ypthima* for Mr. Moore's *Thymipa*, and I have therefore retained the former name for the species *baldus*, *savara*, and *tabella*.

63. *Y. SAVARA*, Grose Smith.

The type specimen named by Mr. Grose Smith and now in my possession was captured by me near Myawaddee, on the Thoungyeen River, Upper Tenasserim, in February, 1881. I have since taken it commonly in the evergreen forests of Upper Burmah. I have some large specimens of *Y. baldus* (so named by Mr. Moore), taken at the same time and place as the type of *Y. savara*, which I am unable to separate from the latter species.

64. *Y. AVANTA*, Moore.

I have both wet and dry season forms of this species, which have been identified by Mr. Moore. Taken in Upper Burmah.

65. *Y. CERALIS*, Watson.

I have numerous specimens taken in the dry plains of Central Burmah, both wet and dry season forms. This is

the species referred to in Moore's L. I. under the heading *Thymipa tabella*, as having been taken in Burmah by Capt. Watson.

66. Y. HUEBNERI, Kirby.

All the forms, *huebneri*, *howra*, *jocularia*, are found in Burmah. It is an excessively common insect at all seasons.

67. Y. (PANDIMA) NEWARA, Moore.

Arracan Hills in the cold season.

68. Y. (PANDIMA) WATSONI, Moore.

This is a common insect in Upper Burmah, both the wet and dry season forms being abundant.

69. Y. (LOHANA) INICA, Hewitson.

I took half a dozen specimens of this insect near Bhamo in October, 1887.

70. CALLEREBIA ORIXA, Moore.

Chin Hills, west of the Chindwin River. May, June, and July.

71. ZIPÆTIS SCYLAX, Hewitson.

Tsinbo in the Bhamo district in May; and in Kalé Valley in April. Rare.

72. RAGADIA CRITOLAUS, de Nicéville.

On the banks of the Aploung Choung in Upper Tenasserim, in October, 1880, and a single specimen in Tavoy in November, 1893.

73. ERITES ARGENTINA, Butler.

The male specimen figured in Moore's "Lepidoptera Indica," plate 121, was caught by me near Kanee, near the Siamese border, in October, 1880.

74. E. ROTUNDATA, de Nicéville.

Six specimens of this insect were taken by me at Aloungdan Kathapa Pagoda, in the Chindwin district, in January, 1893. It inhabits dense, damp jungle, and is very difficult to catch owing to it flying low among the bushes. This is synonymous with *E. beelingia*, Moore.

75. *E. ANGULARIS*, Moore.

I found this species once common near the Three Pagodas marking the frontier between Tenasserim and Siam, in December and January, 1877 and 1878. The insects were then all much worn. I have also found it in April in Upper Tenasserim, but it is rare.

76. *MELANITIS ISMENE*, Cramer.

This insect and its wet weather form, *M. leda*, are very common throughout Burmah.

77. *M. BELA*, Moore.

The wet weather form I have only taken in Arracan in September and October, but the dry weather form I have found also in Bhamo and Tenasserim throughout the cold season.

78. *M. ZITENIUS*, Herbst.

This form is less common in Burmah than *M. ismene*. The two seasonal forms run into each other.

SUB. FAM. ELYMNIINÆ.

79. *ELYMNIAS TINCTORIA*, Moore.

This insect, which I cannot separate from *E. undularis*, Drury, is very common throughout Burmah.

80. *E. DÆDALION*, de Nicéville.

One female at Tavoy in August.

81. *MELYNIAS TIMANDRA*, Wallace.

I have only taken five specimens, of which three are males and two are females; two in September, and one each in February, April, and May. It is a rare insect in Burmah, but appears to extend from Arracan in the north to Tenasserim in the south.

82. *M. MALELAS*, Hewitson.

Fairly common in plaintain gardens during the rains about Moulmain, and also in Upper Burmah during the wet season.

83. *M. PATNOIDES*, Moore.

The specimen figured by Mr. Moore in his "Lepidoptera Indica" was taken by me at Aloungdau Kathapa, in the

Chindwin district, in February, 1892, and is now in my collection.

84. *BRUASA CHELENSIS*, de Nicéville.

In April, 1880, I took a single male in Tenasserim on the road to the Siamese frontier. This is the insect figured by Mr. Moore in his "*Lepidoptera Indica*," pl. 141, fig. 3a.

85. *MIMADELIAS BURMENSIS*, Moore.

One specimen, a male, was taken by me near Aloungdau Kathapa Pagoda, in the Chindwin district, in February, 1892, named by Mr. Moore. The type is in my collection.

SUB-FAM. AMATHUSIINÆ.

86. *AMATHUXIDIA AMYTHAON*, Doubleday.

I captured two males, which flew into my tent at daybreak on two successive mornings when encamped in evergreen forest, near the sources of the Thoungyeen River about Christmas, 1879.

87. *AMATHUSIA PHIDIPPUS*, Linnæus.

Frequents old barns and dimly-lighted places about Akyab in November, and also at Mergui.

88. *DISCOPHORA CONTINENTALIS*, Staudinger.

This insect is very common about Bhamo during the rainy season. The males frequent moist places on the roads through the forest. The females appear to remain among the undergrowth, where, however, they are easily found.

89. (*D. INDICA*, Staudinger, and
 D. ZAL, Westwood.

I have a large series of these insects which have been kindly named for me by Mr. Moore. I am convinced that they are seasonal forms of the same species, and form *Zal* being common in the dry season while *Indica* is the commonest form during the rains. There are many intermediate forms, and as usual the two forms are sometimes flying at the same time.

90. *ENISPE EUTHYMIUS*, Doubleday.

Taken in the Karen Hills near Pegu, but not seen elsewhere in Burmah.

91. *NANDOGIA DIORES*, Doubleday.

Not uncommon about Bhamo in the cold season. One specimen taken in Arracan.

92. *CLEROME ARCESILAUS*, Fabricius.

Not common, but found occasionally on well-wooded hills throughout Burmah during the cold season.

93. *XANTHOTÆNIA BUSIRIS*, Westwood.

Uncommon; frequents thick-wooded evergreen hills in Tavoy and Tenasserim in September.

SUB-FAM. NYMPHALINÆ.

94. *HARIDRA MARMAX*, Westwood.

From Arracan only.

95. *HARIDRA KAHRUBA*, Moore.

From Arracan only. Named by Mr. Moore.

96. *HARIDRA DESA*, Moore.

One specimen, named by Mr. Moore, in Me'play Choung in February.

97. *HARIDRA ADAMSONI*, Moore.

One specimen, caught on the same date and in the same place as the preceding species. It has been named by Mr. Moore, but I do not believe it to be distinct.

98. *HARIDRA HARPAX*, Felder.

This is a common insect about Bhamo.

99. *HARIDRA CORAX*, Felder.

I have specimens so named by Mr. Moore, but I doubt whether they are distinct from *C. harpax*.

100. *HARIDRA JALINDER*, Felder.

This species is common in the hills in the north of Bhamo. It is distinguished from the foregoing species by having a pale discal band within the black border. I have taken about a dozen specimens, of which no two are exactly alike. The colour of the discal band varies from pure white to a dirty yellowish-white; and the basal area of the upper side of the fore-wings varies from dark brown to light fulvous. I am of

opinion that there is only one variable species in Upper Burmah. I have only taken two females.

NOTE.—I am of opinion that many of the species ? of *Haridra* named in Moore's Lep. Ind. are merely varieties of one species, and that when more is known of the life habits of these insects several of the names will disappear. I have taken a considerable number of these insects, and I find they vary much at the same times and in the same localities.

101. CHARAXES FABIUS, Fabricius.

Arracan and Bhamo in the hot season, but scarce.

102. EULEPIS ATHAMAS, Drury.

This is an excessively common insect in Burmah, and varies much in the width and colour of the discal band.

103. EULEPIS ARJA, Felder.

I have specimens of this insect, named for me by Mr. Moore, taken in Upper Burmah in March and in Arracan in January.

104. EULEPIS JALYSUS, Felder.

One specimen taken in August at Poonkan, in Upper Tenasserim, named by Mr. Moore.

105. EULEPIS MOORI, Distant.

One specimen caught in Mergin and identified by Mr. Moore.

106. MUWAREDA DELPHIS, Doubleday.

Taken at Tavoy and Phapoon in October and November, but uncommon.

107. MUWAREDA EUDAMIPPUS, Doubleday.

Not uncommon. I have usually found it about decaying matter in the beds of streams. It is met with from Bhamo in the north to Tavoy in the south at all seasons of the year.

108. MUWAREDA SCHREIBERI, Godart.

I have two specimens, both females, taken between the Narf and Mayu rivers in Arracan in November.

109. ROHANA PARYSATIS, Westwood.

I caught a number of males on the road between Kaukarit and Myawaddee, in the Amherst district, on the 27th April, 1880. I have also taken males in the Upper Chindwin district. Very local.

110. *HERONA MARATHUS*, Doubleday.

Not uncommon in Bhamo, where it always settles on the trunks of trees in forests, with its wings closed over its back, in September and October.

111. *H. ANGUSTATA*, Moore.

I have four specimens from the Moulmain district which have the macular bands narrower than those caught in Upper Burmah. Both males and females also are smaller than the corresponding sexes of *H. marathus*, Doubleday.

112. *SEPHISA CHANDRA*, Moore.

A single female, taken from a spider's web near Bhamo in December, 1888. I have never seen this insect on the wing. My specimen most nearly resembles first variety figured in plate 199, fig. 1 b, in Moore's "Lepidoptera Indica."

113. *HESTINA NAMA*, Doubleday.

I have taken three males only, in the hills in the north of Burmah.

114. *EURIPUS CONSIMILUS*, Westwood.

Four males and one female of this species have been procured by me on the Sinkan Stream, Bhamo district. The males in October and November, 1887, and the female in May. It is rare in Burmah.

115. *E. HALITHESES*, Doubleday and Hewitson.

The males are very common on the lower ranges of hills in Arracan and in Upper and Lower Burmah. I have only caught one female which, when flying, I mistook for *Euplaea dioctetianus*, Fabricius. August to November.

116. *PARTHENOS GAMBRISIUS*, Fabricius.

Common throughout Burmah. A very rapid flyer. Appears at all seasons of the year.

117. *BASSARONA TEUTA*, Doubleday and Hewitson.

I have only caught two specimens of this insect in Arracan during the cold season. Both are females.

118. *ADOLIAS DIRTEA*, Fabricius.

This insect is very common in many parts of Burmah. It

is attracted by all sorts of decaying fruit. It is most plentiful in October.

119. *DICHORRAGIA NESIMACHUS*, Boisduval.

Rare. Three specimens only, caught at Bhamo in August, 1887.

120. *STIBOCHIONA NICEA*, Gray.

I have four specimens which I caught in North Arracan. I have never met with it in the Salween or Irrawaddy valleys.

121. *EUTHALIA (HARAMBA) JAHNU*, Moore.

I have several males and females of this species taken near Bhamo from September to February.

122. *E. (HARAMBA) SADEVA*, Moore.

One male and some doubtful females taken near Bhamo.

123. *E. (HARAMBA) JULII*, Bougainville.

Males and females taken in the neighbourhood of Moulmain and also in Upper Tenasserim. It is a very local insect, and I have never seen it north of Moulmain.

124. *E. (CYNITIA) COCYTUS*, Fabricius.

Two males and one female caught in Tenasserim in the cold season of 1878. Two males and one female from Mergin.

125. *E. (CYNITIA) LEPIDEA*, Butler.

Very common in Arracan and Lower Burmah during the hot season; but scarce in Upper Burmah.

126. *E. (CYNITIA) ANDERSONI*, Moore.

Not uncommon at Tavoy in September.

127. *E. (TASINGA) ANOSIA*, Moore.

I have only two specimens; one caught in Lower Burmah and the other in Bhamo.

128. *E. (DOPHLA) DERMA*, Kollar.

Sparsely spread throughout Burmah. August and September.

129. *E. (NORA) KESAVA*, Moore.

I have several females of this species so named by Mr. Moore. I have caught it not uncommonly at Bhamo and

also near Rangoon. I am unable to distinguish between the males of this species and the next.

130. *E. (NORA) RANGOONENSIS*, Swinhoe.

Females not uncommon at Bhamo. The females named for me by Mr. Moore are very distinct from *E. kasava*, Moore. Some males have a distinct white spot placed, as in the female, below the origin of the third median nervule of the fore-wing. This spot is wanting in other males; but I do not think the presence or absence of this spot is sufficient to distinguish the males of the two species. I think this species is synonymous with the last.

131. *EUTHALIA LUBENTINA*, Cramer.

I have caught males and females of this species at all seasons of the year from Rangoon throughout Central Burmah to Bhamo in the north. It is, however, always scarce.

132. *E. GARUDA*, Moore.

All Burmah; very common. The amount of white markings on the upper side of the fore-wing shows considerable variation.

133. *E. JAMA*, Felder.

One male and one female, both caught in Upper Burmah on the hills, in November and October.

134. *E. PHEMIUS*, Doubleday and Hewitson.

I took one male in the Arracan Hills in December, and I have one female, also taken in the Arracan Hills, which I believe to be the female of this species.

135. *SUMALIA ZULEMA*, Doubleday and Hewitson.

Only one specimen of this exceedingly rare insect seen and caught in Upper Tenasserim in March.

136. *MODUZA PROCRIS*, Cramer.

Very common all over Burmah.

137. *LEBADEA MARTHA*, Fab.

Common in the south of Burmah; less common in the north. Doubtfully distinct from *L. ismene*, Doubleday and Hewitson.

138. *PARATHYMA ADAMSONI*, Moore.

Males and a female caught near Bhamo. Mr. Moore has figured my type specimen in his "Lepidoptera Indica." October and November.

139. *TACORÆA ASURA*, Moore.

Two males and one female, caught in the hills in Upper Burmah in March.

140. *TANTISIA KANWA*, Moore.

Two males and one female. One bred from a chrysalis in November, and the other two taken in Upper Burmah in the cold weather. Rare.

141. *CHENDRANA PRAVARA*, Moore.

One specimen taken in Tenasserim in February, and one in Bhamo district in June.

142. *ATHYMA PERIUS*, Linnæus.

Very common.

143. *PANTOPORIA SELENOPHORA*, Kollar.

On low ranges of hills throughout Burmah.

144. { *P. ASITA*, Moore. }
{ *P. INARINA*, Butler. }

I cannot separate these species. I have a series from Burmah shewing all steps between the two forms. Specimens from the south have, as a rule, less orange than those from further north. It is a common insect on hilly ground throughout the rains. Females of this species are also commonly met with.

145. *KIRONGA MAHESA*, Moore.

One in November and one in December, at Hpapoon, on the Yoonzaleen River.

146. *K. RANGA*, Moore.

A single specimen taken near Mogoung in February, 1888. This is probably the dry weather form of the preceding species.

147. ANDRAPANA MARTABANA, Moore.

Mr. Moore has named all my specimens, of what I considered to be *Neptis ophiana*, Moore, as *N. martabana*. I have two distinct varieties. The variety which I considered to be *N. ophiana* has all the white markings larger on the upper side, and the ground colour of the under side pale brownish ferruginous. This variety occurs commonly in Upper Burmah, in the hilly country, during the dry season, and especially in February and March. The variety which I had considered to be *N. martabana*, and which occurs only in the rainy season, has the white markings on the upper side smaller; and the ground colour of the under side is rich chestnut-brown. I have no doubt that my varieties are dry and wet weather forms of one insect. If *N. ophiana* extends, as Mr. Distant writes that it does, into the Malayan Peninsula, it is strange that a distinct species should occur in Burmah. Since the above was written Mr. Moore has included both forms under the name of *A. columella*, Cramer.

148. A. JUMBAH, Moore.

Common on the Arracan coast in the cold season.

149. A. KHASIANA, Moore.

I have taken this uncommon butterfly both in the rains and in the cold weather in Upper and Lower Burmah. It seems to be very constant.

150. A. MAGADHA, Felder.

One female taken in Upper Burmah.

151. NEPTIS ADARA, Moore.

Very common in Burmah, as is also the form *N. meetana*, which I have included under this name. The latter is the dry weather form.

152. N. SUSRUTA, Moore.

This insect, named for me by Mr. Moore, is common in the hilly parts of Burmah. I have never taken it in the south. It varies greatly in size, and the wet season form approaches nearly to *N. adipala*, Moore, except that it is invariably paler in colour.

153. *N. ADIPALA*, Moore.

Caught in the Bhamo district, where it was not uncommon on the Sinkan Stream, in October and November.

154. *BIMBASARA BURMANA*, de Nicéville.

One specimen of this distinctly marked insect from Moulmain. Named for me by Mr. Moore.

155. *B. HARITA*, Moore.

I have several specimens of this insect caught in Tenasserim and Akyab which vary considerably.

156. *PANDASSA FULIGINOSA*, Moore.

One specimen of the wet season form was taken by me at Mergui. I also took the type specimen at Moulmain.

157. *STABROBATES NOLANA*, Moore.

One specimen taken at Tounggya Sekkan, in Tenasserim, in February, 1881.

158. *S. VIRAJA*, Moore.

Taken at Bhamo, but very uncommon.

159. *RAHINDA HORDONIA*, Stoll.

Very abundant. Both wet and dry season forms.

160. *R. PARAKA*, Butler.

Common. Specimens in my collection almost correspond with *R. dindinga*, Butler.

161. *R. DINDINGA*, Butler.

I have followed Mr. Moore in keeping this insect distinct from *R. paraka*, but I am doubtful about it.

162. *LASIPPA HELIODORE*, Fab.

Taken in the cold season near Rangoon and Moulmain, but scarce.

163. *L. SATTANGA*, Moore.

I have specimens so named by Mr. Moore. They hardly appear to differ from *L. tiga*.

164. *CYRESTIS THYODAMAS*, Boisduval.

Common where met with throughout Burmah, but local.

165. *C. NIVALIS*, Felder.

Taken abundantly on one occasion only on the Megabwee Stream, in Upper Tenasserim, in December, 1879.

166. *CHERSONESIA RISA*, Doubleday and Hewitson.

Moulmain district, but not common. One specimen taken in Upper Burmah in February.

167. *C. RAHRIODES*, Moore.

This insect appears to be a connecting link between *C. risa* and *C. rahria*. It is common in Burmah.

168. *ABSITHRA COCLES*, Fabricius.

One specimen in August and two in February on the Hlinebway River, Moulmain district.

169. *A. PERIANDER*, Fabricius.

I once found this insect abundant on one or two streams in Upper Tenasserim, near the Siamese frontier in March. But except on this occasion I have never met with it. A most local insect.

170. *JUNONIA IPHITA*, Cramer.

Throughout Burmah. In February, 1891, this species was in hundreds near Aloungdau Kathapa Pagoda. I have pale specimens shewing a very near approach to *J. ida*, Cramer.

171. *J. ALMANA*, Linnæus.

Both forms of this insect are very common throughout Burmah. The ocellated form (*J. asterie*, Fabricius) appears to be the more abundant in Burmah, as I have caught it in all the months of the year, while the unocellated forms I have only caught in Lower Burmah from November till June.

172. *J. ATLITES*, Linnæus.

Very common in Lower Burmah, but comparatively scarce in the dry parts of Upper Burmah. During the month of July, 1892, in the Upper Chindwin district, I did not meet with a single specimen.

173. *J. HIERTA*, Fabricius.

Very common.

174. *J. LEMONIAS*, Linnæus.

Very common throughout Burmah. The markings and colouring of the under side vary exceedingly. I have one "sport" caught in September on the Upper Chindwin, with all the markings, including the ocelli on the upper side of both wings, obsolete, with the exception of an indistinct sub-marginal paler line.

175. *J. ORITHYIA*, Linnæus.

Common throughout Burmah alike in the hot plains, in the marshes in the south, and in the hills in the north and west. The colouring of the under side varies according to the locality; being very pale in the hot plains, and a rich vinous-brown in specimens from the Chin Hills.

176. *KANISKA CANACE*, Johanssen.

Common at Bhamo from October till February. It is rare further south.

177. *VANESSA INDICA*, Herbst.

Rarely taken in the Arracan Hills and at Bhamo.

178. *V. CARDUI*, Linnæus.

This is a rare butterfly in Burmah. I caught one specimen in February near Bhamo, and one in December in North Yéu. I have received it from the Chin Hills. I once saw one so far south as Mandalay in January, and I caught one specimen at Mambu.

179. *SYMBRENTHIA LUCINA*, Cramer.

Fairly common in Lower Burmah. Not common in Upper Burmah, though on two successive days I took about a dozen at one spot near Sagaing, in January, 1894.

180. *S. COTANDA*, Moore.

Two specimens taken in Arracan, and one in the north-west of Upper Burmah in the cold season.

181. *RHINOPALPA POLYNICE*, Cramer.

I took four males of this insect at Phapoon, on the Yoonzaleen River, in November. It appears to be scarce in Burmah. I have had one male sent to me from Tavoy.

182. *YOMA VASUKI*, Doherty.

Found throughout Burmah in the dry season. In February, 1892, it was very common near Aloungdau Kathapa Pagoda, in the Chindwin district. It frequents thick forest, and is very difficult to catch in good order.

183. *APATURA BOLINA*, Linnæus.

Common throughout Upper and Lower Burmah.

184. *A. MISIPPUS*, Linnæus.

This insect is not nearly so common in Lower Burmah as the preceding species; but is very common in the dry zone of Central Burmah.

185. *PENTHEMA DARLISA*, Moore.

I took one specimen of this insect near the Siamese frontier in Tenasserim in March. It had settled on some elephant dung.

186. *DOLESCHALLIA INDICA*, Moore.

This insect was common about the villages on the banks of the Hounddraw River in October, 1880, where it settled on the mud under and near the native houses. I have also taken it near Bhamo.

187. *KALLIMA LIMBORGII*, Moore.

Frequent in forests throughout Burmah. I cannot separate, even as a local form, this insect from *K. inicus*, Boisduval. I have specimens from Burmah similar in all respects to the latter.

188. *CETHOSIA CYANE*, Drury.

Common in Burmah up to about 1,000 feet elevation during the rainy season. I have bred it from larvæ feeding on passion flower in Moulmain.

189. *C. BIBLIS*, Drury.

In the north of Upper Burmah and in the hills of Lower Burmah this species replaces *C. cyane*, Drury. This and the last species vary much in size, and the females vary much in the amount of ferruginous colouring on the upper side of both wings.

190. *CYNTHIA EROTA*, Fabricius.

I found the males of this insect very common on one occasion near Phapoon in November, 1878, and again near Bhamo, where I caught one female in October. It is generally spread throughout the hilly parts of Burmah. Females are very uncommonly met with.

191. *ATELLA PHALANTHA*, Drury.

Common all the year round about the edge of streams. I have bred this insect from caterpillars found feeding on willow.

192. *A. ALCIPPOIDES*, Moore.

Common at Tavoy, and also caught near Phapoon in the autumn. Is a local insect.

193. *ISSORIA SINHA*, Kollar.

This insect is not uncommon on the gravelly beds of streams in Burmah in the cold weather. Its flight is very strong and rapid. It invariably rests with its wings closed over its back, and is, in all its habits, quite different from the genus *Atella*.

194. *CUPHA ERYMANTHIS*, Drury.

Common during the rainy season. The under side varies considerably in the intensity of its markings.

195. *DUCAPA FASCIATA*, Felder.

This insect was abundant on the road between Kaukarit and Myawaddee on the 24th April, 1880. I have not since met with it.

196. *D. FLAVOBRUNNEA*, Grose Smith.

A single specimen of this insect was taken by me on the 4th February, 1881, in the Moulmain district. It has been named by Mr. Grose Smith, and the type specimen is in my collection. This may hereafter turn out to be the dry season form of the preceding species.

197. *CIRROCHROA OLIVACEA*, de Nicéville.

Numerous males and one female taken in Tenasserim in March and April.

198. *C. MITHILA*, Moore.

Common on the beds of streams in Tenasserim and Arracan in the cold and hot weather.

199. *C. SURYA*, Moore.

Abundant at the same time and in the same places as *C. mithila*, Moore. The females are considerably larger than the males, and are difficult to distinguish from females of the latter species.

200. *ACIDALIA HYPERBIUS*, Johanssen.

I have only taken three males; all near Bhamo in February and May. It does not seem to extend further south in Burmah. This butterfly is more commonly known as *Argynnis niphe*, Linnæus.

201. *ERGOLIS MERIONE*, Cramer.

Common in Burmah wherever the castor oil plant grows all the year round.

202. *E. ARIADNE*, Linnæus.

Same places and seasons as the preceding species. Common.

203. *LARINGA GLAUDESCENS*, de Nicéville.

One male taken in October, 1880, near Kannee, in the Amherst district, and one female in May, 1881, in the Thoungyeen valley, also in the Amherst district. The insect is found in dense forests, and appears to be very uncommon.

SUB-FAM. ACRÆINÆ.

204. *PAREBA VESTA*, Fabricius.

A very local insect in Burmah. In October, 1886, I found it abundant near one village in the Bhamo district. The specimens were all taken early in the morning in a thick fog. They were resting on dripping grass, apparently helpless from the damp. I have since received it from the Chin Hills.

SUB-FAM. PSEUDERGOLINÆ.

205. PSEUDERGOLIS WEDAH, Kollar.

I have taken this insect in September, October, and February in Moulmain and Arracan, and one specimen at Aloungdau Kathapa in Upper Burmah in February. It is an uncommon insect, and I have always seen it settle on the ground with its wings outstretched. When disturbed it flies away rapidly, returning after a time to the same spot.

SUB-FAM. LIBYTHÆINÆ.

206. LIBYTHEA SANGUINALIS, Fruhstorfer.

Common about streams in Tenasserim. It also extends to Upper Burmah, where I have taken it not uncommonly in the cold season about Sagaing. It is very constant in markings throughout Burmah.

FAM. RIODINIDÆ.

SUB-FAM. NEMEOBIINÆ.

207. SOSPITA FYLLA, Doubleday and Hewitson.

One male and one female, taken in the Eastern Shan Hills at 4,000 feet elevation, in March. Not uncommon in the hills north of Bhamo.

208. S. NEOPHRON, Hewitson.

Not uncommon near Bhamo in April, May, and June.

209. ABISARA ANGULATA, Moore.

A very common insect all the year round. There is a considerable variation in the ground-colour and in the distinctness of the markings on the upper side.

210. TAXILA THUISTO, Hewitson.

Three females, caught on the Salween River above Moulmain, in July and August, 1880, and one at Natchoung in Upper Tenasserim.

211. T. FASCIATA, Moore.

Common in Northern Burmah in April, May, and June.

212. ZEMEROS FLEGYAS, Cramer.

This butterfly, which is found generally throughout Burmah, is sometimes found near Bhamo in great quantities. It is subject to great variation in the extent of the white markings on the upper side.

FAM. PAPILIONIDÆ.

SUB-FAM. PAPILIONINÆ.

213. ORNITHOPTERA ÆACUS, Felder.

This is not an uncommon species in Central Burmah. It is most abundant from June till September. In Lower Burmah it is not so common. I have also seen what was evidently a fresh brood flying in February at Sagaing. I have found pupæ in August from which have emerged perfect insects in September.

214. O. CERBERUS, Felder. Moulmain, Rangoon, Bhamo, and Akyab.

Caught occasionally from June to November. This is a local and doubtfully distinct race of *O. pompeus*, Cramer.

215. O. HELIACONOIDES, Moore.

One specimen taken at Hpapun in the Salween Hill Tracts in October, 1878. It appears to be very rare in Burmah.

216. LOSARIA DOUBLEDAYI, Wallace.

Not uncommon near Rangoon and Moulmain in October and November. The males are much commoner than the females.

217. MENELAIDES ARISTOLOCHIÆ, Cramer.

Very abundant, especially near the sandy beds of streams, throughout the year. The females are as plentiful as the males, and frequent the same places.

218. PANGERANA AIDONEUS, Doubleday.

One male and one female, caught on the Naaf and Mayu Road in Arracan in October.

219. *P. ZALEUCUS*, Hewitson.

I captured about half a dozen males and females of this insect in Upper Tenasserim during the cold months. It is, however, very rare in Burmah.

220. *P. ASTORION*, Westwood.

I have two males and three females of this species. In two of the females the white patch on the hind margin of the fore-wing is distinct, while in the third it can hardly be traced.

221. *PANOSMIOPSIS RHETENOR*, Westwood.

One caught in Arracan, and one on the Taoo plateau, Upper Tenasserim, in March.

222. *SAINIA PROTENOR*, Cramer.

Two specimens, caught at Tsinbo, north of Bhamo, in May.

223. *BYASA ADAMSONI*, Grose Smith.

This butterfly (the type specimen of which is in my collection) was named and described by Mr. Grose Smith in "Annals and Magazine of Natural History" for August, 1886. It is a male, and was caught by me near the Siamese frontier in January, 1880.

224. *B. DASARADA*, Moore.

Two males were caught by me at Tounggya Sekkan, Upper Tenasserim, in May.

225. *ILIADES AGENOR*, Linnæus.

var. *Androgeos*, Cramer.

var. *Phœnix*, Distant.

var. *Agenor*, Linnæus.

var. *Alcanor*, Cramer.

The forms of the females named *Androgeos* I have only taken in the Bhamo district. The other forms which vary much *inter se* I have taken throughout Burmah, where they are not uncommon.

226. *SADENGIA PREXASPES*, Felder.

One specimen caught on the Cocos Islands.

227. *S. CHAON*, Westwood.

Widely spread throughout Burmah, except in the hot plains.

228. *CHARUS HELENUS*, Linnæus.

Common wherever there is forest land in Burmah.

229. *ARAMINTA DEMOLION*, Cramer.

One specimen, caught in Tounggya Sekkan, in Upper Tenasserim, in February. Not uncommon about Tavoy and Mergui in the autumn months.

230. *LAERTIAS PAMMON*, Linnæus.

Males and two forms of females excessively common throughout Burmah. One specimen of the variety *Romulus* was taken by me near Akyab in November.

231. *ZETIDES AXION*, Felder.

Males are very common throughout Burmah. From April to October they frequent beds of streams, flying up and down the same with great rapidity. They are also very common in gardens.

232. *Z. CHIRON*, Wallace.

This insect is by no means common, though I have taken it both in Tenasserim and near Bhamo.

233. *Z. AGAMEMNON*, Linnæus.

Throughout Burmah except in the central plains. It frequents gardens, and the caterpillar is easily found. I have seldom seen a female on the wing.

234. *DALCHINA SARPEDON*, Linnæus.

Throughout Burmah males are very common and females very seldom seen.

235. *PATHYSA ALCIBIADES*, Fab.

I have caught males of this species flying in company with *P. pernomius*, but it is much less common than that species. It occurs in March and April.

236. *P. ANTICRATES*, Doubleday.

In March, 1883, I took two males in Akyab. It also occurs not uncommonly at Katha in Upper Burmah.

237. *P. PERNOMIUS*, Fruhstorpher.

This insect abounds near the borders of tanks and moist places in otherwise dry forests in March, April, and May. The females are very uncommonly met with. I think it is only a local variety of *P. nomius*, Esper.

238. *DEORIS AGETES*, Westwood.

Two males of this lovely insect were taken by me while they were imbibing moisture from damp sand; one in February and one in March, at Tounggya Sekkan, in Moulmain district.

239. *ORPHEIDES DEMOLIUS*, Linnæus.

The commonest *Papilio* in Central Burmah. It is more commonly known by Cramer's name *Erithonius*.

240. *ACHILLAIDES PARIS*, Linnæus.

Rare in Burmah. I have only caught three specimens. One taken in Tenasserim has the spot on the hind-wing brilliant green in some lights and bluish-green in others, while the two specimens caught in Bhamo have the spot bright blue.

241. *HARIMALA PALINURUS*, Fabricius.

Two specimens were taken by me in the Tenasserim provinces; one in October and the other in January.

242. *TAMERA CASTOR*, Westwood.

I found the males of *T. castor* common on a jungle path near Shwègoo, in the Bhamo district, in September, 1887. They, in common with *S. chaon* and *C. helenus*, were to be found resting on damp, sandy roads under lofty trees. No females of *T. castor* were to be seen on the roads, but they could be found by searching the dense undergrowth on the side of the road. I have also caught males of this species in Lower Burmah in May, in which there are two additional small white spots on the upper side of the posteriors between the large spots and the margin.

243. *T. MAHADEVA*, Moore.

One male, caught at Hpapoon on the Yoonzaleen River, in September, 1881. Very rare in Burmah.

244. CHILASA DISSIMILIS, Linnæus.

Common throughout Burmah in suitable places.

245. C. CLYTIA, Linnæus.

A very common insect in Burmah, and very variable in the amount of white markings on both the fore and hind-wing. It occurs wherever the preceding species is found, and varies much in size.

NOTE.—Under these two names *Dissimilis* and *Clytia* I have included the several forms named by Moore as *C. casyapa*, *C. onpape*, *C. janus*, and *C. papone*, as I am quite unable to separate these varieties. I have separated the two forms *C. dissimilis* and *C. clytia*, because, while not admitting their claim to rank as separate species, yet the names are of use as indicating the two varieties which have been long and universally distinguished by these names.

246. EUPLEOPSIS DANISEPA, Butler.

A single specimen of this rare butterfly was caught by me on the Htarooay Stream, Arracan, in March, 1883. On the wing I mistook it for *Euplœa rhadamanthus*.

247. CADUGOIDES AGEATOR, Gray.

One specimen, caught on Taoo plateau, Upper Tenasserim, in March.

248. METAMOPSIS TAVOYANUS, Butler.

My specimens have been so named by Mr. Moore. Those from Upper Burmah approach *M. slateri*, which occurs in Assam. Those from the south approach more closely *M. hewitsoni*, Westwood, from Borneo. I think all three may turn out to be local varieties of one species. At any rate I consider that *Tavoyanus* is synonymous with *Slateri*. I have taken this insect near Méple in Upper Tenasserim in February, and also near Katha in Upper Burmah. It mimics a *Euplœa*, and varies in the light markings according to the *Euplœa* which appears together with it, the markings on the northern form resembling those on *Isamia rogenhoferi*, which is found in the north, while those on the southern form resemble *I. margarita*, which occurs in the same district.

249. *PARANTICOPSIS MEGARUS*, Westwood.

Three specimens have been taken by me in Tenasserim in March and April. It is a rare species in Burmah.

250. *P. NERONUS*, Moore.

Males are not uncommon at slight elevations in Arracan and Tenasserim from July till March. I have not taken a female. I believe this to be a variety of *P. zenocles*, Doubleday.

251. *P. INDICUS*, Moore.

Males are common on beds of streams and damp places in February and March in the Tenasserim province; I have met with it in Upper Burmah, near Mogoung, and also in Arracan. Though I have given this insect Moore's name of *Indicus*, I am of opinion that Godart's name *Macareus* includes this species(?). Specimens from Upper Burmah and Arracan have the white markings rather broader than the specimens from the south.

SUB-FAM. LEPTOCIRCINÆ.

252. *LEPTOCIRCUS MEGES*, Zinken-Som.

Found in suitable places at a slight elevation throughout Burmah, during the rains and in the cold season.

253. *L. CURIUS*, Fabricius.

I have only met with this species rarely. It is much less common in Burmah than the preceding species.

NATURAL HISTORY SOCIETY
OF
NORTHUMBERLAND, DURHAM, AND NEWCASTLE-
UPON-TYNE.

REPORT OF THE COUNCIL
FOR 1903-1904.

THE work of the Society during the past year has followed closely on the lines of that of the year preceding it. As regards membership there has been a further gain; 41 new members have been elected, and there has been a loss of 22 through death and resignation, leaving the total at 346, as against 327 at the end of the last year of the Society. The roll of membership has also been increased by the inclusion of 87 former members of the Tyneside Naturalists' Field Club, who were received as members of the Society by the terms of the amalgamation concluded at the last Annual Meeting on October 14th, 1903.

The Evening Meetings held during the winter have been of the same nature as those of last year; that is to say, they have taken the form of lectures, open to the public, and illustrated by means of the lantern. They have been very well attended on the whole, and have appeared to arouse a great deal of interest. The Society is very much indebted to the lecturers for the large amount of time and trouble which they have willingly expended in preparing them. The series was as follows:—

Nov. 18.—Mr. R. C. Clephan, F.S.A. : "Ancient Egypt," Part II.; chair taken by Mr. N. H. Martin, F.R.S.E.

Jan. 13.—Mr. John Bidgood, B.Sc. : "The Phenomenon of Plant Species"; chair taken by Mr. Norman C. Cookson, F.R.H.S.

Feb. 17.—Dr. A. Randell Jackson, M.Sc. : "Mimicry"; chair taken by Mr. Ernest Scott.

Mar. 9.—Mr. W. H. Young, F.Z.S. : "Marine Algæ"; chair taken by Mr. W. M. Pybus.

Mar. 23.—Rev. J. E. Hull, M.A. : "The Evolution of the Flower"; chair taken by Prof. Thos. Oliver, M.D., F.R.C.P.

April 6.—Mr. A. T. Gillanders, F.E.S. : "Forest Entomology"; chair taken by Mr. John Pattinson, F.I.C.

April 20.—Rev. W. J. Wingate : "Our Hoverer Flies"; chair taken by Lt.-Col. C. H. E. Adamson, C.I.E.

The experiment tried last year, of giving during the Christmas holidays two afternoon lectures adapted for young people, resulted so well as to lead to its repetition, and two very successful lectures, for which the best thanks of the Society are due, were delivered as follows :—

Dec. 29.—Mr. Alex. Meek, M.Sc. : "The Story of the Crab."

Jan. 6.—Mr. Hugh Richardson, M.A. : "Butterflies," with limelight projections of the natural insects.

The series of "museum talks" given by the curator on one evening a month during the winter were also continued, and the attendances were considerably larger, averaging about 50. The majority of the visitors, however, appear to come in order to listen to what may be said; the opportunity of seeing the museum in the evening does not yet appear to be particularly valued by any considerable number of the public.

Since the amalgamation of the Field Club the field meetings have been organized by a committee of the Society, and a series of them has taken place during the summer. A report of these meetings will appear in the Transactions. The average attendance has shown a slight advance on that of recent years, but is still disappointing when considered as a response to the large number of circulars that are issued. The difficulty of making suitable arrangements for the meetings is also considerably increased by the uncertainty as to the numbers likely to attend.

Of the Society's other activities, it may be mentioned that the first part of the new series of Transactions has been issued, and that a portion of the second is already in type.

There is also a prospect of valuable material for publication in the near future, including a completion of Mr. J. E. Robson's catalogue of the local Lepidoptera, an annotated list and key of local Diptera by the Rev. W. J. Wingate, and a catalogue by Col. Adamson of the fine collection of Burmese butterflies which he has presented to the Society. It is gratifying to be able further to report that an illustrated work on the British Tunicates by Joshua Alder and Albany Hancock, two of the greatest naturalists who have ever been connected with this Society, has been accepted for publication by the Ray Society. The manuscript, on the death of the authors, was left in an unfinished condition in the possession of the Natural History Society, and it is owing to the initiative of the Rev. Canon Norman that it is now in process of publication. Canon Norman has also kindly undertaken to supervise the material in the press, and to write an explanatory preface to the work. As regards the museum, a report by the curator on the year's work is appended to the Council's report.

An exceptional feature of the past year of the Society was a conversazione given in the museum on January 19th by the President and Lady Armstrong. On this occasion, through the kindness of members and friends, a large number of objects were brought together to illustrate topics of current interest in the scientific world, local and colonial industrial enterprise, and special points in many branches of natural history. Among the exhibits were photographs showing certain properties of radium emanations lent by Sir Wm. Crookes and Mr. Henry Crookes; models of a number of the most noted ships recently built on the Tyne, lent by Messrs. Armstrong, Whitworth, and Co., Messrs. the Parsons Marine Steam Turbine Co., and Messrs. Swan, Hunter, and Wigham Richardson; models of locomotive and stationary engines lent by Mr. Wilson Worsdell; and a large series of objects and photographs illustrating the scenery, products, and natural history of Rhodesia, exhibited, through the kindness of Earl Grey, by the British South Africa Company. These, together with a large number of special exhibits by members of the

staff of the College of Science and others, formed such an interesting collection that it was subsequently arranged for the greater part of it to remain for a few days at the museum and to be open to the public. During the course of the evening several experimental and lantern demonstrations were given. In one of these, Sir Wm. Ramsay dealt with some of the inactive atmospheric gases; in another Prof. H. Stroud showed a series of experiments with vacuum tubes, and Dr. William Martin illustrated the practical use of the Röntgen Rays; and lastly, Mr. J. M. Moncrieff described a series of lantern slides of the operations for the construction of the Nile dams and reservoirs, kindly lent by Sir Benjamin Baker. Your council have, on behalf of the Society, tendered their warmest thanks to Lord and Lady Armstrong for their kindness in entertaining the members in so generous a manner; and also to the numerous friends who contributed to the success of the evening by lending objects for exhibition or by giving demonstrations.

The competition for the Hancock Prize was again keen. On the recommendation of Canon Tristram and Canon Norman, the examiners, the prize was divided between Mr. Richard S. Bagnall, whose essay was on "A Coleopterist's Ramble in the late part of September," and Mr. Jas. Caygill, a former prize-winner, who described "A Geological Ramble in Weardale." The examiners remarked that at least six of the essays were of merit far above the average of previous years. One of them, on "A Trip to the Farnes in 1903," was by a boy of twelve, Master J. M. Charlton of Cullercoats, and showed so much skill in observing and portraying birds that Canon Tristram asked to be allowed to award it a special prize given by himself.

Members will have heard with regret of the retirement of Mr. Joseph Wright. The step has been forced upon him by a recent illness, from which, however, he has to a large extent recovered. Mr. Wright has been in the service of the Society for over 51 years, and has become identified with its history and with that of its museum to a remarkable extent.

Your council, in accepting his resignation, expressed their warm appreciation of his long and devoted services, and appointed him emeritus keeper of the museum with an annual honorarium from the Society. It is to be hoped that Mr. Wright will yet for a considerable time be able to give the museum staff the benefit of his assistance and knowledge in this honorary capacity.

It has been found necessary during the past year to have a rather large amount of work done on the museum building. The exterior woodwork was much in need of attention, and it was decided that the framework of the roof lights should be repainted, the window frames painted and varnished, and the front entrance doors restored by scraping and re-varnishing. This has now all been carried out, as well as a number of general repairs to the roof-fittings and window sashes. The whole will cost a sum of about £170.

The Society has, as is usually the case, to thank many of its members and others for donations made to the museum. A complete list of these will be found appended. It may be enough here to call attention to the fact that Col. Adamson has deposited the second cabinet of his collection of Burmese butterflies in the museum, and that the Rev. W. J. Wingate has now handed over to the Society his collection, so far unique, of the local Diptera ; and of other donations, to mention Mr. S. Graham's numerous contributions to the new series of birds' nests ; the interesting additions made to the Indian ethnology section by Mr. F. G. Collett ; and the preparations of mammalian skulls showing milk and permanent dentition made and presented by Mr. D. Knight.

Among the members lost during the year by death, the late R. Y. Green was one who for long had been closely connected with the Society and its work. He was a vice-president, and a very regular attender at the committee meetings. He may be said to have made the museum one of his hobbies, and having been a friend of most of the well known naturalists who have been connected with the institution, he possessed a remarkable store of interesting information regarding the

collections, which it was one of his great pleasures to impart. The sad death of Principal Gurney, which has meant a loss in so many directions in the neighbourhood, has also deprived the Natural History Society of a prominent member. As a vice-president, Principal Gurney took a considerable share in the work of the council, and both here and in other capacities his geniality and sound judgment were often of value to the Society.

CURATOR'S REPORT ON MUSEUM WORK,
1903-04.

The main results of the year's work on the museum collections are here briefly reviewed.

Much of the time of the staff is naturally taken up with routine and miscellaneous duties which do not vary much from year to year, and it is only some of the chief lines of recent progressive work that call for mention. Of these, that which has occupied the greatest amount of time has been the labelling of the ethnology collection. This collection, displayed in the upper east corridor, was completely overhauled and re-arranged two years ago, but time and means could not then be found for proceeding with the labelling. Now, however, a small hand printing press belonging to the museum has been brought into use and some new type obtained, and with this outfit Wm. Voutt has printed the whole series of labels required. The manuscript for the labels was made out by me from former labels attached to the objects and from various old catalogues and reports, and in each of the cases all the original labels and a duplicate set of the printed ones are preserved. The title labels to be placed as headings to the cases were beyond the capacity of our printing outfit, and these I have consequently done by hand. The gain in appearance and utility in the ethnology department brought about by recent alterations—the original overhauling, the hanging of Mr. Clephan's Egyptian frescoes, and now the clear and uniform labelling—is very gratifying. Perhaps the

chief desideratum for this section of the museum now is the provision of framed photographs, which could very well be fixed above the desk-cases, illustrating the appearance and manner of life of the various races whose productions are represented in the collection.

The new set of British birds' nests, which was mentioned in the last report as having been taken in hand, has been fitted up in one of the large desk-cases in the bird room, and has proved an attractive addition. It is a companion set to that of the British birds' eggs installed last year. Most of the nests—which in nearly all cases contain eggs—are shown in glass-topped boxes; some to which this method is not applicable are placed on trays or stands, and a few of the largest are of necessity shown in a wall-case in the gallery. Mr. S. Graham has here again, as in the work on the eggs, given much valuable help, in addition to contributing largely from his own cabinets to the new set. Much may still be done with advantage in filling gaps and replacing inferior examples. I am at present doing some labelling in the Hancock bird collection. The rather numerous birds that have been added since the original installation were marked only by rough data-tags; I am now removing these tags and labelling the birds in uniformity with the rest.

A little progress has been made with the geological index cases, intended to provide a simple summary of the past history of life on the earth. The plan adopted has met with approval from a number of people, and it is hoped that quicker progress towards a completion of the series of index-cases may now be made. The skeleton of the hippopotamus, presented several years ago by the Rev. R. Stewart Wright, has been mounted, and forms a striking and valuable addition to the set of skeletons in the museum. The mounting involved many difficulties, but was carried out very satisfactorily by Mr. D. Knight of Edinburgh, with the help of Wm. Voutt. The latter has done many useful and necessary pieces of work during the year, in addition to the printing of the ethnology labels. He has cleaned and painted the cases on the bird

room gallery, a job entailing many days of scraping and washing; he has also gone through the store collections of skins, birds' eggs, and insects, putting them into the best order that our means will allow, and has refilled where necessary the jars containing spirit specimens. Since Mr. Wright's illness and retirement, Wm. Voutt has had to spend most of his time at the entrance door; I have been able, however, to provide him with a much needed piece of work which could be done under these circumstances, namely, the remounting and labelling of some of the Palæozoic fossils. Some really good sets of these had acquired a much neglected appearance through the dirtiness and discoloration of the mounts, and the change being produced is very pleasing. I am revising the old labels, and the new ones are then being printed with our small outfit.

E. LEONARD GILL.

APPENDIX.

SUBJECTS OF "MUSEUM TALKS."

Oct. 28.—A Set of Skulls.

Nov. 25.—The Reptiles.

Dec. 30.—Wings and Flying Animals.

Jan. 27.—The Starfishes and their Relatives.

Feb. 24.—How Coral is made.

April 27.—The Museum Condor.

NATURAL HISTORY SOCIETY OF NORTHUMBER- LAND, DURHAM, AND NEWCASTLE-UPON-TYNE.

OFFICERS, 1904-1905.

Elected at the Annual Meeting, October 12, 1904.

PRESIDENT.

The Right Hon. Lord Armstrong, M.A., D.C.L.

VICE-PRESIDENTS.

The Duke of Northumberland.	Sir Lindsay Wood, Bart.
Earl Grey.	The Mayor of Newcastle.
Viscount Ridley.	Lt.-Col. C. H. E. Adamson, C.I.E.
Lord Barnard.	Prof. G. S. Brady, M.D., F.R.S.
Lord Ravensworth.	E. J. J. Browell.
The Bishop of Durham.	Norman Cookson.
The Bishop of Newcastle.	Geo. E. Crawhall.
Sir Lowthian Bell, Bart, F.R.S.	W. D. Cruddas.
Sir James Joicey, Bart., M.P.	Jno. Daglish.
Sir Arthur Middleton, Bart.	R. R. Dees.
Sir Andrew Noble, Bart., F.R.S.	D. O. Drewett.
Sir Isambard Owen, M.A., M.D.	Samuel Graham.
Sir G. H. Philipson, M.D., D.C.L.	Prof. M. C. Potter, M.A.
Sir Jos. W. Swan, LL.D., F.R.S.	H. N. Middleton.
Sir John Swinburne, Bart.	Thos. Thompson.

COUNCIL.

Rev. W. McLean Brown.	Jno. Pattinson, F.I.C.
R. C. Clephan, F.S.A.	W. M. Pybus.
Clive Cookson.	J. Alaric Richardson.
Dr. Nicholas Hardcastle.	Ernest Scott.
T. E. Hodgkin, M.A.	J. D. Scott.
Prof. G. R. Murray, M.D.	J. D. Walker.

HON. SECRETARIES.

N. H. Martin, F.R.S.E. | C. E. Robson.

HON. TREASURER.

A. H. Dickinson.

HON. AUDITOR.

Samuel Graham.

DONATIONS TO THE MUSEUM

FOR THE YEAR ENDING JUNE 30TH, 1904.

- LIEUT.-COL. C. H. E. ADAMSON, C.I.E.—Second cabinet of the donor's collection of Burmese butterflies, containing the Papilioninæ and Leptocercinæ.
- RICHD. S. BAGNALL.—Continental butterflies reared from imported pupæ (*Papilio podiliarius* and *Thais polyxena*), with particulars as to treatment and emergence.
- MISS BARKER.—Various Carboniferous and Mesozoic fossils, and a piece of "musical stone" from Skiddaw.
- JNO. BIDGOOD, B.Sc.—A young Nightjar picked up dead at the Higher Grade School, Gateshead, Sept. 17, 1903.
- CARDIFF MUSEUM (by exchange).—Five British bats, including Long-eared, Lesser Horseshoe, and Natterer's Bats; and three specimens of *Lingula anatina*.
- J. W. CARR.—A pair of albino Pheasants shot near Shotley Bridge.
- JAS. CAYGILL.—Various mineral specimens and fossils from the Consett district and Weardale, including a piece of iron ore from the first drift opened at Consett.
- F. G. COLLETT (Police Department, Bombay).—Objects of native Indian workmanship, viz. : a carved paper-knife in sandal wood; twelve figures representing various classes of Indian servants; model in alabaster of the great Mohammedan temple or Taj Mahal at Agra.
- MRS. COMMON.—Skin of Greater Bird of Paradise (*Paradisea major*), dried and mounted on a stick, probably by natives.
- GEO. E. CRAWHALL.—Male Wigeon in finest adult plumage, Haydon Bridge, Dec. 9, 1903. Also a pair of Mallard's wings for use in a preparation.
- MRS. DINNING.—Trap-door Spiders, male and female, from the Italian Riviera (nests presented last year). Some instruments for developing fossils, and two local geological survey sheets.
- MR. DUNDAS.—Skins of birds from Colon, Panama (eight humming-birds and eight finch-like birds).

- H. RUSSELL EASTCOTT.—Nest and four eggs of Reed Warbler from Christchurch, Hants.
- JAS. S. FORSTER.—Four quartzite pebbles, disc-shaped and very perfectly rounded, from the beach at Budleigh Salterton, Devon.
- SAMUEL GRAHAM.—About twenty nests of British birds, with eggs, to add to the new exhibited series. Some large tabular fungi from tree stems.
- J. GREEN.—A Dipper, shot at Waring Mill, Belford.
- MR. JOHNSON.—Red sandstone, base of Bernician series, from near Ford and Wooler, bearing plant imprints and (?) fossil sponges. A boulder of black limestone, polished and scratched by ice, from railway cutting at Gosforth.
- CAPT. KING (Hartlepool).—A Monkfish (*Rhina squatina*), female, 2-ft. 10-in. long. A living *Panopæa norvegica*. Both taken with the trawl in the North Sea.
- D. KNIGHT (Edinburgh).—Skulls of ox, calf, and sheep, prepared to show transition from milk to permanent dentition.
- GEO. MACKIE.—A number of eggs of Australian birds.
- J. I. MALING.—A Velvet Swimming Crab (*Portunus puber*) from Newbiggin.
- N. H. MARTIN, F.R.S.E.—About 170 microscope slides of fungi and mosses, mounted by the late Mr. Swallow.
- DR. WM. MARTIN.—Two life-sized X-ray photographs, viz., of wrists and hands of museum mummy No. 2, and the same of a youth of 17. Comparison of epiphyses shows mummy to be that of a fully adult person.
- JNO. E. MCPHERSON.—Irish Hare, probably imported for coursing, shot at Haselton, Gloucestershire.
- ALEX. MEEK, M.Sc.—Enlarged photograph of the White Whale caught at the mouth of the Tyne, June, 1903.
- ALAN M. MORISON.—A Reeve (*Machetes pugnax*, female) shot by the donor at Cramlington, Aug. 22, 1903.
- LIEUT. C. F. G. PAGE (per Dr. F. Page).—Four Penguin's eggs; a tropical eel (*Muraena*).
- MISS W. M. PATTINSON.—Shells (small gasteropod) from a native Australian necklace.
- JNO. REED.—Piece of ironstone containing lower end of a Calamites branch; found on the shore near Tynemouth.

GILBERT H. RICHARDSON.—A Scorpion from Spain; length about 3 inches, alive when presented.

J. D. ROBINSON.—Spirit specimens, including salamander, common lizard, stick-insect, large scorpion. Also the mummified carcass of a rat.

ERNEST SCOTT.—Three Horned Lizards (*Phrynosoma cornutum*) from California; a West Indian Toad (*Bufo marinus*); two Crayfish from a local stream.

REV. THOS. STEPHENS.—A Water Rail, picked up under telegraph wires on the road near Otterburn, October, 1903

COL. H. F. SWAN.—A length (about 6 feet) of old wooden water-piping dug up in Walker Shipyard.

C. T. TRECHMANN.—Fine antler of Red Deer, with part of skull attached, from the submerged forest, Hartlepool; found in 187-.

J. W. TURNBULL.—Nest of Sparrow Hawk with 5-clutch of eggs; 4-clutch of eggs of Carrion Crow; both from Riding Mill, May, 1903.

MISS H. WERNER.—A set of butterflies, in papers, collected near Essuassu, West Africa, by Mr. J. R. Werner, F.R.G.S.

REV. W. J. WINGATE.—The donor's collection of local Diptera, named and arranged in glass-topped boxes for the cabinet.

F. WINTER, F.R.M.S.—Two fossil fishes (*Palæoniscus sp.*) from the Marl Slate; sample of volcanic dust from the eruption of Mont Pelée, deposited in Dominica.

ADDITIONS TO THE LIBRARY
BY DONATION AND EXCHANGE,
FROM JULY 1ST, 1903, TO JUNE 30TH, 1904.

BRITISH SOCIETIES AND INSTITUTIONS.

Berwick-upon-Tweed:—*Berwickshire Naturalists' Club*.

History of the Club, vol. 18, part 1.

Cambridge:—*University Philosophical Society*.

Proceedings, vol. 12, parts 3, 4, 5.

List of Fellows, etc., 1903.

Cardiff:—*Corporation Museum*.

Report for 1902-03.

Popular Guide.

Handbook to Objects from Roman Fort at Gellygaer; Catalogue of
Old Worcester Porcelain; pamphlet "Our Museum."

Cardiff:—*Naturalists' Society*.

Report and Transactions, vol. 36, 1903.

Dublin:—*Royal Dublin Society*.

Transactions, vol. 8, nos. 2-5.

Proceedings, vol. 10, part 1.

Economic Proceedings, vol. 1, part 4.

Edinburgh:—*Botanical Society*.

Transactions and Proceedings, vol. 22, parts 1, 2.

Edinburgh:—*Geological Society*.

Transactions, vol. 8, part 2, and special part.

Edinburgh:—*Scottish Meteorological Society*.

Journal, 3rd ser., nos. 18, 19.

Gateshead:—*Gateshead Teachers' Natural History Society
and Field Club*.

Annual Report, 1903-04.

Greenwich, S.E.:—*Royal Observatory*.

Greenwich Observations (Magnetical and Meteorological), 1900.

Hastings :—Hastings and St. Leonards Natural History Society.

10th Annual Report, 1902-3.

Leeds :—Philosophical and Literary Society.

83rd Annual Report, 1902-03.

Leeds :—Yorkshire Naturalists' Union.

Transactions, parts 28, 29.

Liverpool :—Naturalists' Field Club.

Proceedings, 1903.

London :—British Museum (Natural History), South Kensington.

Catalogue Madreporarian Corals, vol. 4.

,, Lepidoptera Phalaenæ, vol. 4, with plates.

Hand List of Birds, vol. 4.

First Report on Economic Zoology.

London :—Quekett Microscopical Club.

Journal, ser. 2, vol. 8, no. 53 (Nov., 1903) ; vol. 9, no. 54.

London :—Zoological Society.

Proceedings, 1903, vol. 1, parts 1, 2 ; vol. 2, parts 1, 2 ; 1904, vol. 1, part 1.

Transactions, vol. 17, parts 1, 2.

List of Fellows, 1903.

Manchester :—Literary and Philosophical Society.

Memoirs and Proceedings, vol. 47, parts 5, 6 ; vol. 48, parts 1, 2.

Manchester :—Manchester Museum, Owens College.

Report for 1902-03.

Newcastle-on-Tyne :—Literary and Philosophical Society.

Catalogue of the Library, 1903.

Newcastle-on-Tyne :—Institute of Mining and Mechanical Engineers.

Transactions, vol. 51, parts 6, 7 ; vol. 52, parts 5, 6, 7 ; vol. 53, parts 2, 3 ; vol. 54, parts 1-5.

Annual Report, 1902-03.

Report of Committee upon Mechanical Coal-Cutting, part 1.

Subject-matter Index of Mining etc. Literature for 1901.

Northampton :—Northamptonshire Natural History Society and Field Club.

Journal, 1903, vol. 12, nos. 93-96.

Norwich :—Castle Museum.

Report of Committee for 1903.

Norwich:—*Norfolk and Norwich Naturalists' Society*.

Transactions, vol. 7, part 4.

Plymouth:—*Plymouth Institute*.

Report and Transactions, vol. 13, part 5.

Worcester:—*Public Library, Museum, and Art Gallery*.

Report of Committee, 1902-3.

York:—*Yorkshire Philosophical Society*.

Annual Report for 1902, 1903.

COLONIAL SOCIETIES AND INSTITUTIONS.

Cape Town:—*South African Museum*.

Annals, vol. 2, part 12; vol. 3, parts 2-5; vol. 4, parts 1-5.

Report for 1903.

Montreal:—*Natural History Society*.

Canadian Record of Science, vol. 9, nos. 1, 2.

Ottawa:—*Department of the Interior*.

Maps of Assiniboia, Saskatchewan, Alberta, Lake Louise, Banff.

Ottawa:—*Geological Survey of Canada*.

Annual Report, new series, vol. 12, 1899; maps to accompany same.

Catalogue of Canadian Birds, part 2.

Map Sheets 42-48, 56-58, Nova Scotia.

Altitudes in the Dominion of Canada, with maps and profiles.

Sydney, N.S.W.:—*Royal Society*.

Journal and Proceedings, vol. 36, 1902.

Sydney, N.S.W.:—*Australian Museum*.

Records, vol. 4, no. 8; vol. 5, nos. 2, 3.

AMERICAN SOCIETIES AND INSTITUTIONS.

UNITED STATES OF AMERICA.

Boston:—*Society of Natural History*.

Proceedings, vol. 30, nos. 3-7; vol. 31, no. 1.

Memoirs, vol. 5, nos. 8, 9.

Boston:—*American Academy of Arts and Sciences*.

Proceedings, vol. 38, nos. 20-26; vol. 39, nos. 1-20.

Memoirs, vol. 13, no. 1.

Brooklyn, N. Y.:—Brooklyn Institute of Arts and Sciences

Cold Spring Harbor Monographs, nos. 1, 2.

Buffalo:—Society of Natural Sciences.

Bulletin, vol. 8, nos. 1, 2, 3.

Cambridge:—Museum of Comparative Zoology, Harvard College.

Bulletin, vol. 39, nos. 6-9; vol. 40, no. 7; vol. 41, no. 2.

Bulletin, vol. 42 (Geol. Ser., vol. 6), nos. 2-5; vol. 43, no. 1;
vol. 45, nos. 1, 2.Memoirs, vol. 29 (Coral Reef of the Maldives), 2 parts, text, and
plates.

Annual Report of the Curator, 1902-03.

Cincinnati, Ohio, U.S.A.:—Lloyd Library.

Bulletin, no. 6.

Mycological Notes, nos. 10-14.

Minneapolis, Minn.:—Geological and Natural History Survey.

Minnesota Botanical Studies, 3rd series, part 2.

New York:—Academy of Sciences.

Annals, vol. 14, part 3; vol. 15, part 1; vol. 16, part 4.

Philadelphia:—Academy of Natural Sciences.

Proceedings, vol. 55, parts 1, 2, 3.

Philadelphia:—American Philosophical Society.

Proceedings, vol. 42, nos. 172, 173, 174; vol. 43, no. 175.

Springfield, Mass., U.S.A.:—City Library Association.

Reports of the Museum of Natural History, May, 1903.

Washington:—Smithsonian Institution.

Annals of the Astrophysical Observatory, vol. 1.

Annual Report for 1902.

Miscellaneous Collections, vol. 42, 43, nos. 1372, 1376; vol. 44,
no. 1374; vol. 45, no. 1419.

Contributions to Knowledge, vol. 29, nos. 1373, 1413.

Washington:—Smithsonian Institution: Bureau of Ethnology.

20th Annual Report, 1898-99.

Bulletin 25 (Trumbull, Natick Dictionary).

Washington:—Smithsonian Institution, U.S. National Museum.

Report of U.S. National Museum, 1900-01, 1901-02.

Proceedings, vols. 25, 26.

Washington :—United States Geological Survey.

- Monographs, 44, 45.
 Atlas (large folio), to Monographs 45, 46.
 Bulletins, 191, 195-218, 222.
 Professional Papers, nos. 9, 10, 13, 14, 15.
 Mineral Resources of the U.S., 1901.
 Water-supply Papers, nos. 65-87.

SOUTH AMERICAN STATES.

Mexico :—Instituto Geológico.

- Parergones, tomo 1, no. 1.

Mexico :—Sociedad Científica "Antonio Alzate."

- Memorias y Revista, tomo 18, nos. 1-5; tomo 19, nos. 1-4.

Montevideo, Uruguay :—Museo Nacional.

- Anales, tomo 4, part 2; tomo 5, serie 2, entr. 1.
 Flora Uruguaya, tomo 2, part 1.

EUROPEAN SOCIETIES AND INSTITUTIONS.

Bergen :—Bergens Museum.

- Aarsberetning for 1903.
 Aarbog, 1903, hefte 1, 2, 3.
 Crustacea of Norway (G. O. Sars), vol. 5, parts 1, 2, 3, 4.

Bruxelles :—Société Royale Malacologique de Belgique.

- Annales, tome 37 (1902).

Christiania :—Videnskabs-selskabet.

- Forhandlinger, 1902.

Copenhagen :—Naturhistoriske Forening.

- Videnskabelige Meddelelser, 1903.

Dresden :—Naturwissenschaftliche Gesellschaft "Isis."

- Sitzungsberichte and Abhandlungen, 1903, Juli bis Dezember.

Kiew, Russia :—Société des Naturalistes de Kiew.

- Comptes Rendus, tome 18 (année 1901).

Marseilles :—Faculté des Sciences.

- Annales, tome 11.

Paris :—Muséum d'Histoire Naturelle.

- Bulletin, 1900, nos. 5, 6; 1901, nos. 4, 5, 6; 1903, nos. 1-6.

Prague, Bohemia:—Königliches Museum Böhmens.

Archiv der naturwissenschaftlichen Landesdurchforschung von Böhmen,
 Band 10, nos. 2, 5; Band 11, nos. 1-4, 6; Band 12, no. 6;
 Band 9, nos. 5, 6.

Stockholm:—Kongliga Svenska Vetenskaps-Akademien.

Arkiv för Matematik, etc., band 1, heft 1, 2.
 „ Kemi, etc., band 1, heft 1, 2.
 „ Botanik, band 1, heft 1-3, 4; band 2, heft 1-3.
 „ Zoology, band 1, heft 1, 2.
 Aarsbok, 1903.
 Handlingar, band 36, 37; nos. 1, 2, 4, 5, 6, 7, 8.
 Bihang, band 28, 1902-03, in 4 sections.
 Lefnadsteckningar, band 4, nos. 1, 3.

Upsala:—Geological Institution, University of Upsala.

Results of the Swedish Zoological Expedition to Egypt and the White
 Nile, 1901, part 1.

Vienna:—K. k. zoologisch-botanische Gesellschaft.

Verhandlungen, Band 53, Jahrgang, 1903.

MISCELLANEOUS.

“Animal Types”—The Skate; The Norway Lobster (two pamphlets);
 Northumberland Sea Fisheries Committee: Report on Scientific
 Investigations for 1903 *Presented by Alex. Meek, M.Sc.*

Reprint, “Pulse and Rhythm,” from the Popular Science Monthly, Sep.,
 1903, by Mary Hallock-Greenewalt. *Presented by the Author.*

Handbook of British Fungi (Cooke), 2 vols.; Handbook of British
 Mosses (Berkeley); British Fungi (Stevenson), vol. 2.
Presented by N. H. Martin, F.R.S.E.

Philippine Section of the Louisiana Exposition (four catalogues), St. Louis,
 1904.

Presented by the Exposition Board, Manila, Philippine Islands.

“Nature,” July 1st, 1901, to June 30th, 1902.
Presented by the Publishers.

“Museums Journal,” July, 1901, to June, 1902.
From the Museums Association.

THE HONORARY TREASURER IN ACCOUNT WITH THE NATURAL HISTORY SOCIETY.
CURRENT ACCOUNT FROM 1ST JULY, 1903, TO 30TH JUNE, 1904.

RECEIPTS		£	s.	d.	
Balance in Bank, July 1, 1903	173	7	3		
Members' Subscriptions	344	13	0		
Museum Admission Fees	167	17	0		
Sale of Guides and Transactions	12	6	3		
Interest on Investments	164	3	0		
Balance handed over by Tyneside Naturalists' Field Club	68	12	11		
Sundries:—					
Jars sold to Cardiff Museum.....	£0	10	6		
Microscopical Society for Cleaning Room, &c.	1	12	0		
Microscopical Society, Lantern Expenses refunded	1	15	9		
			3	18	3
	£934	17	8		

A. H. DICKINSON, HON. TREASURER.

PAYMENTS.		£	s.	d.	
Salaries and Wages		430	5	2	
Fuel, Lighting, and Water		59	7	6	
Repairs to Building		46	13	1	
Materials and Fittings		42	12	6	
Printing (Transactions and miscellaneous)		169	0	3	
Incidental Expenses :—					
Insurance	£15	4	0		
Postage and Carriage	23	8	5		
Museum Specimens	1	4	1		
Advertising	26	4	3		
Stationery	4	18	7		
Property Tax	8	13	7		
Museums Association Subscription	1	1	0		
Sundries	19	1	4		
			99	15	3
Balance in Bank, 30th June, 1904.....			87	3	11
			£934	17	8

Examined with the books and vouchers and found correct.

SAM. GRAHAM, HON. AUDITOR.

TREASURER'S REPORT.

INVESTMENTS.

209

NATURAL HISTORY SOCIETY.

INVESTMENTS.

The following is a list of the Investments held by the Society at 30th June, 1904:—

	£	s.	d.
Newcastle Corporation Irredeemable Stock at 3½ per cent.	2,000	0	0
River Wear Commission Funded Debt at 4½ per cent.	500	0	0
Tyne Commissioners' Consolidated Fund at 4 per cent.	2,000	0	0
Lambton and Co., Bankers, Newcastle, on Deposit Receipt	95	3	6
	<u>£4,595</u>	<u>3</u>	<u>6</u>

A. H. DICKINSON,

HON. TREASURER.

Documents produced, and seen by

SAM. GRAHAM,

HON. AUDITOR.

*On Copepoda and other Crustacea taken off Northumberland
and Durham in July, 1904.* By GEORGE STEWARDSON
BRADY, M.D., LL.D., D.Sc., F.R.S.

(READ MARCH 14TH, 1905).

(Plates III.-VI.)

ON the 15th of July, 1904, Mr. Dent kindly placed his steamer "Stanley" at the disposal of the Northumberland Coast Club for a short dredging excursion. I was not myself able to be present, but Messrs. Meek and Gill kindly handed to me afterwards part of the results in the shape of washings from the dredged material. These washings were in very small compass, but nevertheless proved to be of extreme interest, containing a few undescribed species of Copepoda and several others new to our own district and to the British Seas. The area which was dredged over extended from off St. Mary's Island on the north to opposite Souter Point southward—a range of about six miles, the depth being about 25 fathoms. The following list embraces all the Crustacea noted by me in the washings, but, of course, many of the larger forms, as well as animals belonging to other groups, did not come under my notice at all.

CUMACEA.

Eudorella truncatula, Sp. Bate.

AMPHIPODA.

Metaphoxus fultoni (T. Scott).

Ampelisca assimilis, Boeck.

Paratylus vedlomensis (Sp. Bate).

Amphilochus manudens, Sp. Bate.

Amphilochoides odontonyx, Boeck.

Photis reinhardi, Kröyer.

Dulichia porrecta, Sp. Bate.

ISOPODA.

- Leptognathia filiformis*, Lilljeborg.
„ *breviremis*, Lilljeborg.
„ *longiremis*, Lilljeborg.
Pleurogonium inerme, G. O. Sars.

COPEPODA.

- Longipedia coronata*, Claus.
„ *scotti*, G. O. Sars.
Microsetella rosea (Dana).
Delavalia pygmaea, n. sp.
Amymone falcata, Norman.
Ameira breviremis, n. sp.
Stenhelia meeki, n. sp.
„ *limicola*, Brady.
„ *denticulata*, I. C. Thompson.
Tetragoniceps bradyi, T. Scott.
Laophonte denticulata, T. Scott.
Cletodes limicola, Brady.
Thalestris robusta, n. sp.
„ *denti*, n. sp.
Oncaea anglica, n. sp.
Cyclopina littoralis, Brady.

Respecting these lists the following items of interest may be noted. *Pleurogonium inerme* had not previously been recognized with certainty as belonging to our district—nor had the typical *Longipedia coronata*, Claus, the form heretofore ascribed to that species being really a closely allied one which has been provided by Professor G. O. Sars with a new name—*L. scotti*. *Tetragoniceps bradyi* and *Laophonte denticulata* are interesting additions to the local fauna, but had been previously found and described by Dr. Scott. The two new species of *Thalestris* are described on the strength of single male specimens only, but are nevertheless, as I think, quite sufficiently characterised. The genus *Oncaea* has not previously been met with, as I believe, in the British area, though many species from more

southern habitats have been described by Giesbrecht and other writers. I cannot, however, identify our Northumbrian specimen with any of these: it is here figured as fully as possible. An interesting fact connected with this collection is that two such extremely distinct and easily recognized creatures—both of them of distinctly southern distribution—should have occurred in this dredging, but have never before been found in British waters. It seems probable that both species—which are really pelagic in habit—were captured not at the bottom, but on the passage of the dredge upward to the surface. And it is not unreasonable to suspect that there may have been a previous prevalence of southerly winds or currents which might have brought into our latitude these certainly unusual visitors. It should be noted here also that one of the new species of *Thalestris* (*T. robusta*) was taken, not on the dredging excursion here recorded, but on the shore at Cullercoats.

GENUS MICROSETELLA, Brady and Robertson.

Body cylindrical, tapering towards each extremity (Plate III., fig. 1), head coalescent with the first thoracic segment, cephalothorax composed of four, abdomen of five segments, caudal segments short and bearing long terminal setæ, rostrum short, falciform. Antennules of moderate length (fig. 2) five-jointed, bearing on the third joint a stout sensory appendage. First four pairs of feet (fig. 3) having both branches three-jointed, the outer branch shorter than the inner, fifth pair (fig. 4) foliaceous. (The antennule of the *male* forms a strong prehensile organ, and the feet of the fifth pair are much smaller than those of the female.—Giesbrecht).

The genus *Microsetella* was established by myself in concert with my friend the late Dr. Robertson in 1873, but I afterwards * withdrew the generic name, uniting the genus with the previously described *Ectinosoma* from which the comparatively small differences seemed to me scarcely sufficient

* See Monograph of the British Free and Semiparasitic Copepoda, vol. ii., p. 13.

to separate it. But Dr. Giesbrecht has still more recently restored the term *Microsetella*, and has been followed by Professor G. O. Sars in his great work on the Crustacea of Norway. The distinctive characters are perhaps as good as are now generally held sufficient in other cases, and I here, though with some misgivings, follow the lead of these excellent authorities in reinstating the original name. The genus differs from *Ectinosoma* chiefly in the greater length of the antennules and tail setæ, and in its purely pelagic habitat.

***Microsetella rosea*, Dana (Plate III., figs. 1-4).**

1852. *Canthocamptus roseus*, Dana, Crustacea of the U.S. Exploring Expedition, p. 1189, plate 83, fig. 10.
 1892. *Microsetella rosea*, Giesbrecht, Systematik und Faunistik der pelagischen Copepoden des Golfes von Neapel, p. 550, Taf. 44, figs. 32, 35, 37, 38, 41, 43, 46, 48, 49.

This species is easily distinguished from *M. atlantica* by its larger size and its extremely long tail setæ, which are not far from twice as long as the body of the animal; the feet of the fifth pair are also quite different. The male is unknown. Length (exclusive of tail setæ) .80 mm. Only one specimen was seen, notwithstanding a most careful hunt over the entire washings from the dredge. The animals belonging to this genus are, however, so far as at present known, entirely pelagic in habit, and seem ill-adapted for life on the sea bottom. It is therefore probable that our specimen was captured by the dredge on its way up from the bottom, and though the tow-nettings taken on the same excursion did not contain further specimens, it is not unlikely that more might have been obtained in nets worked at some distance from the surface. This specimen was evidently imperfect, having, as shown in the figures, lost many small setæ from feet and antennæ. The only previously recorded habitats are the Sooloo Sea (Dana), in lat. 0°-11° N., long. 108°-124° W., depth up to 1000 meters, and at Naples (Giesbrecht).

GENUS DELAVALIA, Brady.

Delavalia pygmaea, n. sp. (Plate III., figs. 5-10).

Female.—Antennules (fig. 5) eight-jointed, short and rather stout, scarcely as long as the first cephalo-thoracic segment, clothed with numerous long hairs, first and third joints considerably longer than the rest, which, except the very short fifth, are nearly equal in length. Antennæ (fig. 6) quite equal in length to the antennules, bearing a long, slender three-jointed secondary branch, the middle joint very short. Inner branch of the first pair of feet (fig. 7) equal in length to the outer branch, two-jointed and destitute of setæ except at the apex, the distal joint equal in length to the two terminal joints of the outer branch; outer branch composed of three equal joints, first and second joints bearing a single stout seta at the external distal angle, last joint with four slender apical setæ: second, third, and fourth pairs sparingly setiferous (fig. 8), the outer branch longer than the inner. Fifth pair (fig. 9) small and foliaceous, basal joint very wide and short, bearing five rather widely separated setæ on the inner lobe, and one seta on the outer angle; second joint obovate, its distal margin bearing four subequal setæ. Caudal stylets (fig. 10) short, fully twice as long as broad, the longest of the terminal setæ about thrice as long as the stylet. Male unknown.

One specimen only was taken, and this was dissected without measurements and general drawings having been made. The mouth organs were not seen, but the general aspect of the animal agreed with that of the family to which it belongs. It is, however, much more minute than other described species of *Delavalia*.

GENUS AMEIRA, Boeck.

Amelra breviremis, n. sp. (Plate III., figs. 11-14;

Plate IV., figs. 1-6).

Female.—Animal rather robust and stout, rostrum short and slender, limbs unusually short (Plate 4, fig. 1), caudal stylets

rather longer than broad (Plate 4, fig. 6), the principal tail seta about half as long as the body. Antennules short and moderately stout (Plate 3, fig. 11), equal in length to the antennæ, eight-jointed and densely setiferous; antennæ (Plate 3, fig. 12) bearing a small one-jointed secondary branch; posterior footjaw (Plate 3, fig. 14) having an angular subquadrate hand with a flexuous terminal claw and two marginal setæ, the basal joint also bears two or three setæ near its distal extremity. Inner branch of the first pair of swimming feet (Plate 3, fig. 13) slender, elongated, its first joint somewhat longer than the entire outer branch, the two distal joints short and nearly equal, and bearing two long slender apical setæ; outer branch three-jointed, joints nearly equal, setose on the outer margin, and with a long spine-like seta at each apex, the last joint bearing also slender terminal setæ; second, third, and fourth pairs (Plate 4, fig. 3) composed of two equal three-jointed branches; fifth pair with a very broad and shallow basal joint (Plate 4, figs. 4, 5) and an elongated narrow distal joint, which is abruptly tapered at each extremity, bearing several marginal setæ and, near the apex of the inner margin, a single spine-like seta: the basal joint is armed with a long seta at its inner angle, following which is a stout spine divided at its apex into three hair-like processes, then a shorter lancet-shaped spine, followed by a still smaller one of the same type, and one or two very small hairs; the outer angle bears the usual seta. Length, exclusive of tail setæ, 0.38 mm. (1.66th in.).

This species, of which only one example was taken, is very similar in most respects to *Delavalia mimica*, T. Scott,* and had it not been for the equality of length in the branches of the swimming feet I should have been disposed to refer it to that species, though there are in addition to this character some other rather important differences. The antennule in Dr. Scott's species seems to be longer, the inner branch of the first foot considerably stouter, and the armature

* Fifteenth Annual Report of the Fishery Board for Scotland (1897), p. 150, pl. 1, figs. 1-9.

of the fifth pair of feet somewhat different, though the same in general character. Perhaps a more important divergence is in the antennæ, which in *D. mimica** are similar "to those of *D. reflexa*": these appendages in *D. reflexa* have a three-jointed secondary branch, while in *A. breviremis* the branch consists only of a single joint.

GENUS STENHELIA, Boeck.

Stenhelium meeki, n. sp. (Plate IV., figs. 7-16).

Female.—Antennules eight-jointed and densely clothed with setæ (fig. 7), the first two joints wider than the rest, outer margin of the fourth joint much produced distally, last joint dilated and truncated at the apex, about twice as long as broad, considerably longer than any of the four preceding joints. Secondary branch of the antennæ two-jointed (fig. 8): chewing lobe of the mandible divided into several slender teeth, and at the inner angle bearing several fine hairs (fig. 9). Posterior footjaw somewhat elongated and slender, basal joint with two apical setæ; hand oblong-ovate, bearing on the proximal margin several fine short hairs, and distally two long slender setæ; terminal claw long and slender (fig. 11). Outer branch of the first pair of feet (fig. 12) about equal in length to the first joint of the inner branch; marginal spines very long and slender; the two distal joints of the inner branch very slender, and together equal in length to the first joint: the second, third, and fourth pairs having both branches of nearly equal length (fig. 13); basal joint of the fifth pair (fig. 14) deeply excavated, the outer lobe elongated, tapering, and bearing a single seta; inner lobe obliquely truncated, with three or four terminal setæ and two marginal spines; distal joint elongated, subovate, and fringed with about five slender setæ. Caudal stylets (fig. 16) nearly thrice as long as broad, with obtuse, subtruncate apices; terminal setæ short, and apparently arising from elongated pits in the substance of the furca.

* Dr. Scott's species is, I think, wrongly referred to *Delavatia*, in which genus the inner branch of the first foot is only two-jointed.

This is a very minute species, and only one specimen was seen. It is in some respects very like *Stenhelia hirsuta*, Thompson, but the antennules, mandible, caudal stylets, and secondary antennal branch—which is distinctly two-jointed—are very different. The specific name is given in recognition of Mr. Meek's unwearied and very efficient services to the marine Natural History and Fisheries of our district.

GENUS TETRAGONICEPS, Brady.

Tetragoniceps bradyi, Scott (Plate V., figs. 1-10).

Tetragoniceps Bradyi, Scott, Tenth Annual Report of the Fishery Board for Scotland, p. 253, Plate 9, figs. 19-32.

Female.—Antennules nine-jointed (fig. 2) about as long as the first cephalo-thoracic segment, first joint as long as the united lengths of the five following joints, second produced into a strong curved spine; last joint equal to the conjoined length of the three preceding ones: antennæ bearing a small one-jointed secondary branch. Posterior footjaws three-jointed (fig. 3), slender, elongated, with a long slender terminal claw and two or three marginal setæ. All the swimming feet have a two-jointed inner and a three-jointed outer branch; inner branch of the first pair (fig. 4) twice as long as the outer branch, its proximal joint very slender, and four times as long as the small distal joint. Second, third, and fourth pairs (figs. 5, 6, 7) having the outer branches very much longer than the inner, and increasing progressively in length from the second to the fourth pair, the inner branches decreasing in a like ratio; fifth pair unusually large (fig. 8), enveloping the entire ovisac, ovate, with crenulated margins which are sparingly setiferous, distal extremity truncated: caudal stylets (figs. 9, 10) bulbously dilated at the base, the inner margin of which is deeply sinuous, and ends in one moderately long seta and a much shorter external one. Length 0.77 mm. The male is unknown.

I have seen only one specimen of this interesting species, the details of which are here figured so far as I have been

able to isolate them. Dr. Scott, of the Scottish Fishery Board, has taken and described specimens found in the Firth of Forth, where, however, he states that they are scarce. The Northumbrian specimen agrees exactly with those figured by Scott, except in the absence of numerous setæ which have no doubt been abraded in the process of capture.

GENUS *THALESTRIS*, Claus.

Thalestris robusta, n. sp. (Plate V., figs. 11-17).

Male.—Antennules (fig. 11) seven-jointed, the third joint short and much narrower than the second and fourth, as is usual in the males of this genus: hand of the posterior foot-jaw ovate (fig. 12), and bearing a slender curved apical claw, which is finely ciliated along its inner margin; first pair of swimming feet (fig. 13) very stout, the two branches of nearly equal length, their outer margins fringed with short setæ, terminal claws strong, falcate, and pectinated on their concave margins; inner branch of the second pair of feet (fig. 14) bearing a long spine-like seta at the apex of the second joint, third joint much narrower and bearing slender setæ; inner branches of the third and fourth feet (fig. 15) much shorter than the outer branches; fifth pair (fig. 16) densely setose, and bearing also several strong spine-like setæ, inner lobes shallow, only slightly produced, outer lobes moderately long and ovate. Caudal stylets robust, scarcely as long as broad (fig. 17), terminal setæ very stout; angles of the abdominal somites and of the caudal stylets fringed with stout hairs.

This species occurred in a gathering from tidal pools at Cullercoats, and though only one specimen was found, the characters are so distinct and well marked that I cannot hesitate as regards its claim to specific rank. The animal is very minute, but I unfortunately have no record of its measurement.

Thalestris denti, n. sp. (Plate VI., figs. 10-15).

Male.—Antennules five-jointed, very robust, of nearly equal thickness throughout, excepting the third joint, which is much narrower than the rest (fig. 10), last joint truncated at the

apex, fringed with a few short hairs, and bearing also three or four long setæ. Posterior footjaw (fig. 11) short and stout, the hand ovate, and having a single marginal seta, terminal claw short and strongly curved: first pair (fig. 12) of feet with branches of equal length, their outer margins finely setose, terminal claws long and slender: inner branches of the third and fourth pairs (fig. 14) equal in length to the first two joints of the outer branch; inner joint of the second pair very robust (fig. 13), outer apical angles of the first and second joints produced into strong spines, second joint bearing also two spine-like setæ, which are at least twice as long as the last joint: last joint small, narrow, and tapered to the slightly hooked apex. Caudal stylets (fig. 15) short and stout, bearing a single long robust seta and three short ones, distal margins of the last abdominal segment finely pectinated.

The curiously robust and truncated character of the antennules, together with the abnormally small number of joints, induced the suspicion of mutilation or distortion of the specimen, but the antennules of the two sides are precisely alike, and have no appearance of injury: moreover the build of the posterior footjaws and second pair of swimming feet does not agree, so far as I know, with any described species. The most closely allied forms seem to be *Thalestris polaris* and *T. frigida*, described by Dr. Thomas Scott in his paper on "The Crustacea of Franz-Josef Land."*

I have pleasure in naming this species after Alderman J. Dent, to whose generosity in many ways the naturalists of Northumberland and Durham are greatly indebted.

GENUS ONCAEA, Philippi.

Cyclopoid in shape: cephalothorax and abdomen of the *female* five-segmented. Mandibles not hatchet-shaped, but having a crest of teeth and bristles. Maxillæ one-jointed. Swimming feet with long slender internal branches, those of the fourth pair half as long again as those of the first and second pair combined. Fifth foot small, rod-, or knob-shaped. Mouth

* Linnean Society's Journal—Zoology—vol. xxvii.

organs of the male like those of the female. Antennules of the *female* six-jointed, with a long middle joint. Antennæ three-jointed. Anterior maxilliped with plumose segments. Posterior maxillipeds four-jointed, margin of the hand fringed with setæ. Outer branches of the swimming feet armed with lancet-shaped spines, the edges of which are finely denticulated. Abdomen of the *male* five-segmented, the median segment very short, genital segment voluminous, with produced lateral angles. Posterior maxilliped more movably jointed than in the *female*, its claw more strongly bent: the three short terminal joints of the antennules anchylosed: other sexual characters unimportant.

The foregoing generic definition is taken—with some abbreviation—from Giesbrecht's work on the Neapolitan Copepoda. Some of the characters I have had no opportunity of verifying—the specimen here described and figured being the only one known to me.

***Oncaea anglica*, n. sp. (Plate VI., figs. 1-9).**

Female.—General appearance much like *Corycaeus*. Last thoracic segment short and small (fig. 9), first abdominal segment very large, more than twice as long as the combined length of the four following segments (fig. 9), caudal stylets nearly thrice as long as broad, quite equal in length to the united fourth and fifth abdominal segments, bearing on the outer margin a single rather long seta near the base, and at the apex five setæ of various length, the longest about equal in length to the whole abdomen. Antennules six-jointed (fig. 1), the third and sixth joints bearing numerous long setæ. Antennæ four-jointed (?), the last joint bearing at the proximal end four strong curved setæ, and at the distal end five similar but larger setæ (fig. 2). Anterior maxilliped (fig. 3) divided apically into two digitiform processes which bear numerous marginal setæ: posterior maxilliped ending in a powerfully clawed hand (fig. 4), the inner margin of which is armed with two spine-like setæ; the claw nearly as long as the hand itself,

and finely setose for nearly its whole length. Outer branches of the swimming feet (figs. 5, 7) three-jointed, the middle joint small, outer margins bearing foliaceous lancet-shaped spines with finely denticulated edges, the spines arranged on the various joints as follows—on the first foot 1, 1, 3, second foot 1, 1, 3, third foot 1, 1, 2, fourth foot 1, 1, 2; besides the marginal spines there is on each foot an apical spine, longer than the rest, but denticulated only on the outer edge; the inner margin of the limbs setiferous: inner branches of all the feet three-jointed, the third joint variable in length, but always much longer than the combined lengths of the first two joints—that of the first foot (fig. 5) bearing a single lancet-shaped apical spine; second foot produced at the apex into a short, blunt process, and bearing on the margin near the apex two slender pectinated spines (fig. 6); inner branch of the third foot (fig. 7) having a slender produced apex, at each side of which are two pectinated spines; fourth foot (fig. 8) very much like the third, but having in addition a small marginal seta attached not far from the apical spines; fifth pair of feet (fig. 9 *a*) minute, one-jointed, with two fine apical setæ.

Only one specimen—a female—of this interesting species could be found, notwithstanding a most careful search over the whole gathering. I am therefore unable to confirm Giesbrecht's definition as to the characters of the male. I have some doubt, however, as to the three-jointed character of the antennæ. In my specimen there seems to be a fourth (basal) joint as shown in the figure, but this is only rather obscure, and it is possible that the species may, in this respect also, conform to Giesbrecht's definition.

EXPLANATION OF PLATES.

PLATE III.

MICROSETELLA ROSEA. ♀

- Fig. 1. Seen from right side $\times 84$.
 2. Antennule $\times 280$.
 3. One of the swimming feet $\times 210$.
 4. Foot of fifth pair $\times 210$.

DELAVALIA PYGMAEA. ♀

5. Antennule $\times 440$.
 6. Antenna $\times 440$.
 7. Foot of first pair $\times 440$.
 8. „ fourth pair $\times 300$.
 9. „ fifth pair $\times 440$.
 10. Posterior abdominal segments and tail $\times 210$.

AMEIRA BREVIREMIS. ♀

11. Antennule $\times 210$.
 12. Antenna $\times 210$.
 13. Foot of first pair $\times 210$.
 14. Posterior footjaw $\times 440$.

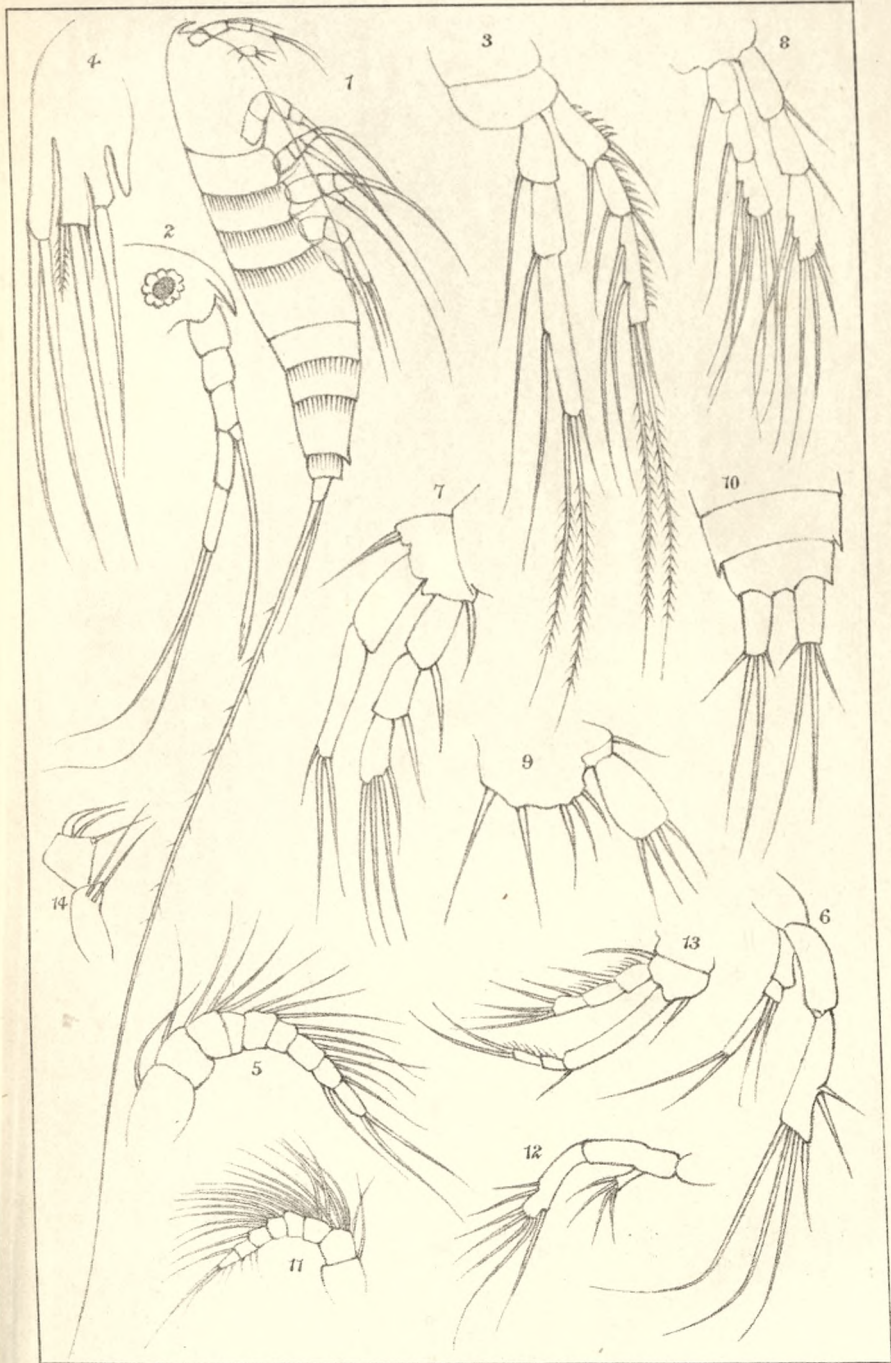
PLATE IV.

AMEIRA BREVIREMIS. ♀

- Fig. 1. Seen from right side $\times 150$.
 2. Anterior footjaw $\times 440$.
 3. Foot of third pair $\times 210$.
 4. „ fifth pair $\times 210$.
 5. „ „ $\times 550$.
 6. Furca $\times 210$.

STENHELIA MEEKI. ♀

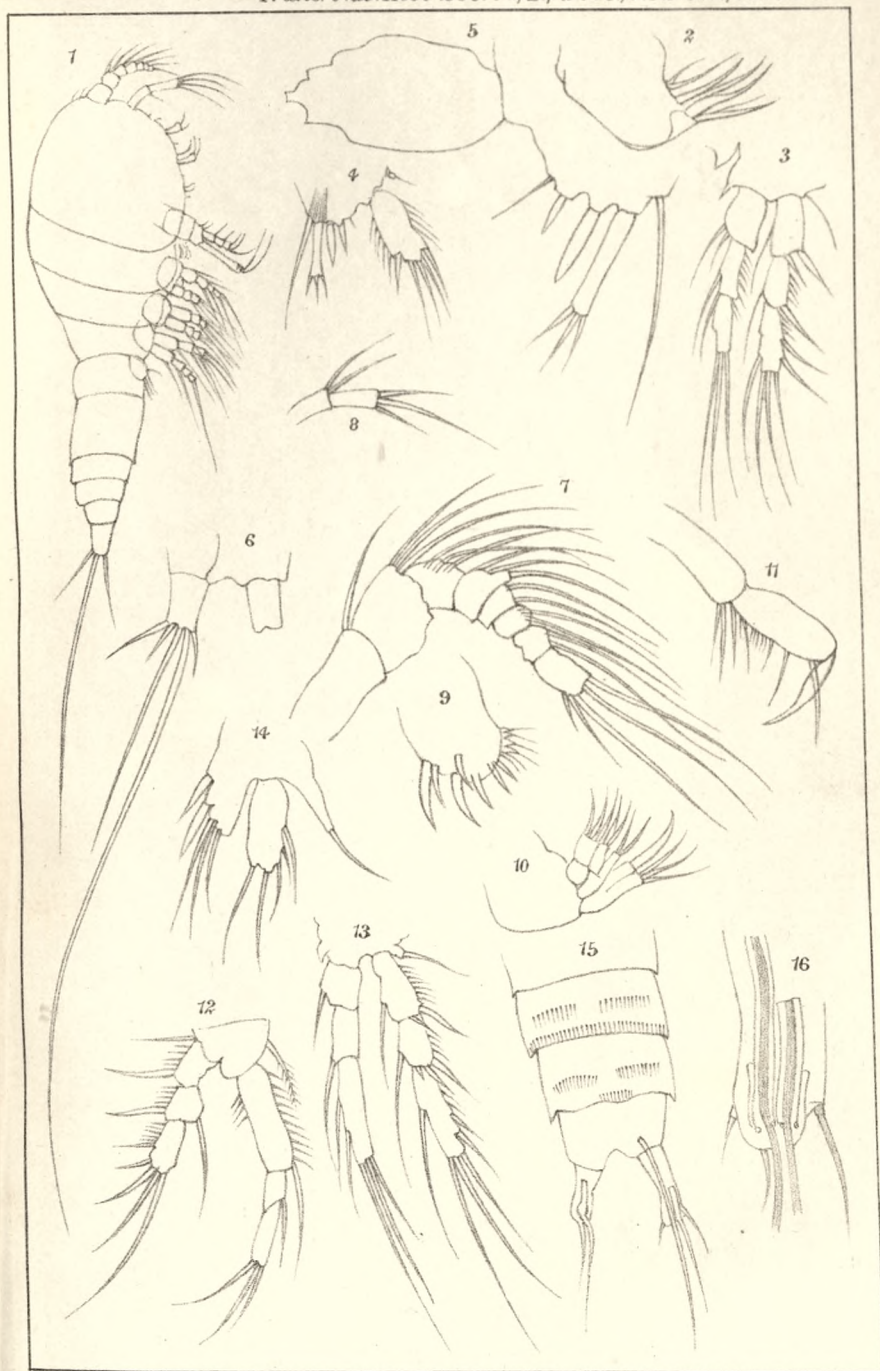
7. Antennule $\times 210$.
 8. Secondary branch of antenna $\times 280$.
 9. Chewing lobe of mandible $\times 440$.
 10. Anterior footjaw $\times 300$.
 11. Posterior footjaw $\times 300$.
 12. Foot of first pair }
 13. „ third pair } $\times 210$.
 14. „ fifth pair }
 15. Posterior segments of abdomen and furca $\times 120$.
 16. Caudal stylet $\times 400$.



G. S. Brady del.

G. West & Sons lith.

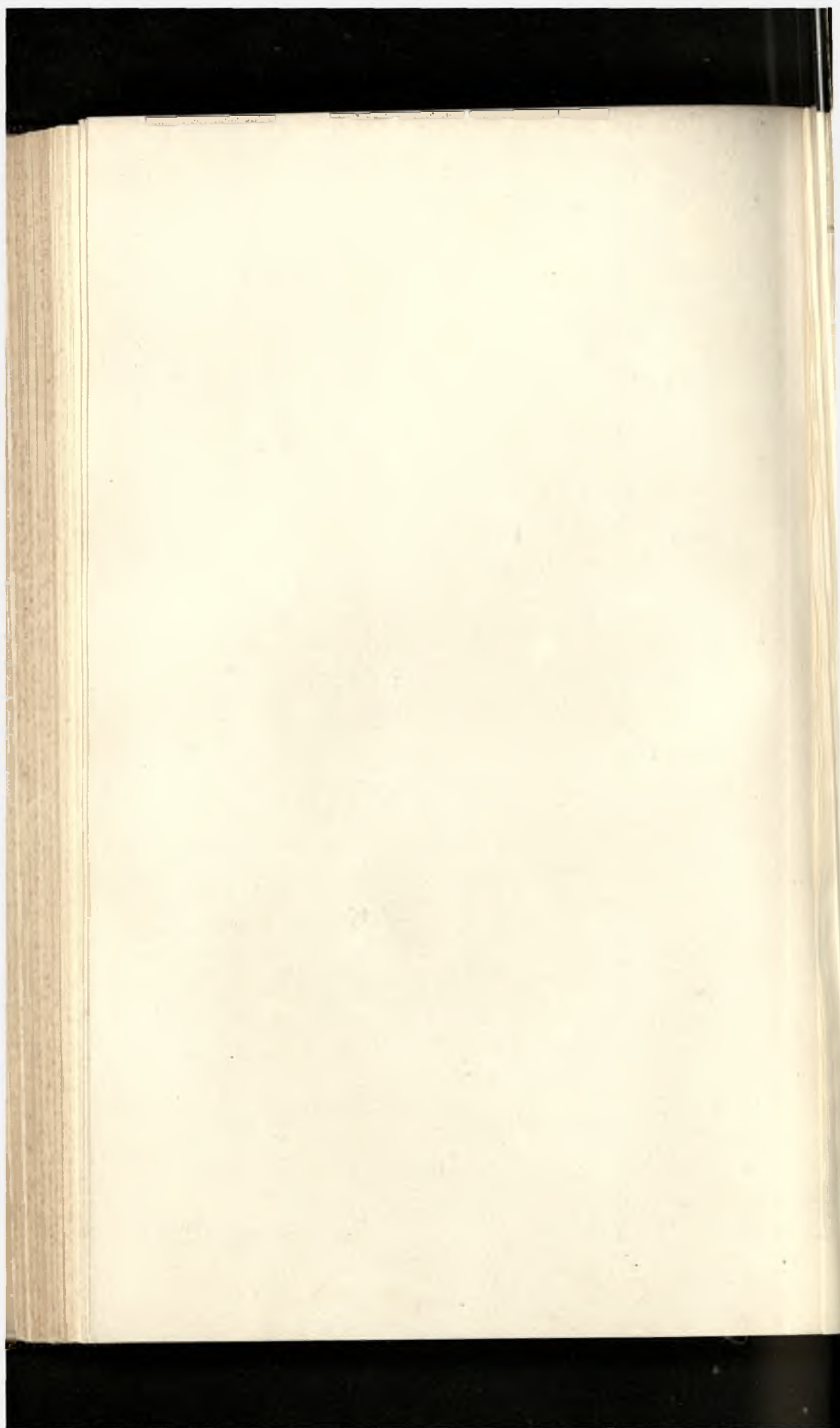
- 1-4. MICROSETELLA ROSEA.
 5 10. DELAVALIA PYGMÆA.
 11 14. AMEIRA BREVIREMIS.

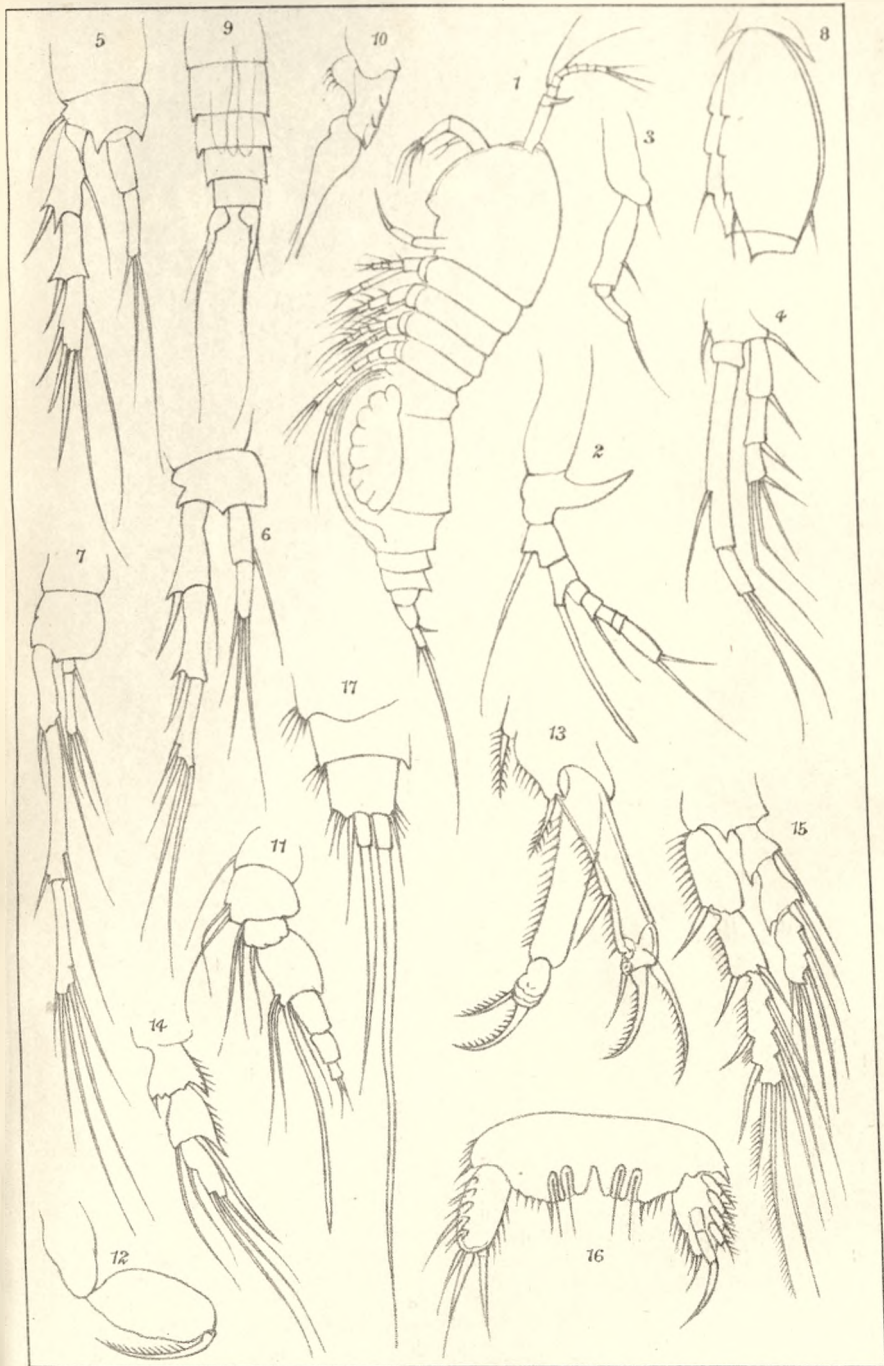


G. S. Brady del.

G. West & Sons lith.

1-6. AMEIRA BREVIREMIS.
7-16. STENHELIA MEEKI.

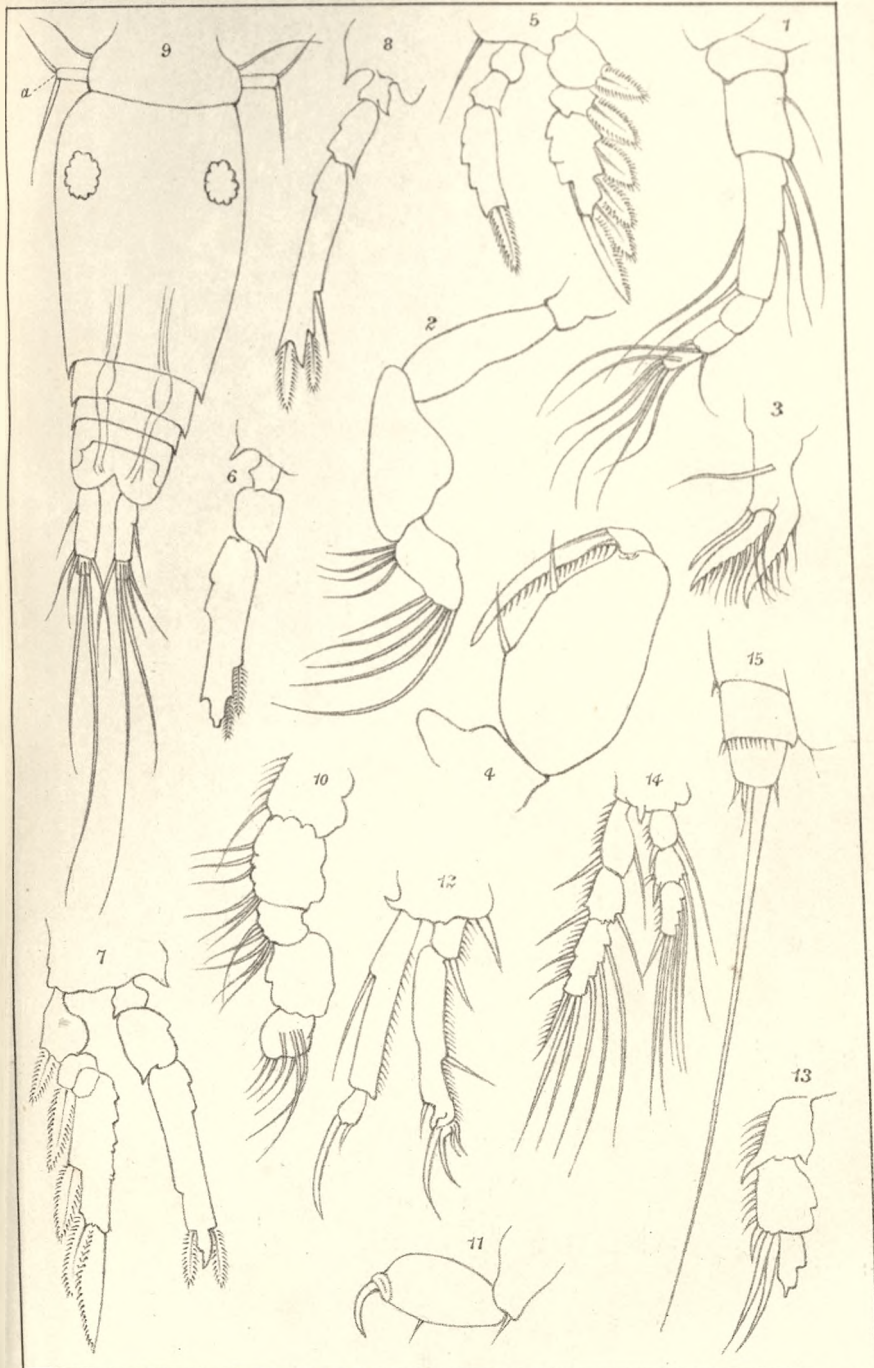




G. S. Brady del.

G. West & Sons lith.

1-10. TETRAGONICEPS BRADYI.
11-17. THALESTRIS ROBUSTA.



G.S. Brady del.

G. West & Sons lith.

1-9. ONCAEA ANGLICA.
10-15. THALESTRIS DENTI.

PLATE V.

TETRAGONICEPS BRADYI. ♀

Fig. 1. Female, seen from left side $\times 90$.

2. Antennule $\times 210$.
3. Posterior footjaw $\times 300$.
4. Foot of first pair $\times 250$.
5. „ second pair $\times 250$.
6. „ third pair $\times 250$.
7. „ fourth pair $\times 210$.
8. „ fifth pair $\times 90$.
9. Abdomen and tail $\times 84$.
10. Base of caudal stylet $\times 210$.

THALESTRIS ROBUSTA. ♂

- | | |
|---------------------------------|------------------|
| 11. Antennule | } $\times 240$. |
| 12. Posterior footjaw | |
| 13. Foot of first pair | |
| 14. „ second pair, inner branch | |
| 15. „ fourth pair | |
| 16. Fifth pair of feet | |
| 17. Caudal stylet and setæ | |

PLATE VI.

ONCAEA ANGLICA. ♀

Fig. 1. Antennules $\times 140$.

2. Antenna $\times 240$.
 3. Anterior footjaw $\times 300$.
 4. Posterior footjaw $\times 240$.
 5. Foot of first pair $\times 140$.
 6. „ second pair, inner branch
 7. „ third pair
 8. „ fourth pair, inner branch
- | | |
|---|-----------------------|
| } | Marginal setæ omitted |
| | $\times 140$. |
9. Abdomen and furca $\times 140$.
with fifth pair of feet (a)

THALESTRIS DENTI. ♂

10. Antennule $\times 200$.
11. Posterior footjaw $\times 240$.
12. Foot of first pair $\times 240$.
13. Inner branch of second foot $\times 240$.
14. Foot of third pair $\times 150$.
15. Caudal stylets $\times 140$.

Notes on some Additions, etc., to the Coleoptera of the Northumberland and Durham District. BY RICHARD S. BAGNALI, F.E.S.

READ MARCH 14, 1905.

It is more than thirty years since Mr. Bold's Catalogue of our beetle-fauna was published in these Transactions, and since then little locally seems to have been done in that study.

As this is the case the following notes may be interesting, and, however trivial many may appear, will, I think, prove useful in the compilation of a new and revised local list.

These notes do not pretend to be in any sense complete, but rather a few records and observations, which, at Mr. Gill's request, I have put together in the form of a short paper, hoping by so doing to stimulate a more active and local interest in this engrossing branch of Entomology.

Thirteen species (eleven imported) and one variety herein noted have but recently been, or will shortly be, introduced to the British Catalogue, and such are marked with a double asterisk (**); several species and varieties not mentioned by Bold in his local list (Nat. Hist. Trans. of Northumberland and Durham, vol. iv., part i., 1871) and therefore regarded as new to the two counties, are marked with a single asterisk (*), whilst those against which I have placed a dagger (†) have not been hitherto, so far as I am aware, recorded from the county of Durham. The numbers in front of each name are those used in the latest British Catalogue, and are invaluable for reference ⁽¹⁾.

Of course several of these species, such as ***Tetropium castaneum*, **Callidium violaceum*, **C. variabile*, †*Clytus arcuatus*, **Monohammus sartor*, †*M. sutor*, ***M. titillator*, †*Acanthocinus ædilis*, **Bruchus pisi*, **Lucanus cervus*, in being imported, bear little faunistic value, but are interesting

⁽¹⁾ Catalogue of British Coleoptera, by T. Hudson Beare, B.Sc., F.R.S.E., F.E.S., and H. St. J. K. Donisthorpe, F.Z.S., F.E.S., March, 1904.

as showing how an insect may be introduced by commerce (witness *Callidium violaceum*), spread, and in the course of time become indigenous to the country.

Just a few words to show how much working scope there is for coleopterists in our district. Comparatively speaking Northumberland and Durham possess a large beetle-fauna. One thousand five hundred and twenty-seven species were catalogued by Bold, ⁽¹⁾ but out of these, owing to erroneous identification, etc., several must be deleted: not a few are very doubtful, whilst a number are introduced species. Up to Mr. Gardner's time the Hartlepool and Tees Valley district was practically unknown, but by his energetic collecting a large number of rare and exceedingly interesting beetles have been discovered (besides introduced species), of which may be mentioned several species of *Carabidæ*, *Haliplidæ*, etc., etc., new to our list, **Aphodius tessellatus*, **Cyrtusa minuta*, various *Agathidium* and *Liodes*, *Anisotoma dubia*, and varieties, †*A. badia*, **A. punctulata*, Gyll. (*litura*, Steph.), *A. calcarata*, **A. triepkei*, **A. lunicollis*, †*A. rugosa*, *Hydnobius perrisi*, *H. punctatissimus*, and other rarities too numerous to mention here, but which, however, will be enumerated in the Victoria History of Durham ⁽²⁾. Our coastline will yet, I am sure, add many more species to the list, and miles and miles of moorland, unworked owing to their general inaccessibility, remain to be opened out. For instance, on the moors near Blanchland, hap-hazard collecting one cold windy day early last April, produced an oil beetle (*Meloe violaceus*) new to us; two very nice moorland Coleoptera, †*Cymindis vaporariorum* and †*Bembidium nigricorne*, and a rather nice Hemipteron (†*Zicrona cœrulea*).

Again my own district, the Derwent Valley, or rather a small portion of it (by Messrs. Bold and Hardy, one of our best

(1) A further list of thirty-three additional species was published in the same volume, part ii. (1872), pages 371 to 379, thus making a grand total of one thousand five hundred and sixty species.

(2) A full account of Mr. Gardner's most interesting captures will, we hope, be shortly published in these Transactions.

worked sub-districts), as a result of spare time collecting during the last three years, has given us two indigenous species new to the British Catalogue (*Lathridius bergrothi* and *Triplax bicolor*, the latter species described in these Transactions), and twenty or more additions to our counties' list. Surely there is yet a lot of work to do in connection with our local beetles, and that without going into the more interesting questions of life-histories, variation, etc.

Several introduced species—mostly taken by Mr. Gardner—with records, etc., of not a few species new to the British list of imported Coleoptera, are held over for a future paper.

Many of these notes have already appeared in either the "Entomologist's Monthly Magazine" or the "Entomologist's Record and Journal of Variation."

In concluding this rambling introduction I must thank all those entomologists and friends who have, in many ways, so kindly helped me.

†15. *Carabus monilis*, F.

Taken in Sunderland by Mr. James W. Corder.
"Twizell," P. J. Selby, (N. H. Trans., p. 6) ⁽¹⁾.

41. *Clivina collaris*, Hbst.

Local. Lockhaugh in spring.

*106. *Harpalus quadripunctatus*, Dj.

This species is recorded from Newcastle by Canon Fowler (Brit. Col., vol. i., p. 52), from whom I quote:—

"A very local northern species, chiefly confined to the Highlands of Scotland, Braemar, Aviemore, &c., Newcastle; recorded by Mr. W. G. Blatch from Cheddar; it has also occurred in Ireland."

Quadripunctatus very much resembles *H. latus* of Linnæus, but is distinguished by being slightly larger and more parallel with a slight steel-blue reflection; the thorax is not furnished with the testaceous edge so evident in *latus*, whilst on the apical half of the third

⁽¹⁾ N. H. Trans., an abbreviation for Natural History Transactions of Northumberland and Durham, iv., pt. 1, 1871.

interstice of each elytron are two or three large pores which are wanting in that species. Length, 9-10 mm.

- †108. *H. rufimanus*, Marsh. (*tardus*, Brit. Cat.).

Fairly common near Winlaton. Bold records it from Hetton Hall, Twizell, and Newcastle (N. H. Trans., p. 11), and Canon Fowler says (Brit. Col., vol. i., p. 52, *H. tardus*, Panz., *fröelichi*, Sturm.) it is common all along the East Coast, inland as well as on the shore.

133. *Pterostichus parumpunctatus*, Germ.

Nearly all Bold's localities for this rarity—taken only in these two counties—have succumbed to the progress of civilisation. Mr. Newbery tells me his examples were taken on the banks of the Wear, and my friend Mr. Corder has taken it not uncommonly under gatherings of dead leaves in the gardens and kitchen areas of Ashbrook Terrace, Sunderland—a habitat totally different to the habitats mentioned by Bold.

- *179v. *Calathus melanocephalus*, L., var *nubigena*, Hal.

Not uncommon on the Blanchland moors and similar localities (Ento. Rec., 1904, p. 260).

- †180. *C. micropterus*, Duft.

"Rare, Hedgehope and Cheviot," Mr. J. Hardy (N. H. Trans., p. 8).

Local near Corbridge (April, 1903, and April, 1904) and Blanchland (April, 1904).

- *192. *Anchomenus sexpunctatus*, L.

On April 13th, 1903, I met a fellow coleopterist who had just taken a strange *Anchomenus* from the moors near Blanchland: the six "punctures" being distinctive, I naturally put it down to *A. sexpunctatus*, L., but hope shortly to make a closer acquaintance, and so record it definitely (Ento. Rec., 1904, p. 260).

†234. *Bembidium nigricorne*, Gyll.

241. *B. stomoides*, Dj.

Bembidium stomoides, Dj., and *B. nigricorne*, Gyll., in the Derwent Valley :—

This spring I took the above species in our district : *B. stomoides*, Dj. (April 12th), at Lockhaugh, near Rowlands Gill, and *B. nigricorne*, Gyll. (April 4th), from the Blanchland moors.

I quote the following from Canon Fowler's work (Brit. Col., vol. i., pp. 110 and 112) :—

"*B. nigricorne*, Gyll. : Sandy heaths, at roots of plants, etc., a rare species ; it was first taken by Mr. G. Wailes in the Newcastle district . . . until discovered in England it was only known to inhabit high European latitudes.

"*B. stomoides*, Dj. : Rare ; first taken by Mr. Bold in Cumberland, and afterwards in other localities in the extreme north of England."

Of *B. stomoides*, Mr. Bold says (Nat. Hist. Trans. of Northumberland and Durham, vol. iv., p. 14, 1871) :—"Banks of streams, but very rarely," and of *B. nigricorne* : "This rare boreal insect was taken in our district by George Wailes, Esq. One of the original specimens, by the kindness of G. R. Waterhouse, Esq., now ornaments my collection."

The following *Bembidia* amongst others also occurred at the same localities this spring, for the most part commonly :—*B. rufescens*, Guér., *B. tibiale*, Duft., *B. atrocæruleum*, Steph., *B. decorum*, Pz., *B. concinnum*, Steph., *B. prasinum*, Duft., and *B. punctulatum*, Drap. I am indebted to Mr. Tomlin for kindly looking over these insects, and to Prof. T. Hudson Beare for confirming the determination of *B. nigricorne* (Ento. Mo. Mag., 1904, p. 259).

†289. *Cymindis vaporariorum*, L.

Blanchland moors, April 4th, 1904.

"Rare. On the moors near Twizell," P. J. Selby, (N. H. Trans., p. 5; *Tarus basalis*, Gyll., Trans. Tyneside Nats'. F. Club, ii., 257).

300. *Dromius agilis*, F.

Rare; Winlaton Mill.

301. *D. meridionalis*, Dj.

Winlaton, Winlaton Mill, and Gibside. Early spring.

D. linearis, Ol., *D. quadrimaculatus*, L., *D. quadrinotatus*, Pz., *D. melanocephalus*, Dj., and *D. nigriventris*, Th., all more or less common in the same district.

- *401. *Agabus conspersus*, Marsh.

Pond near Winlaton. Not uncommon, 1901.

- †521. *Cyclonotum orbiculare*, F.

Near Winlaton, 1901.

"Twizell, Gosforth, etc." (N. H. Trans., p. 68).

- *987v. *Creophilus maxillosus*, L., var. *ciliaris*, Steph.

This rare variety of a very common coleopteron is recorded by the Rev. Canon Fowler from the Tweed, Clyde, and Argyle districts, and as having been taken by Mr. Champion at Deal. Mr. Donisthorpe tells me he took it at Ashstead (Ento. Mo. Mag.); also common in Ireland (Irish List and Irish Naturalist, Donisthorpe and Bouskell). In 1901 (July?) it occurred to me near Winlaton Mill, from a dead dog, literally alive with *Creophilus*, *Necrophorus*, *Necrodes*, *Silpha* (including the fine *S. thoracica*), *Hister*, various Staphylinidæ, etc., all in one writhing heterogeneous mass. Again, on Sept. 2nd, 1902, I took another example of the var. *ciliaris*, this time from under a dead cat "resting" in a field near Winlaton. These several localities are so widely spread—north, south, east, and west—that it seems to me that if all collectors paid the common *Creophilus* particular attention they would very likely

come across var. *ciliaris*, and so add to our knowledge of the distribution of a most interesting beetle (Ent. Rec., 1904, p. 260).

1001. *Ocypus fuscatus*, Gr.

Taken by Prof. Hudson Beare in a field near Winlaton, October, 1904, and by myself in the same locality, spring.

†1136. *Dianthus cærulescens*, Gyll.

"Rare. Ouseburn Dene, Wallington, Dr. Power. Near Wooler, Mr. J. Hardy" (Nat. Hist. Trans., p. 41).

On the Derwent near Rowlands Gill, June, 1904.

1188. *Stenus bifoveolatus*, Gyll.

Gibside.

†1320. *Anthobium sorbi*, Gyll.

Winlaton Mill, 1901.

"Local. On low plants in woods, on the Irthing, and elsewhere" (N. H. Trans., p. 47).

†1321. *Proteinus ovalis*, Steph.

Winlaton Mill, under dead birds in wood, with *P. brachypterus*, F., April, 1904.

"Rare. Near Morpeth, Gosforth, etc." (N. H. Trans., p. 48).

1339. *Agathidium nigripenne*, Kug.

Beneath bark of felled beeches, etc., Winlaton Mill, spring and autumn. This spring (1904) I came across a gathering of more than twenty.

"Gosforth, Jesmond, Ravensworth, Whittle Dene, etc., "Wallington," Dr. Power" (N. H. Trans., p. 53).

1347. *A. rotundatum*, Gyll.

From a rotten tree lying in a wood near Winlaton Mill, May 13th, 1904.

"In woods, &c., somewhat rare" (N. H. Trans., p. 53).

1351. *Liodes humeralis*, Kug.
Rather common.
1352. *L. glabra*, Kug.
From fungus, Gibside, July, 1904.
"In woods, &c. Apparently rare" (N. H. Trans.,
p. 53).
1360. *Anisotoma dubia*, Kug.
Evening sweeping near Winlaton Mill, October,
1903.
1388. *Necrophorus humator*, Goetz.
Winlaton Mill, Winlaton, Gibside, etc.
1389. *N. mortuorum*, F.
Lockhaugh.
1391. *N. ruspator*, Er.
Winlaton, Lockhaugh.
1393. *N. vespillo*, L.
Lockhaugh.
1394. *Nicrodes littoralis*, L.
Winlaton Mill, 1901. Great numbers beneath
dead greyhound lying by the Derwent side in a
wood.
1396. *Silpha nigrata*, Cr.
Near Winlaton Mill, June, 1904.
1401. *S. thoracica*, L.
Winlaton, Winlaton Mill, Swalwell, Lockhaugh,
and Gibside.
1405. *S. lævigata*, F.
Whitley Bay, 1901.
"Sea coast near South Shields and Marsden"
(N. H. Trans., p. 49).
- *1406v. *S. atrata*, L., var. *brunnea*, Hbst.
Occasionally in the Derwent Valley, where I once
took a remarkably small example. It has also
occurred to me at Riding Mill, in Tynedale (Ento.
Rec., 1904, p. 260).

†1603. *Olibrus æneus*, F.

"Rare. By sweeping near Gilsland" (N. H. Trans., p. 58).

Winlaton Mill, 1902.

1656. *Mycetæa hirta*, Marsh.

Cellar, Winlaton.

*1662. *Triplax russica*, L.

This species, as will be seen in another note, was erroneously identified, and proved to be *T. bicolor*, Gyll., an insect hitherto unknown to the fauna of Great Britain.

1663. *T. ænea*, Schal.

"*Triplax ænea*, Schal., and *T. russica*, L., at Gibside :—Early in the morning (about 5.30 a.m.) of July 8th, 1904, I found *Triplax ænea*, Schal., in some fungi growing on elm in Gibside. Returning with my friend, Mr. H. S. Wallace, on the evening of the 22nd, we shook some more fungi, and besides turning out several *T. ænea*, were lucky enough to come across *T. russica*, L., an insect hitherto unrecorded from the Northumberland and Durham district. On Saturday, the 23rd, I examined this part of Gibside more closely, and soon found an elm overgrown with fungi to a height of over twenty feet, and not far from it a holly also overgrown; and made some observations which may prove interesting.

T. ænea and *T. russica* occurred in almost equal numbers at the foot of the tree, whilst from a height of over four feet *T. ænea* had the advantage in numbers, and at a height of over eight feet there were scarcely three examples of *T. russica* to fifty *T. ænea*! What is the reason?

I found several freshly emerged *T. russica* in the fungus stems, but no pupæ rewarded me, search as I would, though larvæ (I should imagine of *T. russica*) were legion.

All the *T. ænea* were fully mature, and I think had passed their earlier stages between the fungi and the surface of the tree beneath the bark. I have recorded *T. ænea* as common under holly bark in the Derwent Valley (Ento. Mo. Mag., 1904, p. 108), where it has occurred to me in autumn, winter, and spring, but rarely in summer, and never in such numbers as in this instance; so in these circumstances I think (though I have no definite proof) that it must hibernate or spend the cooler months under the bark, and in the summer search for "pastures new."

Even beetles must have their summer holidays! (Ento. Mo. Mag., 1904, p. 210).

** *Triplax bicolor*, Gyll. (*scutellaris*, Charp.).

A species new to Great Britain, and mistaken for *T. russica* (Ento. Mo. Mag., 1904, p. 210, and Ento. Record, 1904, p. 260-2).

See description at a later page of this volume and also above note.

1678. *Cerylon histeroides*, F.

Though by no means common, the commonest of the British species of *Cerylon*.

Recorded by Mr. Bold, "Beneath bark, Ravensworth, and near Gilsland. Rare" (N. H. Trans., p. 59, 1871). I have met with this species only once, from under the bark of a felled cherry tree in Gibside, June 29th, 1904 (Ento. Rec., 1904, p. 260-2).

Gibside, beneath bark of holly, etc. March and April, 1905.

*1679. *C. fagi*, Bris.

Very rare. On May 13th, 1904, I came across a *Cerylon* answering to *C. fagi*, Brisout, from a rotten tree lying in a wood near Winlaton Mill.

Liodes humeralis, Kug., *Agathidium nigripenne*, Kug., *A. rotundatum*, Gyll., *Scaphisoma agaricinum*,

L., various *Rhizophagus*, two (♂ and ♀) *Clinocara undulata*, Kr., *Cerylon ferrugineum*, Steph., etc., were also taken (Ento. Record, 1904, p. 260-2).

Mr. Tomlin's identification of this species was kindly verified by Mr. Donisthorpe:—*Fagi* is distinguished from *C. histeroides* in having shorter and thicker antennæ, basal impressions of thorax (in *histeroides* transverse and rather shallow) longitudinal and deep, and in comparison the thorax is more strongly and sparingly punctured.

*1680. *C. ferrugineum*, Steph. (*angustatum*, Er.).

Is, I think, the commonest species of this genus we have in the Derwent Valley. I have taken it beneath the bark of fallen oaks at Winlaton Mill, Gibside, and Rowlands Gill, and one evening (April 28th, 1904) I took it in numbers from a rotten oak-stump near Winlaton, many of the specimens evidently freshly emerged. From the same stump I captured several coleopterous larvæ and pupæ of *C. ferrugineum* (?), but unfortunately they died before reaching maturity. Thus it will be seen that the whole of the genus *Cerylon* is found in our valley (Ento. Record, 1904, p. 260-2).

1686. *Hister succicola*, Th.

Not at all uncommon.

1694. *H. bimaculatus*, L.

Winlaton, spring, 1904.

1730. *Cercus bipustulatus*, Pk.

From wild cherry blossom, May, 1904, Winlaton, Winlaton Mill, etc.

1736. *Epuræa melina*, Er.

Occasionally from meadow sweet, July, 1902, and from hawthorn blossom, June, 1904; Winlaton Mill.

"On flowers, but very rare" (N. H. Trans., p. 56).

†1740. *E. longula*, Er.

One ♂ from a lingering flower of meadow sweet, Gibside, Sept., 1903. This was kindly identified by Mr. Champion, and confirms Mr. Bold's doubtful record (N. H. Trans., p. 56).

E. æstiva, L., *E. deleta*, Er., *E. parvula*, Stm., *E. obsoleta*, F., and *E. pusilla*, Ill., are other examples of this genus which have occurred to me from the Derwent Valley.

1758. *Omosita depressa*, L.

Winlaton Mill, June, 1902.

1764. *Meligethes rufipes*, Gyll.

Winlaton, 1902.

1793. *M. obscurus*, Er. (*distinctus*, Shp. Cat.).

Winlaton and Rowlands Gill, Sept. and Oct.

"Rare. Seghill Dene, May" (N. H. Trans., p. 57).

M. distinctus, Erich., l.c. 203 (?).

Mr. E. A. Newbery very kindly identified this insect, which confirms Mr. Bold's seemingly doubtful record.

1799. *Cychramus luteus*, F.

"Rare" (N. H. Trans., p. 58).

Not uncommon in flowers, hawthorn, and meadow sweet; Winlaton Mill.

I have found it more commonly than *C. fungicola*, Heer. (recorded by Bold as common), if, indeed, these two names are not synonymous.

1803. *Ips quadriguttata*, F.

Beneath oak bark, Winlaton Mill, June, 1904. In boletus (*Polyporus radiatus*) Gibside, October and November, 1904.

"Beneath bark of oak, bird-cherry, etc. Rare" (N. H. Trans., p. 58).

*1809. *Rhizophagus perforatus*, Er.

Was taken from beneath the bark of a felled plane tree at Lockhaugh, near Rowlands Gill, in Sept.,

1903, where I came across it again early this year. *R. depressus*, F., *R. ferrugineus*, Pk., *R. dispar*, Pk., and *R. bipustulatus*, F., occur commonly in the same locality (Ento. Rec., 1904, p. 261).

An extremely small example occurred from a hard fungus, Gibside, October, 1904.

1819. *Tenebriodes mauritanicus*, L.

Introduced. Taken by Mr. F. Johnson, Byer Moor, near Burnopfield.

(N. H. Trans., p. 59. *Trogosita mauritanica*, Linn.)

**1835. *Lathridius bergrothi*, Reit.

For more than three years I have taken *Lathridius bergrothi*, Reit.—but recently added to the British Catalogue—commonly with other species of the *Lathridiidae*, in a cellar at Winlaton, mostly from the whitewashed walls and ceiling (Ento. Record, 1904, p. 260-2).

1836. *Coninomus nodifer*, West.

Not uncommon at sap, in fungi, etc., autumn.

1839. *Enicmus minutus*, L.

From cherry blossom, Winlaton Mill, May, 1904.

Lathridius lardarius, De G., *Enicmus transversus*, Ol., *Corticaria pubescens*, Gyll., *C. crenulata*, Gyll., *C. denticulata*, Gyll., *C. fulva*, Com., and *C. elongata*, Gyll., are other small things which have occurred with us lately.

1890. *Antherophagus pallens*, Ol.

From hawthorn blossom, Winlaton Mill, spring, 1904.

†1916. *Paramecosoma melanocephalum*, Hbst.

Near Blanchland, beneath flood refuse of a small stream. April, 1904.

“Hartford Bridge, Briar Dene, and on the Irthing” (N. H. Trans., p. 62).

1951. *Scaphidium quadrimaculatum*, Ol.

"Gibside," Mr. John Hancock. "Wood above Gibside," Mr. J. Kidson Taylor (N. H. Trans., p. 54).

On fungoid growth beneath bark of rotten oak branches lying in woods; sometimes a party of three and four examples. Spring and autumn. Winlaton, Winlaton Mill, and Gibside.

1984. *Cytillus varius*, F.

(N. H. Trans., p. 65. *C. sericeus*, Forst.).

Winlaton, June 26th, 1902.

1990. *Elmis æneus*, Müll.

Winlaton Mill, 1901.

- *2014. *Lucanus cervus*, L. (Stag beetle).

Evidently introduced. ♂ and ♀ taken alive at Sunderland, one from the shore near Roker, and the other from Monkwearmouth, 1904. Now in the Sunderland Museum.

- *2051 *Aphodius tessellatus*, Pk.

Taken in the Hartlepool district by Mr. Gardner.

Recorded from Hartlepool by Canon Fowler (British Coleoptera, vol. iv., p. 29).

2072. *Ægalia sabuleti*, Pk.

Local; Derwent side near Rowlands Gill.

2144. *Athous niger*, L.

Occasionally.

2149. *A. vittatus*, L.

Winlaton. Spring.

- *2166v. *Corymbites cupreus*, F., var. *æruginosus*, F.

I have found this variety commoner in hilly districts than the type *cupreus*. The latter, however, occurs the more frequently in the Derwent Valley (Ento. Rec., 1904, p. 261).

2202. *Lampyrus noctiluca*, L. (Glow-worm).

Chopwell and Lockhaugh.

*2222. *Malthinus frontalis*, Marsh.

I took one example (early June) by beating birch and hazel in a wood near Winlaton. It unfortunately managed to escape whilst I was bottling an *Attelabus*. I had no opportunity for searching further in that district, but, luckily, the *Malthinus* being new to me, I happened to make a careful examination of it before it "slipped" me (Ento. Record, 1904, p. 261).

2254. *Thanasimus formicarius*, L.

Winlaton Mill, 1901.

Also taken by Mr. William Johnson at Byer Moor, near Burnopfield, Mr. Johnson's capture being most evidently an imported insect.

2265. *Ptinus fur*, L.2268. *Niptus hololeucus*, Fall.2269. *N. crenatus*, F.

All house species, Winlaton.

2285. *Ptilinus pectinicornis*, L.

One ♂ living, Gibside, July 23rd, 1902.

"Durham, Sunderland, Ravensworth, and Long Benton" (N. H. Trans., p. 79).

**. *Sinoxylon anale*, Lesne.

Introduced. An Indian species, injurious to bamboo, etc.

Records of the following imported species are held over for a further paper.

2322A. *Tetropium castaneum*, L. *Semanotus undatus*.*2324. *Callidium violaceum*, L.*2325. *C. variabile*, L.†2327. *Clytus arcuatus*, L.*2333. *Molorchus minor*, L.*2347. *Strangalia aurelenta*, F.** *Leptura testacea*.** *L. pubescens*.

- ** *L. revestita*, L. In list of doubtful species, Brit. Catalogue, under generic name of *Strangalia*.

†2356. *Acanthocinus ædilis*, L.

* *Monohammus sartor*, F.

† *M. sutor*, L.

** *M. tittillator*, F.

*2358. *Pogonochærus fasciculatus*, De G.

2365. *Saperda scalaris*, L.

** *Chrysobothris chrysostigma*.

** *Pissodes gyllenhali*, Schön. (N. H. Trans., p. 91).

** *P. piniphilus*, Hbst.

** *Caligrapha signatipennis*, Ställ.

and a few others not yet determined.

2328. *Clytus arietus*, L. (Wasp beetle).

Not uncommon, Winlaton Mill.

2338. *Toxotus meridianus*, L.

In July, 1902, I took a red variety from an umbelliferous plant at Lockhaugh, Rowlands Gill.

2339. *Pachyta cerambyciformis*, Schr. (*octo-maculata*, F.).

Very local. In 1902 I came across this fine longicorn at Gibside in hundreds on umbelliferous plants, and once noticed as many as sixteen clustering on one flower head! (Ento. Mo. Mag.).

2348. *Strangalia quadrifasciata*, L.

Two examples, Winlaton Mill and Rowlands Gill, July, 1902.

2357. *Leiopus nebulosus*, L.

Not uncommon. Winlaton Mill, Hollinside, and Gibside. On lichen-covered railings, this insect harmonized so well in colour with the grey lichen as to be most difficult to detect.

2359. *Pogonochærus bidentatus*, Th. (*hispidus*, Brit. Cat.).

Beneath plane-tree bark in a wood near Winlaton Mill (March 3rd, 1903); and whilst sweeping a bed

of *Equiseti* (a local species) at the same locality Prof. Beare met with another example (October 1st, 1904), evidently from some brushwood lying amongst the *Equiseti*. Winlaton, April 1st, 1905.

2368. *Stenostola ferrea*, Schr.

I think, if not our rarest, one of our rarest British longicorns. In June and July of 1902 I took and saw several examples on long grass bordering the river between Winlaton Mill and Rowlands Gill (Ento. Mo. Mag., vol. xl., p. 86, "*Stenostola ferrea*, Schrank, and other longicorns in the Derwent Valley"), whilst this year (1904) I met with it again at Gibside, in two different localities, always on plants above or near water.

"Near Gibside," Mr. J. Hardy (N. H. Trans., p. 99).

I believe this is the only British locality where *Stenostola ferrea* can now be taken with any certainty.

Rhagium inquisitor, F., *R. bifasciatum*, F., *Strangalia armata*, Hbst., *S. melanura*, L., *Grammoptera tabacicolor*, De G., and *G. ruficornis*, F., are other longicorns which have lately occurred in the Derwent Valley.

*2375. *Bruchus pisi*, L.

Introduced. My brother found a living specimen in a dried pea which he picked up in the Durham College of Science, Newcastle, March 3rd, 1904.

2387. *Donacia versicolora*, Brahm. (*bidens*, Ol.)

Gibside, September.

†2432. *Cryptocephalus fulvus*, Goez. (*minutus*, F.)

One example from rail-post near Winlaton (introduced with timber?)

"Newcastle," G. Wailes (N. H. Trans., p. 101).

- *2447. *Chrysomela orichalcia*, Müll. (*lamina*, F.), var.

hobsoni, Steph.

Very local and rare. In August, 1904, I took a nice series on the Wear at South Hylton. They occurred from under decaying hemlock leaves lying close to the ground in a certain favoured spot scarcely four yards in extent, and amongst those I took there was not a single example of the type *orichalcia*. All but one answered to Stephens' (Man. Brit. Col., iii., p. 310, and Man., iv., 343), and Canon Fowler's (Brit. Col., iv., p. 305, pl. 131, fig. 4) description of the var. *hobsoni*. The solitary exception, a ♀, was, in comparison, much larger, and was of a dull unicolorous purple; the var. *hobsoni* possessing æneous pitchy or brown-black elytra, the thorax of most being smooth and brassy.

Recorded by Canon Fowler from Manchester; in abundance (Stephens), Crohamhurst, Surrey; and Honington (Power).

- 2473v. *Phyllodecta vitellinæ*, L.

The rare blue variety not uncommon at Winlaton Mill. Spring and autumn.

- *2484. *Lochmæa suturalis*, Th.

Though not recorded by Bold, this is, I believe, common on all our moorlands.

- **2484v. *L. suturalis*, Th., var. *nigrita*, Weise.

On April 10th, 1903, Mr. David Rosie, Newcastle, sent me a few very dark examples of *suturalis* taken at Prestwick Carr, one of which I think must be referred to *L. suturalis*, Th., var. *nigrita*, Weise, described by Mr. Tomlin in the Ento. Mo. Mag., August, 1904.

2486. *Galerucella viburni*, Pk.

On guelder rose bushes, and sometimes, when in contact with guelders, on hazel. Winlaton Mill and Gibside. September and October.

2542. *Haltica pusilla*, Duft. (*helianthemii*, Al.).
Winlaton and Blanchland. Spring.
2566. *Batophila rubi*, Pk.
Winlaton Mill and South Hylton. August.
2568. *Sphaeroderma testacea*, F.
Winlaton.
2569. *S. cardui*, Gyll.
Common on thistles. July. Winlaton.
2577. *Mantura rustica*, L.
South Hylton, August, 1904.
2601. *Psylliodes chrysocephala*, L.
Winlaton, September.
2626. *Blaps mucronata*, Lat. (Cellar beetle).
Cellar. Winlaton.
2637. *Scaphidema metallicum*, F. (*æneum*, Pk.).
"Rare. Near Axwell Park, and Ryhope Dene"
(N. H. Trans., *S. ænea*, Payk., p. 80).
Near Swalwell (below Axwell Park), 1902.
2655. *Helops striatus*, Fourc.
"Gibside," Mr. John Hancock (N. H. Trans., p. 81).
Lockhaugh, spring, 1902.
- †2664. *Tetratoma fungorum*, F.
"Twizell," P. J. Selby, "Hetton Hall, near
Belford," W. B. Boyd (N. H. Trans., p. 81).
Hibernating beneath holly bark, Gibside, February
12th, 1905. Mr. Gardner has also taken it in the
Hartlepool area.
Superficially—though quite apart and distinct—it
very much resembles *Triplax ænea*, with which I
found it.
- †2667. *Orchesia micans*, Pz.
"Bred from *Polyporus radiatus* (1862), growing on
alder near Wooler," Mr. J. Hardy [N. H. Trans.,
p. 81, and Trans. Tyneside Nat. Field Club, vol. vi.,
p. 3 (1863)].

One example from a hard boletus (*P. radiatus*) growing on elm, Gibside, October, 1904. This fungus, besides several good little *Lathridiidae*, *Epurea*, *Cryptophagus*, etc., contained innumerable small pinkish coleopterous larvæ which Mr. Donisthorpe kindly identified as the larvæ of *O. micans*.

*2669. *Clinocara undulata*, Kr.

Locally near Winlaton Mill, in numbers on fungoid growth, beneath bark of small trees (Ento. Mo. Mag., May, 1904). I have taken odd examples this year, three (two ♀'s and one ♂) in a dry and fallen branch (April 30th), and two (♂ and ♀) on a brown growth covering this branch (May 13th). Those taken on April 30th were very fresh looking, the elytra of one of them were not quite hard, so I think they must have been but shortly emerged from the pupæ. Search as I would for pupæ I was not successful, taking, instead, a cocoon and pupa of *Campylus linearis*, near foot of tree (Ento. Record, 1904, p. 261).

2672. *Melandrya caraboides*, L.

From birch stump near Winlaton Mill, June, 1904.

2685. *Salpingus castaneus*, Pz.

"Rare" (N. H. Trans., p. 83).

By beating a dead-oak hedge, September, 1903, Lockhaugh.

2693. *Rhinosimus viridipennis*, Steph.

Rare. Under plane-tree bark, May, 1903, Gibside.

2728. *Metæcus paradoxus*, L.

Metæcus paradoxus, L., in the Derwent Valley.

On September 12th, 1902, I took a fine example of *Metæcus paradoxus*, L., from a common dock flower growing by the river side at Lockhaugh, near Rowlands Gill; whilst again on October 16th of the same year I met with another specimen, this time clinging to bracken, scarcely fifty yards distant from the locality of my first capture. That which I took in September was a male, and in comparison with

other examples of *M. paradoxus* I have seen, was, I think, an unusually fine insect. The other (also a large example) proved to be a female, which I believe is not represented in Bold's collection.

Though I searched the district high and low for a wasps' nest, I met with no success in the immediate neighbourhood, but later in the year I came across a nest—of *Vespa rufa* I think—in Gibside, at a spot fully a mile from Lockhaugh. As both the *Metecus* took readily to wing, and seemed to possess strong flying powers, they could easily have crossed the river from Gibside, a place where various wasps abound (Ento. Mo. Mag., 1904, p. 159).

*2742. *Meloë violaceus*, Marsh.

Whilst crossing the Blanchland moors on April 4th of this year my friend, Mr. J. E. Patterson, of Newcastle, found *Meloë violaceus*, Marsh., under a stone in a sandy situation. I was surprised that such a common insect had not been recorded from our district before, but upon consideration one can easily see with what difficulties men in Mr. Bold's time would have to contend to get on these moorlands. Even now Blanchland lies ten long and hilly miles from the generally used station Shotley Bridge, and little less from Riding Mill. Near the site of Mr. Patterson's capture I met with *Cymindis vaporariorum*, L., hitherto only recorded from Twizell Moor (Ento. Record, 1904, p. 262).

†2761. *Attelabus curculionoides*, L.

"Rare. Near Gilsland, and at Twizell" (N. H. Trans., p. 84).

Winlaton, Winlaton Mill, Gibside, Burnopfield, etc., from saplings and grass, in or at the edge of small woods.

2782. *Apion cerdo*, Gers.

Gibside, spring, 1904.

†2789. *A. miniatum*, Germ.

Near Winlaton Mill, 1901.

A. genistæ, Kirb., *A. apricans*, Hbst. (*fagi*, Kirb.),
A. carduorum, Kirb., *A. pisi*, F., *A. ononis*, Kirb.,
A. ervi, Kirb., *A. loti*, Kirb., *A. marchicum*, Hbst.,
A. violaceum, Kirb., and *A. humile*, Germ., occurred
more or less commonly this year (1904).

†2868. *Otiophynchus sulcatus*, F.

"Rare. Twizell and Newcastle" (N. H. Trans.,
p. 90).

By beating; Winlaton Mill, Hollinside, and
Gibside. Winlaton, common in cellar.

2899. *Trophiphorus tomentosus*, Marsh., (*elevatus*, Hbst.).(N. H. Trans., p. 89. *T. mercurialis*, Fab.).

Not uncommon.

2902. *Liophlæus nublius*, F.

Winlaton.

Phyllobius oblongus, L., *P. urticæ*, De G. (*alneti*, F.),
P. pyri, L., *P. argentatus*, L., *P. maculicornis*, Germ.,
P. pomonæ, Ol. (?), *P. viridiæris*, Laich. (*uniformis*,
Marsh.), *P. viridicollis*, F., *Polydrusus micans*, F.,
P. tereticollis, De G. (*undatus*, F.), *P. pterygomalis*,
Sch., *P. cervinus*, L., etc., are all among this year's
records.

2923. *Philopodon geminatus*, F.

(N. H. Trans., p. 87. *Cneorhinus geminatus*, Fab.).
Winlaton Mill.

2926. *Barynotus schönherri*, Zett.

Rare, Winlaton. *B. obscurus*, F., and *B. elevatus*,
Marsh., (*moerens*, F.), not uncommon.

2949. *Hypera punctata*, F.

Autumn, 1903.

2955. *H. polygoni*, L.

Spring, 1903.

2958. *H. suspiciosa*, Hbst.
Autumn, 1903.
2964. *H. nigrirostris*, F.
Common.
These last four species from Winlaton Mill district.
2974. *Liosoma ovatum*, Clair.
Generally distributed, but seemingly rare. Winlaton, Winlaton Mill, Swalwell, Hollinside, Gibside, and Rowlands Gill.
2979. *Curculio abietis*, L. (The Pine Curculio).
(N. H. Trans., p. 89. *Hylobius abietis*, Linn.).
Not uncommon.
2984. *Orchestes quercus*, L.
Rare. Summer, 1904.
2990. *O. fagi*, L.
Very common. June.
2994. *O. stigma*, Germ.
Common. Autumn.
2996. *O. salicis*, L.
Rather rare. Autumn, 1903.
2997. *O. saliceti*, F.
Rare and local. Autumn, 1903.
From Winlaton Mill and Gibside district.
3003. *Grypidius equiseti*, F.
Hollinside, Winlaton Mill, and Barlow. Autumn, 1903.
Prof. Beare took an example by sweeping a bed of a species of a rare and local *Equisetum*, October, 1904.
Erirhinus acridulus, L., *Dorytomus tortrix*, L., recorded by Bold from Twizell and Durham, *D. validirostris*, Gyll., *D. maculatus*, Marsh., *D. pectoralis*, Gyll., *Anthonomus pedicularis*, L., and *A. pomorum*, L., all occurred by beating willow at Winlaton Mill, autumn, 1903, whilst *Anthonomus ulmi* fell to me in 1902.

3089. *Cionus scrophulariæ*, L.

Exceedingly common in the Derwent Valley.
May to October.

3095. *C. pulchellus*, Hbst.

Very local. Lockhaugh, June, 1904.

3108. *Caliodes geranii*, Pk.

"Twizell," P. J. Selby, "Wallington," Dr. Power.

Mr. Hardy records it from Axwell Park, Gibside, and Hartlepool. His specimens I have not seen (N. H. Trans., p. 93).

Local, but plentiful where it occurs. Winlaton Mill and Gibside, June, 1904. From the flower-heads of the wild geranium, and in the autumn from under the leaves of the same plant. Mr. Gardner has also taken it in numbers from the Hartlepool district, which captures confirm Mr. Hardy's records.

3226. *Hylesinus crenatus*, F.3228. *H. fraxini*, Pz.

Common. Winlaton Mill.

3230. *Myelophilus piniperda*, L.

(N. H. Trans., p. 97. *Blastophagus (Hylurgus) piniperda*, Linn.).

Common. Winlaton.

3234. *Phlæophthorus rhododactylus*, Marsh.

Winlaton Mill.

*3254. *Tomicis laricis*, F.

Evidently introduced. Was taken by Mr. Fred Johnson at Byer Moor early this year (1904) (Ento. Rec., 1904, p. 262).

The Genus Tapinocyba. BY A. RANDELL JACKSON,
M.B., M.Sc.

READ MARCH 14TH, 1905.

(Plates VII. and VIII.)

Last summer, when in conversation with Rev. O. P. Cambridge, F.R.S., I expressed a wish that the *Tapinocybae* were well worked out. He suggested that I should do this necessary piece of work, and has very kindly lent me his unrivalled collection of the species of that genus. Without this material the work could never have been accomplished. Messrs. Falconer, F. P. Smith, Evans, Warburton, Dr. Carpenter, and the late F. O. P. Cambridge have all assisted me with material and information. MM. Simon and de Lessert have kindly lent and given me most useful examples from France and Switzerland. I believe I have seen and examined very nearly all the known British examples of this interesting genus.

The genus *Tapinocyba* was created in 1884 by M. Simon for the reception of several species of minute spiders. It is without doubt very nearly related to the genus *Diplocephalus*, it being extremely difficult to draw a hard and fast line between the two. In *Tapinocyba*, however, the eyes are usually larger and closer together. The second row is not so strongly procurved. The legs are shorter. The tarsi are longer in relation to the metatarsi, and there is no cephalic eminence, or lobe, in the male sex.

The species *T. insectus* (L. Koch), however, comes very near to *Diplocephalus*, only differing essentially from *D. Beckii* (Camb.) by its slightly shorter legs, longer tarsi, and the absence of the cephalic elevation. It is significant of this close relationship that M. Simon considers the first a *Diplocephalus*, and Professor Kulczynski the second a *Tapinocyba*.

Nevertheless the five British species are all very distinct *specifically*, both from each other and from allied forms.

The following are the generic characters :—

GENUS TAPINOCYBA (Simon), 1884.

Spiders small, all under 1·8 mm., and all pale in colour.

Cephalothorax oval, devoid of any lobe or elevation. In profile the shape varies considerably both as to species and individuals. It is, however, never very high. Clypeus always lower than ocular area. In the males there is on each side of the cephalothorax a deep post-ocular sulcus. The exact shape of these varies both as to species, and a little as to individuals. They always, however, begin behind the posterior lateral eyes, and run obliquely backwards, and slightly outwards. The cephalothorax is always of a yellow brown colour.

Eyes, eight in number, and arranged in two rows. The anterior row is always straight, the centrals in contact and the smallest of the eight. They are separated from the laterals by a space never much greater than their diameter. The posterior row is always more or less procurved, the distance between its component eyes varying in the different species. Each lateral pair is placed obliquely on a very slight prominence. The size of the eyes varies in the different species, sometimes they are very large, sometimes only medium. They are never small. Besides this *natural* variation, the eyes of all spiders are apt to vary: first, with the condition of the spider when caught; second, with the time it has been kept in spirit. A spider may be caught immediately after its last moult, before its eyes have attained their full dimensions. A spider kept for a long time in spirit is liable to show absorption of the ocular pigment, and consequent shrinking of the eyes. When the eyes shrink the interocular spaces of course appear larger. I am also inclined to think that the eyes of any given species may vary in the different individuals, and I frequently find among the series of *T. subitanea* (Camb.), captured at the same time, and in the same locality, marked differences, both in the size of the eyes and the breadth of the interocular spaces. Thus the ingenious

system of classifying these minute spiders by the arrangement of their eyes, which was invented by M. Simon, although generally correct, may occasionally break down and lead to error.

The *sternum* is large, longer than broad, and heart-shaped. Behind it is bent down, and ends between the fourth pair of coxæ, in a point, broader than either of those joints.

The *chelicera*, or *falces*, are very powerful, and much longer than the height of the clypeus. The terminal joints, or fangs, lie when at rest in the usual groove, which is armed with strong teeth both behind and before. The external surface of each basal joint is decorated with a number of parallel, transverse, chitinous striæ. These are supposed to form a stridulating apparatus, which, when rubbed by the palpi, might give rise to a sound of some sort. They exist in both sexes, but there is no proof of their sound-emitting functions.

The *rostrum* is soft, prominent, convex, and rather hairy.

The *labium* is short, semicircular, and thickened along its curved anterior border.

The *maxillæ* are large, they converge towards the labium, but their internal borders anterior to that organ are straight and parallel. Below they are smooth and shining, but above they possess a large patch of hairs arranged in a kind of tuft.

The *palpi* of the female resemble the legs in colour. They do not carry a terminal claw. The palpi of the male are longer, the relative length of the joints varies in the different species, but the femur is always cylindrical, and by far the longest. The tibia bears an apophysis above, which is produced over the tarsus. It ends in either one or two simple points. The patella never bears any apophysis or strong seta.

The *legs*, like the above-mentioned appendages, are always of a yellow-brown colour. They are always short. Their order of length is 4, 1, 2, 3. The first two are nearly equal, whilst the last is by far the smallest. In order of length the joints are—femur, tibia, metatarsus, tarsus, coxa, patella, and trochanter.

The *coxae* are large, stout, and rather grooved below.

The *trochanters* are small, and their cuticle shows one or two chitinous projections.

The *femora* are long, cylindrical, and clothed with rather stout and long hairs.

The *patellæ* are short. Each bears a short spine above, near the apex.

The *tibiæ* are long and cylindrical. Each bears a short spine above, near the base. Tibiæ I. and II. bear a so-called acoustic seta above, at the juncture of middle and lower thirds. Tibiæ III. and IV., in addition to the above, bear another similar organ about the middle.

The *metatarsi* are rather short. Metatarsi I., II., and III. bear a so-called acoustic seta about the middle of their upper sides. This is wanting on metatarsus IV.

The *tarsi* are very nearly equal to the metatarsi in length. In the males they are slightly fusiform. The tarsal claws are three in number. The superior pair are strongly toothed, while the single inferior one is smaller and simple.

As regards the so-called acoustic setæ, the sound-perceiving function is very much open to doubt in my opinion. In this Mr. Cambridge agrees with me.

The *abdomen* of the *Tapinocybæ* is greyish-yellow in colour, rounded or oval, and bears no scutum.

An *epigyne* is always more or less developed in the female. A single oviducal aperture pierces it in the middle. On each side of this is placed a smaller spermothea.

The *spiracles* and *spinnerets* are of the usual number, in the normal positions, and call for no remark.

There are in Great Britain five known species of *Tapinocyba*. All five are found in England, two in Scotland, and as yet none in Ireland. They fall into two groups.

Females.

A.—Eyes large; central anteriors not very much less than central posteriors. The trapezium composed by the four centrals is very nearly as wide in front as behind, and nearly as broad as long. The posterior row only slightly procurved,

so that the distance between the anterior and posterior centrals is less than one diameter of the latter. Epigyne small, inconspicuous, not deeply pigmented.

I. Posterior row of eyes roughly equidistant :

T. subitanea (Camb.), (see figure of vulva).

II. Central posteriors nearer to the adjacent laterals than to each other : *T. praecox* (Camb.),

(see figure of vulva).

B.—Eyes of medium size, central anteriors much less than central posteriors. The trapezium formed by the four centrals is much narrower in front than behind, and much longer than broad. The posterior row is strongly procurved, and the distance between the anterior and posterior centrals is a good deal wider than one diameter of either of them. Epigyne large, conspicuous, and deeply pigmented.

1. *T. mitis* (Camb.). See figure of vulva.

2. *T. pallens* (Camb.). See figure of vulva.

3. *T. insectus* (L. K.). See figure of vulva.

Males.

A.—Palpal tibia bearing an apophysis which terminates in a fine point. Palpal tarsus narrow. Palpal organs small and inconspicuous.

I. Apophysis very minute and thornlike. Patella of palpus longer than tibia : *T. praecox* (Camb.)

II. Apophysis about as long as tibia. Patella of palpus shorter than tibia : *T. subitanea* (Camb.)

B.—Palpal tibia bearing a bifid apophysis. Tarsus of palpus broad. Palpal organs large, well developed, and conspicuous.

I. The processes of the apophysis about equal in length.

(a) Processes large, stout, and blunt :

T. pallens (Camb.)

(b) Processes very minute, the inner one thornlike, the outer one blunter : *T. mitis* (Camb.)

II. The internal process much longer than the outer one, and rather curved :

T. insectus (L. K.)

1. TAPINOCYBA PRAECOX (Camb.), 1872 (Type species).

Synonymy. *Walckenaëra praecox* (Camb.), Spid. Dors., p. 143.

Walckenaëra ingrata (Camb.), Spid. Dors., p. 443.

Tapinocyba praecox (Camb., Simon), Arach.

France, T. 5, P. 3, P. 779.

Tapinocyba ingrata (Camb.), Proc. Dors. F.

Club, vol. xvi., p. 111.

Tapinocyba praecox (Camb.), List of Brit.

and Irish Spiders.

MALE.—Average length 1.2 mm. The type specimen is under 1 mm. in length.

Cephalothorax devoid of any lobe or eminence. In profile it is rounded and not high. The clypeus is much less in height than the ocular area. The highest point of the cephalothorax is behind the posterior centrals. From this point it slopes evenly down to the abdominal peduncle.

Eyes. Posterior row rather strongly procurved. Centrals less than one diameter apart, rather more from laterals. Eyes very large.

Post-ocular sulci begin behind the posterior lateral eyes. They run backwards, and a trifle outwards, and are practically straight.

Palpi rather long. Patella considerably longer than tibia. Tibial apophysis springs from the middle of the dorsum of the anterior border. It is very minute, and thorn-like. Tarsus narrow. Palpal organs small and inconspicuous.

FEMALE.—Length 1.2, 1.3, or 1.4 mm., as a rule not much larger than the male.

Cephalothorax without elevation, uniformly rounded.

Eyes. Posterior row distinctly, but slightly procurved. Centrals barely one diameter apart, less than half a diameter from laterals. Eyes very large.

Vulva. Aperture of oviduct large and transversely elongated, the spermathecae being placed above it. The epigynal area is not distinctly separated from the surrounding integuments.

Abdomen oval; it never seems to become globular.

DISTRIBUTION.—*England*: Dorset, Lancashire, Yorkshire, and Northumberland. *France*: North and Central. *Germany*.

HABITAT.—Not rare among moss, and occasionally dead leaves. It is adult in the autumn, and living through the winter it re-appears in spring.

2. TAPINOCYBA SUBITANEA (Camb.), 1875.

Synonymy. *Walckenaëra subitanea* (Camb.), Spid. Dors.,
p. 144, also Proc. Dors. F. Club, vol. iv., p. 152.
Tapinocyba subitanea (Camb.-Sim.), Arach.
France, T. 5, P. 3, p. 783.
Tapinocyba parisiensis (Sim.), *loc. cit.*, p. 784.
Tapinocyba subitanea (Camb.), Proc. Dors.
F. Club, vol. vi., p. 9, vol. xv., p. 111,
also List of Brit. and Irish Spiders.

MALE.—Average length 1.15 mm., shorter than *T. praecox* (Camb.), but a trifle broader, and more robust.

Cephalothorax devoid of lobe or eminence. Usually rounded, and similar in shape to that of *T. praecox*, except that it is a little higher. The clypeus too is rather higher in proportion to the ocular area. In the specimen M. Simon described as *T. parisiensis* (Simon), the caput is a little higher behind the eyes, and there is a slight dip at the thoracic juncture. All the *Tapinocybæ*, however, are so subject to variation in the exact shape of the cephalothorax that I cannot accept this slight aberration as being of specific value.

Eyes large and round. Posterior row of eyes very slightly procurved, in fact almost straight. The centrals are less than a diameter apart, and not more than a diameter from the laterals. When the eyes are somewhat shrunk the interspaces appear larger, and the eyes more or less oval in shape. This is the case in M. Simon's specimen above mentioned, and it is often the case in English specimens from various localities.

Post-ocular sulci not straight. Beginning behind the posterior lateral eyes, they curve sharply inwards. They reach a point about one diameter behind and external to the central posterior eyes, and then run backwards and a little outwards. Finally in their posterior thirds, or halves, they become straight. They vary considerably in a long series of specimens, and frequently, as in M. Simon's specimen, the curves are badly marked. These curves are, however, in my experience always present.

Palpi. Patella much shorter than tibia. The apophysis of the latter springs from the whole of the dorsum of the anterior border, and is nearly or quite as long as the joint itself. It terminates in a single fine sharp point. In M. Simon's spider, described as a separate species, the tibial apophysis is a little shorter than usual, but not more so than occurs in other specimens that I have examined. Tarsus small and narrow. Palpal organs small and inconspicuous.

FEMALE.—Length 1·6 or 1·7 mm., or more. There is more disparity in sizes between the sexes than in the other species of the genus *Tapinocyba*.

Cephalothorax rounded, without elevations or sulci.

Eyes. Posterior row practically straight. The procurvature is exceedingly slight. Eyes about equidistant.

Vulva. Aperture of oviduct very small, inconspicuous, and not much broader than long. Spermothea placed on each side of it.

Abdomen, when distended with ova becomes very large and almost globular. For this reason the female is often much larger than the male.

Legs in both sexes are rather longer than obtains in the other species of the genus.

DISTRIBUTION.—*England*: Dorset, London, Lancashire, Yorkshire, Cumberland, and Northumberland. *Scotland*: Near Edinburgh. Also in France and Switzerland. The specimens recorded by Bösenberg, from Germany, probably are not referable to this species.

HABITAT.—This spider occurs in Britain almost always among hay or straw in outhouses, barns, stackyards, etc. All my specimens were found in such situations. In Switzerland, according to Lessert, it occurs in cellars. In such situations it is very common in autumn.

NOTE.—The specimens captured by Mr. F. P. Smith and myself, and recorded by Rev. O. P. Cambridge as *T. parisiensis* (Sim.), were all typical examples of *T. subitanea* (Camb.). M. Simon's specimen only differs from the types by a slight gibbosity of the cephalothorax, *not* I think of specific value. This gibbosity is absent in the above mentioned British specimens.

3. *TAPINOCYBA PALLENS* (Camb.), 1872.

Synonymy. *Erigone pallens* (Camb.), Proc. Zool. Soc.

Lond., 1872, p. 753, pl. lxxv.

Tapinocyba pallens (Camb.—Simon), Arach.

France, T. v, P. 3, p. 781.

Tapinocyba pallens (Camb.), Proc. Dors. F.

Club, vol. xxi., p. 23.

Tapinocyba pallens (Camb.), Chyz. Kulcz:

Aran. Hung., T. ii., P. 1, p. 129, and plate.

Tapinocyba pallens (Camb.), List of Brit.

and Irish Spiders.

MALE.—Length 1·4 mm. or more.

Cephalothorax rounded and rather high. Devoid of lobe or elevation. The exact shape varies a good deal. Clypeus forms a very obtuse angle with the ocular area, and does not project in front of chelicerae. Clypeus rather less than ocular area.

Eyes. Posterior row strongly procurved. Centrals about one diameter apart, much more from the laterals.

Postocular sulci nearly straight; they bend in, very slightly, about the level of the posterior centrals, and then run obliquely backwards and outwards.

Palpi. Patella and tibia about equal in length. The latter bears a short broad apophysis terminating in two equal blunt, short processes, somewhat triangular in shape. Tarsus large and broad. Palpal organs prominent and bulky.

FEMALE.—Length 1.4 mm. or less.

Cephalothorax a good deal lower than in male.

Eyes. Posterior row strongly procurved, eyes equidistant, and about a diameter apart.

Vulva. Aperture of oviduct broader than long, with the spermathecae placed lateral to, and rather above it. Epigynal area deeply pigmented, and distinctly separated off from surrounding integuments. The vulva is rather variable.

Abdomen of a very pale grey-brown.

DISTRIBUTION.—*England*: Staffordshire, Northumberland, Yorkshire. *Scotland*: Pentland Hills, Lanark. Also in France, Germany, Switzerland, and Hungary.

HABITAT.—Occurs among dead leaves and pine needles in woods. Occasionally among moss and grass. Adult in autumn. This spider hibernates, and may be found abundantly in spring.

4. TAPINOCYBA INSECTUS (L. K.), 1869.

Synonymy. *Plaesiocraerus insectus* (L. K.—Simon), Arach.

France, T. v., P. 3, p. 774.

Tapinocyba insecta (L. K.—Kulcz.), Aran.

Hung., T. ii., P. 1., plate, and p. 129.

Tapinocyba insecta (L. K.—Camb.), List of

Brit. and Irish Spiders.

MALE.—Length 1.5 mm. or more.

Cephalothorax devoid of any lobe or elevation. In profile very flat, so that upper and lower borders appear nearly parallel. In Swiss specimens kindly sent by M. R. de Lessert this was not well marked, and the caput was somewhat raised as in *T. pallens*, otherwise the examples were identical with our British specimens. The clypeus projects strongly and

roundly in front of the chelicerae. It is less in height than the ocular area, which it joins in a curved line as seen in profile.

Eyes. Posterior row very strongly procurved, more so than in the other species of the genus. The ocular area has a band of pubescence running from one pair of central eyes to the other. Central posteriors about one diameter apart, very much more from the laterals.

Postocular sulci as in *T. pallens* (Camb.).

Palpi. Tibia and patella about equal in length. Tibial apophysis terminating in two long processes with a deep bay between. The external process is shorter, nearly straight and blunt. The inner one is longer, narrower, and curves slightly outwards. Tarsus broad and large. Palpal organs prominent and bulky.

FEMALE.—Length 1.5 mm. or less.

Cephalothorax much as in male.

Eyes. Posterior row strongly procurved. Eyes equal, equidistant, and about one diameter apart.

Vulva large. Aperture of oviduct much longer than broad. Spermathecae are placed laterally, and rather below it. Epigynal area sharply separated off from the surrounding integuments.

DISTRIBUTION.—*England*: Northumberland, Yorkshire. Also in France, Germany, Hungary, Switzerland, and the Tyrol.

HABITAT.—Among moss, generally in rather damp places. Adult in autumn. It hibernates, and may be again found in spring.

5. TAPINOCYBA MITIS (Camb.), 1882.

Synonymy. *Walckenaëra mitis* (Camb.), Ann. and Mag.

Nat. Hist., S. 5, vol. ix., p. 8., also Proc.

Dors. F. Club. vol. xiv., p. 159.

Tapinocyba mitis (Camb.), List of Brit. and

Irish Spiders.

MALE.—Length 1.1 mm. to 1.2 mm.

Cephalothorax without lobe, or elevation. Shape varies a little, never high. Clypeus hollowed in profile, forming a more acute angle with the ocular area than obtains in *T. pallens* (Camb.). It is considerably less in height than the ocular area.

Eyes closer together than in the other species. Posterior row strongly procurved, centrals about one diameter apart, under two diameters from the laterals.

Post-ocular sulci nearly straight, and shorter than in *T. pallens* (Camb.).

Palpi. Patella and tibia about equal in length. The tibial apophysis terminates in two minute point-like processes not easily seen. The inner one is sharp and thorn-like, the outer one blunt. They are about equal in size. Tarsus large and broad. Palpal organs prominent and bulky.

FEMALE.—Length 1·2 mm.

Cephalothorax lower than in male.

Eyes. Posterior row procurved, eyes equal, equidistant, and about one diameter apart.

Vulva. Aperture of oviduct much longer than broad. Spermothecæ placed laterally. Epigynal area distinctly separated off from the surrounding integuments.

The whole spider in both sexes is of a very pale yellowish-brown colour. It is much paler than any of its congeners.

DISTRIBUTION.—*England*: Dorsetshire.

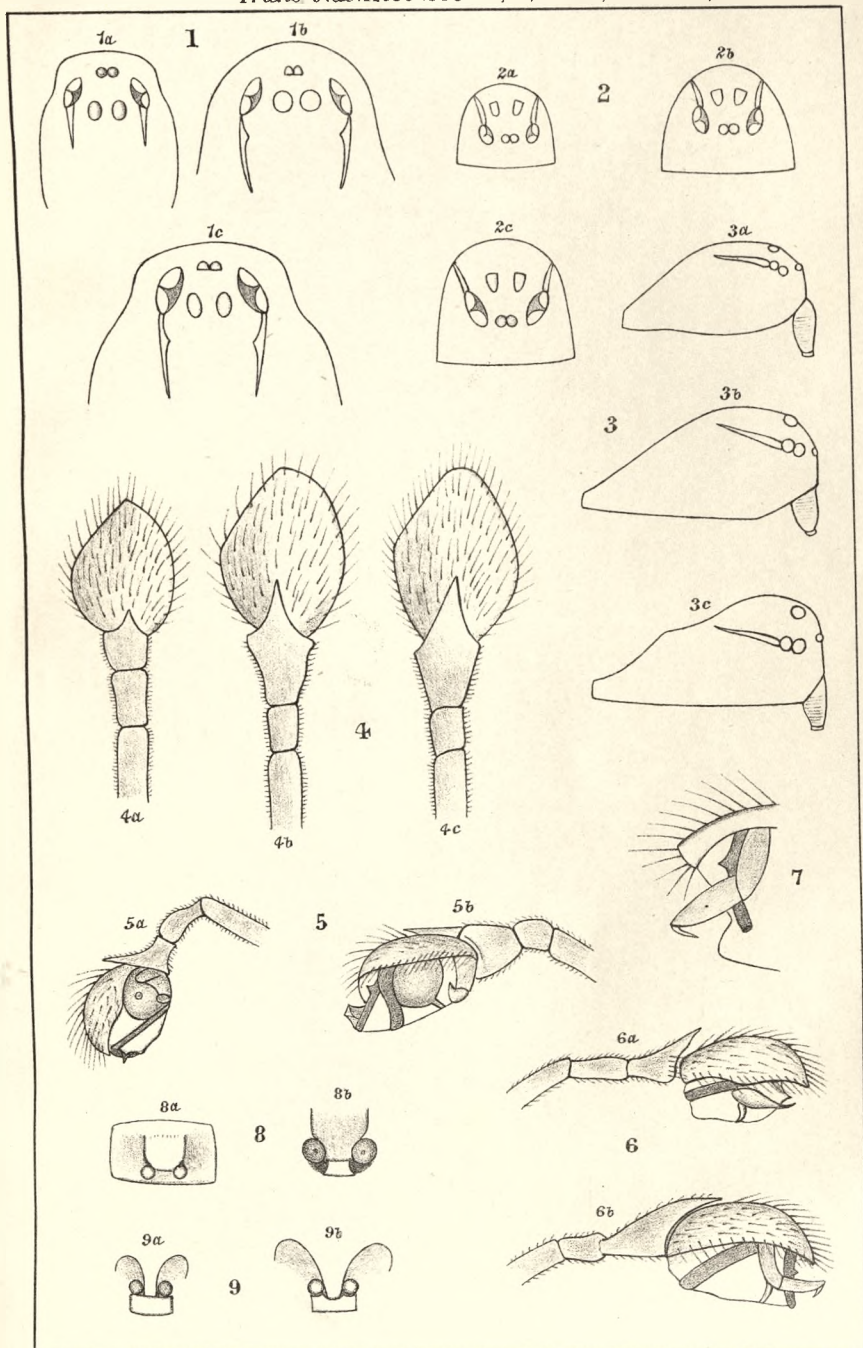
This interesting spider has as yet only occurred among moss at Bloxworth. It is adult in spring. Mr. Cambridge has recorded this spider from Scotland. He has kindly sent me the specimen, and I find it is undoubtedly only a female of *T. pallens*.

EXPLANATION OF PLATES.

PLATE VII.

1. Cephalothorax of male from above.
 - 1a of *T. praecox* (Camb.).
 - 1b of *T. subitanea* (Camb.).
 - 1c of *T. subitanea*—Simon's "*Parisiensis*" specimen.
2. Front view of cephalothorax.
 - 2a of *T. praecox* (Camb.).
 - 2b of *T. subitanea* (Camb.).
 - 2c of *T. subitanea*—Simon's "*Parisiensis*" specimen.
3. Profile of cephalothorax.
 - 3a of *T. praecox* (Camb.).
 - 3b of *T. subitanea* (Camb.).
 - 3c of *T. subitanea*—Simon's "*Parisiensis*" specimen.
4. Left palpus from above.
 - 4a of *T. praecox* (Camb.).
 - 4b of *T. subitanea* (Camb.).
 - 4c of *T. subitanea*—Simon's "*Parisiensis*" specimen—palpus is in a slightly different position.
5. Left palpus.
 - 5a. *T. praecox* (Camb.). Left palpus from outer side.
 - 5b. *T. subitanea* (Camb.). „ „
6. Left palpus.
 - 6a. *T. praecox* (Camb.). Left palpus from inner side.
 - 6b. *T. subitanea* (Camb.). Left palpus from inner side, and rather below.
7. Enlarged view of apex of right palpus (inner side) of *T. subitanea* (Camb.).
- 8 and 9. Vulvæ.
 - 8a. Vulva of *T. subitanea* (Camb.).
 - 8b. The same more enlarged.
 - 9a and 9b. Vulvæ of two different individuals of *T. praecox* (Camb.).

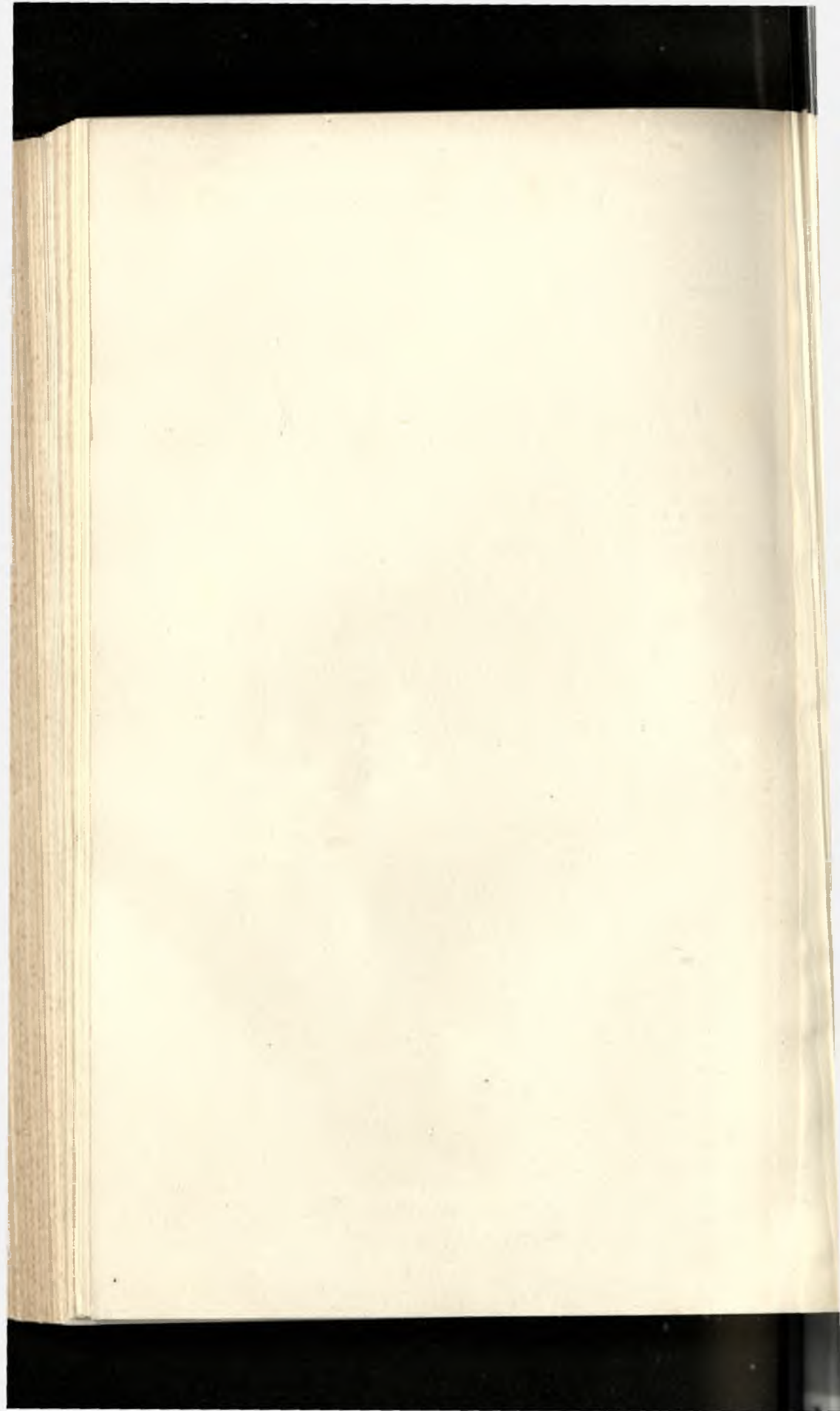
No figures have been made of the palpal organs of M. Simon's spider, as these organs are identical with those of normal *T. subitanea* (Camb.), from which M. Simon's specimen only differs by the slightly different outline of the cephalothorax, which is shown at 3c.

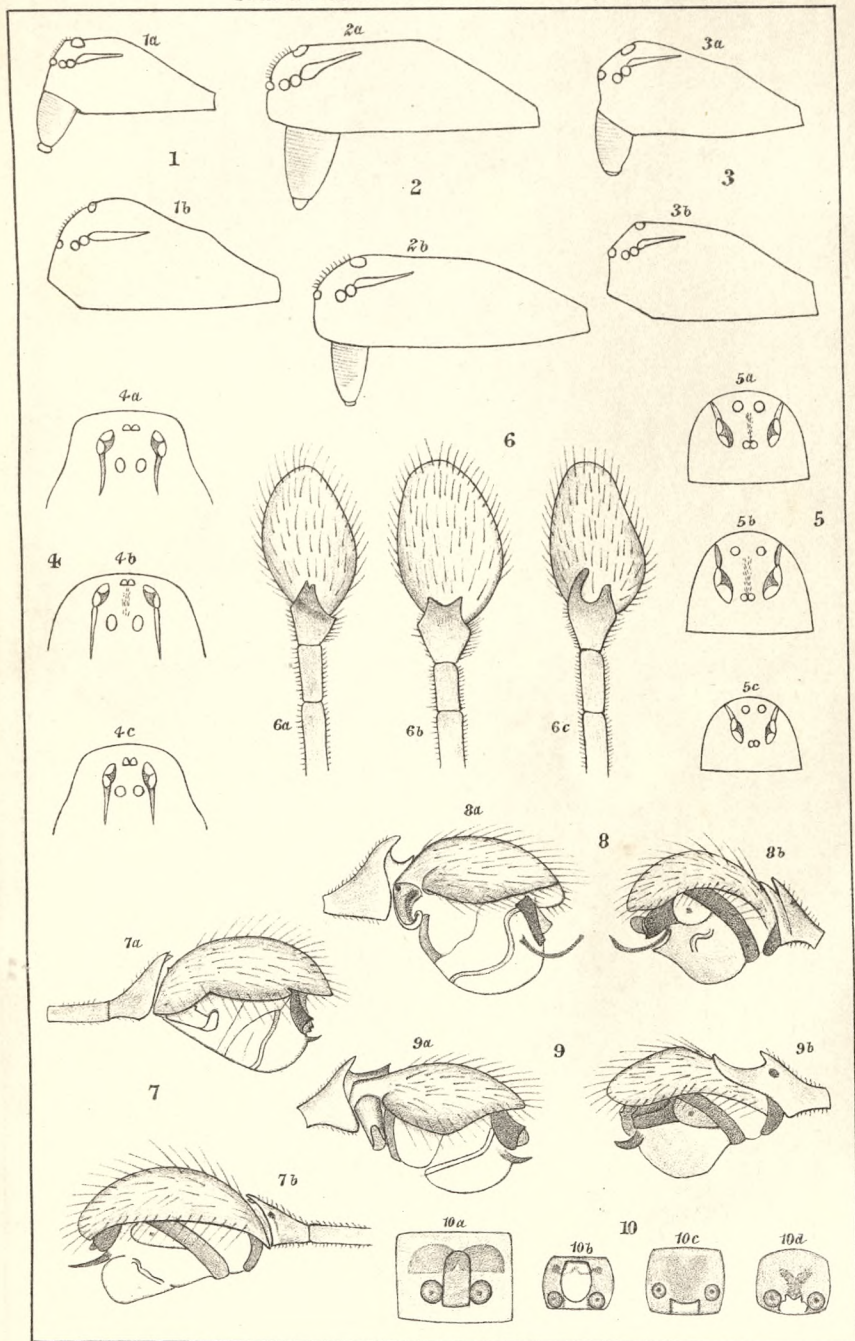


A. Rendell Jackson del

G. West & Sons lith.

TAPINOCYBA.





A. Randell Jackson del.

G. West & Sons lith.

TAPINOCYBA.

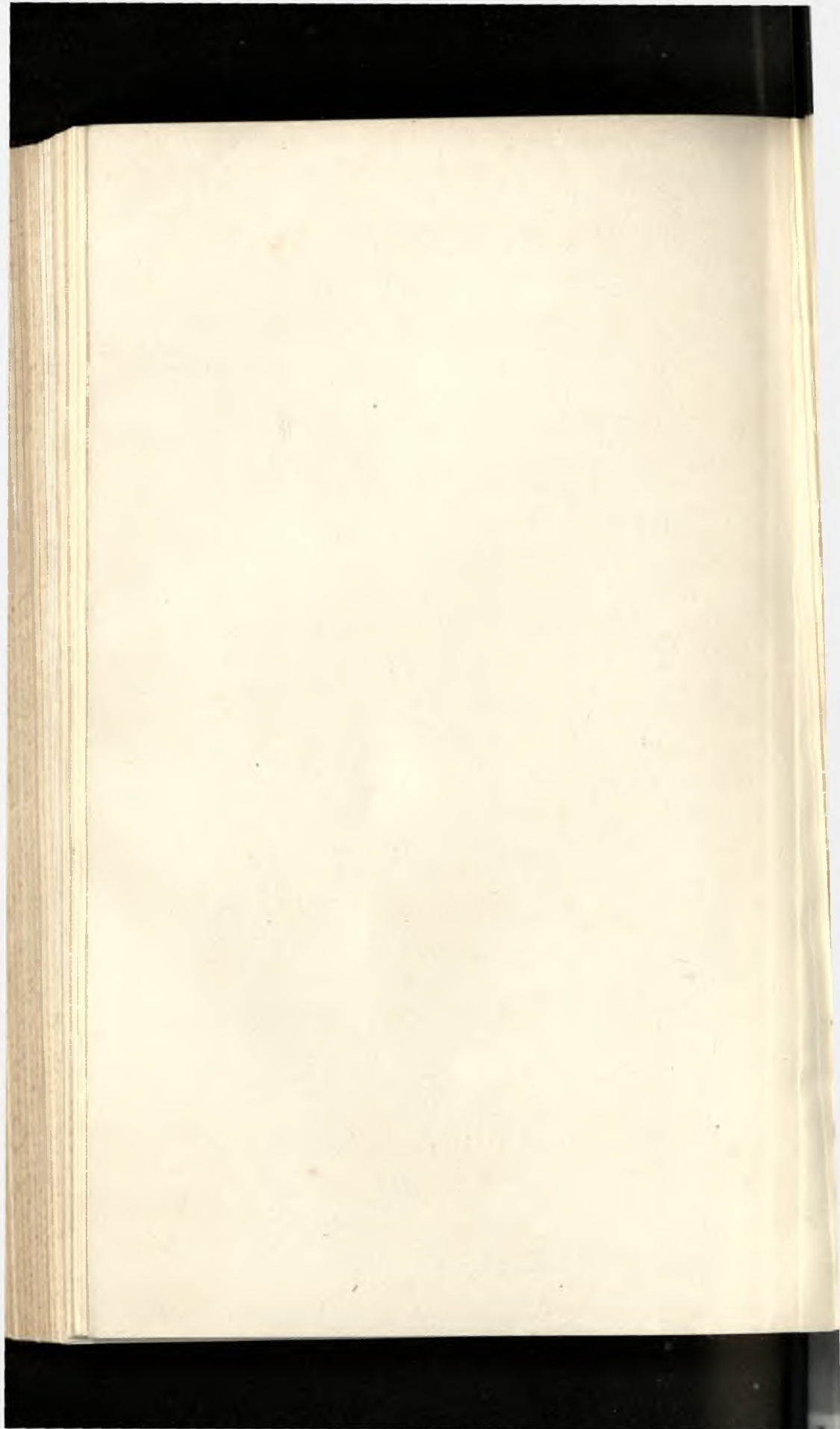


PLATE VIII.

1. Profile of cephalothorax in male of *T. pallens* (Camb.).
1a and 1b show variation in this regard.
2. Ditto of *T. insectus* (L. K.).
2a and 2b show variation.
3. Ditto of *T. mitis* (Camb.).
3a and 3b showing variation.
4. Male cephalothorax seen from above.
4a in *T. pallens* (Camb.).
4b in *T. insectus* (L. K.).
4c in *T. mitis* (Camb.).
5. Male cephalothorax seen from in front.
5a in *T. pallens* (Camb.).
5b in *T. insectus* (L. K.).
5c in *T. mitis* (Camb.).
6. Right palpus seen from above.
6a of *T. mitis* (Camb.).
6b of *T. pallens* (Camb.).
6c of *T. insectus* (L. K.).
7. Right palpus of *T. mitis* (Camb.).
7a. From outer side.
7b. From inner side.
8. Right palpus of *T. pallens* (Camb.).
8a. From outer side.
8b. From inner side.
9. Right palpus of *T. insectus* (L. K.).
9a. From outer side.
9b. From inner side.
10. Vulvæ.
10a. *T. mitis* (Camb.).
10b. *T. insectus* (L. K.).
10c. *T. pallens* (Camb.).
10d. Ditto from another example.

The spiders shown in this plate are rather less magnified than those in the last.

REPORT OF THE FIELD MEETINGS OF THE NATURAL HISTORY SOCIETY FOR 1904.

READ 14TH MARCH, 1905, BY THE REV. W. McLEAN BROWN, CHAIRMAN OF THE FIELD MEETINGS COMMITTEE, 1904.

MR. CHAIRMAN AND GENTLEMEN,—Although the position which I have occupied during the past year has been shorn of a great part of the honour which formerly belonged to the President of the Tyneside Naturalists' Field Club, yet my first word must be one of thanks for electing me to the still honourable position of chairman of the Field Meeting Section of the Natural History Society. Under the new conditions arising from the amalgamation of the Natural History Society and the Tyneside Naturalists' Field Club, the chairman of the Field Section may be considered to be the direct successor to the President of the old Field Club, and thus a certain inherited honour descends with the position, restricted though it is. Recognising also that it depends a good deal upon how the first occupants of a new position carry out the functions of their office, and what trend they give to it, what its future will be, I desire as the first chairman of the new committee to hand it over to my successor, shorn of none of its inherent possibilities, and with all its inherited honour. Knowing that it is the desire of the Committee that its chairman should, as far as possible, carry on the traditions of the older office of President, I shall do my best to give you a report of the various Field Meetings held during the year 1904. Beyond that I cannot hope to go, for however willing I may be, my qualifications will not permit me to follow in the steps of the honoured Presidents of the old Naturalists' Field Club.

The FIRST FIELD MEETING of the year was held at Ravensworth on the 12th of May; Lord Ravensworth having kindly granted permission to visit the grounds and gardens. The party started from the Central Station at two o'clock, taking

the train to Lamesley. The morning had been wet and threatening, and the afternoon was close and sultry as if thunder was not far distant. But in spite of the threatening outlook, a fair number of members turned up, the party numbering 18 or 20. A leisurely walk of about half an hour brought us to the main entrance to the castle, where we were met by a guide and conducted to the gardens. These are extensive and well kept, but there was nothing of very special interest to note by the naturalists. An extensive and elaborate system of heated walls for the cultivation of outdoor fruits would appeal more to practical gardeners than to the members of a Natural History Society. Some very fine trees were observed in the grounds, especially one specimen of a beech with a very fine spread of branches. There was also a beautiful specimen of a weeping holly; but by far the most interesting object seen was one of the Himalayan rhododendrons (*R. Thomsonii*), growing in a sheltered position, and covered with an abundance of crimson blossoms, resembling the flowers of *Lapageria rosea* in colour and texture. The bark of trunk and branches was of a whitish colour, and contrasted well with the dark foliage and brilliant blossoms.

Among the birds noticed were a number of the summer migrants, some of which had been already in the district for several weeks. The Willow Wren, Wood Wren, Chiff-chaff, Redstart, Tree Pipit, and Cuckoo were all heard in song; the Blackcap and Garden Warbler would doubtless also have been heard but for the overcast and sultry nature of the afternoon. Of the Chiff-chaff, two were heard; a fact worth noticing in this district, where the scarcity of the species in comparison with its numbers in other parts of the country is difficult to account for. Several Wild Ducks were seen flying round; and in some of the smaller copses the noisy chatter of the Lesser Redpole was heard.

Many of the spring flowers were in full blossom; among the most conspicuous of these being *Ranunculus Ficaria*, *Anemone nemorosa*, *Caltha palustris*, *Cardamine pratensis*, *Viola canina*, *Stellaria Holostea*, *Ulex europæus*, *Prunus Cerasus*, *Fragaria*

vesca, *Potentilla fragariastrum*, *Oxalis acetosella*, *Chrysosplenium oppositifolium*, *Myrrhis odorata*, *Anthriscus vulgaris*, *Nepeta Glechoma*, *Primula vulgaris*, *Scilla nutans*, and *Arum maculatum*.

The SECOND FIELD MEETING was held at Wooler and Chillingham, on Wednesday and Thursday, 22nd and 23rd of June. Through the kindness of the North Eastern Railway Company, members were permitted to make the journey on Tuesday, the 21st; several of whom took advantage of this privilege and fixed their headquarters at "The Cottage Hotel." This advance guard was reinforced by several members on the arrival of the first train on Wednesday morning. As these had been obliged to make a very early start from Newcastle, their first object was to reconnoitre the breakfast table, which, fortunately, was able to meet their demands. The advance party, which included the honorary secretary, Mr. C. E. Robson, had arranged to make the ascent of "The Cheviot" the chief business of the day. Accordingly, as soon as the new comers were ready, a start was made by way of Middleton Hall, for Langleeford. The road in some parts, as those who have passed over it will have cause to remember, is steep and rugged, and needs both strong and steady horses to tackle it. These, however, had been supplied, and after a very pleasant journey we reached Langleeford Farmhouse, where the real work of the day was to commence. On setting out from Wooler the day had been very threatening. The clouds were low and a drizzling rain was falling, and the landlord of "The Cottage" hoped we would get a good drenching before we returned. No doubt the wish was father to the thought, as he remembered the parched condition of the soil and the needs of his young turnips. However, there was a stiff breeze blowing, and as we neared the foot of the hill the sun was breaking through, and there was every prospect of a successful ascent. Leaving the farmhouse we soon began the ascent, and broke up into two parties, one climbing the southern slope, the other veering round towards the north, or north-east. The Cheviot is not very rich botanically, but in our

upward march we found abundance of *Melampyrum pratense*, var. *montanum*, and about the same elevation we came across the first specimens of *Rubus Chamæmorus*. To those who had not previously ascended the hill the abundance of this species was the most remarkable event of the day. When first met with it was in little patches, the flower was past, and the fruit was forming; but as we ascended it became gradually more plentiful, and the flowers were fresher, until, when we neared the summit, the surface was literally covered with it, and the blossoms so abundant as to give the ground the appearance of a slight coating of snow. The two parties got separated, and though they both claim to have reached the summit and to have left a written message on the cairn, it is rather suspicious that neither saw any trace of the other, and no message was found by either. On the very summit of the hill we found a covey of young Grouse, one of which we caught, but soon liberated, and were amused to see the way it sought the assistance of every patch of rough cover until it got into the more robust heather and was soon lost to sight. On the top a steady breeze was blowing, which had effectually scattered the mist; but at intervals a cloud came sailing along, flecking not only the Cheviot, but the neighbouring hills as well, with light and shade. We did not tarry long on the summit, but began the descent on the south-western slope, so as to reach the valley that separates Cheviot from Hedgehope. This slope was found to be very much rougher than the one by which we had ascended, thickly clad with rough boulders in places, so that we found the descent even more difficult than the ascent had been. In the sykes that drain the lower slopes of the hill on this side abundance of *Saxifraga stellaris* was found, and also in damp hollows growing among *Sphagnum*. The parties were reunited at Langleeford, and were soon driven back to "The Cottage" for dinner, which was very acceptable after the day's exertions and the breezes of the hill.

A few members were obliged to return home by the evening train, but some of the remainder, not satisfied with their day's

performance on Cheviot, proposed a visit to the "Gulleries" near Weetwood Moor, not more than a mile and a half distant. Piloted by an enthusiastic ornithologist—Mr. Isaac Clark, jun.—who had visited the place the preceding evening, we were soon at the spot, and in the midst of thousands of Black-headed Gulls, which rose screaming at our approach. By the side of the little loch, among the rushes and heather, the nests were in hundreds, each containing from two to four eggs; or sometimes the little downy chicks had taken the place of the eggs and were hard to distinguish from their surroundings. Our guide took us to a rush that rose above the water by the side of the lake, where he had discovered a Coot's nest containing eggs the previous evening; but in the interval the eggs had changed into black downy chicks. A Mallard with her brood was also observed to rise with the Gulls and escape to a safe distance.

The morning of Thursday, the 23rd, was spent in short rambles in the vicinity of Wooler; the afternoon being left free for a visit to Chillingham Castle. Driving by way of Fowberry Tower and Chatton, the east lodge of Chillingham was reached after a pleasant drive. The Earl of Tankerville had kindly granted permission to visit the park and the wild cattle; so the park keeper was ready to conduct us to the place where he had located the herd earlier in the day. It requires careful stalking to get within easy distance of viewing them, but under the keeper's guidance this was at last successfully accomplished, and from behind a clump of brackens we were enabled to view them at a distance of not more than 200 yards. Although the herd numbered 57, it is rather singular that there were only four calves; no doubt the close inbreeding for so many generations accounting for the fact. In that portion of the park where the cattle were grazing we found abundance of the beautiful *Trientalis europæa* in full flower. We next visited the "Heronry," one of the few breeding places of this bird in the county. As usual the nests were seen in the tops of the tallest trees, and though we did not see them all, the keeper informed us that last spring there were 24 nests in all.

In passing through the woods we noticed many decaying trees whose bark bore traces of the Woodpecker, and near the top of a tree whose head had been broken off by the wind, a hole made by the bird, no doubt a nesting place, was distinctly visible; but no glimpse of the bird itself was seen. Retracing our steps to the lodge where our brake was waiting for us, we returned to Wooler by way of Lilburn and Ilderton, in time for dinner and the evening train to Newcastle.

One noticeable feature of this excursion was the abundance of bird life observed, the following species having been seen during our visit:—Black-headed Gull, Mallard, Coot, Rook, Jackdaw, Grouse, Blackcock, Partridge, Pheasant, Curlew, Lapwing, Golden Plover, Snipe, Sandpiper, Dipper, Wood Pigeon, Chaffinch, Greenfinch, Tree Pipit, Meadow Pipit, Common Wren, Wood Wren, Willow Wren, Wheatear, Grey Wagtail, Pied Wagtail, Swift, House Martin, Sand Martin, Reed Bunting, Yellow Bunting, Common Bunting, Whitethroat, Blackbird, Thrush, Missel Thrush, Ring Ousel, Blue Tit, Great Tit, Starling, Corncrake, and Tufted Duck. This list is still further increased by the observations of Colonel Adamson, a member of the Society, who was staying at Wooler at the time of our meeting, but who did not form one of our party. The following most interesting letter was sent by him to the Curator of the Museum, which I incorporate herewith:—

“Dear Mr. Gill,—Last week I happened to be staying at Wooler during the visit of the Natural History Society; but though there I did not to my knowledge meet any of the members. I made some notes of the more interesting birds seen during the week, within two miles of Wooler, by my sister and myself. On leaving our hotel, “The Cottage,” and walking down the side of the Wooler water as far as the Till, we noticed a pair of Ring Dotterels on the gravelly bank of the burn. Knowing that they would either have eggs or young, we lay down and watched them carefully for a long time, and at last having marked both birds to a small patch of gravel, we proceeded to the spot and thoroughly searched it, the birds

almost touching us in their anxiety to entice us away. After a most careful search my sister found one of the young squatting among the gravel, and on calling me to come to her, I found a second similarly squatting about two yards distant. Though we searched carefully, we could not find the others. Within a few yards we also found some young Peewits hiding on the sand and gravel.

"Next, in walking along the side of the river, in a rank pasture, we put up a Corncrake at our feet, and on looking among the grass we were lucky enough to find three of the young ones, which were apparently just hatched. They were most lovely little creatures, very like young water hens, but instead of being black, they were of a rich dark brown colour. I had never seen a young Corncrake alive previously. Presently, along the bend of the river, where it was overgrown with long grass, we flushed a Water Hen. There was no difficulty in finding her nest, as one or two young scrambled into the water and showed us where it was. In it were some eggs, one of which was already chipped ready for the young one to emerge.

"Next day we visited the lake where the Black-headed Gulls breed. There were as usual hundreds of the old birds flying about, but at first we could not distinguish any young ones on the wing. On getting to the breeding place we found that there were still lots of eggs and many young just hatched, but very few of any size. The inference to be drawn from this fact is that most of the early eggs had been taken, as by the end of June most of the young should have been able to fly. Later on we saw a few young birds flying about with the old ones, but very few. At the lake we also saw Wild Duck and Teal, and we discovered some very young Teal chicks swimming about in the water, but when approached they got under the heather hanging over the water and disappeared from view.

"Perhaps the most interesting sight we saw was a Wild Duck hiding its young from us. We had seen some Redshanks, and were watching them to see if we could make out where they had their young. One of the birds alighted near the middle

of a large grass field. My sister followed it and found a runlet of water, on the edges of which were long grass and weeds. Presently she saw some little brown birds swimming about in the water at the bottom of the ditch. On becoming alarmed, they hastened to the muddy bank overhung by weeds, and were there met by their mother, who took them under her protection. My sister made signs for me to come, and then called me, and though I had to walk about 150 or 200 yards, I arrived where she was standing, and saw the old duck with its head stretched forward and its wings expanded over its young ones. I watched it from within four or five yards for two or three minutes, and then we both walked on a few yards to be out of sight, and having waited about a minute, we returned and found that the bird had not moved. We then left it in peace.

"We afterwards saw four Redshanks together, so I have no doubt that the young birds had already flown. We also saw several pairs of Common Sandpipers and the young of one pair; but though my sister saw the young, and picked up two from under the sandy bank where they were hiding, yet afterwards, when they were running with the old ones over a ploughed field, and she took her eyes momentarily from them, they squatted, and she was unable to find them again.

"Among other birds seen by us were a Kingfisher, Water Ousels, Curlews, Grouse, Wheatears (very common), and a Spotted Woodpecker.

"The only butterflies, except whites, were Little Heaths, which were very plentiful on the hills.

"I forgot to mention a Brown Owl which I saw in the trees in the hotel garden in the evening, and which had its nest in one of the trees.

Yours sincerely,

C. H. E. ADAMSON."

The THIRD MEETING of the season was held on the 21st of July at Ratcheugh Crag, a well known portion of the basaltic dyke lying to the west of Longhoughton Station. Taking

train to Alnmouth, we walked by way of Lesbury along the Alnwick road, and reached the crag from the south. Like the rest of the basaltic cliffs on this side of the county, Ratcheugh faces the west; the approach from the east being by a gradual ascent, the cliff being quite hidden from view until you actually stand upon the top. The crag itself is well wooded and picturesque in appearance, except at the extreme north and south, where there are quarries for the production of paving setts. On the invitation of Mr. Lamb, the lessee of the quarries, several members visited the one at the northern end of the crag, where the newest machinery for drilling the hard rock, and also for crushing it, was seen in operation. More interesting to the geologists were traces of the glacial age in the form of striated markings on the surface of the whinstone which had been recently bared. While the geologists were examining the quarry, the botanists were busy exploring the wooded portion of the crag, and were successful in finding the maiden pink (*Dianthus deltoides*) fairly abundant, growing in thin soil on the top of the crag. Among other plants which they found were the blue grass (*Sesleria caerulea*), growing on the limestone, the only place in the county where it is known to occur; also the spindle tree (*Euonymus europæus*), and abundance of *Viola hirta*. The two sections of the party gathered once more at the little observatory that crowns the summit, where tea was partaken of in the open air. After rest and refreshment, the party set out for the village of Boulmer by a path that runs through the fields. We did not actually enter the village, but skirted it, and returned by another route to Alnmouth Station; one or two of the party prolonging the day by going on to Alnmouth village and returning by a later train. The day was hot and sultry, but the walk through the fields in the evening air, especially as we neared the shore, was delightful. Bird life was not abundant, but the Corncrake was still busy rasping out his notes, and a few of the commoner species were noticed both in the woods and in the fields.

The FOURTH MEETING of the season was fixed for the 17th of August, the place to be visited being Corbridge and the Devil's Water. Unfortunately the weather was bad; a dull morning giving place to a steady pitiless rain for the rest of the day. On gathering at the Central Station a consultation was held as to whether we should proceed with the excursion or abandon it altogether. The majority were in favour of proceeding, in case any members from other localities might be on their way, and also in the hope that the weather might improve as the day advanced. This hope was not realised, however, and the rain continued to pour for the whole day. It was not surprising therefore that we had only a small party, numbering nine in all; and as our route lay principally through the "pathless woods," the best preparation would have been oilskins and sea boots. However, having made up our minds, there was no flinching on the part of any; so boldly plunging into the woods, we made our way upwards, following the river as closely as possible. Under such conditions it was not possible to make a very careful search for natural history objects, but we were very much struck with the beauty of the sylvan scenery, and realised how grand it must be under favourable weather conditions. Ant hills are not very common objects in this part of the country, but one very fine one was noticed as we passed through the wood. Our original plan was to go as far as Linnels Bridge, but by the time we reached Sunnyside we had got as much as we cared for, so striking the Hexham road, we travelled thence and returned to Newcastle. The party, however, got broken up in passing through the woods, several members getting detached from the rest. These retraced their steps through the woods to Dilston Castle and Corbridge, reaching Newcastle by another train. This was the one unfortunate meeting of the year; all the rest being favoured with good weather for our purpose.

The FIFTH MEETING of the year was held on the 15th of September, Rothley Crag and Lakes being the destination. On arriving at Scots Gap Station we found that, through the

kindness of Mr. Daglish, of Rothley Crag, a conveyance was waiting to drive any who preferred that mode of locomotion. The majority of the company, which numbered about a dozen and a half, preferred to walk, and in the hedges by the roadsides some beautiful fruits of the wild rose and barberry were seen and gathered. On the top of the crag, and standing about half a mile back from the road, are the artificial ruins of a castle, said to have been erected by Sir W. C. Blackett in the 18th century. Here we were met by Mr. Daglish, of Rothley Crag, and Mr. Perceval, of Longwitton Hall, whose intimate knowledge of the district made the view from that commanding point both interesting and intelligible. The view from the top of the ruins is very extensive, and favoured by fine weather, the Simonside hills were seen standing out clear to the north, while Redesdale, wild and bare, lay in the distant west. In the nearer distance, lying to the south and east, were seen Cambo and Wallington, Longwitton and Netherwitton. From the top of the crag, Mr. Daglish, with the aid of maps and charts, pointed out the principal geological features of the district, which are more fully treated by Professor Lebour in the accompanying paper, which was read during the afternoon. Mr. Daglish, acting as our guide and host, next led us to his own beautifully sheltered residence, which takes its name from Rothley Crag. Here we were welcomed by Mrs. and Miss Daglish, and hospitably entertained to lunch.

Taking leave of our host and hostess, we proceeded to Rothley Lakes, where Mr. Herbert Coxon has his ideal summer residence. The lakes are evidently artificial; the one lying furthest to the west being formed by the embankment made to permit the Rothbury road to pass across the valley. This is the more romantic of the two, being well sheltered by pine woods on either side; at the north-eastern corner of which Mr. Coxon's house stands, with its lawn sloping down to the water's edge. To the sheltered waters of this lake many species of wild fowl repair; ducks of several kinds being especially numerous; and to Mr. Coxon's kind-

ness I am indebted for the following interesting list of rare birds that have nested in the neighbourhood within the last few years. The lake which lies to the east of the Rothbury road is the larger of the two, but its banks are bare, and it has not the beauty of its neighbour. At both ends of this lake the bulrush (*Typha latifolia*) is very abundant, and at the western end it is mingled with the handsome water dock (*Rumex hydrolapathum*). Other plants seen during the day were *Paris quadrifolia* and *Rubus cæsius*, both in fruit. After a ramble through the woods and around the lake, Mrs. Coxon entertained the company to afternoon tea, and one of the most pleasant excursions of the year came to an end.

RARE BIRDS NESTING OR TAKEN ABOUT ROTHLEY LAKE
AND THE ROTHBURY HILLS.

RAVEN. Nested in 1901 in the Key Heugh (a romantic spot on Sir John Riddell's moors between Whitefield and Darden Lough). The Ravens were first seen preparing their nest on 18th February. At this date snow was lying thickly. The nest was revisited at the end of March, and it contained three eggs. One egg was taken. The birds reared two young, and on the 10th of May these were taken from the nest, one being kept and tamed by Wm. Bell, then keeper for Edward Newton, Esq., of Hepplewoodside. This bird was alive last autumn at Forest Hall, near Newcastle, and is a very fine specimen. Sir John Riddell's keeper got the other young bird from the nest, but it died shortly afterwards. In 1902 the ravens nested on a rock on the Simonside Hills, and reared four young. In 1903 and 1904 ravens were frequently seen, but so far as I am aware their nest was not located. As late as Wednesday, the 18th of January, 1905, I heard the raven calling to the north of the Rothbury Hills.

PEREGRINE FALCON. In 1902 a pair of these birds nested in the Key Heugh, not far from the nesting place of the raven. The female was destroyed, and the nest taken with three eggs. The eggs were hard set, and therefore of little value from a

collector's point of view. The Peregrine is frequently seen about the Biddlestone moors.

HEN HARRIER (Female). Was taken in March, 1898, at Hepplewoodside, and is now in Mr. Newton's collection.

MERLIN. Is frequently seen, and a pair reared their young on Tosson last year (1904).

WATER FOWL. At Rothley Lake we have a variety of visitors, and the following have all been shot during the past few years :—Wild Duck, Teal, Pochard, Golden Eye, Wigeon, Tufted Duck; Pintail Duck in 1903; and the Long-tailed Duck in 1904. A Cormorant (immature) was shot after stormy weather on the 1st December, 1902.

The LITTLE GREBE sometimes nests on the lake; and four years ago the PIED FLYCATCHER nested in the lake woods. In the autumn of 1896, and again in 1897, the Crossbills were seen in the fir plantations near the Lake House.

WOODCOCKS nest regularly about Rothley, and in 1903 we found two nests in the lake woods, and another about a mile away.

The NIGHTJAR is sometimes seen on Linneal Law in the spring and early summer, and nests regularly near Holystone on the Coquet.

The DUNLIN is a spring visitor to Fallowlees Lough, and the REDSHANK has often been seen on Rothley South Moor.

The GREAT SPOTTED WOODPECKER is sometimes a visitor, and has twice reared a brood in the lake woods.

The SIXTH and last FIELD MEETING of the season was held on Friday, October 7th, the destination being Wheel Birks, near Stocksfield, the country residence of Mr. David Richardson. Fine weather again favoured the party, which numbered about two dozen. It was rather late in the season for much natural history work being done, but it was an ideal autumn day for an outing in the country. Only belated specimens of the wild flowers were met with, and bird life was not abundant. A Jay and a Magpie were seen, and a tree in which the Great Spotted Woodpecker nested in spring was pointed out. This

bird is probably not quite so rare in the north as is usually supposed ; at least one other nest was known in the district last spring in Gibside woods, while the bird itself was seen near Wooler, and abundant traces of it in the woods at Chillingham. The party was met by Mr. Richardson near his residence, and conducted over the gardens and extensive vineries and greenhouses. In one of these he had a collection of fragments from the remains of an ancient iron smelting furnace, to which the party was conducted later, a description of which is given in the accompanying paper by Mr. Richardson. After a ramble through the woods the company was entertained to tea, and then departed homewards after a most enjoyable afternoon.

Altogether, the Field Meetings for the year 1904 have been an improvement upon those of recent years. With the exception of the August meeting, we were favoured with delightful weather, which is always an important factor in an outdoor meeting ; but the very fact of nine members turning up in such a day as that experienced in the Dilston woods by Devil's Water, is even more emphatic testimony in favour of Field Meetings than crowded attendances on fine days. So long as members are prepared to face the discomforts of such a day as that there is not much danger of the love of natural history pursuits falling into abeyance, and it augurs well for the future of the Society.

In conclusion, I wish to call attention very briefly to a subject which I think deserves some attention from the Natural History Society. We are fortunate in having in the Transactions of the Society at least two very complete Floras of Northumberland and Durham, one by N. J. Winch, published in 1831, with an appendix bringing it down to 1836, and another by Mr. J. G. Baker, published in 1868, and forming Vol. II. of the last series of Transactions. Included in these volumes are many plants which even in those days were rare, some of which are now probably extinct, in the two counties. No doubt much has been done during the interval by the Tyne-

side Naturalists' Field Club especially to verify some of the stations of these species, but we have no collected account of these, nor are they complete. Great changes have taken place in the character of the two counties within the last forty years, and the time has arrived for some authoritative revision of the flora to be undertaken. So far as I am aware no reliable record exists of some of these species having been seen for many years, and we may be including in our floras several species which no longer exist. This may flatter our vanity, but it is hardly creditable to our scientific accuracy. Fortunately some of our rarer species are so abundant that extinction need not be feared, such as *Primula farinosa* and *Potentilla fruticosa*; those who have seen the abundance of these in Upper Teesdale in recent years have had all fears set at rest. The lovely *Gentiana verna* is also fairly plentiful, and what is greatly in its favour, it is very difficult to find except when in bloom. But a few enthusiastic collectors in the flowering season would soon make sad havoc with this lovely native. *Bartsia alpina* is also fairly common in the same district. But *Arenaria uliginosa* I have sought for in vain in all my visits to that locality, and it would be interesting to know if it has been gathered within recent years, or if this is one of the species that should be dropped from our local flora—and, if so, from the British flora, as this is the one station given for it in the British Isles. Two or three other species I have sought for in vain in their reputed habitats, such as *Polygonatum verticillatum* in the North Tyne district, *Polygonatum officinale* in the Kyloe Crags, and *Linnæa borealis* near Scots Gap Station. Then there is *Cypripedium Calceolus*, once fairly plentiful in Castle Eden Dene, but not gathered by anyone whom I have personally met, but which may yet be found to survive in some secluded nook in that rather extensive dene. *Melampyrum sylvaticum* is still found in the little island in the Tees above Winch Bridge; *Scilla verna* on the basalt at Cullernose; *Statice Limonium* on St. Cuthbert's Rock at the south of Holy Island; and *Sisymbrium Irio* near the old walls close to the pier at Berwick-on-Tweed.

All these I have gathered myself within the last few years. It is possible that others have succeeded in their search after species where I have failed, but it would be of great advantage to botanical students if some such revision as I have indicated could be made, bringing our local flora up to date. If some individual with sufficient time and enthusiasm could be found to do the work that would be the most satisfactory solution, but, failing that, I do not see why the Natural History Society itself should not undertake it. It is a work in which many could co-operate, and to which I am sure many would be delighted to give a helping hand, but some one must take the initiative and be responsible for carrying it through.

Geological Notes for a Visit to Rothley Crag. By PROF. G. A. LEBOUR, M.A., M.Sc., F.G.S.

READ AT THE ROTHLEY CRAG FIELD MEETING, 15TH SEPT.,
1904.

When, in 1867, I first began to geologize in Northumberland, it was customary to regard the "Great Limestone" as the topmost bed of the Carboniferous Limestone series. The beds next above were therefore regarded as forming part of the Millstone Grit, and thus is explained the enormous area which is assigned to that division of the Carboniferous rocks in the older geological maps of North Eastern England. I believe I am right in stating that the Rothley Crag and the late Sir Walter Trevelyan were jointly responsible for this view, though its actual publication was due to Professor John Phillips. It was natural enough for Sir Walter, an excellent and enthusiastic observer residing close by, having the fine grit escarpments of Rothley and Shaftoe Crag constantly before him, to conclude that the rocks which produced them were the representatives of the first coarse grit, or "Kinderscout" bed, which in Derbyshire and in West Yorkshire immediately follows the shales, sandstones, thin

limestones, and rare coals of the Yoredale series. It was especially natural when one remembers that the grits of these crags are much coarser than those of any beds above them in the higher Carboniferous deposits, and tally exactly with all preconceived notions as to the characters proper to typical Millstone Grit. That marine fossils were found in beds above the crag-forming strata was not held to be in any way inconsistent with this classification, since not very dissimilar fossils had been found in more than one marine band in the undoubted Millstone Grit in the more southern counties. It must not be forgotten also that the bands of limestone which are now such invaluable factors in the correlation of the Carboniferous beds had then been carefully distinguished, and to some extent mapped, only in the lead-mining districts of Alston, Allenheads, and Weardale, all many miles away. It was the patient following of the outcrops of the most remarkable of these limestones from these districts northward, which, after many years' delightful labour, enabled one to rectify the erroneous inferences which had been arrived at in the absence of sufficiently accurate data, and showed that the strata from the "Great Limestone" upwards as far as and including the "Felltop Limestone," belonged to the Carboniferous Limestone series, and that, in mid-Northumberland, the true Millstone Grit (*i.e.*, the beds between the Limestone series and the Coal Measures) was represented by a comparatively insignificant set of sandstones and shales with very occasional coal seams of no great value and *no* limestone—altogether of quite small thickness, and devoid for the most part of that character of coarseness of grain which had usually been regarded as essential to that division. I must hasten to say that as soon as the stratigraphical evidence was placed before Sir Walter Trevelyan he not only cheerfully adopted the conclusions to which it led, but helped personally in working out their details. Rothley Crag is thus a classic spot as regards Northumbrian geology, and deserves notice as such; it affords besides a most extensive view over a considerable extent of interesting country. From its summit the eye ranges

as far as the Simonside Hills and the Cheviots, and therefore embraces the outcrops of the whole of the "Bernician" and "Tuedian" rocks, which together make up the Lower Carboniferous deposits of Northumberland.

The following table will show at a glance the position which the grits of Rothley hold in the series, viz. :—

COAL MEASURES.

MILLSTONE GRIT.

UPPER BERNICIAN.

Felltop Limestone.

Sandstones, shales, thin occasional coals.

3rd. Intercalated Limestone.

Sandstones, shales, thin occasional coals.

2nd. Intercalated Limestone.

Sandstones, shales, thin occasional coals.

1st. Intercalated Limestone.

Sandstones, shales, thin occasional coals.

Little Limestone.

Shale and sandstone alternating.

Coal (the "Little Limestone Coal," upper portion of seam, thin).

"Black and Grey Freestone"=sandstone

6 feet

"Black Metal"=shale

3 "

"Black Stone"=hard shale

1 "

"Grey Stone"=shaly sandstone

5 "

"Black Stone"=shale

1½ "

White sandstone

14 "

Shale

19½ "

"Whinstone"=hard compact sandstone

1½ "

"Grey Slate"=compact shale

7½ "

Coal (the "Little Limestone Coal," lower portion).

1½ "

Fireclay

1 "

This set of beds is extremely variable, in some places wanting altogether, in others considerably thicker, the seams of coal in some places coalescing into one, at others splitting into three.

Shale and sandstone alternating, including the Inghoe Grits of which the Rothley Crag is composed.

Shale (thick).

Great Limestone.

Many hundred feet of sandstones, shales, limestones, and coals.

The Ridsdale Limestone and Ironstone Shale.

LOWER BERNICIAN.

Many hundreds of feet of sandstones, shales, thin limestones, and coals, with at its base a very thick crag-and-hill-making set of sandstones (often coarse) known as the Fell Sandstones, which is placed by the Geological Survey at the top of the

TUEDIAN.

Many hundreds of feet of sandstones, shales, and thin more or less argillaceous limestones (Cement Stone), with at the base an irregular deposit of pebbly conglomerate which is usually known as the

BASEMENT BEDS (of the Carboniferous System).

(N.B. The entire thickness of the Bernician series at the latitude of Rothley is probably between 6,000 and 7,000 feet; that of the beds between the Felltop Limestone and the Great Limestone is here about 1,300 feet, whereas the same group south of the River Tyne is not more than 300 feet in many places).

It was in 1878 that I gave the name "Inghoe Grits" to the coarse grits which form the marked feature first seen between the Tyne and Wansbeck (as at Inghoe and Shafthoe Crags), and continued to Rothley between the Wansbeck and Coquet. Rothley Crag is in fact the northermost of the bolder escarpments due to these rocks. At the three places mentioned the nature of the stone is identical. It consists of thick lenticular-shaped accumulations of angular grains of glass-clear quartz held together in a cement, much of which is more or less completely decomposed felspar. In this matrix are irregularly distributed pebbles of vein quartz, more or less opaque and milky, and often perfectly rounded and waterworn. The rock, where these pebbles are numerous, thus becomes a true conglomerate or compacted shingle-bed, which must have been deposited near shore. It would obviously help one to re-construct the physical geography of the district at the time of its formation if one could with any degree of certainty trace these rolled pebbles to the parent mass from which they were originally torn. They are frequently over an inch in diameter, though usually smaller, so that the distance which they travelled from can scarcely have been very great, and they are generally accompanied by a fair quantity of small but

quite visible equally rolled crystals of red garnet. Sir Walter Trevelyan had collected quite a number of these garnets in the course of years, some from Rothley, but mostly from the Shafthoe Crag in the neighbourhood of the well known "Punch Bowl" there. I have also found many in both places in the seventies. The material of the crag came therefore from a region where garnetiferous rock and considerable masses of white quartz were exposed to the action of denudation, probably a mica-schist with quartz reefs such as are common in rocks of this kind. Unfortunately there are no such rocks anywhere at all near. One is therefore driven to the conclusion that either the rocks from which the quartz pebbles and the garnets came are now (what is left of them, or in other words their "roots") covered up by newer deposits—or that the parent mass is in one of the many quartz-and-schist regions at least one hundred miles off in Scotland. I can make no nearer approach at a reasonable guess than this. The great thickening of the group of beds of which the Rothley Crag or Inghoe grit forms part in a limited portion of mid-Northumberland seems to point to some special source of supply comparatively near at hand—such as the mouth of a large and, at times, swift-running river, for example. Perhaps careful examination of the material of the rock, such as the members of the Natural History Society or Field Club should be encouraged to carry out, might bring stronger evidence to bear upon this point.

Fossils are not to be expected in coarse beds like these, but they are not unknown in the finer-grained and more thinly bedded sandstones which are comprised in the series, and are interpolated between the coarser grits. I have notably found numerous specimens of *Streptorhynchus crenistria* and other flattish-valved brachiopods in such beds overlying the coarser beds on the dip-slope both of Rothley Crag and of Inghoe Crag, *i.e.*, of course, to the east. In the same direction one soon comes upon quite a number of small annular spoil heaps dotted over the surface of the ground—about Rothley Shield, &c., for instance; these are the remains of the ancient pits by

means of which the "Little Limestone Coal" was formerly worked in a small way.

The Little Limestone itself is not well exposed in the Rothley neighbourhood, but plenty of marine fossils can be obtained in the long range of quarries which can be seen extending to the north at Greenleighton when one is looking westward from the crag top. These quarries are in the Great Limestone, and well worth a visit. To the left, still from the same point of view, close to the railway on its southern side, used to be open the famous Elf Hills Quarry—now most unfortunately covered up and lost to sight—in the Four-Fathom Limestone beneath the Great Limestone. It was in the cutting leading from this quarry to the railway that the Great Whin Sill was, in the sixties and seventies, seen invading this limestone and sending slender shoots and strings of the diabase into the baked stone. Fossils were very common in this quarry, and comprised many rarities, such as trilobites in quantities in a baked calcareous shale in the cutting referred to. In the main quarry it was that the well-known foraminifer *Saccamina Carteri* was first found by Sir Walter Trevelyan—a form which we fondly hoped was characteristic of this particular horizon in the Bernician. It turned out however afterwards that *Saccamina* was to be found in the Silurian of Girvan in Ayrshire, in the Jurassic rocks of India, in the glacial deposits round Lake Erie in North America, and actually living in the shallow Arctic Seas round Franz Joseph Land. A few years ago it was found dead, but, undoubtedly recent, on the shore at Sandsend, in Yorkshire, by Miss M. V. Lebour. Thus were our hopes dashed to the ground, and the name "*Saccamina* Limestone," which we had too soon engraved upon our geological maps, turned to ridicule.

But although the great Elf Hills Quarry is now but a memory, there is still much of interest to be seen in its neighbourhood, especially in connexion with that ever fascinating sheet of intrusive diabase the Whin Sill. This unique sill (for it *is* the most extensive post-Archæan sill in Britain, and

perhaps in Europe) crops out in rugged mounds between the covered-in quarry and the adjoining farm buildings, where it reaches the Great Limestone, and is seen to contain large angular fragments of shale (altered by the baking into hard porcellanite) dragged by it from the rocks through which it was injected from below.

In the shale-cliff forming the right bank of the upper Hartburn, where that stream runs through a thick plantation a short distance west of Rothley Crag, and north of the Wansbeck Railway, quite a crowd of *Chonetes* valves can always be found beautifully preserved, but very fragile, and needing careful packing for removal.

Notes of an Old Iron Smelting Furnace at Wheel Birks.

By DAVID RICHARDSON, Esq.

No record or tradition exists respecting the Iron Smelting Furnace at Wheel Birks. The oldest inhabitant in 1884, now departed this life, knew nothing of it beyond the fact of its existence. The owner of the nearest dwelling at "The Bridges," which had been built by his grandfather—Hornsby—and occupied therefore by that family for three generations, could remember no tradition respecting it. Even the owners of the adjacent land, who have come and gone as transiently even as the cottagers, have left no records about it, and yet there is reason to suppose that it does not date further back than the reign of Queen Elizabeth or King James.

The compilers of the new History of Northumberland, Vol. VI., have found record that in 1608 Wheel Birks was tenanted by Cuthbert Richardson, Henry Fairbarne, and Henry Robson, the previous tenant being William Thompson. This William Thompson is mentioned as having a 21 years lease dating from 1566, and he is named in rent rolls of 1570 and 1576; his "tenement" being nameless, whilst the rent of 13s. 4d. continues the same, and the acreage of 15 is once

mentioned. The name Wheel Birks first occurs when in 1608 the three tenants before named, Richardson, Fairbarne, and Robson, were in occupation. The supposition therefore that the place took its name from the water wheel constructed to work the furnace bellows seems reasonable, and points to this date. And this idea is strengthened by the word never appearing as spelled Huel or Wheal, which are well known Cornish terms for a mine or smelting place; but the strongest testimony pointing to this period as the time of its erection is the internal form of the furnace itself. When excavated in 1884 it was plain to see that the

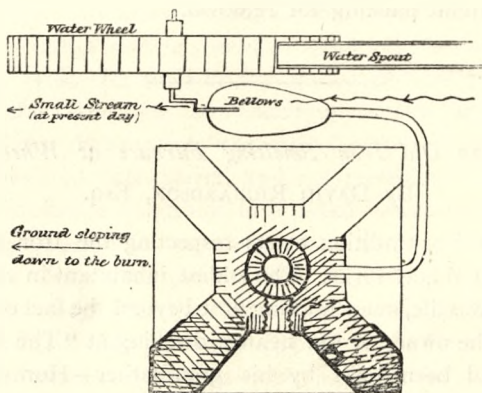


Fig. 1. Plan of Old Iron Furnace at Wheel Birks. Only the shaded parts remain.

small diameter of the furnace bottom was designed for collecting the molten metal, and the enlargement of its waist or "boshes" immediately above this receptacle was a marked feature. It was the invention of this form of furnace—patented by Dudley about 1620—which made it possible for the first time in history to produce and collect molten iron protected from the air in a quantity sufficient to be run fluid into moulds. An iron fire-place is preserved in Warkworth Castle bearing the date of about this time, and there are other examples of Sussex fire backs dated 1636, and others about the same period—all illustrations of the then new ironfounder's art.

The land on which this ruin of a furnace stands was up to the date of the Enclosure Act of 1817 part of Broomley Common. The award of this enclosure makes no mention of a furnace. It must at that time have already lain a forgotten ruinous heap for over a century. A stone built boundary wall which runs close past it was built soon after this time, and before 1826, when the adjoining woods were planted; and the ruins furnished the stone—burnt red by fire—for some distance of this wall.

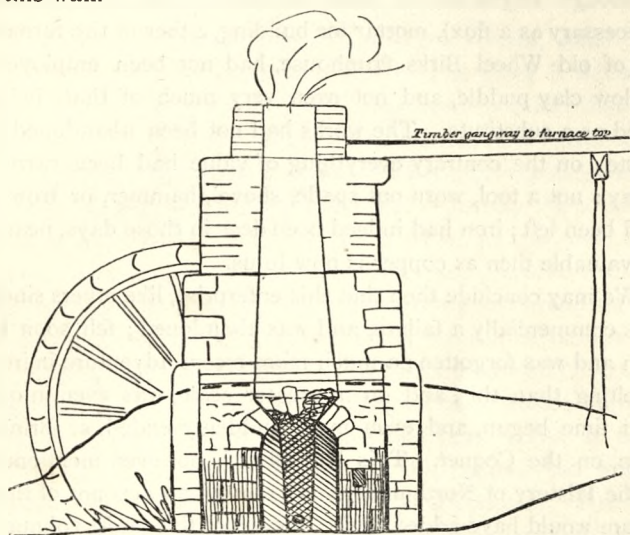


Fig. 2. Sketch showing probable design of the Old Iron Furnace at Wheel Birks.

That the works were not in operation very long—perhaps not more than a year or two—may be inferred from the limited quantity of slag—only 50 or 60 cart loads—spread about the surface in front of the tap hole. The expenditure of capital on it must have been considerable. The furnace stood on four dressed stone piers and was probably some 30 feet high, so that a level gangway of timber from the adjoining bank reached its top for feeding in the fuel, ore and flux. To build the furnace: dam up the stream, and form a mill race with spouts and sluices: construct the water-wheel of 20 to 25

feet diameter with leathern bellows: buildings, roads, and accessories—all must have taken a longer time in preparation than was occupied in operating the works, when at last all was completed. No bricks nor mortar were used, or fragments would have remained. Some coal they had, but birch charcoal was the fuel used. The ore was the nodular iron-stone of the district, which accompanies the coal seams lowest in these strata, and obtainable in many neighbouring places. Although fragments of limestone are among the remains (necessary as a flux), mortar for building, either of the furnace or of old Wheel Birks farmhouse, had not been employed; yellow clay puddle, and not even very much of that, being used as a substitute. The works had not been abandoned in haste; on the contrary everything of value had been carried away: not a tool, worn-out spade, shovel, hammer, or trowel, had been left; iron had indeed been dear in those days, nearly as valuable then as copper is now to us.

We may conclude then that this enterprise, like others since, was commercially a failure, and was abandoned; fell soon to ruin and was forgotten; a much more recent adventure in iron smelting than this, and on a greater scale, was even in our own time begun, and even more suddenly ended, at Brinkburn, on the Coquet. This late effort is not even mentioned in the History of Northumberland; though an account of that failure would have added to the interest of this latest volume.

That molten iron was produced at this old furnace is proved by a piece of a few pounds weight found during the excavation. Some heavy lumps of half molten iron and slag were got also from the inside of the furnace. That the charcoal used was chiefly of birch wood is evident from numerous fragments unearthed, with pieces of birch bark, which from its natural oil does not soon decay. The bottom of the interior of the furnace for a depth of 3 or 4 feet was found full of clean red sand; and who had filled this sand into it, where it had been obtained, and what could have been the object of doing it, were moot questions during the excavation, until the explanation became evident that this stone-built furnace, after being

blown out, stood some years complete, and inaccessible to depredation at top; and the rain and frost disintegrated the upper interior part, which was not vitrified by heat like the lower and hottest portion, and thus gradually showered down a rain of this fine bright red clean sand.

In an article on "The Mineral Kingdom" in "Knight's Store of Knowledge," published about 1840, is an engraving which represents very nearly what this old furnace must have been in plan and elevation.

The old water course from a dam in the stream, some 200 yards in length, can still be traced. In one place it deviates from the straight to avoid an old thorn tree—a proof that the thorn must have even then been a thick one, or it would have been removed and made a double debt to pay—getting out of the way as well as feeding the furnace. Clearing the countryside of its natural growth of birch, thorn, juniper, oak, and other trees for smelting purposes, must have prepared the land for enclosure, cultivation, and the planting of larch, spruce, and Scotch firs, just as in Spain to-day the use of brushwood in smelting has allowed the hills to be covered with olive trees instead. During the short existence of this remote outlying iron work, the power of the Stocksfield burn would at times of drought be insufficient to work the bellows—no wonder therefore that smelting work did not long continue. Annexed are drawings giving some idea of the existing remains and of the probable design of the complete structure.

On some Lacustrine Deposits in the Drift near Ferryhill.

By JOHN COGGIN BROWN, B.Sc.

READ JUNE 3RD, 1905.

At the Dean and Chapter Colliery just west of Ferryhill village, and about two miles to the west of Ferryhill Station (which lies on the main line of the N.E.R. nine miles south of Durham), three new sections have been made in the drift which revealed an interesting local development of these deposits. As the accompanying sketch map (p. 289) shows, the sections are close to the main road from Durham to Ferryhill, and almost on the footpath joining the latter place to Spennymoor. Their exact dimensions and position are seen from the plan given below.

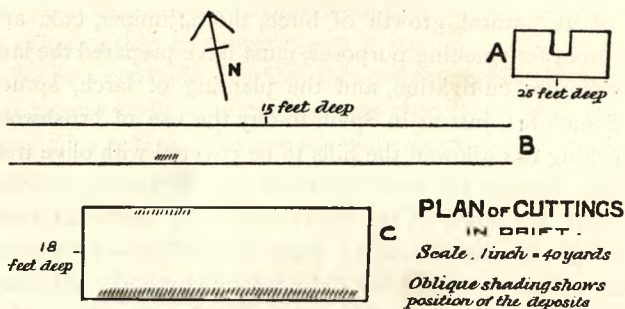


Fig. 1. The depth of cutting C at its eastern end is 3 feet.

Three cuttings running parallel, and approximately east and west, have been made; the two to the south gradually deepen towards the west, as the ground gently ascends in that direction. The outcrop of the Magnesian Limestone rises up as a steep-sided hill about 200 yards to the south, and there is also a thin outlier of the limestone about 200 yards to the north of the cuttings.

In the first exposure (marked A on the plan) the drift was observed to be of the usual character found in this district, and consisted of stiff brownish clay with a few sub-angular

pieces of red and white sandstone, and fewer boulders of Magnesian Limestone, 25 feet having been cut through without reaching the base.

Two more sections were exhibited in the railway cutting (marked B on the plan), which is 9 yards wide and 190 yards long, and lies 10 yards to the south of the first exposure. On the northern side the drift was found to be of the same nature as that described above, and attained a thickness of 16 feet, the base not being seen. The southern section of the cutting showed the same kind of drift except in one place, where for a distance of three yards blackish bands were found

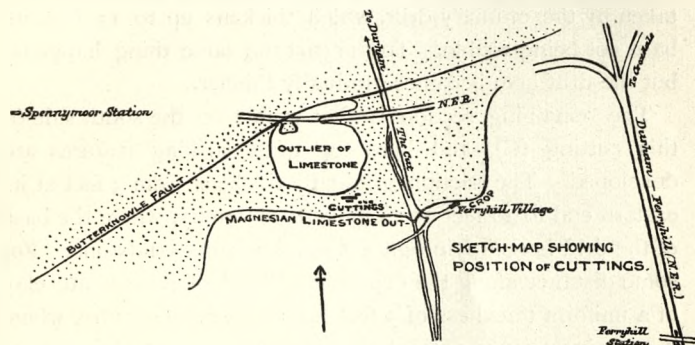


Fig. 2. Sketch-map of the district.

Scale: $1\frac{1}{4}$ inches = 1 mile. The stippled area is Coal-Measures, with superficial deposits of drift.

in the clay at the bottom of the section overlain by others of a reddish colour, containing fairly large lumps of a red sandstone. Above these was found clay of a lighter colour, the whole being about four feet thick, very irregularly deposited, surrounded by the ordinary drift and hardly to be distinguished from it.

Ten yards to the south two other sections are visible in a cutting (marked C on the plan), 60 yards long and 20 yards wide. The one visible on the north side showed, on nearly the same north and south line as the one described above in B, a very similar set of deposits, somewhat more per-

sistent, but still hardly to be distinguished from the surrounding drift, and not continuing very far in a horizontal direction. The following main lines of division were here made out :—

Ordinary drift	...	...	...	...	8 feet.
Clay of a white colour with small sandstone boulders	...	...	...	...	0-1 feet.
Reddish clay with rather larger blocks of sandstone	...	...	...	...	3 inches.
Yellowish clay with small bits of Magnesian Limestone (base not seen)	...	...	...	...	2-8 inches.

To the west this section at once changes, its place being taken by the ordinary drift, which thickens up to 15 feet, its base not being visible. To the east the same thing happens, but the drift here becomes gradually thinner.

The remaining section is that visible on the south side of this cutting (C), and here the most striking features are developed. The section gradually thickens from 3 feet at its eastern end to 16 feet at its western extremity, where the base of the drift is seen lying on a Coal Measure sandstone. For some distance along the exposure a band of pure white clay of a uniform thickness of 3 feet (except near the centre, where it contains an undulation) occupies the base of the section, being continued for about fifty yards from east to west, when it gradually sinks out of sight.

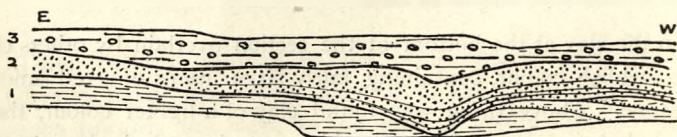
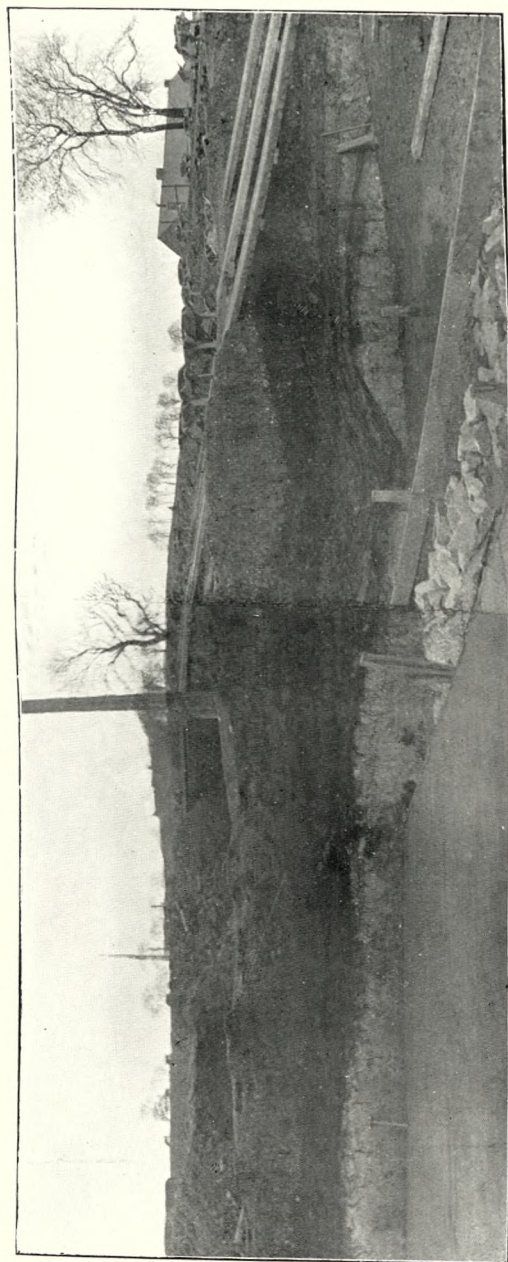


Fig. 3. *Section on south side of south cutting; sketch explanatory of photograph of same section.*

- | | | |
|-----------------|--|--------------------|
| 1. White clay. | | 3. Ordinary drift. |
| 2. Yellow sand. | | |

This white clay is very well developed, entirely devoid of stratification, and contains no pebbles of any kind; towards



PHOTOGRAPH OF SECTION AT SOUTH SIDE OF SOUTH CUTTING.

(See explanatory figure in text).

TO FACE PAGE 200.



the west, as the photograph shows, it becomes intermingled with some of the yellow sand which overlies it, beyond which its place is taken by the ordinary drift again.

Above the white clay, and filling up the undulation in it, is a bed of yellow friable sand about three feet thick; it is very finely bedded, the planes being visible even in small hand specimens. The rounded character of the grains and general appearance of this sand at once show it to be derived from the yellow sands of the Permian formation of this district. To the east the sand and clay are entirely distinct, but towards the west, before the white clay dies out, bands of sand are found in it. Further on still the sand overlies the clay, its western end resting on the rock before mentioned—a hard, white, coarse-grained Coal Measure sandstone. The ordinary drift covers the whole of the section from a few inches in thickness at the eastern to ten or twelve feet at the western end, where it occupies the whole exposure.

The clue to the origin of these deposits is obtained on drawing a section of the district where they occur, when it is seen that the sands are found very close to the place where the yellow sands of the Permian should outcrop.

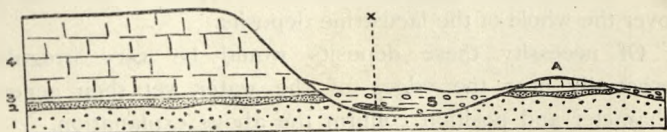


Fig. 4. *Section across the district.*

- | | |
|----------------------------|--|
| 1. Coal Measure sandstone. | 5. Drift (containing lacustrine deposits). |
| 2. Yellow Sands. | A. Outlier of Permian strata. |
| 3. Marl Slate. | X. Position of cuttings. |
| 4. Magnesian Limestone. | |

Towards the close of the Glacial Period, a warmer state of the climate than usual caused the ice to melt away from lower levels, small streams being formed in all suitable positions, carrying off the water so produced. One of these streams flowing rapidly down from the Magnesian Limestone outcrop,

becoming dammed, formed a miniature lake, into which was washed the fine white mud usually carried by streams flowing from glaciers. This being deposited in the still and probably deep water of the small lake formed the deposit of white clay which we now find so well preserved in the south cutting. There is no doubt that the undulation in the white clay which was traced right across the cutting in a north-easterly direction was caused by a current or eddy in the stream of water coming into the lake, probably as it flowed swiftly round the eastern end of the outlier of Magnesian Limestone. The general shape, gradual thinning out, and intermingling with the other coarse deposits of the white clay, all go to prove its lacustrine origin. The stream having now cut its way back so as to erode the yellow sands, which must have lain across its path, quickly removed them, and deposited them over the white mud which was gradually silting up the lake. The deposits seen in the north cutting and on the north side of the south cutting are part of those formed near the very edge of the lake, and are therefore found much intermingled with drift and coarser fragments. Owing to some change in the climate, the ice line again crept down to lower levels; and glacial conditions again intervening, a deposit of drift was left over the whole of the lacustrine deposits.

Of necessity these deposits would be very irregular, especially near the edges of the water, yet their general character and position confirm the above explanation.

The author would acknowledge his indebtedness to Mr. T. Charles Cook, of the Dean and Chapter Colliery, for the numerical data of the sections, and for his kind preparation of the sketch map of the district.

Summer Frosts and their Effects on Swedes and Mangels in the North of England. By PROF. D. A. GILCHRIST, M.Sc.

READ JUNE 3RD, 1905.

As summer frosts (on the grass) are very prevalent in the north-east of England, the writer has endeavoured to find whether there is any connection between these and the variation in the composition of swedes from year to year, and also to note what effects these may have on the mangel and swede crops of the north of England. All the frosts tabulated are taken from the records of the minimum night temperatures registered on the grass, and not at four feet above the ground as is usually done. The former are generally lower than the latter.

The following table gives the summer frosts at Cockle Park, Northumberland, during the summers of 1900-1904, as well as the variations in amount of dry matter, and in the feeding value of swedes grown at that centre in these years:—

Frosts on grass (degrees Fahrenheit) 324 feet above sea level.						
	1900	1901	1902	1903	1904	
June	3rd 1°	7th 0·1°	11th 1°	3rd 0·1°	None	
		19th 3°	18th 1°	14th 2°		
				19th 2°		
				20th 1°		
				21st 2°		
July	None	None	25th 1°	20th 1°	None	
August	None	17th 1°	None	None	None	
September	25th 2°	2nd 0·1°	19th 1°	16th 0·1°	21st 0·5°	
October (first severe frost)	5th 5°	10th 3°	8th 4°	11th 3°	13th 5°	
Percentage of dry matter in swedes*	11·43	10·32	11·93	11·67	14·96	
Comparative value of swedes per ton (average 8/-) ...	7/7	6/10	7/11	7/9	10/-	
Approximate crop per acre	25 tons	20 tons	22 tons	21 tons	26 tons	

Freezing point is 32° F. In the foregoing table the number of degrees of frost is given and not the temperatures as recorded. These are given for each night that frost occurred

* Analyses of Mr. S. H. Collins, F.C.S., Armstrong College, Newcastle-upon-Tyne.

from the beginning of June till the end of September of these years.

It is probable that the severe frosts on June 19th, 1901, and the succession of these from June 14th till 20th, 1903, had a very depressing effect on the amount of dry matter in the swede crop of these years as well as on the crop generally; and that the frost on August 17th, 1901 (the month of most active growth for the swede crop), was one of the principal causes of the exceptionally low amount of dry matter in the swedes of that year. The summer of 1900 was comparatively free from frost till September 25th, but the decided frost on that date and the early severe frost in October (5°, October 5th) probably account for the low amount of dry matter in the swedes of that year. On the other hand the practically entire freedom from frosts, and the favourable growing conditions during the summer of 1904, as well as the occurrence of no severe frost till the middle of October, coincide with the exceptionally high percentage of dry matter in the swedes of that year. In Northumberland the maturation of the swede crop may go on till about the middle of October in a favourable season, and in the counties where the climatic conditions are more favourable till a much later period.

Feeding experiments with cattle and with sheep at Cockle Park have shown that the amount of dry matter in the swede crop is probably the best indication of the comparative value of swedes grown in the same year. It is also probable that the amount of dry matter in this crop from season to season indicates the comparative feeding value of swedes in different years. Assuming that this is so, the figures on the last line but one of the foregoing table show a very marked variation in the feeding value of swedes at Cockle Park during the seasons 1900-1904. The figures given on the last line indicate approximately the weights per acre of the crop for the different seasons when grown under favourable conditions.

There are of course other climatic conditions, such as drought, or continued spells of wet or cold weather, or on the other hand favourable periods of good growing weather,

which must necessarily have affected the growth of the swede crop throughout these seasons. The active period of growth of the swede crop usually extends from the beginning of June till the middle of October, and it is therefore during this period only that the frosts would seriously affect this crop.

MANGELS COMPARED WITH SWEDES.

The value of mangels as compared with swedes is an important question for the root growing farmer in the north-east of England. The former have many advantages over the latter. They have no troublesome disease like finger-and-toe, and no severe insect pest like turnip fly, while they keep better till the late spring, and they also do not give a flavour as turnips do to dairy produce. It is usually considered also that they have a greater feeding value than swedes. In the south, when swedes are valued at 8s., mangels are considered to be worth 10s. a ton; and there they are also usually the richer in dry matter. Warington in "Chemistry of the Farm," states the average amount of dry matter in mangels as 12 per cent., and in swedes as 10·7 per cent.

In 1902, Mr. T. B. Wood, Cambridge University, obtained the following average results from thirteen varieties of swedes grown at three centres in Norfolk, and from eight varieties of mangels grown at three centres in Norfolk and one in Cambridgeshire :—

			Mangels.	Swedes.
Dry matter	...	...	12·9%	12·1%
Containing sugar	...	...	8·3%	6·4%

The Agricultural Returns (Board of Agriculture) for 1904 give the following estimates of the average yields per acre of these crops for the ten years 1894–1903 :—

			Mangels.	Swedes (and turnips).
England	...	...	18·36 tons	11·96 tons
Northumberland	...	...	15·21 "	15·63 "
Durham	...	...	14·64 "	13·02 "

While, therefore, the average crop of mangels in England is more than one-third greater than that of swedes, the average

crop of the former in Northumberland is actually less than that of the latter.

The following figures give the average amounts of dry matter in the two crops for a succession of years, grown at Cockle Park (Northumberland) :—

	1900	1901	1902	1903	1904
Dry matter in mangels (%)	9.98	...	11.96	10.57	11.91
„ swedes „	11.43	10.32	11.93	11.67	14.96

These figures show that mangels have actually on the average less dry matter than swedes when grown at Cockle Park, and on the average the results from the county of Durham are of a similar character. These amounts of dry matter in mangels do not show any distinct relation to the summer frosts, nor to the amounts of bright sunshine during these summers ⁽¹⁾. They rather indicate that the summers of the north-east of England are neither prolonged nor warm enough to permit of the proper ripening of this crop. At Cockle Park the average crop of mangels is quite one-fourth less than that of swedes, and this crop is never anything like mature at this centre before late autumn frosts necessitate its harvesting and storage. In the Midlands, and especially in the southern counties, the maturation of this crop is of a much more complete character.

SUMMER FROSTS IN NORTH-WEST AND NORTH-EAST OF ENGLAND.

By the courtesy of Principal Smith Hill, of the Aspatria Agricultural College, Cumberland, I am able to give the summer frosts on grass for 1901-4 at that station :—

Frosts on grass (degrees Fahrenheit) 251 feet above sea level.			
	1901	1902	1903
June	None	None	14th 0.6°
July	None	None	None
August	None	None	None
September ...	None	13th 1.8° 19th 3.2°	13th 1.4° 14th 1.7° 15th 2.8° 16th 0.4° 17th 0.2°

(¹) The numbers of hours sunshine for June-September (inclusive) at Cockle Park were :—

1900	1901	1902	1903	1904
658	851	523	675	680 hours.

From the foregoing it will be seen that summer frosts are much less common at Aspatria than at Cockle Park. These frosts at the two centres may be taken as indicating the general occurrence of these in Durham and Northumberland represented by Cockle Park, a north-eastern station; and in Cumberland and Westmoreland represented by Aspatria, a north-western station. The following table, abstracted from the returns of the Board of Agriculture, shows how much more favourable the north-west is than the north-east for the growth of roots, which, although there are other conditions, such as more rainfall, must be largely due to the comparative absence of summer frosts in the north-west:—

		Swedes and Turnips.		Mangels.	
		Acreage 1904.	Average crop per acre 1894-1903.	Acreage 1904.	Average crop per acre 1894-1903.
England	...	1,091,344	11·96 tons	385,646	18·36 tons
Durham (N.E.)	...	19,876	13·02 „	994	14·64 „
Northumberland (N.E.)	...	35,014	15·63 „	680	15·21 „
Cumberland (N.W.)	...	28,422	15·57 „	2,614	20·47 „
Westmoreland (N.W.)	...	5,811	18·51 „	764	21·93 „

These figures show that, whereas in England more than one acre of mangels is grown for every three acres of turnips, the proportion of mangels to turnips is about one to twenty in Durham, one to fifty in Northumberland, one to eleven in Cumberland, and one to eight in Westmoreland. The greater proportion of mangels in the two latter counties is undoubtedly chiefly because of the rarity of summer frosts. To the same cause must be mainly attributed the better average crops of roots in these counties as well as the more susceptible root crop—the mangel—being influenced to the greatest extent by the better conditions.

There must of course be very varied local climatic conditions, but the results from Aspatria and Cockle Park give a general idea of the likely occurrence of summer frosts in the north-west and in the north-east of England.

There can be no doubt that the north-east of England suffers to the greatest extent from spring and summer frosts,

although this disadvantage applies to the eastern counties generally. The western counties are much more favoured in this respect. It is on the west, south-west, and south of Britain that all the early potato growing districts are to be found, an essential condition of which is freedom from these as well as spring frosts. As illustrating the mildness of our west coast climate, it may be stated that the minimum air temperature recorded for 1904 at Scilly was 33° F., and at Pembroke 30° F.

It will be interesting to note in conclusion that in Scotland swedes and turnips constitute almost entirely the root crop, the acreage of mangels being very small, whereas in France it is the latter only which practically form the root crop, swedes and turnips being grown to a very small extent in that country.

MISCELLANEA.

Farne Islands: Notes on a Visit in May, 1904.—On the 15th May, 1904, in the steam yacht "Falaise," I paid a visit to these islands and made some notes, principally intended to be preserved as a record of the times when the various birds commence nesting. Leaving our anchorage at Holy Island, we proceeded to the Megstone. A strong wind was blowing from the west, but without any great difficulty we effected a landing in one of the boats. We expected to find the interesting and numerous colony of birds which we have seen now for so many years back, but we were greatly disappointed in finding not a vestige of a nest on the island. A few birds left the rock as we approached, but evidently as a nesting station this island is quite deserted. None of the islands were more interesting to the ornithologist than the Megstone, and that it should have lost its interest is a subject of very great regret. In my address as President of the Field Club, delivered on May 2nd, 1902, I expressed an opinion that if the wanton destruction of nests and eggs was not put an end to it was not improbable the Cormorants would desert this island. My prediction unfortunately has been fulfilled. Certainly last year some heavy seas swept the Megstone, and these may have taken off the old nests and removed its white crest, but this has happened many times in the long course of years in which the birds have made the rock their home, and no doubt the primary cause was the destruction pointed out.

We next landed on the Staples Island. Four men were here in a sailing boat. They were carrying handkerchiefs filled with what we believed to be eggs, but we cannot speak positively. In walking over the island we found the burrows of the Puffins, which in many cases had their tops removed, and from this we concluded the four visitors to the island had obtained some eggs. It may have been that a few eggs of the Lesser Black-backed Gull were taken, but we saw none ourselves on the island, and only two or three nests which

appeared scarcely completed. One pair of Herring Gulls were observed. On the Pinnacles there were a few Guillemots, but so far as we could see there were no eggs. Some Kittiwakes were on their nests on the sides of the Pinnacles, but so far as we could see no eggs had been laid. With a little difficulty we landed on the North Wamses. We saw about half-a-dozen single eggs of the Lesser Black-backed Gull, no doubt the first which had been laid. Here on a rocky ledge we found probably a little over 50 nests of the Cormorant. These, no doubt, were the birds which had left the Megstone. They were not so numerous as we have in past years seen the colony on the Megstone. Every nest was empty with the exception of one, which contained a single egg. These are generally early nesting birds, and I cannot account for there being no eggs. We next proceeded to the Farne, and after anchoring in the Kettle for luncheon we landed on the island, and one of the light keepers with very great courtesy showed us all the nests he knew of. A Ring Dotterel left three eggs on the shingle just above high water mark. These, from their feel, evidently were considerably incubated. Higher up on the island we found a nest containing three young and an egg. An Eider Duck flew off a nest containing three eggs, and here were two nests of the Lapwing, one with two eggs, and the other with three. Rowing across to the West Wideopen, we found nests of the Eider containing five eggs, three eggs and one egg. On the East Wideopen we found a single nest of the Lesser Black-backed Gull. On these two last-named islands, and on the sea near to them, we saw many Eiders, but ducks and drakes being together, nesting evidently had not fairly commenced. There were two or three pairs of Oyster Catchers, but we cannot say whether they had commenced nesting. We observed a number of Ring Dotterels in flocks. In steaming from Holy Island to the Megstone at some distance we observed a very large flock of ducks. We were some distance from them. They appeared all black, and we could only conclude they were Scoters.—*W. Mark Pybus.*

Gull and Tern.—On the 5th June, 1904, about midway between Alnmouth and Warkworth, I observed an Arctic or Common Tern (I could not at the distance say which) chased by a Lesser Black-backed Gull. The tern ascended and descended. The gull was more powerful on the wing and overtook it, but each time the gull neared, the tern by rapidity in wheeling secured the lead again. This continued for a considerable time, the birds going in the direction of Alnmouth. When they got near the bathing houses there the gull discontinued the chase, and the tern proceeded northwards.—*W. Mark Pybus.*

Bernicle Goose near Warkworth.—On Saturday, the 8th October, 1904, I crossed on a very high tide, and walked along the top of the sand dunes to Warkworth. Stints and Dunlins were numerous. When about half way to Warkworth I noticed a goose walking about the sand above high water mark, and apparently feeding on the bent grass. It allowed me to approach within a very short distance, and continued feeding undisturbed by my presence. I made some balls of bracken fronds and bent grass and threw them down, but the goose paid little heed. At a distance I took this for the Brent Goose, but I found it to be the Bernicle. Soon a flock of twelve other Bernicle Geese flew overhead at only a short distance above me. The solitary bird remained walking about the sand. It was in good plumage, and I could see no sign of injury. I went down the steep sandy slope, and it allowed me to approach within a very few yards. It then slowly flew away and alighted at a distance of about twenty yards. Whether it was a bird from ornamental waters, or whether it had been wounded or exhausted I am unable to say. On the Sunday morning I walked along the beach again, but I could neither see nor hear anything of the bird. This note I think may be interesting, as the nesting haunts of the Bernicle are almost unknown, and its recorded captures on the Northumberland coast are by no means numerous.—*W. Mark Pybus.*

Spoonbill at Holy Island.—On 22nd May, 1904, I saw a large bird flying round and round at a great height overhead, which two days later I identified as a Spoonbill. It was then watched for an hour or two, both morning and afternoon, at fairly close range, standing on the bank of the fresh-water pool near Emmanuel Head. The other birds round the pool, duck, coot, gulls, but especially the Lesser Black-backed Gull, treated the Spoonbill as an intruder, and drove it away if it ever came near them. It was very shy, and got up as soon as I emerged from cover, though on the other side of the pool and two hundred yards away. On June 4th, being again at Holy Island, I found the bird still frequenting the pool.—*T. E. Hodgkin.*

The Spoonbill remained at Holy Island for a few days after the last date mentioned by Mr. Hodgkin. Its presence had then become generally known, and attempts were made to shoot it, but whether it was finally shot or driven away I have not been able to ascertain. It is interesting to note that the only occurrence of the Spoonbill in these counties recorded by John Hancock is that of an example in his collection killed at Holy Island in 1857.—*E. L. Gill.*

Spotted Redshank at Cramlington.—An example of this rare bird was shot at Cramlington on September 10th, 1904, by Mr. A. M. Morison, of Cramlington House, and was presented by him to the museum. In John Hancock's catalogue only five local records are given for this species. Some interesting notes on the occurrence, kindly furnished me by Mr. Morison, are appended. Mr. Morison has also lately added to the museum collections two Reeves (*Machetes pugnax*, female) and a Greenshank.—*E. L. Gill.*

The first I saw of the Spotted Redshank was on Friday morning, when there was another feeding in company with it. The same afternoon I watched the bird for some time, and seeing it was rather dark in colour for a Common Redshank, I disturbed it. It uttered its note while on the wing, the note being very much like that of the Common Redshank, but with

short, sharp whistles every now and again. Its flight was strong and very fast, and to alight the bird almost closed its wings. On Saturday I again watched it, there being only one bird then, and noticed that while feeding it frequently was carried off its legs and appeared to be floating or swimming. When feeding, the bird was actively employed in probing about in the mud, and often its head was almost under water; and every ten minutes or so it lay down to rest. I shot the bird on Saturday morning, September 10th, and on the Monday morning there was another of the same species on the same pond, but it has since disappeared.—*A. M. Morison.*

Swifts, Swallows, and Martins.—During the present summer in Warkworth the Swifts nesting in the Castle walls appear to have been in about the usual number, but there has been a very great scarcity of Swallows, House and Sand Martins, in fact they have been almost absent. It is suggested their scarcity is to be attributed to the two past exceedingly cold summers, which, depriving the birds largely of insect food, was the cause of a very small number of young birds reaching maturity.

On the 31st August, 1904, a House Martin's nest fell from the corner of an upper window in Roxburgh House, Warkworth. It contained but one young bird, which, being well feathered, broke its own fall to the cement footpath below. The remains of the nest and the young bird were placed in a small basket on the sill of the window immediately below the place from which the nest had fallen, and its position was made secure by a nail. A hole was cut in the basket. The birds fed the young one, and on the 10th September it was sitting on the outside of the basket evidently ready to take its first flight to the trees opposite. On the 12th the young House Martin left its basket and attempted to fly from Roxburgh House to the hotel, which is very near; but it was not sufficiently strong to reach the hotel, and fell to the ground. It was picked up and put in the basket on the window sill. The following morning it was sufficiently strong to fly over to the hotel, and has not since been seen.

1st October. The Swallows in Warkworth are all gathered together and sitting on the telegraph wires. It looks as though their departure was at hand. I observe one House Martin in the air.

2nd October. I see nothing of either Swallows or House Martins.

3rd October. Again I see nothing of these birds, so I conclude they must have gone on Saturday shortly after I saw them together on the wires.—*W. Mark Pybus.*

Though most of the Swifts leave us quite suddenly and completely towards the end of August, a straggler or two is almost every year to be seen at the beginning of September. This year I saw one flying round over Claremont Place and the Leazes, Newcastle, on September 8th. This is the latest date on which I have yet seen a Swift, though many later records are quoted in the books. On October 27th Mr. H. V. Charlton saw some House Martins flying about over the Town Moor Recreation Ground, and I saw a single Swallow over the Leazes on October 31st.—*E. L. Gill.*

Birds in Abnormal Plumage.—Recent donations to the museum include several examples of birds showing variations in plumage. Some are cases of partial albinism. Of these the most singular is a male Wheatear shot on the moor at Newbiggin-by-the-Sea, and presented by Mr. J. Alaric Richardson; it has the body mostly of a light blue grey, tinged on the throat with pale rust colour; the wing feathers are brown with light edges. A pale brown variety of the Starling, presented by Mr. J. I. Maling, was also shot on Newbiggin Moor on October 5th, 1904; and Mr. G. E. Crawhall has presented a young Hedge Sparrow in abnormally light coloured plumage, which was killed near Haydon Bridge on July 17th. Mr. Crawhall has made another extremely interesting addition to the museum collection in the form of two hen Pheasants showing the plumage of the cock. Both were shot near Haydon Bridge, and as is usual in such cases both proved to have the ovaries diseased. One is in an early

stage in the assumption of the male plumage; the other has assumed it so completely that but for the absence of spurs and ear-tufts and the small development of the wattles, no one could have suspected that the bird was not a cock.—*E. L. Gill.*

Wild Swans over Newcastle.—The following is quoted from a letter written by Mr. G. E. Crawhall :—"On the afternoon of January 2nd, 1905, while walking up the North Road, I noticed four large birds flying towards me, at no great distance from the ground. When they got nearer I saw that they were swans. I was then about opposite the ornamental water in the Brandling Park, on which two or three tame swans are usually kept. The wild birds, attracted no doubt by the appearance of the birds on the water, seemed to hesitate in their flight, and hovered as it were for a time, breaking their formation, and turned back apparently calling to the tame birds. Meeting no response, the swans resumed their flight, falling into the usual single line formation; but they changed their course, flying to the N.W. till lost to sight. The swans checked their flight when just about over my head. I thus had an excellent view of them; they were all white birds (adult). I noticed a peculiarity that I have not seen mentioned by other observers; when the birds were turning in their flight they frequently turned their head from side to side, looking about, and, I think, calling, (I am very deaf). The neck was held straight and rigid, and the head turned only at the junction of head and neck—much the same action as that of the hand turning on the wrist at the end of the forearm."

Hare Breeding in Confinement.—Mr. Thomas Thompson sends a copy of the following letter, written to him by Mr. Mann, of Aigle Gill, Cumberland. In some notes in a local newspaper it had been stated that hares will never breed in captivity, and Mr. Thompson obtained this letter as evidence to the contrary :—"Aigle Gill, November 23, 1904.—Dear Sir,—I am much obliged for your letter and paper with regard to the hares breeding. We were cutting a field of oats on

August 18, 1900, when I picked up two leverets, just about four or five days old, and brought them home. They were fed at first with milk from a spoon, and afterwards with bread soaked in milk. They throve and grew well, living in a box for some time, and were afterwards turned into the wire run in which you have seen them, the run being about 15 ft. by 6 ft. The doe produced three young ones in 1901, a two and one. Next year she had two young again at two different times. In 1903 she had four young at three times. The doe died early this year, and we decided to give the buck his liberty, but he would not leave the place. However, in July he got out of his run, some wire having become displaced. In the evening he was sitting about waiting to get in again, when two of our dogs found him and chased him away over the fields. However, he returned to try and get in three times, but failed to do so, and at last he was hounded off, as I thought, for good. But, thinking he might return at night, I left an opening in the wire of his run, and next morning he was safe at home again, and does not seem as if he wants to go away at all."

NATURAL HISTORY SOCIETY
OF
NORTHUMBERLAND, DURHAM, AND NEWCASTLE-
UPON-TYNE.

REPORT OF THE COUNCIL

FOR 1904-1905.

DURING the year under review the various branches of the Society's work have been carried on upon the same general lines as in the two or three preceding years. Your Council have on this occasion no large questions of policy to report upon or to bring before the members. The only change affecting the conduct of the Society's business is a change in the Museum staff. In the last report allusion was made to the retirement of Mr. Joseph Wright after fifty-one years spent in the service of the Society. It was decided that the vacancy thus created should be filled by the appointment of a lady assistant and typist, and from a large number of applicants Miss T. Conradi was chosen for the post. This appointment has proved a very satisfactory one, as in addition to relieving the curator of much clerical routine, Miss Conradi is doing good work upon the museum collections.

In connexion with this change in the staff, some alterations have been made in the entrance vestibule of the Museum. Entrance and exit turnstiles have been placed at opposite sides of the vestibule, and a small office has been fitted up in one corner, adjoining the entrance turnstile. This arrangement works well in practice, and it is generally agreed that no disfigurement is caused by the additions. After the repairs and painting carried out last year, the building itself has required very little attention. The lightning conductors were, however, by no means in safe order, and through the kindness

of Mr. Ernest Scott they have been overhauled by Messrs. Scott and Mountain for a sum covering only the cost of the labour and the materials used. The heating apparatus of the Museum is also at present in an unsatisfactory condition. One of the three boilers is practically worn out, and an extension of one of the main pipes is necessary to produce a better circulation of the hot water in the front of the building. But the work needed to remedy these defects has had to be postponed owing to want of funds.

The following programme of Evening Meetings and Afternoon Lectures for Children was drawn up :—

EVENING MEETINGS.

- Nov. 9.—Rev. Arthur Watts, F.G.S. : “The History of the Browney Valley” ; chair taken by Mr. Ernest Scott.
- Dec. 14.—Mr. R. Coltman Clephan, F.S.A. : “The Social Life and Literature of Ancient Egypt” ; chair taken by Mr. C. E. Stuart, B.Sc.
- Jan. 11.—Mr. J. W. Turnbull : Photographs of Nests and Eggs of British Birds taken by Messrs. Cookson ; chair taken by Mr. W. M. Pybus.
- Feb. 8.—Mr. D. Woolacott, D.Sc. : “The Geological History of the Rivers of Northumberland and Durham” ; chair taken by Sir G. H. Philipson, M.D., D.C.L.
- Mar. 8.—Lieut.-Col. C. H. E. Adamson, C.I.E. : “The Secondary Sex Characters of certain Genera of Butterflies” ; chair taken by Sir Isambard Owen, M.A., M.D.
- Mar. 22.—Mr. J. E. Robson, F.E.S. : “Appearance and Disappearance of Species among Lepidoptera” ; chair taken by Prof. Thos. Oliver, M.D., F.R.C.P.
- April 12.—Mr. A. T. Gillanders, F.E.S. : “Insects Injurious to Forest Trees.”

AFTERNOON LECTURES TO CHILDREN.

- Dec. 29.—Prof. G. S. Brady, M.D., F.R.S. : “The Colours of Plants and Animals” ; chair taken by Lieut.-Col. C. H. E. Adamson, C.I.E.
- Jan. 5.—Mr. John Bidgood, B.Sc., F.R.H.S. : “Daffodils” ; chair taken by the Right Hon. Lord Armstrong.

With the exception of the April meeting, which was abandoned through the illness of Mr. Gillanders, this programme was successfully carried out. For most of the meetings there was an audience that comfortably filled the library (the somewhat unsuitable room in which the meetings have still to be held), and on the occasion of the children's lectures the room was crowded. The Council desire again to express the warm thanks of the Society to the gentlemen who have given their time and thought to the preparation of the lectures delivered at these meetings.

Seven addresses or "museum talks" were given during the winter by the curator. These addresses are given on the last Wednesday evening in each winter month, when the Museum is opened for two hours after dark. The attendance has maintained the improvement reported last year, the average again working out to about fifty. The Field Meetings taking place in each summer are separately reported in the Transactions and do not therefore call for much notice here. Your Council have been glad to find some encouraging features in the reports, but they must express regret that the numbers taking part in the field meetings are still sometimes disappointingly small.

Another important department of the Society's activity is the publication of papers on natural history, and in this direction more than usual has been done during the past year. Two parts of the Transactions have been issued, namely, Vol. XV., part I., of the old series, and Vol. I., part II., of the new series. The first is a continuation of Mr. J. E. Robson's catalogue of local Lepidoptera; the second is a general number of over 200 pages, and contains several papers of considerable importance. In connexion with its publications, as in so many other lines of work, the Society is unfortunately confronted by financial obstacles. Material has been published recently at a faster rate than usual, and the account for the two parts just issued will be a heavy charge on the finances; while at the same time there is an unusually large accumulation of manu-

script waiting to be printed. This includes the final sections of Mr. Robson's catalogue, a number of papers to be embodied in a general part of the Transactions, and the Rev. W. J. Wingate's work on local Diptera, which is at present in the printer's hands, and which promises to possess an importance far exceeding the limits of purely local natural history. It is highly desirable that all this matter should be published without delay, but on the other hand the Society is scarcely justified in publishing anything more at present. The usefulness of the Society is being hampered seriously in many directions by lack of funds, and your Council would appeal to the members for help in securing what appears to be the only remedy, a largely increased roll of annual subscribers.

Eleven essays were submitted in competition for the Hancock Prize in 1904. Canon Tristram and Canon Norman again kindly consented to act as judges, and upon their recommendation the prize was awarded to Mr. A. Cleghorn, of Darlington, for an essay on the natural history of the sea shore at Marsden. The judges also specially commended the essays submitted by Mr. R. S. Bagnall and Mr. W. Tweddle, and felt justified in saying that the essays sent in this time were the best set they had yet been called upon to examine. It is gratifying to find that latterly the competition has met with decidedly increased success in calling forth and encouraging local talent in the field of outdoor natural history.

The donations received during the year include several of special interest. The bird room has been enriched by more than fifty birds selected from the well known collection of Mr. George Bolam, of Berwick. The remainder of the collection has been purchased by Lord Armstrong, who will give it a permanent resting place in Bamborough Castle. Several other very interesting birds have been presented by Mr. G. E. Crawhall. Through Miss Embleton, as a bequest from the late Dr. Embleton, has been received the original of the "Sleeping Leopard," a taxidermic study by John Hancock which formed the subject of one of his published drawings. A number of excellent and unusual marine specimens have been

presented by Capt. King, of one of the Hartlepool trawlers. It is to be hoped that others who have similar opportunities may be induced to follow Capt. King's example in saving the valuable objects which are not infrequently brought to the surface in the course of commercial fishing operations. Two notable additions have been made to the botanical section. Dr. T. H. Walker has presented a handsome cabinet containing the collection of micro-fungi formed by the late Mr. Swallow. The fungi are preserved as beautifully finished microscope slides and are of great value for reference. The other addition is likewise a valuable accession to the Society's reference collections. It consists of a systematic series of British mosses, selected by the Rev. A. J. Campbell from packets previously in the Museum. Mr. Campbell has named, mounted, and arranged the selected specimens, and has also provided a type-written catalogue for use with them. Two other donations may be mentioned which are not objects for the Museum, but which possess interesting associations with the history of the Society. These are the painting by Miss M. J. Hancock of a scene at Oatlands, the Surrey residence of W. C. Hewitson, and later of John Hancock; and the early certificate of membership of the Society, bearing signatures of several of its most distinguished original members. The painting was presented by Miss Lambert, and the certificate by the Rev. W. J. Wingate. These and other gifts received during the year will be found acknowledged in full in an appendix to the report.

The fire insurance policies on the property of the Society have been reconsidered by the Council. It has been found possible by a fresh arrangement to obtain a considerably fuller insurance for the same annual premium as before, and new policies on this basis are being prepared.

Another question which has been under discussion is that of the incorporation of the Society. This question has been discussed once before in recent years, and on that occasion, as in the present instance, the conclusion come to was that in the case of the Natural History Society the advantages

of incorporation would not be sufficient to justify the expense and trouble that would be involved. The matter was brought forward in consequence of the death of Sir Lowthian Bell. By this loss the number of the Trustees was reduced below the number required by the rules; and as the proposal to incorporate the Society has been abandoned, the election of additional Trustees is on the agenda for the present Annual Meeting.

In Sir Lowthian Bell the Society has lost not only a Trustee and one of its most distinguished Vice-Presidents, but also one who was by many years its oldest member. He had joined the Society in 1833, only four years after its foundation; the member who now succeeds to the honour was elected in 1850. Sir Lowthian Bell always had a warm interest in the Society's welfare, and he took an active part in the business connected with the founding of the present museum on Barras Bridge. It must be mentioned with regret that we are, for the present at any rate, losing Dr. A. Randell Jackson as a member, owing to his leaving the district. Dr. Jackson was one of our best local naturalists, and is well known as an authority on spiders. The Society is indebted to him for some admirable lectures and for a valuable technical paper; and he has further promised to contribute to the Transactions a summary of the results of his collecting and observation in the valley of the Tyne.

The names of the twenty-five new members elected during the year are given below. The loss by death and resignation has been thirty-two, leaving at the end of the year a membership of 340. To these are to be added eleven honorary members and eighty-two former members of the Tyneside Naturalists' Field Club, bringing up the total to 433.

NEW MEMBERS ELECTED FROM JULY, 1904, TO JUNE, 1905.

Sir Hugh Bell, Bart., Rownton Grange, Northallerton

H. F. Bulman, Leazes Hall, Burnopfield, R.S.O.

Hugh V. Charlton, Cullercoats.

Kenneth Cookson, Oakwood, Wylam.

F. W. Dendy, M.A., F.S.A., Eldon House, Osborne Road,
Newcastle.

J. Askew Dixon, Corbridge.

Edward Eccles, South Close, Low Fell.

Sir Edward Grey, Bart., Falloden, Northumberland.

Alfred Goddard, 14, North Terrace, Newcastle.

Rev. H. Greene, M.A., Vicar of St. John's, Newcastle.

Thomas Harrison, Eastburn, Hexham.

W. A. Harle, Osborne Avenue, Newcastle.

Mrs. T. E. Hodgkin, Whiteknights, Bellegrove, Newcastle.

Max Holzapfel, Heddon Hall, Heddon-on-the-Wall.

Sir Isambard Owen, M.A., M.D., Armstrong College,
Newcastle.

Howard Pease, Otterburn Towers, Otterburn.

Mrs. Pease, Pendower, Newcastle.

J. R. Perrett, Elswick Shipyard.

Roland Philipson, Tynemouth.

J. E. Proud, Bishop Auckland.

Wm. Wilson Proctor, 184, Portland Road, Newcastle.

The Right Hon. Lord Ravensworth, Ravensworth Castle.

Viscount Ridley, Blagdon, Northumberland.

Wigham Richardson, Hindley Hall, Stocksfield.

John W. Spencer, Newburn, Northumberland.

CURATOR'S REPORT ON MUSEUM WORK.

1904-1905.

The remounting and labelling of various groups of specimens has formed the main object of the museum work for the past year. It will probably long continue to be an important part of the work, for the chief present need of the museum is the proper displaying and clear labelling of the collections already exhibited in the cases. Work of this description has been done during the year upon the Palæozoic fossils, the general shell collection, the later additions to the Hancock birds, the large objects placed in the lower east corridor and

elsewhere in the museum, the series of horns in the entrance hall, and also to a smaller extent upon the mammals and the ethnology collection. In every case a gratifying improvement has been produced. The old labels for the horns and for the large objects referred to above had been unprotected, and had in consequence quickly acquired a dirty and neglected appearance. The effect of the new labels, printed and neatly bound behind glass, is as in all similar instances to make the objects at once appear much better worth looking at.

The remounting and re-labelling of the Palæozoic fossils was continued as long as it was necessary for Wm. Voutt to remain at the door. By the end of that time all the fossils on the south side of the geology room had been dealt with. Since Miss Conradi has been working regularly in the new front office, much of her time has been spent upon the general shell collection. The change brought about by both of these pieces of work is very pleasing. The remounting of the shells is much hindered by the necessity of dealing with a kind of corrosion to which shells kept in closed cases are liable. A large proportion of the shells in this museum are more or less affected by it, and the treatment by which we are endeavouring to remedy it is rendered more complicated through the fact that the identity of the specimens must be preserved throughout. The new labels for the shells are being done with the typewriter. The use of type-written labels in museums is necessarily restricted, but in this particular instance they prove very suitable. The typewriter has also been satisfactorily employed for general descriptive labels in different departments.

It was mentioned in the last report that the birds added to the Hancock collection since the original installation were being labelled in uniformity with the rest; this has now been completed. Another and more formidable work in this section is being carried out by Wm. Voutt. The cases of the Hancock birds were originally lined with white paper. This has gradually become discoloured by the resin of the wood, until at last the general aspect of the bird room has been

to some extent spoilt. The paper is now being removed, and the wood given a coat of size and several coats of white paint. In this way we hope to get a permanent result; the improvement effected by the work as far as it has gone is very striking. Mr. Bolam's birds have been alluded to in the council's report. We brought the whole of his collection from Berwick to the museum to examine it and to make a selection, and the birds chosen are temporarily exhibited together before being distributed to their places.

Some further examination and re-arrangement has been done amongst the contents of the store cupboards, and we have sorted through a large accumulation of old documents and publications. It should also be mentioned that the Society's library is being catalogued, with a view to making it of more service to the members for reference.

The number of ordinary visitors to the museum varies only very slightly from year to year. By a rough calculation based on the amount of the admission fees taken at the door, the number has usually been stated at 16,000 to 20,000 in the year. With the turnstile it will now be possible to arrive at a more accurate figure. Calculating from the record for the seven months during which the turnstile has been in use, it appears that the year's total is likely to amount to about 17,000. A pleasant feature in connexion with the visitors is that the collections in the museum are now frequently consulted by highly qualified specialists as an aid in their work. It is also gratifying to find that local naturalists are making more use of the reference collections; and there has been a considerable increase in the number of parties making the museum the object of a special visit, usually on Saturday afternoons. In such cases I give, as a rule, a short demonstration upon some part of the collections. Lately also I have occasionally given short lessons to school classes.

A few words as to the general position of the museum may not be out of place in an annual report. Since the appointment of a lady assistant and the return to a normal working

of the staff, it may probably be said that the museum is being administered on as efficient a plan as is possible with the resources available. Progress is being made towards bringing the collections into creditable order, and we are keeping up also with the unavoidable incidental work. The position is considerably improved, but I believe it is scarcely realised how far we still are from being able to deal effectively with the real demands of the institution. The progress is deplorably slow in view of the amount of work waiting to be taken in hand in almost every section of the museum. Taking up any piece of work at present implies neglecting others which will probably in the judgment of someone be of more importance than anything else. Valuable reference collections must receive less attention than they need in order that some of the worst defects in exhibited collections may be remedied. It is difficult to get any comprehensive piece of work carried through; and much work that is most desirable cannot be undertaken at all because it would involve the consumption of too much time in consulting technical literature.

I lately received the report of one of our principal provincial museums. It is one of the best administered museums of Britain and its collections are considerably more extensive than ours, but in size it corresponds very closely with this museum. Its income, however, is five times that of this museum, and the report nevertheless consists largely in an appeal for the decidedly increased support which is essential if its natural development is not to be crippled. A comparison with any other well organised museum, taking account of relative size, would point to the same conclusion. Under present conditions there is no prospect of the Society's museum being brought into a state really compatible with its size, importance, and traditions. The museum started with many advantages in its favour—a fine building, some noted collections, strong local interest. But large sections of it, including the whole of the zoology and geology rooms and the collection of rocks, have never been more than roughly planned out, and the disproportion between the size of the museum

and its income is such that it has never yet been possible to make much progress towards bringing these sections into good order. A very large amount of detailed labour will be required, and the first need of the moment is for more working strength which could be brought to bear upon this. Beyond, again, lie many projects whose fulfilment is highly desirable if the best is to be made of the museum as a stimulating and educational factor in the district. Such are, for example, the formation of a proper botanical section, the better representation of the larger mammals (always of chief interest to the public), the provision of a small series of cases illustrating geographical distribution and of index or introductory cases in several departments. These and other progressive schemes are, however, under existing circumstances little more than visionary.

To maintain such a museum at all is an achievement of which any local society may justly be proud. But in reporting upon the condition and progress of the museum, it seems proper to point out how much remains to be accomplished before its position among the kindred institutions of this country can be adequately sustained.

E. LEONARD GILL.

APPENDIX.

SUBJECTS OF "MUSEUM TALKS," 1904-05.

Oct. 26.—Winter Migrants.

Nov. 30.—Birds of the Town Moor.

Dec. 28.—English Song Birds.

Jan. 25.—Arms and Legs.

Feb. 22.—Crabs and Lobsters.

Mar. 29.—Some British Mammals.

Apr. 26.—The Whales.

NATURAL HISTORY SOCIETY OF NORTHUMBER- LAND, DURHAM, AND NEWCASTLE-UPON-TYNE.

OFFICERS OF THE SOCIETY

Elected at the Annual Meeting, November, 1905.

PRESIDENT.

The Right Hon. Lord Armstrong, M.A., D.C.L.

VICE-PRESIDENTS.

The Duke of Northumberland.	The Mayor of Newcastle.
Viscount Ridley.	Lt.-Col. C. H. E. Adamson, C.I.E.
Lord Barnard.	Col. W. M. Angus, C.B.
Lord Ravensworth.	Prof. G. S. Brady, M.D., F.R.S.
The Bishop of Durham.	E. J. J. Browell.
The Bishop of Newcastle.	Norman C. Cookson.
Sir Hugh Bell, Bart.	Geo. E. Crawhall.
Sir James Joicey, Bart., M.P.	W. D. Cruddas.
Sir Arthur Middleton, Bart.,	Jno. Daglish.
Sir Andrew Noble, Bart., F.R.S.	R. R. Dees.
Sir Isambard Owen, M.A., M.D.	D. O. Drewett.
Sir G. H. Philipson, M.D., D.C.L.	Samuel Graham.
Sir Jos. W. Swan, LL.D., F.R.S.	H. N. Middleton.
Sir John Swinburne, Bart.	Prof. M. C. Potter, M.A.
Sir Lindsay Wood, Bart.	Thos. Thompson.

COUNCIL.

Richard Adamson.	T. E. Hodgkin, M.A.
W. E. Beck.	Alex. Meek, M.Sc.
Rev. W. McLean Brown.	Jno. Pattinson, F.I.C.
R. C. Clephan, F.S.A.	J. Alaric Richardson.
Clive Cookson.	Ernest Scott.
Wilfred Hall.	J. D. Walker.

HON. SECRETARIES.

N. H. Martin, F.R.S.E. | C. E. Robson.

HON. TREASURER

A. H. Dickinson.

HON. AUDITOR

Samuel Graham.

LIST OF DONATIONS

FOR THE YEAR ENDING JUNE 30TH, 1905.

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- LIEUT.-COL. C. H. E. ADAMSON, C.I.E.—Third cabinet of the donor's collection of Burmese butterflies. Also male and female of *Ornithoptera crasus*.
- E. D. BARTLETT (London).—A goat moth larva from Epping Forest (which has since pupated, and emerged after nine months.)
- W. E. BECK.—Some fossil corals from the Carboniferous Limestone, Wensleydale.
- SEYMOUR BELL.—An allice shad (*Clupea alosa*) taken off the north-east coast.
- GEORGE BOLAM.—Fifty-five birds selected from the collection made by him in the neighbourhood of Berwick, and including Bartram's sandpiper, red-breasted flycatcher, and other rarities. (Some account of these birds will probably appear in the Transactions). Also a pine marten, polecat, and other mammals; and a collection of local Lepidoptera.
- T. BRAYSHAW.—A fine perch (*Perca fluviatilis*), 16 inches in length.
- THOS. BOWSER.—Part of skull of a brow-antlered deer (*Panolia eldi*) from Rangoon, Burma.
- REV. A. J. CAMPBELL.—A series of local mosses, selected by Mr. Campbell from the collections of Sir Walter Trevelyan and Dr Embleton, and cleaned, mounted, named and arranged by him to form a reference collection; also a classified type-written list of the species represented.
- MR. CAPPLEMAN (Hartlepool, per J. E. Robson).—A bass (*Labrax lupus*), length 20 inches, taken in a trawl off Hartlepool.
- MRS. FRED. CARRICK.—Shells collected on the north-east coast, to replace faded and corroded specimens in the museum collections.
- JAS. CAYGILL.—Various small glacial boulders from the Consett district; a piece of "cone-in-cone"; old pattern hammer and pick from disused workings lately re-opened.
- MASTER NORMAN C. CHAMPNESS.—Some shells from the shore at Alnmouth.

- HUGH V. CHARLTON.—A small octopus (*Eledone cirrhosa*) found cast up near St. Mary's Island; two "father lashers" (*Cottus bulbalis*) and a hermit crab (*P. bernhardus*) in spirit.
- MISS D. F. CLEPHAN.—Two living specimens of an Indian wood-boring beetle (*Sinoxylon anale*.)
- F. G. COLLETT (Bombay).—A second set of twelve clay models representing household servants of Upper and Central India.
- WM. COLMAN.—A female otter, trapped on the donor's poultry farm at Jesmond Dene after heavy depredations.
- HAROLD COOKSON (per Clive Cookson, on loan).—Eight further big game trophies (heads or horns) from Africa, to add to the set lent in December, 1902.
- GEO. E. CRAWHALL.—Young semi-albino hedge sparrow; two hen pheasants in cock's plumage, one in an early stage and the other completely changed; a male shoveller in perfect adult plumage; a wigeon, adult male changing from summer dress; and a stoat in a transition stage towards the white dress. All the above from Haydon Bridge.
- MRS. DINNING.—A palm leaf hat, 25 inches diameter, worn by the Shans of Burma.
- DUNSTON ENGINE WORKS CO.—Greater pipe fish (*Syngnathus acus*), female, found by the quay at Dunston.
- MISS EMBLETON.—The "Young Leopard Asleep," stuffed and afterwards depicted in a published drawing by John Hancock.
- A. L. FORSTER.—A double shell-less hen's egg.
- S. GRAHAM.—Part of the horn of a roebuck, somewhat mineralised, dug up under the south aisle of St. Nicholas' Cathedral. Various nests with eggs to add to the museum series.
- P. HETHERINGTON (Allendale).—A peewit's nest, cut out complete with the turf.
- T. E. HODGKIN, M.A.—Nest of sand martin, Northumberland.
- MRS. RICHARD HOWSE.—Some foreign birds, including two New Zealand owl parrots (*Stringops habroptilus*). A large piece of red jasper.
- CAPT. KING (Hartlepool).—A number of marine specimens brought up by the trawl, including fine growths of the marine worm *Filograna*, two examples of the "knotty cushion star" (*Goniaster equestris*), a living *Panopæa norvegica*, and a bottle grown over with barnacles, polyzoa, etc.

- MISS LAMBERT.—An oil painting by Miss M. J. Hancock of a view at Oatlands, Surrey.
- J. I. MALING.—A starling, pale brown variety, shot at Newbiggin-by-the-Sea.
- B. B. MEWBURN.—Nests of yellow wagtail, garden warbler and sedge warbler.
- ALAN M. MORISON.—A reeve (*Machetes pugnax*, female) from Cramlington; a spotted redshank (*Totanus fuscus*) from Cramlington; a greenshank (*Totanus canescens*) from Holy Island.
- J. ALARIC RICHARDSON.—A wheatear, pale and unusually coloured variety, from Newbiggin-by-the-Sea.
- E. O. REID.—A bunch of dried "mountain flax" from Scaw Fell.
- F. W. RICH.—Skin of a large dog otter, from the Coquet, near Rothbury.
- A. RIPPON.—A specimen of the "painted squat lobster," *Galathea*. Two boxes of "mushroom" or "German" tinder.
- C. E. ROBSON.—Fossil corals from the Carboniferous Limestone of Wensleydale.
- HENRY ROBSON.—A set of geological models illustrating surface exposures, faulting, etc.
- J. E. ROBSON.—Four coloured slides of Lepidoptera.
- MESSRS. ROBSON and SONS.—Various ethnological objects: a South-Seas fish spear; a Chinese compass; a cap of chain armour from India; three old wrought iron padlocks; an old sextant.
- K. RUSSELL-BRADY.—Samples of iron ore collected by the donor in Lulea, Sweden.
- ERNEST SCOTT.—A number of crayfish of all sizes, from the Tyne valley. A glacial boulder of black limestone from near the High Street, Gateshead.
- H. W. SETON-KARR.—A set of palæolithic implements of quartzite, from Madras Province, India. Implements of flint and chert from the Fayoom, Egypt.
- L. STEEL.—A young porbeagle (*Lamna cornubica*) brought in to North Shields by a line fishing boat.
- MISS STRAUGHAIR.—A packet of pressed plants gathered locally about 1831-36.
- R. TARBET (per Jas. Gordon, B.A.)—A piece of stone bearing curious concretionary markings, from Buittle, near Castle Douglas.

HARRY TAYLOR (per W. H. Young.)—A "sea hare," *Aplysia depilans*, taken near the coast in a trawl.

EDW. WALKER.—Jaws of a large shark from the Bay of Biscay. Baton as used by Calcutta police in the Indian Mutiny, etc.

DR. T. H. WALKER.—Cabinet of micro-fungi collected and mounted by the late Mr. Swallow.

REV. W. J. WINGATE.—Certificate of election of Wm. Backhouse as a member of the Society in 1831; an engraved document, bearing the signatures of Wm. Hutton and Geo. Wailes as secretaries, and of Edward Maltby, Bishop of Durham, as president.

ADDITIONS TO THE LIBRARY
BY DONATION AND EXCHANGE,
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BRITISH SOCIETIES AND INSTITUTIONS.

Berwick-upon-Tweed:—Berwickshire Naturalists' Club.

History of the Club, vol. 18, part 2.

Cambridge University:—Philosophical Society.

Proceedings, vol. 12, part 6; vol. 13, parts 1, 2.

Cardiff:—Museum and Art Gallery.

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Dublin:—Royal Dublin Society.

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Proceedings, vol. 10, part 2.

Economic Proceedings, vol. 1, part 5.

Edinburgh:—Botanical Society.

Transactions and Proceedings, vol. 22, parts 2, 3, 4.

Greenwich:—Royal Observatory.

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Glasgow:—Natural History Society.

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Arkiv, Band 11, no. 5 ; Band 12, no. 4 ; Band 13, no. 1.

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Vienna:—K. k. zoologisch-botanische Gesellschaft.

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THE HONORARY TREASURER IN ACCOUNT WITH THE NATURAL HISTORY SOCIETY.

CURRENT ACCOUNT FROM JULY 1ST, 1904, TO JUNE 30TH, 1905.

RECEIPTS		PAYMENTS.	
	£ s. d.		£ s. d.
Balance in Bank, July 1st, 1904	87 3 11	Advertising	25 2 3
Members' Subscriptions	363 17 0	Fuel, Lighting, and Water	51 1 5
Interest on Investments	163 19 9	Insurance	23 3 0
Museum Admission Fees	141 6 0	Materials and Fittings, Office and Turnstiles.....	106 2 3
Sale of Guides and Transactions	4 6 2	Postage and Carriage	11 3 10
Deposit and Interest withdrawn from Bank	103 8 7	Printing	39 8 10
		Property Tax	9 3 4
		Repairs to Buildings	141 11 8
		Salaries and Wages	400 18 6
		Stationery	7 12 3
		Sundries	25 10 1
		Balance in Bank, June 30th, 1905.....	23 4 0
	<u>£864 1 5</u>		<u>£864 1 5</u>

A. H. DICKINSON, HON. TREASURER.

Examined with the books and vouchers and found correct.

SAM. GRAHAM, HON. AUDITOR.

On the Crustacean Fauna of a Salt-water Pond at Amble.

By G. STEWARDSON BRADY, M.D., LL.D., D.Sc., F.R.S.
(Plates 9 and 10).

AT Amble, immediately south of the mouth of the Coquet, is an old disused quarry separated from the sea by a narrow wall of rock through which, by means of a small opening, it receives intermittent supplies of sea-water at the time of high tides; and during stormy weather, especially with an east wind, the sea is liable to break in considerable volume over the intervening rampart of rock. In this way the quarry has been filled with sea-water, whose level varies to a small extent with the rise and fall of the sea. There is no influx of fresh water other than mere surface drainage, and the water of the quarry has thus, by evaporation, become more salt than that of the sea outside. The depth of water is about fifty feet at the south-eastern end of the pond; thence it decreases rapidly to the north-western end, which is shallow and shelving. The whole area of the pond is about one acre and a quarter. There is very little vegetation—nothing but a scanty growth of small brown algæ (*Ectocarpus*?) and some *Confervæ*. The quarry was disused about fifty years ago, and since that time has been allowed to fill with water: it is therefore within a comparatively short period that the existing fauna must have been selected and adapted to present conditions.

The bottom consists of sandy mud with many stones in the deeper part, and of shelving rock at the shallow end. Fishes such as plaice, dab, flounder, eel, and even herring have been occasionally caught, and with a view to further investigation Mr. Meek planned a visit to the quarry during November of last year (1905). I was to have accompanied him, but was unable to do so owing to inclement weather, and the necessity of rising earlier in the morning than I found quite agreeable. The scanty proceeds of some netting and dredging were, however, submitted to me by Mr. Meek, and proved so interesting that I made an excursion to the pond in December in order to obtain further material for examination. When one considers the small amount of interchange which

can take place between the pond and the sea, the uniformly quiescent water and the absence of aëration such as is brought about in the sea by constant currents and break of waves, it is not surprising that both animal and vegetable life in their higher grades are here almost entirely absent, and that even in lower grades there should be great scarcity. Such, indeed, seems to be the case, but the small crustacea which constituted almost the sole proceeds of the nettings—though few in number—proved to be of great interest, several of them being new to our district and two new to science. The following list embraces all the species observed.

Macromysis flexuosa (Müller)

Melita palmata, Mont.

Isias clavipes, Boeck.

Temora longicornis (Müller)

Acartia longiremis (Lilljeborg)

Cyclopina gracilis, Claus.

Ectinosoma brunnea, n. sp.

Bradya minor, T. & A. Scott.

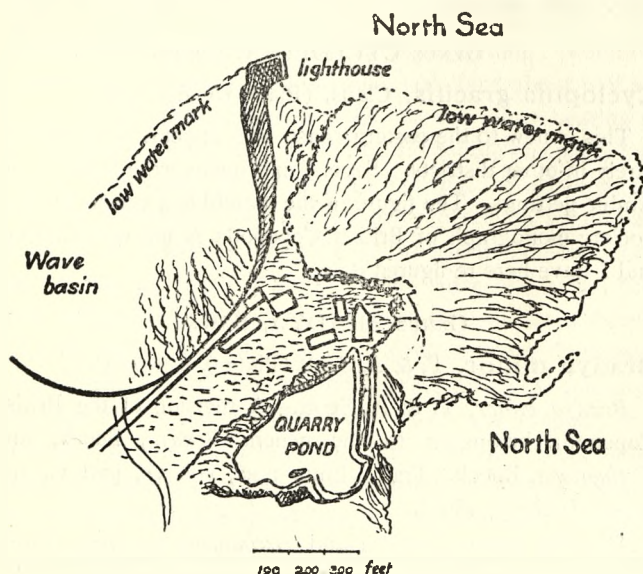
Harpacticus chelifera (Müller)

Idya furcata (Baird)

Proteocypris salina, nov. gen. et sp.

Daphnia pulex, Lin.

The accompanying sketch map will give a fair idea of the position and surroundings of the pond.



Macromysis flexuosa, a common littoral species, occurred abundantly; of *Melita palmata* there were only two immature specimens. *Acartia longiremis* and *Temora longicornis*, both of them abundant in the open sea, were here tolerably plentiful. *Idya furcata*, a very common form in tidal pools, was extremely plentiful, with many ovigerous females, among the scanty coating of algæ at the shallow end of the pond. Of *Harpacticus chelifer* there were only few examples, and of *Daphnia pulex* only one. How this one managed to get there from its usual fresh-water haunts one can only conjecture: it was a very robust, deeply coloured specimen, and had doubtless been alive when captured.

GENUS ISIAS, Boeck.

Isias clavipes, Boeck.

This species is new to our district, and there is only one previous record of its occurrence on the east coast of England, off Robin Hood's Bay. It is, however, not uncommon off the southern and western coasts. Only one specimen was seen in the Amble gathering.

GENUS CYCLOPINA, Claus.

Cyclopina gracilis, Claus. (Plate 10, fig. 13).

This is new to the eastern coast, and appears to occur only rarely in other districts. Several specimens were found in the Amble nettings. The figure of the mandible given in the Ray Society monograph of British Copepoda is not quite correct, and I have here re-figured it.

GENUS BRADYA, Boeck.

Bradya minor, T. & A. Scott (Plate 9, figs. 1-3).

Bradya minor, T. & A. Scott.—A revision of the British Copepoda belonging to the genera *Bradya*, Boeck, and *Ectinosoma*, Boeck. (Trans. Linn. Soc., vol. vi., part v., 2nd series, Zoology, 1896).

The two genera *Bradya* and *Ectinosoma* are very closely allied, and are distinguished from each other chiefly by the

characters of the first pair of footjaws. The present species may be easily recognized by a conspicuous dusky patch at the base of the anterior antennæ (fig. 2). It occurred in considerable numbers in the netting from the deeper water of the pond. This is the first record of its occurrence in our district, and it has been found by the Messrs. Scott only in two localities—Firth of Forth, and Hilbre Island, Liverpool Bay.

GENUS ECTINOSOMA, Boeck.

Ectinosoma brunnea, sp. nov. (Plate 9, figs. 4-11).

The body is rather stout (fig. 4), and usually without flexure at the junction of thorax and abdomen: it is rather larger than most species of the genus, but otherwise there is not much that is distinctive in its general build except that the colour is usually of a dark brown. Anterior antennæ (fig. 5) short and stout, five-jointed, and densely setiferous; posterior antennæ (fig. 6) much larger than the anterior, the secondary branch three-jointed, reaching at least as far as the apex of the main branch, the median joint very small, last joint very long and slender; anterior footjaws (fig. 8) very stout, the two joints equal in size and about as broad as long; posterior footjaws (fig. 9) slender, three-jointed, last joint about half as long as the two preceding joints, the first two joints bearing a few marginal setæ—three apical setæ, the middle one much the longest. The basal joint of the fifth foot (fig. 10) is prolonged internally, forming an oblong subquadrate lamina somewhat furcate at its extremity, tipped with two stout plumose setæ, and bearing on its inner margin a few spine-like hairs: the outer segment of the basal joint ends as usual in a single seta: the second or distal joint is divided into three digitiform lobes of nearly equal length, each bearing an apical plumose seta, that of the middle lobe being much the longest; the innermost digit has also two additional but very short setæ. Furca of moderate length, about twice as long as broad (fig. 11), bearing three apical setæ of unequal length. Length of the animal, exclusive of tail setæ, .85 mm.

This species was the most abundant of those found in the deeper water of the pond. The genus *Ectinosoma* includes a large number of forms differing only slightly from each other, the differences being in most cases quite unrecognizable without careful dissection. I therefore submitted specimens to Mr. Andrew Scott, who, with his father Dr. T. Scott, has made a special study of the genus, and he entirely agrees with me as to their being specifically distinct.

PROTEOCYPRIS*, NOV. GEN.

Swimming setæ of the posterior antennæ reaching much beyond the apices of the terminal claws; setæ of the first pair of maxillæ simple, devoid of lateral spines; second pair of maxillæ in the male strongly prehensile, post-abdominal rami consisting of slender papillæ with long terminal setæ. Sexes distinct.

The long swimming setæ, the rudimentary post-abdomen, bi-sexual character and marine habitat sufficiently distinguish this genus from any of those hitherto described.

Proteocypris salina, sp. nov. (Plate 10, figs. 1-12).

Shell seen laterally (fig. 1) reniform, greatest height situated in the middle and equal to rather more than half the length, anterior extremity broad and well rounded, posterior narrower and subtruncate; dorsal margin evenly arched, ventral sinuated in the middle; seen from above (fig. 2) the outline is elongate-ovate, widest in the middle, and tapering evenly to the extremities, width considerably less than half the length; anterior extremity sharply acuminate, posterior very narrowly rounded, lateral margins evenly curved throughout. Shell very thin, almost colourless, semitransparent, bearing a few fine marginal hairs at the extremities. The two sexes alike in shape, or nearly so. Length .55 mm. Terminal claws of the anterior antennæ finely pectinate (figs. 3, 4). Lobes of the first maxillæ (fig. 5) digitiform and bearing simple apical and marginal setæ; second maxillæ simply palpate in the female,

* Proteus, a sea-god.

but in the male (figs. 6, 7) forming powerful forcipate claws; first pair of walking feet simple (fig. 8), second pair (fig. 9) bearing a slender falcate terminal claw and a long seta equal in length to the joint from which it springs: caudal rami (fig. 10) composed of slender papilliform bases from each of which springs a long terminal seta. The ejaculatory duct of the male (fig. 11) has a series of 12-14 whorls; the external copulatory organs biramose distally (fig. 12).

This species is especially interesting, inasmuch as, so far as I am aware, it is the only instance of a typically fresh-water Cyprid occurring in a truly marine habitat. Only four or five specimens were found.

EXPLANATION OF PLATES.

PLATE 9.

BRADYA MINOR.

- Fig. 1. Female and male in coitu $\times$ 84.
2. Anterior antenna $\times$ 350.
3. Fifth foot $\times$ 350.

ECTINOSOMA BRUNNEA.

4. Female $\times$ 84.
5. Anterior antenna $\times$ 280.
6. Posterior „ $\times$ 280.
7. Mandible $\times$ 280.
8. First footjaw $\times$ 350.
9. Second „ $\times$ 280.
10. Fifth foot $\times$ 240.
11. Furca $\times$ 120.

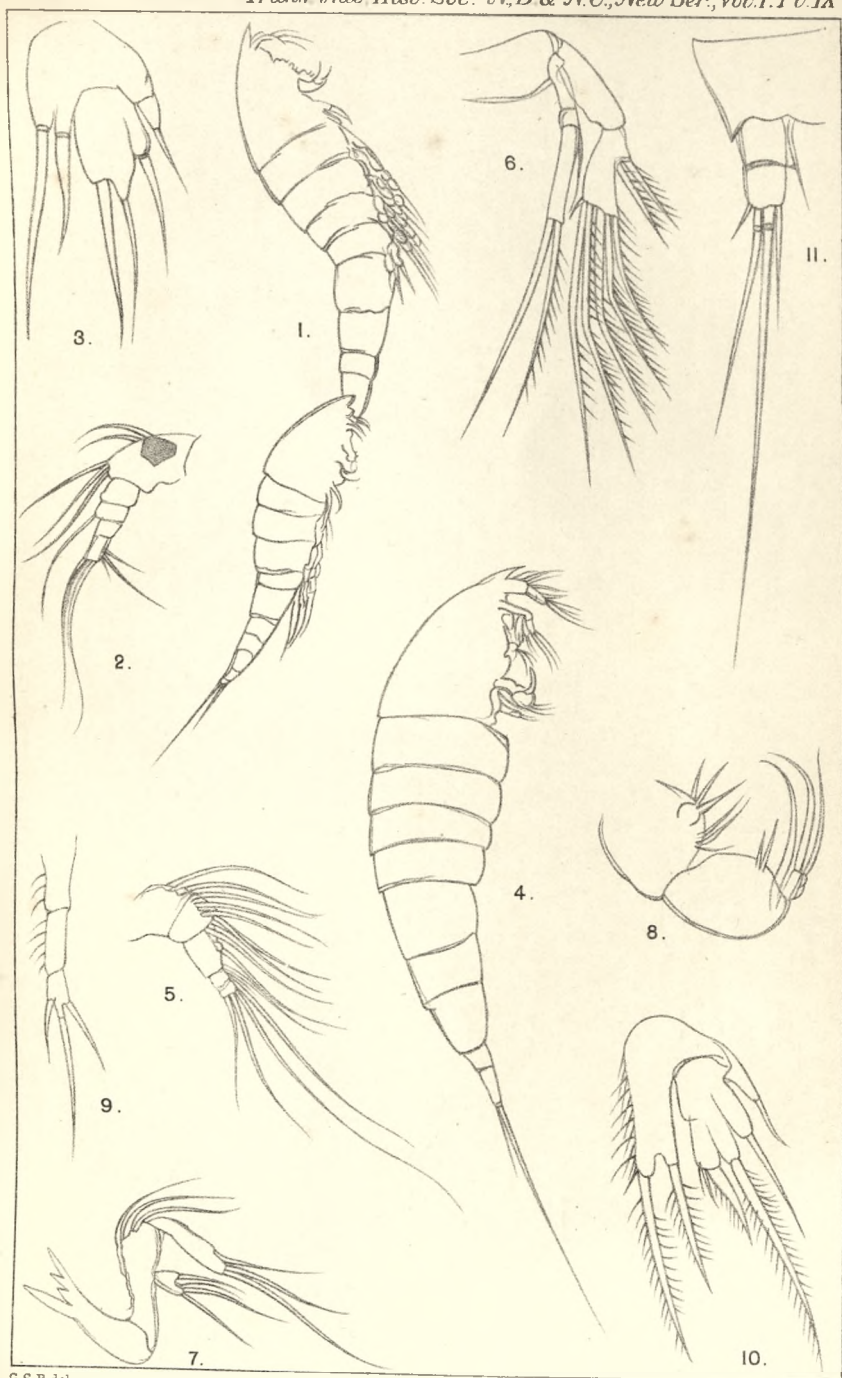
PLATE 10.

PROTEOCYPRIS SALINA.

- Fig. 1, 2. Shell from left side and from above $\times 84$.
3. Posterior antenna $\times 240$.
4. „ apical claws $\times 350$.
5. Anterior maxilla $\times 320$.
6. Posterior „ (right, ♂) $\times 300$.
7. „ left $\times 300$.
8. First foot $\times 240$.
9. End of second foot $\times 350$.
10. Post-abdomen $\times 350$.
11. Ejaculatory duct. (part) $\times 440$.
12. Penis $\times 300$.

CYCLOPINA GRACILIS.

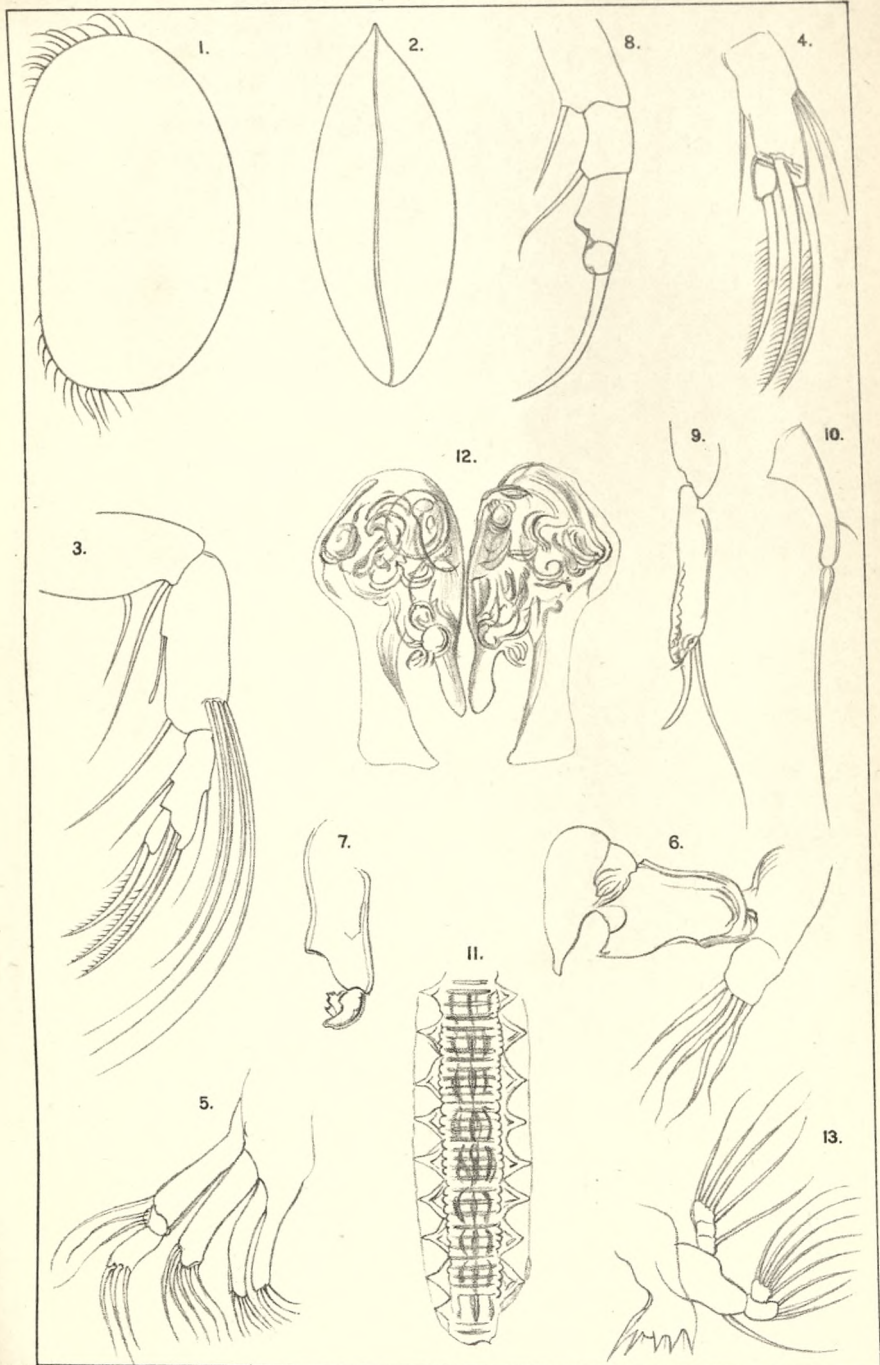
13. Mandible $\times 350$.
-



G.S.B. del.

E. Wilson, Cambridge

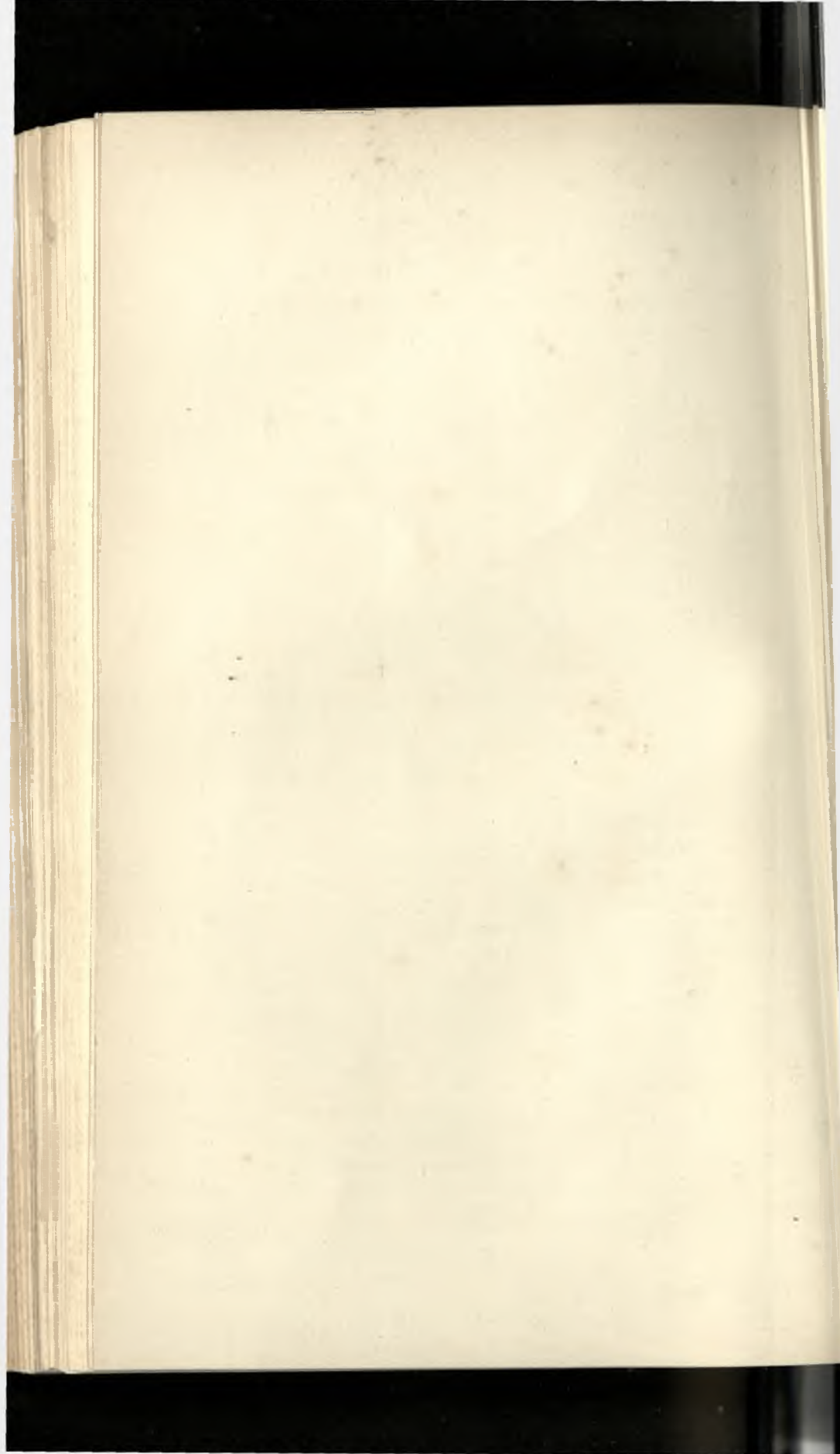
1-3. *BRADYA MINOR*.
4-11. *ECTINOSOMA BRUNNEA*.



G.S.B. del.

E. Wilson, Cambridge.

1-12. *PROTEOCYPRIS SALINA*.
13. *CYCLOPINA GRACILIS*.



The Spiders of the Tyne Valley.

BY A. RANDELL JACKSON, M.B., M.Sc.

(Read April 5, 1906).

HAVING resided for over three years in Hexham, and having devoted some time to the study of the spiders of that district, I now publish the results of my observations. I am aware of course that many of my captures have been previously recorded in the several lists of Northern Spiders which have already appeared. Nevertheless I feel that I have done sufficient work to make a new list of Northumbrian spiders more desirable than a mere schedule of additions and corrections. In the year 1858 Mr. Hardy published a list of 70 species of Berwickshire spiders. These were identified by Mr. Blackwall, and many of them are noted in his "Spiders of Great Britain and Ireland." In 1875 the Rev. O. P. Cambridge published a list of Berwickshire and Northumberland spiders. In this he recorded 75 species for the former, and 143 for the latter county. These were also collected by Mr. Hardy, and came largely from the Cheviot district. Again in 1896, the Rev. J. E. Hull, in his "Catalogue of the Spiders of Northumberland and Durham," enumerated 192 species which had been found in the two counties. This total included the Northumberland spiders in Mr. Cambridge's list. Mr. Hull thus added 49 new species. In a list of additions to the above, published in 1901, he increased the total for the two counties to 210. Since that time various species have been dropped from the British, and hence from the Northumbrian list. Their abandonment was due to the fact that their differences from their allies were no longer considered to be specific in value (see Appendix II.). By these losses Mr. Hull's list was reduced to 205 species. I now record the occurrence of 259 species of spiders from Tynedale, and this raises the total for the two counties to the number of 286 species, 284 of which have been found in Northumberland. This number includes 177 names previously recorded by Mr.

Hardy, Mr. Hull, or both, and 81 additions to the known fauna of Northumberland. The two previous observers have, however, reported 28 species which I did not obtain in the Tyne Valley. Their names will be found in the first two appendices. In the third appendix is a list of various spiders found in Cumberland and the Lake District, but which have not as yet turned up in either of the two North Eastern counties. The total for the four northern counties is 322 species, a number that exceeds that of the spiders recorded in the Irish or Scottish lists. The Northumberland list itself considerably exceeds that of any English county with the exception of Dorset, and contains the names of about half the species known to inhabit Britain. I also publish the names of 14 kinds of Phalangidea or harvest-spiders; only 25 species are recorded as British. In addition to these I record the name of the solitary species of Chernetid, or Pseudo-scorpion, known to inhabit Northumberland.

I have added to the names of these Arachnids some account of the kinds of locality in which they may be found, and the seasons in which they are adult. Their distribution in the British Isles and on the Continent has also been indicated, and I have tried to do this on the lines of Dr. Carpenter in his "List of the Spiders of Ireland." To this work I am indebted for much useful information, and I much regret that I have not had access to such a large quantity of appropriate literature as had the author.

Mr. Hardy, as I have stated, made his observations in the extreme north of the county, and on both sides of the Cheviots. Mr. Hull travelled about and worked at various distant points. My collecting on the other hand has been done entirely in the valley of the Tyne. With the exception of a day at Whitley Bay, and another at Bellingham, I have worked within a radius of ten miles from Hexham. Most of my collecting indeed has been done within four or five miles of that town. The district of course is a very rich one, but has a limitation, in that the country, though very beautiful, has little or no tendency to diversity. The formation is Carboniferous, and

consists chiefly of the Bernician series of grits and limestones. Hence there are no great elevations and no deeply cut valleys. There are no rugged mountains and no precipitous chasms. The formation also affects the character of the vegetation, and secondarily of the fauna. Again, the land is very largely under cultivation. Therefore there are in the immediate neighbourhood of Hexham no great morasses and no elevated moors. Incidentally, the coast line is a long way off. The bulk of the county of Northumberland is sparsely populated, and not well cultivated, and very satisfactory bogs and moors exist at some little distance. However, with the exception of a few hours on Blanchland Common, I have been unable to reach them. It is quite certain that when these inland wastes and the coastline have been worked out, our list of Northumbrian spiders will be much longer.

My district was thus small, and the ground was very similar throughout it. Furthermore I had little opportunity of travelling about, and of exploring fresh localities. As a set off against these disadvantages is the fact that I did a little work on nearly every day throughout the year for three consecutive years. By these means one can obtain a fair idea of the fauna of a restricted locality. The district may be divided into several varieties of ground, according to its nature and soil. Firstly, there are the woods. These are very extensive in the neighbourhood of Hexham. The Swallowship wood for instance is some miles in circumference. In places it consists of conifers planted close together, their straight rosy trunks looking in the distance like the columns of some vast cathedral. Amongst the boles of the larches and firs rise the huge dome-shaped nests of the wood ants. These are composed of the fragrant pine-needles which thickly carpet the ground in the shade of the stately trees. In places more open are bushes of overgrown heather, their roots deeply sunk in green moss, and wrapped about with fallen leaves. Deep ditches intersect these woods. Their banks are bosky with ferns, heather, and other plants, which overhang and dip into the leisurely running or stagnant water. Some clearings

are carpeted with verdant moss, and dotted over with clumps of rushes. Others in the form of heather-grown knolls emerge from the shelter of the tallest trees and bask in the sunshine. In the heart of these woods there is a deep silence, broken at intervals by the piercing and monotonous calls of the titmice, the needle-like song of the golden-crest, the cooing of the wood pigeons, and the rippling voice of the yellow-hued wood wren.

Other woods like those of St. John Lee are perched on the side of some hill. They are well drained and comparatively dry. Deciduous trees are here more in evidence, dominated by the beech with its rounded trunk, so suggestive of giant limbs turned suddenly into wood. Such woods are breezy and open, they are filled with bird and animal life, and their spider fauna differs considerably from that of the deep, silent, mossy woods described above. In due season they are carpeted with primroses, anemones, wood sorrel, and garlic, or enamelled with countless blue hyacinths. The river banks also are worthy of study. In places there are great beds of water-worn stones and shingle; in places dunes composed of blown sand, similar in form, and somewhat in fauna, to those of the sea coast. Beds of rushes are also present, but the river is a rapid shallow one, it does not tend to form swamps, and its banks are generally dry and grassy.

There are several extensive tracts of heather in the district, but unfortunately they are all at some little distance from Hexham. There is one that rises from, and is surrounded by Dipton Wood. This was once covered with trees, but these have now been felled, and the heather is struggling with newly planted foot-high conifers. The largest and boldest however is that of Blanchland Common, or Blanchland Moor, as it is sometimes called. This rises to an elevation of over 1300 feet. It sweeps in bold curves along the sky line, and is dotted with the turf-built shelters used by the grouse shooters. In places there are emerald patches of moss marking the position of bogs, but most of the surface is covered with dry, short, rustling heather. Here the grouse may be seen in skimming

flight. Here the curlew, lapwing, snipe, and other moorland birds join their voices to his and produce the breezy sounds so characteristic of a northern moor. The dry piercing air suits some spiders more than others, and while many forms common in the valleys beneath are absent, several distinctly subalpine species occur under the stones and cut turves, or amongst the heather. In winter the snow falls heavily, lies long, and the Common well deserves its name.

Extensive swamps are rare, but there is one in connection with the Erring Burn, which joins the North Tyne near Chollerton. It is in process of silting itself up, and has in consequence formed this swamp, which is of considerable extent. In summer much of it is used as pasture, but in winter it is largely under water.

There are also sandhills on the coast at Whitley and Monk-seaton. They are not well developed, but I have done too little work there to criticize their fauna.

In addition to these particular kinds of locality, we must refer to the general character of the Hexham district. The face of the country side is exceedingly beautiful. Undulating, wooded, and fertile, with a noble river rolling swiftly through its midst, it is one of which its inhabitants should be proud. Several English counties are more striking in appearance. Very few I should imagine are so sweet.

It is a fact that whereas some species of spiders are generally distributed, others only inhabit certain particular kinds of locality. Hence we should not expect to find in Tynedale spiders peculiar to mountainous districts, such as have occurred on the Cheviots and Cumbrian mountains. Neither, since the coast is not yet worked out, should we find in our list the names of many truly littoral species. In a district like that of Hexham we *should* however expect to find a good average selection of British spiders, with a preponderance of northern forms, also a few subalpine forms, and one or two spiders whose range is chiefly southern, but which do occur, though rarely, in the North. This is exactly

the sort of fauna that does obtain. In addition to these we have five species which were not previously known to inhabit Britain. Three of them, when first obtained, were new to science. *Diplocephalus adjacens* (Camb.), and *Diplocephalus Jacksonii* (Camb.), occur on the sandy and grassy banks of the Tyne. They have not as yet been found elsewhere. *Tmeticus firmus* (Camb.) was discovered in the female sex near Hexham, and at Huddersfield about simultaneously. The male, however, has only as yet been found in the former locality*. Of the two spiders which were known from Continental localities, and unknown in Britain, one, *Tapinocyba insecta* (Koch), was discovered near Newbrough, and has since been found at Leeds. The other, *Erigone arctica* (White), is a Siberian spider, which was found at Whitley Bay, close to the shore. It was at once recognised as something new to Britain, but unrecorded specimens from Scotland, Ireland, and the South of England were already in the hands of the Rev. O. Pickard-Cambridge. In the case of three other species only one sex was previously known to science until the other was discovered near Hexham. In *Onesinda minutissima* (Camb.) the male was the sex to be discovered, and in *Sintula fausta* (Camb.) and *Gongylidium distinctum* (Sim.) the females were new to science. Two other rare species inhabit the nests of ants; these are *Thyreosthenius biovatus* (Camb.) and *Evansia merens* (Camb.). The former lives in the nests of *Formica rufa*, and the latter in those of *Formica fusca* and *Lasius nigra*. Other rare and noteworthy forms are *Lophocarenum Mengii* (Sim.), *Troxochrus ignobilis* (Camb.), *Araoncus crassiceps* (Westr.), *Panamomops bicuspis* (Camb.), *Lophomma subaequale* (Westr.), *Tapinocyba pallens* (Camb.), *Entelecara Thorellii* (Westr.), *Walckenaera nodosa* (Camb.), *Walckenaera obtusa* (Bl.), *Wideria fugax* (Camb.), *Hilaira reproba* (Camb.), *Tmeticus Hardii* (Bl.), *Porrhomma egeria* (Sim.), *Porrhomma miser* (Camb.), *Zora nemoralis* (Bl.), *Trochosa cinerea* (Panz.), and *Xysticus bifasciatus* (C. L. K.)

* Since the above was written, a single male, and numerous females, of this interesting species have been turned up in Delamere Forest in Cheshire.

The chief *subalpine* forms in the list are *Caledonia Evansii* (Camb.), *Tmeticus prudens* (Camb.), *Tmeticus arcanus* (Camb.), *Microneta sublimis* (Camb.), and *Bolyphantes alticeps* (Sund.).

Lastly a few spiders here recorded are chiefly of southern habit. Although several of them extend into Scotland, they all have their British headquarters in the South of England. Such are *Xysticus pini* (Hahn.), *Xysticus lanio* (C. L. K.), *Amaurobius ferox* (Walck.), *Gongylidium graminicolum* (Sund.), *Enidia cornuta* (Bl.), *Cyclosa conica* (Pall.), and *Cercidia prominens* (Westr.).

Finally I have to thank those who have so kindly assisted me in my pleasant observations on the Tynedale spiders. The Rev. O. P. Cambridge, F.R.S., has seen and identified all the spiders which I had not taken before in other localities. He has also verified my identification of nearly all the other species. The only forms I have *not* sent to him are the very common ones. He has at all times been ready to assist me with his advice, and with specimens from his unrivalled collection. I have followed his nomenclature of genera and species almost exclusively, but in the case of the arrangement of the minute spiders have adopted M. Simon's family Argiopidæ with its subdivisions. The Rev. J. E. Hull, the author of the "Catalogue of the Spiders of Northumberland and Durham," has also been very kind in directing me to certain localities, as well as in looking up many Continental references in works to which I have not had access. Mr. Falconer, of Huddersfield, Mr. F. P. Smith, of Islington, and Mr. J. C. Varty-Smith, of Penrith, have all assisted me in sending MS. lists of the spiders of their respective districts. Mr. Falconer has also sent me many rare, and several new Yorkshire spiders for comparison with Northumbrian examples, and Mr. Bagnall is now sending me numerous Arachnids from Winlaton-on-Tyne. As regards other local records I may here say that my own notebooks have been extremely useful, the Glamorgan and Manx notices being entirely, and the Cumberland, Lancashire, and Staffordshire records partly taken from their pages. I must also express my thanks to

Mrs. Backhouse, of the Duke's House, near Hexham, who kindly allowed me to explore the recesses of the splendid Swallowship woods, which are her property. Without her kind permission my list of the spiders of Tynedale would be considerably shorter than it is.

In conclusion I should like to say that much work still remains to be done among the Northumbrian spiders. This is particularly the case along the coast, and among the wilds of the central part of the county. Many new and rare things await discovery in the marshes and on the hills that divide Tyneside and Cheviot. I shall always be happy to inspect and identify any collections which members of the Society or others may send to me. Placed in bottles, or tubes, full of ordinary methylated spirit, spiders are easy to pack and send by post. If some such collections could be made in various parts of the county, I have no doubt that species would soon be found new, not only to Northumberland, but to Britain and science.

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Order I. ARANEÆ.

Family DYSDERIDÆ.

Harpactes Hombergii (Scop.). Not very abundant, but may generally be found under bark, and amongst grass and heather overhanging banks and walls. Adults occur throughout the year. Widely distributed in Britain, Ireland, and Europe.

Segestria senoculata (L.). Common under bark, and in crevices of walls, rocks, etc., as well as under stones. Widely distributed.

Family OONOPIDÆ.

Oonops pulcher (Templ.). This little spider is not uncommon among the debris at the bottoms of hedges, and among fallen leaves and pine-needles in the woods. It is widely distributed in Britain and Ireland, occurring also in the Isle of Man. Abroad it has been found from Lapland to the Madeiras, also in Italy, and lately in Switzerland. It seems, however, absent from Central Europe.

Family DRASSIDÆ.

Prothesima Latreillii (Sim.). Occasional under stones on Blanchland Common, and on the open places near Dipton Wood. It occurs in Ireland, and in several English counties from Dorset to Cumberland. It has not yet been recognized in Scotland, but is recorded from France, Germany, Austria, and Hungary.

Drassodes cupreus (Bl.).

Drassus lapidicola (Walck.—Hull, op. cit.)

Drassus lapidosus (Walck.—F. O. P. Cambridge, List of the Araneida of Cumberland and the Lake District).

Mr. Cambridge refers all the northern forms to this species, and states that the true *Drassodes lapidosus* (Walck.) is only known in this country as an inhabitant of the South of England. The present species may be found under stones and amongst grass throughout Tyne-dale. It is adult in May and June, and is common and widely distributed in Britain, Ireland, and on the Continent.

Drassodes troglodytes (Koch). Not rare in the Hexham district amongst grass and dead leaves, also under stones. Adults may be found throughout the summer. Distribution very wide in Britain, Ireland, and almost the whole Palæarctic area.

Scotophæus Blackwallii (Thor.). Occasionally found wandering about on the walls and ceilings of rooms at night. The males are adult in May and June. The females may be found with their white egg sacs in the crevices of ivy-draped walls in late summer and autumn. This spider probably occurs throughout Britain. It is reported from Dorset, Essex, Norfolk, Leicester, Cheshire, Lancashire, and Edinburgh. It is not recorded as Irish, but has been recognised in France, Austria, and Hungary.

Gnaphosa anglica (Camb.). In May, June, and July both sexes may be found under stones and turves on Blanchland Common at about 1,000 feet. Later the females may be observed in the same situations with their spherical white egg sacs. They usually make, or at all events utilize, excavations in the ground to receive these treasures, the roof of each nursery being formed by its sheltering stone. This spider is not recorded for Ireland, and on the Continent only for France, where it is however

widespread. In Britain it occurs from the Channel Islands to Berwickshire, reaching an altitude of nearly 3,000 feet on the Cumberland mountains.

Clubiona trivialis (L. Koch). Not rare in the heather districts near Hexham. In the summer it may frequently be beaten from the topmost shoots of that plant. Adults of both sexes may be found from May till September. This spider is common in Scotland and the North of England, but very rare in the South. It has occurred in the North of Ireland. On the Continent its distribution is northern and eastern, and it is not recorded for Western France or the Iberian Peninsula.

Clubiona reclusa (Camb.). An abundant spider, occurring in every wood and hedgerow, and on every grassy bank in the district. Both sexes are adult throughout the summer. Widespread in Britain, Ireland, and on the Continent.

Clubiona grisea (L. Koch). Not common, but occurs occasionally in swamps, such as that formed by the Erring Burn at Chollerton. Widely distributed in Britain, it occurs in Ireland, and has been recognized in France, Germany, and Hungary.

Clubiona holosericea (De Geer). This is another marsh loving species. Mr. Falconer found it at Houtley by the side of the river Devil's Water. It is common in most parts of Britain, Ireland, and Europe, but as I never met with it myself in Tynedale it can hardly be very abundant there, though it may easily occur in many districts I have not explored. It is nearly always found near water, and I have noticed that the comparatively rare specimens found in dry places are generally of stunted growth.

Clubiona pallidula (Clerck). Not very common, but may be beaten out of ivy or holly bushes, or extracted from cracks in walls, etc. It is adult in May and June, and is of wide distribution.

Clubiona lutescens (Westr.). Occurs abundantly throughout Tynedale in company with *C. reclusa* (Camb.). It is remarkable that its close ally *C. terrestris* (Westr.) has not yet been found in Tynedale. The latter has occurred at Wooler, in Durham, and abundantly in Cumberland and the other northern counties, but the most careful search has so far failed to turn it up in the Hexham district. As a rule *C. terrestris* (Westr.) is far commoner than *C. lutescens* (Westr.). Both spiders are widely distributed in Britain, Ireland, and on the Continent, although *C. lutescens* (Westr.) has not yet occurred in Scotland.

Clubiona neglecta (Camb.). Males and females are occasionally found among long grass on banks and in fields. Both sexes are adult in June and July. This is a commoner spider than is generally supposed, though probably nowhere very abundant. It has occurred in Dorset, Glamorgan, near London, in Norfolk, Lincoln, Lancashire, Yorkshire, Cumberland, and the Isle of Man. It occurs in both the North and the South of Ireland, and is recorded for France, Spain, Germany, Austria, and Hungary.

Clubiona brevipes (Bl.). This dark little spider has, like the next species, considerable jumping powers. It may be beaten from trees and bushes in May and June, and during the winter the young may be found under the bark of trees. This species ranges from Dorset to Edinburgh, occurs in Ireland, and is reported from most of the European countries.

Clubiona comta (C. L. Koch). The males of this common species are adult in April, and are the first Clubionæ of the year to be met with in that state. This is a common and widely distributed spider, occurring chiefly amongst herbage on the ground.

Clubiona diversa (Camb.). Not rare at the roots of heather and among herbage; also among fallen pine-needles in the woods. Both sexes may be found adult

throughout the summer. The species occurs from Dorset to Dunkeld, in Britain; it is not rare in Lancashire, Yorkshire, and Cumberland, as well as being fairly common in Tynedale. In Ireland it is recorded from Antrim and Armagh, and abroad from France, Germany, Austria, and Hungary.

Chiracanthium carnifex (Fabr.). Occurs among heather near Dipton Wood. An adult male was found on July 13th, 1902. Females may be found throughout the year, but the male has a very short season. The females spin nests at the tips of the heather shoots, and in these they deposit their eggs. The young of both sexes make similar nests, but the adult males seem to lead a vagabond life, and in my experience are seldom found freely. This spider occurs from Dorset to the Grampians. It also inhabits the South of Ireland, as well as most of the European countries.

Chiracanthium lapidicolens (Sim.). A single adult female was found in June under a stone on Blanchland Common. It has occurred once in Ireland, and in Dorset, Glamorgan, Hertford, Norfolk, Lancashire, Perthshire, and Aberdeen. It is widely distributed on the Continent.

Anyphœna accentuata (Walck.). Immature examples may be beaten from trees and shrubs in spring, and again in autumn. I have never found adults in Tynedale, but in the South of England maturity is attained in June. Widely distributed in Britain (Dorset to Perth), Ireland, and on the Continent. The genus *Anyphœna* has its headquarters in South America, two or three species straggle to Europe, and only one reaches Britain.

Agrœca brunnea (Bl.). Occurs abundantly in one or two places near Hexham. Such places are generally clearings in woods, in which there is a profuse growth of heather. In other situations it is very rare. Both sexes are adult in September. *A. brunnea* (Bl.) is not recorded for

Ireland. It ranges from Dorset to Cumberland in Britain. Its synonymy is a little confused, but it appears to occur in several of the countries of Western Europe.

Agroeca proxima (Camb.). Common and widely distributed in Tynedale and throughout Britain. It occurs in a variety of situations, and is adult in autumn. Abroad its range is rather restricted, as it is only recorded for France and Austria. It occurs in Ireland.

Agroeca celans (Bl.). This spider occurs at the same time as, and in similar situations to *A. brunnea* (Bl.) Adults of the two species may generally be found side by side. It has occurred once in Ireland, and is reported from Dorset, Devon, Lancashire, and Cumberland in Britain, also from France, Germany, Switzerland, and Austria.

Agroeca gracilipes (Bl.). Females of this spider have occurred among short heather on the moor which is surrounded at its base by Dipton Wood. It seems to prefer open spaces, while *A. celans* (Bl.) loves the long heather growing in the woods. Adult females occur in September, and some survive the winter, and may be found in spring. The males are probably mature in July and August, but I have not come across them in Northumberland, where the spider is distinctly the rarest of its genus. It occurs in Ireland, and ranges from Dorset to Paisley in Britain. Abroad it occurs in France, Switzerland, and Croatia.

Zora spinimana (Sund.). Frequent among herbage, especially heather. Adults may be found throughout the year. Widely distributed at home and abroad.

Zora nemoralis (Bl.). Two pairs were found among heather in Dipton Wood in June, 1903. One female occurred also near Staward Peel in April of the following year. The male is very swift of foot and dark of hue. It looks very like a *Lycosa* as it dashes about among the heather. It is not recorded for Ireland, but has occurred

in Dorset and North Wales, and at Balmoral in Scotland. It has been recognized in France, Bavaria, Austria, Hungary, and the Tyrol.

Micaria pulicaria (Sund.). Common in Tynedale and in most places in Britain. It seems rarer in Ireland, but occurs in many Continental localities. Adults may be found throughout the year.

Micariosoma festivum (C. L. Koch). Rare; one or two adult females have occurred on the banks of the Tyne near Priest's Seat in summer. On May 2nd, 1903, I found a large number of nearly adult examples at this place under some water-borne debris. Later in the year only one or two adult females could be obtained. It has occurred once in Ireland, in various British localities from Dorset to Edinburgh, and in most of the countries of Europe.

Family THOMISIDÆ.

Xysticus cristatus (Clk.). This is as common in Tynedale as it is elsewhere in Britain, Ireland, and Europe. Like most of its congeners it spends its time on the ground amongst grass and herbage, where it stalks its prey. Sometimes it is found sunning itself on the bare ground. The males are very swift of foot, the females lethargic. The egg sacs are placed in hollows of the ground, under stones, or snugly ensconced within fallen leaves which have been folded up by the mother. I have met with this spider on the summit of Bowfell (Cumberland), an altitude of nearly 3,000 feet.

Xysticus pini (Hahn). A nearly mature male was found among heather at Staward, in Allendale, in May, 1904. Mr. Cambridge has seen and verified this. It is a common species in the South of England, and is abundant as far north as Nottinghamshire. It then becomes very rare, but has occurred in Scotland, and in Kerry in Ireland. Its Continental distribution is very wide.

- Xysticus sabulosus** (Hahn). An immature female in June on Blanchland Common. This specimen also has been verified by Mr. Cambridge. Has occurred in Ireland, and ranges from Dorset into the Highlands of Scotland. I have taken adults in Cumberland. It must, however, be regarded as rare in the North, and much commoner in the South. Wide Continental distribution.
- Xysticus bifasciatus** (C. L. K.). Adult males and females were obtained in May from fields near Houtley. They were found among grass and moss in the pastures. The species has occurred in Dorset, Edinburgh, and Inverness, as well as in the Channel Islands. Also in France, Germany, Austria, Hungary, and Sweden.
- Xysticus erraticus** (Bl.). Rare. One female occurred among grass near Colwell in May. It has been found in various British localities, such as Dorset, Glamorgan, Surrey, North Wales, Derbyshire, Lancashire, Cumberland, Edinburgh, Kincardine, and Aberdeen. Also in Ireland both North and South, and on the Continent.
- Xysticus ulmi** (Hahn). Males and females among long grass at the roadside near Houtley. The males are adult in May, but have a very short season, and are all over by the middle of June. Adult females may be found throughout the year. Dorset, Glamorgan, Sussex, Oxford, Lincoln, and Howth in Ireland are the only home localities I can find. It ranges from Croatia to France and Norway on the Continent.
- Oxyptila trux** (Bl.). This little spider is not rare among grass, dead leaves, and herbage in Tynedale. Adults may be found throughout the year. It occurs almost all over Britain, Ireland, and Europe.
- Oxyptila atomaria** (Panz.). Rare in Tynedale. Both sexes have, however, been found among heather in Dipton Wood. It seems to be as well distributed as the last species, and in some places (as in Cumberland) is more frequent. This is, however, not the rule. Adults occur in late summer and autumn.

Oxyptila praticola (Koch). I have occasionally found adult females of this species among dead leaves, especially the detritus of hawthorn or holly hedges. They may be found at all seasons. In autumn and winter young males often accompany them, but I have never found the adult male in Tynedale. Rare in Ireland, and apparently not on record for Scotland, this spider occurs in most of the English counties whose spider fauna has been investigated. Widely distributed abroad.

Oxyptila flexa (Camb.). An adult male near Warden in June. Also an adult female taken by Mr. Falconer at Staward, near Allendale, in August of the same year. This distinct spider has occurred in Dorset, Kent, Sussex, Cambridge, Leicestershire, Yorkshire, Durham, Cheshire, and Dublin. It is not recorded for Scotland, and apparently is not recognized on the Continent.

Philodromus aureolus (Clk.). Common on trees and bushes of all kinds. It is adult in May and June, and is widely distributed in the British Isles and on the Continent.

Philodromus cespiticollis (Walck.). This is even commoner than the last spider, to which it is closely related. The Continental authors regard them merely as sub-species, and Kulczynski has described various intermediate forms. These, however, do not occur in Britain, where the two species are distinct enough. Both have a very wide range, *P. aureolus* (Clk.) having been recorded from North America, Kamtschatka, and China.

Tibellus oblongus (Walck.). Occasional among long grass and rushes in marshy places. Adult in early summer. This spider is of very wide distribution. It occurs in great abundance among the starr grass or marram grass that grows on the sandhills of the south and west coast. I have no doubt that in suitable places it would be found on the Northumbrian shores.

Family ATTIDÆ.

Epiblemium scenicum (Clk.). Fairly common on walls round Hexham, this pretty spider has its home and deposits its egg sacs in their crevices. Widely distributed at home and abroad.

Epiblemium cingulatum (Panz.). In most places this seems rather a rare spider, and though recorded from England, Scotland, and Wales, seems unknown in Ireland. In Tynedale it is commoner than its congener, and can generally be found in considerable colonies under the bark of trees and old palings. In Switzerland it reaches a height of 3,000 feet, and is there found under stones. It is of wide European distribution.

Heliophanus flavipes (Clk.). A mature male and several mature females were found among grass in Dipton Wood in June. It is widely distributed in England, where, however, it is commoner in the South. It is reported for Ireland, but not as yet for Scotland. It is noted from various European countries from Norway to Italy. The genus contains many species, but only three reach Britain, or rather, no more have yet been found here.

Neon reticulatus (Bl.). This little spider may frequently be found among fallen pine-needles and moss in the woods. In hilly districts it seems to prefer living under stones. It reaches an altitude of over 3,000 feet in Cumberland and on Snowdon. Widely distributed in Britain and Europe.

Euophrys frontalis (Walck.). Found rarely among grass and herbage on sunny banks. Much commoner in most parts of Britain and Ireland. It ranges north as far as Aberdeen.

Euophrys erraticus (Walck.). Local, but occurring commonly in some places. It was rather common in my kitchen garden at Hexham, where it made its home under the little clods of earth on the beds. Sometimes it may

be found among grass, but in districts where stone walls supply the place of hedges it especially abounds, living underneath the stones of the topmost row. Adult in May and June; lately I have received a mature male taken in December. This is a rare species in the South of England, where Devon and Glamorgan seem the only records. It has only occurred once in Ireland, in Connaught. It is abundant in many places between Staffordshire and Inverness, and has a wide Continental range.

Hasarius falcatus (Bl.). This striking spider is not rare, and may be beaten from gorse and heather through the summer. It occurs in several Irish localities, in most British counties, and ranges abroad from Finland to Sumatra.

Family AGELENIDÆ.

Cryphœca silvicola (C. L. K.). Abundant among dead leaves and pine-needles, beneath bark, and on the foliage of conifers in the woods round Hexham. Adults may be found throughout the year. An abundant spider in Scotland and the northern counties. It occurs freely in Derbyshire and Staffordshire, but south of the Peak district becomes very rare. It is recorded on the strength of one or two examples from Norfolk, Buckinghamshire, and Glamorgan, but has not yet been noticed south of the Thames. It occurs throughout Ireland, where it is not rare in the south. It is reported from Finland to the South of France and Croatia. Curiously enough a considerable number of northern spiders seem to be unable to thrive in the South of England, though getting much further south on the Continent. The present species is a case in point.

Cœlotes atropos (Walck.). Frequent under stones, especially in woods. This large and striking spider is common in the North of England, and occurs also in Scotland, although absent from the Edinburgh list. It is also absent from the Irish list, and I was unable to find

it in the Isle of Man. It is however abundant in the North of England, reaches a height of over 3,000 feet on Scafell Pike and Snowdon, and extends down into the South of England, where in most places it is very rare. It occurs, however, abundantly in North Devon. Abroad it has been recognized in France, Hungary, and Switzerland, and doubtfully in Germany.

Tegenaria Derhamii (Scop.). One of the two common northern house spiders. It is adult in summer, and its horizontal web spun in neglected corners is a familiar object to all. Cosmopolitan.

Tegenaria sylvestris (C. L. K.). One nearly mature female found under a stone by the roadside near Hexham. This spider is not recorded for Ireland. It occurs in a good many British localities from Dorset to Cumberland, and on the Continent in France, Switzerland, Hungary, and the Tyrol.

Cicurina cinerea (Panz.). Rare; adult females and a nearly adult male were found under stones in the Swallowship woods at the end of May. Other adult females were found in early spring, and the young of both sexes in autumn in other localities. In Britain it has been reported from Dorset, Cambridge, and Essex. Abroad it seems to prefer mountainous and hilly districts, and inhabits France, Germany, Switzerland, Austria, and Hungary.

Textrix denticulata (Oliv.). Common in the crevices of stone walls in Tynedale. The male is adult in May and June, and has rather a short season. It is widespread in the British Isles and on the Continent, but seems rather commoner in northern than in southern localities.

Family HAHNIIDÆ.

Antistea elegans (Bl.). Occasional among grass and rushes in marshy places. The Erring swamp at Choller-ton is the best place for it. Widely distributed at home and abroad.

Hahnia montana (Bl.). Not rare in woods among dead leaves and moss. Widely distributed in Britain, and occurring in Ireland and the Isle of Man. It is not recognized on the Continent, or rather is probably known there under another name.

Hahnia helveola (Sim.). Occasional at the roots of conifers, among their fallen needles, or concealed in moss in the woods. It has occurred in France, Germany, and Switzerland, but not as yet in Ireland. In Britain it is reported from Dorset, Glamorgan, North Wales, Yorkshire, Cheshire, the Lake District, and Lanarkshire. It cannot, however, be considered common.

Hahnia nava (Bl.). Occasional under stones and at the roots of herbage, especially among the debris under gorse bushes. It occurs in many British localities ranging from Dorset to Edinburgh. It is unrecorded for Ireland, but has been recognized in Sweden, Germany, Austria, Hungary, France, and Corsica.

Family PISAURIDÆ.

Pisaura mirabilis (C. L. K.). Frequent among heather and other herbage. Both sexes are adult in June. The female at first carries about her egg sac attached to her spinners, and grasped also by her falces. Afterwards in late July or in August she constructs a large dome-shaped nest among the topmost twigs of some tall heather plant, or in a gorse bush. The young hatch in this airy nursery, and do not become mature till the next summer. Very widely distributed both in the British Isles and on the Continent.

Family LYCOSIDÆ.

Pirata piraticus (Clk.). Fairly common in most of the marshes. Adults may be found throughout the summer, the females carrying about with them their nearly spherical egg sacs. Widely distributed in the Palearctic area,

Pirata hygrophilus (Thor.). Not common. Females were found in autumn in a swamp in Dipton Wood. Females and young males in spring in the same locality, and near Greenshaw Plains. A rare spider in Northumberland, though more frequent in Cumberland. It is abundant in Dorset, and occurs also in Bucks, Glamorgan, Cheshire, Durham, and Westmoreland. It is reported from Ireland, and is widely distributed abroad, though not on record for Scotland.

Trochosa ruricola (De Geer). Common on the banks of the Tyne among grass and herbage. Adult in September, it passes the winter alive, and may again be found in spring. It is generally found in colonies. Widespread.

Trochosa terricola (Thor.). About as common as the last, but not generally found in colonies. Habits and distribution as in the last species. A third form, *T. spinipalpis* (Camb.), was found on the banks of the South Tyne by Mr. Hull. He has kindly allowed me to examine the specimen. It has occurred in Dorset and Cumberland, but is only recognized on the Continent in Poland and Austria.

Trochosa picta (Hahn). This beautiful spider occurs very rarely on sandy places near the Tyne and on Blanchland Common. It is more frequent on the sandhills of Whitley Bay. It makes a burrow several inches long in the sand. This it lines with silk, and there is generally a diverticulum to which the spider can retreat if necessary. Adults may be found throughout the year. The spider is generally distributed, being usually most common on the sandhills round the coast.

Trochosa cinerea (Fabr.). This splendid spider is the largest known to inhabit Northumberland. It occurs freely on the banks of the Tyne and of its two constituents, as well as on those of the Devil's Water. It inhabits the beds of water-worn stones that are so con-

spicuous in many places. I have never seen it running about of its own accord. It constructs a cell or nest several inches down among the stones, and this is connected with a flimsy tube running upwards and opening under the shelter of a stone or pebble on the surface. This roof stone is generally of small or medium size. The spider may usually be found under the stone, but sometimes retires to its nest. Here I suppose the egg sacs must be deposited, but I have never seen them, and the adult females never seem to have them attached to their spinners. In September the spiders vanish from the tops of their tubes, probably taking refuge in the recesses of their nests. These, however, are very difficult to dig out or define, owing to the slightness of the texture, and the falling in of the pebbles which form their walls. In the winter the shingle beds are completely submerged under several feet of swirling water. In April and May the spiders once more emerge, and may be found under the surface stones. Both sexes are adult in June, but there is a good deal of overlapping, and individuals of all ages may be found throughout the summer. *T. cinerea* (Fabr.) seems to occur in similar situations wherever it is found. It has been recorded from Aberdeen, Perth, Wicklow, Kerry, Cumberland, and North and South Wales. Abroad its distribution is very wide, as it inhabits Norway, the Canaries, and Turkestan, as well as most of the intermediate countries.

Tarentula pulverulenta (Clk.). A common and handsome spider, which may frequently be observed in its adult state in May and June. It is exceedingly swift of foot. Distribution very wide.

Tarentula andrenivora (Walck.). Not common, but may sometimes be found among heather on the moors. Adults may be found in autumn, and again in spring and early summer. Distribution wide, but not on record for Ireland.

Lycosa amentata (Clk.). Abundant everywhere. This is one of the commonest of the "wolf-spiders," and may be seen on any bright day dashing about in fields, woods, lanes, and in every conceivable situation. Both sexes are adult in May and June. Later the females may be seen carrying their brown, lenticular, white-zoned egg sacs. The newly hatched young climb upon their mother's back, and accompanying her in all her peregrinations, make her look like an animated ball of fluff. Later they leave her to make their own living. They hibernate when about two-thirds grown. Common everywhere.

Lycosa agricola (Thor.). Very common, but restricted to the shingle beds and sands of the riverside. Habits as in the preceding. Adult in May and June. Abundant in many places in Scotland, the North of England, North Wales, and Ireland. Absent from the South of England, though very widely distributed in Europe. It is probably the absence of suitable localities that prevents this species, *T. cinerea* (Fabr.) and others from colonizing the South of England. They both seem to prefer the stony banks of rapid and shallow streams.

Lycosa pullata (Clerck). Habits as in *L. amentata*; just as ubiquitous, and even more common.

Lycosa lugubris (Walck.). Restricted to woods, where it is however very abundant. In other respects it resembles its congeners.

Lycosa palustris (Linn.). Common, and generally distributed.

Lycosa herbigrada (Bl.). Several females in June on Blanchland Common. Mr. Cambridge verified my determination, but the specimens were of the variety approaching closely to *L. palustris* (Linn.). The present species seems to be restricted to sandy heaths, and has occurred in Dorset, Sussex, several Scotch localities up to Ross, and various places in Ireland. It is widely distributed abroad, but seems to be chiefly northern.

Lycosa monticola (C. L. K.). A solitary female near Houtley by Mr. Falconer. This species is abundant in Cumberland, and ranges from Dorset to Aberdeen, as well as occurring in Ireland. It is generally dispersed abroad, and like some other spiders seems to prefer either elevated land or the sea shore.

Lycosa nigriceps (Thor.). Abundant in the heather districts. Common and widely distributed on the Continent, as well as in the British Isles.

Family DICTYNIDÆ.

Dictyna arundinacea (Linn.). Fairly common in the heath districts. In May and June the adults of both sexes may be found in their little nests spun among the topmost twigs of heather. Afterwards the widowed females may be observed guarding their egg sacs in similar situations. Of wide distribution in Britain, Ireland, and Europe.

Dictyna latens (Fabr.). Commoner than the last species, but occurring chiefly on gorse bushes growing by the river, and in sheltered situations. This is the most northerly British record of this spider, which also occurs commonly in Cumberland, Westmoreland, Lancashire, and Yorkshire, as well as in the South of England. It is widespread in Ireland, and in Europe ranges north to Sweden.

Amaurobius fenestralis (Ström). Abundant under stones, beneath bark, and among dead leaves. Adult throughout the year. Widely distributed in Northern Britain, Ireland, and Europe as far south as Italy, it nevertheless becomes very rare in the South of England.

Amaurobius similis (Bl.). This species shares with *Tegenaria Derhamii* (Scop.), the title of "house spider." It is very common in outhouses and such buildings. In September it invades the warm rooms of dwelling houses seeking for places in which to hibernate. It is common

and widely distributed in the British Isles, but abroad is only reported from Spain, France, Western Germany, and Switzerland. Its range is thus chiefly western.

Amaurobius ferox (Walck.). Rather rare, but occasionally found on old walls, especially among coarse herbage at their bases. In such a situation a colony was found near Acomb. In Europe this species is common and widely distributed. In Scotland and the North of England it is rare, becoming very common in the South. It occurs in Ireland, and is abundant locally in the Isle of Man.

Family MIMETIDÆ.

Ero furcata (Vill.). This species is thinly distributed over Britain, Ireland, and Europe. It is nowhere common. Perhaps this is due to the fact that the beautiful pear-shaped, stalked egg sacs (each resembling a balloon held captive by a short rope) only contain some half-dozen eggs a-piece. We do not however know how many of such receptacles are woven by each spider. It occurs sparingly among grass, heather, and other herbage. Adults may be found throughout the year.

Family THERIDIIDÆ.

Episinus truncatus (Latreille). Males and females adult in June. Among heather near Dipton Wood. Much commoner in the South of England than elsewhere in Britain. It has, however, been recorded for both Scotland and Ireland. In the North of England it is a rarity. The Hexham specimens are possibly identical with those recorded as *E. lugubris* (Sim.) from the Lake District.

Theridion tepidariorum (C. L. Koch). Several mature females, with their egg sacs, were found in August in one of the greenhouses belonging to the Tynedale Hydro at Hexham. The distribution of this species is world wide, and it occurs even in such remote places as the Chatham Isles. It is supposed to have been artificially introduced into Britain and Europe, and to have originated in

America (McCook). Be that as it may, in Britain it is seldom found far away from greenhouses.

Theridion lineatum (Bl.). Abundant in Tynedale, and widely distributed in Europe and North America. Adult in summer, and found amongst leaves and herbage, where its beautiful green colour probably helps to conceal it.

Theridion denticulatum (Walck.). Not very common, but may be beaten from the branches of conifers, or observed in the crevices of lichen-covered bark. Adult in May and June. Of wide distribution.

Theridion varians (Hahn). Very common on trees and shrubs, and in the angles of porches, etc. Abundant everywhere.

Theridion sisypium (Clerck). As beautiful and as widely distributed as most of its congeners. It especially favours gorse and holly bushes. Its beautiful tent-like retreat must be familiar to all possessors of a garden.

Theridion pallens (Bl.). Common on shrubs and trees of all kinds. Adult in May and June.

Theridion vittatum (Koch). Not very abundant, but may be beaten occasionally from oak trees or gorse bushes. Rare in Ireland, and unrecorded for Scotland. It is common in the South of England, becoming rarer in the North, where, however, it has occurred in Lancashire and Cumberland. Widely distributed abroad, and adult in May and June.

Theridion bimaculatum (Linn.). Occasional among grass and herbage on the ground. Unlike the other species of the genus, this spider seems to lead a wandering life, the females carrying their egg sacs with them. The males are adult in May and June, the females throughout the summer. It has occurred in various Irish localities, but is not on record for Scotland. In England it is reported from Dorset, Bucks, Surrey, Sussex, Glamorgan, Lancashire, Yorkshire, and North Wales. European distribution wide.

Steatoda bipunctata (Linn.). Common on window sashes of neglected rooms and stables; also in the angles of walls and palings. Adult in May and June. This spider is common and widely distributed in England and Europe, but is not on record for Ireland.

Robertus lividus (Bl.). Common under stones, and amongst moss in woods. Adult throughout the year, and of Holarctic distribution.

Robertus arundinetus (Camb.). Females with their egg sacs on Blanchland Common in July. Almost mature males in October. Males are probably mature in May. The spiders may be found under stones and turves. A rare spider in Britain; it has, however, occurred in Dorset, Kent, Yorkshire, and near Paisley. It is also reported from Sweden, Holland, Bavaria, and Switzerland.

Robertus neglectus (Camb.). Rare; several males have however occurred amongst moss in woods and swampy places. The males seem to have no particular season, as they were obtained in May, August, September, and November respectively. *R. neglectus* (Camb.) has occurred near Paisley, in Fife, and in Midlothian, also in Dorset and Essex. It would therefore seem to be well distributed in Britain, but it has not yet been recorded for Ireland. Abroad it occurs in France, Switzerland, Hungary, and Norway.

Enoplognatha thoracica (Hahn). Several examples of either sex amongst grass and herbage in fields near Hexham. It is more common in hilly districts, where there are many stones under which it can live. In such situations it is frequent in Cumberland and Westmoreland. It is widespread in Ireland, and occurs in Dorset, Sussex, Glamorgan, Nottinghamshire, and the Highlands of Scotland. It is found in several European countries from France to Hungary.

Pholcomma gibbum (Westr.). Occurs sparingly among grass, herbage, and fallen leaves. Adults may be found

almost throughout the year. Widely distributed over Europe from Ireland to Russia, and from Sweden to Algeria.

Onesinda minutissima (Camb.). This minute spider is not rare among moss in woods. It had previously been found at Balmoral in Scotland, in Donegal and Galway in Ireland, in Dorset, in Yorkshire, in France, and in Switzerland. All these records were, however, of the female sex, and most of them on the strength of one or two examples only. At Hexham the species is not rare, both sexes become adult in October, and may be found till March. Mr. Cambridge described and figured the male in Proc. Dors. Field Club, vol. xxvi., 1905. Quite lately I have found both sexes freely at Mouldsworth near Chester. Here again they were obtained from damp moss growing in a wood.

Family ARGIOPIDÆ.

SUB-FAMILY I. LINYPHIINÆ.

Ceratinella brevis (Wid.). Widely distributed in Tyne-dale, Britain, and Europe, this spider is found amongst grass, moss, and dead leaves. In Cumberland and Switzerland it reaches a considerable altitude on the mountains. Adult in autumn and spring.

Ceratinella brevipes (Westr.). Habits much as in the above, except that it does not appear to live among the mountains. In Britain it occurs from Dorset to Aberdeen, but is not on record for Ireland. It has been found in Sweden, France, Germany, Switzerland, and the Tyrol.

Lophocarenum parallelum (Bl.). Occasional amongst grass and herbage. Adult, like most of these minute black spiders, in autumn. Many of the males die during the winter, but a few, and most of the females, survive till spring. Not on record for Ireland, this spider is found from Dorset to Edinburgh. It is widely distributed on the Continent.

Lophocarenum Mengii (Sim.). Local; a male occurred among heather near Bellingham in June. Both sexes were found in the mature condition among the debris under gorse bushes near Acomb in May. This is a rare spider. It has occurred in Armagh and Monaghan, in Cumberland, Yorkshire, and Staffordshire. On the Continent, France is the only country in which it has been noticed.

Cnephalocotes obscurus (Bl.). Rather rare amongst moss and rushes in marshy places. Adult from autumn to spring. Occurs from Dorset to Paisley, but is nowhere abundant. Widely distributed on the Continent, but not recorded for Ireland.

Tiso vagans (Bl.). Another spider of wide, though sparse distribution. Adults may be found at any season and in every conceivable situation. It ascends about 2,000 feet in Derbyshire. It seems rare in Eastern Europe, but occurs throughout Western Europe, including Britain and Ireland.

Aræoncus humilis (Bl.). Very common amongst grass in my garden at Hexham, and found also on the river banks and in other situations. Adults may be obtained throughout the year, but are especially abundant in May. Widely distributed in these Islands and on the Continent.

Aræoncus crassiceps (Westr.). A single male running on the parapet of the small bridge between Humshaugh and Haughton on November 16th, 1904. Prolonged search in the neighbourhood failed to turn up more specimens. This species has occurred in Arran, and commonly on the shores of Loch Leven in Scotland. Also, though rarely, in Dorset. Abroad it is reported from France and Germany.

Troxochrus scabriculus (Westr.). Common in sandy places on the banks of the Tyne. Also on the sandhills at Whitley. It is adult in autumn and spring. It occurs in suitable situations (chiefly on the coast) in a good

many localities from Dorset to Scotland. It is not recorded for Ireland, but occurs in France and other European countries.

Troxochrus cirrifrons (Camb.). This spider occurs in company with the last, and its female is not yet separated from that of *T. scabriculus* (Westr.). It has also occurred in the South of England. There is a difference of opinion as to whether it has a right to be considered as a distinct species, or as a remarkable example of dimorphism in the male sex. It, too, has occurred in France.

Troxochrus hiemalis (Bl.). Abundant amongst moss in woods, where it is adult from autumn to spring. Widespread in Ireland, and occurring from Dorset to Edinburgh in Britain. Abroad it is recorded from Sweden, Holland, Germany, Hungary, and France.

Troxochrus ignobilis (Camb.). Adults of both sexes were taken freely among moss in a swamp near Dipton Wood. This was in April and May, 1905. Its only previous records were Dorset (very rare), Glamorgan (one example), France, and Bavaria.

Baryphyma pratensis (Bl.). Rare; it may, however, be found amongst grass on the banks of the Tyne, and in the Erring swamp at Chollerton. Both sexes hibernate in the immature state. They become adult at the beginning of April, the males (as usual) rather before the females. The males are over before the end of May, the females lingering till July. Dorset, Sussex, Essex, Cambridge, Lincoln, Notts, Norfolk, and North Wales. Abroad in France and Denmark.

Caledonia Evansii (Camb.) Blanchland Common amongst short heather. Both sexes are adult in October, some survive the winter, and the females may linger as late as the June of the following year. This spider is unknown on the Continent and in Ireland. The only other localities for it are the Pentland Hills in Scotland, the mountains of Cumberland (up to 2,000 feet), and the high moors near Huddersfield in Yorkshire.

Savignia frontata (Bl.). Very abundant throughout the British Isles. In October the adults swarm on walls, palings, etc., previous to making aerial trips to new hunting grounds. They hibernate under fallen leaves, in woods, and hedge bottoms. This spider has only been recognised abroad in Scandinavia and Germany, which, considering its unmistakeable form, is very remarkable.

Diplocephalus cristatus (Bl.). Fairly common in Tyndale. It is generally found either among dead leaves in gardens, or near the river bank. It occurs in many places in England, Scotland, and Wales. Not recorded for Ireland, it has a wide European distribution.

Diplocephalus permixtus (Camb.). Fairly common among moss in the swamps, but never actually swarming as in some parts of Britain. It occurs in Ireland, France, and Germany, and is widespread in Britain.

Diplocephalus adjacens (Camb.). This interesting spider was first found in September, 1902, among grass and herbage on the banks of the Tyne. It was previously unknown to science, and has never yet occurred elsewhere than in similar situations near Hexham. The species is adult in September, and not at all rare close to the river. It hibernates, and may be found in considerably diminished numbers in the spring.

Diplocephalus Jacksonii (Camb.). In September, 1903, on going to a place on the river bank to collect specimens of the last species, I found occurring with them several males, which in size and facies closely resembled them, but which differed greatly in the structure of the caput. Several females also among my captures on that day differed slightly from the types of *D. adjacens* (Camb.). These probably correspond with the males under discussion, at all events they are at present believed to do so. Mr. Cambridge described and figured both species in Proc. Dorset Field Club, vol. xxiv., 1903. The present

species is not nearly so numerous as *D. adjacens* (Camb.), only four or five per cent. of the males being assignable to it. Both are unique for Britain and Europe.

Diplocephalus latifrons (Camb.). Abundant amongst dead leaves, pine-needles, etc., in woods. Rarer in fields and gardens. Adult from autumn to spring. It occurs in several Continental countries and in Ireland, while in Britain it is much commoner in the north than the south.

Diplocephalus fuscipes (Bl.). Another abundant little spider, occurring in almost every variety of situation. It is widespread, though not common in Ireland. In the South of England too it is not abundant. In Scotland and the North of England it is common. Abroad it is only on record for France and Switzerland.

Diplocephalus picinus (Bl.). Another woodland spider. It prefers dry hanging woods, composed chiefly of deciduous trees and carpeted with hyacinths and the wild garlic. In such situations it is fairly common round Hexham in May and June, when it is adult. It is not yet on record for Ireland, but in Britain has occurred in Dorset, Glamorgan, London, Norfolk, North Wales, and Lancashire, as well as near Edinburgh and near Paisley. Abroad it is recorded for Sweden, Germany, Hungary, Austria, France, and Switzerland.

Tapinocyba præcox (Camb.). Occasional among moss or dead leaves in Tynedale, also under stones on Blanchland Common. It is adult in autumn, and has occurred in Dorset, Lancashire, and Yorkshire; also in France and Germany on the Continent.

Tapinocyba subitanea (Camb.). Common in autumn and winter amongst hay and straw in stables, outhouses, etc. Has occurred in Dorset, London, Lancashire, Yorkshire, Cumberland, and near Edinburgh. Also in France and Switzerland.

Tapinocyba pallens (Camb.). Very abundant amongst moss and dead leaves in woods. Adults may be found from autumn to spring. It has been observed on the Pentland Hills, in Lanarkshire, Yorkshire, Staffordshire, and lately in Cheshire. Not on record for Ireland, but recognised in France, Switzerland, Germany, and Hungary.

Tapinocyba insecta (L. Koch.). A male was found in October, 1903, in a marshy spot near Newbrough. This was the first British record. Subsequently both sexes were found there, and females in another locality near Warden. A male has since been found near Leeds. These are the only British records, but abroad it has occurred in France, Germany, Hungary, Switzerland, and the Tyrol.

Lophomma punctatum (Bl.). Common in marshes and damp places in Tynedale, where it occurs amongst moss and grass. Adult throughout the year. It is reported from many places in Britain and on the Continent.

Lophomma herbigradum (Bl.). Fairly common at any time amongst grass, moss, herbage, and the like. It is found both in marshes and in dry places, and ascends at least 2,000 feet in Cumberland and on Snowdon. It occurs in Sweden, France, Italy, Hungary, and Bavaria. Abundant in most parts of Britain, ranging north to Edinburgh, where, however, it is rare. I know of no Irish record.

Lophomma subæquale (Westr.). Not rare amongst herbage on grassy banks near Hexham. Adult males may be found from April to August, females throughout the year. It also occurs in some numbers in Staffordshire and Yorkshire. The only other British records are Basingstoke and Banff, but it has occurred once near Dublin. Abroad it was discovered in Sweden, but the other Continental records are unreliable, as some, or all, of them are referable to the allied *L. laudatum* (Camb.).

Dicymbium nigrum (Bl.). Common, especially among grass in pastures. Adult throughout the year, but most commonly in autumn. Widely distributed at home and abroad.

Dicymbium tibiale (Bl.). Can generally be found amongst moss and grass in damp places in the woods. Very seldom found elsewhere. It occurs in Donegal in Ireland, and in Devonshire, Warwickshire, Staffordshire, Glamorgan, North Wales, Cheshire, Yorkshire, Cumberland, and Berwickshire. It is widespread on the Continent, but in these islands appears chiefly of northern and western range.

Pocadicnemis pumila (Bl.). This differs from the eighteen preceding species, and resembles the next two, in its season of maturity. The males become adult in May and June, and are over before August; the females may be found in autumn, but both sexes pass the winter in an immature state. Very abundant amongst grass and herbage. It occurs throughout Britain (Dorset to Edinburgh), but is commoner in the north. It is unrecorded for Ireland, but occurs on the Continent, where it is widely distributed.

Peponocranium ludicrum (Camb.). Frequent in the heather districts. Season as in the last species. Widely distributed in Britain (Dorset to Edinburgh), occurring wherever gorse and heather abound. Abundant in the Isle of Man, but not recorded for Ireland. On the Continent has only been observed in France, and there only in the north.

Metopobactrus prominulus (Camb.). Several specimens of each sex on grassy banks in June. A rare spider, the only other British records being Dorset, Sussex (Hastings), Glamorgan, Cheshire, and Yorkshire. It is found in nearly all the European countries; its three congeners on the other hand being confined to Spain, Corsica and France, and Hungary respectively.

Minyriolus pusillus (Wid.). This very minute spider—one of the smallest known—is abundant amongst moss in most of the damp woods of Tynedale. It is adult chiefly in autumn, but examples may be taken throughout the year. In Britain it ranges from Dorset to Aberdeen, and it is widely distributed on the Continent.

Panamomops bicuspis (Camb.). Occasionally found amongst moss in pastures. Adults may be taken throughout the year, but I have found them chiefly in May. In Britain it is reported from Dorset, Cambridge, Somerset, Sussex, and Surrey. Abroad from France, Germany, and Switzerland.

Styloctetor penicillatus (Westr.). Examples of both sexes were found by Mr. Falconer, and afterwards by myself, at Houtley and other places near Hexham. The males are adult in June and July, and the females may be found both then and throughout the summer. The spiders live in the crevices of bark, especially when coated with lichens. Ash seemed to be the favourite tree, but oaks, elms, and larches were tenanted. The spider is, however, by no means common. It has occurred in Dorset, Hants, Cheshire, and Essex, as well as in Sweden, Hungary, Austria, Germany, and France.

Entelecara erythropus (Westr.). Abundant in May and June, when both sexes are adult. It is chiefly found on the foliage of trees and shrubs, or on tall herbage. Common in most places in Britain from Dorset to Inverness. It occurs in Ireland, and ranges from Iceland to Hungary.

Entelecara trifrons (Camb.). An inhabitant of marshes, where it can be found adult in April and May. It has been taken in Dorset, Norfolk, Cumberland, and Midlothian, as well as in Ireland. Abroad it has occurred in France and Belgium, and turns up again in Kamtschatka.

Entelecara Thorellii (Westr.). Rare, but occasionally found amongst short moss growing in pastures. It was found in several places separated by some miles from each other. All were near Hexham. Only four British specimens were previously on record. One from Southport in Lancashire, a pair from county Dublin, and one from Edinburgh. Nearly forty years separated the first and the second British records. It occurs also in France, Germany, and Sweden. Adult in May.

Thyreosthenius biovatus (Camb.). This interesting spider inhabits the large dome-like nests of the wood ant *Formica rufa*. The nests are frequently to be seen among the trunks of the conifers in the woods of Northumberland. They are chiefly composed of pine-needles. The spiders are found in the interior of the nests living among the ants. They are collected by taking up handfuls of the nest and throwing them on to outspread newspapers. The material then must be spread out with a stick and carefully inspected. Ants of course are seen in thousands running in every direction, and occasionally one of these little spiders is detected amongst them. Females can be found throughout the year, but I obtained very few adult males. Possibly they leave the nest when mature, as immature examples are as common there as the young females of the same generation. I never, however, succeeded in finding them outside the nests of their hosts. The adult males found occurred in May, June, and August, so that some of them are in the nests throughout the summer. *T. biovatus* (Camb.) appears to be always commensal with *Formica rufa*. It has occurred in Surrey and Sussex, as well as in France, Germany, and Holland. Mr. Bagnall has recently sent it to me from the neighbourhood of Winlaton.

Evansia merens (Camb.). This is another myrmecophile. It inhabits the nests of *Formica fusca* in Tynedale and *Lasius niger* in Glamorgan. It was discovered in Perth-

shire, but its connection with the ants was not then noticed. Lately it has again been found living with *Formica fusca* near Carlisle, and with the same ant at Barmouth in Wales. Both these ants make very simple nests under stones. When the sheltering stone is lifted a number of little galleries are exposed. The spiders are found either in the galleries or on the underside of the sheltering stone. They are amongst the ants, and not merely hiding under the edges of the stone as so many other spiders do. They are not enclosed in cocoons, but the ants do not molest them. Adults may occasionally be found throughout the year, but most of the males are mature in September and October. The species ascends about 1,000 feet in Glamorganshire.

Wideria antica (Wid.). Occurs sparingly in the Hexham district, and is chiefly found amongst heather and grass on moors and pastures. Also under stones, and occasionally amongst dead leaves in woods. Adult in autumn, some individuals (chiefly females) surviving till spring. It occurs in Ireland, and is widely distributed both in Britain and on the Continent.

Wideria cucullata (C. L. K.). Not rare among fallen leaves and pine-needles in the woods. It can be found throughout the year, but is commonest from autumn to spring. In Tynedale it is much commoner than the last species, and is distinctly a woodland form. It has been taken in Dorset, near London, and in Sussex, Yorkshire, and Cumberland. Abroad it is reported from Sweden, France, Germany, Hungary, and Poland.

Wideria fugax (Camb.). Two males were found in 1902. Both occurred amongst moss, one near Acomb in May, the other at Houtley in June. I never came across it again. Abroad it occurs in France, Switzerland, Germany, and Hungary; while in Britain it only appears to be reported from Dorset, Notts, Cheshire, and Yorkshire.

Prosopotheca monoceros (Wid.). Both sexes were found, though rarely, amongst moss on Blanchland Common in October. Unrecorded from Ireland, this species ranges from Dorset to Edinburgh, seeming to prefer either elevated moorlands or the sea coast. It occurs in France, Germany, Sweden, the Tyrol, and Switzerland. In the last country it reaches an altitude of 5,000 feet, and on the mountains of Cumberland of 2,500 feet.

Cornicularia cuspidata (Bl.). Fairly common amongst moss and grass in woods, fields, and marshes. It is adult principally from autumn to spring, and has occurred in most of the districts which have been investigated from Dorset to Edinburgh. Also in most of the European countries and in Kamtschatka.

Cornicularia unicornis (Camb.). Occasional amongst grass in damp places near the Tyne. Also, though rarely, in woods. Adult chiefly in autumn. It has occurred once in Ireland near Dublin. Also in Dorset, Hants, Surrey, Norfolk, Lancashire, Yorkshire, and Cumberland. Abroad it is found in France, Sweden, Germany, and Austria.

Cornicularia vigilax (Bl.). Several examples of each sex on Blanchland Common and near Fourstones. Adult in autumn, and occurring after hibernation as late as April and May. Dorset, Glamorgan, North Wales, Lancashire, and Galway. Also in several European countries and in North America.

Walckenaera acuminata (Bl.). Not rare; amongst moss, grass, dead leaves, etc., in woods, fields, marshes, and on moors. The males are adult in autumn, but very few survive the winter. The females are more hardy, and may be found freely in spring. Widely distributed in Britain, Ireland, and on the Continent. In this country at all events it is much more frequent in the north.

Walckenaera nudipalpis (Westr.). Occasional amongst moss in swampy places. Adult from autumn to spring. It seems to be widely distributed at home, as it has occurred in three Irish and ten British counties. It goes as far north as Edinburgh at all events. It ascends 2,000 feet on the mountains of Cumberland. It has been found in a good many Continental countries.

Walckenaera obtusa (Bl.). A single adult male of this fine and distinct species was found amongst moss in the High Wood near Hexham in October, 1903. In December of last year Mr. R. Bagnall sent me an example of each sex from Winlaton-on-Tyne. It had previously only occurred in North Wales, Dorset, and the Cheviots, and always seems very rare. It is reported from Bavaria, Hungary, and Switzerland.

Walckenaera nodosa (Camb.). A single male amongst rushes in the Erring swamp near Chollerton. It was captured in October. Discovered many years ago at Wooler by the late Mr. James Hardy. Both sexes have occurred in Dorsetshire. It is reported also from France.

Nerienne rubens (Bl.). Common amongst grass and herbage throughout Tynedale, Britain, and Europe. The males are adult from autumn to spring.

Nerienne rubella (Bl.). Rather rare, but may be found amongst herbage on the banks of the Devil's Water, and in the Swallowship woods. I have obtained adult males in August, September, and December; females throughout the year. This spider seems widespread, but is never as common as the last.

Enidia bituberculata (Wid.). Common in April, May, and June amongst grass and rushes in swampy places. Widespread.

Enidia cornuta (Bl.). Rare, but may occasionally be beaten from the foliage of trees, particularly yews. This spider has a wide European distribution, ranging into

Sweden. In these Isles, however, it is a southerner. Not recorded for Scotland or Ulster, it is rather rare in the northern counties. In the Thames valley and in Dorset it is a very abundant form. Adult in May and June.

Dismodicus bifrons (Bl.). Very abundant amongst grass and in gorse bushes on the banks of the Tyne. The males are adult in May and June; the females survive them, and may be taken at any time. Widespread in Britain, and occurring also in Ireland, France, Germany, Hungary, and Sweden.

Gongylidium rufipes (Sund.). Occurs amongst herbage and dead leaves in the woods. Males adult in May and June. Widely distributed at home and abroad. The restriction of the genus to this one species seems to me to serve no useful purpose, and it entails much research in the realms of nomenclature.

Gongylidium agreste (Bl.). Not rare under stones and amongst herbage on the banks of the Tyne and elsewhere. Adults may be found throughout the year. It has been found in many localities between Dorset and Edinburgh, though not yet in Ireland. Abroad it is reported from France, Belgium, Switzerland, Italy, Austria, Hungary, and Sweden.

Gongylidium fuscum (Bl.). Common, and widely distributed in Tynedale, Britain, and Europe.

Gongylidium retusum (Westr.). Nearly as common as the last, and like it found at any season and in any situation.

Gongylidium apicatum (Bl.). Frequent under stones on the banks of the Tyne. This spider appears to be nowhere common, but occurs in England, Scotland, and most of the countries of Europe.

Gongylidium gibbosum (Bl.). An inhabitant of marshy places, where it occurs amongst grass and moss. It almost invariably is found in company with the next species, and the distinctions between the two females are

very obscure. Adult in May and June. It occurs in several English and Scotch localities, and abroad in France and Bavaria.

Gongylidium tuberosum (Bl.). Accompanies the last species, to which it is closely related in structure and habits. It has been found in various English localities, and in France, Bavaria, Algeria, and Egypt.

Gongylidium dentatum (Wid.). Another inhabitant of marshes. Adults may be found throughout the year, the British Islands, and Europe.

Gongylidium distinctum (Sim.). A common spider on the banks of the Tyne, among grass and rushes and under stones. Both sexes are adult from autumn to spring, and may be found, though more rarely, throughout the summer. Previous to their capture, one example of the male found near Carlisle was unique as British. The females found at Hexham were new to science. Lately Mr. Varty-Smith, of Penrith, has obtained both sexes from Marton Mere, near Blackpool, in Lancashire. Abroad the male has been found in France; the female, however, has not yet been recorded outside Britain.

Gongylidiellum vivum (Camb.). Obtained occasionally amongst grass and moss in swampy places near Hexham. Adults may be found throughout the year. This spider has occurred in Dorset, Essex, Norfolk, Glamorgan, Cheshire, Lancashire, and Yorkshire. Also in France and Germany on the Continent.

Typhochrestus dorsuosus (Camb.). Females were found on a sandy place on Blanchland Common in June, 1903. The males are adult from autumn to spring, but have not yet been found in Northumberland. The species usually affects the coasts, and has been found in such situations near Edinburgh, in County Meath, in Glamorganshire and Anglesey, and at Southport in Lancashire. Inland it has occurred on the moors near Huddersfield, and abroad in Holland and the South of France.

Erigone dentipalpis (Wid.). Common in Tynedale and elsewhere both at home and abroad.

Erigone promiscua (Camb.). Very closely allied to the last, but not so common. Widely distributed in England, Scotland, and Ireland, and occurring in France on the Continent.

Erigone atra (Bl.). Very common and widely distributed. This species and its two predecessors may be found in the adult state throughout the year and in all kinds of places. The present one ascends nearly 3,000 feet in Cumberland, but I have never found either of the others to do so.

Erigone longipalpis (Sund.). Several examples of each sex at Whitley Bay in October, 1902. This is a coast species, occurring in a good many places in Britain and Ireland. At home it has been traced from Dorset to Aberdeen, and abroad from Venice to Spitzbergen.

Erigone arctica (White). Several males and females at Whitley Bay in company with the last species. All were found amongst grass on the golf links. At that time the species was not recorded as British, but Mr. Cambridge had in his possession examples from Dorset, Ireland, and Scotland. Lately I have found both sexes in the Isle of Man. The female is figured in Proc. Dors. Field Club, vol. xxvi., 1905. *E. arctica* (White) has occurred in Northern Siberia and Spitzbergen.

Maso Sundevallii (Westr.). Common amongst grass and dead leaves in fields and woods. It is widely distributed in Britain and Ireland, and is common in many localities between Dorset and Edinburgh. The males are adult from the end of May to August. Females may be found throughout the year. Of wide Continental distribution.

Hilaira excisa (Camb.). Frequent amongst rushes, grass, and moss in swampy places. The males are adult from June to September, the females throughout the year. On

the Continent this is a very rare spider, and is only recorded from France, where it has occurred in two localities. It has not yet been obtained in Ireland. In Britain it is reported from Dorset, Glamorgan, Yorkshire, Durham, Berwick, and the neighbourhood of Paisley. It is mainly a northern form.

Hilaira uncata (Camb.). Several males and females amongst moss in a swampy place near Dipton Wood in September. Also females in the same spot in the following March. Another northern spider, this is reported from only one Continental locality—Central France. It has occurred in Armagh in Ireland, and in Aberdeen, Edinburgh, Cumberland, Lancashire, Yorkshire, Cheshire, Norfolk, Essex, and Dorset in Britain. In the last named place it is very rare, but is, or was, abundant near Southport in Lancashire.

Hilaira reproba (Camb.). An adult male and several adult females, with numerous immature examples of either sex, occurred in October, 1902, under stones on the shore at Whitley Bay. They inhabit the zone immediately above high water mark. Mr. Hull, who first discovered them in this locality, kindly directed me to it. The species has occurred, always close to the tide mark, at Dublin, Weymouth, Llandudno, North Lancashire, Edinburgh, Linlithgow, Arran, and Aberdeen. Abroad it has only occurred on the Chausey Isles between Jersey and the French coast.

Tmeticus Hardii (Bl.). Males and females frequent on Blanchland Common beneath stones and turves. Adult in September and October, and found again in much diminished numbers in February. Has occurred at North Berwick, and Aberlady near Edinburgh, in Berwickshire, at Ravenglass in Cumberland, Southport in Lancashire, Wallasey in Cheshire, Huddersfield in Yorkshire, on Snowdon at about 2,000 feet, and at Wicken in Cambridgeshire. Unknown in the South of England or

in Ireland. Abroad it is found in Norway (up to 4,000 feet), Finland, Prussia, Bavaria, and once in France. Its range is thus chiefly northern, and it appears to prefer either elevated moors or the sea coast.

Tmeticus abnormis (Bl.). Frequent amongst grass and leaves and under stones in the woods. The males are adult in June and July, the females throughout the year. In Britain it has occurred in many localities from Dorset to Inverness, but is commonest in the North. It is widely distributed in Ireland, and abroad is reported from Belgium and Switzerland, as well as from France, Germany, and Spain. It extends to an altitude of nearly 3,000 feet in Cumberland and on Snowdon, in such situations being generally found under stones.

Tmeticus rufus (Wid.). Common in woods, where it accompanies the last species. Adults occur throughout the year. Very rare in Ireland, but in Britain widely distributed (Dorset to Inverness), and in many places common. It occurs in several Continental countries, but on the whole, like most of its congeners, is a northerner.

Tmeticus Huthwaitii (Camb.). Not rare in swampy places, where it is adult from autumn to spring. Females may be found throughout the year. It occurs from Dorset to Inverness, and in the North of England is reckoned a fairly common spider. It is also widely distributed in Ireland, and is reported from Sweden, Germany, Hungary, and the Tyrol.

Tmeticus scopiger (Grübe). Infrequent amongst grass and rushes in swampy places near Hexham. Both sexes are adult in September; few females, and practically no males, managing to survive the winter. This also is a northern spider, and is reported from Glasgow, Durham, Isle of Man, Cumberland, Westmoreland, Lancashire, and Yorkshire. In the South, Glamorgan seems to be the only county in which it has been noted.

Tmeticus firmus (Camb.). Females of this species were found by Mr. Falconer at Huddersfield, and by myself at Hexham early in 1903. In the autumn of the same and the succeeding year I succeeded in finding the adult males. These are mature in October, appear to have a very short season, and are much rarer than the females. Both sexes are found among moss in woods, especially where there is a thick undergrowth of heather, as in Dipton and the Swallowship woods near Hexham. *T. firmus* (Camb.) is described by Rev. O. P. Cambridge in Proc. Dors. Field Club, vol. xxvi., 1905. Since this paper has been in the press both sexes have occurred in Delamere Forest in Cheshire.

Tmeticus prudens (Camb.). Single females were taken on Blanchland Common in July and February respectively. This spider prefers either a maritime or a subalpine district. In Lancashire, Dorset, and the South of France (the only Continental record), it inhabits the former kind of locality. It has also been found on the Mourne Mountains and McGillicuddy's Reeks in Ireland, as well as on the Grampians, Pentlands, Cheviots, Cumbrian, Pennine, Cambrian, and Glamorganshire mountains in Britain; also on the summit of Snaefell, Isle of Man. On several of these it attains an altitude of over 3,000 feet. Both sexes are adult in October, whilst odd females may be obtained throughout the year.

Tmeticus arcanus (Camb.). An example of what is supposed to be the female of this species occurred near Haltwhistle in October. It is figured as such by Kulczynski (Aran. Hung.). Males sometimes accompanied by this female have occurred on the Cheviots, Cumbrian mountains, Pennines, and the mountains of Glamorgan. They reach an altitude of 3,000 feet, but are sometimes found at lower levels, as in the present case and at Penrith. Abroad it is only recorded for France (where it is rare) and Hungary.

Tmeticus silvaticus (Bl.). Frequent amongst moss, grass, and fallen leaves in woods. Adult from autumn to spring. It occurs freely in most British localities from Dorset to Edinburgh, and has occurred (once) in the West of Ireland. Of wide Continental distribution.

Tmeticus expertus (Camb.). An inhabitant of marshes, where adults may be found throughout the year. Its chief season, however, is in autumn. It ranges from Dorset to Fife in Britain, and has occurred in the North of Ireland. Abroad it is reported from Norway, France, Switzerland, Germany, and Hungary.

Tmeticus bicolor (Bl.). Abundant everywhere in autumn, when it becomes mature. Females may, however, be found at any time. Widely distributed in Britain and Ireland, but in both islands commonest in the north. It also occurs in several Continental countries.

Tmeticus concinnus (Thor.). Probably a variety of the last, which it resembles in structure and habits. Both species reach an altitude of over 3,000 feet on Scafell Pike and on Snowdon, but at such an elevation the present one is by far the more common.

Porrhomma pygmæum (Bl.). Abundant in Tynedale in marshes, woods, fields, and other situations. Widely distributed in Britain, Ireland, and on the Continent.

Porrhomma oblongum (Camb.). Mr. Cambridge has so named a small pale *Porrhomma* which occurs in woods amongst moss and fallen leaves. The same spider occurs in Yorkshire and Staffordshire in similar situations, and attains an altitude of 2,500 feet in Cumberland and 2,000 feet in the Isle of Man. Apparently, however, it is not identical with *P. oblongum* (Camb.-F. O. P. Camb.) described and figured in *Ann. and Mag. Nat. Hist.*, vol. xiii., 1894. I possess a gynandrous specimen taken at Hexham. It has one male palpus, one female palpus, and a distorted epigyne.

Porrhomma microphthalmum (Camb.). An adult male in July, and several females in June and July under stones on the river bank. It is closely allied to the last two, and its relations to them are not yet cleared up. It is reported from the North of Ireland, the Pentland Hills, and from several British localities both north and south. Also in France and Hungary. It has been found abundantly in a coal pit near Durham, to which place it is supposed to have been conveyed among fodder supplied to the horses.

Porrhomma egeria (Sim.). Mr. Falconer found a single female in a barn at Staward in August, 1902. This is a rare spider, and is not recorded for Ireland. It is reported from Edinburgh, Yorkshire, the Cheddar caves in Somerset, the Isle of Wight, from France (once), and from Hungary. This species is related to the last two, and, like them and others of the genus, seems to take up its abode in barns, caves, and places of that description.

Porrhomma miser (Camb.). Both sexes amongst moss in marshy places near Dipton Wood. Adults were found from September to April. This is another rare spider unrecorded for Scotland or Ireland. Although reported from the Continent, it is doubtful whether the examples are really identical with the British specimens (see Mr. Cambridge's remarks in Proc. Dors. Field Club, vol. xxiv., 1903). It has, however, occurred in Dorset, Cheshire, and Glamorgan. In the last locality I found it adult in May and June. *P. miser* (Camb.) is very distinct from all its present congeners.

Sintula corniger (Bl.). This remarkable spider is of occasional occurrence in Tynedale, where it is found among dead leaves, herbage, etc., in the woods. Odd specimens may be found at any season, autumn being the best time for the males. These, however, are not so frequently found as the females. It has occurred in Dorset, North Wales, Cheshire, Grange-over-Sands in

Lancashire, and Mr. Hull found it several years ago at Haltwhistle. I have recently received it from Winlaton in County Durham, where it was found by Mr. Bagnall. Abroad it occurs in France, Switzerland, Italy, Hungary, and Norway.

Sintula diluta (Camb.). A very minute spider, found commonly in autumn and winter amongst moss and fallen leaves. It may also be found in spring, being fairly successful in evading or withstanding the rigours of winter. It is reported from Dorset, Middlesex, Essex, Glamorgan, Staffordshire, Cheshire, Yorkshire, and the Pentland Hills.

Sintula fausta (Camb.). Abundant in March and April, 1905, amongst moss and grass in a swampy place near Dipton Wood. Single males had previously occurred in Perthshire and in Glamorganshire. The females found at Hexham were new to science, and were described and figured in Proc. Dors. Field Club, vol. xxvi., 1905. *S. fausta* (Camb.) has not yet been observed in Ireland or on the Continent.

Syedra pholcommoides (Camb.). Rare; several examples were found amongst moss and grass on sunny banks or amongst dead leaves in hedge bottoms. Adults were obtained in May, June, July, and October. The only other British records are Dorset and Yorkshire. Abroad it has been recognized in Germany, Austria, and Hungary.

Microneta viaria (Bl.). Very common amongst moss, dead leaves, etc., in woods. The males are distinctly larger than the females, a very unusual character amongst British spiders. Adults may be found throughout the year. Common and widely distributed in Britain, Ireland, and Europe. Also occurs in North America.

Microneta cauta (Camb.). Occasional amongst grass and moss in the woods, where it is adult in May, June, and July. Females may occasionally be found in autumn and winter. Has occurred at Southport in Lancashire,

in Cheshire, Yorkshire, and in Glamorgan. It is quite possible that eventually this species will be found to be identical with *M. subtilis* (Camb.).

Microneta innotabilis (Camb.). Rare ; both sexes may, however, be found in the crevices of, and under, the bark of fir trees, especially larches. Adult in July. The females, however, may be found throughout the year. This species has occurred among other localities in Dorset, Hants, Surrey, Hertford, Cheshire, Edinburgh, and Wicklow.

Microneta conigera (Camb.). Not common ; examples may, however, be beaten from the branches of conifers, or found on their bark in company with the last species, to which it is closely related. Adult in June and July. This is probably a widespread form ; it has occurred in Dorset, Glamorgan, Cheshire, Derbyshire, Lancashire, Cumberland, Edinburgh, Aberdeen, and Inverness. Also in France, Bavaria, and Hungary. It is not, however, recorded as Irish.

Microneta clypeata (F. Camb.). To this species Mr. Cambridge has referred some forms which occurred in various parts of Tynedale from Acomb to Winlaton. They are identical with a spider from Penrith described under the above name by the late F. O. B. Cambridge. Possibly *M. clypeata* (F. Camb.) is identical with *M. decora* (Camb.), but this is not yet certain.

Microneta rurestris (Koch). Abundant in Tynedale, as elsewhere in Britain and on the Continent. Occurs also in Ireland. It is adult in autumn, some examples surviving till spring. In July a very large race of this species becomes adult ; in it several of the characters of the type are exaggerated, but there seems to be no specific difference between the two. I have seen this form from Essex and Yorkshire, as well as in Tynedale.

Microneta beata (Camb.). This spider is common amongst grass and herbage in Tynedale. It was discovered in Yorkshire by Mr. Falconer in 1901, the Hexham records being made in 1902. The species was only described in 1906. *M. beata* (Camb.) has also occurred in Cumberland, Kent, and Somerset. It is adult in June and July, and is a very distinct species.

Microneta sublimis (Camb.). Not rare on Blanchland Common, where adults may be found in June and July. This is a subalpine form, occurring on the Cheviots, the Lead Hills in Lanarkshire, the Cumbrian mountains, the Pennines near Huddersfield, and on Snowdon. It ascends 3,500 feet on the last mountain, and is found on the summit of Scafell Pike, 3,210 feet. At such elevations it is only just becoming mature in August and September. It is not yet *recorded* for the Continent, but is very closely related to, if not identical with, *Microneta gulosus* (Koch).

Microneta saxatilis (Bl.). Common amongst grass and herbage, both sexes being adult in June and July. It has occurred in Dorset, Glamorgan, Herts, Middlesex, Surrey, Norfolk, North Wales, Cheshire, Derbyshire, Lancashire, Yorkshire, Cumberland, and Scotland. In some of these places it is very common. It is not yet reported from Ireland or the Continent, which, as it is one of the most distinct species of the genus, is somewhat remarkable.

Bathypantes nigrinus (Bl.). Abundant amongst moss and grass in marshy places, as well as amongst leaves and herbage in woods, hedgerows, etc. Adult all the year round. It is widespread in Europe, and occurs in North America, but seems to be very common nowhere except in the British Isles.

Bathypantes gracilis (Bl.). Abundant at all times of the year in all situations and throughout Britain. Rarer in Ireland; it occurs in most of the countries of Central and Southern Europe. It is not, however, recorded for Sweden.

Bathyphantes parvulus (Westr.). Not rare; probably often confused with the last species. It is found in swamps, and amongst herbage on the banks of the Tyne. Adult in June and July. It has occurred in various localities, such as Dorset, Glamorgan, Lancashire, and Cumberland, also from one locality in the North of Ireland, but not yet I think from Scotland. Abroad it occurs in France, Germany, Sweden, and Italy.

Bathyphantes approximatus (Camb.). Common in marshes, where adults may be found nearly all the year round. It occurs in various British localities from Dorset to Edinburgh, but is not reported from Ireland. Abroad it has been recognized in France, Bavaria, Hungary, and Siberia.

Bathyphantes pullatus (Camb.). Occasional in swamps and boggy places, where adults may be found in May and June. It is noted from Dorset, Glamorgan, Cheshire, Lancashire, Cumberland, and several Irish localities. Also from France, Sweden, Prussia, and Italy.

Bathyphantes concolor (Wid.). A common spider found all over the British Isles, most of Europe, and even North America. It is found amongst herbage, concealed amid dead leaves, and very often under stones. Adult throughout the year.

Bathyphantes dorsalis (Wid.). Adult in April, May, and June; females linger till August, but all seem to hibernate in an immature state. It is generally beaten from gorse and other bushes, but may sometimes be found amongst long grass, especially in marshy places. Generally distributed in Britain and Ireland, and occurring in most of the European countries.

Bathyphantes variegatus (Bl.). Not very abundant, but found under stones and beaten from gorse and heather. It attains an altitude of over 2,000 feet on the mountains of Britain and Ireland, and over 7,000 feet on those of Switzerland. It is also frequent on the sandhills of the

west coast, as well as being thinly spread all over Britain and Ireland. Abroad it is reported from Finland, Sweden, France, and Northern Hungary. Adults may be found throughout the year.

Leptyphantes ericaeus (Bl.). Common everywhere amongst moss, dead leaves, heather, etc., and found all the year round. It is a common spider in Scotland and the North of England, although very rare in the South. Reported from the West of Ireland, it seems not yet recognized on the Continent.

Leptyphantes pallidus (Camb.). Occasional amongst moss in woods, also under overhanging ferns and herbage on the banks of woodland ditches. Sometimes it may be found under large stones. Adult males occur in June and July, the females throughout the year. *L. pallidus* (Camb.) is not a very common spider, but is reported from Dorset, Hertford, Lincolnshire, Glamorgan, Warwickshire, Derbyshire, Cheshire, Yorkshire, Cumberland, and the South of Ireland. It occurs also under stones on the summit of Snowdon, at an altitude of 3,500 feet. The Irish and Derbyshire specimens were discovered in caves, and the spider is a cave dweller, as well as a woodlander, in France. It is recorded also as inhabiting Norway, Prussia, Bavaria, Austria, and Switzerland.

Leptyphantes obscurus (Bl.). Not very common, but may occasionally be beaten from the branches of trees and bushes. Adult in May, June, and July, and widely distributed. It ranges from Dorset to Edinburgh, occurs in several Irish localities, and has been reported from various European countries from Sweden to Corsica.

Leptyphantes Mengii (Kulcz.). Abundant everywhere amongst grass, herbage, fallen leaves, etc., and adult throughout the year. It is reported from Dorset, Glamorgan, Cheshire, Yorkshire, Cumberland, and Durham. Abroad it occurs in Austria, Hungary, and the Tyrol.

Leptyphantes flavipes (Bl.). This species is exceedingly like the last, and is probably often confused with it. It is very rare in Northumberland, but I took two males in Dipton Wood in October. It is reported from Ireland, and several British localities from Dorset to Cumberland. It is not rare in the classic Bere wood at Bloxworth, where I have myself taken it. I believe it to be in Britain a southern species largely replaced by *L. Mengii* (Kulcz.) in the North. Abroad it is reported from Sweden, France, Switzerland, Germany, and Austria, but on the Continent also it is probably often confused with its ally.

Leptyphantes tenuis (Bl.). Very common everywhere at home and abroad. Adults may be found throughout the year.

Leptyphantes tenebricola (Wid.). Occasional amongst fallen leaves in woods, or amongst grass on banks. Adult in May and June. This spider occurs in Dorset, Norfolk, Cheshire, Lancashire, Yorkshire, Cumberland, and near Edinburgh. Abroad it has been noted from Sweden, Germany, Switzerland, Austria, Hungary, and the Tyrol. It is not recorded from France or Ireland. On Helvellyn it reaches an altitude of nearly 3,000 feet. It seems to be a northern spider, which is enabled to spread itself southward along mountain ranges, but which does not thrive on the southern plains.

Leptyphantes Blackwallii (Kulcz.). Very common everywhere, and at all seasons. It is abundant on the summits of Scafell Pike and Helvellyn, and occurs on that of Snowdon. It occurs also in France, Spain, Belgium, and Sweden, but seems absent from Switzerland, Germany, and Hungary.

Leptyphantes cristatus (Menge). Abundant in some years amongst moss and grass in swampy places. Adults occur chiefly from autumn to spring. It is widely distributed in Britain (Dorset to Inverness), occurs in Ireland, and in most of the countries of Europe.

Leptyphantes terricola (Koch). Abundant amongst dead leaves, fallen pine-needles, and herbage in woods. This is another spider common in northern countries at low levels, but in Central Europe being confined to mountainous districts. It is common in Scotland, Ulster, and the North of England, but is rare in the South of England and of Ireland. It occurs in Norway, Sweden, Germany, Austro-Hungary, and the Tyrol. Also, though rarely, in France and Switzerland.

Leptyphantes leprosus (Ohl.). Not very common, but sometimes found in outhouses, timber stacks, etc. Males are adult from autumn to spring. It is widely distributed in Britain and Ireland, and abroad occurs from Kamtschatka to St. Helena.

Leptyphantes minutus (Bl.). A woodland spider, inhabiting the crevices of bark, and especially found under that of dead or dying trees. Males are adult in September and October; they very seldom survive the winter, the species contrasting strongly in this particular with most of its congeners. The females are more hardy, and survive in much diminished numbers till spring. Widely distributed at home. It is commoner in northern than in southern Europe, and occurs also in North America.

Labulla thoracica (Wid.). Fairly common in woods under overhanging banks, on mossy rocks and walls, and in the crevices of lichen-covered bark. Adult in late summer. Generally distributed in Britain, Ireland, and on the Continent.

Linyphia clathrata (Sund.). Common in every situation, and adult all the year round. Of Holarctic distribution.

Linyphia montana (Clerck). Not very common, but sometimes found in the angles of sheds, timber stacks, etc., or beaten from the branches of spruce, yew, or gorse. Adult in May and June. Another Holarctic form.

- Linyphia triangularis** (Clerck). Very common on herbage and low bushes. Adult in August, September, and October. Widely distributed in Britain, Ireland, and Europe; occurring also in Siberia.
- Linyphia peltata** (Wid.). Very abundant on bushes and in the branches of trees. It generally lives higher up in the latter than does *L. triangularis* (Clerck). Adult in May, June, and July. Very widely distributed at home and abroad.
- Linyphia pusilla** (Sund.). Rare, but occasionally found amongst grass in marshy places. Adult in June and July. Holarctic.
- Linyphia hortensis** (Sund.). Not rare in woods, where it spins its snare amongst grass stems and low herbage. Adult in May and June. It is most commonly met with in winter, but is then, of course, immature. Widely distributed in Britain, Ireland, and on the Continent.
- Linyphia insignis** (Bl.). Common in September and October in its adult state. It is generally beaten from trees and bushes in the woods. This is another northern spider. It is of Holarctic range. Common in the North, it is rare in the South, except in subalpine districts. It occurs throughout Britain and Ireland, but is commonest in the north of the former island.
- Drapetisca socialis** (Bl.). Very abundant on the trunks of various trees, spinning no true snares, but running rapidly over the mossy or lichen-covered bark, with the hues of which its sober colours harmonize. Adult in September and October. Distribution Holarctic.
- Stemonyphantes lineatus** (L.). Common everywhere, and at all times of the year. Another Holarctic species.
- Bolyphantes luteolus** (Bl.). Abundant in Tynedale from the moors of Bellingham to the shores of Whitley Bay. Adult in September and October. It seems rare in Ireland, and is certainly rare in the South of England.

In Scotland and the North of England it is however abundant. Abroad it is a northern species, in southern countries found only amongst mountains.

Bolyphantes alticeps (Sund.). Frequent amongst grass, heather, and other herbage. Adult in September and October. This, too, is a northern species. It occurs in Scotland, Cumberland, Westmoreland, Lancashire, Yorkshire, and the Peak of Derbyshire. It appears not to be recorded with certainty from Britain south of this last locality, or from Ireland. Its range extends to Siberia, and it ascends the mountains of Switzerland and Central Europe to an altitude of 5,500 feet.

Floronia bucculenta (Clerck). This fine species is rare in Tynedale, but both sexes have been found in the mature condition among long grass near Hexham in September. Unrecorded for Ireland, it has been recorded from the Channel Isles, Dorset, Cheshire, Lancashire, Yorkshire, and Cumberland. It is widely distributed in Northern and Central Europe.

Tapinopa longidens (Wid.). Not rare amongst herbage and under stones. It is adult in autumn, but both sexes may sometimes be found throughout the year. Widely distributed in Britain, Ireland, and Europe.

SUB-FAMILY II. TETRAGNATHINÆ.

Pachygnatha De Geerii (Sund.). Adults are common at all times and in every situation. Widely distributed throughout Europe.

Pachygnatha Clerckii (Sund.). Another widely distributed and common form. This one, however, is found nearly always in swampy places, or near water. Adult throughout the year.

Pachygnatha Listerii (Sund.). Rare; both sexes have, however, been found at Hexham, Chollerford, and Acomb. They frequent woods, and may be found from autumn to spring amongst fallen leaves, herbage, etc. This species

is widely distributed on the Continent and at home. Here, however, it seems very local. It is fairly common in Dorset, and has occurred in Cheshire, North Wales, Cumberland, and near Edinburgh. In Ireland, too, it is widespread, but is not recorded for Ulster. It is probably spread thinly all over England.

Tetragnatha extensa (L.). Occasional on the moors, where it is generally found near water. Adult throughout the summer. Holarctic.

Tetragnatha Solandrii (Scop.). Much commoner than the last, and nearly always occurring in woods. It is generally beaten from the branches of trees. Adult throughout the summer, and generally distributed in Britain, Ireland, and Europe.

Tetragnatha obtusa (Koch). An adult male was beaten from a spruce growing on the banks of the Devil's Water in August. It is not rare in Dorset, Epping Forest, Buckinghamshire, and the South, but seems very rare in the North of England. It is, however, widely distributed in Ireland and on the Continent.

Meta segmentata (Clerck). An abundant spider, widely distributed at home and abroad. Adults and immature individuals may be found side by side almost throughout the year. Every winter adults were found hibernating in outhouses, etc. In Tynedale there are not two distinct generations as far as I can make out, the majority of individuals being mature in autumn, and the spring brood (*M. Mengii*, Bl.) being explained by hibernation.

Meta Merianæ (Scop.). This spider accompanies *Nesticus cellunanus* (Clerck) and *Leptyphantes pallidus* (Camb.) in their shady, dark, and cool retreats under the banks of streams and ditches in the woods. It is especially fond of undermined banks overhung with dank vegetation. Sometimes also found in outhouses and cellars. *M. Merianæ* (Scop.) is very widely distributed, and adults may be found throughout the year.

Nesticus cellulanus (Clerck). Not common, but occasionally found in the situations described for the last species. It also occurs under stones in dark places in the woods, and sometimes in drains, sewers, etc. Adult in summer and autumn. Very widely distributed, though apparently never very abundant.

SUB-FAMILY III. ARGIOPINÆ.

Zilla x-notata (Clerck). Very abundant everywhere, both sexes being mature in late summer and autumn. The females survive the winter, and may be seen constructing their webs on any warm day in that season. Of Holarctic distribution.

Zilla atrica (Koch). This is not so common a species as the last. It occurs in colonies, the members of which spin their webs generally on the branches of trees, particularly of conifers. Adult in late summer and autumn, and generally distributed at home and abroad.

Cyclosa conica (Pall.). Two adult females were beaten from heather near the Swallowship woods on May 22nd, 1904. Mr. Bagnall also sent me an immature male from Winlaton in 1906. This is a very rare spider in the North of England, but has occurred near Edinburgh, and in Aberdeen, Banff, and Inverness. It has also occurred once in the West of Ireland, is common in the South of England, and has a wide Continental range.

Epeira cucurbitina (Clerck). Fairly common in Tynedale, where it is adult in June and July. It is generally beaten from oak trees or gorse bushes. Widely distributed in Britain, Ireland, and the Palæarctic region.

Epeira triguttata (Fabr.). Immature individuals are somewhat frequently beaten from the branches of conifers. A pair of adults were found near the Swallowship in June. This is another spider which ranges north to Inverness, but is much commoner in the south. It is not on record

for Ireland, but occurs in France, Switzerland, Germany, Hungary, and Austria.

Epeira diadema (Clerck). Fairly common on gorse bushes, hedges, etc., in Tynedale. The Hexham district possesses few igneous rocks and no slate quarries, so one is not surprised at the absence of the protectively coloured dark form. Of Holarctic distribution.

Epeira cornuta (Clerck). Rare; one or two examples of each sex were found on the moors in several places near Hexham. Their snares were as usual made on boggy ground amongst the heather. Adult throughout the summer, but most commonly so in autumn. Generally distributed in Europe and Northern Asia.

Epeira patagiata (Clerck). Abundant on gorse bushes near the Tyne. Adults may be found from May till September. This interesting spider occurs in the North and West of Ireland, but is not yet reported from Scotland. It has occurred also in Dorset, Middlesex, Norfolk, Cheshire, Cumberland, and other localities. It is found in various Continental countries.

Epeira quadrata (Clerck). This handsome spider occurs sparingly on the moors round Hexham. It is adult from July to October. It is generally distributed in Britain, Ireland, and on the Continent.

Epeira umbratica (Clerck). Mr. Bagnall obtained this large species at Winlaton. It was found under the bark of a rotten tree, and several specimens were secured. Mr. Hardy found it at Langleyford, and Mr. Hull at Ninebanks, near Allendale. I never observed it whilst living at Hexham. It occurs in many localities from Dorset to Edinburgh, being abundant near Penrith. It has been reported from several Irish localities, is common in the Isle of Man, and has a wide Continental distribution.

Order II. PHALANGIDEA.

Family PHALANGIIDÆ.

Liobunum rotundum (Latr.). Common amongst grass and herbage in marshes and on the banks of streams. Also, though more rarely, in woods and meadows. Adult from July to September. Common throughout Britain from Dorset to Edinburgh.

Megabunus insignis (Meade). Not very common, but immature examples occur under stones in spring. Several adults were found in July and August in the same situations. The species ranges from Dorset to Edinburgh, and occurs also in Ireland and on the Continent.

Platybunus corniger (Herm.). Not common, but occasionally found amongst herbage in May and June. Immature examples (*P. triangularis*, Herbst.) are abundant in winter and early spring. Has been traced north to Linlithgowshire, and occurs commonly on the Continent.

Phalangium opilio (Linn.). Common, and adult in August and September amongst grass and herbage on the river bank. It is widely distributed at home and abroad.

Phalangium parietinum (De Geer). Not rare on walls and in outhouses in August and September, when it is adult. Another animal of wide distribution.

Oligolophus morio (Fabr.). Abundant everywhere among herbage. Adult in August and September.

Oligolophus alpinus (Herbst.). May be beaten commonly from the branches of spruces in the Swallowship woods in autumn. It also occurs among heather. This is an alpine form, occurring in Scotland, Cumberland, and on Snowdon. It may be found on the summits of Scafell Pike, of Snowdon, and of Snaefell, Isle of Man. It

reaches an altitude of 7,000 feet in Switzerland. Probably it is really only an alpine variety of *O. morio* (Fabr.).

Oligolophus tridens (C. L. K.). This common and generally distributed animal is abundant in Tynedale. It becomes mature in August and September, some individuals hibernating successfully and appearing again in spring.

Oligolophus palpinalis (Herbst.). Occasionally found accompanying the last species, to which it is closely related. It is recorded from Dorset, North Wales, Cheshire, Yorkshire, and Edinburgh. Also from France and Germany. It does not seem to be common in Britain.

Oligolophus Hansenii (Kraep.). Several examples in November amongst dead leaves near Haughton Castle. This Phalangid is only reported from Edinburgh, Nottinghamshire, Yorkshire, and Hamburg.

Oligolophus agrestis (Meade). Abundant in Tynedale, and adult like its congeners in late summer and autumn. Widely distributed in Britain and on the Continent.

Family NEMASTOMATIDÆ.

Nemastoma lugubre (Müller). Common throughout the British Isles. Adults may be found equally abundantly throughout the year. M. Simon states that its life extends over several years, and its prolonged season of maturity certainly contrasts strongly with the short sexual epoch of the Phalangidæ.

Nemastoma chrysomelas (Herm.). Common in late summer and autumn amongst long grass and herbage. I never found adults at any other season. It occurs in Britain from Dorset to Edinburgh, and accompanies *Oligolophus alpinus* (Herbst.) to the summits of Scafell Pike and Snowdon. In Switzerland it ascends to an altitude of over 4,000 feet.

Order III. CHERNETIDEA.

Family CHERNETIDÆ.

Obisium muscorum (Leach). Very abundant in all the woods amongst dead leaves and fallen pine-needles. Also, though more rarely, amongst moss in marshes. It may be found throughout the year. It occurs in Ireland, ranges from Dorset to Edinburgh in Britain, and is common and widespread on the Continent. It is a remarkable thing that out of over twenty British Pseudoscorpions only one has as yet been found in Northumberland. Several others are recorded for Scotland, and one of these has also occurred in Cumberland. The present one seems however to be the only one at all common in the North of England.

APPENDIX I.

The following spiders were obtained in Berwickshire and Northumberland by Mr. Hardy. Those from the Scottish county only are distinguished by an asterisk. I have indicated the British distribution of these spiders, none of which were found by me in Tynedale.

Prosthesima Petiverii (Scop.). This species was taken at Wooler. It occurs from Dorset to Edinburgh, and in Ireland. It is usually found in mountainous districts.

Prosthesima nigrita (Fabr.) Found (in the female sex) on the top of Cheviot. Ranges from Dorset to Edinburgh, and occurs also in Ireland and the Isle of Man.

**Drassodes sylvestris* (Bl.). Occurs also in Dorset and the South.

Clubiona terrestris (Westr.). A common spider, ranging from Dorset to Inverness, and occurring also in Ireland.

Xysticus lanio (C. L. K.). A single female was obtained on Cheviot Hill. This is a southern form, usually beaten from trees and bushes.

Xysticus Kochii (Thor.). Widespread ; occurs in Dorset and Aberdeen, as well as in a good many intermediate localities. Females only were taken by Mr. Hardy, Wooler.

***Asagena phalerata** (Panz.). Berwickshire. Occurs in Dorset, Devon, Glamorgan, Cheshire, Westmoreland, Cumberland, Peebles, Inverness, and in the Isle of Man. Prefers northern latitudes, and is found under stones and amongst heather.

Lophocarenum nemorale (Bl.). Wooler. Its distribution extends from Dorset to Edinburgh. It has occurred in Cumberland and Cheshire, but is much more frequent in the South than the North.

Lophomma curtipes (Camb.). A unique male specimen from Langleyford. It is unfortunately immature.

Cornicularia pudens (Camb.). A single female from Cheviot Hill.

Cornicularia pavitans (Camb.). Like the last, this species is based on a single female from Cheviot Hill. Neither species has been found elsewhere.

Wideria subita (Camb.). A single female. This species has also occurred in Dorsetshire.

Gongylidium graminicolum (Sund.). Females were found at Wooler by Mr. Hardy. This spider extends into Scotland, but is only common in the South of England. In the Thames valley it is very abundant. It is not on the Cumbrian or Irish lists.

Tmeticus adipatus (Koch). Was found on the Cheviots. It has since occurred in Cumberland, Westmoreland, and on Snowdon. It reaches an altitude of nearly 3,000 feet.

Tmeticus contritus (Camb.). A single adult male on Cheviot Hill. This still remains unique. It occurred in October.

Sintula morula (Camb.). A single adult pair on Cheviot Hill. This species has never been rediscovered.

Leptyphantus angulatus (Camb.). An adult male on Cheviot Hill. As yet this species has not been rediscovered.

***Cercidia prominens** (Westr.). An adult male and female were found by Mr. Hardy in Berwickshire. This is a southern spider, not very rare in Dorset and the South. Lately it has occurred near Leeds. This is the only other northern record.

APPENDIX II.

The following species were found by Mr. Hull in Northumberland and Durham. Those from the latter county only are distinguished by an asterisk. None of these spiders were found by me in Tynedale, or by Mr. Hardy in the Cheviot district.

Thanatus striatus (C. L. K.). River bank at Ovingham. This rare spider has occurred in Dorset and in Newtown Moss near Penrith.

Hasarius Adansonii (Sav.). An imported exotic that occurs in orchid houses from Kew to Edinburgh. Mr. Hull obtained it from greenhouses in Jesmond.

Tegenaria atrica (C. L. K.). An adult male from Jesmond Dene, and a young female from Winlaton. This is a common spider in the South of England. It has occurred as far north as Glasgow, but I believe it has been introduced into these latitudes by man, and that recently. This is certainly the case in Southport, where the spider radiates from the Botanic Gardens, in which place alone it is abundant.

Trochosa spinipalpis (F. Cb.). On the banks of the South Tyne near Featherstone. Has only occurred elsewhere in Dorset and Cumberland. Mr. Hull has kindly shown me this example.

Dictyna uncinata (Westr.). A widely distributed spider, much commoner in the South than the North. It is generally found in northern localities in gardens and other cultivated places.

Theridion pictum (Hahn.). Found on garden shrubs in both counties.

***Theridion Blackwallii** (Camb.). A female in Shincliffe Wood. This rare spider has only occurred elsewhere in Dorset, Cambridge, and Oxford.

Diplocephalus Beckii (Camb.). A male specimen from Preston near North Shields. Lately Mr. Bagnall has sent me an adult female from Alnwick. This interesting little spider has occurred in Dorset, London, Warwick, Stafford, Yorkshire, and Cumberland, near Edinburgh, and at Dunkeld in Perthshire. It seems, however, to be nowhere common.

Gongylidiellum latebricolum (Camb.). Walltown Moss, Bardon Mill. The only other British records are Dorset, Cheshire, and Paisley.

Leptyphantes nebulosus (Sund.). Ovingham. A widespread but local spider, living chiefly in cellars and outhouses, sometimes also spinning its snares at considerable distances down rabbit holes. It ranges at all events from Hertford to Glasgow. Probably it is spread about partly through the agency of man, but it sometimes occurs far from his habitations.

Taranucnus setosus (Camb.). Haltwhistle. Occurs also in Dorset and in Newtown Moss near Penrith.

***Meta Menardii** (Latr.). Recorded by Mr. Cambridge in his "Spiders of Dorset" as occurring in Durham. This cave-inhabiting species is widespread in Ireland, occurs in the Isle of Man, and ranges from Devon to Aberdeen in Britain.

The following spiders recorded by Mr. Hull are dropped temporarily from the Northumberland and Durham lists.

Cryphaea diversa (Camb.). The example recorded by Mr. Hull was not mature, and Mr. Cambridge now says that it certainly is not referable to this species. *C. diversa* (Camb.) is only on record for the counties of Cumberland, Notts, and Surrey, and very few specimens are extant, some of which are immature. *Diplocephalus spinosus* (Hull) must be referred to *D. permixtus* (Camb.). *Diplocephalus alpinus* (Camb.) is now expunged from the British list, the recorded specimens being only *D. latifrons* (Camb.). *Cornicularia clara* (Camb.) is now synonymous with *C. cuspidata* (Bl.). *Bathyphantes cruciger* (Bl.) is merely a strongly marked form of *B. pullatus* (Camb.).

APPENDIX III.

Spiders found in Cumberland and Westmoreland, and not yet obtained in Northumberland or Durham. This list is compiled partly from the late F. O. P. Cambridge's list (see Bibliography), and partly from species captured by Mr. Falconer, of Huddersfield, Mr. Varty-Smith, of Penrith, and by myself.

Prothesima electa (Koch). Ravenglass sandhills.

Clubiona cœrulescens (L. Koch). Arnside.

Philodromus fallax (Sund.). Ravenglass sandhills.

Dendryphantes hastatus (Clk.). Newtown Moss, Penrith.

Euophrys petrensis (C. L. Koch). Summit of Grisedale Pike, 2,500 feet.

Attus saltator (Sim.). Ravenglass sandhills.

Argyroneta aquatica (Latr.). Newtown Moss.

Agelena labyrinthica (Clk.). Eskdale.

Pirata latitans (Bl.). Newtown Moss near Penrith.

Pirata piscatoria (Clerck). Newtown Moss.

- Tarentula cuneata* (Clerck). Elterwater.
Tarentula miniata (C. L. Koch). Ravenglass sandhills.
Lycosa annulata (Thor.). Elterwater.
Lycosa Purbeckensis (F. Camb.). Solway Moss.
Lycosa Traillii (Camb.). Sty Head Pass.
Hyptiotes paradoxus (C. L. K.). Lake District, 1863.
Theridion riparium (Bl.). Eskdale.
Theridion lepidum (Walck.). Coniston.
Crustulina guttata (Wid.). Summit of Grasmoor, 2,800 feet.
Ceratinella scabrosa (Camb.). Newtown Moss.
Entelecara acuminata (Wid.). Carlisle.
Entelecara omissa (Camb.). Summit of Scafell Pike,
3,210 feet.
Styloctetor uncinus (Camb.). Summit of Scafell Pike.
Walckenaera capito (Westr.). Summit of Great End,
2,984 feet.
Wideria melanocephala (Camb.). Elterwater.
Cornicularia Karpinskii (Camb.). Helvellyn at about
2,000 feet.
Tmeticus Warburtonii (Camb.). Penrith and Keswick.
Tmeticus montigena (Koch). Helvellyn and Scafell Pike
summits.
Bathyphantes setiger (F. Camb.). Newtown Moss, the
only known locality of this very distinct species.
Leptyphantes pinicola (Sim.). Scafell Pike, Helvellyn,
etc., up to 3,000 feet.
Leptyphantes Whymperei (F. Camb.). Summits of
Scafell Pike and Great Gable.
Tetragnatha pinicola (Sim.). Solway Moss.
Singa hamata (Clerck). Eskdale.
Epeira Redii (Scop.). Tilberthwaite.

NOTES ON NEW AND RARE LOCAL BEETLES.

I.—*Triplax bicolor*, Gyll., a species of *Coleoptera* new to the *British Catalogue*.

BY RICHARD S. BAGNALL, F.E.S.

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Early one morning in July, 1904, I came across a piece of fungus growing on elm, in Gibside, in which occurred two species of *Triplax*, and about a fortnight later the same species were met with in some numbers at the same locality (Ent. Mo. Mag., 1904, p. 210; Ent. Record, 1904, p. 260). The commoner of the two, which was in hundreds, was easily identified as *T. ænea*, Schall., an insect usually regarded as rare, but which I had taken not infrequently before in this locality; the others I supposed to be immature specimens of *T. russica*, L., knowing them to be unlike any other species of British *Erotylidæ*, and at the same time having no example of *russica* with which to compare my captures. I sent specimens of both insects to Mr. Holland, as well as to many other coleopterists, and in a letter dated December 12th, 1904, Mr. Holland stated that my supposed *russica* could not possibly be that species, as on comparing them with authentic *russica* he found several specific characters which at once separated them from the latter; he thought that they would prove to be *T. bicolor*, of Gyllenhal, described by him in the "Insecta Suecica," vol. i., p. 205. This letter came at a very opportune moment, shortly before I left for Edinburgh to spend a few days with Prof. Beare, where, with his kindly assistance, Mr. Holland's surmise was found to be correct.

In the European Catalogue, and in Ganglbauer's "Die Käfer von Mitteleuropa," vol. iii., p. 643, certain species of the genus *Triplax* are separated off into the subgenus *Platichna*, Th. Of those which are now known to occur in Great Britain only *bicolor* belongs to *Platichna*; the other

three—*russica*, L., *anea*, Schall., and *lacordairei*, Crotch—belong to *Triplax sensu stricto*. The characters given by Ganglbauer for these divisions are as follows:—

Triplax:—Base of thorax strongly bordered, or furnished with a strongly marked transverse furrow in front of the scutellum; in shape more or less parallel-sided, elongate-ovate.

Platichna:—Base of thorax throughout very finely bordered, and never provided with a transverse furrow; shape, more or less ovate.

I am indebted to Prof. Beare for the following rough translation of Ganglbauer's description of *bicolor*:—

"*Triplax bicolor*, Gyll.—Usually about the same size as *russica**, but distinguished from that species by its more ovate form, by the yellowish-red colour of the base of the antennæ and of the scutellum, and by the fact that the whole of the underside of the body is reddish in colour. It may also be readily separated from *russica* by the generic characters already given."

General description:—Oblong, moderately ovate, yellowish-red, elytra shining black; antennæ black or brown, with the first two joints, and occasionally the third, rusty-red in colour. The head is large, with the clypeus thickly punctured. The third joint of the antennæ is about half as long again as the second and fourth, the fourth and fifth joints are elongate, the sixth is about as long as broad, and the seventh is slightly, and the eighth distinctly, transverse. The thorax is somewhat strongly contracted in front, and at the base is about twice as broad as long; the sides are finely, and the base very finely, bordered. The elytra are oblong, slightly widened in the basal third; moderately coarsely punctate-striate, with the interstices somewhat strongly punctured. Length, 4·5 to 5·0 mm.

Occurs rarely throughout Central and Northern Europe.

The synonymy of this species has been terribly confused, apparently owing to the fact that authorities have copied statements from one another without taking the trouble to confirm their accuracy. Prof. Beare kindly undertook to unravel the tangle, and he has supplied me with the following notes on the synonymy.

Marsham, in his "Entomologia Britannica" (1802), vol. 1, p. 122, described a new species under the name *T. bicolor*. Apart from the fact that, as usual, the description is so meagre that it will fit several of the species, we have authentic proof

* The examples taken at Gibside were on the average smaller than *T. russica*, being intermediate in size between that species and *T. anea*.

that this insect was only *T. ænea*. (There are in the Stephens collection of Coleoptera in the British Museum two specimens, which are simply *ænea*, marked Marsham's types, and standing under the name *bicolor*).

Gyllenhal, in his "Insecta Suecica," vol. i., p. 205 (1808), gives a full and accurate description of a species of this genus, which he states to be Marsham's *bicolor*, but there is little doubt that he never saw any of Marsham's types, and from this mistake of Gyllenhal has arisen the whole confusion. Gyllenhal's description fits accurately the insect we are dealing with, and in most of the European works up to the present the species has been ascribed to him as the first author to give a true and recognisable description.

Stephens, in his "Illustrations of British Entomology (Mandibulata)," iii., p. 89 (1827-35), copied Gyllenhal's description, and thus made it appear that he had taken steps to confirm Gyllenhal's supposition that his *bicolor* was Marsham's, but he did nothing of the kind. All three specimens in the Stephens collection, as was pointed out by Mr. G. R. Waterhouse* in his Catalogue of British Coleoptera (1861), were incorrectly named, two being *ænea*†, and one *lacordairei*, and it is the neglect by some of the Continental authorities of the clear and explicit statement of Mr. Waterhouse, which has perpetuated right up to the present the confusion in the synonymy of this insect.

Lacordaire, in his "Monograph of the Erotylidæ" (1842), deals with the genus *Triplax* on pages 202 to 218. He ascribes *bicolor* (p. 215) to Gyllenhal, and states that Marsham's and Stephens' *bicolor* were synonymous with it; he evidently followed Gyllenhal in this matter.

Bedel, in "L'Abeille," for 1868-9, vol. v., p. 1, published a Monograph of the *Erotylidæ* of Europe, North Africa, and Western Asia. In this monograph he ascribes Marsham's

* At the request of Prof. Hudson Beare, Mr. C. O. Waterhouse kindly re-examined these three specimens, and he absolutely confirms their identification with *ænea* and *lacordairei*.

† Stephens says (*l.c.*), "I possess a pair from Marsham's collection, and I once beat a single example from a birch tree in Coombe Wood in June."

and Stephens' *bicolor* to *ænea*, Schall., but in the synonymy of *bicolor*, Gyll., he brings in again Stephens' *bicolor* in part, and he considers Charpentier's *scutellaris*, taken in Hungary, and described in Horæ Ent. Ross. (1825), p. 244, to be merely a variety of Gyllenhal's *bicolor*. Lacordaire had retained Charpentier's insect as a distinct species. In the same volume of "L'Abeille," p. 136, M. Bedel published three notes of corrections on his monograph, and in the second note refers to Mr. Waterhouse's examination of the Stephensian specimens of the genus *Triplax*. He says that Mr. Waterhouse had stated, in an article published in the Transactions of the Entomological Society of London, 3rd series, 1862-64, p. 129, that of the three insects standing under the name of *bicolor* in the Stephens collection two were *ænea* (and these were marked Marsham types), and that the third specimen was *ruficollis*, Lac., = *lacordairei*, Crotch, and that this latter had by a strange confusion served as a model for fig. 4, plate 17, vol. iii., of the "Illustrations," to which had been attached the name *bicolor*. It will be seen, therefore, that as far back as 1868-9 a Continental authority of high standing had abandoned the notion that Gyllenhal's insect was the same as Marsham's and Stephens', the evidence against such an idea being overwhelming, and yet, strangely enough, Ganglbauer, in "Die Käfer von Mitteleuropa," has gone back again, and insists that Stephens' insect is the same as Gyllenhal's, though he rightly enough ascribes Marsham's insect to *ænea*, Schaller.

Mr. Crotch, in "The Entomologist," 1870, vol. v., p. 7, published some notes, based upon Bedel's "Monograph," on the genus *Triplax*. He there introduced the name *gyllenhali* for *bicolor*, Gyll., and, strictly speaking, Crotch's name ought to be adopted for the insect we are dealing with; as, since Marsham had already used the name of *bicolor* for another species, Gyllenhal's name, according to the strict law of priority, ought to drop; but as nearly all the European authorities seem to have made up their minds definitely to keep to the name of *bicolor*, Gyll., for this insect, it seems preferable, for the present at any rate, to retain that name.

Thomson, in his "Skandinaviens Coleoptera" (vol. v., p. 295), 1863, retains the name of *bicolor*, Gyll., but considers Marsham's insect to be a synonym of it. Stierlin, in "Die Käfer-fauna der Schweiz," 1900 (vol. i., p. 496), also retains *bicolor*, Gyll., and places *scutellaris* as a synonym of it; and this is the way it is treated in the latest European Catalogue of Heyden, Reitter, and Weise (1891).

In concluding these remarks about the synonymy of this insect, it ought to be mentioned that Ganglbauer has selected, as the name of the species, *scutellaris*, Charp., for what reason it is impossible to say*.

A few additional notes as to its habitat may be of interest. As mentioned before, it occurred with *ænea*, and this latter was in countless numbers, in fungi growing on elm and holly up to a height of twelve feet, or more, but *bicolor* was more local, and was found chiefly in fungi growing on elm, and later in the month on holly, and in greatest numbers at a height of about only four feet from the ground. There were numerous larvæ in the fungi, most probably those of *bicolor*, and in cells in the fungus stems I found some freshly emerged *bicolor*. It appears probable, therefore, that its larval and pupal life is spent within fungus. All the specimens of *ænea* taken were fully mature, and amongst them were a few taken from fungi on yew, agreeing in all respects with *ænea*, but with the elytra shining black, instead of the usual bluish-green colour. Upon briefly examining one of these holly trees a few days ago (Feb. 5th, 1905) *ænea* was found in even greater numbers than in the summer, making the fungoid surface beneath the bark one blue glittering mass, and in a web wherein numbers of *ænea* had perished, a mutilated example of *bicolor* was found. Further and more particular search, I am sure, will bring to light *bicolor's* hibernating quarters.†

* Ganglbauer probably considered it necessary to adhere to the strict law of priority, and therefore to abandon the name *bicolor*, owing to its use by Marsham in describing *ænea*.

† *Bicolor* was eventually found hibernating gregariously as larvæ in moss at foot of fungus-affected trees, and in the spring, after a short while spent in the pupal stage, the perfect beetles emerge, and ascending neighbouring trees, lie "possum" till their "food-fungi" appear. *T. ænea* hibernates as a perfect beetle (also gregariously) under bark of trees. In the year 1906 *T. bicolor* was found in some thousands at more than thirty localities in Gibside and Hollinside.

One point is quite clear from Prof. Beare's examination of the synonymy, *i.e.*, this particular species has never before been taken in Great Britain, and therefore it is a genuine addition to the British fauna.

My sincerest thanks are due to Mr. Holland for having first pointed out this interesting addition to our fauna, and to Prof. Hudson Beare for so kindly and generously supplying me with its literature and history.

II.—*The European Species of the Genus Triplax, with some notes on the species which occur in Great Britain, and a table of their distinctive characters.*

By PROF. T. HUDSON BEARE, B.Sc., F.R.S.E.

(Reprinted, by permission, from the "Entomologist's Monthly Magazine," Second Series, vol. xvi.)

During the past few weeks, in my endeavours to settle the synonymy of the new species of this genus introduced into our fauna by Mr. Bagnall, I have been consulting most of the literature on the genus *Triplax*, and it occurred to me that there were interesting points to which the attention of our present-day coleopterists might be drawn. Marsham in his Ent. Brit. (1802), p. 121, described four species as occurring in this country, *russica*, *bicolor*, *flava*, and *castanea*; the last three were then described for the first time, but the first of these three we now know to have been *ænea*, Schal., the last of them was only an immature variety of *russica*, and about the second I can say nothing, as I have failed to identify it. Stephens in his "Manual of British Coleoptera" (1839), p. 133, in addition to *russica*, *ænea*, and *bicolor*, introduced *rufipes*, F., and *ruficollis*, Steph. Mr. G. R. Waterhouse in his Catalogue (1861) corrected the mistake of Stephens in regard to *bicolor*, and thus introduced for the first time *ruficollis*, Lac.=*lacordairei*, Crotch; he, however, retained the last two species of Stephens' list, though correcting their synonymy,

and identified *ruficollis* of Stephens as *nigriceps* of Lacordaire. Mr. Crotch again drew attention to these two doubtful species of Stephens in his notes on the genus (The Entomologist, vol. v., p. 7), but from that date onwards *ruficollis*, Steph. (now identified as *melanocephala*, Lat.) and *rufipes*, F., have disappeared from our list. I am informed, however, by Mr. C. O. Waterhouse, who very kindly carefully examined the species of *Triplax* in the Stephens collection at the British Museum, that there are two undoubted specimens of *rufipes*, F., one with the label Windsor; it is quite a distinct insect, as Mr. Waterhouse says, more approaching *Cyrtotriplax* in form; of *ruficollis* there is one undoubted specimen, without locality, but said to have been taken near Windsor.

In view of the fact that the species of this genus are excessively local, though when found they often occur in great numbers, and that Mr. Bagnall has just discovered a species, new to our list, in great abundance in a locality worked for many years by that well-known collector Mr. Bold, I have every hope that we may yet see the other two doubtful species of Stephens restored to our list. It seems desirable, therefore, to give a simple table for separating the European species likely to occur in Great Britain.

In his "Monograph on the Erotylidæ" (1842), Lacordaire described eleven European species, and Bedel in his "Monograph" [l'Abeille, vol. v. (1868-69), p. 1], also described eleven species, but he sank two of Lacordaire's species into varieties, namely, *scutellaris*, Charp., as a var. of *bicolor*, Gyll., and *clavata*, Lac., as a var. of *rufipes*, Fabr.; in addition he added two new species to Lacordaire's list, and made a few changes in synonymy.

In the European Catalogue of Heyden, Reitter, and Weise, 1891, the genus contains fourteen species; one of Bedel's species, *cyanescens*, Bedel, is sunk as a synonym of *marseuli*, Bedel, and there are in addition four new species not mentioned by Bedel. I propose to confine my table to those species of the European list which might be expected, from their distribution on the Continent, to occur in Great Britain.

I. Subgenus TRIPLAX.

Base of thorax strongly bordered, or furnished with a strongly marked furrow before the scutellum, body more or less parallel-sided.

A. Head black.

- (1) *melanocephala*, Lat. = *ruficollis*, Steph.

Easily distinguished by the fact that the antennæ are pitchy-red, with the intermediate joints very close, moniliform, sub-equal, and that the scutellum is black.

(Occurs in Western Germany, France, Italy, and Spain, and was said by Stephens to have been taken near Windsor).

B. Head red.

- (a) Under-side of the body entirely yellowish-red.

- (2) *anea*, Schal.

Easily distinguished by the bluish-green colour of the elytra, and the red scutellum.

(Very local, and usually rare, in Great Britain ; occurs in Northern and Central Europe).

- (b) The breast beneath black, the abdomen yellowish-red.

- (3) *russica*, L.

The scutellum of this species is black, and the antennæ blackish or brownish, with a black club.

(It is generally distributed throughout Great Britain, but usually very local and not common).

- (c) The breast beneath and the abdomen black, but the apex of the latter sometimes reddish.

- (4) *lacordairei*, Crotch.

This species resembles *russica*, but is only about half the size, and it is more parallel in shape. It is easily distinguished by its black abdomen.

(Very rare : in this country only so far found in the London district).

II. Subgenus PLATICHTNA, Thoms.

Base of the thorax throughout very finely bordered, and never provided with a transverse furrow, shape more or less ovate.

A. Head red.

- (a) The whole of the under-side of the body yellowish-red.

- (5) *bicolor*, Gyll.

The scutellum and the basal joints of the antennæ are red.

(This is the species recently taken in numbers by Mr. Bagnall at Gibside, Durham. On the Continent it occurs in the northern and central districts).

- (b) The breast beneath and the abdomen black, the latter reddish at the apex.

(6) *rufipes*, Fabr.

The short ovate form of this species will at once distinguish it; the scutellum is black.

(It occurs all over North and Central Europe, and Stephens apparently took it at Windsor. Thomson records it as occurring all over Scandinavia).

The other European species are *marseuli*, Bedel; *emgei*, Reitt.; *elongata*, Lac.; *lepida*, Fald.; *tergestana*, Reitt.; *carpathica*, Reitt.; *pygmæa*, Kr.; *collaris*, Schal. Most of them occur in the eastern or eastern-central parts of Europe, or in South Europe, and can hardly be expected, therefore, to occur in Great Britain.

III.—*Agathidium badium*, Er., a New British Beetle from Gibside.

By RICHARD S. BAGNALL, F.E.S.

(Oct. 23, 1905).

It is with pleasure I am able to record this species from Gibside. *Agathidium badium*, Er., was added to the British fauna last year by Dr. George W. Chaster, who took a single example—a ♂—at Patterdale on Lake Ullswater, which was identified by Mr. Donisthorpe (Ent. Record, xvi., p. 18, 1904).

When Mr. Donisthorpe was staying with me this autumn (October, 1905), we took an *Agathidium* in Gibside from beneath beech bark, and upon his return to London Mr. Donisthorpe wrote me that it was the new British species *badium* of Erichson. This tempted me to examine my Gibside "beech-bark" captures, which, not having worked at the genus, I thought were referable to the rather common south-country species *A. seminulum*, L.; and I soon found they were all to be referred to the species which forms the subject

of this short note. I cannot do better than quote Mr. Donisthorpe's translation of Ganglbauer's description :—

"*Agathidium badium*, Er.—Very like *seminulum*, on the whole of a lighter red brown, the ground work of head and thorax shining, smooth, also under very strong magnification with a hardly perceptible network, the elytra with much weaker sutural striæ, very slight or extinct towards the middle, often only noticeable more or less towards the apex, the metasternum with less strong lateral lines, the hind femora of the ♂ with a very sharp-edged apical corner, forming a broad three-cornered tooth. The third joint of the antenna about half as long again as the second, as long or a little shorter than the following joints taken together.

Long, 2 mm.—2.5 mm., North and Middle Europe, common."

Two very marked characters not mentioned in Ganglbauer's description are noticeable upon comparing *badium* with *seminulum*. Owing to the earlier antennal joints being more slender than those of *seminulum*, the club is much more conspicuous, and the antenna of the latter species is always unicolorous, whereas in *badium* the club is pitchy.

Dr. Chaster (Ent. Record, 1904, p. 18) also points out that the posterior femora of *badium* are longer, so that their apices project beyond the margins of the elytra and exhibit the characteristic tooth.

My examples occurred from beneath *beech* bark exclusively*—apparently throughout the year, and in the summer I have found it in a tree-growing fungus (one of the *Hymenomycetes*). Though a common European species, it is evidently extremely local in Britain, and confined to the North; and, as *seminulum* has not been taken in the North, I cannot think *badium* will be found confused with that species in British collections.

* Since this note was written the author (Jan. 1st, 1906) has discovered, feeding beneath beech bark, a Silphid larva which he believes to be the larva of *A. badium*.

IV.—*Epuræa angustula*, Er., and *Acrulia inflata*, Gyll.,
Coleopterous Parasites on species of the Stephensian
genus Trypodendron.

BY RICHARD S. BAGNALL.

(Sept. 7, 1906).

Many theories, interesting, probable and otherwise, are now and then put forward to explain the great rarity of certain insects; some insects are rare according to the rarity of the food upon which they subsist, others because of the peculiarity of the conditions, or series of conditions, necessary for their existence, but we feel sure that the majority of so-called "very rare" insects (at any rate so far as beetles are concerned) are only of such rarity because their true habits and haunts are unknown to us, and to bear out this view many interesting instances could be quoted. This is the case with *Epuræa angustula*, Er., and *Acrulia inflata*, Gyllenhal. The writer regards both species as in some measure parasitical upon certain species of wood-boring beetles of the genus *Trypodendron*, Steph., and is almost certain that on the publication of these meagre and very incomplete notes both species will be found in various parts of the country, and many more interesting facts relating to their life history will be brought to light, and in these hopes alone is the writer's excuse for hastening publication at the expense of completeness. Owing to the tediousness and difficulty of working *Trypodendron* burrows, however, we do not think that the species will ever come to be regarded as "common."

It may be advisable first of all to give a brief outline of the wood-borers upon which our little friends prey. The species of this genus [*Trypodendron*, Steph. (*Xyloterus*, Er.) Brit. Col., v., 444-446, pl. clxxx., fig. 1, and pl. clxxix., fig. 13], which are almost confined to the northern hemisphere, are small cylindrical insects with the head and thorax usually dark, and the elytra testaceous with or without longitudinal dark bands, and almost glabrous except towards the apex. The perfect beetles bore galleries into the solid wood perpendicularly to

the surface of the trunks and larger limbs of trees, appearing to prefer fallen timber. There are three British species, *Trypodendron domesticum*, L., *T. quercus*, Eich., and *T. lineatum* of Olivier. The two first mentioned affect the dead wood of beech, birch, oak, and other trees; but whereas *domesticum* is widely distributed, though local, in Great Britain, being rare in Ireland [Westport, Co. Mayo (J. J. Walker)] and Scotland, *quercus* is apparently confined to Sherwood Forest, where it has been taken in numbers by the late Messrs. Matthews and Blatch, Canon Fowler, and other coleopterists. The third, *T. lineatum*, Ol., affects fir logs, and is regarded as a very local Scotch species, where it occurs in the districts around Braemar and Rannoch; it has, however, been taken recently in Cumberland (F. H. Day) and Northumberland (Gillanders), and in his "Further Notes on Arboreal Insects" (Ann. Rep. and Trans. Manchester Microscopical Society, 1904, pp. 58-66, pl. ii. and iii.), our friend Mr. Gillanders informs us that though *lineatum* will attack spruce timber lying on the ground, it prefers the standing stumps of broken trees. In the field *T. domesticum* is the only species known to the writer. It bores a gallery into the interior, and at right angles to the surface of some fallen timber, this gallery (which we take to be chiefly if not wholly the work of the female) varying in depth according to the circumference, and no doubt the solidity of the wood selected; for instance the old borings in the trunk of a fallen beech were of greater depth than those in a smaller branch of the same tree. The presence of *domesticum* and other wood-borers of like habits may be easily recognised by the heap of white sawdust-like frass at the entrance of the gallery. These galleries rarely exceed forty to fifty millimetres in depth, and at a short distance from the entrance the ♀ commences to lay her eggs; soon hatching, the larvæ, by eating the timber, bore themselves tunnels at right angles to the parent gallery from perhaps six to ten millimetres in length, and thus eating, each grub invariably follows the grain of the timber, in other words boring upwards or downwards in the longitudinal direction of the stem. Each larva, then, bores

for itself a chamber in which, on attaining its full larval growth, it pupates, and it will be readily understood that the condition of the timber in a great measure rules the length of the beetle's larval life, and in a certain degree its size and vigour in maturity. The beetles of the bark-boring *Scolytidæ* eat their way out from their pupating chambers, but *Trypodendron*, upon emerging from its quiescent state of "pupa-hood," simply makes its exit by the parent gallery already formed. Therefore in the early spring one finds each *Trypodendron*-gallery occupied by a female facing inwards, and later in the year when the brood is emerging either sex may be seen with its head peeping from the entrance, *i.e.*, facing *outwards*, and towards evening they come out one after the other to taste the pleasures of maturity in a wider world. We have thus a rough outline of the life of a *Trypodendron*, which will be similar in a greater or less degree with that of all the species of that genus; and, to proceed with the insects under review, we must now consider Erichson's *Epuræa angustula*.

It is recorded by Canon Fowler (Brit. Col., vol. iii., p. 233, pl. lxxxviii., fig. 2) as very rare under bark of beech, fir, holly, etc., and he gives seven localities for it, whilst Ganglbauer* in his "Die Käfer von Mitteleuropa" says nothing about its parasitical habits, merely "North and Central Europe, under bark of birch and pine, rare." It seems strange to us that though Canon Fowler (without comment) actually records *angustula* from Scotland as "very rare, in the burrows of *Xyloterus lineatum* in Scotch fir," and since his work was published other coleopterists have taken the species from under bark of holly and birch infested by *Trypodendron domesticum*, no connection between the *Epuræa* and species of *Trypodendron* seems to have hitherto been suggested or established. Also, *E. angustula* differs in shape from all the other species of its genus, being an elongate, linear, and parallel insect, its form alone being

* I would mention that Prof. Hudson Beare, to whom I am indebted for his kindness in supplying me with translated extracts from Ganglbauer's *Die Käfer von Mitteleuropa*, and who was with me on two occasions when the *Acrutia* (Gibside, 24. iii. 06, and Winlaton, 23. vi. 06), and *Epuræa* (Winlaton, 23. vi. 06) were captured, quite agrees in regarding both species as parasitical.

suggestive of a parasite, especially in light of the record above quoted. So after the writer had taken a single example from beneath the bark of a *Trypodendron*-infested birch (Winlaton, Co. Durham, 13. vi. 06), and further solitary specimens on three occasions the following week, in order to ascertain whether the beetle was truly parasitic three hours were spent one evening (25. vi. 06) sitting on a waterproof sheet watching the *Trypodendron* borings. The Scolytids' hind-part continually appeared and disappeared in many holes, and after an hour's patient waiting the quivering antennæ of a small beetle were dimly seen, and a sharp knife thrust into the wood at an angle to the hole effectively cut off retreat and brought to light not the *Epuræa*, but *Acrulia inflata*. At the end of three hours, when owing to the deepening dusk (not to mention a bladeless knife), further operations had to be postponed, three fine examples of *E. angustula* had been taken in a like manner, and further vigils at dusk resulted in many specimens being found within the galleries†. Considering these facts there is little doubt that *E. angustula* is truly parasitic upon various species of the genus *Trypodendron*: it enters the gallery after the mother-borer has laid her eggs, and most probably laying a small batch of eggs departs to another burrow to repeat the performance (though, of course, it may confine its attention to only one gallery), and the *Epuræa* no doubt spends its larval days in plenty, subsisting on *Trypodendron* grubs.

The hypothesis as to the parasitic nature of *Acrulia inflata*, a small semi-globular (*i.e.* inflated) Staphylinid closely allied to, and at one time embodied in the genus *Homalium*, Grav., merely rests on the fact that, after taking an example at Gibside beneath the bark of a *Trypodendron*-infested beech tree (24. iii. 06), and later from beneath the bark of the above-mentioned birch (Winlaton, ♀ and ♂, 9. vi. 06) four

† Dr. Joy tells me that his single example of *Epuræa angustula* was captured beneath the bark of a holly attacked by *T. domesticum*, whilst Mr. Morse, who has recently taken so many rare species of *Scolytidæ*, and to whom I mentioned capturing *E. angustula* with *Trypodendron*, reports taking two with *T. domesticum* at Newnham, Glos., and also three specimens at birch sap, Roundhay Park, Leeds.

specimens were actually found in the *Trypodendron* burrows; and as the larvæ of certain beetles (*Homalia*) closely related to *Acrulia* are known to prey upon other Scolytid larvæ, it is most probable that the species in question lives on the grubs of its hypothetical host *Trypodendron*. Of this species Ganglbauer (*Die Käfer von Mitteleuropa*) says "North and Central Europe, under tree bark and in damp rotten wood; tolerably rare," whilst Canon Fowler (Brit. Col., vol. ii., p. 424, pl. lxx., fig. 2) records it "under bark; very rare; Northumberland district, Ravensworth woods (J. Hardy); Scotland, very rare, Tay and Tee districts; a very few specimens have been taken, for one of which I am indebted to Mr. J. J. King, of Glasgow, who kindly gave me one of his only pair." In June, 1890 (Ento. Mon. Mag., vol. xxvi., p. 90), the late Mr. Blatch records taking four *Acrulia inflata* from under the loose bark of an elm lying in a wet place near Ludlow, this being our only southern record; whilst Mr. Black writes of taking two examples in June, 1903, near Newtonmore, Inverness-shire, from beneath the bark of a fallen Scotch fir, and the beetles in question appeared to be burrowing into the wood, which was in a very damp condition*. These two notes do not appear to confirm the idea of a relationship existing between *Acrulia* and *Trypodendron*, but it is significant that the Scotch specimens were found on the tree exclusively attacked by the Scotch *Trypodendron* (*T. lineatum*), and mayhaps in both cases *Trypodendron* was somewhere in the immediate neighbourhood. So, until we learn to the contrary, we are inclined to believe that this species as well as *Epuræa angustula* is parasitic on certain species of *Trypodendron*.

* It is only fair to report finding a single *Acrulia* this evening (7. ix. 06) from under the bark of a birch in a rather damp condition, and not attacked by *Trypodendron*; but on further search I found a *Trypodendron*-infested tree not far away from which I took both the *Epuræa* and *Acrulia*.

DERWENTHAUGH LAND IN DERWENT GUT.

OPENING ADDRESS OF TYNESIDE NATURALISTS'
FIELD CLUB WINTER SESSION,
22ND OCTOBER, 1901.

BY REV. ARTHUR WATTS, L.TH., F.G.S., F.R.G.S.,
RECTOR OF WITTON GILBERT.

The twelve borings on Derwenthough in the Gut of the Tyne-Derwent were begun, on behalf of the Consett Iron Company, by Mr. F. Coulson, on the 25th August, 1900, and were completed on the 2nd April of the present year. The particulars of this work are in my hands by the kindness of Mr. Wm. Logan, of Stobbilee, Langley Park.

The borings are in three groups, 300 feet apart, each hole in each group being 220 feet from its neighbour. The area therefore made known is 44,000 square yards. Each group is at right angles to the present bed of the Tyne, and may be conveniently referred to as the Western, Middle, and Eastern groups.

The Western Group consists of the holes numbered on the plan, accompanying this paper, 1, 2, 3, and 4. They are respectively 160-ft., 161-ft. 1-in., 116-ft. 9-in., and 119-ft. deep; and pass through alluvium respectively in 149-ft. 6-in., 124-ft. 8-in., 115-ft. 3-in., and 116-ft.

The Middle Group consists of the holes numbered 5, 6, 7, and 8, and were to the several depths of 138-ft. 6-in., 135-ft., 132-ft. 6-in., and 122-ft. 6-in., passing through the alluvium in 136-ft., 132-ft. 10-in., 129-ft., and 118-ft. 6-in.

The Eastern Group consists of those numbered 9, 10, 11, and 12, and were 121-ft., 112-ft. 10-in., 129-ft., and 117-ft. 2-in., reaching rock at 118-ft. 6-in., 112-ft., 126-ft., and 114-ft. 1-in. respectively. For fuller detail see appendix.

These reveal a trough passing in a meandering way through numbers 1, 5, and 11 at depths 149-ft. 6-in., 136-ft.,

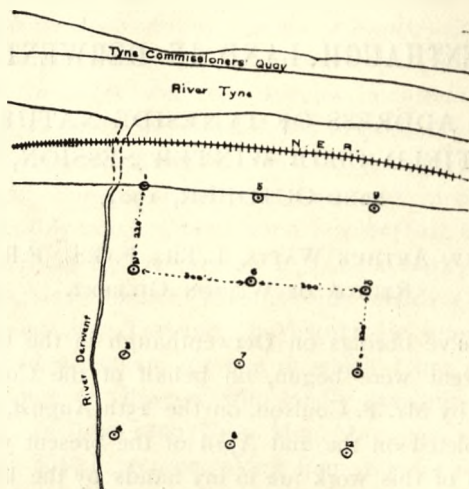


FIG. 1.—Plan of the borings at Derwenthaugh.

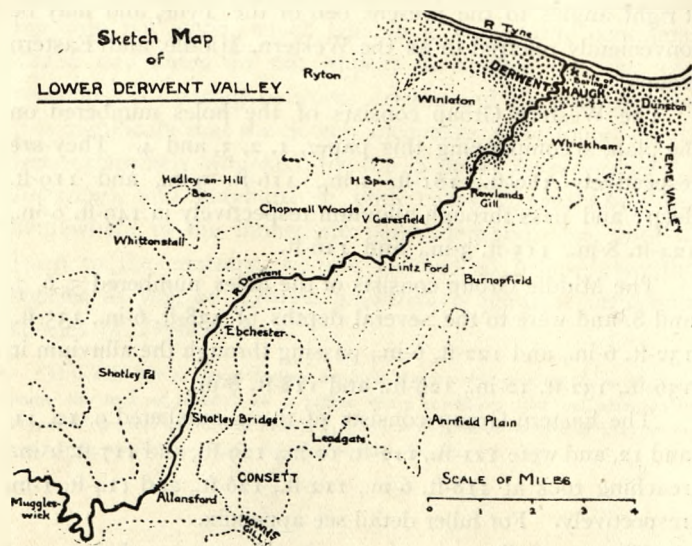


FIG. 2.

and 126-ft., with slope toward the Tyne westwardly, and reveal part of an olden mouth of the Derwent, which ended then as now in the Tyne, somewhere N.W. of No. 1 hole, and deeper than 150-ft. below the present surface, which is only 6-ft. above high-water mark at the present day in that river. This trough was about 3 fathoms deep, and can be traced upwards through the varying deposits, thus linking past and present.

These 12 borings, therefore, place beyond all doubt the facts that the Derwent has followed roughly its present course for a very long period, and did so at a time when the surface was at least 150-ft. higher than it is now—that it subsequently filled up the rock-bed with the present alluvial deposits in consequence of a gradual sinking of the whole N.E. coast in this neighbourhood. Nay, these borings do much more than this, for the alluvium is not uniform; its character changes several times most markedly and apparently abruptly, and in these changes reveals to us climatal and surface variations, thus preserving to us a record, which once read extends the history of Derwent-dale back many centuries, probably many thousands of years, and with it the history of the Tyne; takes us back in fact to the earlier and most energetic ages of the last Glacial period, for ice, so far as we know, is the only physical agent capable of scooping out such a rock-bed as is revealed here in Derwent Gut; and running water is the only agent likely to have filled that Gut up with its present alluvium.

The deposits in Derwent Gut fall into six natural groups as follows :—

1. Soil with average thickness nearly 2-ft. 2-in., maximum 4-ft., and minimum 1-ft. 2-in.
2. River Muds and Peat, average 35-ft. 6-in., maximum 44-ft., and minimum 28-ft. 2-in.
3. Hard Gravel and Sand, average 9-ft., maximum 14-ft. 2-in., and minimum 2-ft. 4-in.
4. Brown Clay, average 64-ft. 6-in., maximum 88-ft. 8-in., and minimum 54-ft. 1-in.

5. Sand, average 1-ft. 3-in., maximum 2-ft., and minimum 6-in.
6. Boulder Clay, average 13-ft., maximum 23-ft., and minimum 3 ft.

It is important to notice the differences between these maxima and minima.

The rock-bed is mostly in grey Carboniferous shale resting on white "post," as sandstones are locally called.

Carboniferous post forms the bed in holes 10 and 12, shale in all the others. When the ancient undisturbed Carboniferous strata are penetrated to any considerable distance there is evidence of a much more venerable denudation than this under consideration, in the presence in No. 2 hole of *gravel* mixed with grey shale below the ordinary grey shale, and over hard post and grey shale with post girdles.

Immediately above this shale and post lies a bed of hard boulder clay with an average thickness of 13-ft. In No. 12 hole an empty space of 6-in. was passed through, near the middle of this boulder clay. This open space is significant, as it may indicate the existence of life forms even in that inclement period.

Above the boulder clay rests generally brown clay with sand partings, mostly dry, but sometimes wet, and in No. 3 hole with a whinstone (basalt) boulder 1-ft. thick. In No. 10 hole this brown clay rests on a 2-ft. bed of sand, and in No. 1 hole on 6-in. of sand mixed with coal. This clay deposit has the great average thickness of 65-ft. 6-in., and seems identical with the Teme Valley or Birtley clay*. Geologists appreciate the presence of the whinstone boulder more than the sinker did.

The absence of this bed of sand in 10 out of the 12 holes is very significant, for it clearly indicates a very considerable

* The brown clay appears in holes Nos. 10 and 11 not only below but also *above* the gravel and sand. This may mean that the quiet conditions were interrupted towards the close of that period and again resumed, or it may be that the gravel and sand of these two holes is on a different horizon to the gravel and sand of all the other holes. In either case considerable denudation is indicated, and the evidence becomes valuable.

denudation, so that a large period of time parts the two lower clay deposits, the boulder clay and the Birtley brown clay.

Above this brown clay comes a bed of wet hard gravel and sand of an average thickness of 8-ft. 8½-in., parting the great clay stratum from another of soft blue clay and river mud with average thickness 33-ft., and above which lies a yellow clay and surface soil of an average thickness of 5-ft. 2-in. This gravel and sand deposit shows variations which indicate just as we might expect, shifting currents, in first, the *rough* gravel and sand of No. 9 hole; in second, the *very rough* gravel and sand of No. 6 hole; in third, the gravel without sand of No. 12 hole; in fourth, the 6-ft. sand over the 6½-ft. gravel of No. 10 hole; and fifth, in the 3-ft. of loamy sand above the usual sand and gravel of No. 7 hole. In this upper bed of clay and river-mud appears, in all the holes except Nos. 1 and 5, a peat-bed of maximum thickness 6-ft. 9-in., and average thickness 4-ft. 3½-in., capping the bed.

Now here we have a succession of deposits of gravels and muds, and shall do well to remember that deposition of gravels points to times of energetic action and shallow waters, and muds to quiet times and deep waters. There were three such times of energetic action, one in the very beginning of the filling up of this rock-bed exceptionally active, for among the pebbles are many considerable boulders; and another between the boulder and brown clays; the third when the filling up work was two-thirds done and its energy was getting spent, for the stones here are true pebbles, such as we may find to-day in any of our river beds. There is considerable ground for believing that the first of these marks the beginning of the retirement, the second a genial interval, and the third the end of the retirement of the Glacial age in our county, and the presence of that whinstone boulder in No. 3 hole confirms this. The brown clay is therefore a Till.

In more quiet times, and with ameliorated climate, the upper soft clay was laid down, that bed which yet bears its last cap of verdure in the peat-bed which underlies the present soil some 5 or 6 feet.

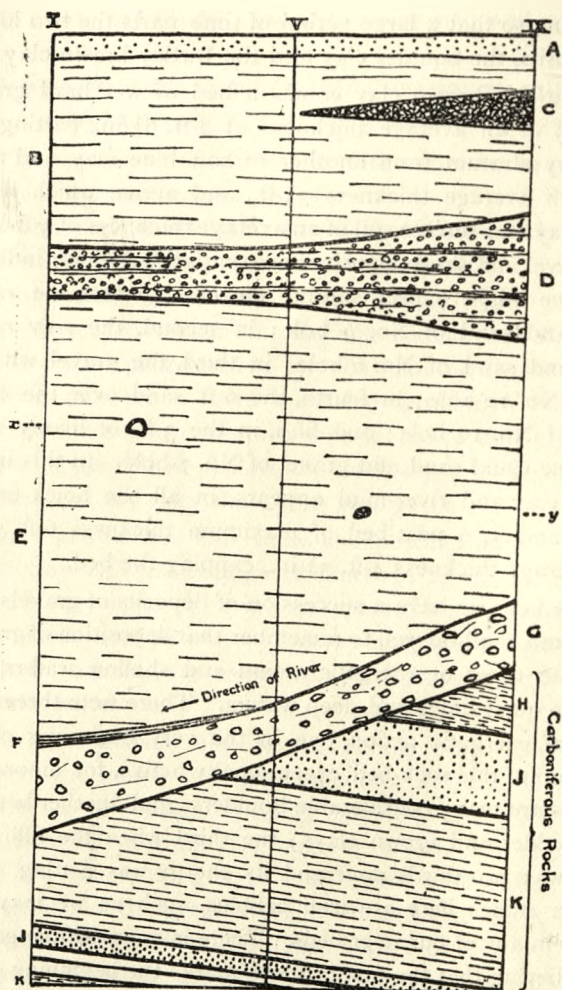


FIG. 3.—Section at the Derwenthaugh borings.

Present surface 6 ft. above high water. A. Soil and yellow clay. B. Brown clay and river mud. C. Peat. D. Hard gravel with sand and water. E. Brown clay with sand partings. F. 2-ft. sand bed with coal in No. X. G. Hard boulder clay. H. Grey shale. J. White post. K. Shale with post girdles.

x. Empty space (6 ins.) in No. XII.

y. Whinstone boulder (1 ft.) in No. III.

A close examination thus reveals the fact that these changes of surface level and of climatal conditions were not quite continuous, for much of the several deposits that were made were afterwards removed before the next deposit began. The times of deposition were separated by times of denudation, so that denudation has its say in the story as well as deposition, and the inevitable conclusion is forced on us that the general sinking of the surface was broken by stationary periods. Such stationary periods have produced the irregularity which marks the upper face of the boulder clay, whose base or lower face is of wonderfully uniform slope, as the following figures show. And the same holds good for the hard gravel and sand, and also for the peat-bed.

BOULDER CLAY.

Western Group.			Middle Group.			Eastern Group.		
fths.	ft.	ins.	fths.	ft.	ins.	fths.	ft.	ins.
24	5	6	22	4	0	19	4	6
20	4	8	22	0	10	18	4	0
19	1	3	21	3	0	21	0	0
19	2	0	19	4	6	19	0	1

HARD GRAVEL AND SAND.

Western Group.			Middle Group.			Eastern Group.		
fths.	ft.	ins.	fths.	ft.	ins.	fths.	ft.	ins.
7	3	4	7	5	0	8	2	4
7	4	8	7	3	9	8	2	0
7	3	0	7	3	4	8	1	0
7	2	11	7	1	5	8	0	4

Observe the decline in the slope as the Gut is filling up; in the boulder clay the fall is measured by fathoms, in the later time of the gravel and sand scarcely by feet.

The upper soft clay, with its yellow and brown clays, its river mud and loamy sand, and especially its loamy and mossy peat, belongs to comparatively recent times, and to conditions not much dissimilar to those now existing. Yet those times, even for the peat-bed, are most likely pre-historic, for that deposit suffered considerable denudation before the yellow clay, which overlies it, was dropped down, and considerable and uniform denudation demands time. The Peat

bed thins out towards the present Derwent mouth from 6-ft. 9-in. to 1-ft. 9-in., and towards the Tyne from 6-ft. 9-in. to 4-ft. 6-in. at No. 9 hole, whilst it is entirely removed from Nos. 1 and 5.

The yellow clay and soil, whose average depth is 5-ft. 2-in., of course belongs to recent times, and brings us up to date.

There is a good deal of prose in life, and still more perhaps in science, but here we have some of its poetry. Here, with the help of imagination, are a few layers of mud, and sand, and gravel, and peat, telling us a story of changes in the far past, that one might have thought had hopelessly receded out of human ken. Telling us that the Derwent flowed into the Tyne once upon a time, in the long ago, when the North Sea was perhaps unknown; when the Tyne itself was the tributary of a greater Rhine; when our two counties of Northumberland and Durham raised their heads hundreds of feet nearer the sky than they do to-day; and when the seasons were so different that life could scarce exist, for ice and snow reigned supreme, filling the lower valleys and wrapping the intervening plains in a cloak of glacial ice slowly making its way down the eastern slope like an irresistible plough, pushing before it all the earth's soft coverings, and laying the bones of the land bare. Further the cold grew in intensity and the ice in power, till deep furrows were ploughed in the bottoms of the valleys, in this case at least 144 feet below sea-level. How then a change came slowly and intermittently on; the furrows grew no deeper, and were channels now for ice, now for water; life came back, animal and vegetable, and conditions were once again as in the good old times, when water always flowed.

But meanwhile another mighty power had begun to make itself felt. The surface had begun gradually to fall and fall slowly but continuously inch by inch, century by century, till the old smooth floor was hidden under an ever-growing accumulation of mud, sand, and gravel, brought down by rain and storm from the upper reaches of the river, and simultaneously the sea invaded the plains of the North Sea,

submerging forests and sweet pastures, helping the climate to grow milder and milder, less and less extreme in character, till at last, once again, the seasons resumed their usual sway, and the sea attacked our coast line as it is doing at the present time.

These twelve borings place beyond all doubt :—

1st. That a Glacial age existed in our neighbourhood since the Derwent began to pursue its present course.

2nd. That the N.E. of England has sunk at least 150-ft. since that Glacial age began to depart; since the ice and water finished its direct work on the grey shale and white post that form the floor of Derwent Gut.

3rd. And if the brown clay is the Birtley clay, that the Derwent is so old a stream that it was a contemporary of the "ancient Teme," which has ceased to flow ages ago.

4th. That the stream, whose erosive work we see in Hown's Gill, is co-eval with the excavation of Derwent Gut, and ceased when the deposits that fill Derwent Gut began, so that the Gill is older than Derwenthaugh.

5th. It is highly probable that the Derwent and Teme belong to that interesting group of old rivers, of which the "Dunmail Raise" is another example in our Western neighbours, Cumberland and Westmoreland.

APPENDIX.

Record of the strata bored through in the several holes :—

No. 1.—Begun 25th August, 1900; finished 30th October, 1900.

Strata.	Thickness.			Depth.		
	fths.	ft.	ins.	fths.	ft.	ins.
1. Soil and brown clay	0	4	0	0	4	0
2. A soft blue clay (river mud)	5	4	0	6	2	0
3. Hard gravel (with sand and water)	1	1	4	7	3	4
4. Brown clay	8	2	8	16	0	0
5. Brown clay with a few thin sand-partings	6	2	0	22	2	0
6. Sand mixed with coal (water)	0	0	6	22	2	6
7. Hard boulder clay	2	3	0	24	5	6
8. Soft grey shale	0	3	0	25	2	6
9. (Into) White post (water)	1	1	6	26	4	0

No. 2.—Begun 5th November, 1900; finished 22nd December, 1900.

Strata.	Thickness			Depth.		
	fths.	ft.	ins.	fths.	ft.	ins.
1. Soil	0	2	8	0	2	8
2. Yellow clay	0	3	0	0	5	0
3. Loamy peat (water)	1	0	0	1	5	0
4. River mud	5	0	6	6	5	6
5. Hard gravel with sand (water)	0	5	2	7	4	8
6. Brown clay with loamy sand-partings	11	1	0	18	5	8
7. Boulder clay	1	5	0	20	4	8
8. Grey shale	0	5	8	21	4	4
9. Gravel mixed with grey shale	2	0	2	23	4	6
10. Hard post with water	0	1	3	23	5	9
11. Grey shale with post girdles	2	5	4	26	5	1

No. 3.—Begun 4th December, 1900; finished 22nd December, 1900.

Strata.	Thickness.			Depth.		
	fths.	ft.	ins.	fths.	ft.	ins.
1. Soil	0	2	8	0	2	8
2. Yellow clay	0	2	10	0	5	6
3. Mossy peat	0	2	0	1	1	6
4. River mud	3	5	4	5	0	10
5. Gravel and sand	2	2	2	7	3	0
6. Brown clay—sand partings	6	0	4	13	3	4
7. Whinstone boulder	0	1	0	13	4	4
8. Brown clay—sand partings	3	1	8	17	0	0
9. Boulder clay	2	1	3	19	1	3
10. Grey metal—(into)	0	1	6	19	2	9

No. 4.—Begun 22nd March, 1901; finished 2nd April, 1901.

Strata.	Thickness.			Depth.		
	fths.	ft.	ins.	fths.	ft.	ins.
1. Soil	0	2	0	0	2	0
2. Yellow clay	0	2	3	0	4	3
3. Mossy peat—water	0	1	9	1	0	0
4. River mud	5	2	0	6	2	0
5. Gravel and sand—water	1	0	11	7	2	11
6. Brown clay—sand partings	9	2	1	16	5	0
7. Boulder clay	2	3	0	19	2	0
8. Grey shale (into)	0	3	0	19	5	0

NOTE.—No water below gravel, No. 5.

No. 5.—Begun 22nd March, 1901; finished 2nd April, 1901.

	Strata.	Thickness.			Depth.		
		fths.	ft.	ins.	fths.	ft.	ins.
1. Soil		0	3	6	0	3	6
2. Yellow clay		0	3	6	1	1	0
3. River mud		4	5	0	6	0	0
4. Gravel and sand—water		1	5	0	7	5	0
5. Brown clay—sand partings		13	3	0	21	2	0
6. Boulder clay		1	2	0	22	4	0
7. Grey shale (into)		0	2	6	23	0	6

NOTE.—No water below gravel.

No. 6.—Begun 25th February, 1901; finished 18th March, 1901.

	Strata.	Thickness.			Depth.		
		fths.	ft.	ins.	fths.	ft.	ins.
1. Soil		0	1	6	0	1	6
2. Yellow clay		0	4	0	0	5	6
3. Mossy peat—water		0	1	3	1	0	9
4. River mud		5	3	6	6	4	3
5. Very rough gravel and sand—water...		0	5	6	7	3	9
6. Brown clay—sand partings—dry		7	4	3	15	2	0
7. Brown clay—sand partings—water		5	0	10	20	2	10
8. Boulder clay		1	4	0	22	0	10
9. Grey shale (into)		0	2	2	22	3	0

NOTE.—Water at No. 7 was very little, and did not rise in the hole.

No. 7.—Begun 27th December, 1900; finished 23rd January, 1901.

	Strata.	Thickness.			Depth.		
		fths.	ft.	ins.	fths.	ft.	ins.
1. Soil		0	1	6	0	1	6
2. Yellow clay		0	4	6	1	0	0
3. Mossy peat—water		0	4	0	1	4	0
4. River mud		3	4	0	5	2	0
5. Loamy sand		0	3	0	5	5	0
6. Sand and gravel—water		1	4	4	7	3	4
7. Brown clay—sand partings		10	0	8	17	4	0
8. Boulder clay		3	5	0	21	3	0
9. Grey shale (into)		0	3	6	22	0	6

NOTE.—Water from shale stands at 126-ft. from surface.

No. 8.—Begun 13th December, 1900; finished 19th January, 1901.

Strata.						Thickness.			Depth.		
						fths.	ft.	ins.	fths.	ft.	ins.
1. Soil	...	...	...	...	...	0	1	2	0	1	2
2. Yellow clay	...	...	...	...	...	0	2	0	0	3	2
3. Mossy peat	...	...	...	...	...	0	5	6	1	2	8
4. River mud	...	...	...	...	...	3	5	0	5	1	8
5. Gravel and sand	...	...	...	...	...	1	5	9	7	1	5
6. Brown clay—sand partings	...	...	...	...	...	9	0	1	16	1	6
7. Boulder clay	...	...	...	...	...	3	3	0	19	4	6
8. Grey shale (into)	...	...	...	...	...	0	4	0	20	2	6

No. 9.—Begun March 7th, 1901; finished March 22nd, 1901.

Strata.						Thickness.			Depth.		
						fths.	ft.	ins.	fths.	ft.	ins.
1. Soil	...	...	...	...	...	0	4	0	0	4	0
2. Yellow clay	...	...	...	...	...	0	4	6	1	2	6
3. Mossy peat—water	...	...	...	...	...	0	4	6	2	1	0
4. River mud	...	...	...	...	...	4	0	0	6	1	0
5. Rough gravel and sand—water	...	...	...	...	...	2	1	4	8	2	4
6. Brown clay—sand partings	...	...	...	...	...	9	4	2	18	0	6
7. Boulder clay	...	...	...	...	...	1	4	0	19	4	6
8. Grey shale (into)	...	...	...	...	...	0	2	6	20	1	0

NOTE.—No water in this hole below gravel.

No. 10.—Begun 12th February, 1901; finished 1st March, 1901.

Strata.						Thickness.			Depth.		
						fths.	ft.	ins.	fths.	ft.	ins.
1. Soil	...	...	...	...	...	0	2	0	0	2	0
2. Yellow clay	...	...	...	...	...	0	3	0	0	5	0
3. Mossy peat—water	...	...	...	...	...	0	5	0	1	4	0
4. River mud	...	...	...	...	...	4	0	0	5	4	0
5. Brown clay	...	...	...	...	...	0	3	6	6	1	6
6. Sand—water	...	...	...	...	...	1	0	0	7	1	6
7. Gravel—water	...	...	...	...	...	1	0	6	8	2	0
8. Brown clay—sand partings	...	...	...	...	...	9	3	0	17	5	0
9. Sand	...	...	...	...	...	0	2	0	18	1	0
10. Boulder clay	...	...	...	...	...	0	3	0	18	4	0
11. Grey post (into)	...	...	...	...	...	0	0	10	18	4	10

No. 11.—Begun 23rd January, 1901; finished 1st March, 1901.

	Strata	Thickness.			Depth.		
		fths.	ft.	ins.	fths.	ft.	ins.
1. Soil	...	0	1	6	0	1	6
2. Yellow clay	...	0	2	6	0	4	0
3. Mossy peat—water	...	1	0	0	1	4	0
4. River mud	...	3	5	0	5	3	0
5. Brown clay	...	2	0	0	7	3	0
6. Sand and gravel—water	...	0	4	0	8	1	0
7. Brown clay—sandy partings	...	10	1	6	18	2	6
8. Boulder clay	...	2	3	6	21	0	0
9. Grey shale (into)	...	0	3	0	21	3	0

No. 12.—Begun 5th February, 1901; finished 1st March, 1901.

	Strata.	Thickness.			Depth.		
		fths.	ft.	ins.	fths.	ft.	ins.
1. Soil	...	0	2	0	0	2	0
2. Yellow clay	...	0	1	3	0	3	3
3. Mossy peat—water	...	1	0	9	1	4	0
4. River mud	...	6	0	0	7	4	0
5. Gravel water	...	0	2	4	8	0	4
6. Brown clay—sand partings	...	9	1	4	17	1	8
7. Boulder clay	...	0	5	10	18	1	6
8. Open space	...	0	0	6	18	2	0
9. Boulder clay	...	0	4	1	19	0	1
10. Grey post	...	0	1	1	19	1	2
11. Grey shale	...	0	2	0	19	3	2

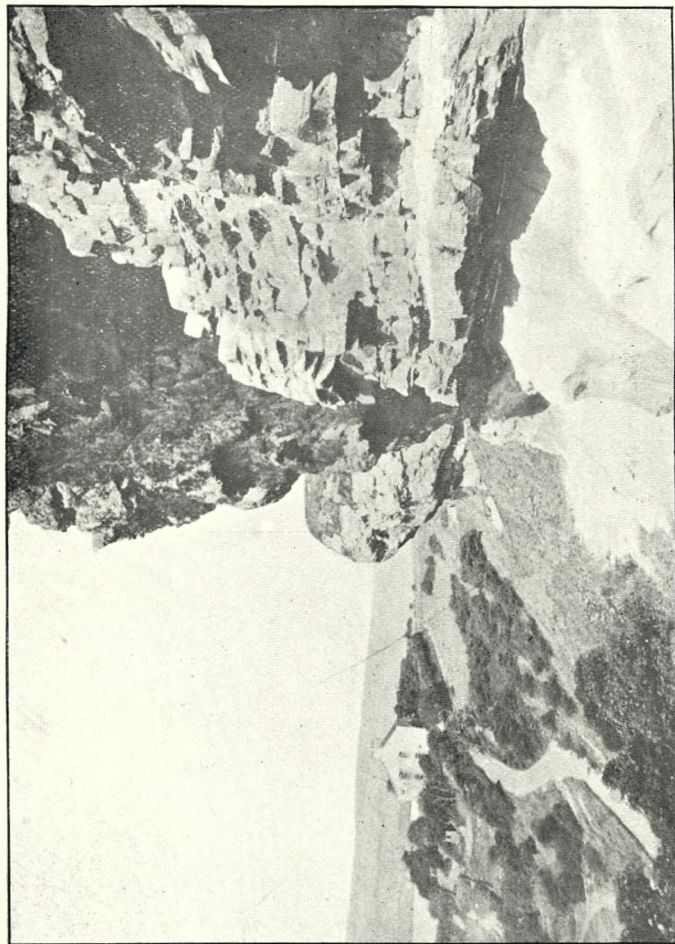
The Landslip at Claxheugh, Co. Durham, September, 1905.

By DAVID WOOLACOTT, D.Sc., F.G.S.

On the 15th of September, 1905, a landslip occurred at Claxheugh, which is an escarpment of Permian rocks situated by the side of the river Wear, about two miles to the west of Sunderland. An explanation of the interesting and peculiar section exposed there, was given by the present writer in a former volume of the Transactions of the Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne (vol. xiv., pt. ii., 1903), and as the causes of the landslip are primarily due to certain phenomena described in that paper, it seems proper that a short description of it should appear in these Transactions.

The section at Claxheugh is about 100 feet high, and is built up of four distinct layers of rock. Its base is composed of the soft, incoherent, and easily-weathered Yellow Sands, of which about 60 feet are exposed, and which has been denuded both by man and natural eroding forces, the upper strata having been thus continuously undermined. At the western end of the section the Marl Slate rests on the Yellow Sands, and it is in turn overlaid by the regularly-bedded Magnesian Limestone (Lower Magnesian Limestone of Howse). The whole of the upper part of the section consists of a hard, durable, compact, crystalline, unbedded and fossiliferous limestone, which is the lower division of the Middle Magnesian Limestone of Howse. It formed—until the landslip occurred—a bold, jutting-out crag along the entire length of the upper portion of Claxheugh.

The peculiarity of the section was that the two middle layers—the Marl Slate and the regularly-bedded Magnesian Limestone—did not extend along the whole of the escarpment, being absent from the eastern end under rather peculiar



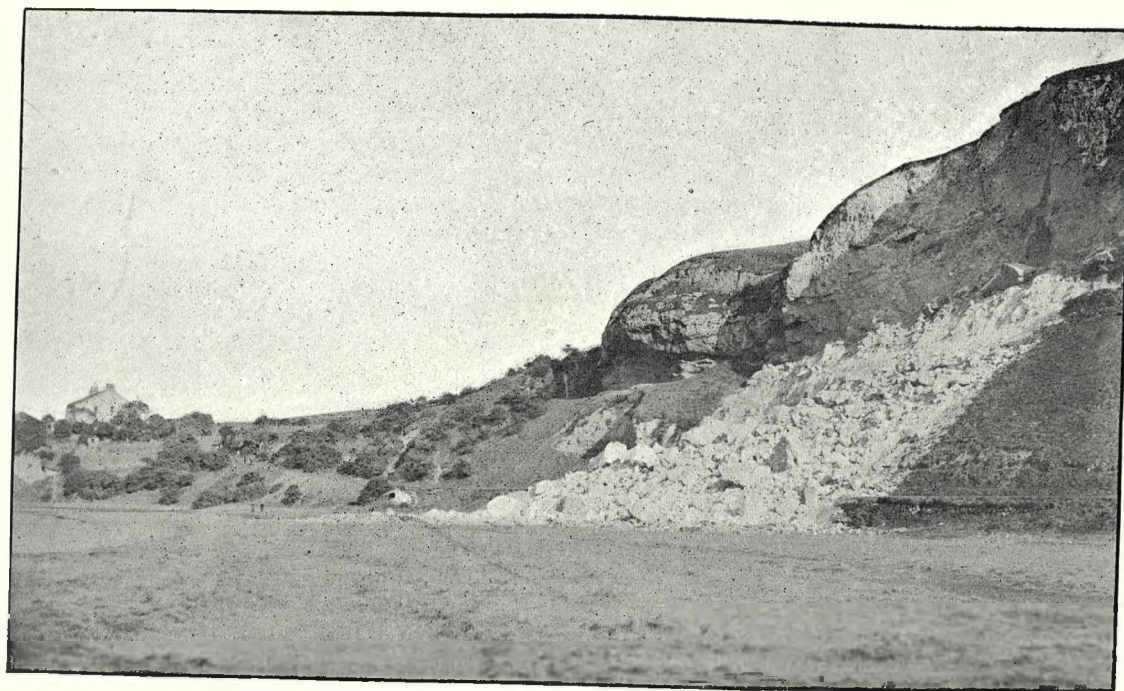
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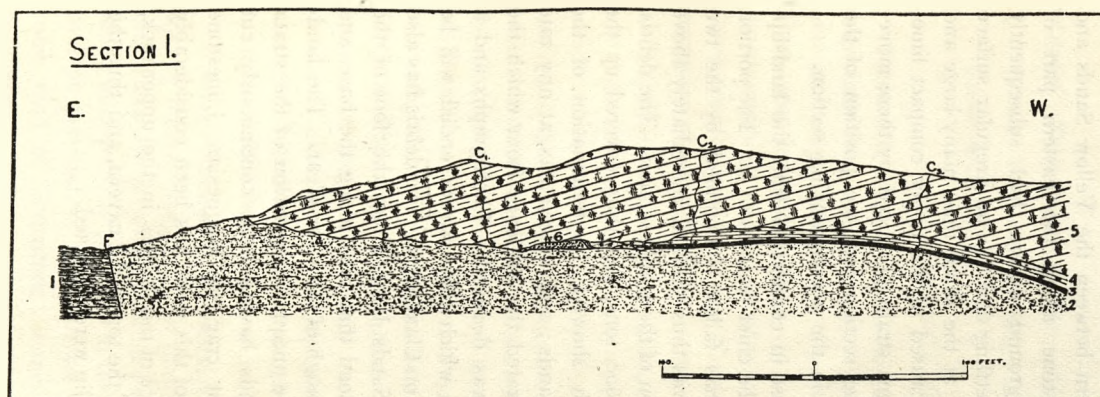
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Photograph of Claxheugh before the occurrence of the landslip.

1. Yellow Sands.
2. Marl Slate.
3. Regularly bedded Magnesian Limestone.
4. Fossiliferous, unbedded Magnesian Limestone.



Photograph of Claxheugh after landslip, September, 1905.



Section I.

SECTION OF CLAXHEUGH ROCK.

1. Coal Measures. 2. Yellow Sands. 3. Marl Slate.
 4. Compact, regularly-bedded Magnesian Limestone.
 5. Shell Limestone, unbedded. Middle Magnesian Limestone.
 6 and 7. Broken masses of Limestone and Breccia.
 b. Piece of Compact Limestone. a. Puckerings in Yellow Sands. F. Fault. C1, C2, C3, Cracks.
 The part of the Middle Magnesian Limestone which fell lies between the fissures C1 and C2.
 The lines representing the Shell Limestone No. 5 are conventional, and do not indicate bedding.

conditions. In the paper just referred to I proved that this was due to their removal subsequent to deposition, and that there had existed a cavern between the Yellow Sands and upper Magnesian Limestone along the eastern part of Claxheugh. This underground cavern had subsequently closed up, the limestone settling down on an irregular surface of the Yellow Sands; and at the same time many large and prominent fissures were caused in the upper compact limestone, due to the consequent strain produced by these movements. The nature of the section and the position of the cracks are clearly shown in the accompanying section.

The cracks are of interest in connection with the landslip, as they have determined the chief features of it. The portion of the upper rock that has fallen is bounded by the two fissures C 1 and C 2, and was thus situated immediately above the most interesting portion of the whole section. The debris, which amounts to over 600 tons, has thus covered up the peculiar exposures which showed the termination of the Marl Slate and Yellow Sands; and indeed has, at any rate for the time being, obliterated the evidence from which the existence of the cavern was deduced. Photographs and a section of the manner in which these strata ended will be found in my former paper on Claxheugh. The debris has also covered up the Yellow Sands lying along the foot of the section, blocked up the road that runs along the base, and spread far out over the haugh of the river Wear. The landslip is primarily due to the unequal denudation of the strata exposed, the Yellow Sands having been continuously cut away and the prominent crag of Magnesian Limestone formed, but the influence of this work has been considerably augmented by the existence of the fissures in the upper rock, caused by the falling in of the top of the cavern, and thus the main features of the landslip were predicted.

Larval Trematodes of the Northumberland Coast. By
MARIE V. LEBOUR, B.Sc. (Armstrong College, New-
castle-upon-Tyne).

(Plates IX.-XIII.)

Trematodes have been much neglected in this country, especially the younger stages. This is a curious fact, since one has only to examine a few of the commonest Mollusca from some favourable locality to find these larval Trematodes in abundance. So far as I know no digenetic Trematodes have been recorded for the Northumberland coast with the exception of a few larval forms recently described by myself*.

It is, however, not only in Northumberland that Trematodes are little known, but all over Great Britain, and one could almost count on one's fingers the larval Trematodes hitherto noticed in this country. It seems therefore that there is a real need for workers in this field, and whilst investigating the Northumberland mussel beds I have tried to find out as much as possible about the larval Trematodes, my work giving me exceptional opportunities for the purpose, especially on Fenham Flats near Holy Island. The younger stages, *i.e.*, sporocysts and rediæ, with enclosed cercariæ, occur in Mollusca exclusively. Independent encysted cercariæ are also often found in these, although almost any other invertebrate, or even a fish, may serve as hosts for them.

Although numerous Trematodes are to be found, it is not by any means every mollusk that is infested. For instance, out of 200 *Purpura lapillus* from Fenham Flats only two were found to have these parasites in them†, but on the other hand over 60 per cent. of *Paludetrina stagnalis* were infested by some kind of Trematode; sometimes two species in one specimen.

* See Northumberland Fisheries Report for 1904-5.

† See Annals and Magazine of Natural History, January, 1907.

To show how many there are to be found I give here a list of Mollusca, with the number of species of Trematodes infesting them. Up to the present I have noted 18 species of Trematodes, some of which occur in more than one kind of mollusk. Probably many more will be discovered hereafter, for besides those inhabiting Mollusca, many encysted cercariæ occurred in Crustacea; for instance in the common barnacle *Balanus balanoides*, the green crab *Carcinus mænas*, and *Cerophium grossipes*, details of which will, I hope, be given in a later paper.

MOLLUSCA INFESTED BY TREMATODES.

<i>Cardium edule</i> ...	...	5 species of Trematodes.	
<i>Mytilus edulis</i> ...	...	3	" "
<i>Macoma balthica</i> ...	...	3	" "
<i>Mya arenaria</i> ...	...	1	" "
<i>Scrobicularia tenuis</i> ...	...	1	" "
<i>Tellina tenuis</i> ...	...	1	" "
<i>Donax vittatus</i> ...	...	1	" "
<i>Littorina littorea</i> ...	...	2	" "
<i>L. rudis</i> ...	...	1	" "
<i>L. obtusata</i> ...	...	1	" "
<i>Purpura lapillus</i> ...	...	1	" "
<i>Buccinum undatum</i> ...	...	1	" "
<i>Paludestrina stagnalis</i> ...	...	6	" "

This list includes most of the commoner Mollusca of this coast.

The liver is the most usual place for sporocysts and rediæ (as in *Littorina littorea*, *L. rudis*, etc.*), but often the reproductive organs are infested (as in *Cardium edule*†), or the kidney (as in *Littorina littorea*‡), or it may infest the whole animal (as *Bucephalus haimænanus* in the cockle§). Encysted cercariæ may occur in any part, but frequently seem to prefer the foot (*Echinostomum leptosomum* in *Scrobicularia tenuis* and

* Northumberland Fisheries Report for 1905.

† Annals and Mag. Nat. Hist., Jan., 1907.

‡ Lespès, Annales des Sciences Naturelles, Sér. IV., Tom 7, 1857.

§ Lacaze-Duthiers, Ann. des Sci. Nat., Sér. IV., Tom 1, 1854.

Echinostomum secundum, Nicoll, from the cockle and mussel‡). In the Crustacea almost any part of the body seems to be suitable. In *Carcinus menas* they have been found in the nerve sheaths, the digestive organs, etc.,|| and in certain amphipods almost the whole of the inside of the body is crowded with them.

Seven larval forms are here described, six of which are from *Paludestrina stagnalis*, Basterot, or as it is more commonly called *Hydrobia ulvæ*, Penn. Two of these belong to the genus *Monostomum*, and the others appear to be *Distoma* of various subgenera. One which I have provisionally named *Cercaria ubiquita* on account of its occurring in three different species of Mollusca, I am somewhat doubtful about, as I cannot find any ventral sucker. I place this form for the present under *Distomum*, as it bears such a strong resemblance to *Cercaria microcotyla* of Filippi, which has a very small and inconspicuous ventral sucker. It is also like *C. virgula*, Filippi*. I have given provisional names for the sake of convenience to those cercariæ which I cannot find described. These are *Cercaria ubiquita*, *C. pirum*, and *C. oocysta*.

It is interesting to note that the cercaria which I believe to be *Echinostomum leptosomum*, Creplin, is extremely like the same stage in *E. secundum*, Nicoll. The arrangement of the organs is identical, and also the number of head spines; it is only by a slight difference in the lengths of some of these latter, and in the size of the animal that a distinction can be made, yet the rediæ from which these two species are developed are absolutely dissimilar.

Another interesting fact is the occurrence of the Trematodes *Monostomum flavum*, Mehlis, and *M. lophocerca*, Filippi, in *Paludestrina stagnalis*, which, although fond of brackish water, is here distinctly marine, being covered by the tide twice a day for several hours. The few freshwater streams which flow into the sea do not occur just at this point,

‡ Villot, Ann. des Sci. Nat., Sér. VI., Tom 8, 1879, and Nicoll, Ann. and Mag. of Nat. Hist., Jan., 1906.

|| McIntosh, Journal of Microscopical Science, V., N.S., 1865, p. 201.

* Filippi, "Mém. p. servir à l'histoire génétique des Trématodes," Turin, 1851-5.

although they are not far off. The usual molluscan host for *M. flavum* is *Planorbis corneus*, and that for *M. lophocerca* is *Bythinia tentaculata*, both true freshwater Gastropods.

The specimens of *Paludestrina stagnalis* in which these Trematodes were found, were collected from the muddy sand opposite Holy Island, quite close to Beal. Here they live in pools uncovered by the tide for about eight hours a day. They are quite the commonest mollusks in that part, and must serve largely as food for birds, and most probably also for fish.

Whilst at Stranraer in August and September, 1906, I took the opportunity of observing such Trematodes as were easily obtainable from the common mollusks on the shores of Loch Ryan. *Paludestrina stagnalis* is one of the common shells of the muddy flats left uncovered by the tide on the east side of the Loch, and in specimens from there I found five of the six Trematodes now described from Fenham Flats. As the proportion of the different species varied considerably in the two localities, it may be useful to compare them.

It is not unusual for one individual mollusk to harbour several different Trematodes at the same time. It is even stated that one of the common Paludinas has been known to contain as many as nine species at once. In *Paludestrina stagnalis* not more than two species were found together, viz., *Echinostomum leptosomum* and *Cercaria oocysta* most frequently in the Fenham Flats specimens, and *C. ubiquita* and *C. lophocerca* at Stranraer.

The Trematodes here described are the following:—

From *Paludestrina stagnalis*:

Monostomum flavum, Mehlis.

Monostomum (*Cercaria lophocerca*, Fil.).

Cercaria ubiquita.

C. pirum.

C. oocysta.

Echinostomum leptosomum, Creplin.

From *Cardium edule*:

Bucephalus haimeanus, Lacaze-Duthiers.

MONOSTOMUM FLAVUM, Mehlis (larval form). In the liver of *Paludetrina stagnalis* a larval Trematode occurs in yellow rediæ, which I believe to be identical with the *Cercaria ephemera* of Siebold* and the *Glenocercaria flava* of Diesing†, which was found in *Planorbis corneus*. The adult worm lives in different species of duck, although La Valette succeeded in experimentally infecting the House-sparrow with it‡. The ducks known to serve as hosts are the following:—Eider Duck, *Somateria mollissima* (L.); Velvet Scoter, *Oedemia fusca* (L.); Scaup, *Fuligula marila* (L.); the Smew, *Mergus albellus* (L.); and the Red-breasted Merganser, *Mergus serrator*. The worm occupies the trachea, œsophagus and thoracic cavity. The Eider Duck is a resident on the Northumberland coast, and all the others are winter visitants, so any of them may easily be the final host of this cercaria from Fenham Flats, which is a great feeding place for ducks and other wild fowl.

These larval Trematodes were found in November, 1906, from specimens of *Paludetrina stagnalis* from Fenham Flats, near high-water mark, in pools left uncovered by the tide. The liver was full of the rediæ, from which many cercariæ had escaped and were moving about very quickly, continually lashing their tails and contracting and expanding their bodies. The redia (see Plate IX. A) is pale yellow with a dark brown intestine, and is furnished with a good sized anterior pharynx. It is very transparent and contractile, and is somewhat irregularly fusiform in shape. The enclosed cercariæ are easily seen through the transparent walls of the redia, which may hold one or several in different stages of development. The cercaria (see Plate IX. B and C) is very opaque with a brownish tinge, and is speckled more or less with dark brown. There are three eyes arranged in a triangle, but the most anterior eye is not developed until after the others, a fact

* "Ueber die Band- und Blasenwürmer," 1854, p. 18-19, fig. 1-9.

† "Berichtigungen und Zusätze zur Revision der Cercarien," 1858, p. 8.

‡ La Valette "Symb. ad Tremat. evolut. historiam," 1855, fide J. J. Moulinié,

"De la Reproduction chez les Trématodes endoparasites," 1856, p. 207.

already observed in connexion with this species by Siebold*. The eyes are surrounded by many speckles, and are dark and conspicuous. In shape the cercaria is sometimes oval and sometimes shield-shaped, and by contraction becomes perfectly spherical (see Plate IX. C). At the posterior end of the body each side is drawn out slightly above the tail, so that this end is angular instead of rounded. At each of these angles is a peculiar sucker-like structure which does not seem to have been noticed before (see Plate IX. B, s); it is very small with a circular outline, and divided in two by a transverse bar. This reminds one of the small suckers round the posterior end of some of the Heterocotyleans which are ectoparasitic on the gills of fish (e.g., *Octobothrium melangi*, Kuhn, from the gills of a whiting), and is interesting, as it may help to throw light on the origin of the Malacotylea. Two excretory ducts full of granules run down the sides of the body, beginning at the hinder pair of eyes, and unite further down in a clear sac with a posterior opening. The oral sucker is large, and opens at the extreme anterior end; it leads into a very inconspicuous intestine, bifurcating just below the anterior eye, the lobes extending nearly the whole length of the body. The tail is colourless, long when extended, and very active and contractile. It easily drops off, and continues lively for long after its separation from the body. The cercaria measures about 0.40 mm. in length with its tail when not much extended, but it may be a good deal longer; without the tail it is, when at rest, about 0.24 mm. long (Moulinié's measurements†—total length 0.8 mm. to 1 mm., body 0.20–0.50 mm.).

This Trematode was found in about 6 per cent. of the individuals of *Paludetrina stagnalis* from Fenham Flats in November, and at Stranraer in August in 20 per cent. of the same mollusk. This is an interesting addition to the British fauna, and specially so because it is now seen to live in a larval state, not only in purely freshwater Gastropods, but also in brackish water species which are covered regularly

* "Ueber die Band- und Blasenwürmer."

† "De la Reproduction chez les Trématodes endoparasites," Mém. de l'Institut Genevois, Tom. III., 1856.

twice a day by the sea. The fact that the ducks in which the adult may be found commonly come to feed on these flats in the winter, makes it quite natural to find the larval forms in the common mollusks of the flats.

MONOSTOMUM (CERCARIA LOPHOCERCA, Filippi). This peculiar cercaria (see Plate X., B, C, D), which appears to be the same as that found by Filippi in *Paludina impura*, i.e., *Bythinia tentaculata*†, is very common in the liver of *Paludetrina stagnalis* from Fenham Flats, and fairly common in these shells from Loch Ryan. It is contained in long colourless rediæ (see Plate X. A), which have a small yellowish-brown intestine, and the body alternately swollen and constricted. The cercaria is only described very briefly by Filippi, but he mentions the two eyes and the longitudinal membranous crest ("crête") with which the tail is furnished, and also figures the beginning of a reproductive system which I have not succeeded in observing. He gives no measurements. My specimens are small, the cercaria without the tail measuring 0·13 mm. long; the tail when extended being more than three times the length of the body. Two dark eyes are very conspicuous, and there is a large oral sucker opening at the extreme anterior end. Two large opaque glands occupy most of the body in the more fully developed specimens, and four ducts run from these to open by the side of the mouth. There is a large semilunar excretory sac posteriorly, and directly behind this the tail begins. The body in the oldest specimens is covered with minute spines. The tail is very long and contractile, and bears the peculiar membranous fin or "comb" which is excessively thin and delicate, and seems to be strengthened by setæ; since when the membrane is destroyed (which is frequently the case) a few setæ sometimes remain. This tail is extraordinarily active, and lives for a long time without the body, from which it is easily detached. By aid of this tail the cercaria whizzes about with wonderful agility. In fresh specimens the shape can hardly be seen at all as the creature is incessantly in the most violent motion.

† Mem. d. Reale Acc. del Sci. Torino, 1859, p. 201.

Besides moving by means of the tail the worm is very contractile, and pushes out its oral sucker like a snout.

This form was found inhabiting 40 per cent. of the Fenham Flats specimens at the end of September, but only about 2 per cent. at the end of November. This seems to indicate that this species as a rule migrates into another host well before the winter sets in. In the Stranraer specimens 15 per cent. contained this Trematode.

CERCARIA UBIQUITA (see Plate IX. D and E). In the liver of *Paludetrina stagnalis* at Fenham Flats and Stranraer, and also in the liver of *Littorina rudis* at Stranraer and *L. obtusata* at both localities, a small Trematode was found. As it occurred commonly, and in three different mollusks, I shall call this worm *Cercaria ubiquita*. It is found in oval sporocysts containing many cercariæ in different stages of development. The sporocysts (see Plate IX. D) measure about 0.3 mm. or more in length, and although apparently colourless when viewed alone, when crowded together have a pinkish tinge. The cercaria (see Plate IX. E) measures 0.12 mm. without its tail and 0.20 mm. with the tail. It is transparent and very active. The most conspicuous features are the "stacheldrusen," *i.e.*, large glands with long ducts opening near the single spine with which the head is armed. There are two ducts each side, which curve in a regular and exceedingly graceful way, and reach more than half way down the body where the glands appear as clear masses. The inner ducts are smaller, and are somewhat hidden further back, as they become overlapped by the outer ones. No posterior sucker could be made out, but there is a large circular oral sucker armed with the spine above mentioned, and opening at the extreme anterior end. A digestive apparatus is not visible, but there is a clear bilobed excretory sac at the posterior end. The tail is pointed and very contractile, coming off early and living for a long time separately. This worm occurred in 8 per cent. of *Paludetrina stagnalis* from Fenham Flats and 30 per cent. from Stranraer; in one *Littorina obtusata* out

of 50 from Stranraer and two out of six from Budle Bay, Northumberland; and in two out of 50 *Littorina rudis* from Stranraer. It has not yet been found in the Northumbrian *L. rudis*.

This species is very like *Cercaria microcotyla* described by Filippi, but his is much smaller (0.004 mm. in length, including the tail), and has two brown spots posteriorly. His specimens came from the freshwater mollusks *Paludina vivipara* and *P. achatina*. There is a small ventral sucker in his, and it seems likely that there is really one present in the species here described, though it is very difficult to see.

CERCARIA OOCYSTA (see Plate X. E, F, G). In the liver of *Paludetrina stagnalis*, both from Fenham Flats and Stranraer, a cercaria occurs, which from its oval cysts I shall call *Cercaria oocysta*. It is enclosed in thin walled sporocysts of no definite shape, and it encysts in these in colourless transparent oval cysts measuring 0.12 by 0.07 mm. The curious fact that the cercaria encysts in the same sporocysts in which it was developed was noticed by me in a Trematode occurring in *Cardium edule**, where tailed cercariæ were seen in the sporocysts at the same time as encysted forms. In the present case it is much the same, for unmistakably tailed cercariæ, although not fully developed, were found within the sporocysts along with those which had already encysted, and there were also separate bodiless tails wriggling about. The sporocysts with cercariæ are packed closely into the liver—the cercariæ occurring in hundreds. Many of the cysts appear to be free, the walls of the sporocysts having probably burst or been dissolved away. The cercaria lies curled up in the cyst, and when pressed out measures 0.24 mm. long. In shape it is a long oval, being about $3\frac{1}{2}$ times as long as it is broad. The anterior sucker measures 0.026 mm. across, and leads by a thin straight tube to a small pharynx which is almost midway between the oral sucker and the bifurcation of the intestine, but slightly further forward. The short lobes of the intestine

* Annals and Magazine of Natural History, Jan., 1907.

reach to about the level of the centre of the ventral sucker, which measures 0.019 mm. across. Two faint excretory canals run from near the anterior sucker and unite posteriorly in a pore. Some reproductive organs are present in the shape (first) of a penis sac (?) which appears to run in front of and open at the side of the ventral sucker, (secondly) of two round masses at the posterior end, presumably the vitellaria, and (thirdly) of a less conspicuous similarly shaped body slightly in front of these.

This Trematode is very common in the *Paludetrina stagnalis* from Fenham Flats, and occurs in 50 per cent. of these. It also occurs at Stranraer in about 2 per cent. I cannot find anything recorded about this and the following species, and think they have not been found before.

CERCARIA PIRUM (see Plate IX. F, G). In the liver of *Paludetrina stagnalis* another cercaria was found. It occurred encysted in 4 per cent. of the Fenham Flats specimens from October to December, 1906. From the way the cercariæ were packed in the liver I should think that they had encysted in sporocysts very much in the same way as *C. oocysta*, and that the walls of the sporocysts had dissolved, but no traces of these could be seen. The cysts and enclosed cercariæ are colourless and transparent, the cysts being spherical and measuring 0.08 mm. in diameter. The cercaria when pressed out carefully from the cyst is seen to be pear-shaped with a very broad flat base, and measures 0.20 mm. in length, the body being covered with small sharp spines, which are more conspicuous near the head, giving it a rough appearance. The anterior sucker is 0.026 mm. across, and the ventral sucker is about the same size, and occurs about three-parts of the way down the body. The oral sucker leads directly into a broad-lipped pharynx, from which a narrow and straight intestine runs to about the centre of the body, where it bifurcates into two short lobes, the ends of which are nearly on the same level as the posterior border of the ventral sucker. Two excretory canals run down from the sides of the oral

sucker, unite for a short space immediately behind the pharynx, separate again and finally open together in a posterior pore.

This Trematode was not found at Stranraer.

DISTOMUM (ECHINOSTOMUM) LEPTOSOMUM, Creplin (see Plate XI.). In the liver of *Paludetrina stagnalis* a species of Echinostomum is found. It occurs commonly in specimens from Fenham Flats, and also at Stranraer; more frequently in the former locality, 26 per cent. being infected there, whereas only two out of some hundred specimens occurred at Stranraer. This Trematode was found most plentifully in shells from the marshy pools above high-water mark, where there is a good deal of grass, but also in those from the pools left uncovered by the tide for several hours in the day.

The worm occurs in curiously shaped rediæ, which are a pale yellowish colour, gradually becoming colourless towards the posterior end. The smallest rediæ seen measured 0.2 mm. long, and the largest 1.4 mm. They were contractile and moved slowly, changing their shape constantly, and were full of cercariæ in different stages (see Plate XI. A, B, C). The cuticle is extremely thick, and the anterior part very much wrinkled up into grooves. A pharynx is conspicuous in young specimens, but an intestine could not be made out. This pharynx, however, in older examples sinks in, and only the anterior opening is clearly seen. A collar surrounds this anterior part, which is peculiarly flat and blunt. The full grown cercaria, which is tailed (see Plate XI. H), is from 0.4 to 0.5 mm. long without its tail (the latter being about 0.3 mm. long). In shape and structure it is extremely like the larval *Echinostomum secundum*, Nicoll, encysted in the cockle, mussel, and other bivalves, the younger stages of which I believe I have found in the common periwinkle *Littorina littorea**, and although this has not yet been proved by experiment, I still hold to that opinion. The size of the cercaria in the periwinkle is about 0.7 mm. long, and this agrees with those encysted in the cockles' and

* Northumberland Fisheries Report for 1905.

mussels' foot, the cercaria described here being a good deal smaller. It is also more transparent, and has a curious habit of bending backwards in a U shape with the ventral sucker exerted. *E. secundum* has 29 head spines arranged in a row round three parts of the head, two at each end being below the others, and these and the spine between them are smaller—long spines 0.025 mm. long†, and in the adult from *Larus ridibundus* they measure 0.050 mm.—0.053 mm., and the small spines 0.026 mm.‡ My specimens have 29 spines, but although the two end ones are arranged in the same way as in *E. secundum*, there is not much difference in the size—long spines 0.019–0.02 mm., short spines 0.016 mm. With these exceptions to describe one is to describe the other. The cercaria has a long body with a heart-shaped head bearing spines, and a large oral sucker 0.030 mm. across (*E. secundum* 0.065 mm.), this leads by a thin tube to a pharynx 0.026 mm. long by 0.016 mm. broad (*E. secundum* 0.05 by 0.03 mm.), and from this a narrow œsophagus runs down to nearly the centre and bifurcates, each lobe reaching nearly to the posterior end. Just below the bifurcation there is a large ventral sucker 0.046 mm. across (*E. secundum* 0.095 mm.). Excretory canals begin in two curves near the head and running down the sides, branching frequently, open into an excretory sac with a posterior pore. The canals are filled with clear granules. The tail is simple and very contractile, separating from the body at the slightest touch, and remaining active for some time. Two ducts, one each side of the oral sucker, are to be seen in both cercariæ before encysting; they appear to come from glands down the sides, and probably contain the material for the cysts, as they are not to be seen in the encysted forms. In the cercaria from *Paludetrina stagnalis* there are several small ducts running straight along the anterior sucker and opening anteriorly near the oral aperture (see Plate XI. J); these do not disappear in any of the encysted cercariæ I have seen. The cercaria moves by

† Nicoll, Ann. and Mag. Nat. Hist., Jan., 1906, p. 152.

‡ Nicoll, Ann. and Mag. Nat. Hist., June, 1906, p. 516.

violently shaking its tail, and then contracting and elongating its body. The body is covered with small backwardly directed spines for about two-thirds of its length from the neck downwards. In one specimen of *Paludetrina* this cercaria was found encysted all among the rediæ and tailed cercariæ, but it is also to be found encysted in the foot of the little bivalve *Scrobicularia tenuis* (Mont.). This is a small white shell living amongst weed and sand in the flats uncovered by the tide at low water. It is very abundant on Fenham Flats, and occurs with *Paludetrina stagnalis*. The cysts are 0·12 mm. across (*E. secundum* 0·21–0·25 mm.), with a thin wall of two layers, and are perfectly transparent, showing the larva curled up inside. This encysted cercaria agrees almost exactly with that described by Villot as *Cercaria leptosoma*, the larva of *Distoma leptosoma* which he found in the adult state in the Dunlin *Tringa alpina*. He found this encysted in the foot of *Scrobicularia tenuis**, measuring 0·110 to 0·120 mm. across, pharynx 0·020 by 0·006 mm., oral sucker much smaller than ventral, length of head spine 0·020 mm., agreeing fairly well with my measurements except in the breadth of the pharynx, which is greater in the present specimens. Villot has followed the development of this worm from *Scrobicularia tenuis* to the intestine of the Dunlin and up to its adult stage. The ventral sucker in his figures of the adult worm is much higher up than in my larval forms, and the pharynx narrower. The position of the ventral sucker in Villot's encysted Trematodes is not referred to by him, only a very brief description being given. I believe my specimen to be *Distomum* (*Echinostomum*) *leptosomum*, Creplin, and if this be the case, the life history of this Trematode is complete:—

Distomum (*Echinostomum*) *leptosomum*, Creplin.

First Host.	Second Host.	Final Host.
<i>Paludetrina stagnalis</i> .	<i>Scrobicularia tenuis</i> or encysts in <i>Paludetrina stagnalis</i> .	Dunlin <i>Tringa alpina</i> .

* Villot, Ann. des Sc. Nat., Zool. 6 sér., Tom. 8, 1899.

It is a curious fact that there should be two cercariæ so very much alike, but apart from the measurements the difference in the rediæ would prove them to be different species. In what I believe to be the first stage of *E. secundum* in *Littorina littorea* the rediæ are bright orange, with a conspicuous brownish red intestine; in those from *Paludetrina stagnalis* the rediæ are pale yellow or colourless, and have no conspicuous intestine. In the Turnstone *Streptilas interpres* from Beadnell I have found a species of Echinostomum (see Plate XII.) which is almost certainly the adult of the cercaria described above, young forms almost exactly corresponding to it being found in the intestine along with the adult forms. Unfortunately the spines could not be exactly made out, as the specimens were not quite fresh. Although this worm does not agree fully with the description of *Distomum leptosomum* in every particular, yet I believe it to be this species, possibly a variety. The worm has a broadly heart-shaped head surrounded by spines. A small anterior sucker is followed by a short tube and a thick-lipped pharynx, this leads to a straight intestine bifurcating just above the large ventral sucker. Excretory tubes begin in the head, are very much branched, and end in the excretory pore at the extremity of the body. Two large oval testes are plainly seen at the posterior part, one in front of the other, a rather dense ovary in front of these, and a twisting oviduct full of clear oval eggs. The vitelline glands are dense and take up the greater part of the body. The genital aperture is just above the ventral sucker, the penis sac and vesicula seminalis being plainly seen. The body is covered with spines for about two-thirds of the way down, and the further back these go the more conspicuous they become, forming transverse lines. The worm is much longer than those described by Villot, but beyond the ventral sucker it is usual for the species of Echinostomum to elongate greatly. A more serious difference is the position of the ventral sucker, which is situated much further down than is shown in Villot's figures; and this is also the case with the cercaria above described.

In the following table measurements are given of the two worms, which agree fairly well.

			<i>Distomum leptosomum</i> , Villot.	<i>Distomum</i> (<i>Echinostomum</i>).
			From Dunlin.	From Turnstone.
Oral sucker	...	...	0.056 mm.	0.06 mm.
Length of pharynx	...	...	0.064 mm.	0.06 mm.
Breadth	„	...	0.024 mm.	0.049 mm.
Ventral sucker	...	...	0.200 mm.	0.26 mm.
Egg	...	...	0.080 × 0.050 mm.	0.080 × 0.052 mm.
Testis	...	...	0.400 × 0.200 mm.	0.60 × 0.26 mm.

BUCEPHALUS HAIMEANUS, Lacaze-Duthiers (see Plate XIII.). This peculiar cercaria has long been known, but it appears few have found it in Britain, the only record I know being in the Report of the Lancashire Sea Fisheries Scientific Investigations for 1904, "Internal Parasites and Diseased Condition of Fishes," by James Johnstone, B.Sc. In this paper a *Bucephalus* larva from *Cardium edule*, "probably *B. haimeanus*," is mentioned (p. 106-7). It is satisfactory to be able to record it for Northumberland, although only one specimen of the cockle *Cardium edule* infested with the parasite was found. This was from the Mussel Scaup, Holy Island, which forms part of Fenham Flats, and as the oysters kept by Lord Tankerville are planted there, it is very probable that the cockle was infected by reason of its proximity to these. This worm is a well known parasite of the oyster, and Lacaze-Duthiers* describes it from that mollusk as well as from *Cardium rusticum*, a cockle closely resembling *C. edule*, but larger. Huet† also found it in *C. edule*. A full and detailed account of its life history in America has been published by Mr. David Hilt Tennant‡. The author in this work shows that *Bucephalus haimeanus* is the larval form of *Gasterostomum gracilescens* (Rnd.), inhabiting the intestine of the Angler

* Ann. des Sci. Nat., Sér. VI., Tom. I., 1854.

† Bull. Soc. Linn. de Normandie II., 1889, p. 145-9.

‡ Quarterly Journal of Microscopical Science, N.S., No. 196 (Vol. 49, Part IV.), Feb., 1906.

Lophius piscatorius. Mr. Tennant found the adult in the Gar *Tylosurus marinus* and the encysted stage in the Silverside *Menidia menidia*; he however doubts if it is necessary for the worm to encyst in a fish different from its final host. He is also of the opinion that the freshwater *Gasterostomum fimbriatum* and its larval form *Bucephalus polymorphus* are identical with *G. gracilescens* and *B. haimeanus*, and gives various reasons for this view. The theory that a marine and a freshwater form can be identical is borne out by the fact that I have found *Monostomum flavum* and *M. lophocerca* in *Paludetrina stagnalis* when their usual hosts are true freshwater Gastropods. Cobbold* found *Gasterostomum gracilescens* in *Lophius piscatorius*—presumably from Britain, although he does not say so—and figures it. This is probably the final host on this coast, as it is common. Maddox found it encysted in the nerves of the common Haddock†, and I have found it in the nerves of this fish from the Northumberland coast. It has also been found by Mr. Johnstone in the Gadidæ of the Lancashire coast‡. Giard found it encysted in *Belone vulgaris*, and this fish used to be very common at Budle, where there was a special fishery for it, but now it is rare.

Bucephalus haimeanus is found in long winding and branching sporocysts, in my specimens so long and tangled together that one could hardly find out where they began or ended. These fill up the visceral cavity, completely destroying the gonad, riddling the liver, and enveloping the intestines. The whole animal of the cockle looks whitish, and long strings of sporocyst can be pulled out of it (see Plate XIII. A). Inside the sporocyst are the *Bucephalus* cercariæ in all stages of development. Young ones have short tails, and show not much more than a large excretory sac (see Plate XIII. C). The full grown cercaria (A) is about 0·26 mm. long without the tail—slightly larger than the American specimens, which are 0·15 to 0·20

* Trans. Linn. Soc., London, XXII., 1858, p. 161.

† Quart. Journ. Micr. Sci., VII., 1867.

‡ Op. cit., p. 101.

mm. It is about four to five times as long as it is broad. At its posterior end is the characteristic and peculiar tail, broad in the middle, and bearing on each side a long and contractile process which, when extended, is several times the length of the animal. With the help of this tail the larva swims about and enjoys a free existence for a little time in the water. Claparède† found these free swimming forms on the coast of Normandy. The mouth is in the centre of the body, and leads to an oblong intestine. There is a large clear posterior excretory organ, and anteriorly there is the cystogenous organ with an invagination which Lacaze-Duthiers regarded as the mouth. The whole surface of the body is covered with small spines arranged in rows, giving it a transversely striated appearance, and it is also minutely striated longitudinally. Mr. Tennant's observations show that this parasite thrives best in brackish water, and that increase of salinity destroys it. Fenham Flats is therefore a favourable locality, for several small streams from the mainland here mix with the sea water.

EXPLANATION OF PLATES.

PLATE IX.

A, B, C.—MONOSTOMUM FLAVUM.

A. Redia.

B and C. Cercaria. (s) Posterior suckers.

D, E.—CERCARIA UBIQUITA.

D. Sporocyst.

E. Cercaria.

F, G.—CERCARIA PIRUM.

F. Cercaria from cyst.

G. Encysted cercaria.

† "Beobachtungen über Anatomie und Entwicklungsgeschichte niederer Thiere, angestellt an der Küste Normandie," 1868.

PLATE X.

A, B, C, D.—MONOSTOMUM (CERCARIA LOPHOCERCA).

A. Redia.

B, C, D. Cercariæ.

E, F, G.—CERCARIA OOCYSTA.

E. Sporocyst containing encysted cercariæ and cercariæ
in different stages of development.

F. Cercaria from cyst.

G. Encysted cercaria.

PLATE XI.

DISTOMUM (ECHINOSTOMUM) LEPTOSOMUM.

A, B, C. Rediæ.

D. Head of older redia.

E. Favourite position of cercaria.

F, C. Cercaria in different positions when moving.

H. Full grown cercaria.

J. Head of cercaria showing gland ducts.

K. Head of cercaria (side view).

L. Encysted cercaria.

PLATE XII.

DISTOMUM (ECHINOSTOMUM) LEPTOSOMUM.

× about 16½.

GA. Genital aperture.

OD. Oviduct.

EG. Egg.

OV. Ovary.

T. Testes.

V. Vitelline glands.

E. Excretory pore.

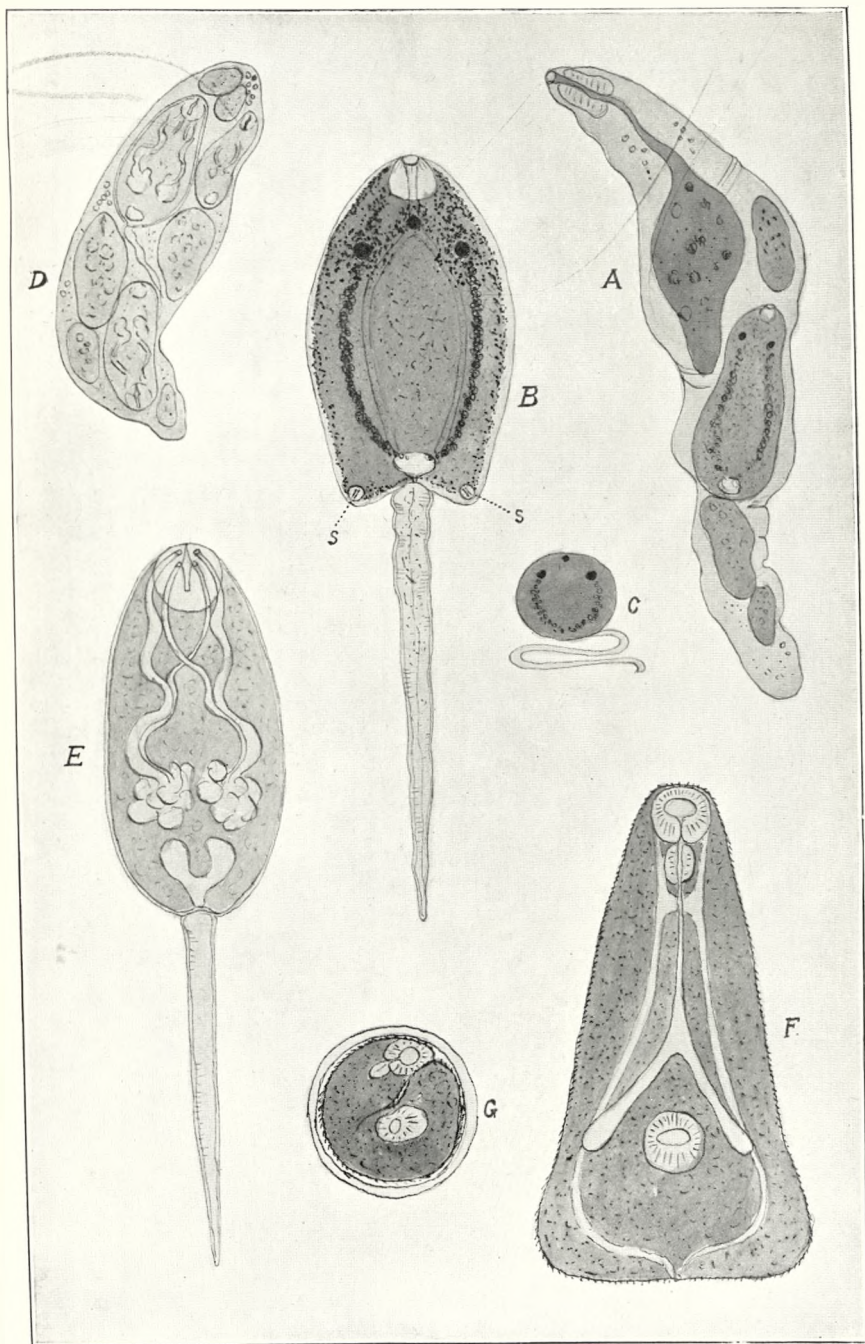
PLATE XIII.

BUCEPHALUS HAIMEANUS.

A. Sporocyst.

B. Full grown cercaria.

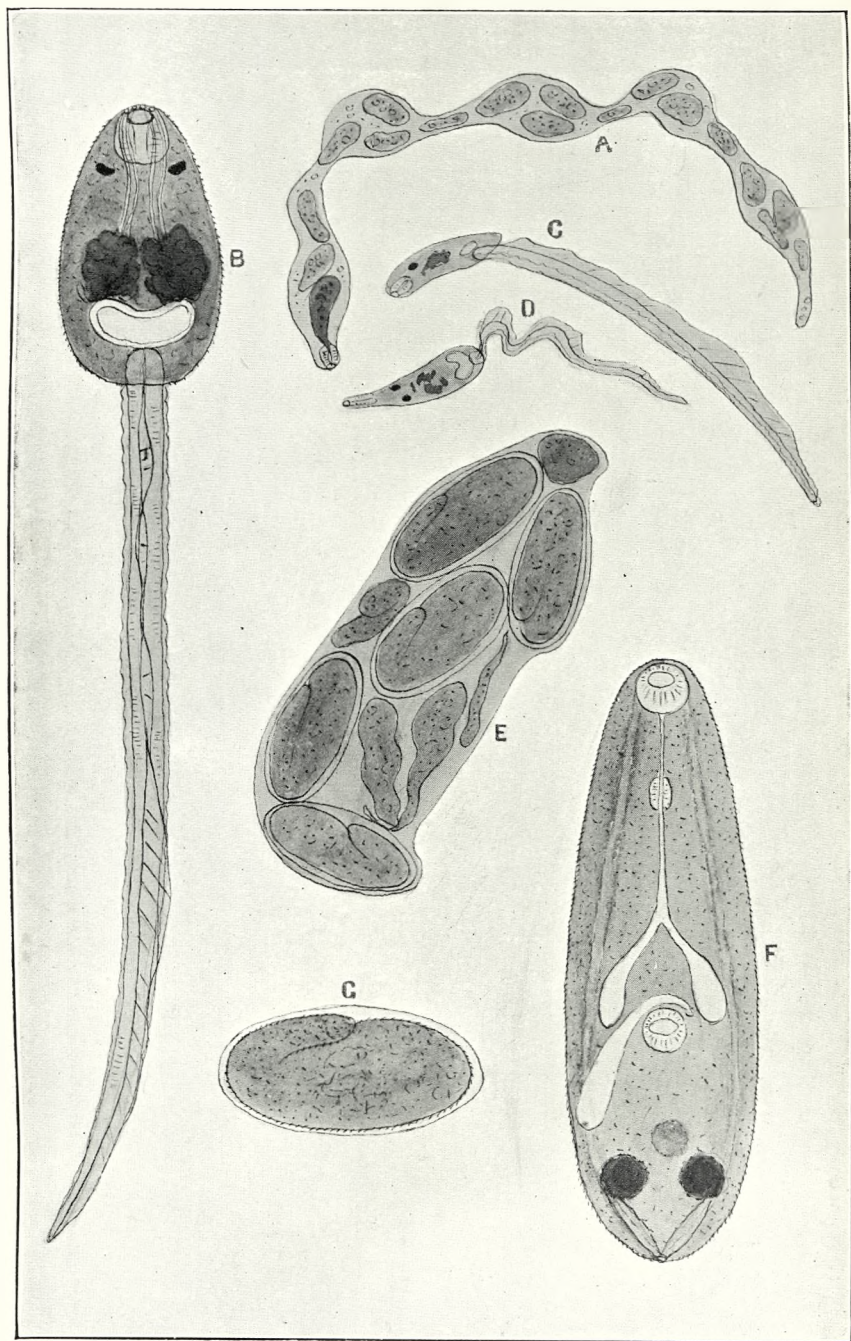
C. Young cercaria.



A-C.—*Monostomum flavum*.

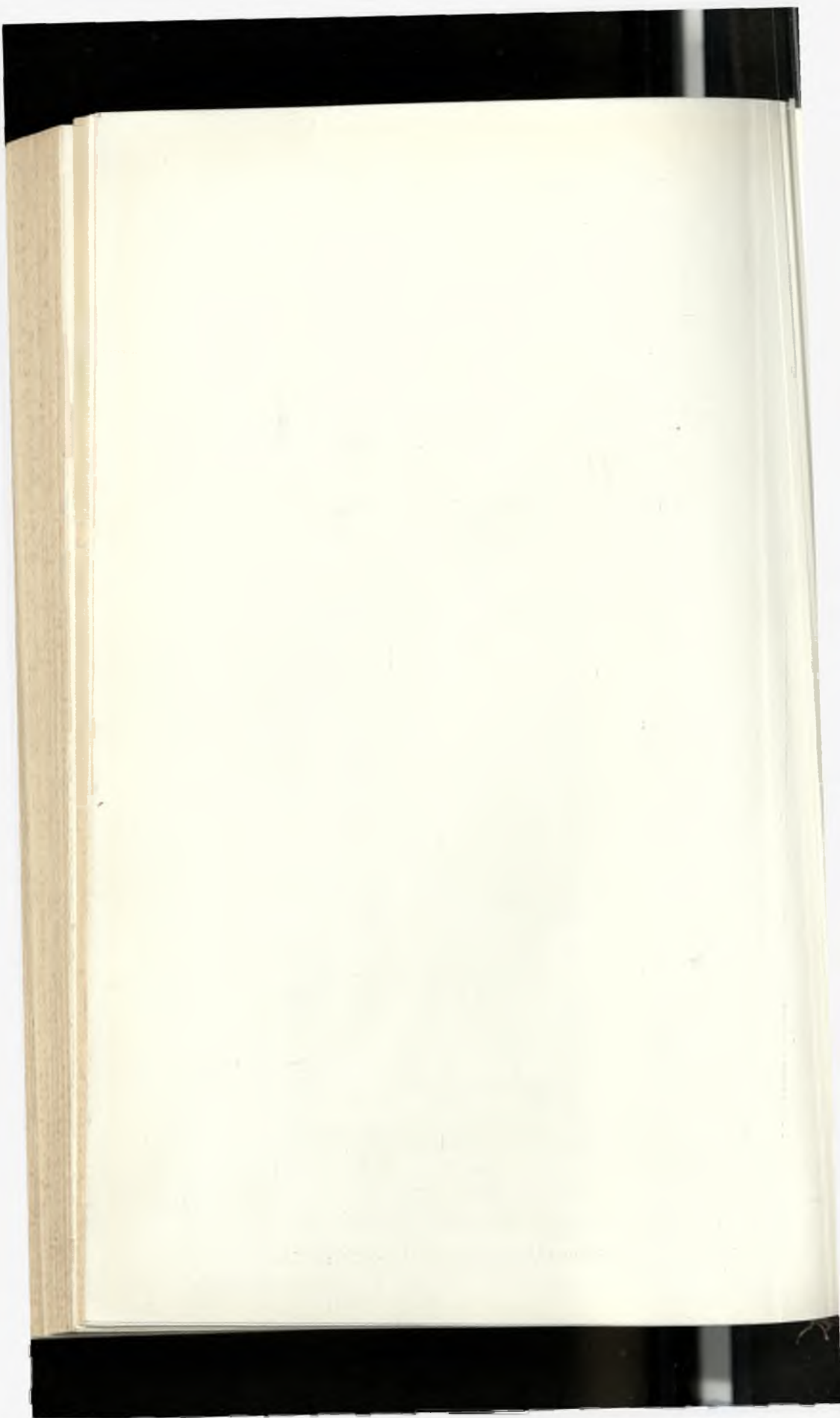
D, E.—*Cercaria ubiquita*.

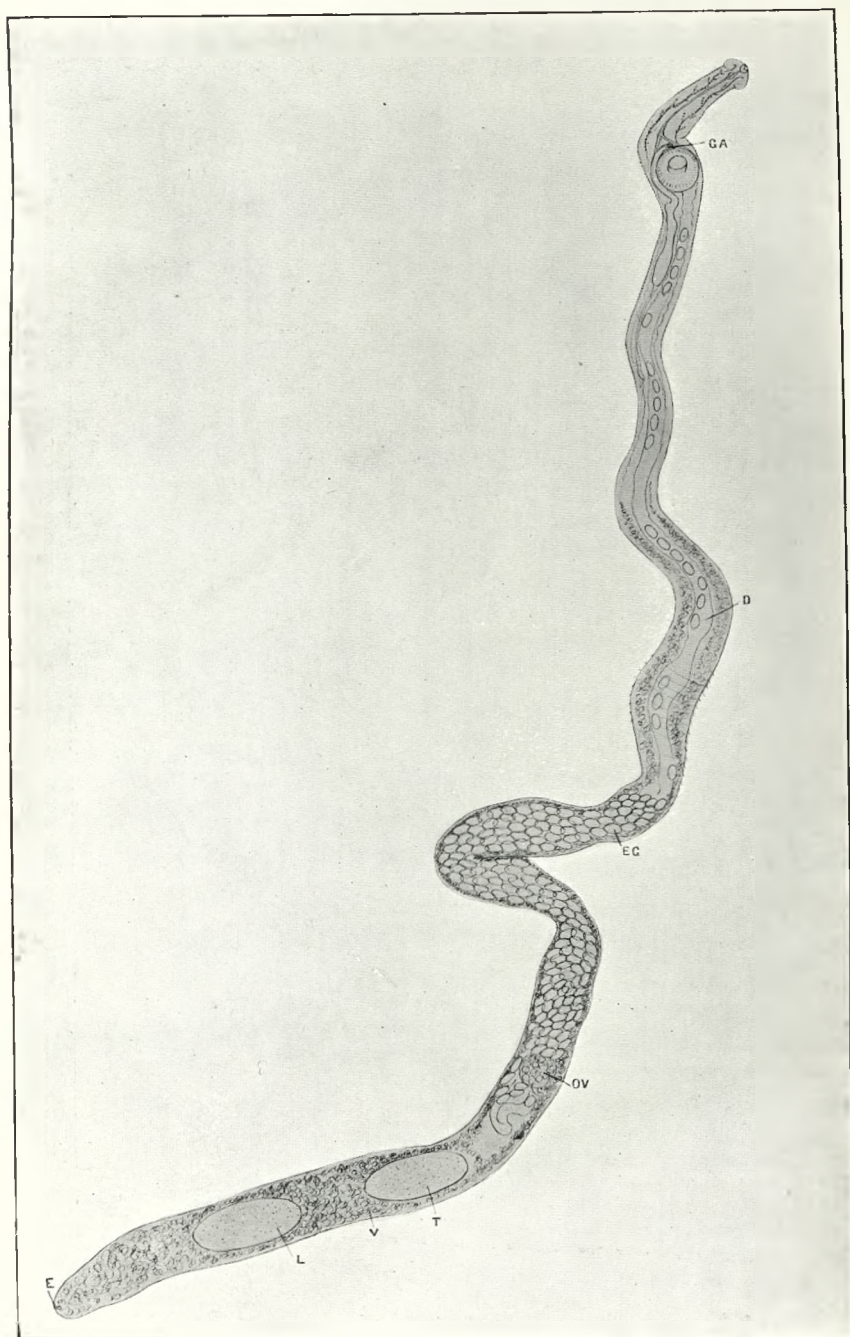
F, G.—*Cercaria pirum*.



A-D.—*Monostomum* (*Cercaria lophocerca*).

E-G.—*Cercaria oocysta*.

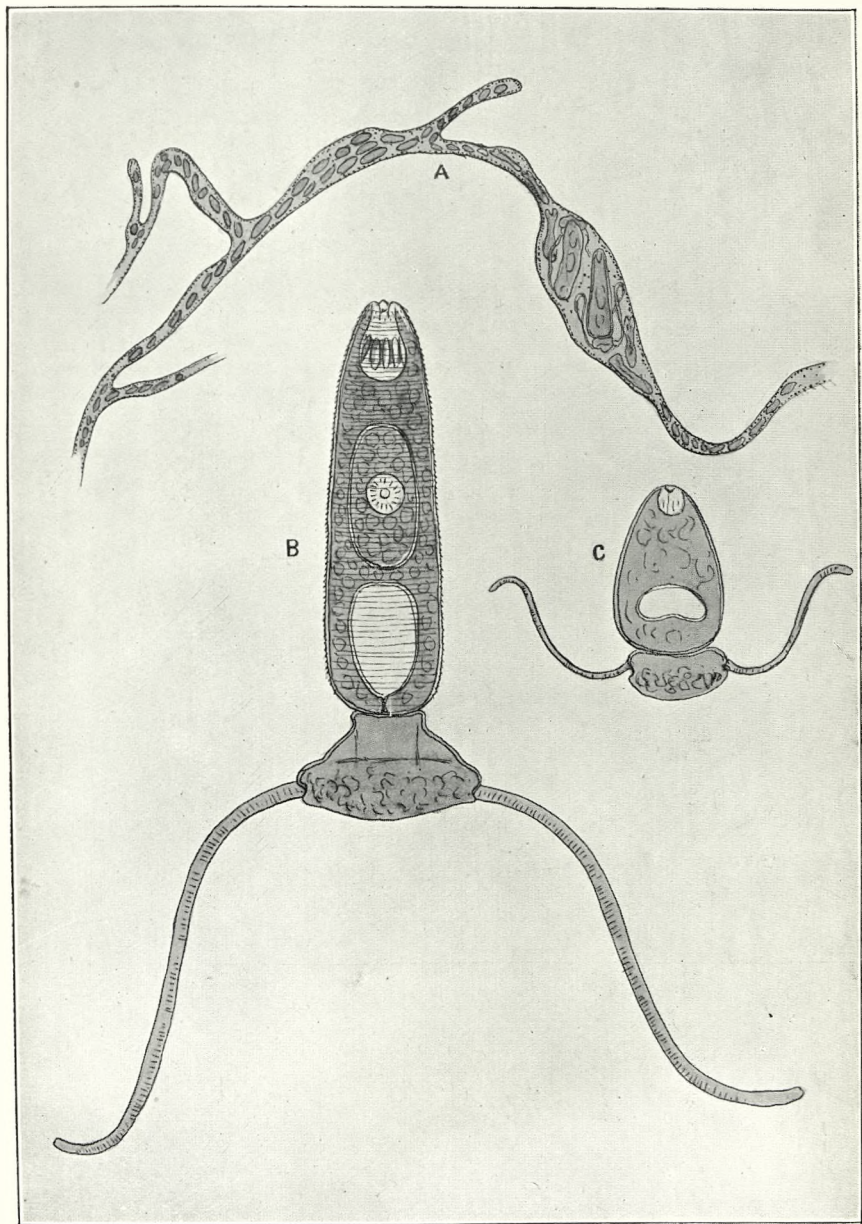




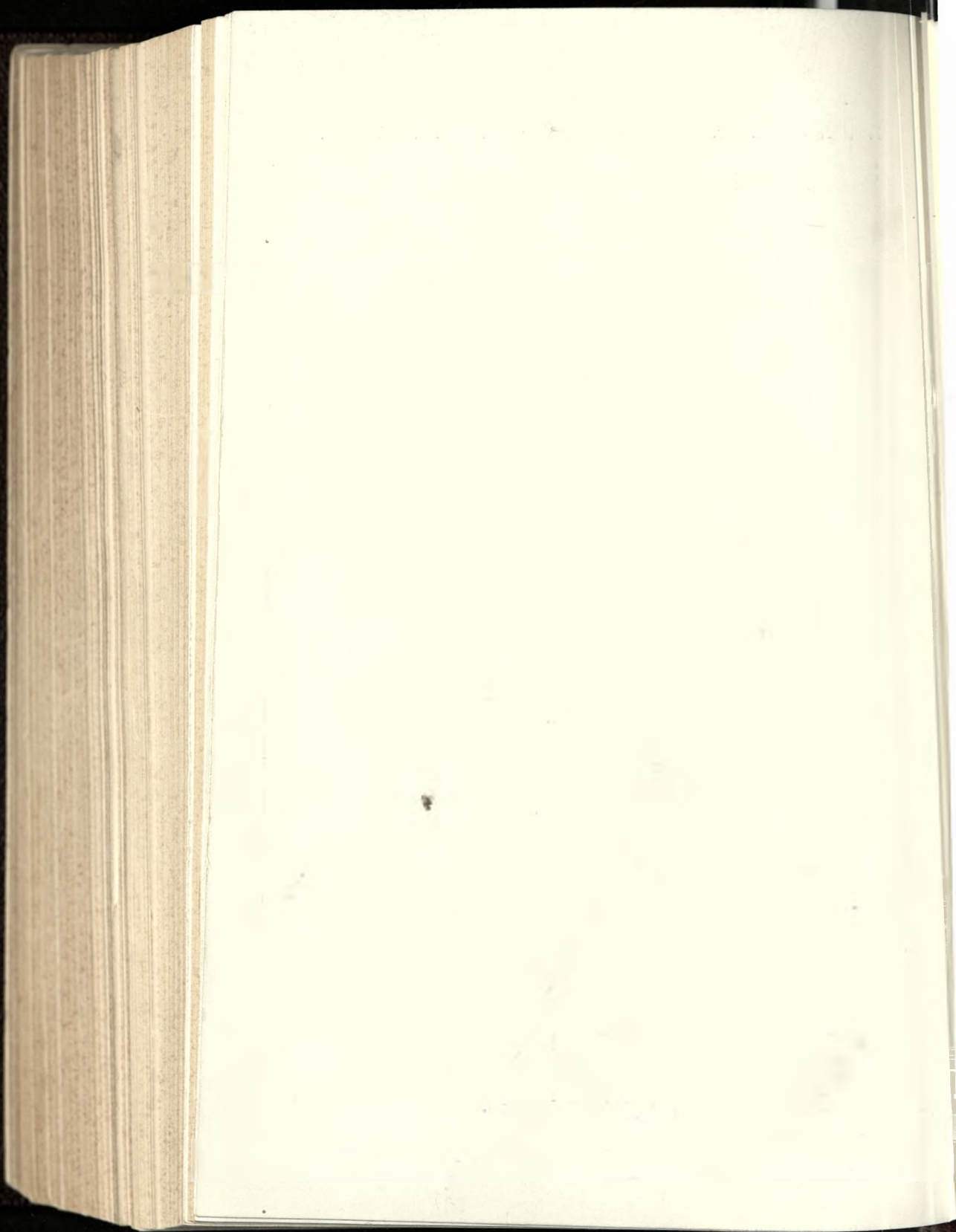
Distomum (Echinostomum) leptosomum.

The reference-letter L. should be T.





Bucephalus haimeanus.



REPORT OF THE FIELD MEETINGS OF THE NATURAL HISTORY SOCIETY FOR 1905.

READ APRIL 5TH, 1906, BY W. E. BECK, ESQ., CHAIRMAN
OF THE FIELD MEETINGS COMMITTEE FOR 1905.

MR. CHAIRMAN AND GENTLEMEN,—In accepting the post of President of the field section of the Natural History Society, which honour you so kindly conferred upon me, I did so with feelings of the greatest diffidence, as I felt at the time that there were members much better qualified to undertake the duties pertaining to the office. It is, however, very gratifying to have been placed in a position which enabled me to be of some little assistance in furthering the aims of this Society.

I will now give you, with one or two short digressions, an account of our various Field Meetings :—

The FIRST FIELD MEETING was held at Prestwick Carr on the 18th of May. The Carr is a tract of low lying land seven miles north-west of Newcastle, bounded on the north and south by the gently rising lands of Berwick Hill and Prestwick. To the east lies the village of Dinnington, and along the west end it is bounded by the river Pont, into which it is drained.

Before giving an account of the day's proceedings, I will endeavour to give you a short history of this district which may be of some interest to you.

The Carr, which is now cultivated fields and woods, was described in 1840 as a marshy waste containing about 1,100 acres. In winter and wet seasons it was inundated and covered with water to the extent of over one half of the whole surface. At all seasons there were pools interspersed on the plain, the principal of which was named the Black Pool, about eighty acres in extent. In this and the other pools were found pike, perch, roach, and eel.

Before this period the remains of a number of trees were found beneath the surface, consisting of the oak, Scotch pine, birch, and hazel, from which it is evident that in former times this district must have been well wooded.

In June, 1814, a stratum of shell marl, seven feet in thickness, was discovered at the east end of the Carr. It extended about 230 yards from north to south, and about 90 yards from east to west. The soil lying above it was of a peaty nature, and about three feet in thickness.

In this marl are to be found a number of shells of the *Helix* and *Turbo* genera, and at the upper part of the stratum quantities of bog moss and stems and leaves of other aquatic plants. At the bottom layer the shells are incrustated hard together. The bed upon which the marl lies is of a gravelly nature. After the discovery of this deposit a quantity of it was dug out by farmers in the neighbourhood and applied as a manure to their lands, but not perceiving any beneficial effects, they discontinued its use.

In 1856 to 1859, whilst the Carr was being drained, Mr. Marriott, who had charge of the drainage operations, informs me that the drainers came across this deposit, which corresponded closely with the foregoing account.

From this description of the marshy surface of the Carr, we can imagine it was formerly the natural haunt of numerous wild fowl and other birds, and a suitable field for the ornithologist, the botanist and other students of natural history.

The name of the late John Hancock will always be associated with Prestwick Carr. It was one of his happy hunting grounds, and the birds in his collection taken here bear silent testimony to his labours in this district. Amongst these are such interesting species as the Black-tailed Godwit, the Little Stint and Temminck's Stint, the Ruff, male and female, the Green, Spotted, and Common Redshank, and the Wood Sandpiper. In the Catalogue it is mentioned that this bird belonged to a nest taken by John Hancock in 1853. The nest with four eggs was the first recorded nest taken in

England. Then follow the Coot, the Pomarine Skua, Bewick's Swan, the White-fronted and Grey-lag Goose, and the Teal.

The draining of the Carr was begun in 1856, and finished three years later. There are upwards of nine miles of drains, the cost of which, together with compensation paid on the removal of Kirkley Mill on the river Pont, averaged £19 per acre. The land was then ploughed up by teams of oxen brought from Norfolk, the boggy nature of the soil being unsuitable for horses. Strips, principally of Scotch firs, were planted, which give the visitor of to-day a correct idea of their growth during a period of forty-six years.

I will now give you a short account of the day's proceedings of the meeting.

About twenty members assembled at one o'clock at the Museum, and after a pleasant drive by way of Coxlodge and Fawdon, arrived at Dinnington. The party proceeded on foot to the Carr, where they were met by the respective keepers of Mr. C. L. Bell and Mr. L. E. Smith, by whose courtesy we were permitted to visit the estates.

The most interesting part of the Carr to the naturalist is the site of what was known as the Black Pool. It is principally covered with heather and coarse grasses, and becomes partially covered with water in rainy seasons.

Here an interesting incident happened. A fox, who had evidently been asleep, jumped up in the midst of our party and galloped away towards Blagdon, accompanied by a very creditable chorus of who-whoops, tally-hos, and other hunting noises.

Several pairs of Snipe, evidently breeding, were here noticed, and in one instance that curious bleating or humming sound which has led to so much controversy amongst naturalists was heard as one of these birds was observed descending. A Long-eared Owl was also noticed, being noisily pursued by a number of small birds. Hereabout shells of the fresh water mussel were picked up by one of our party. The Marsh Marigold, amongst other flowers, was found growing in profusion on the sloping banks of the principal cuts or drains.

Proceeding westward, towards Ponteland, the members visited a gravel deposit, evidently the bed of some former stream, from which quantities of water-worn gravel had been taken and used in the construction of roads in connection with the drainage of this district.

Making our way past Eland Hall, the members arrived at Ponteland, where tea was partaken of at the Blackbird Hotel. A pleasant drive homeward, by way of Kenton, terminated a very enjoyable outing.

The following were the chief plants observed in flower :—

White Dead-nettle, *Lamium album*.
 Red Dead-nettle, „ *purpureum*.
 Cross-leaved Bedstraw, *Galium cruciatum*.
 Common Furze, *Ulex europæus*.
 Lady's Smock, *Cardamine pratensis*.
 Marsh Marigold, *Caltha palustris*.
 Wild Pansy, *Viola tricolor*.
 Dog Violet, „ *canina*.
 Bulbous Crowfoot, *Ranunculus bulbosus*.
 Water Crowtoot, „ *aquatilis*.
 Lesser Celandine, „ *ficaria*.
 Cowslip, *Primula veris*.
 Stitchwort, *Stellaria Holostea*.
 Chickweed, „ *media*.
 Water Avens, *Geum rivale*.
 Speedwell, *Veronica Chamædrys*.
 Beaked Parsley, *Anthriscus sylvestris*.
 Butter-bur, *Petasites vulgaris*.
 Meadow Woodrush, *Luzula campestris*.

Amongst others the following birds were noticed :—

Curlew	Wood and Willow Wren
Snipe	Tree Pipit
Long-eared Owl	Blue Titmouse
Cuckoo	Whinchat
Landrail	Whitethroat
Reed Bunting	Sedge Warbler

Wensleydale was fixed upon for the SECOND FIELD MEETING. The members arriving at Leyburn on the evening of the 3rd of June, made the Bolton Arms their headquarters.

On rising the next morning we found the weather indications very favourable for our work. After breakfast, the private museum of Mr. Horne was visited, who kindly described the collection, which included a large number of carboniferous limestone fossils, sharks' teeth, and other marine specimens found in the neighbourhood.

Accompanied by Mr. Horne, who kindly acted as guide for the day, we journeyed to Redmire by train. On arriving we proceeded through charming meadows to Bolton Castle. After going over this fine old ruin (and inspecting the museum recently formed by Lord Bolton, consisting of objects appertaining to the geology, the history and folk-lore of the district), we walked to Aysgarth.

The view of the Falls here, so well known to the tourist, was thoroughly enjoyed. On the limestone near were noted very good records of the fossil corals. At the head of the Falls, and along some boggy ground, the Butterwort (*Pinguicula vulgaris*) was found.

After partaking of tea at the Mill House, the members proceeded by way of the Upper Falls to Bear Park, the residence of Mr. T. Bradley, who kindly gave permission to view the gardens. In these a most beautiful collection of alpine and herbaceous plants was much admired. In another part of the grounds, near the River Ure, a spring of water evidently flowing through the carboniferous limestone was viewed with interest, having all the properties of the dropping well at Knaresborough near Harrogate. Here we gathered some interesting specimens of carboniferous limestone corals (*Cyathophyllum stutchburyi*).

The next day was principally devoted to botany. Guided by Mr. Hartshorn, an enthusiastic botanist, the Moors and Shawl (a limestone escarpment about one mile in length) were visited. Among interesting plants here were found the Herb Paris (*Paris quadrifolia*) and the Moon Wort (*Botrychium lunaria*).

In the evening the members strolled along the banks of the Ure. A pair of Redshanks was observed evidently breeding,

but neither nest nor young was found. A brood of four young Lapwings was discovered huddled together on the river shingle, their plumage assimilating closely with their surroundings.

One feature of the bird life of this neighbourhood was the very large number of Starlings observed. These birds have vastly increased in nearly every district of late years. There seem to be some differences of opinion as to their usefulness, but I'm glad to think the following is certainly strong evidence in their favour. The very elaborate investigations made by Sir John Gilmour, of Montrane, for the Highland Agricultural Society, into the economic relationship of Starlings to farming and gardening, showed that these interesting and beautiful birds were almost wholly beneficial.

A brief visit the next morning to the beautiful village of Wensley concluded our stay. The generous welcome given to us by local naturalists, the fine weather, and the beautiful scenery of this district, made our visit to Wensleydale most interesting and enjoyable.

Plant life is rich in Wensleydale, the following being the principal varieties noticed :—

- Water Crowfoot, *Ranunculus aquatilis*.
- Lesser Celandine, „ *ficaria*.
- Meadow Buttercup, „ *acris*.
- Creeping Buttercup, „ *repens*.
- Bulbous Buttercup, „ *bulbosus*.
- Marsh Marigold, *Caltha palustris*.
- Greater Celandine, *Chelidonium majus*.
- Lady's Smock, *Cardamine pratensis*.
- Water Cress, *Nasturtium officinale*.
- Hairy Rock Cress, *Arabis hirsuta*.
- Garlic Mustard, *Alliaria officinalis*.
- Rock Rose, *Helianthemum vulgare*.
- Dog Violet, *Viola canina*.
- Mountain Pansy, *Viola lutea*.
- Milk Wort, *Polygala vulgaris*.
- Red Campion, *Lychnis diurna*.
- Greater Stichwort, *Stellaria Holostea*.
- Lesser Stichwort, „ *graminea*.
- Meadow Cranesbill, *Geranium pratense*.
- Dove's Foot Cranesbill, *Geranium molle*.

- Herb Robert, *Geranium Robertianum*.
Rest Harrow, *Ononis arvensis*.
Bird's Foot Trefoil, *Lotus corniculatus*.
Hop Trefoil, *Trifolium procumbens*.
Kidney Vetch, *Anthyllis vulneraria*.
Meadow Vetch, *Vicia sativa*.
Water Avens, *Geum rivale*.
Tormentil, *Tormentilla officinalis*.
Wood Strawberry, *Fragaria vesca*.
Lady's Mantle, *Alchemilla vulgaris*.
Parsley Piert, „ *arvensis*.
Stone Crop, *Sedum Rhodiola*.
Rue-leaved Saxifrage, *Saxifraga tridactylites*.
Golden-leaved Saxifrage, *Saxifraga oppositifolium*.
Wood Sanicle, *Sanicula Europæa*.
Pignut, *Bunium flexuosum*.
Angelica, *Angelica sylvestris*.
Hemlock, *Conium maculatum*.
Cross-leaved Bedstraw, *Galium cruciatum*.
Heath-leaved Bedstraw, „ *saxatile*.
Marsh Valerian, *Valeriana dioica*.
Great Valerian, „ *officinalis*.
Scorpion Grass, *Myosotis arvensis*.
Common Speedwell, *Veronica officinalis*.
Germander Speedwell, „ *Chamædrys*.
Bugle, *Ajuga reptans*.
Butter Wort, *Pinguicula vulgaris*.
Common Primrose, *Primula vulgaris*.
Bird's Eye Primrose, *Primula farinosa*.
Cowslip, *Primula veris*.
Dog Mercury, *Mercurialis perennis*.
Sandwort, *Arenaria verna*.
Purple Orchis, *Orchis mascula*.
Spotted Orchis, „ *maculata*.
Herb Paris, *Paris quadrifolia*.
Wild Hyacinth, *Agrophis nutans*.
Garlic, *Allium ursinum*.
Bracken, *Pteris aquilina*.
Male Fern, *Lastrea Filix-mas*.
Lady Fern, *Athyrium Filix-femina*.
Moon Wort, *Botrychium lunaria*.
Wall Rue, *Asplenium Ruta-muraria*.

The following birds were seen :—

Landrail	Swift
Magpie	Swallow
Jackdaw	House and Sand Martin
Jay	Yellow Wagtail
Black-headed Gull	Spotted Flycatcher
Moor Hen	Chiff-chaff
Redshank	Wood Wren
Dipper	Tree and Meadow Pipit
Sandpiper	Whitethroat
Cuckoo	Blue Titmouse
Wheatear	Great Titmouse

The THIRD FIELD MEETING of the Society was held on June 29th. This meeting was originally fixed for the Kyle Hills, but unfortunately the ground had been recently planted with seedling trees, and Embleton was chosen in its place.

The members, to the number of eighteen, including eight ladies, left Newcastle by the 10.18 a.m. train, arriving at Christon Bank Station at 12.28 p.m.

It was regretted that owing to the unsuitable train service the time actually spent on field work (about $3\frac{1}{2}$ hours) was found much too short. The ladies drove to Embleton by wagonette; the gentlemen walking by a pathway through the fields. Evidence of the drought experienced during the previous months showed itself very plainly in the lightness of the crops—turnips and oats showing signs of having suffered severely.

Leaving the whinstone quarries on our left, a pleasant country lane led us to the links to the north of Dunstanborough Castle. Geologically speaking this district is very interesting, and is well worth a visit for this alone. Here we noticed that peculiar formation named the Grey Mare or Saddle Rock. The tide being low, the party had a splendid view of the bold headland, rising to a height of 120 feet, on which the Castle of Dunstanborough was built, the different sections of columnar whin, shales and sandstone being distinctly seen.

The ruins of this once famous castle were then visited with much interest. The members interested archæologically

were sorry to see parts of the ruin repaired with yellow coloured bricks, which had a spoiling effect on this venerable pile.

Birds were scarce owing to most of them being still at their breeding grounds. The following among others were observed :—

Meadow Pipit	Ring Dotterel (nest with four
Skylark	eggs)
Brown Linnet	Black-headed Gull
Wheatear	Kittiwake
Pied Wagtail	Common Tern
Bunting	Sandwich Tern
Swift (nesting in ruins)	

The following plants were noted :—

Fumitory, *Fumaria officinalis*.
 Corn Spurry, *Spergula arvensis*.
 Greater Celandine, *Chelidonium majus*.
 Common Mallow, *Malva sylvestris*.
 Agrimony, *Agrimonia Eupatoria*.
 Bladder Campion, *Silene inflata*.
 Red Campion, *Lychnis diurna*.
 White Campion, „ *vespertina*.
 Bush Vetch, *Vicia sepium*.
 Meadow Vetchling, *Lathyrus pratensis*.
 Lady's Fingers, *Anthyllis Vulneraria*.
 Spotted Orchis, *Orchis maculata*.
 Marsh Orchis, „ *latifolia*.
 Yellow Iris, *Iris Pseud-acorus*.
 Brooklime, *Veronica beccabunga*.
 Forget-me-not, *Myosotis palustris*.
 Wild Rose, *Rosa canina*.
 Burnet-leaved Rose, *Rosa spinosissima*.
 Square-stalked St. John's Wort, *Hypericum quadrangulum*.
 Herb Robert, *Geranium Robertianum*.
 Bloody Cranesbill, *Geranium sanguineum*.
 Jagged-leaved Cranesbill, *Geranium dissectum*.
 Hairy Bitter-cress, *Cardamine hirsuta*.
 Cotton Grass, *Eriophorum polystachyon*.
 Thrift, *Armeria maritima*.
 Wild Thyme, *Thymus serpyllum*.

Water Crowfoot, *Ranunculus aquatilis*.
 Shepherd's Needle, *Scandix pecten*.
 Hound's Tongue, *Cynoglossum officinalis*.
 Viper's Bugloss, *Echium vulgare*.
 Mouse-eared Hawkweed, *Hieracium Pilosella*.
 Meadow Sweet, *Spiræa ulmaria*.
 Yellow Rattle, *Rhinanthus Crista-galli*.
 Eyebright, *Euphrasia officinalis*.
 Hop Trefoil, *Trifolium procumbens*.

By the kind permission of Mr. Walton Wilson, the FOURTH FIELD MEETING was held on the Shotley Estate, Shotley Bridge.

Starting from Shotley Bridge Station, the members made their way across the river Derwent to Burn Cottage, where the keeper, who acted as guide, was waiting to receive them. A visit was first paid to the pheasantry, where a number of fine young birds were seen running among the coops wherein their foster-mothers were confined. The pathway up the Burnhouse Gill was then followed; search being made on some boggy ground for the bog asphodel, without success. The woods of High Waskerley were then visited. Proceeding down towards the River Derwent the members followed the course of the Mere Burn; on the way a dragon fly and a butterfly, one of the fritillaries, were noticed hovering round.

After a pleasant walk along the banks of the Derwent, Shotley Bridge was reached, where tea was partaken of.

The following plants were found in bloom:—

Giant Bellflower, *Campanula latifolia*.
 Harebell, *Campanula rotundifolia*.
 Agrimony, *Agrimonia Eupatoria*.
 Perforated St. John's Wort, *Hypericum perforatum*.
 Small Upright St. John's Wort, *Hypericum pulchrum*.
 Bog Stitchwort, *Stellaria uliginosa*.
 Common Centuary, *Erythraea Centaurium*.
 Fine-leaved Heath, *Erica cinerea*.
 Brooklime, *Veronica beccabunga*.
 Forget-me-not, *Myosotis palustris*.
 Rose Bay Willow, *Epilobium angustifolium*.
 Purple Comfrey, *Symphytum officinale*.

Hairy Willow Herb, *Epilobium hirsutum*.
 Foxglove, *Digitalis purpurea*.
 Great Valerian, *Valerian officinalis*.
 Wood Sage, *Teucrium Scorodonia*.
 Knotted Figwort, *Scrophularia nodosa*.
 Enchanter's Nightshade, *Circea Lutetiana*.
 Ragged Robin, *Lychnis flos-cuculi*.
 Herb Robert, *Geranium Robertianum*.
 Meadow Cranesbill, *Geranium pratense*.
 Lady's Mantle, *Alchemilla vulgaris*.
 Yellow Rattle, *Rhinanthus crista-galli*.
 Milk Wort, *Polygala vulgaris*.
 Yellow Pimpernel, *Lysimachia nemorum*.
 Betony, *Betonica officinalis*.
 Nipple Wort, *Lapsana communis*.
 Herb Bennet, *Geum urbanum*.
 Wall Speedwell, *Veronica arvensis*.
 Cathartic Flax, *Linum catharticum*.
 Ragwort, *Senecio Jacobæa*.
 Knapweed, *Centaurea nigra*.
 Yarrow, *Achillea Millefolium*.
 Toad Flax, *Linaria vulgaris*.
 Thyme-leaved Sandwort, *Arenaria serpyllifolia*.

Amongst the birds noted were the following :—

Woodcock	Willow Wren
Jay	Chiff-chaff
Tree Pipit	Golden-crested Wren
Wren	Pied Wagtail
Wood Wren	

Whilst the members were resting in one of the High Waskerley Woods, I took the opportunity of reading the following paper on the

Bird Life of the Shotley Estate.

Having been over the ground traversed to-day a great many times, I have had opportunities of observing the birds usually met with here. I thought, therefore, it would perhaps interest you if I detailed some of my observations on the bird life of the estate we have just visited. The Hawks will be the first to receive our attention. The Merlin is uncommon, but

it has been observed on the higher ground. The Kestrel is fairly common, and so is the Sparrow Hawk, the female of which is particularly fierce and bloodthirsty. I observed on one occasion a large bird, evidently one of the Buzzards, but I could not get near enough to identify it. Three species of Owls are found here, the Short-eared, the Long-eared, and the Tawny; the last mentioned seems to be the most numerous. In my opinion the owl is a much maligned bird. By comparisons made by some he is supposed to be "old and silly," and usually in "an advanced state of inebriation." He is looked upon with more than suspicion by gamekeepers, and is frequently mobbed and illused by his feathered kind. He is, however, a very respectable member of bird society, as the following little anecdote will show. A gardener living on the estate we have been over to-day found an owl which had got into a disused room of his cottage. In a little while the male bird appeared. On discovering his spouse at the window, he, after making some vain endeavours to release her, flew away, returning shortly with a mouse which he placed on the window sill. This occurred at intervals during her captivity. However, the noise which they made over two nights was too much for the gardener, who, whether melted by the domestic affection displayed by the birds or by want of sleep felt by himself I cannot say, allowed the poor prisoner to join her dutiful husband. The sex was easily determined, as the female laid an egg during her captivity.

The Greater Spotted Woodpecker nests every year in some of the woods you have been in to-day. The Kingfisher is frequently seen darting up and down the various burns which run into the Derwent. The Corvidæ, much I suppose to the disgust of the gamekeepers, are well represented. The Carrion Crow, the Hooded Crow, the Rook, Jackdaw, Magpie, and Jay complete the list. It is a pity the latter is so mischievous in regard to its fondness for eggs, as its plumage is scarcely excelled by any of our British birds. The Bullfinch occurs in most of the woods. Another un-

common bird found here is the Crossbill ; it seems a very migratory species, and is only seen here in flocks. Its parrot-like actions feeding on the fir trees are very interesting to watch. The Hawfinch nests each year, but does not seem to increase in numbers. Some time ago I secured a specimen of the Mountain Finch, which is not often noted in this neighbourhood. That beautiful bird, the Goldfinch, is also sometimes seen. Other interesting birds that are found include the Reed Bunting, the Redpole, the Woodlark, the Tree Pipit, Redstart, Blackcap, Greater and Lesser White-throat, the Garden Warbler, Sedge Warbler, the Grasshopper Warbler, the Willow Wren, Chiff-chaff, Tree Creeper, and several species of Wagtails. The Dipper and Sandpiper both breed here. The Fieldfare and Redwing are frequently seen in large flocks during the approach of winter. That delightful little bird, the Gold-crest, is frequently seen nesting, usually in the under part of the branches of the spruce fir. The Titmice are well represented, they include the Great Titmouse, the Blue, the Cole, the Marsh, and the Long-tailed. The nest of the latter is a beautiful structure in the shape of a hollow ball with one and sometimes two openings. A peculiar trait in these birds is that both the male and female use the nest at the same time. The Flycatchers consist of two species, the Spotted and the Pied. The Waxwing has been taken here, but I have not had the pleasure of seeing one. The Swallow tribe are quite numerous, all the familiar species being in evidence. The Nightjar may be seen on summer evenings hawking for flies, moths, and other insects. Among the Columbidae I have only noticed the Ring Dove and the Stock Dove. The Curlew is common, but its lesser counterfeit, the Whimbrel, is seldom seen. The genus *Scolopax* includes the Woodcock, the Common Snipe, and the Jack Snipe. Several pairs of the former breed here each year ; I have had the good fortune of seeing the parent bird sitting on her nest containing four eggs. The Heron is frequently seen, but I have not heard of it nesting here. The Mallard and Teal are the only Ducks I have noticed.

In the foregoing short account of the birds of the Shotley estate I have omitted any mention of the more familiar species which are quite numerous. On the other hand I have given you, I think, the more interesting species and those that are characteristic of the district. There may be some rarer birds that have not been mentioned, but I have given you those which I am personally acquainted with and can vouch for.

The FIFTH FIELD MEETING was held at Alnwick on September 6th. By the courtesy of His Grace the Duke of Northumberland permission was granted to visit Hulne Park.

On arrival at Alnwick Station the members were met by Mr. Gillanders, F.E.S., Forester to the Duke, who had kindly arranged to accompany them.

The day was almost entirely devoted to forestry, a subject which I might say is becoming of national importance. A recent Royal Commission showed that there are in Great Britain over twenty million acres of absolutely waste land capable of being put under timber. It is pleasing to note that grants are now being made to the different colleges which will secure for students instruction in forestry in all its branches.

The nurseries were first visited, and the different strips of seedlings and young trees, reared with a view to transplanting, were seen with interest. Curious was a row of Japanese wine berries in fruit, and near at hand the acacia was to be seen in bloom. Proceeding to the northern banks of the River Aln the members made their way past the Castle, and crossing the Lion Bridge, entered Hulne Park.

Here among some very fine timber was noticed a belt of very promising young Japanese larches. After lunch taken at Moor Lodge (the residence of Mr. and Mrs. Gillanders), the collection of tree insects formed by Mr. Gillanders was examined with much interest. The specimens were arranged to show the damage to tree life, the egg, the larva, the pupa, and the imago.

The saw mills were next visited, the members being shown the creasoting of timber by vacuum pressure. Carriages were now taken, and the party proceeded by way of the Deer Park to Hulne Abbey.

The red and fallow deer, including white varieties from Germany, were observed *en route*; here also were seen magnificent specimens of the silver and Douglas firs, the oaks, larches, beeches, and walnuts.

The members made a brief stay at the Abbey, afterwards driving back to Alnwick. After tea had been partaken of, Mr. Gillanders read a most interesting and instructive paper on "Modern Forestry."

It was felt that the success and enjoyment of the meeting was due in a great measure to the efficient manner in which Mr. Gillanders fulfilled the role of guide and instructor during the day's proceedings.

Few birds of interest were seen; the head keeper, however, informed us that on the moor adjoining the park a short time previously a company of sixteen Ruffs and Reeves had been seen, of which three Ruffs were shot, all young birds.

The following plants in bloom were observed :—

- Sun Spurge, *Euphorbia helioscopia*.
- Cypress Spurge, „ *Cyparissias*.
- Nipplewort, *Lapsana communis*.
- Thyme-leaved Speedwell, *Veronica serpyllifolia*.
- Smooth Hawk's-beard, *Crepis virens*.
- Mouse-eared Hawkweed, *Hieracium Pilosella*.
- Large Flowered St. John's Wort, *Hypericum calycinum*.
- Ragwort, *Senecio Jacobæa*.
- Viper's Bugloss, *Echium vulgare*.
- Herb Robert, *Geranium Robertianum*.
- Small Willow Herb, *Epilobium montanum*.
- Winter Green Chickweed, *Trientalis Europæa*.
- Sow Thistle, *Sonchus oleraceus*.
- Ivy-leaved Toadflax, *Linaria Cymbalaria*.
- Red Spur Valerian, *Centranthus ruber*.

The SIXTH AND LAST FIELD MEETING was held in the Cresswell district on October 4th. The members walked from

Widdrington Station to Druridge Bay, proceeding leisurely by the beach to the village of Cresswell, situated a short distance to the south.

After lunch, the grounds of Cresswell Hall, by the kind permission of Mr. Mangin, the agent, were visited. As a contrast to the bleak nature of the adjoining coast line, the timber here is very fine, consisting of firs, pines, yews, and other conifers.

After a pleasant walk by way of the Lyne Burn our party reached Newbiggin, a very enjoyable meeting ending the field work of the season.

The following birds were noted :—

Kestrel	Lesser Black-backed Gull
Curlew (several flocks)	Wild Duck (Mallard)
Linnet	Oyster Catcher
Whinchat (a lingering migrant)	Redshank
Blue Titmouse	Ringed Dotterel
Marsh Titmouse	Dunlin
Kittiwake	Sanderling
Herring Gull	

In October the season of flowers is almost over, but the following were still in bloom :—

White Campion, *Lychnis vespertina*.
 Yarrow, *Achillea Millefolium*.
 Knapweed, *Centaurea nigra*.
 Chickweed, *Stellaria media*.
 Greater Stitchwort, *Stellaria Holostea*.
 Fool's Parsley, *Æthusa Cynapium*.
 Oat's Ear, *Hypochaeris radicata*.
 Autumnal Hawkbit, *Apargia autumnalis*.
 Mouse-eared Hawkweed, *Hieracium Pilosella*.
 Smooth Hawk's-beard, *Crepis virens*.
 Sow Thistle, *Sonchus oleraceus*.
 Ragwort, *Senecio Jacobaea*.

The courtesy accorded, the kind assistance given by the members who accompanied me at the different meetings, and the admirable arrangements made by our secretary (Mr. Robson), rendered my duties both light and agreeable.

NATURAL HISTORY SOCIETY
OF
NORTHUMBERLAND, DURHAM, AND NEWCASTLE-
UPON-TYNE.

REPORT OF THE COUNCIL

FOR 1905-1906.

THE work of the Society has proceeded steadily during the past year, and in most departments of it the record is very similar to that of other recent years. Certain developments—for example the giving of evening lectures and addresses—which were started experimentally not long ago, may now be considered as holding a permanent place in the annual programme. For the winter session of 1905-6 the following syllabus was drawn up and was successfully carried out:—

EVENING MEETINGS.

- Nov. 15.—Miss E. Hollis: "The Northumbrian Coast"; chair taken by Dr. Ethel Williams.
- Dec. 13.—Mr. A. T. Gillanders, F.E.S.: "Insects injurious to Forest Trees"; chair taken by Mr. George Jenkins.
- Jan. 17.—Prof. M. C. Potter, M.A.: "Yeast"; chair taken by Mr. T. W. Lovibond.
- Feb. 14.—Dr. T. M. Allison: "Bacteriology and its Study"; chair taken by Prof. M. C. Potter, M.A.
- Mar. 14.—Mr. Richard Adamson: "Birds in the Field and Garden, their value and use to man"; chair taken by Mr. J. Alaric Richardson.
- April 11.—Rev. W. McLean Brown: "Cross Fertilization of Plants"; chair taken by Mr. W. Mark Pybus.

AFTERNOON LECTURES TO CHILDREN.

- Dec. 28.—Mr. C. E. Stuart, B.Sc.: "Coal and Products obtained from it"; chair taken by Mr. Ernest Scott.
- Jan. 4.—Prof. G. A. Lebour, M.A.: "Rain and Rivers"; chair taken by Mr. T. E. Hodgkin, M.A.

In spite of one or two small audiences, the average attendance at these lectures was 85, a result which must be considered decidedly encouraging. At the curator's evening "museum talks," of which as usual seven were given during the winter, the attendance was also somewhat irregular, but the average works out to a little over 50, or rather more than the average of the last two or three years. These figures, taken in conjunction with the interest displayed on the various occasions, show that this branch of the Society's work is meeting with success, and that it is worth an effort to keep up the standard that has been attained. The thanks of the Society have been expressed towards the lecturers at each meeting, but the Council feel that such a great service should be publicly acknowledged in the report. It should also be mentioned here that in the unavoidable absence of the curator, one of the "museum talks" was kindly undertaken by Mr. Richard Adamson, of Winlaton. It would assist the curator in keeping up the interest and variety of the "talks" if other members would occasionally volunteer to share this work.

A series of Field Meetings, to some extent taking the place in summer of the winter evening meetings, has been arranged as usual by a sub-committee. At the time of writing there are still two of the meetings to be held, and the report presented later by the chairman of the section makes it unnecessary to say much here about the summer's work in this department. Your Council are, however, glad to know that the gradual improvement in the numbers attending the Field Meetings—an improvement of which there has been some sign in the last year or two—has this year been still more evident.

During the year an important volume of the Transactions has been issued, the work on "Durham Diptera," by the Rev. W. J. Wingate, forming Volume II. of the new series. As a number of reviewers have pointed out, the title of this work errs somewhat on the side of modesty. It is not only a catalogue of local flies: with its introductory chapters and

analytical tables of nearly all the British species, it serves as a beginner's handbook to the group; and as no such handbook in English existed previously, the appearance of Mr. Wingate's book should be welcomed by entomologists. Those in this district who think of taking up the study of the Diptera have the further advantage that they can refer to the excellent collection formed by Mr. Wingate and presented by him to the Society. An unusually large amount of material has been handed in of late for publication; this is gratifying as an indication of activity in natural history work among the members, but it also places the Council in a difficulty, since the funds are not adequate even for the ordinary course of the Society's work, much less to meet any unusual demand. Nearly all the manuscripts in hand are of precisely the nature that is most desirable in our Transactions, and it would be extremely regrettable if the Society were compelled to declare itself unable to publish them. Most of them would furthermore lose materially in value if the printing were delayed, and it has therefore been decided to appeal to the members for a special subscription, and a circular explaining the circumstances is sent herewith. It is hoped that if the expenses of the printing at present outstanding can be met by this subscription, it may be possible for some time to continue the issue of Transactions without further special appeal.

In the report of two years ago it was mentioned, in connexion with the Transactions, that a work on the British Tunicates by Joshua Alder and Albany Hancock, left as an unfinished manuscript in the possession of this Society, was being published by the Ray Society. Another very satisfactory step of the same sort can now be recorded. The same two authors had left with the Society a large amount of material—specimens, drawings, and notes—connected with another group, the nudibranch molluscs. Some of the notes and drawings were intended to serve for a supplement to their great monograph of this group, published in 1845-54 by the Ray Society. All that is important in this material has now been put for examination into the hands of Sir Charles Eliot,

K.C.M.G., who has made a special study of the nudibranchs, and who kindly offered to undertake the necessary labour; he has already published several papers on his results, and has arranged for the Ray Society to bring out as the contemplated supplement such of Alder and Hancock's notes and drawings as can be utilised for that purpose.

An account by the curator of the year's work done in the museum will be found at the end of this report. Attention may here, however, be directed to the difficulties attending the proper maintenance of the museum, and in particular to the pressing need for further assistance in the curatorial work. Unfortunately out of the present income of the Society it is impossible to pay the salary of an additional assistant. In one respect, however, the record of the museum for the past year is highly satisfactory. The collections have always been growing, chiefly through gifts from members and others; and this year's list (which will be found in full on a later page) includes an unusual number of important acquisitions. A few of these call for special mention. Mr. George E. Crawhall, who has for long been one of the chief contributors to the museum, has now made over to the Society almost the whole remainder of his fine collection of British game birds and carnivora; he has also presented some very valuable and beautiful ethnological objects, chiefly weapons and implements from the South Sea Islands. Another most valuable donation is that made to the insect section of the museum by Colonel and Miss Adamson. Members will be aware that Colonel Adamson is handing over his well known collection of Burmese butterflies to the care of the Society; but he has now made an independent gift of two cabinets of Burmese insects, including moths and beetles, whilst Miss C. T. Adamson has presented a cabinet of exotic butterflies from various parts of the world. These gifts will be especially valuable when the very necessary replacement of the general collection of lepidoptera is carried out. In the geological department the chief accession of the year is an excellent set of local Coal Measure fossils presented by Mr. Jos. Taylor. The donor has had unusual opportunities

in the course of his occupation, and his gift represents the carefully selected results of many years of collecting. Other donations that must be noted here are those of two well preserved mummy hawks from Egypt, given by the President, and of several very rare local beetles given by Mr. R. S. Bagnall. A very interesting addition to the bird collection is a chiffchaff shot on December 20th at Cullercoats by Mr. H. V. Charlton, and presented by him to the museum. The set of Central African big game heads deposited on loan by Mr. Harold Cookson forms for the present a striking and beautiful group on the wall of the lower west corridor.

The Hancock Prize for 1905 was awarded to Mr. Richard S. Bagnall for an excellent essay describing his beetle-collecting during "An October Day in Gibside"; and the examiners also spoke highly of the ornithological essay sent in by Mr. R. Smith, of Sunderland, on "A Ramble around Morpeth." As the late Canon Tristram was at the time too ill to undertake any work, Mr. A. Meek kindly acted instead of him as joint examiner with Canon Norman. By instruction of the Council a sub-committee has revised the rules of the competition. The alterations made are chiefly aimed at confining the competition to "those whose education has not been of a definitely scientific character," and who are "not members of the learned professions." Partly owing to the intended revision of the rules, fewer circulars than usual had been sent out; and the result was seen in the smaller number of competitors, only five having submitted essays this year. Now that the revised circulars are ready the competition will be more thoroughly advertised, and a return to the higher numbers of recent years may be expected.

At the last Annual Meeting authority was given for the appointment of a number of additional Trustees to replace those lost by death since the last appointment was made in 1877. Out of the fifteen Trustees elected in that year only four remained, namely, His Grace the Duke of Northumberland, Sir Andrew Noble, Mr. E. J. J. Browell, and Mr. Norman Cookson. A Special General Meeting was held on

December 13th, and the following eleven new Trustees were then elected :—Right Hon. Lord Armstrong, Right Hon. Viscount Ridley, Right Hon. Lord Joicey, Sir Hugh Bell, Bart., Sir John D. Milburn, Bart., Lieut.-Col. C. H. E. Adamson, Mr. Clive Cookson, Mr. G. E. Henderson, Mr. Edward Joicey, Mr. H. N. Middleton, and Mr. J. H. B. Noble. The number of Trustees has therefore now been restored to fifteen, the original number, and also the highest limit permitted by the rules.

A change in the staff has taken place during the year. Miss Conradi, who for nearly eighteen months had filled the post of lady clerk and typist, was obliged to resign in order to leave the district with her family. The post was a new one when Miss Conradi entered upon it, and she deserved the highest credit for the way in which she surmounted the initial difficulties, and for her subsequent efficient discharge of the duties connected with it. It was with much regret that the Council received her resignation. Miss E. Welford has been appointed to the vacancy, and is carrying on the work in a thoroughly capable and systematic manner.

During the year the Society has lost several prominent members by death. The most widely known of these was Canon Tristram, who had had a very long connexion with the Field Club, and who is to be specially remembered as the virtual founder of the Hancock Prize Competition. He was distinguished as a naturalist-traveller, and had formed excellent collections of the birds of some of the most interesting parts of the world. The loss of two Vice-Presidents, Thomas Thompson and John Daglish, has also to be recorded. Thomas Thompson was one of the oldest members of the Society. He was a typical countryside naturalist and a friend of John Hancock. He was Hon. Treasurer of the Society for a number of years, and was made a Vice-President when he retired from that office. Few men have felt a closer attachment to the Society and to the museum. John Daglish also showed a warm and practical interest in the welfare of the Society. In addition to taking his share, when health allowed

him, in the management of its affairs, he had recently been at considerable trouble to get together a really representative series of coal samples for the museum, and a few years ago he defrayed the cost of having the labels throughout the mineral collection rewritten. Another Vice-President, Dr. G. S. Brady, F.R.S., has been lost owing to his removal from the district. It is to be hoped that Dr. Brady, as one of our most distinguished naturalists, and the last representative of the group who were associated with Joshua Alder and Albany Hancock, will still remain closely in touch with us.

Two matters may here be alluded to which do not come strictly within the year under review, but which can hardly be reserved for the next annual report. For the Royal Visit on July 11th special arrangements were made to accommodate members and their friends. The procession passed the whole length of the museum grounds, and stands commanding a good view of it were put up at three points. Members were admitted free, but a charge of half-a-crown per head was made for their friends; and in this way the expenses were cleared without any call upon the regular funds. The arrangements made on this occasion by the Council appear to have given general satisfaction.

The other matter referred to is the erection and unveiling of the memorial statue to the late Lord Armstrong. The statue is the work of Mr. Hamo Thornycroft, R.A.; it stands on a large stone base at the southern corner of the museum grounds, overlooking Barras Bridge, and it is intended that the ground which it occupies shall be formally handed over to the city. The unveiling ceremony was performed on July 24th by the Duke of Northumberland.

Your Council feel compelled once more to call attention to the inadequacy of the Society's income. So far the Council have always avoided actually running into debt; but in every direction—the publication of transactions, the care and improvement of the collections, the upkeep of the buildings and grounds, the organizing of lectures, the development of educational work—the Society's activity is continually checked

by lack of the necessary means. If it were more generally realised that the Natural History Society is endeavouring to discharge what is now usually a municipal function, and that to this fact its difficulties are due, it could hardly fail to obtain more widespread support in the district. In view of the position of the finances, it is by no means satisfactory to have to report a further decrease in the membership. Fifteen new Members and two Associates have joined the Society; but the loss by death and resignation has considerably more than counterbalanced this accession, and the year closed with a total membership (inclusive of Honorary Members, Associates, and former Members of the Field Club) of 422, or a loss of eleven on the year.

NEW MEMBERS ELECTED FROM JULY, 1905, TO JUNE, 1906.

W. F. Allden, Elmfield Road, Gosforth.

B. Amsden, LL.B., B.A., B.Sc., 63, Westgate Road, Newcastle.

T. H. Atkinson, Eilans Gate, Hexham.

Hon. Francis Bowes-Lyon, Ridley Hall, Haydon Bridge.

Hereward S. Brackenbury, Benwell Lodge, Newcastle.

William Ferguson, St. Thomas' Place, Newcastle.

G. P. Hughes, J.P., F.R.G.S., Middleton Hall, Wooler.

Miss M. V. Lebour, B.Sc., Radcliffe House, Corbridge.

Mrs. Ridley Makepeace, 30, Grosvenor Place, Newcastle.

Mrs. M. A. Robson, 6, Collingwood Terrace, Newcastle.

J. J. Robson, Henshelwood Terrace, Jesmond.

J. S. Smirk, 16, Clayton Street West, Newcastle.

Miss M. H. Thompson, 74, Warrington Road, Newcastle.

Norman M. Thornton, Seaton Burn.

George Weddell, North Cottage, Adderstone Crescent, Newcastle.

ASSOCIATES.

R. S. Bagnall, F.E.S., The Groves, Winlaton.

Ernest E. Patterson, 311, Scotswood Road, Newcastle.

CURATOR'S REPORT ON MUSEUM WORK.

1905-1906.

Several of the pieces of work mentioned in the report for last year have been continued in the year under review. Two of them in fact have constituted the chief work accomplished, namely, the remounting of the shells, and the cleaning and painting of the cases containing the Hancock birds. The remounting of the shells included cleaning and special treatment to remedy the corrosion with which many were attacked, refixing on freshly covered tablets with new type-written labels, and replacement in the cases upon sloping false-bottoms instead of, as before, upon the flat floor of the case. Finally the arrangement and labelling had to be revised, and in this Miss M. V. Lebour has very kindly been giving expert assistance. The work on the shell collection is now practically completed. The painting of the Hancock bird cases is also nearly at an end, and the result is a striking improvement in the general appearance of the bird room. The old paper lining of the cases, which was becoming discoloured, has been removed, and the paint that has been substituted for it is likely to prove much more lasting.

Work in a number of other directions has also been done in the course of the year. In the zoology room we are gradually replacing the old labels by new printed ones; this will soon have been done throughout the mammal cases, and from those that are already finished it is evident that it will produce a marked change for the better. Labels have also been printed for various other objects in the zoology room, and for Mr. Harold Cookson's big game heads. In the ethnology corridor a considerable amount of re-arrangement has been necessary to incorporate fresh acquisitions, and a good many new or revised labels have been printed. The birds from Mr. George Bolam's collection have been worked into their places in the bird room, and during the year I have set up several fresh birds for the museum. Some more rectangular jars containing specimens in spirit or formalin have been fitted up; much

time and trouble formerly spent in the drilling of glass for this purpose are now saved by the use of gelatine as a cement. The various reference collections of insects and the Raine collection of birds' eggs have been carefully examined and cleaned; and in connexion with this it may be mentioned that there are now, framed and hung up in the museum, several copies of a list of the museum reference collections, the object being to make known the resources of the museum to those visitors who could best make use of them. The list is reprinted as an appendix to the report.

Miss Conradi and her successor, Miss Welford, have made good progress with the catalogue of the library. The slips for the catalogue are all prepared, and are now mostly arranged in readiness for the typing of the final copy. Miss Conradi also did work on the shells, in relaxing and setting butterflies, and in printing labels; and in all these lines Miss Welford has followed up the work very successfully. William Voutt's chief work has been that described above upon the Hancock bird cases; but he has also at odd times printed a number of labels, and has fitted false bottoms into the shell cases, as well as cleaning glass and doing many other minor jobs. Much of my own time has as usual been occupied by proof-reading and other miscellaneous work. My proper museum work has chiefly consisted in dealing with fresh acquisitions, making out labels for printing, setting out the new labels and re-arranging the contents of certain cases, cleaning and treating the corroded shells, and revising the library catalogue.

Several members and others have given valuable help in the museum work during the past year, and I beg here gratefully to acknowledge their kindness. Miss Lebour's revision of the shell collection has already been referred to. Colonel Adamson has sorted through a large quantity of unset Indian butterflies which have long been lying in the storeroom; he has named them all, and has selected those that are of use to the museum and others that may be used for exchange. The work required much patience, but it is very satisfactory to

have it done. Mr. S. Graham has again given a good deal of time to overhauling the Raine collection of eggs; and my thanks are also due to Mr. R. C. Clephan for making out labels for a set of flint implements; to Mr. T. Oppe (who worked for some time in the museum whilst recruiting after an illness) for help in cataloguing the library, and for making a beginning upon the more detailed classification of the rock collection; to Dr. Woolacott for giving advice as to the rock collection and drawing up a scheme of arrangement for it; and to Prof. Lebour, who is preparing a series of geological sections which are to be enlarged and put up above the cases in the fossil room. I must also specially thank Mr. Richard Adamson for so kindly taking my place at one of the evening "talks." It would be an advantage in many ways if a change of this sort could be arranged for more frequently.

Among scientific men who have used the museum this year in the course of their work, mention may be made of Prof. F. W. Oliver and Mr. A. N. Arber, who came to study our examples of the Carboniferous seed-bearing plants, and to whom some large slabs were lent for closer examination. Sir Charles Eliot also spent several days at the museum in working through Alder and Hancock's collection of nudibranchs, before the most important part of the material was handed over to him on loan. And since the value of the museum collections is not everywhere fully appreciated, the opinion of an expert ethnologist from Cambridge is worth recording: on a recent visit, speaking especially of our series of ethnological objects from New Zealand and the South Seas, he said that he knew of no collection of moderate size which contained such a high proportion of extremely rare and valuable specimens.

In my last report I pointed out how far we were from being able, on the present resources of the institution, to discharge the curatorial duties in a satisfactory manner. The position in this respect is still the same. I can hardly be allowed to repeat all that I wrote last year, but it may perhaps help to a practical understanding of the real position if I mention some

of the pieces of work that are waiting to be taken in hand. In the fossil room almost every specimen requires remounting or re-labelling or both. We have done this for most of one side of the ground floor, but to get any further will require so much time to be spent in the work of identification that for the present it is not to be thought of. There is enough work waiting in the fossil room alone to keep one well qualified man busy for several years. The rock collection needs a thorough re-arrangement on the lines begun by Mr. Oppe. The fine Tankerville collection of corals has long needed cleaning, mounting, and arranging. Some day there is to be on the gallery of the bird room a representative selection of the birds of the world, and there are skins in the museum which would furnish nearly all the specimens needed, if we could once get them mounted. Something should be done at once to make the fishes—now perhaps the poorest section of the whole museum—rather more presentable and useful; and in the same room all the invertebrates, with the exception of the mollusca, are urgently in need of fresh fitting up, and in many cases of complete replacement. Then again several of the reference collections, especially Alder's shells and some of the sets of insects, require much attention and labour before they can be regarded as in satisfactory order. It should be remembered, too, that all the pieces of work above mentioned are of a very detailed nature. The proper fitting up of the two rows of cases representing the invertebrates will take more time than would the overhauling of the entire museum if it contained only such objects as those in the ethnology corridor. And there is further a completely new section of the museum, a section for botany, to be established as soon as possible.

It is plain that this programme—which comprises only the work that any curator would at once see to be urgent, without reference to any modern educational developments—is one which we could not expect to carry out in a year or two. There would be little to complain of if we were only making reasonable progress in it each year. This, however, we are by no means able to do under present conditions; and the

prospects for the coming year are no better than in the past. The Society's museum is a large one, and the present staff and the present resources are quite inadequate to the task of maintaining it in a really creditable state. A report such as this is not concerned with the ways and means of bringing about a more satisfactory position of affairs ; but in presenting it I have felt bound to call attention to the disabilities under which the curatorship of the museum is at present carried on, and to the pressing need of increased financial resources and a larger staff.

E. LEONARD GILL.

APPENDIX I.

SUBJECTS OF "MUSEUM TALKS," 1905-06.

- Oct. 25.—Recent Additions to the Bird Collection.
Nov. 29.—Burrowing Animals.
Dec. 27.—Animals of South America.
Jan. 31.—Corals and Coral Reefs (lantern lecture).
Feb. 23.—The Build of a Bird.
Mar. 28.—Spring Flowers (Mr. Richard Adamson).
Apr. 25.—The Summer Migrants.
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APPENDIX II.

Reprint of Notice as to Reference Collections.

HANCOCK MUSEUM.

REFERENCE COLLECTIONS.

In addition to the objects exhibited to the public, the Museum contains a number of Reference Collections in various departments of natural history. A list of these reference collections is given below ; they can usually be seen by those specially interested, on application to the Curator.

General Collection of Birds' Skins.	
Hancock Collection of Birds' Skins.	
Hancock Collection of British Birds' Eggs and Nests.	
Raine Collection of British Birds' Eggs and Nests.	
Alder Collection of British Mollusca (Shells).	
Angas Collection of Land Shells (Pacific Region).	
Alder and Hancock's Collection of Nudibranchiata.	
Alder and Hancock's Collection of Tunicata.	
British Hymenoptera	} Museum Reference Collections.
British Coleoptera	
British Lepidoptera (Watson Collection)	
British Hemiptera	
Bold Collection of British Hymenoptera.	
Bold Collection of British Coleoptera.	
Raine Collection of British Lepidoptera.	
Raine Collection of Continental Butterflies.	
Colonel Adamson's Collection of Burmese Butterflies.	
Wingate Collection of Local Diptera.	
Alder Collection of British Hydrozoa.	

Reference Collection of British Flowering Plants and Ferns.
 Collections of British Brambles, Hawkweeds, and Willows.
 Collections of British Plants formed by the Rev. J. F. Bigge and Dr. Thos. Pigg.
 General Herbaria of N. J. Winch (in part), R. B. Bowman, and the Rev. H. E. Fox.
 Reference Collection of British Mosses.
 Reference Collection of British Seaweeds.
 Swallow Collection of Micro-Fungi.

Duplicates and study-specimens of British Fossils, especially those of the local Carboniferous and Permian Beds.

NATURAL HISTORY SOCIETY OF NORTHUMBER- LAND, DURHAM, AND NEWCASTLE-UPON-TYNE.

HONORARY OFFICERS OF THE SOCIETY

Elected at the Annual Meeting, October 10th, 1906.

PRESIDENT.

The Right Hon. Lord Armstrong, M.A., D.C.L.

VICE-PRESIDENTS.

The Duke of Northumberland.

Viscount Ridley.

Lord Barnard.

Lord Ravensworth.

Lord Joicey.

The Bishop of Durham.

The Bishop of Newcastle.

Sir Hugh Bell, Bart.

Sir Arthur Middleton, Bart.

Sir Andrew Noble, Bart., F.R.S.

Sir Isambard Owen, M.A., M.D.

Sir G. H. Philipson, M.D., D.C.L.

Sir John Swinburne, Bart.

Sir Lindsay Wood, Bart.

The Lord Mayor of Newcastle.

Lt.-Col. C. H. E. Adamson, C.I.E.

Col. W. M. Angus, C.B.

Prof. G. S. Brady, M.D., F.R.S.

E. J. J. Browell.

R. C. Clephan, F.S.A.

Norman C. Cookson.

Geo. E. Crawhall.

W. D. Cruddas.

R. R. Dees.

D. O. Drewett.

Samuel Graham.

H. N. Middleton.

John Pattinson, F.I.C.

Prof. M. C. Potter, M.A.

COUNCIL.

Richard Adamson.

W. E. Beck.

Harry Benson.

Rev. W. McLean Brown.

Clive Cookson.

John Dent.

Wilfred Hall.

George Jenkins.

Prof. Alex. Meek, M.Sc.

J. Alaric Richardson.

Ernest Scott.

C. E. Stuart, B.Sc.

HON. SECRETARIES.

N. H. Martin, F.R.S.E.

C. E. Robson.

HON. TREASURER.

A. H. Dickinson.

HON. AUDITOR.

Samuel Graham.

DONATIONS TO THE MUSEUM

FOR THE YEAR ENDING JUNE 30TH, 1906.

- LIEUT.-COL. C. H. E. ADAMSON, C.I.E.—Two cabinets of Burmese insects, various orders, about 1600 specimens; with in addition about 200 British butterflies. Also the horns and part of skull of the takin (*Budorcas taxicolor*), a very rare Himalayan ruminant.
- MISS C. T. ADAMSON.—A cabinet of exotic butterflies from various parts of the world; about 400 specimens.
- RIGHT HON. LORD ARMSTRONG.—Two ancient Egyptian mummy hawks.
- RICHD. S. BAGNALL.—Examples of four very rare British beetles to fill gaps in the collection. Some local nematode worms.
- W. E. BECK.—A piece of *Lepidodendron obovatum* in sandstone, from near Harbottle.
- MATTHEW BERKLEY (per W. E. Beck).—A white variety of the meadow pipit and a waxwing, both from Ponteland.
- ADAM BIGGART.—A living chamæleon brought by the donor from Alexandria.
- T. BRAYSHAW.—A "lake trout," length 22 inches, caught by the donor in Malham Tarn.
- M. WALTON BROWN.—Samples of encrinite- and spirifera-limestone from Barton Quarries, near Darlington (the limestone used as ballast on the local electrified lines).
- JAS. CAYGILL.—A number of geological specimens from the Consett district and from Ingleborough, including Coal Measure plant remains, boulder clay erratics, and an interesting boulder taken out of a coal seam.
- ABEL CHAPMAN.—Skin of great bustard, male in full plumage, from Spain. Skin of nearly adult ivory gull (*Pagophila eburnea*).
- MRS. CLAY.—A box of shells, chiefly tropical, arranged in a pattern.
- MASTER N. C. CHAMPNESS.—Shells of *Cyprina islandica* and *Macra stultorum*.
- HUGH V. CHARLTON.—A chiffchaff, male, shot on Dec. 20th by the donor at Cullercoats. A garfish (*Belone belone*), length 31 inches.

- ALFRED COCHRANE.—An egg of the dusky shearwater (*Puffinus obscurus*), and an egg of Bulwer's petrel (*Bulweria columbina*), both from Porto Santo.
- MRS. COOCH (Buluwayo).—Various objects of natural history and ethnology from Rhodesia, including gold quartz, mahogany bean pod, native pipe, bracelets, and bead work.
- HAROLD COOKSON.—Skull of African jabiru (*Ephippiorhynchus senegalensis*). Also, deposited on loan: a set of big game trophies from Central Africa, including 35 excellently mounted heads, 7 mounted pairs of horns, and a number of unmounted skins, skulls, tusks, etc.
- WALTER S. CORDER.—A crystal (pseudomorph) of Jarroite from the original find in Jarrow Slake.
- GEO. E. CRAWHALL.—A young jackdaw, grey-mottled variety, and a stoat in almost complete white dress, from Haydon Bridge. The following, mounted and cased, from the donor's private collection: an otter, male, from the Wansbeck; a badger, male, from Haydon Bridge; a pine marten from Cumberland; a case of ten stoats in different stages of summer and winter dress from Haydon Bridge; a pair of red grouse in exceptional plumage from Weardale; three couples of ptarmigan from Forfarshire, showing the year's changes of plumage; shovellers, two young and a full-plumaged drake, from Haydon Bridge. Skulls of tiger, wild cat, fox, badger, otter, and squirrel. The following weapons and implements from the South Sea Islands: a very fine stone adze from Mangaia, Hervey Is.; two highly carved paddles from Raivavai, Austral Group; finely finished war club from Nukahiva, Marquesas; heavy war club and two throwing clubs from Fiji; carved club from (?) Tonga; handle of fan (?), probably from the Hervey Is.
- GODFREY W. DODDS.—Two emu's eggs from Eastern Australia.
- T. FAIRLESS.—Leopard, black variety, killed in India in 1880.
- J. GRAHAM.—Block of sandstone with fine impression of *Lepidodendron* stem.
- MISS GRAHAM.—A large ichneumon fly (*Ophion undulatus*?), with the cocoon from which it emerged.
- SAMUEL GRAHAM.—Several nests with eggs added to the museum series. Four bramblings from Bellingham. A series of shells of *Pecten opercularis* from Bamborough.
- G. E. HENDERSON.—Block of kauri pine with a large quantity of "kauri gum," from New Zealand.

- WM. HENDERSON.—An introduced longicorn beetle, *Astynomus adilis*, found at Chester Moor Colliery.
- C. W. HUTCHINSON.—Six sea-horses (*Hippocampus*), two species, from the Mediterranean.
- MATTHEW P. ISMAY.—Shale with a frond of *Neuropteris* (*N. Loshii*), from Wardley Colliery.
- GEO. JENKINS.—Skin of an African kingfisher, *Ceryle maxima*, female.
- CAPT. KING (Hartlepool).—Five examples of *Fusus antiquus* and four of *F. norvegicus*.
- J. I. MALING.—Skin of a grey phalarope shot at Newbiggin.
- J. RUSSELL MARTINSON.—Poplar-hawk moth caught at Bellingham.
- MAJOR GEO. NOBLE.—A female golden-eye.
- REV. W. NOLL.—A coral (*Cyathophyllum*) from the Great Limestone, Alston; a piece of the Cheviot "pitchstone porphyrite."
- M. PELEGRIN.—Polished samples of ornamental rocks (British and foreign marbles, serpentines, etc.; about 70 specimens). Eight cases of birds, including pairs of fieldfares, kingfishers, pheasants, partridges, eider-ducks, and single specimens of little owl, scops owl, etc.; all excellently mounted.
- F. H. PHILLIPS & CO.—A small lumpsucker (*Cyclopterus lumpus*).
- MRS. PUNSHON.—Framed pencil sketch of Miss M. J. Hancock, by W. B. Scott, 1847.
- MAJOR RODDAM.—Common snipe and jack snipe in spring plumage.
- ERNEST SCOTT.—A living slow-worm from Riding Mill. A collection of shore-pool animals from Newbiggin.
- G. S. SMART.—A male brambling in winter plumage.
- CLEMENT STEPHENSON.—Skull of the donor's celebrated Aberdeen-Angus cow "Bride." A sheep-tick (*Ixodes*).
- JOS. TAYLOR.—The donor's collection of Coal Measure fossils, chiefly from Shiremoor; all selected examples. Also some fossils from the Carboniferous Limestone, Permian, Lias and Chalk. A stone axe-head found at Earsdon, Northumberland, and a set of Danish flint implements.
- P. WALTHER.—Ores of copper and iron from the Desert of Atacama, Chile; including brochantite, copiapite, fibroferrite, and pisanite.
- MRS. AGNES WARD.—A whydah bird (*Vidua paradisea*), male.

MISS SPENCE WATSON.—A mantis (*Blepharopsis mendica*) brought from Teneriffe and kept alive for some months in England.

CONRAD WHITE (the late).—Group of seven well mounted tropical birds.

FRED. G. WILSON.—A young garfish taken off Berwick.

REV. W. J. WINGATE.—A natural clump of fossil coral, *Lonsdaleia rugosa*, from the Great Limestone, Craster.

FRANK WINTER.—A large exotic beetle, *Blaps gages*, L., imported with oranges from Porta Belgrada.

E. SEYMOUR WOOD.—Samples of sand-rock from the bottom of the Permian Yellow Sands at Dawdon Colliery, Seaham Harbour.

REV. R. STEWART WRIGHT.—Various ethnological and natural history objects from Central Africa; including a primitive cotton spindle, an idol, wooden figures, etc., from Tanganyika and the Congo Free State; various ores and a copper ingot; a queen white ant, a rare Tanganyika shell, *Tiphobia horci*, and eight pairs of horns of antelopes (seven species).

ADDITIONS TO THE LIBRARY

BY DONATION AND EXCHANGE,

FROM JULY 1ST, 1905, TO JUNE 30TH, 1906.

BRITISH SOCIETIES AND INSTITUTIONS.

Berwick-upon-Tweed:—*Berwickshire Naturalists' Club*.

History of the Club, vol. 19, part 1.

Cambridge University:—*Philosophical Society*.

Proceedings, vol. 13, parts 3, 4, and 5.

Cambridge University.

Report of the Library Syndicate for 1904.

Cardiff:—*Museum and Art Gallery*.

Report of the Welsh Museum for 1904-5.

Cardiff:—*Naturalists' Society*.

Transactions, vol. 37, 1904; vol. 38, 1905.

Dublin:—*Royal Dublin Society*.

Transactions, vol. 9, parts 2, 3.

Scientific Proceedings, vol. 10, part 3; vol. 11, parts 1-9.

Economic Proceedings, vol. 1, parts 6, 7.

Edinburgh:—*Botanical Society*.

Transactions and Proceedings, vol. 23, part 1.

Edinburgh:—*Geological Society*.

Transactions, vol. 8, part 3.

Greenwich:—*Royal Observatory*.

Results of the Magnetical and Meteorological Observations, 1903.

Glasgow:—*Natural History Society*.

Transactions, vol. 7 (new series), part 1, 1902-03.

Leeds:—*Literary and Philosophical Society*.

85th Annual Report, 1904-5.

Leicester:—*Corporation Museum and Art Gallery*.

14th and 15th Reports.

Liverpool:—Literary and Philosophical Society.

Proceedings, vol. 58.

*Liverpool:—Institute of Commercial Research in the Tropics,
Liverpool University.*

Quarterly Journal, vol. 1. nos. 1, 2.

London:—British Association for the Advancement of Science.

Report of 75th Meeting, South Africa, 1905.

London:—British Museum (Natural History), South Kensington.

Catalogue of Moths, vol. 5, text and plates.

Guide to Bird Gallery.

Catalogue of Corals, vol. 5.

Catalogue of Glossopteris Flora.

London:—Quekett Microscopical Club.

Journal, ser. 2, vol. 9, nos. 57, 58.

London:—Zoological Society.

Proceedings, 1905, vol. 1, part 2; vol. 2, parts 1, 2.

Transactions, vol. 17, parts 4, 5.

Manchester:—Literary and Philosophical Society.

Memoirs and Proceedings, vol. 49, part 3, 1904-5; vol. 50, parts 1, 2.

Manchester:—Manchester Museum, The University.

Report for year 1904-5.

Newcastle-on-Tyne:—Armstrong College.

Calendar, 1905-6.

*Newcastle-on-Tyne:—North of England Institute of Mining
and Mechanical Engineers.*

Transactions, vol. 52, part 8; vol. 53, part 5; vol. 54, part 8;
vol. 55, part 5; vol. 56, parts 1, 2.

Annual Report, 1904-05.

Report of the Committee upon Mechanical Coal-cutting.

*Northampton:—Northamptonshire Natural History Society
and Field Club.*

Journal, vol. 13, nos. 101-104.

Norwich:—Castle Museum.

The Report of the Committee to the Town Council, 1905.

Norwich:—Norfolk and Norwich Naturalists' Society.

Transactions, vol. 8, part 1, 1904-5.

Plymouth:—*Municipal Museum and Art Gallery*.

Sixth Annual Report.

Plymouth:—*Plymouth Institute*.

Report and Transactions, vol. 14, part 2, 1904-5.

Stone, Staffs:—*North Staffordshire Field Club*.

Annual Report and Transactions, vol. 39, 1904-05.

Stratford, Essex:—*Essex Field Club*.

"The Essex Naturalist," vol. 2, nos. 3, 4; vol. 8— vol. 14, part 4.

Worcester:—*Public Library, Museum, and Art Gallery*.

Report for 1903-4.

York:—*Yorkshire Philosophical Society*.

Annual Report for 1905.

COLONIAL SOCIETIES AND INSTITUTIONS.

Cape Town:—*South African Museum*.

Annals, vol. 3, parts 7, 8, 9, title, index, &c.; vol. 5, parts 1, 2.

Report for year ending December, 1904.

Halifax, Nova Scotia:—*Nova Scotian Institute of Science*.

Proceedings and Transactions, vol. 2, part 1.

Melbourne:—*Public Library, Museum, and National Gallery of Victoria*.

Catalogue of Current Periodicals, 1905.

Montreal:—*Natural History Society*.

Canadian Record of Science, 1905, vol. 9, nos. 3-5.

Ottawa:—*Department of the Interior*.

Relief Map, Windsor Map, Resource Map.

Perth, Western Australia:—*Geological Survey*.

Bulletin, nos. 16, 17, 18, 20.

Pietermaritzburg:—*Natal Government Museum*.

First Report (1904).

Sydney, N.S.W.:—*Australian Museum*.

51st Annual Report.

Records, vol. 5, no. 6; vol. 6, no. 2.

Sydney, N.S.W.:—*Australasian Association for the Advancement of Science*.

Report of the Hobart Session, vol. 9, 1902.

AMERICAN SOCIETIES AND INSTITUTIONS.

UNITED STATES OF AMERICA.

Ann Arbor, Michigan, U.S.A.:—Michigan Academy of Science.
5th and 7th Annual Reports.

Boston:—American Academy of Arts and Sciences.

Proceedings, vol. 40, nos. 23, 24; vol. 41, nos. 1, 2, 4-10, 12-29.

Memoirs, vol. 13, no. 3.

Brooklyn, N.Y.:—Brooklyn Institute of Arts and Sciences.

Science Bulletin, vol. 1, no. 7.

Cambridge:—Museum of Comparative Zoology, Harvard College.

Bulletin, vol. 43, no. 4; vol. 46, nos. 6-14; vol. 48, nos. 1-3;
vol. 50, no. 1.

Bulletin, Geological Series, vol. 8 (vol. 49), nos. 1-3.

Memoirs, vol. 30, no. 2; vol. 32; vol. 33; vol. 36, no. 5.

Annual Report of the Curator, 1904-05.

Chicago, U.S.A.:—Field Columbian Museum.

Anthropological Series, vol. 6, nos. 2, 3; vol. 7, no. 2; vol. 8; vol. 9,
nos. 1, 2.

Report Series, vol. 2, no. 5.

Botanical Series, vol. 2, no. 3.

Geological Series, vol. 2, no. 7; vol. 3, no. 2.

Cincinnati:—Lloyd Library.

Bulletin, no. 5.

Mycological Series, no. 2.

Mycological Notes.

Columbus:—Ohio State University.

Bulletin, vol. 10, nos. 1, 3, and supplement to no. 5.

Minneapolis, Minn.:—Geological and Natural History Survey.

Minnesota Botanical Studies, series 5.

New York:—Academy of Sciences.

Annals, vol. 16, part 2.

Philadelphia:—Academy of Natural Sciences.

Proceedings, vol. 57, parts 1, 2.

Philadelphia:—American Philosophical Society.

Proceedings, vol. 44, nos. 179, 180, 181.

Transactions, vol. 21, part 2.

St. Louis :—Academy of Science.

Transactions, vol. 14, nos. 7, 8 ; vol. 15, nos. 1-5.

Tufts College, Mass..

Tufts College Studies, vol. 2, no. 1 (scientific series).

Washington :—Carnegie Institute of Washington.

"Stages in the development of *Sium Cicutæfolium* Mutants and Hybrids of the *Oenotheras*."

Washington :—Smithsonian Institution.

Annual Report for 1904.

Miscellaneous Collections, vol. 46, nos. 1444, 1571, and 1572 ; vol. 49, no. 1584.

Miscellaneous Collections, Quarterly Issue, vol. 2, part 4 ; vol. 3, parts 1, 2.

Contributions to Knowledge, vol. 34, no. 1651.

Washington :—Smithsonian Institution, U.S. National Museum.

Report of U.S. National Museum, 1903-04 ; 1904-5.

Bulletin, no. 53, part 1, nos. 54, 55.

Proceedings, vol. 28, 29.

Contributions to the History of American Geology.

Washington :—United States Geological Survey.

25th Annual Report, 1903-04, and 26th Annual Report, 1904-5.

Bulletins 234-240, 242-274, 276.

Professional Papers, 34, 36-38, 40-44 ; no. 48, parts 1, 2, and 3.

Mineral Resources of the U.S., 1903, 1904.

Water-supply Papers, nos. 99, 100, 103, 105-152, 154-167.

Monographs, 29-33, 35, 39, 47, 48 ; atlas, no. 32.

SOUTH AMERICAN STATES, ETC.

Mexico :—Instituto Geologico.

Parergones, tomo 1, num. 9, 10.

Boletin, num. 20.

Montevideo, Uruguay :—Museo Nacional.

Anales, tomo 2, 1905 ; serie 2, entr. 2.

Anales, Seccion Historico-Filosofica, tomo 1 ; tomo 2, entr. 1.

Manilla :—Department of the Interior.

Ethnological Survey Publications, vol. 1.

EUROPEAN SOCIETIES AND INSTITUTIONS.

Bergen :—*Bergens Museum*.

Aarsberetninger for 1905.

Aarbog, 1905, hefte 2, 3.

Crustacea of Norway (G. O. Sars), vol. 5, parts 9-12.

Brussels :—*Société Royale Zoologique et Malacologique de Belgique*.

Annales, tome 40 (1905).

Christiania :—*Royal University of Norway*.

Winge : Den Norske Sindssygelovgivning.

Copenhagen :—*Naturhistoriske Forening*.

Videnskabelige Meddelelser, 1905.

Dresden :—*Naturwissenschaftliche Gesellschaft "Isis."*

Sitzungsberichte and Abhandlungen, Juli bis Dezember, 1904 ; Jan. bis Juni, 1905 ; Juli bis Dezember, 1905.

Frankfurt a. M. :—*Senckenbergische Naturforschende Gesellschaft*.

Bericht, 1868-1905 (except for 1871-2, 1872-3, 1874-5).

Index to Scientific Publications, 1826-97.

Catalogues of Birds, Reptiles, and Batrachians.

Helsingfors :—*Societas pro Fauna et Flora Fennica*.

Acta, vol. 21, 22, 23, 25.

Meddelanden, parts 28, 29.

Kiew, Russia :—*Société des Naturalistes de Kiew*.

Mémoires, tome 20, livr. 1.

Marseilles :—*Faculté des Sciences*.

Annales, tome 15, fasc. 1, 5 ; and various papers.

Paris :—*Muséum d'Histoire Naturelle*.

Bulletin, 1905, nos. 1-5.

Stockholm :—*Kongliga Svenska Vetenskaps-Akademien*.

Les Prix Nobel en 1903.

Handlingar, band 39, nos. 1-6 ; band 40, nos. 1-4.

Arkiv for Botanik, band 4, hefte 1-4 ; band 5, nos. 1-4.

Arkiv for Zoologi, band 2, hefte 2, 3 ; band 3, hefte 1.

Arkiv for Matematik, Astronomi och Fysik, band 2, hefte 1-4.

Arkiv for Kemi, Mineralogi och Geologi, band 2, hefte 1, 2.

Aarsbog, 1905.

Meddelanden, band 1, no. 1.

"Bicentenary Memoir of Peter Artedi."

Upsala :—*Geological Institution, University of Upsala.*

"Results of the Swedish Zoological Expedition to Egypt and the White Nile," part 2.

Vienna :—*K. k. zoologisch-botanische Gesellschaft.*

Verhandlungen, Band 55.

MISCELLANEOUS.

Cash and Hopkinson.—"British Freshwater Rhizopoda and Heliozoa," vol. 1, part 1.

West.—"A Monograph of the British Desmidiaceæ," vol. 2, 1905.

From the Ray Society (by subscription).

Sherborn and Smith Woodward.—Catalogue of British Fossil Vertebrata.

Sherborn.—"Index Animalium," 1758-1800.

From C. Davies Sherborn (in exchange for the catalogue of the "Museum Humphredianum.")

Papers by C. Davies Sherborn :—"Note on the Museum Humphredianum, 1779" (2 reprints); "Birds in Vroeg's Catalogue" (pamphlet).

Presented by the Author.

Papers by Charles Janet :—"Observations sur les Guêpes"; "Observations sur les Fourmis"; "Description du Matériel d'une petite Installation scientifique."

Presented by the Author.

Papers by D. Woolacott, D.Sc. :—"Superficial Deposits and Pre-glacial Valleys of the Northumberland and Durham Coalfield"; "The Pre-glacial 'Wash' of the Northumberland and Durham Coalfield."

Presented by the Author.

Catalogue of British Columbia Birds in the Provincial Museum, Victoria, B.C.; Catalogue of British Columbia Lepidoptera in the Provincial Museum, Victoria, B.C.

Presented by N. H. Martin, F.R.S.E.

"Nature," July 1st, 1905, to June 30th, 1906.

Presented by the Publishers.

"Museums Journal," July, 1905, to June, 1906.

From the Museums Association (by subscription).

THE HONORARY TREASURER IN ACCOUNT WITH THE NATURAL HISTORY SOCIETY.

CURRENT ACCOUNT FROM JULY 1ST, 1905, TO JUNE 30TH, 1906.

RECEIPTS.		PAYMENTS.	
£	s. d.	£	s. d.
Balance in Bank, July 1st 1905	23 4 0	Salaries and Wages	442 18 2
Members' Subscriptions	445 19 6	Advertising	7 1 9
Museum Admission Fees	153 7 11	Fuel, Lighting, and Water	42 10 4
Sale of Guide Books and Society's Transactions... 5 13 11	5 13 11	Insurance	13 6 1
Interest on Investments*	201 17 6	Materials and Fittings	16 15 8
Sundries	4 19 4	Postage and Carriage	22 17 5
		Printing (Transactions and miscellaneous)	156 9 0
		Property Tax	9 3 4
		Building Repair Fund	40 0 0
		Stationery	2 13 9
		Sundries	38 12 3
		Balance.....	42 14 5
	<u>£835 2 2</u>		<u>£835 2 2</u>

* This includes *three* half-year's interest on the Tyne Commissioners' Consolidated Fund 4 per cent. Stock.

† In addition to this there is an outstanding liability for printing for £136 11s. 3d.

BUILDING REPAIR FUND.

1905.		1905-06	
£	s. d.	£	s. d.
To Cash in hand	40 0 0	By Repairs, 1905-06	3 17 5
		" Balance	36 2 7
	<u>£40 0 0</u>		<u>£40 0 0</u>

A. H. DICKINSON, Hon. Treasurer.

SAML. GRAHAM, Hon. Auditor.

NATURAL HISTORY SOCIETY.

INVESTMENTS.

The following is a list of the Investments held by the Society, June 30th, 1906 :—

	£	s.	d.
Newcastle Corporation Irredeemable Stock at $3\frac{1}{2}$ per cent.	2,000	0	0
River Wear Commission Funded Debt at $4\frac{1}{2}$ per cent. ...	500	0	0
Tyne Commissioners' Consolidated Fund at 4 per cent....	2,000	0	0

£4,500 0 0

A. H. DICKINSON,
Hon. Treasurer.

SAML. GRAHAM,
Hon. Auditor.

MISCELLANEA.

Waxwing at Ravensworth.—On the 26th December, 1906, in the afternoon, just a few hours before the severe thunderstorm which was followed by the heaviest snowfall we have experienced this winter, I was walking along the coach-road of the Ravensworth estate when I noticed, in the wood which borders the road, a Waxwing. The bird was feeding busily on the berries of a guelder-rose tree. I was able to get quite near it without disturbing it, and so got a very good view of the details of its plumage. Its colouring was very bright, but the wax-like tips to its secondaries were few and small. It had no wax tips to its tail feathers. Though I watched the guelder-rose trees for some considerable time, I could not see any more than this one solitary bird.—*George W. Temperley.*

Local Breeding of the Tufted Duck.—It has been frequently remarked lately that the Tufted Duck (*Fuligula cristata*) is becoming commoner as a breeding species in the northern counties of England. It is therefore of interest to record a local instance. Mr. Geo. E. Crawhall reports that a pair of Tufted Ducks bred last year (1906) on a piece of water near Haydon Bridge; he saw them with their brood on July 23rd, the young ones then appearing to be about three days old.

A Cat-fish new to British Seas.—On July 25th, 1906, Mr. Andrew Thomson, fishmonger, of Elswick Road, brought to the museum a large cat-fish which had been landed that morning at North Shields, where the fishermen said that its like had never been seen before. Its most obvious point of difference from the common cat-fish (*Anarrhichas lupus*, Linn.) was in colour; instead of being slate-green with dark bars it was of a uniform grey-brown or dark stone-colour, finely mottled and streaked with whitish. Its snout also was not quite so blunt as in the common species, the dorsal fin was very low, thick and fleshy, and the tail very small. Its total

length was 4-ft. 1-in. With the kind assistance of Mr. C. T. Regan, of the British Museum, the fish was identified as an example of an arctic species of cat-fish, *Anarrhichas latifrons*, Steenstrup and Hallgrimossn (= *A. denticulatus*, Kroyer*). This species is known chiefly from within the Arctic Circle, and it had never previously been recorded from British waters. Mr. Thomson has ascertained for us that the present example was caught 15 miles east-north-east from Tynemouth bar, on 50 fathoms of water (s.s. Nellie, skipper R. A. Lang).

The most important characteristic of this species from a systematic point of view is the size and arrangement of the teeth. These are much smaller than in *A. lupus*, and the vomerine teeth in the middle of the roof of the mouth do not extend so far back as the palatine series at the sides; in *A. lupus* exactly the opposite arrangement is found. A cast of the entire fish was taken, and the head is preserved at the museum.—*E. L. Gill.*

Fusus islandicus, a correction.—In the list of Mollusca taken with a dredge in 1901 (see "Report on Dredging and other Marine Research off the North-East Coast of England in 1901," by G. S. Brady, M.D., F.R.S., etc., Natural History Transactions of Northumberland, Durham, and Newcastle-upon-Tyne, vol. 14, page 93), I much regret having recorded *Fusus islandicus*, Chem., from this coast. The specimens turned out to be large *Fusus gracilis*, Da Costa.—*M. V. Lebour.*

Larval Trematodes: further notes and references.—In my paper on larval Trematodes in the present number I find I was mistaken in stating with regard to *Monostomum flavum* that the small suckers at the posterior angles of the body had apparently not before been noticed. They were noticed by Nitzsch in his *Cercaria ephemera*, and Looss ("Recherches sur la Faune Parasitaire de l'Egypte," 1896, p. 194) gives a detailed account of these structures in *Cercaria imbricata*.

* See Jordan and Evermann, Bulletin of the U.S. National Museum, No. 47, p. 2446 (in the Society's library).

He considers them to be auxiliaries to locomotion, serving to fix the body whilst the anterior part is extended. The Cercaria he describes, found in *Paludina impura* and *Melania tuberculata*, agrees very well with my specimens. He considers it however to be the larval form of *Monostomum verrucosum*, Froel. I had not seen this work when I wrote my paper. His *Cercaria pleurolophocerca* seems closely allied to *C. lophocerca*, and my *Cercaria ubiquita* is very like his *C. exigua*, *C. cellulosa*, and *C. pusilla*, though probably not identical with any of them; but in all these there is a conspicuous ventral sucker, which makes it all the more probable that one will be found in my specimens.—*Marie V. Lebour.*

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